SEN01983-01

Shop Manual

HYDRAULIC
EXCAVATOR

GALEO

PC300 -8
PC300LC -8
PC350 -8
PC350LC -8

SERIAL NUMBERS

PC300- 60001
PC300LC- 60001
PC350- 60001
PC350LC- 60001

and up

ecot3

KOMATSU

HYDRAULIC EXCAVATOR

PC300-8
PC300LC-8
PC350-8
PC350LC-8

Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

00 Index and foreword

Index

Composition of shop manual

The contents of this shop manual are shown together with Form No. in a list.

Note 1: Always keep the latest version of this manual in accordance with this list and utilize accordingly.
The marks shown to the right of Form No. denote the following:
○: New issue (to be filed additionally) ●: Revision (to be replaced for each Form No.)

Note 2: This shop manual can be supplied for each Form No.

Note 3: To file this shop manual in the special binder for management, handle it as follows:
- Place a divider on the top of each section in the file after matching the Tub No. with No. indicated next to each Section Name shown in the table below:
- File overview and other materials in sections in the order shown below and utilize them accordingly.

Table of contents

PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN01985-01

HYDRAULIC EXCAVATOR

PC300-8
PC300LC-8
PC350-8
PC350LC-8

Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

00 Index and foreword

Foreword and general information

Safety notice

(Rev. 2007/03)

Important safety notice

Proper service and repair are extremely important for safe machine operation. The service and repair techniques recommended by Komatsu and described in this manual are both effective and safe. Some of these techniques require the use of tools specially designed by Komatsu for the specific purpose.

To prevent injury to workers, the symbol ⚠ is used to mark safety precautions in this manual. The cautions accompanying these symbols should always be followed carefully. If any dangerous situation arises or may possibly arise, first consider safety, and take the necessary actions to deal with the situation.

1. General precautions

⚠ **Mistakes in operation are extremely dangerous. Read the Operation and Maintenance Manual carefully before operating the machine.**

1) Before carrying out any greasing or repairs, read all the safety plates stuck to the machine. For the locations of the safety plates and detailed explanation of precautions, see the Operation and Maintenance Manual.
2) Decide a place in the repair workshop to keep tools and removed parts. Always keep the tools and parts in their correct places. Always keep the work area clean and make sure that there is no dirt, water, or oil on the floor. Smoke only in the areas provided for smoking. Never smoke while working.
3) When carrying out any operation, always wear safety shoes and helmet. Do not wear loose work clothes, or clothes with buttons missing.
   - Always wear safety glasses when hitting parts with a hammer.
   - Always wear safety glasses when grinding parts with a grinder, etc.
4) When carrying out any operation with 2 or more workers, always agree on the operating procedure before starting. Always inform your fellow workers before starting any step of the operation. Before starting work, hang UNDER REPAIR warning signs in the operator's compartment.
5) Only qualified workers must carry out work and operation which require license or qualification.
6) Keep all tools in good condition, learn the correct way to use them, and use the proper ones of them. Before starting work, thoroughly check the tools, machine, forklift, service car, etc.
7) If welding repairs are needed, always have a trained and experienced welder carry out the work. When carrying out welding work, always wear welding gloves, apron, shielding goggles, cap and other clothes suited for welding work.
8) Before starting work, warm up your body thoroughly to start work under good condition.

Safety points

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

2. Preparations for work

1) Before adding oil or making any repairs, park the machine on hard and level ground, and apply the parking brake and block the wheels or tracks to prevent the machine from moving.
2) Before starting work, lower the work equipment (blade, ripper, bucket, etc.) to the ground. If this is not possible, insert the lock pin or use blocks to prevent the work equipment from falling. In addition, be sure to lock all the control levers and hang warning signs on them.

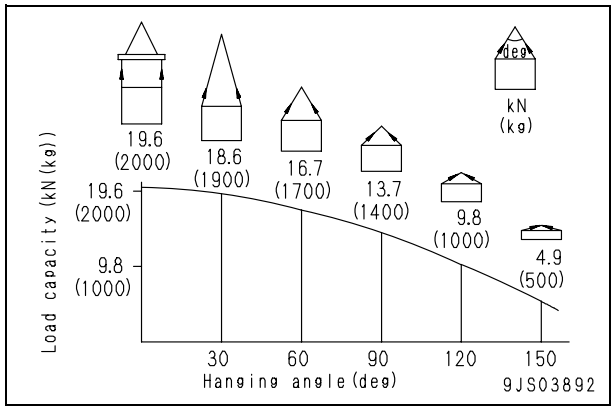
3) When disassembling or assembling, support the machine with blocks, jacks, or stands before starting work.
4) Remove all mud and oil from the steps or other places used to get on and off the machine. Always use the handrails, ladders or steps when getting on or off the machine. Never jump on or off the machine. If it is impossible to use the handrails, ladders or steps, use a stand to provide safe footing.

3. Precautions during work

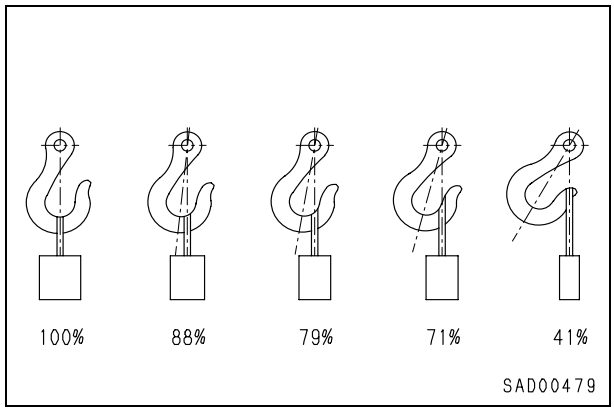
1) Before disconnecting or removing components of the oil, water, or air circuits, first release the pressure completely from the circuit. When removing the oil filler cap, a drain plug, or an oil pressure pickup plug, loosen it slowly to prevent the oil from spurting out.
2) The coolant and oil in the circuits are hot when the engine is stopped, so be careful not to get scalded. Wait for the oil and coolant to cool before carrying out any work on the oil or water circuits.
3) Before starting work, stop the engine. When working on or around a rotating part, in particular, stop the engine. When checking the machine without stopping the engine (measuring oil pressure, revolving speed, temperature, etc.), take extreme care not to get rolled or caught in rotating parts or moving parts.
4) Before starting work, remove the leads from the battery. Always remove the lead from the negative (–) terminal first.
5) When raising a heavy component (heavier than 25 kg), use a hoist or crane. Before starting work, check that the slings (wire ropes, chains, and hooks) are free from damage. Always use slings which have ample capacity and install them to proper places. Operate the hoist or crane slowly to prevent the component from hitting any other part. Do not work with any part still raised by the hoist or crane.
6) When removing a cover which is under internal pressure or under pressure from a spring, always leave 2 bolts in diagonal positions. Loosen those bolts gradually and alternately to release the pressure, and then remove the cover.
7) When removing components, be careful not to break or damage the electrical wiring. Damaged wiring may cause electrical fires.
8) When removing piping, stop the fuel or oil from spilling out. If any fuel or oil drips onto the floor, wipe it up immediately. Fuel or oil on the floor can cause you to slip and can even start fires.
9) As a general rule, do not use gasoline to wash parts. Do not use it to clean electrical parts, in particular.
10) Be sure to assemble all parts again in their original places. Replace any damaged parts and parts which must not be reused with new parts. When installing hoses and wires, be sure that they will not be damaged by contact with other parts when the machine is operated.
11) When installing high pressure hoses, make sure that they are not twisted. Damaged tubes are dangerous, so be extremely careful when installing tubes for high pressure circuits. In addition, check that connecting parts are correctly installed.
12) When assembling or installing parts, always tighten them to the specified torques. When installing protective parts such as guards, or parts which vibrate violently or rotate at high speed, be particularly careful to check that they are installed correctly.
13) When aligning 2 holes, never insert your fingers or hand. Be careful not to get your fingers caught in a hole.
14) When measuring hydraulic pressure, check that the measuring tools are correctly assembled.
15) Take care when removing or installing the tracks of track-type machines. When removing the track, the track separates suddenly, so never let anyone stand at either end of the track.
16) If the engine is operated for a long time in a place which is not ventilated well, you may suffer from gas poisoning. Accordingly, open the windows and doors to ventilate well.

4. Precautions for sling work and making signs

1) Only one appointed worker must make signs and co-workers must communicate with each other frequently. The appointed sign maker must make specified signs clearly at a place where he is seen well from the operator's seat and where he can see the working condition easily. The sign maker must always stand in front of the load and guide the operator safely.
   - Do not stand under the load.
   - Do not step on the load.
2) Check the slings before starting sling work.
3) Keep putting on gloves during sling work. (Put on leather gloves, if available.)
4) Measure the weight of the load by the eye and check its center of gravity.
5) Use proper sling according to the weight of the load and method of slinging. If too thick wire ropes are used to sling a light load, the load may slip and fall.
6) Do not sling a load with 1 wire rope alone. If it is slung so, it may rotate and may slip out of the rope. Install 2 or more wire ropes symmetrically.
   ⚠ Slinging with 1 rope may cause turning of the load during hoisting, untwisting of the rope, or slipping of the rope from its original winding position on the load, which can result in a dangerous accident.
7) Limit the hanging angle to 60°, as a rule. Do not sling a heavy load with ropes forming a wide hanging angle from the hook. When hoisting a load with 2 or more ropes, the force subjected to each rope will increase with the hanging angle. The table below shows the variation of allowable load in kN {kg} when hoisting is made with 2 ropes, each of which is allowed to sling up to 9.8 kN {1,000 kg} vertically, at various hanging angles. When the 2 ropes sling a load vertically, up to 19.6 kN {2,000 kg} of total weight can be suspended. This weight is reduced to 9.8 kN {1,000 kg} when the 2 ropes make a hanging angle of 120°. If the 2 ropes sling a 19.6 kN {2,000 kg} load at a lifting angle of 150°, each of them is subjected to a force as large as 39.2 kN {4,000 kg}.



8) When installing wire ropes to an angular load, apply pads to protect the wire ropes. If the load is slippery, apply proper material to prevent the wire rope from slipping.
9) Use the specified eyebolts and fix wire ropes, chains, etc. to them with shackles, etc.
10) Apply wire ropes to the middle portion of the hook.
    - Slinging near the tip of the hook may cause the rope to slip off the hook during hoisting. The hook has the maximum strength at the middle portion.



11) Do not use twisted or kinked wire ropes.
12) When lifting up a load, observe the following.
    - Wind in the crane slowly until wire ropes are stretched. When settling the wire ropes with the hand, do not grasp them but press them from above. If you grasp them, your fingers may be caught.
    - After the wire ropes are stretched, stop the crane and check the condition of the slung load, wire ropes, and pads.

- If the load is unstable or the wire rope or chains are twisted, lower the load and lift it up again.
- Do not lift up the load slantingly.

13) When lifting down a load, observe the following.
- When lifting down a load, stop it temporarily at 30 cm above the floor, and then lower it slowly.
- Check that the load is stable, and then remove the sling.
- Remove kinks and dirt from the wire ropes and chains used for the sling work, and put them in the specified place.

5. Precautions for using mobile crane

★ Read the Operation and Maintenance Manual of the crane carefully in advance and operate the crane safely.

6. Precautions for using overhead hoist crane

⚠ **When raising a heavy part (heavier than 25 kg), use a hoist, etc. In Disassembly and assembly, the weight of a part heavier than 25 kg is indicated after the mark of .**

1) Before starting work, inspect the wire ropes, brake, clutch, controller, rails, over wind stop device, electric shock prevention earth leakage breaker, crane collision prevention device, and power application warning lamp, and check safety.
2) Observe the signs for sling work.
3) Operate the hoist at a safe place.
4) Check the direction indicator plates (east, west, south, and north) and the directions of the control buttons without fail.
5) Do not sling a load slantingly. Do not move the crane while the slung load is swinging.
6) Do not raise or lower a load while the crane is moving longitudinally or laterally.
7) Do not drag a sling.
8) When lifting up a load, stop it just after it leaves the ground and check safety, and then lift it up.
9) Consider the travel route in advance and lift up a load to a safe height.
10) Place the control switch on a position where it will not be an obstacle to work and passage.
11) After operating the hoist, do not swing the control switch.
12) Remember the position of the main switch so that you can turn off the power immediately in an emergency.
13) If the hoist stops because of a power failure, turn the power switch OFF. When turning on a switch which was turned OFF by the electric shock prevention earth leakage breaker, check that the devices related to that switch are not in operation state.
14) If you find an obstacle around the hoist, stop the operation.
15) After finishing the work, stop the hoist at the specified position and raise the hook to at least 2 m above the floor. Do not leave the sling installed to the hook.

7. Selecting wire ropes

1) Select adequate ropes depending on the weight of parts to be hoisted, referring to the table below.

Wire ropes
(Standard “Z” twist ropes without galvanizing)
(JIS G3525, No. 6, Type 6X37-A)

Nominal diameter of rope	Allowable load	
mm	kN	ton
10	8.8	0.9
12	12.7	1.3
14	17.3	1.7
16	22.6	2.3
18	28.6	2.9
20	35.3	3.6
25	55.3	5.6
30	79.6	8.1
40	141.6	14.4
50	221.6	22.6
60	318.3	32.4

★ The allowable load is one-sixth of the breaking strength of the rope used (Safety coefficient: 6).

8. Precautions for disconnecting and connecting hoses and tubes in air conditioner circuit

1) Disconnection

⚠ **Collect the air conditioner refrigerant (R134a) from the air conditioner circuit in advance.**

★ Ask professional traders for collecting and filling operation of refrigerant (R134a).

★ Never release the refrigerant (R134a) to the atmosphere.

⚠ **If the refrigerant gas (R134a) gets in your eyes, you may lose your sight. Accordingly, when collecting or filling it, you must be qualified for handling the refrigerant and put on protective goggles.**

2) Connection

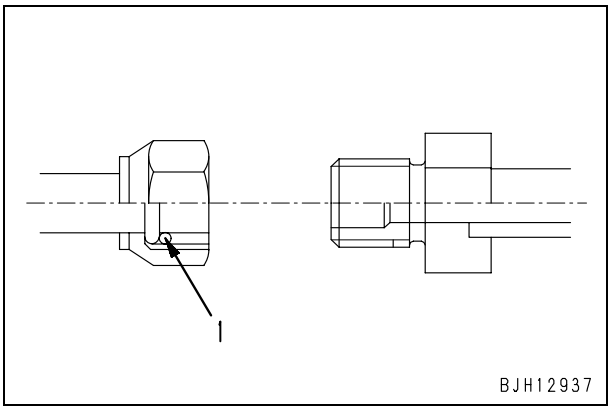
1] When installing the air conditioner circuit hoses and tubes, take care that dirt, dust, water, etc. will not enter them.

2] When connecting the air conditioner hoses and tubes, check that O-rings (1) are fitted to their joints.

3] Check that each O-ring is not damaged or deteriorated.

4] When connecting the refrigerant piping, apply compressor oil for refrigerant (R134a) **(DENSO: ND-OIL8, ZEXEL: ZXL100PG (equivalent to PAG46))** to its O-rings.

★ Example of O-ring (Fitted to every joint of hoses and tubes)



★ For tightening torque, see the precautions for installation in each section of "Disassembly and assembly".

How to read the shop manual

- Some attachments and optional parts in this shop manual may not be delivered to certain areas. If one of them is required, consult KOMATSU distributors.
- Materials and specifications are subject to change without notice.
- Shop manuals are divided into the “Chassis volume” and “Engine volume”. For the engine unit, see the engine volume of the engine model mounted on the machine.

1. Composition of shop manual

This shop manual contains the necessary technical information for services performed in a workshop. For ease of understanding, the manual is divided into the following sections.

00. Index and foreword

This section explains the shop manuals list, table of contents, safety, and basic information.

01. Specification

This section explains the specifications of the machine.

10. Structure, function and maintenance standard

This section explains the structure, function, and maintenance standard values of each component. The structure and function sub-section explains the structure and function of each component. It serves not only to give an understanding of the structure, but also serves as reference material for troubleshooting. The maintenance standard sub-section explains the criteria and remedies for disassembly and service.

20. Standard value table

This section explains the standard values for new machine and judgement criteria for testing, adjusting, and troubleshooting. This standard value table is used to check the standard values in testing and adjusting and to judge parts in troubleshooting.

30. Testing and adjusting

This section explains measuring instruments and measuring methods for testing and adjusting, and method of adjusting each part. The standard values and judgement criteria for testing and adjusting are explained in Testing and adjusting.

40. Troubleshooting

This section explains how to find out failed parts and how to repair them. The troubleshooting is divided by failure modes. The “S mode” of the troubleshooting related to the engine may be also explained in the Chassis volume and Engine volume. In this case, see the Chassis volume.

50. Disassembly and assembly

This section explains the special tools and procedures for removing, installing, disassembling, and assembling each component, as well as precautions for them. In addition, tightening torque and quantity and weight of coating material, oil, grease, and coolant necessary for the work are also explained.

90. Diagrams and drawings (chassis volume)/Repair and replacement of parts (engine volume)

- Chassis volume
  This section gives hydraulic circuit diagrams and electrical circuit diagrams.
- Engine volume
  This section explains the method of reproducing, repairing, and replacing parts.

2. Revision and distribution

Any additions, revisions, or other change of notices will be sent to KOMATSU distributors. Get the most up-to-date information before you start any work.

3. Filing method

File by the brochures in the correct order of the form number printed in the shop manual composition table.

- **Revised edition mark**
  When a manual is revised, the ones and tens digits of the form number of each brochure is increased by 1. (Example: 00, 01, 02 …)

- **Revisions**
  Revised brochures are shown in the shop manual composition table.

4. Symbols

Important safety and quality portions are marked with the following symbols so that the shop manual will be used practically.

Symbol	Item	Remarks
	Safety	Special safety precautions are necessary when performing work.
★	Caution	Special technical precautions or other precautions for preserving standards are necessary when performing work.
	Weight	Weight of parts of component or parts. Caution necessary when selecting hoisting wire, or when working posture is important, etc.
	Tightening torque	Places that require special attention for tightening torque during assembly.
	Coat	Places to be coated with adhesives, etc. during assembly.
	Oil, coolant	Places where oil, etc. must be added, and capacity.
	Drain	Places where oil, etc. must be drained, and quantity to be drained.

5. Units

In this shop manual, the units are indicated with International System of units (SI). For reference, conventionally used Gravitational System of units is indicated in parentheses { }.

Explanation of terms for maintenance standard

The maintenance standard values necessary for judgment of products and parts are described by the following terms.

1. Standard size and tolerance

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

Example:

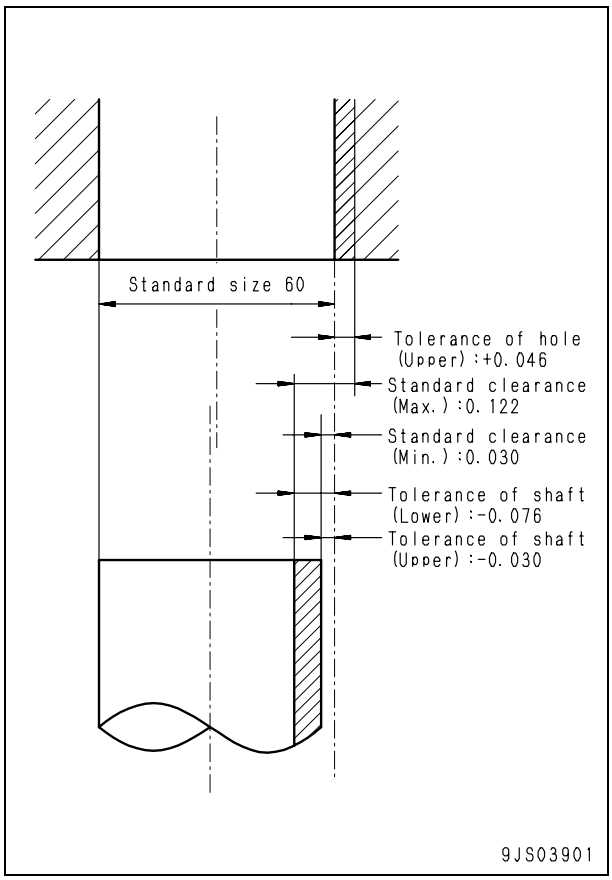
Standard size	Tolerance
120	–0.022 –0.126

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

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

Example:

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



2. Standard clearance and standard value

- The clearance made when new parts are assembled is called the “standard clearance“, which is indicated by the range from the minimum clearance to the maximum clearance.
- When some parts are repaired, the clearance is generally adjusted to the standard clearance.
- A value of performance and function of new products or equivalent is called the “standard value“, which is indicated by a range or a target value.
- When some parts are repaired, the value of performance/function is set to the standard value.

3. Standard interference

- When the diameter of a hole of a part shown in the given standard size and tolerance table is smaller than that of the mating shaft, the difference between those diameters is called the “interference”.
- The range (A – B) from the difference (A) between the minimum size of the shaft and the maximum size of the hole to the difference (B) between the maximum size of the shaft and the minimum size of the hole is the “standard interference”.
- After repairing or replacing some parts, measure the size of their hole and shaft and check that the interference is in the standard range.

4. Repair limit and allowable value

- The size of a part changes because of wear and deformation while it is used. The limit of changed size is called the “repair limit”.
- If a part is worn to the repair limit must be replaced or repaired.
- The performance and function of a product lowers while it is used. A value below which the product can be used without causing a problem is called the “allowable value”.
- If a product is worn to the allowable value, it must be checked or repaired. Since the permissible value is estimated from various tests or experiences in most cases, however, it must be judged after considering the operating condition and customer's requirement.

5. Clearance limit

- Parts can be used until the clearance between them is increased to a certain limit. The limit at which those parts cannot be used is called the “clearance limit”.
- If the clearance between the parts exceeds the clearance limit, they must be replaced or repaired.

6. Interference limit

- The allowable maximum interference between the hole of a part and the shaft of another part to be assembled is called the “interference limit”.
- The interference limit shows the repair limit of the part of smaller tolerance.
- If the interference between the parts exceeds the interference limit, they must be replaced or repaired.

Handling of electric equipment and hydraulic component

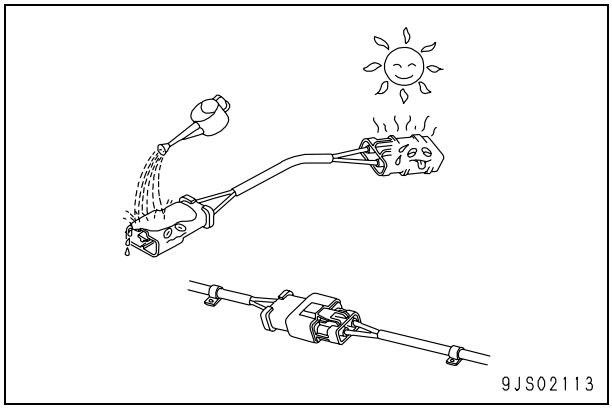
To maintain the performance of the machine over a long period, and to prevent failures or other troubles before they occur, correct “operation“, “maintenance and inspection“, “troubleshooting“, and “repairs” must be carried out. This section deals particularly with correct repair procedures for mechatronics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

Points to remember when handling electric equipment

1. Handling wiring harnesses and connectors

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

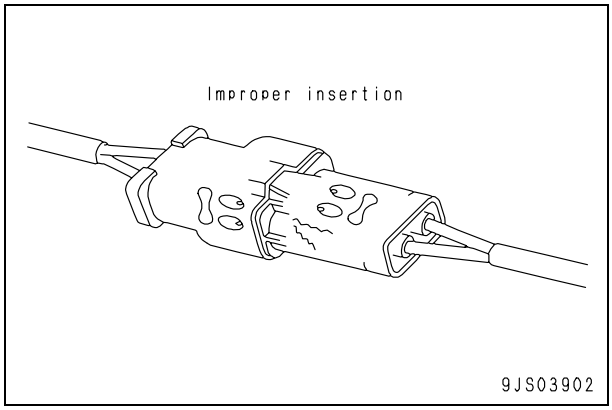
Compared with other electrical components fitted in boxes or cases, wiring harnesses are more likely to be affected by the direct effects of rain, water, heat, or vibration. Furthermore, during inspection and repair operations, they are frequently removed and installed again, so they are likely to suffer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



2. Main failures occurring in wiring harness

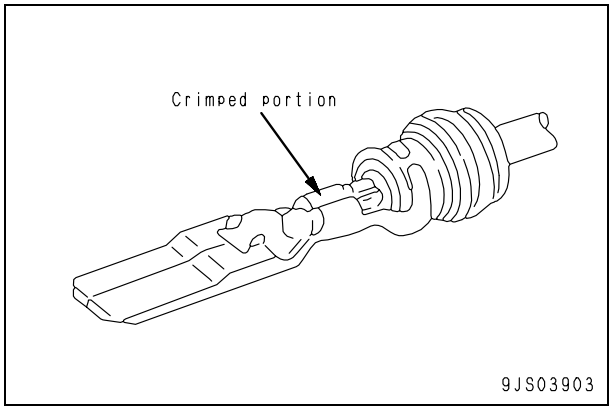
1) Defective contact of connectors (defective contact between male and female)

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

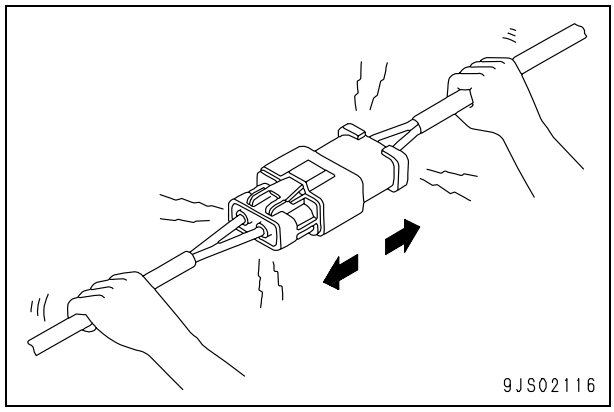


2) Defective crimping or soldering of connectors

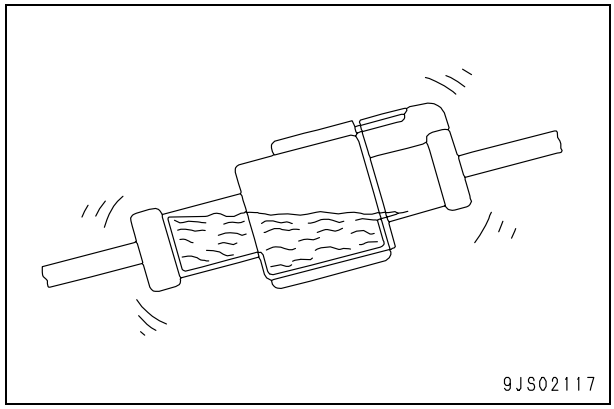
The pins of the male and female connectors are in contact at the crimped terminal or soldered portion, but if there is excessive force brought to bear on the wiring, the plating at the joint will peel and cause improper connection or breakage.



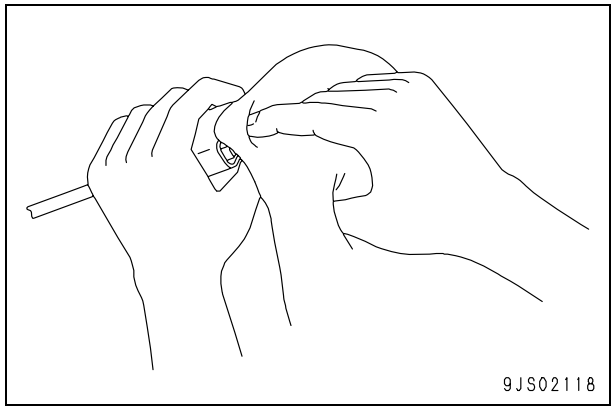
3) Disconnections in wiring
If the wiring is held and the connectors are pulled apart, or components are lifted with a crane with the wiring still connected, or a heavy object hits the wiring, the crimping of the connector may separate, or the soldering may be damaged, or the wiring may be broken.



4) High-pressure water entering connector
The connector is designed to make it difficult for water to enter (drip-proof structure), but if high-pressure water is sprayed directly on the connector, water may enter the connector, depending on the direction of the water jet. Accordingly, take care not to splash water over the connector. The connector is designed to prevent water from entering, but at the same time, if water does enter, it is difficult for it to be drained. Therefore, if water should get into the connector, the pins will be short-circuited by the water, so if any water gets in, immediately dry the connector or take other appropriate action before passing electricity through it.



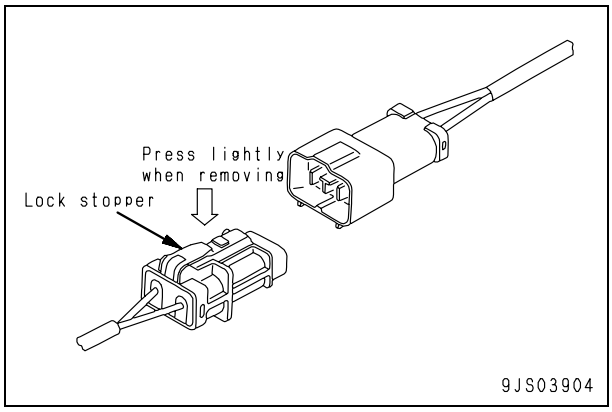
5) Oil or dirt stuck to connector
If oil or grease are stuck to the connector and an oil film is formed on the mating surface between the male and female pins, the oil will not let the electricity pass, so there will be defective contact. If there is oil or grease stuck to the connector, wipe it off with a dry cloth or blow it dry with compressed air and spray it with a contact restorer.
★ When wiping the mating portion of the connector, be careful not to use excessive force or deform the pins.
★ If there is oil or water in the compressed air, the contacts will become even dirtier, so remove the oil and water from the compressed air completely before cleaning with compressed air.



3. Removing, installing, and drying connectors and wiring harnesses

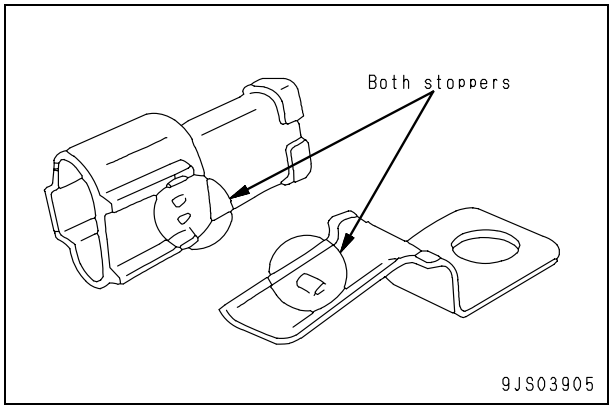
1) Disconnecting connectors

1] Hold the connectors when disconnecting.
When disconnecting the connectors, hold the connectors. For connectors held by a screw, loosen the screw fully, then hold the male and female connectors in each hand and pull apart. For connectors which have a lock stopper, press down the stopper with your thumb and pull the connectors apart.
★ Never pull with one hand.

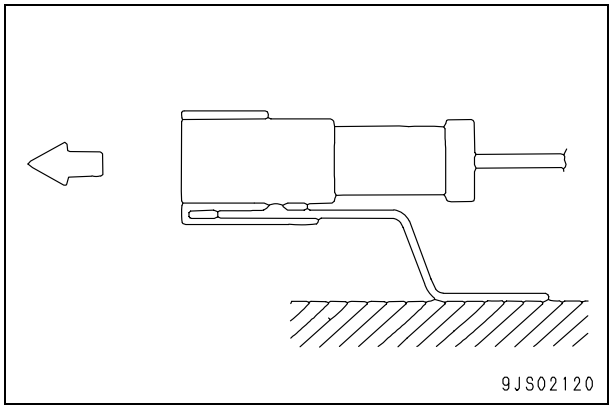


2] When removing from clips

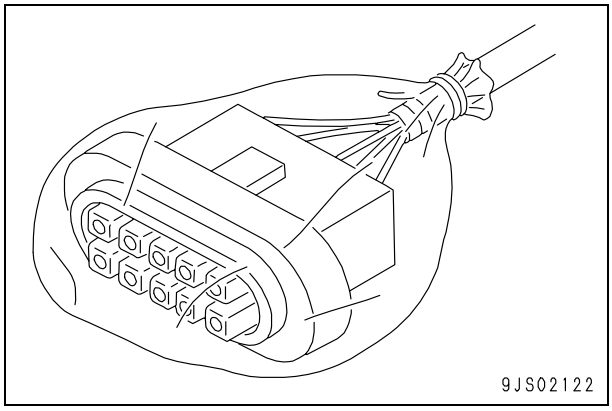
- Both of the connector and clip have stoppers, which are engaged with each other when the connector is installed.



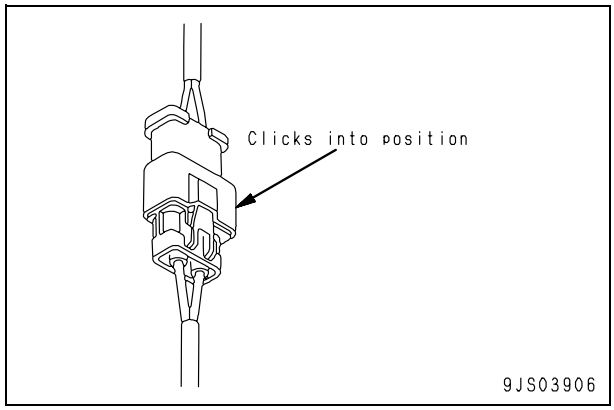
- When removing a connector from a clip, pull the connector in a parallel direction to the clip for removing stoppers.
★ If the connector is twisted up and down or to the left or right, the housing may break.

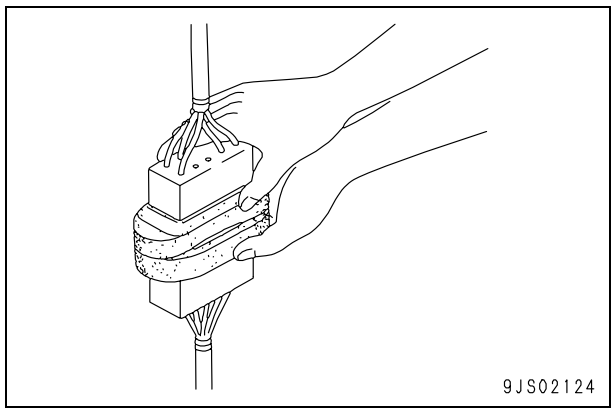


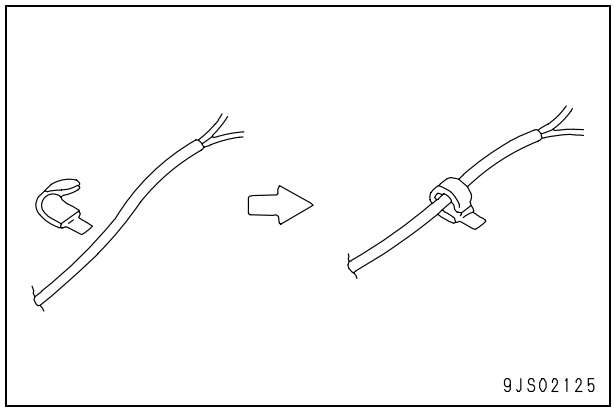
3] Action to take after removing connectors
After removing any connector, cover it with a vinyl bag to prevent any dust, dirt, oil, or water from getting in the connector portion.
★ If the machine is left disassembled for a long time, it is particularly easy for improper contact to occur, so always cover the connector.



2) Connecting connectors
   1] Check the connector visually.
   Check that there is no oil, dirt, or water stuck to the connector pins (mating portion).
   Check that there is no deformation, defective contact, corrosion, or damage to the connector pins.
   Check that there is no damage or breakage to the outside of the connector.
   ★ If there is any oil, water, or dirt stuck to the connector, wipe it off with a dry cloth. If any water has got inside the connector, warm the inside of the wiring with a dryer, but be careful not to make it too hot as this will cause short circuits.
   ★ If there is any damage or breakage, replace the connector.
   2] Fix the connector securely.
   Align the position of the connector correctly, and then insert it securely. For connectors with the lock stopper, push in the connector until the stopper clicks into position.
   3] Correct any protrusion of the boot and any misalignment of the wiring harness.
   For connectors fitted with boots, correct any protrusion of the boot. In addition, if the wiring harness is misaligned, or the clamp is out of position, adjust it to its correct position.
   ★ If the connector cannot be corrected easily, remove the clamp and adjust the position.
   ● If the connector clamp has been removed, be sure to return it to its original position. Check also that there are no loose clamps.

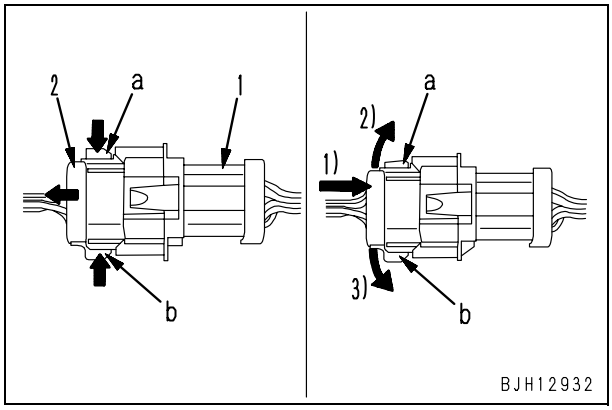




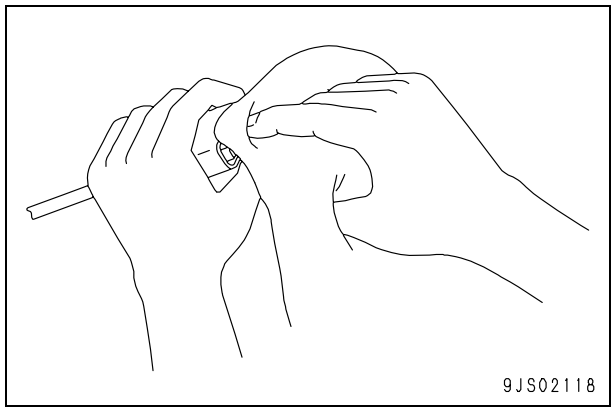


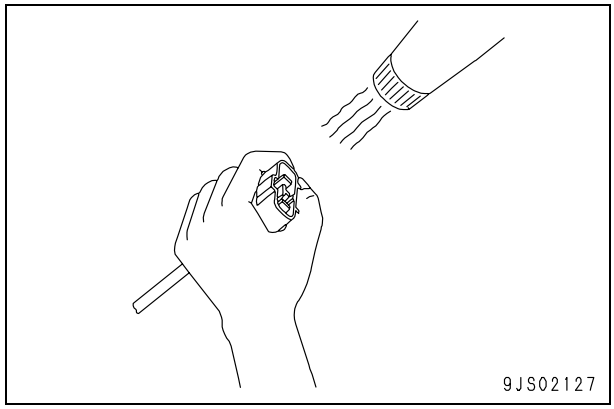
3) Heavy duty wire connector (DT 8-pole, 12-pole)
Disconnection (Left of figure)
While pressing both sides of locks (a) and (b), pull out female connector (2).
Connection (Right of figure)
1] Push in female connector (2) horizontally until the lock clicks.
Arrow: 1)
2] Since locks (a) and (b) may not be set completely, push in female connector (2) while moving it up and down until the locks are set normally.
Arrow: 1), 2), 3)
★ Right of figure: Lock (a) is pulled down (not set completely) and lock (b) is set completely.
(1): Male connector
(2): Female connector
(a), (b): Locks

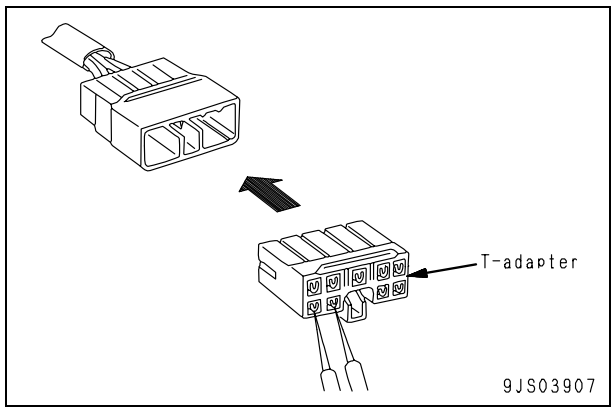
- Disconnection
- Connection (Example of incomplete setting of (a))



4) Drying wiring harness
If there is any oil or dirt on the wiring harness, wipe it off with a dry cloth. Avoid washing it in water or using steam. If the connector must be washed in water, do not use high-pressure water or steam directly on the wiring harness. If water gets directly on the connector, do as follows.
   1] Disconnect the connector and wipe off the water with a dry cloth.
      ★ If the connector is blown dry with compressed air, there is the risk that oil in the air may cause defective contact, so remove all oil and water from the compressed air before blowing with air.
   2] Dry the inside of the connector with a dryer.
      If water gets inside the connector, use a dryer to dry the connector.
      ★ Hot air from the dryer can be used, but regulate the time that the hot air is used in order not to make the connector or related parts too hot, as this will cause deformation or damage to the connector.
   3] Carry out a continuity test on the connector.
      After drying, leave the wiring harness disconnected and carry out a continuity test to check for any short circuits between pins caused by water.
      ★ After completely drying the connector, blow it with contact restorer and reassemble.

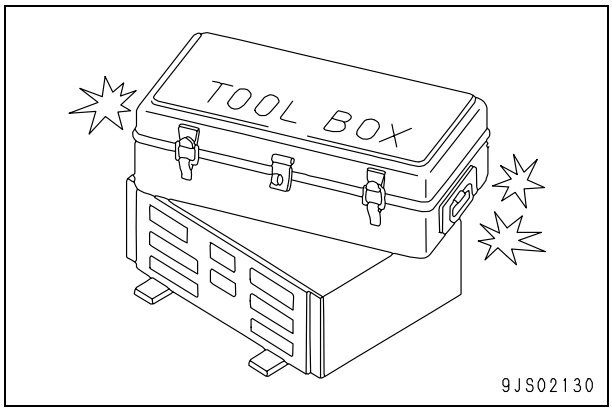


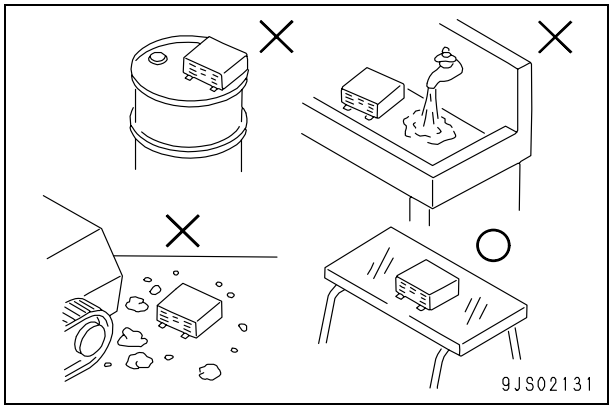




4. Handling controller

1) The controller contains a microcomputer and electronic control circuits. These control all of the electronic circuits on the machine, so be extremely careful when handling the controller.
2) Do not place objects on top of the controller.
3) Cover the control connectors with tape or a vinyl bag. Never touch the connector contacts with your hand.
4) During rainy weather, do not leave the controller in a place where it is exposed to rain.
5) Do not place the controller on oil, water, or soil, or in any hot place, even for a short time. (Place it on a suitable dry stand).
6) Precautions when carrying out arc welding
When carrying out arc welding on the body, disconnect all wiring harness connectors connected to the controller. Fit an arc welding ground close to the welding point.





5. Points to remember when troubleshooting electric circuits

1) Always turn the power OFF before disconnecting or connecting connectors.
2) Before carrying out troubleshooting, check that all the related connectors are properly inserted.
   ★ Disconnect and connect the related connectors several times to check.
3) Always connect any disconnected connectors before going on to the next step.
   ★ If the power is turned ON with the connectors still disconnected, unnecessary abnormality displays will be generated.
4) When carrying out troubleshooting of circuits (measuring the voltage, resistance, continuity, or current), move the related wiring and connectors several times and check that there is no change in the reading of the tester.
   ★ If there is any change, there is probably defective contact in that circuit.

Points to remember when handling hydraulic equipment

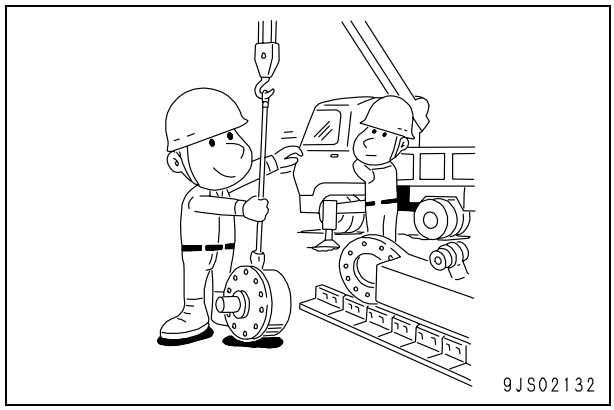
With the increase in pressure and precision of hydraulic equipment, the most common cause of failure is dirt (foreign material) in the hydraulic circuit. When adding hydraulic oil, or when disassembling or assembling hydraulic equipment, it is necessary to be particularly careful.

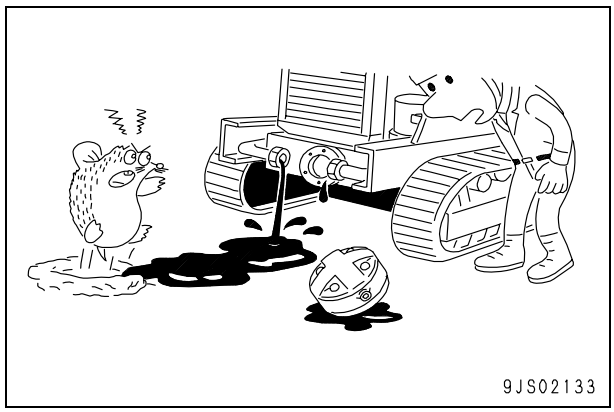
1. **Be careful of the operating environment.**
   Avoid adding hydraulic oil, replacing filters, or repairing the machine in rain or high winds, or places where there is a lot of dust.

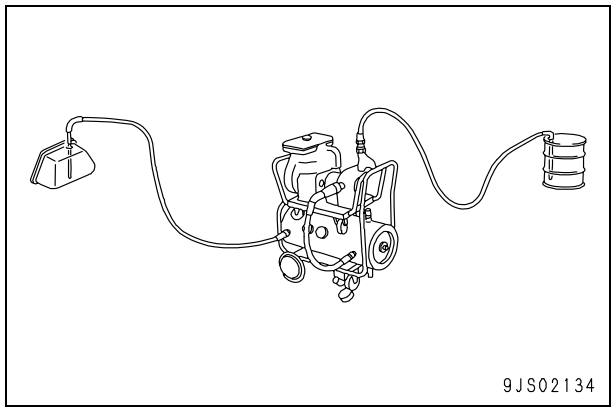
2. **Disassembly and maintenance work in the field**
   If disassembly or maintenance work is carried out on hydraulic equipment in the field, there is danger of dust entering the equipment. It is also difficult to check the performance after repairs, so it is desirable to use unit exchange. Disassembly and maintenance of hydraulic equipment should be carried out in a specially prepared dustproof workshop, and the performance should be checked with special test equipment.

3. **Sealing openings**
   After any piping or equipment is removed, the openings should be sealed with caps, tapes, or vinyl bags to prevent any dirt or dust from entering. If the opening is left open or is blocked with a rag, there is danger of dirt entering or of the surrounding area being made dirty by leaking oil so never do this. Do not simply drain oil out onto the ground, but collect it and ask the customer to dispose of it, or take it back with you for disposal.

4. **Do not let any dirt or dust get in during refilling operations**
   Be careful not to let any dirt or dust get in when refilling with hydraulic oil. Always keep the oil filler and the area around it clean, and also use clean pumps and oil containers. If an oil cleaning device is used, it is possible to filter out the dirt that has collected during storage, so this is an even more effective method.





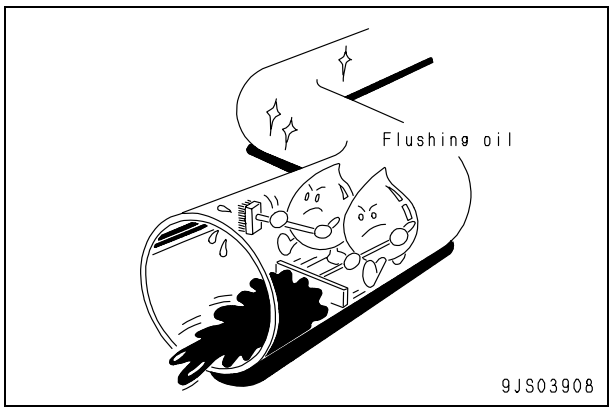


5. Change hydraulic oil when the temperature is high

When hydraulic oil or other oil is warm, it flows easily. In addition, the sludge can also be drained out easily from the circuit together with the oil, so it is best to change the oil when it is still warm. When changing the oil, as much as possible of the old hydraulic oil must be drained out. (Drain the oil from the hydraulic tank; also drain the oil from the filter and from the drain plug in the circuit.) If any old oil is left, the contaminants and sludge in it will mix with the new oil and will shorten the life of the hydraulic oil.

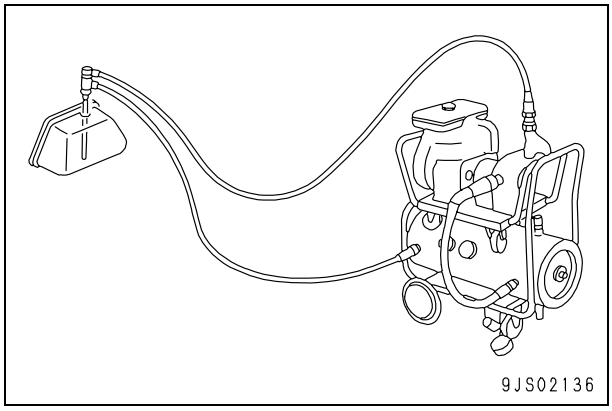
6. Flushing operations

After disassembling and assembling the equipment, or changing the oil, use flushing oil to remove the contaminants, sludge, and old oil from the hydraulic circuit. Normally, flushing is carried out twice: primary flushing is carried out with flushing oil, and secondary flushing is carried out with the specified hydraulic oil.



7. Cleaning operations

After repairing the hydraulic equipment (pump, control valve, etc.) or when running the machine, carry out oil cleaning to remove the sludge or contaminants in the hydraulic oil circuit. The oil cleaning equipment is used to remove the ultra fine (about 3 μ) particles that the filter built in the hydraulic equipment cannot remove, so it is an extremely effective device.



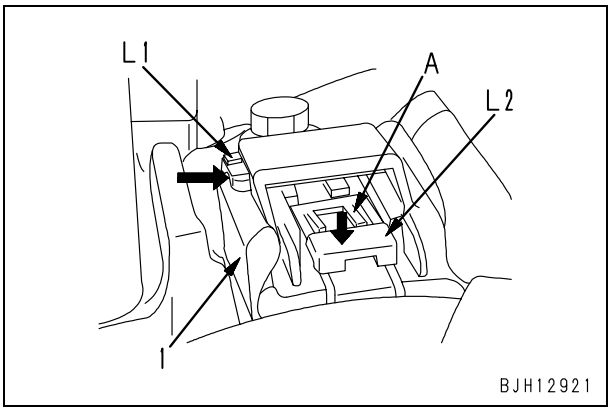
Handling of connectors newly used for engines

★ Mainly, following engines are object for following connectors.
- 107E-1
- 114E-3
- 125E-5
- 140E-5
- 170E-5
- 12V140E-3

1. Slide lock type (FRAMATOME-3, FRAMATOME-2)
- 107 – 170, 12V140 engines
  - Various pressure sensors and NE speed sensor

  Examples)
  Intake air pressure in intake manifold: PIM (125, 170, 12V140 engines)
  Oil pressure sensor: POIL (125, 170, 12V140 engines)
  Oil pressure switch (107, 114 engines)
  Ne speed sensor of flywheel housing: NE (107 – 170, 12V140 engines)
  Ambient pressure sensor: PAMB (125, 170, 12V140 engines)

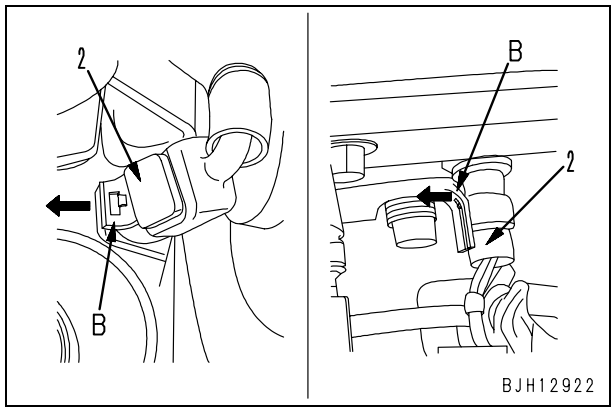
Disconnect connector (1) according to the following procedure.
1) Slide lock (L1) to the right.
2) While pressing lock (L2), pull out connector (1) toward you.
   ★ Even if lock (L2) is pressed, connector (1) cannot be pulled out toward you, if part A does not float. In this case, float part A with a small screwdriver while press lock (L2), and then pull out connector (1) toward you.



2. Pull lock type (PACKARD-2)
- 107 – 170, 12V140 engine
  - Various temperature sensors

Example)
Intake air temperature sensor in intake manifold: TIM
Fuel temperature sensor: TFUEL
Oil temperature sensor: TOIL
Coolant temperature sensor: TWTR, etc.

Disconnect the connector by pulling lock (B) (on the wiring harness side) of connector (2) outward.



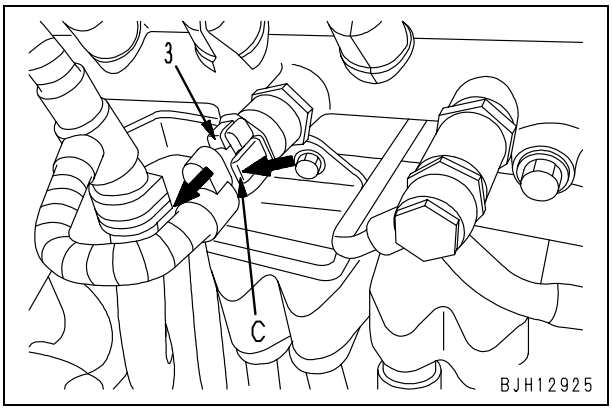
3. Push lock type

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

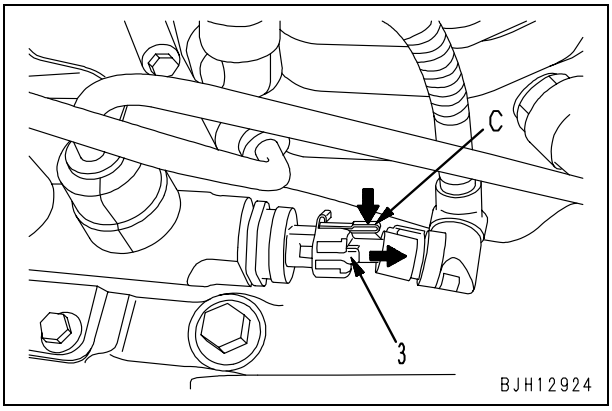
Disconnect connector (3) according to the following procedure.

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

- 114 engine

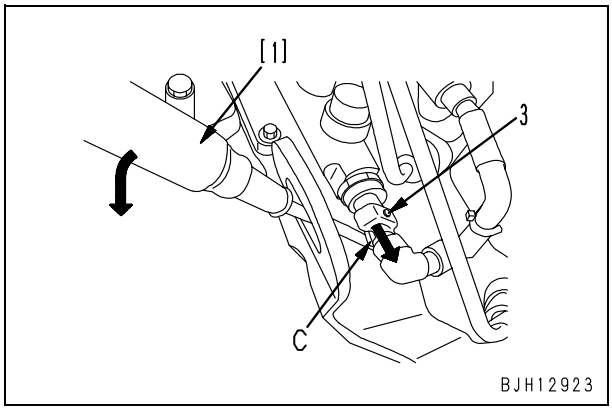


- 107 engine



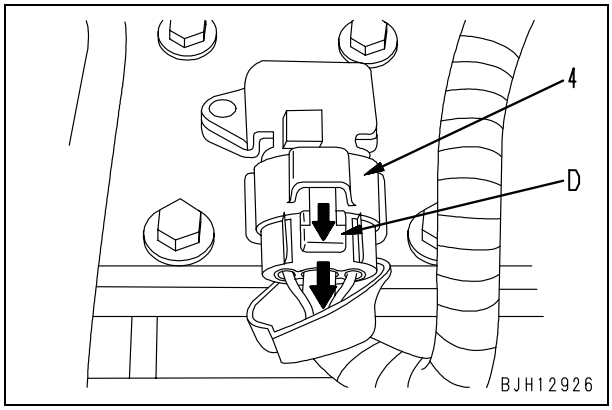
★ If the lock is on the underside, use flat-head screwdriver [1] since you cannot insert your fingers.

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



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

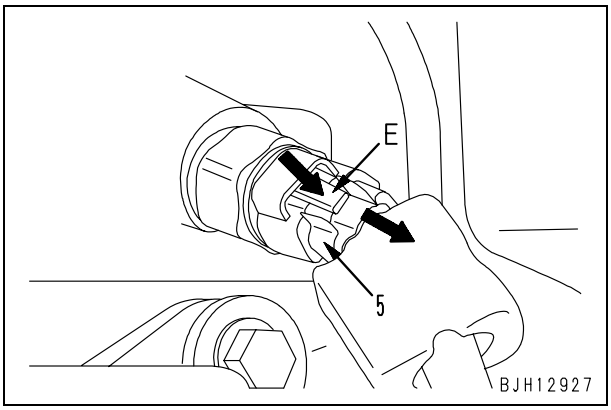
3) While pressing lock (D), pull out connector (4) in the direction of the arrow.



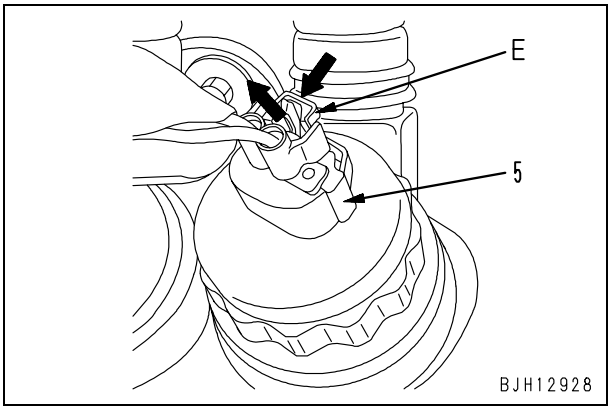
- 125 – 170, 12V140 engine

4) While pressing lock (E) of the connector, pullout connector (5) in the direction of the arrow.

Example)
Fuel pressure in common rail: PFUEL etc. (**AMP-3**)

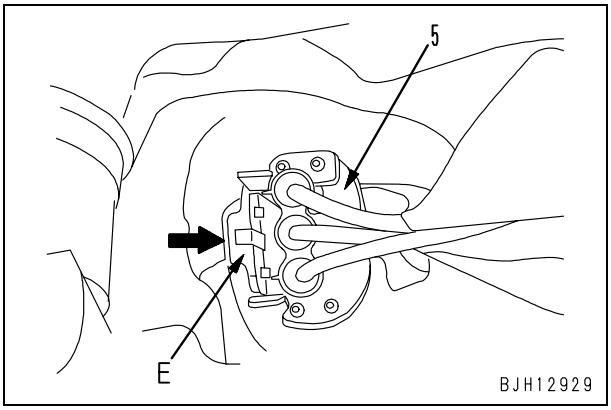


Example)
Injection pressure control valve of fuel supply pump: PCV (**SUMITOMO-2**)



Example)
Speed sensor of fuel supply pump: G (**SUMITOMO-3**)

★ Pull the connector straight up.



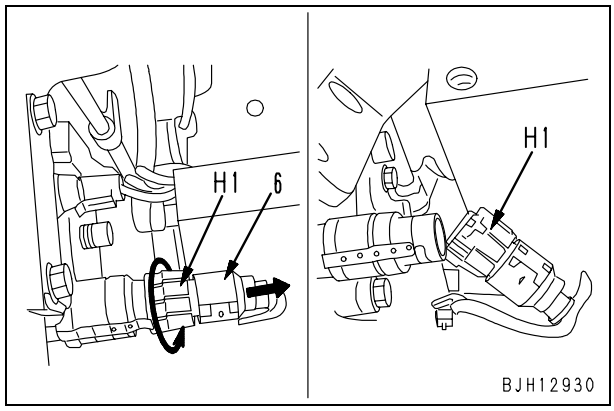
4. Turn-housing type (Round green connector)

- 140 engine

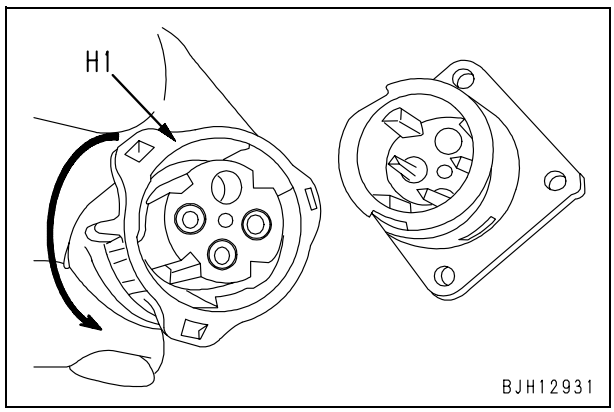
Example)
Intake air pressure sensor in intake manifold (CANNON-04): PIM etc.

1) Disconnect connector (6) according to the following procedure.
   1] Turn housing (H1) in the direction of the arrow.
      ★ When connector is unlocked, housing (H1) becomes heavy to turn.
   2] Pull out housing (H1) in the direction of the arrow.

★ Housing (H1) is left on the wiring harness side.



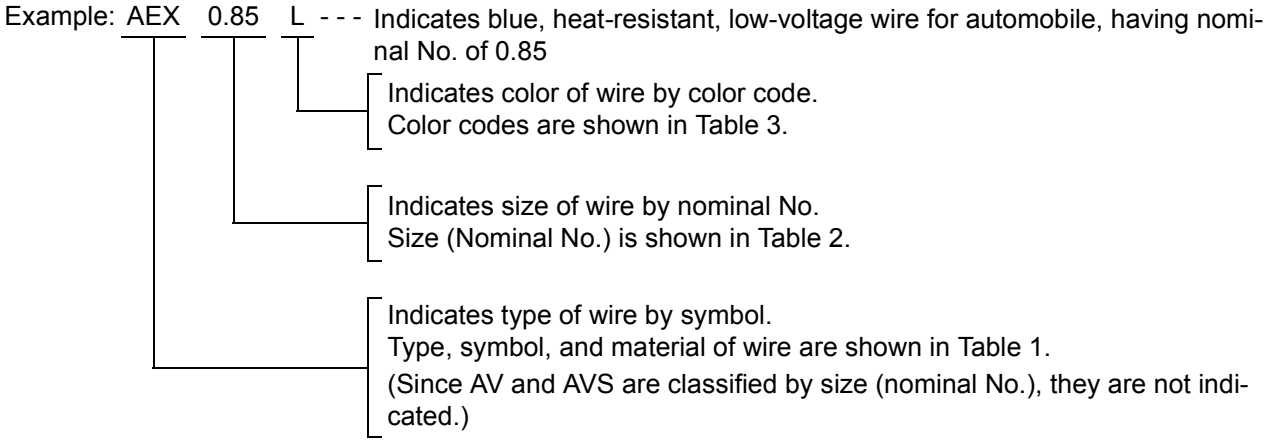
2) Connect the connector according to the following procedure.
   1] Insert the connector to the end, while setting its groove.
   2] Turn housing (H1) in the direction of the arrow until it “clicks”.



How to read electric wire code

★ The information about the wires unique to each machine model is described in Troubleshooting section, Relational information of troubleshooting.

In the electric circuit diagram, the material, thickness, and color of each electric wire are indicated by symbols. The electric wire code is helpful in understanding the electric circuit diagram.



1. Type, symbol, and material

AV and AVS are different in only thickness and outside diameter of the cover. AEX is similar to AV in thickness and outside diameter of AEX and different from AV and AVS in material of the cover.

(Table 1)

Type	Symbol	Material		Using temperature range (°C)	Example of use
Low-voltage wire for automobile	AV	Conductor	Annealed copper for electric appliance	–30 to +60	General wiring (Nominal No. 5 and above)
		Insulator	Soft polyvinyl chloride		
Thin-cover low-voltage wire for automobile	AVS	Conductor	Annealed copper for electric appliance		General wiring (Nominal No. 3 and below)
		Insulator	Soft polyvinyl chloride		
Heat-resistant low-voltage wire for automobile	AEX	Conductor	Annealed copper for electric appliance	–50 to +110	General wiring in extremely cold district, wiring at high-temperature place
		Insulator	Heat-resistant crosslinked polyethylene		

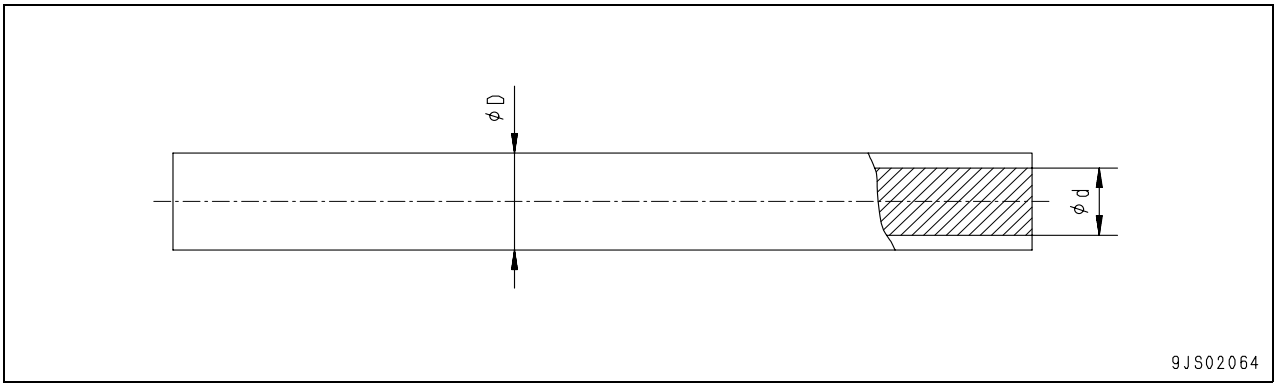
2. Dimensions

(Table 2)

Nominal No.			0.5f	(0.5)	0.75f	(0.85)	1.25f	(1.25)	2f	2	3f	3	5
Conductor		Number of strands/Diameter of strand	20/0.18	7/0.32	30/0.18	11/0.32	50/0.18	16/0.32	37/0.26	26/0.32	58/0.26	41/0.32	65/0.32
		Sectional area (mm^2)	0.51	0.56	0.76	0.88	1.27	1.29	1.96	2.09	3.08	3.30	5.23
		d (approx.)	1.0		1.2		1.5		1.9	1.9	2.3	2.4	3.0
Cover D	AVS	Standard	2.0		2.2		2.5		2.9	2.9	3.5	3.6	–
	AV	Standard	–		–		–		–	–	–	–	4.6
	AEX	Standard	2.0		2.2		2.7		3.0	3.1	–	3.8	4.6

Nominal No.			8	15	20	30	40	50	60	85	100
Conductor		Number of strands/Diameter of strand	50/0.45	84/0.45	41/0.80	70/0.80	85/0.80	108/0.80	127/0.80	169/0.80	217/0.80
		Sectional area (mm^2)	7.95	13.36	20.61	35.19	42.73	54.29	63.84	84.96	109.1
		d (approx.)	3.7	4.8	6.0	8.0	8.6	9.8	10.4	12.0	13.6
Cover D	AVS	Standard	–	–	–	–	–	–	–	–	–
	AV	Standard	5.5	7.0	8.2	10.8	11.4	13.0	13.6	16.0	17.6
	AEX	Standard	5.3	7.0	8.2	10.8	11.4	13.0	13.6	16.0	17.6

"f" of nominal No. denotes flexible".



3. Color codes table

(Table 3)

Color Code	Color of wire	Color Code	Color of wire
B	Black	LgW	Light green & White
Br	Brown	LgY	Light green & Yellow
BrB	Brown & Black	LR	Blue & Red
BrR	Brown & Red	LW	Blue & White
BrW	Brown & White	LY	Blue & Yellow
BrY	Brown & Yellow	O	Orange
Ch	Charcoal	P	Pink
Dg	Dark green	R	Red
G	Green	RB	Red & Black
GB	Green & Black	RG	Red & Green
GL	Green & Blue	RL	Red & Blue
Gr	Gray	RW	Red & White
GR	Green & Red	RY	Red & Yellow
GW	Green & White	Sb	Sky Blue
GY	Green & Yellow	Y	Yellow
L	Blue	YB	Yellow & Black
LB	Blue & Black	YG	Yellow &Green
Lg	Light green	YL	Yellow & Blue
LgB	Light green & Black	YR	Yellow & Red
LgR	Light green & Red	YW	Yellow & White

Remarks: In a color code consisting of 2 colors, the first color is the color of the background and the second color is the color of the marking.
Example: “GW” means that the background is Green and marking is White.

4. Types of circuits and color codes

(Table 4)

Type of wire		AVS or AV						AEX	
Type of circuit	Charge	R	WG	–	–	–	–	R	–
	Ground	B	–	–	–	–	–	B	–
	Start	R	–	–	–	–	–	R	–
	Light	RW	RB	RY	RG	RL	–	D	–
	Instrument	Y	YR	YB	YG	YL	YW	Y	Gr
	Signal	G	GW	GR	GY	GB	GL	G	Br
	Others	L	LW	LR	LY	LB	–	L	–
		Br	BrW	BrR	BrY	BrB	–	–	–
		Lg	LgR	LgY	LgB	LgW	–	–	–
		O	–	–	–	–	–	–	–
		Gr	–	–	–	–	–	–	–
		P	–	–	–	–	–	–	–
		Sb	–	–	–	–	–	–	–
		Dg	–	–	–	–	–	–	–
		Ch	–	–	–	–	–	–	–

Precautions when carrying out operation

[When carrying out removal or installation (disassembly or assembly) of units, be sure to follow the general precautions given below when carrying out the operation.]

1. Precautions when carrying out removal work

- If the coolant contains antifreeze, dispose of it correctly.
- After disconnecting hoses or tubes, cover them or fit plugs to prevent dirt or dust from entering.
- When draining oil, prepare a container of adequate size to catch the oil.
- Confirm the match marks showing the installation position, and make match marks in the necessary places before removal to prevent any mistake when assembling.
- To prevent any excessive force from being applied to the wiring, always hold the connectors when disconnecting the connectors. Do not pull the wires.
- Fit wires and hoses with tags to show their installation position to prevent any mistake when installing.
- Check the number and thickness of the shims, and keep in a safe place.
- When raising components, be sure to use lifting equipment of ample strength.
- When using forcing screws to remove any components, tighten the forcing screws uniformly in turn.
- Before removing any unit, clean the surrounding area and fit a cover to prevent any dust or dirt from entering after removal.

★ Precautions when handling piping during disassembly
Fit the following plugs into the piping after disconnecting it during disassembly operations.

1) Face seal type hoses and tubes

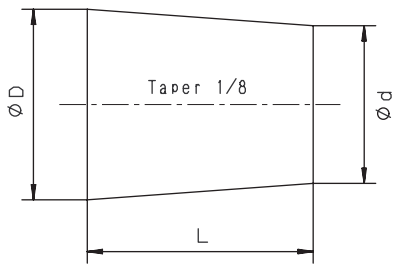
Nominal number	Plug (nut end)	Sleeve nut (elbow end)
02	07376-70210	02789-20210
03	07376-70315	02789-20315
04	07376-70422	02789-20422
05	07376-70522	02789-20522
06	07376-70628	02789-20628
10	07376-71034	07221-21034
12	07376-71234	07221-21234

2) Split flange type hoses and tubes

Nominal number	Flange (hose end)	Sleeve head (tube end)	Split flange
04	07379-00400	07378-10400	07371-30400
05	07379-00500	07378-10500	07371-30500

3) If the part is not under hydraulic pressure, the following corks can be used.

Nominal number	Part Number	Dimensions		
		D	d	L
06	07049-00608	6	5	8
08	07049-00811	8	6.5	11
10	07049-01012	10	8.5	12
12	07049-01215	12	10	15
14	07049-01418	14	11.5	18
16	07049-01620	16	13.5	20
18	07049-01822	18	15	22
20	07049-02025	20	17	25
22	07049-02228	22	18.5	28
24	07049-02430	24	20	30
27	07049-02734	27	22.5	34



DEW00401

2. Precautions when carrying out installation work

- Tighten all bolts and nuts (sleeve nuts) to the specified (KES) torque.
- Install the hoses without twisting or interference and fix them with intermediate clamps, if there are any.
- Replace all gaskets, O-rings, cotter pins, and lock plates with new parts.
- Bend the cotter pins and lock plates securely.
- When coating with adhesive, clean the part and remove all oil and grease, then coat the threaded portion with 2 – 3 drops of adhesive.
- When coating with gasket sealant, clean the surface and remove all oil and grease, check that there is no dirt or damage, then coat uniformly with gasket sealant.
- Clean all parts, and correct any damage, dents, burrs, or rust.
- Coat rotating parts and sliding parts with engine oil.
- When press fitting parts, coat the surface with anti-friction compound (LM-P).
- After fitting snap rings, check that the snap ring is fitted securely in the ring groove.
- When connecting wiring connectors, clean the connector to remove all oil, dirt, or water, then connect securely.
- When using eyebolts, check that there is no deformation or deterioration, screw them in fully, and align the direction of the hook.
- When tightening split flanges, tighten uniformly in turn to prevent excessive tightening on one side.

★ When operating the hydraulic cylinders for the first time after reassembling cylinders, pumps and other hydraulic equipment removed for repair, always bleed the air as follows:
  1) Start the engine and run at low idle.
  2) Operate the work equipment control lever to operate the hydraulic cylinder 4 – 5 times, stopping the cylinder 100 mm from the end of its stroke.
  3) Next, operate the hydraulic cylinder 3 – 4 times to the end of its stroke.
  4) After doing this, run the engine at normal speed.

★ When using the machine for the first time after repair or long storage, follow the same procedure.

3. Precautions when completing the operation

1) Refilling with coolant, oil and grease
   - If the coolant has been drained, tighten the drain valve, and add coolant to the specified level. Run the engine to circulate the coolant through the system. Then check the coolant level again.
   - If the hydraulic equipment has been removed and installed again, add engine oil to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.
   - If the piping or hydraulic equipment have been removed, always bleed the air from the system after reassembling the parts.
     ★ For details, see Testing and adjusting, “Bleeding air”.
   - Add the specified amount of grease (molybdenum disulphide grease) to the work equipment parts.
2) Checking cylinder head and manifolds for looseness
   Check the cylinder head and intake and exhaust manifold for looseness.
   If any part is loosened, retighten it.
   - For the tightening torque, see “Disassembly and assembly”.
3) Checking engine piping for damage and looseness
   Intake and exhaust system
   Check the piping for damage, the mounting bolts and nuts for looseness, and the joints for air suction and exhaust gas leakage.
   If any part is loosened or damaged, retighten or repair it.
   Cooling system
   Check the piping for damage, the mounting bolts and nuts for looseness, and the joints for coolant leakage.
   If any part is loosened or damaged, retighten or repair it.
   Fuel system
   Check the piping for damage, the mounting bolts and nuts for looseness, and the joints for fuel leakage.
   If any part is loosened or damaged, retighten or repair it.

4) Checking muffler and exhaust pipe for damage and looseness
   1] Visually check the muffler, exhaust pipe and their mounting parts for a crack and damage.
      If any part is damaged, replace it.
   2] Check the mounting bolts and nuts of the muffler, exhaust pipe and their mounting parts for looseness.
      If any bolt or nut is loosened, retighten it.
5) Checking muffler function
   Check the muffler for abnormal sound and sound different from that of a new muffler.
   If any abnormal sound is heard, repair the muffler, referring to “Troubleshooting” and “Disassembly and assembly”.

Method of disassembling and connecting push-pull type coupler

⚠ **Before carrying out the following work, loosen the oil filler cap of the hydraulic tank gradually to release the residual pressure from the hydraulic tank.**

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

Type 1

1. Disconnection

1) Hold adapter (1) and push hose joint (2) into mating adapter (3). (Fig. 1)
   - ★ The adapter can be pushed in about 3.5 mm.
   - ★ Do not hold rubber cap portion (4).
2) After hose joint (2) is pushed into adapter (3), press rubber cap portion (4) against adapter (3) until it clicks. (Fig. 2)
3) Hold hose adapter (1) or hose (5) and pull it out. (Fig. 3)
   - ★ Since some hydraulic oil flows out, prepare an oil receiving container.

Fig. 1

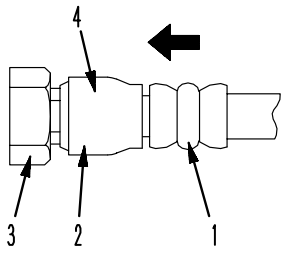


Fig. 2

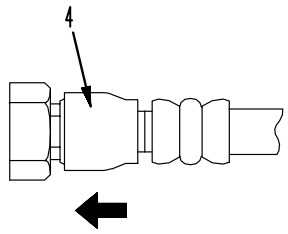
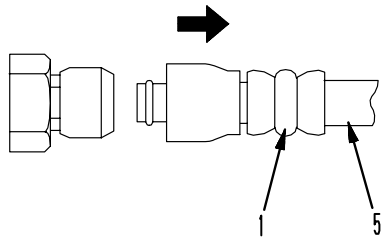


Fig. 3



9JS02109

2. Connection

1) Hold hose adapter (1) or hose (5) and insert it in mating adapter (3), aligning them with each other. (Fig. 4)
   - ★ Do not hold rubber cap portion (4).
2) After inserting the hose in the mating adapter perfectly, pull it back to check its connecting condition. (Fig. 5)
   - ★ When the hose is pulled back, the rubber cap portion moves toward the hose about 3.5 mm. This does not indicate abnormality, however.

Fig. 4

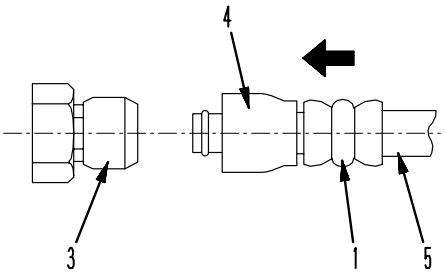
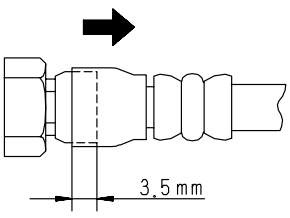


Fig. 5

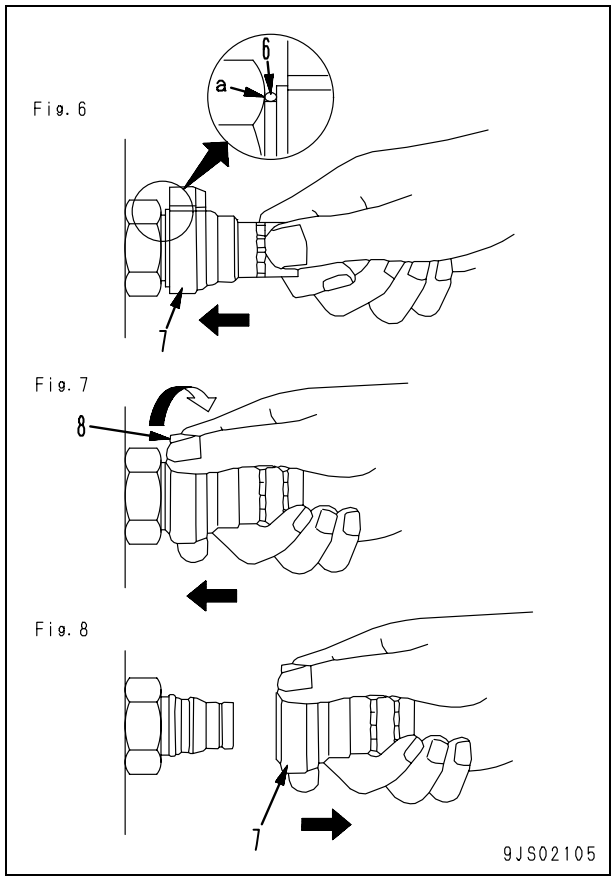


9JS02110

Type 2

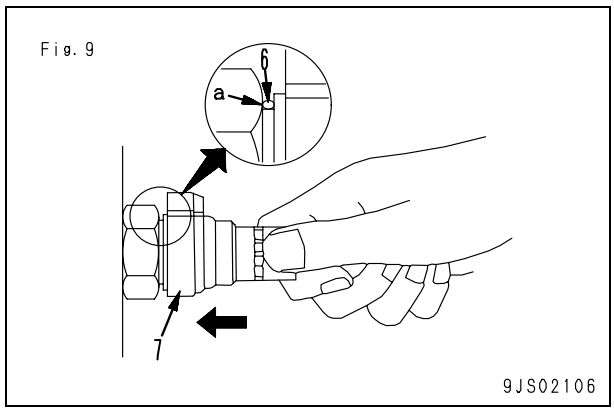
1. Disconnection

1) Hold the tightening portion and push body (7) straight until sliding prevention ring (6) contacts contact surface (a) of the hexagonal portion at the male end. (Fig. 6)
2) While holding the condition of Step 1), turn lever (8) to the right (clockwise). (Fig. 7)
3) While holding the condition of Steps 1) and 2), pull out whole body (7) to disconnect it. (Fig. 8)



2. Connection

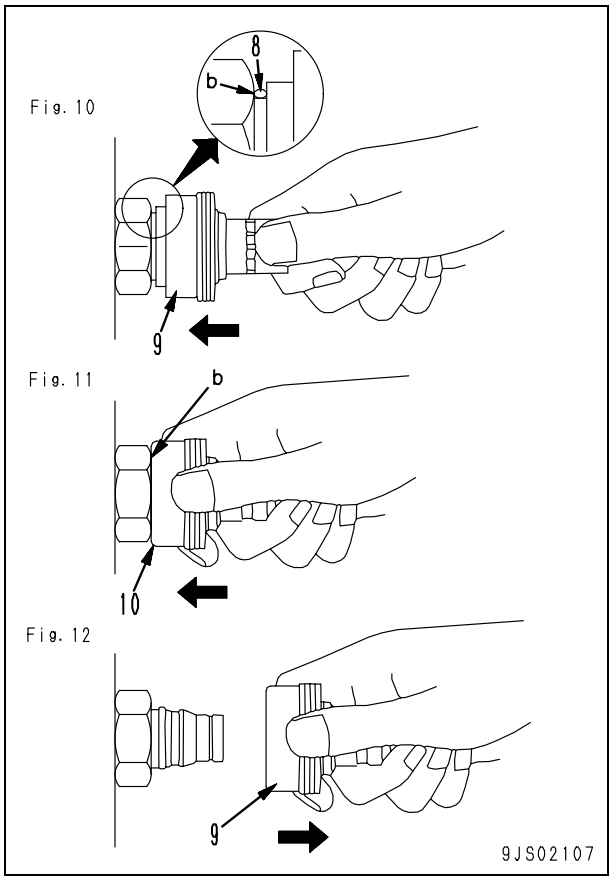
- Hold the tightening portion and push body (7) straight until sliding prevention ring (6) contacts contact surface (a) of the hexagonal portion at the male end. (Fig. 9)



Type 3

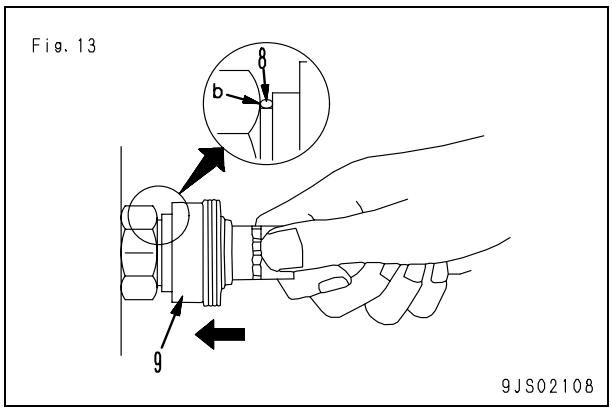
1. Disconnection

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



2. Connection

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



Standard tightening torque table

1. Table of tightening torques for bolts and nuts
   ★ Unless there are special instructions, tighten metric nuts and bolts to the torque below. (When using torque wrench)

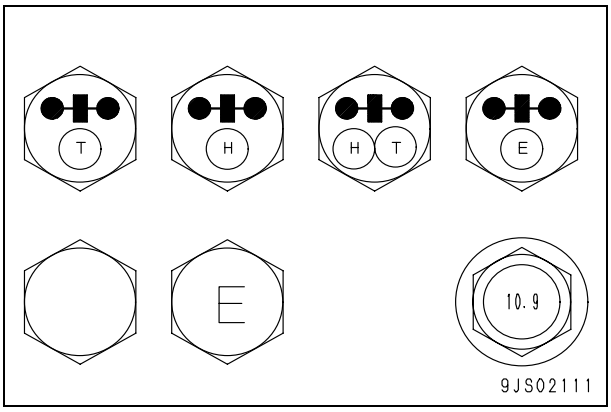
   ★ The following table corresponds to the bolts in Fig. A.

Thread diameter of bolt	Width across flats	Tightening torque	
mm	mm	Nm	kgm
6	10	11.8 – 14.7	1.2 – 1.5
8	13	27 – 34	2.8 – 3.5
10	17	59 – 74	6.0 – 7.5
12	19	98 – 123	10.0 – 12.5
14	22	153 – 190	15.5 – 19.5
16	24	235 – 285	23.5 – 29.5
18	27	320 – 400	33.0 – 41.0
20	30	455 – 565	46.5 – 58.0
22	32	610 – 765	62.5 – 78.0
24	36	785 – 980	80.0 – 100.0
27	41	1,150 – 1,440	118 – 147
30	46	1,520 – 1,910	155 – 195
33	50	1,960 – 2,450	200 – 250
36	55	2,450 – 3,040	250 – 310
39	60	2,890 – 3,630	295 – 370

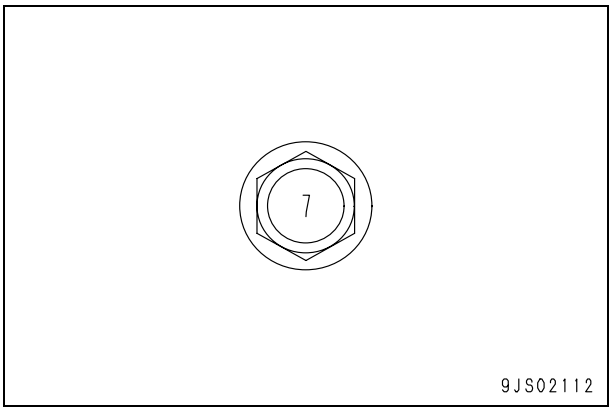
   ★ The following table corresponds to the bolts in Fig. B.

Thread diameter of bolt	Width across flats	Tightening torque	
mm	mm	Nm	kgm
6	10	5.9 – 9.8	0.6 – 1.0
8	13	13.7 – 23.5	1.4 – 2.4
10	14	34.3 – 46.1	3.5 – 4.7
12	27	74.5 – 90.2	7.6 – 9.2

★ Fig. A



★ Fig. B



2. Table of tightening torques for split flange bolts

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

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

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

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

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

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

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

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

5. Table of tightening torques for hoses (taper seal type and face seal type)

★ Unless there are special instructions, tighten the hoses (taper seal type and face seal type) to the torque below.

★ Apply the following torque when the threads are coated (wet) with engine oil.

Nominal No. of hose	Width across flats	Tightening torque Nm {kgm}		Taper seal	Face seal	
		Range	Target	Thread size (mm)	Nominal No. - Number of threads, type of thread	Thread diameter (mm) (Reference)
02	19	34 – 54 { 3.5 – 5.5}	44 { 4.5}	–	9/16-18UN	14.3
		34 – 63 { 3.5 – 6.5}		14	–	–
03	22	54 – 93 { 5.5 – 9.5}	74 { 7.5}	–	11/16-16UN	17.5
	24	59 – 98 { 6.0 – 10.0}	78 { 8.0}	18	–	–
04	27	84 – 132 { 8.5 – 13.5}	103 {10.5}	22	13/16-16UN	20.6
05	32	128 – 186 {13.0 – 19.0}	157 {16.0}	24	1-14UNS	25.4
06	36	177 – 245 {18.0 – 25.0}	216 {22.0}	30	1-3/16-12UN	30.2
(10)	41	177 – 245 {18.0 – 25.0}	216 {22.0}	33	–	–
(12)	46	197 – 294 {20.0 – 30.0}	245 {25.0}	36	–	–
(14)	55	246 – 343 {25.0 – 35.0}	294 {30.0}	42	–	–

6. Table of tightening torques for 102, 107 and 114 engine series (Bolts and nuts)

★ Unless there are special instructions, tighten the metric bolts and nuts of the 102, 107 and 114 engine series to the torque below.

Thread size	Tightening torque	
	Bolts and nuts	
mm	Nm	kgm
6	10 ± 2	1.02 ± 0.20
8	24 ± 4	2.45 ± 0.41
10	43 ± 6	4.38 ± 0.61
12	77 ± 12	7.85 ± 1.22
14	—	—

7. Table of tightening torques for 102, 107 and 114 engine series (Eye joints)

★ Unless there are special instructions, tighten the metric eye joints of the 102, 107 and 114 engine series to the torque below.

Thread size	Tightening torque	
mm	Nm	kgm
6	8 ± 2	0.81 ± 0.20
8	10 ± 2	1.02 ± 0.20
10	12 ± 2	1.22 ± 0.20
12	24 ± 4	2.45 ± 0.41
14	36 ± 5	3.67 ± 0.51

8. Table of tightening torques for 102, 107 and 114 engine series (Taper screws)

★ Unless there are special instructions, tighten the taper screws (unit: inch) of the 102, 107 and 114 engine series to the torque below.

Thread size	Tightening torque	
inch	Nm	kgm
1/16	3 ± 1	0.31 ± 0.10
1/8	8 ± 2	0.81 ± 0.20
1/4	12 ± 2	1.22 ± 0.20
3/8	15 ± 2	1.53 ± 0.20
1/2	24 ± 4	2.45 ± 0.41
3/4	36 ± 5	3.67 ± 0.51
1	60 ± 9	6.12 ± 0.92

Conversion table

Method of using the conversion table

The conversion table in this section is provided to enable simple conversion of figures. For details of the method of using the conversion table, see the example given below.

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

1. Convert 55 mm into inches.

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

2. Convert 550 mm into inches.

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

Millimeters to inches

(B)

1 mm = 0.03937 in

	0	1	2	3	4	5	6	7	8	9
0	0	0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354
10	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748
20	0.787	0.827	0.866	0.906	0.945	0.984	1.024	1.063	1.102	1.142
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.536
40	1.575	1.614	1.654	1.693	1.732	1.772	1.811	1.850	1.890	1.929
						(C)				
50	1.969	2.008	2.047	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	2.874	2.913	2.953	2.992	3.032	3.071	3.110
80	3.150	3.189	3.228	3.268	3.307	3.346	3.386	3.425	3.465	3.504
90	3.543	3.583	3.622	3.661	3.701	3.740	3.780	3.819	3.858	3.898

(A)

Millimeters to inches

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
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	2.874	2.913	2.953	2.992	3.032	3.071	3.110
80	3.150	3.189	3.228	3.268	3.307	3.346	3.386	3.425	3.465	3.504
90	3.543	3.583	3.622	3.661	3.701	3.740	3.780	3.819	3.858	3.898

Kilogram to pound

1 kg = 2.2046 lb

	0	1	2	3	4	5	6	7	8	9
0	0	2.20	4.41	6.61	8.82	11.02	13.23	15.43	17.64	19.84
10	22.05	24.25	26.46	28.66	30.86	33.07	35.27	37.48	39.68	41.89
20	44.09	46.30	48.50	50.71	51.91	55.12	57.32	59.53	61.73	63.93
30	66.14	68.34	70.55	72.75	74.96	77.16	79.37	81.57	83.78	85.98
40	88.18	90.39	92.59	94.80	97.00	99.21	101.41	103.62	105.82	108.03
50	110.23	112.44	114.64	116.85	119.05	121.25	123.46	125.66	127.87	130.07
60	132.28	134.48	136.69	138.89	141.10	143.30	145.51	147.71	149.91	152.12
70	154.32	156.53	158.73	160.94	163.14	165.35	167.55	169.76	171.96	174.17
80	176.37	178.57	180.78	182.98	185.19	187.39	189.60	191.80	194.01	196.21
90	198.42	200.62	202.83	205.03	207.24	209.44	211.64	213.85	216.05	218.26

Liters to U.S. Gallons

1 ℓ = 0.2642 U.S.Gal

	0	1	2	3	4	5	6	7	8	9
0	0	0.264	0.528	0.793	1.057	1.321	1.585	1.849	2.113	2.378
10	2.642	2.906	3.170	3.434	3.698	3.963	4.227	4.491	4.755	5.019
20	5.283	5.548	5.812	6.076	6.340	6.604	6.869	7.133	7.397	7.661
30	7.925	8.189	8.454	8.718	8.982	9.246	9.510	9.774	10.039	10.303
40	10.567	10.831	11.095	11.359	11.624	11.888	12.152	12.416	12.680	12.944
50	13.209	13.473	13.737	14.001	14.265	14.529	14.795	15.058	15.322	15.586
60	15.850	16.115	16.379	16.643	16.907	17.171	17.435	17.700	17.964	18.228
70	18.492	18.756	19.020	19.285	19.549	19.813	20.077	20.341	20.605	20.870
80	21.134	21.398	21.662	21.926	22.190	22.455	22.719	22.983	23.247	23.511
90	23.775	24.040	24.304	24.568	24.832	25.096	25.361	25.625	25.889	26.153

Liters to U.K. Gallons

1 ℓ = 0.21997 U.K.Gal

	0	1	2	3	4	5	6	7	8	9
0	0	0.220	0.440	0.660	0.880	1.100	1.320	1.540	1.760	1.980
10	2.200	2.420	2.640	2.860	3.080	3.300	3.520	3.740	3.950	4.179
20	4.399	4.619	4.839	5.059	5.279	5.499	5.719	5.939	6.159	6.379
30	6.599	6.819	7.039	7.259	7.479	7.699	7.919	8.139	8.359	8.579
40	8.799	9.019	9.239	9.459	9.679	9.899	10.119	10.339	10.559	10.778
50	10.998	11.281	11.438	11.658	11.878	12.098	12.318	12.528	12.758	12.978
60	13.198	13.418	13.638	13.858	14.078	14.298	14.518	14.738	14.958	15.178
70	15.398	15.618	15.838	16.058	16.278	16.498	16.718	16.938	17.158	17.378
80	17.598	17.818	18.037	18.257	18.477	18.697	18.917	19.137	19.357	19.577
90	19.797	20.017	20.237	20.457	20.677	20.897	21.117	21.337	21.557	21.777

kgm to ft.lb

1 kgm = 7.233 ft.lb

	0	1	2	3	4	5	6	7	8	9
0	0	7.2	14.5	21.7	28.9	36.2	43.4	50.6	57.9	65.1
10	72.3	79.6	86.8	94.0	101.3	108.5	115.7	123.0	130.2	137.4
20	144.7	151.9	159.1	166.4	173.6	180.8	188.1	195.3	202.5	209.8
30	217.0	224.2	231.5	238.7	245.9	253.2	260.4	267.6	274.9	282.1
40	289.3	296.6	303.8	311.0	318.3	325.5	332.7	340.0	347.2	354.4
50	361.7	368.9	376.1	383.4	390.6	397.8	405.1	412.3	419.5	426.8
60	434.0	441.2	448.5	455.7	462.9	470.2	477.4	484.6	491.8	499.1
70	506.3	513.5	520.8	528.0	535.2	542.5	549.7	556.9	564.2	571.4
80	578.6	585.9	593.1	600.3	607.6	614.8	622.0	629.3	636.5	643.7
90	651.0	658.2	665.4	672.7	679.9	687.1	694.4	701.6	708.8	716.1
100	723.3	730.5	737.8	745.0	752.2	759.5	766.7	773.9	781.2	788.4
110	795.6	802.9	810.1	817.3	824.6	831.8	839.0	846.3	853.5	860.7
120	868.0	875.2	882.4	889.7	896.9	904.1	911.4	918.6	925.8	933.1
130	940.3	947.5	954.8	962.0	969.2	976.5	983.7	990.9	998.2	1005.4
140	1012.6	1019.9	1027.1	1034.3	1041.5	1048.8	1056.0	1063.2	1070.5	1077.7
150	1084.9	1092.2	1099.4	1106.6	1113.9	1121.1	1128.3	1135.6	1142.8	1150.0
160	1157.3	1164.5	1171.7	1179.0	1186.2	1193.4	1200.7	1207.9	1215.1	1222.4
170	1129.6	1236.8	1244.1	1251.3	1258.5	1265.8	1273.0	1280.1	1287.5	1294.7
180	1301.9	1309.2	1316.4	1323.6	1330.9	1338.1	1345.3	1352.6	1359.8	1367.0
190	1374.3	1381.5	1388.7	1396.0	1403.2	1410.4	1417.7	1424.9	1432.1	1439.4

kg/cm^2 to lb/in^2

1 kg/cm^2 = 14.2233 lb/in^2

	0	1	2	3	4	5	6	7	8	9
0	0	14.2	28.4	42.7	56.9	71.1	85.3	99.6	113.8	128.0
10	142.2	156.5	170.7	184.9	199.1	213.4	227.6	241.8	256.0	270.2
20	284.5	298.7	312.9	327.1	341.4	355.6	369.8	384.0	398.3	412.5
30	426.7	440.9	455.1	469.4	483.6	497.8	512.0	526.3	540.5	554.7
40	568.9	583.2	597.4	611.6	625.8	640.1	654.3	668.5	682.7	696.9
50	711.2	725.4	739.6	753.8	768.1	782.3	796.5	810.7	825.0	839.2
60	853.4	867.6	881.8	896.1	910.3	924.5	938.7	953.0	967.2	981.4
70	995.6	1,010	1,024	1,038	1,053	1,067	1,081	1,095	1,109	1,124
80	1,138	1,152	1,166	1,181	1,195	1,209	1,223	1,237	1,252	1,266
90	1,280	1,294	1,309	1,323	1,337	1,351	1,365	1,380	1,394	1,408
100	1,422	1,437	1,451	1,465	1,479	1,493	1,508	1,522	1,536	1,550
110	1,565	1,579	1,593	1,607	1,621	1,636	1,650	1,664	1,678	1,693
120	1,707	1,721	1,735	1,749	1,764	1,778	1,792	1,806	1,821	1,835
130	1,849	1,863	1,877	1,892	1,906	1,920	1,934	1,949	1,963	1,977
140	1,991	2,005	2,020	2,034	2,048	2,062	2,077	2,091	2,105	2,119
150	2,134	2,148	2,162	2,176	2,190	2,205	2,219	2,233	2,247	2,262
160	2,276	2,290	2,304	2,318	2,333	2,347	2,361	2,375	2,389	2,404
170	2,418	2,432	2,446	2,460	2,475	2,489	2,503	2,518	2,532	2,546
180	2,560	2,574	2,589	2,603	2,617	2,631	2,646	2,660	2,674	2,688
190	2,702	2,717	2,731	2,745	2,759	2,773	2,788	2,802	2,816	2,830
200	2,845	2,859	2,873	2,887	2,901	2,916	2,930	2,944	2,958	2,973
210	2,987	3,001	3,015	3,030	3,044	3,058	3,072	3,086	3,101	3,115
220	3,129	3,143	3,158	3,172	3,186	3,200	3,214	3,229	3,243	3,257
230	3,271	3,286	3,300	3,314	3,328	3,343	3,357	3,371	3,385	3,399
240	3,414	3,428	3,442	3,456	3,470	3,485	3,499	3,513	3,527	3,542

Temperature

Fahrenheit-Centigrade conversion: A simple way to convert a Fahrenheit temperature reading into a Centigrade temperature reading or vice versa is to enter the accompanying table in the center (boldface column) of figures. These figures refer to the temperature in either Fahrenheit or Centigrade degrees.
When convert from Fahrenheit to Centigrade degrees, consider the center column to be a table of Fahrenheit temperatures and read the corresponding Centigrade temperature in the column at the left.
When convert from Centigrade to Fahrenheit degrees, consider the center column to be a table of Centigrade values, and read the corresponding Fahrenheit temperature on the right.

1°C = 33.8°F

°C		°F	°C		°F	°C		°F	°C		°F
–40.4	**–40**	–40.0	–11.7	**11**	51.8	7.8	**46**	114.8	27.2	**81**	177.8
–37.2	**–35**	–31.0	–11.1	**12**	53.6	8.3	**47**	116.6	27.8	**82**	179.6
–34.4	**–30**	–22.0	–10.6	**13**	55.4	8.9	**48**	118.4	28.3	**83**	181.4
–31.7	**–25**	–13.0	–10.0	**14**	57.2	9.4	**49**	120.2	28.9	**84**	183.2
–28.9	**–20**	–4.0	–9.4	**15**	59.0	10.0	**50**	122.0	29.4	**85**	185.0
–28.3	**–19**	–2.2	–8.9	**16**	60.8	10.6	**51**	123.8	30.0	**86**	186.8
–27.8	**–18**	–0.4	–8.3	**17**	62.6	11.1	**52**	125.6	30.6	**87**	188.6
–27.2	**–17**	1.4	–7.8	**18**	64.4	11.7	**53**	127.4	31.1	**88**	190.4
–26.7	**–16**	3.2	–7.2	**19**	66.2	12.2	**54**	129.2	31.7	**89**	192.2
–26.1	**–15**	5.0	–6.7	**20**	68.0	12.8	**55**	131.0	32.2	**90**	194.0
–25.6	**–14**	6.8	–6.1	**21**	69.8	13.3	**56**	132.8	32.8	**91**	195.8
–25.0	**–13**	8.6	–5.6	**22**	71.6	13.9	**57**	134.6	33.3	**92**	197.6
–24.4	**–12**	10.4	–5.0	**23**	73.4	14.4	**58**	136.4	33.9	**93**	199.4
–23.9	**–11**	12.2	–4.4	**24**	75.2	15.0	**59**	138.2	34.4	**94**	201.2
–23.3	**–10**	14.0	–3.9	**25**	77.0	15.6	**60**	140.0	35.0	**95**	203.0
–22.8	**–9**	15.8	–3.3	**26**	78.8	16.1	**61**	141.8	35.6	**96**	204.8
–22.2	**–8**	17.6	–2.8	**27**	80.6	16.7	**62**	143.6	36.1	**97**	206.6
–21.7	**–7**	19.4	–2.2	**28**	82.4	17.2	**63**	145.4	36.7	**98**	208.4
–21.1	**–6**	21.2	–1.7	**29**	84.2	17.8	**64**	147.2	37.2	**99**	210.2
–20.6	**–5**	23.0	–1.1	**30**	86.0	18.3	**65**	149.0	37.8	**100**	212.0
–20.0	**–4**	24.8	–0.6	**31**	87.8	18.9	**66**	150.8	40.6	**105**	221.0
–19.4	**–3**	26.6	0	**32**	89.6	19.4	**67**	152.6	43.3	**110**	230.0
–18.9	**–2**	28.4	0.6	**33**	91.4	20.0	**68**	154.4	46.1	**115**	239.0
–18.3	**–1**	30.2	1.1	**34**	93.2	20.6	**69**	156.2	48.9	**120**	248.0
–17.8	**0**	32.0	1.7	**35**	95.0	21.1	**70**	158.0	51.7	**125**	257.0
–17.2	**1**	33.8	2.2	**36**	96.8	21.7	**71**	159.8	54.4	**130**	266.0
–16.7	**2**	35.6	2.8	**37**	98.6	22.2	**72**	161.6	57.2	**135**	275.0
–16.1	**3**	37.4	3.3	**38**	100.4	22.8	**73**	163.4	60.0	**140**	284.0
–15.6	**4**	39.2	3.9	**39**	102.2	23.3	**74**	165.2	62.7	**145**	293.0
–15.0	**5**	41.0	4.4	**40**	104.0	23.9	**75**	167.0	65.6	**150**	302.0
–14.4	**6**	42.8	5.0	**41**	105.8	24.4	**76**	168.8	68.3	**155**	311.0
–13.9	**7**	44.6	5.6	**42**	107.6	25.0	**77**	170.6	71.1	**160**	320.0
–13.3	**8**	46.4	6.1	**43**	109.4	25.6	**78**	172.4	73.9	**165**	329.0
–12.8	**9**	48.2	6.7	**44**	111.2	26.1	**79**	174.2	76.7	**170**	338.0
–12.2	**10**	50.0	7.2	**45**	113.0	26.7	**80**	176.0	79.4	**175**	347.0

PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN01986-00

HYDRAULIC EXCAVATOR

PC300-8
PC300LC-8
PC350-8
PC350LC-8

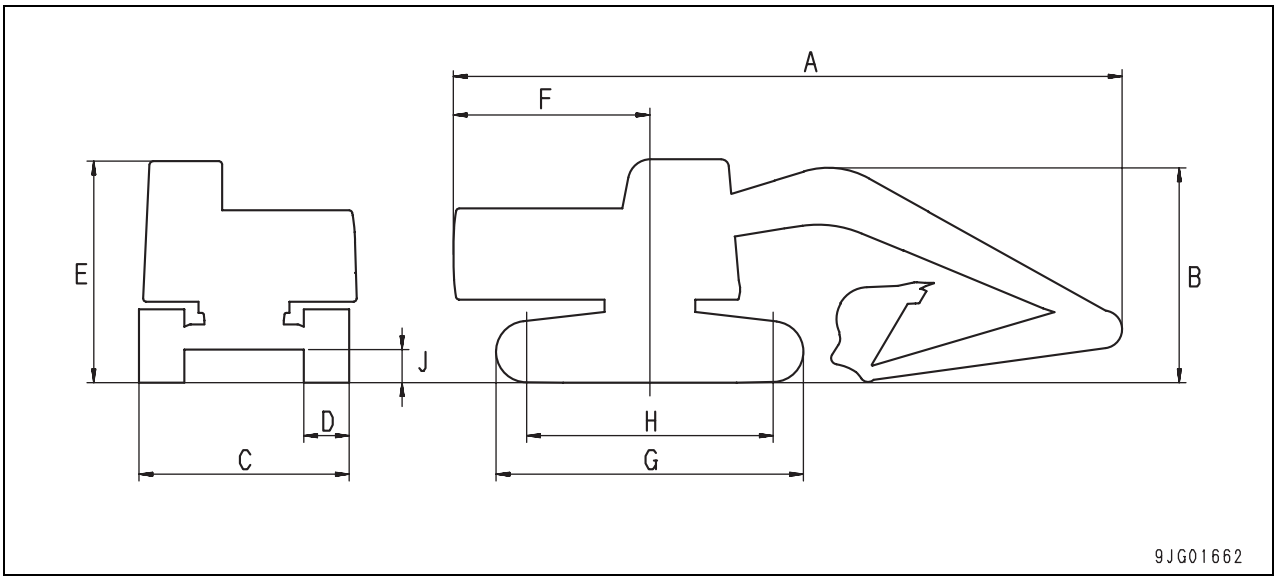
Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

01 Specification

Specification and technical data

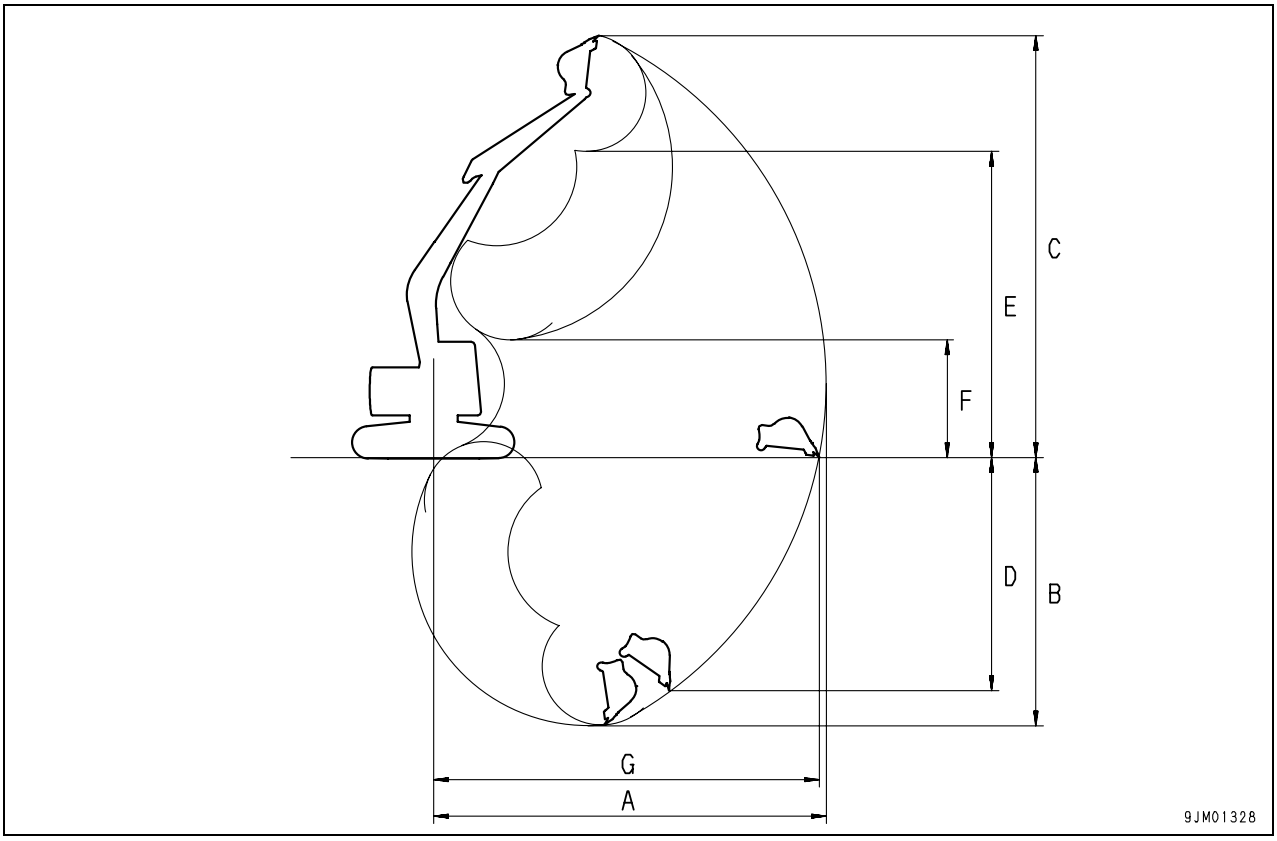
Specification dimension drawings

Dimensions



	Item	Unit	PC300-8	PC300LC-8	PC350-8	PC350LC-8
A	Overall length	mm	11,140	11,140	11,140	11,140
B	Overall height	mm	3,250	3,250	3,250	3,250
C	Overall width	mm	3,190	3,190	3,190	3,190
D	Shoe width	mm	600	600	600	600
E	Cab height	mm	3,110	3,110	3,110	3,110
F	Tail swing radius	mm	3,450	3,450	3,450	3,450
G	Overall track length	mm	4,625	4,955	4,625	4,955
H	Length of track on ground	mm	3,700	4,030	3,700	4,030
J	Min. ground clearance	mm	498	498	498	498

Working ranges



	Item	Unit	PC300-8	PC300LC-8	PC350-8	PC350LC-8
A	Max. digging reach	mm	11,100	11,100	11,100	11,100
B	Max. digging depth	mm	7,380	7,380	7,380	7,380
C	Max. digging height	mm	10,100	10,100	10,100	10,100
D	Max. vertical wall digging depth	mm	6,400	6,400	6,400	6,400
E	Max. dumping height	mm	7,050	7,050	7,050	7,050
F	Min. dumping height	mm	2,640	2,640	2,640	2,640
G	Max. reach at ground level	mm	10,920	10,920	10,920	10,920

Specifications

PC300-8, PC300LC-8

Machine model				PC300-8	PC300LC-8
Serial number				60001 and up	
Bucket capacity			m^3	1.4	1.4
Operating weight			kg	31,100	31,600
Performance	Working range	Max. digging depth	mm	7,380	7,380
		Max. vertical wall digging depth	mm	6,400	6,400
		Max. digging radius	mm	11,100	11,100
		Max. reach at ground level	mm	10,920	10,920
		Max. digging height	mm	10,100	10,100
		Max. dumping height	mm	7,050	7,050
	Max. digging force (When power max. function is turned on)		kN {kg}	211.8 {21,600} (226.5 {23,100})	211.8 {21,600} (226.5 {23,100})
	Swing speed		rpm	9.5	9.5
	Swing operation max. slope angle		deg.	21	21
	Travel speed		km/h	Lo: 3.2 Mi: 4.5 Hi: 5.5	Lo: 3.2 Mi: 4.5 Hi: 5.5
	Gradeability		deg.	35	35
	Ground pressure		kPa{kg/cm^2}	62.9 {0.64}	59.0 {0.60}
Dimensions	Overall length		mm	11,140	11,140
	Overall width		mm	3,190	3,190
	Overall crawler width		mm	3,190	3,190
	Overall height (During transportation)		mm	3,250	3,250
	Machine body overall height		mm	3,110	3,110
	Ground clearance of upper structure bottom		mm	1,185	1,185
	Min. ground clearance		mm	498	498
	Tail swing radius		mm	3,450	3,450
	Work equipment minimum swing radius		mm	4,310	4,310
	Top height at minimum swing radius of work equipment		mm	8,520	8,520
	Length of track on ground		mm	3,700	4,030
	Track gauge		mm	2,590	2,590
	Cab height		mm	3,110	3,110
	Width of standard shoe		mm	600	600

Machine model				PC300-8	PC300LC-8
Serial number				60001 and up	
Engine	Model			SAA6D114E	
	Type			4-cycle, water-cooled in-line, direct injection with turbocharger and air-cooled aftercooler	
	Number of cylinders – bore x stroke		mm	6-114x135	
	Piston displacement		ℓ {cc}	8.27 {8,270}	
	Performance	Flywheel horsepower	kW/rpm {HP/rpm}	183.9/1,980 {250/1,980}	
		Max. torque	Nm/rpm {kgm/rpm}	1,108/1,450 {113/1,450}	
		High idle under no load	rpm	2,050	
		Low idle under no load	rpm	1,000	
		Min. fuel consumption ratio	g/kWh {g/HPh}	205 {151}	
	Starting motor			24 V, 7.5 kW	
	Alternator			24 V, 60 A	
	Battery			12 V, 126 Ah x 2	
	Radiator type			Aluminum wave type, 4 rows	
Undercarriage	Carrier roller			Two on one side	
	Track roller			7 on one side	8 on one side
	Track shoe			Assembly-type triple grosser 45 on one side	Assembly-type triple grosser 48 on one side

Machine model				PC300-8		PC300LC-8
Serial number				60001 and up		
Hydraulic system	Hydraulic pump	Type and numbers		HPV125+125, Variable displacement piston type: 2		
		Delivery	ℓ/min	267.5 x 2		
		Set pressure	MPa {kg/cm^2}	37.8 {380}		
	Control valve	Type and numbers		6-spool + 1-spool type: 1		
		Operating method		Hydraulic		
	Hydraulic motor	Travel motor		HMV160ADT-2, piston type: 2 (with brake valve and parking brake)		
		Swing motor		KMF230ABE-5, piston type: 1 (with safety valve, shaft brake and reverse prevention valve)		
	Hydraulic cylinder			Boom (*1)	Arm (*1) (*2)	Bucket
		Type		Double acting piston	Double acting piston	Double acting piston
		Cylinder inner diameter	mm	140	160	140
		Piston rod diameter	mm	100	110	100
		Stroke	mm	1,480	1,825	1,285
		Max. pin-to-pin distance	mm	3,525	4,255	3,155
		Min. pin-to-pin distance	mm	2,045	2,430	1,870
	Hydraulic tank			Box-shaped, closed type		
	Hydraulic oil filter			Tank return side		
	Hydraulic oil cooler			CF40-1 (Air-cooling type)		

*1: Cushion is provided on head side
*2: Cushion is provided on bottom side

PC350-8, PC350LC-8

Machine model				PC350-8	PC350LC-8
Serial number				60001 and up	
Bucket capacity			m^3	1.4	1.4
Operating weight			kg	32,600	33,660
Performance	Working range	Max. digging depth	mm	7,380	7,380
		Max. vertical wall digging depth	mm	6,400	6,400
		Max. digging radius	mm	11,100	11,100
		Max. reach at ground level	mm	10,920	10,920
		Max. digging height	mm	10,100	10,100
		Max. dumping height	mm	7,050	7,050
	Max. digging force (When power max. function is turned on)		kN {kg}	212.8 {21,700} (227.5 {23,200})	212.8 {21,700} (227.5 {23,200})
	Swing speed		rpm	9.5	9.5
	Swing operation max. slope angle		deg.	18	18
	Travel speed		km/h	Lo: 3.2 Mi: 4.5 Hi: 5.5	Lo: 3.2 Mi: 4.5 Hi: 5.5
	Gradeability		deg.	35	35
	Ground pressure		kPa{kg/cm^2}	65.9 {0.67}	62.9 {0.64}
Dimensions	Overall length		mm	11,140	11,140
	Overall width		mm	3,190	3,190
	Overall crawler width		mm	3,190	3,190
	Overall height (During transportation)		mm	3,250	3,250
	Machine body overall height		mm	3,110	3,110
	Ground clearance of upper structure bottom		mm	1,185	1,185
	Min. ground clearance		mm	498	498
	Tail swing radius		mm	3,450	3,450
	Work equipment minimum swing radius		mm	4,310	4,310
	Top height at minimum swing radius of work equipment		mm	8,520	8,520
	Length of track on ground		mm	3,700	4,030
	Track gauge		mm	2,590	2,590
	Cab height		mm	3,110	3,110
	Width of standard shoe		mm	600	600

Machine model				PC350-8	PC350LC-8
Serial number				60001 and up	
Engine	Model			SAA6D114E	
	Type			4-cycle, water-cooled in-line, direct injection with turbocharger and air-cooled aftercooler	
	Number of cylinders – bore x stroke		mm	6-114x135	
	Piston displacement		ℓ {cc}	8.27 {8,270}	
	Performance	Flywheel horsepower	kW/rpm {HP/rpm}	183.9/1,950 {250/1,950}	
		Max. torque	Nm/rpm {kgm/rpm}	1,108/1,450 {113/1,450}	
		High idle under no load	rpm	2,050	
		Low idle under no load	rpm	1,000	
		Min. fuel consumption ratio	g/kWh {g/HPh}	205 {151}	
	Starting motor			24 V, 7.5 kW	
	Alternator			24 V, 60 A	
	Battery			12 V, 126 Ah x 2	
	Radiator type			Aluminum wave type, 4 rows	
Undercarriage	Carrier roller			Two on one side	
	Track roller			7 on one side	8 on one side
	Track shoe			Assembly-type triple grosser 45 on one side	Assembly-type triple grosser 48 on one side

Machine model				PC350-8		PC350LC-8
Serial number				60001 and up		
Hydraulic system	Hydraulic pump	Type and numbers		HPV125+125, Variable displacement piston type: 2		
		Delivery	ℓ/min	267.5 x 2		
		Set pressure	MPa {kg/cm^2}	37.8 {380}		
	Control valve	Type and numbers		6-spool + 1-spool type 1		
		Operating method		Hydraulic		
	Hydraulic motor	Travel motor		HMV160ADT-2, piston type: 2 (with brake valve and parking brake)		
		Swing motor		KMF230ABE-5, piston type: 1 (with safety valve, shaft brake and reverse prevention valve)		
	Hydraulic cylinder			Boom (*1)	Arm (*1) (*2)	Bucket
		Type		Double acting piston	Double acting piston	Double acting piston
		Cylinder inner diameter	mm	140	160	140
		Piston rod diameter	mm	100	110	110
		Stroke	mm	1,480	1,825	1,825
		Max. pin-to-pin distance	mm	3,525	4,255	3,155
		Min. pin-to-pin distance	mm	2,045	2,430	1,870
	Hydraulic tank			Box-shaped, closed type		
	Hydraulic oil filter			Tank return side		
	Hydraulic oil cooler			CF40-1 (Air-cooling type)		

*1: Cushion is provided on head side
*2: Cushion is provided on bottom side

Weight table

⚠ **This weight table is prepared for your reference when handling or transporting the components.**

PC300-8, PC300LC-8

Unit: kg

Machine model	PC300-8	PC300LC-8
Serial number	60001 and up	
Engine assembly	1,148	1,148
● Engine	865	865
● Damper	14.3	14.3
● Hydraulic pump	178	178
Radiator and oil cooler assembly	153	153
Hydraulic tank and filter assembly (Not including hydraulic oil)	176	176
Fuel tank and filter assembly (Not including fuel)	238	238
Revolving frame	2,723	2,723
Cab	570	570
Operator seat	35	35
Counterweight	5,480	5,480
Swing machinery	442	442
Control valve	242	242
Swing motor	88	88
Travel motor	164 x 2	164 x 2
Center swivel joint	29.9	29.9
Track frame assembly	7,311	7,979
● Track frame	3,879	4,441
● Swing circle	487	487
● Idler	169 x 2	169 x 2
● Idler cushion	287.5 x 2	287.5 x 2
● Carrier roller	28 x 4	28 x 4
● Track roller	52.2 x 14	52.2 x 16
● Final drive (including travel motor)	583 x 2	583 x 2
Track shoe assembly		
● Standard triple shoe (600 mm)	3,470	3,700
● Standard triple shoe (700 mm)	4,030	4,300
● Wide triple shoe (800 mm)	4,380	4,680
● Load liner (Rubber pad type) (600 mm)	–	–
Boom assembly	2,290	2,290
Arm assembly	1,105	1,105
Bucket assembly	1,015	1,015
Boom cylinder assembly	254 x 2	254 x 2
Arm cylinder assembly	382	382
Bucket cylinder assembly	228	228
Link (large) assembly	316	316
Link (small) assembly	–	–
Boom pin	76 + 15 x 2 + 56 + 17 + 42	76 + 15 x 2 + 56 + 17 + 42
Arm pin	13 + 17	13 + 17
Bucket pin	30 x 2	30 x 2
Link pin	27 x 2	27 x 2

PC350-8, PC350LC-8

Unit: kg

Machine model	PC350-8	PC350LC-8
Serial number	60001 and up	
Engine assembly	1,148	1,148
● Engine	865	865
● Damper	14.3	14.3
● Hydraulic pump	178	178
Radiator and oil cooler assembly	153	153
Hydraulic tank and filter assembly (Not including hydraulic oil)	176	176
Fuel tank assembly (Not including fuel)	238	238
Revolving frame	2,828	2,828
Cab	570	570
Operator seat	35	35
Counterweight	6,380	6,380
Swing machinery	442	442
Control valve	242	242
Swing motor	88	88
Travel motor	164 x 2	164 x 2
Center swivel joint	29.9	29.9
Track frame assembly	7,538	8,183
● Track frame	4,074	4,602
● Swing circle	487	487
● Idler	169 x 2	169 x 2
● Idler cushion	287.5 x 2	287.5 x 2
● Carrier roller	28 x 4	28 x 4
● Track roller (double frame)	57.5 x 6	57.5 x 8
● Track roller (single frame)	52.2 x 8	52.2 x 8
● Final drive (including travel motor)	583 x 2	583 x 2
Track shoe assembly		
● Standard triple shoe (600 mm)	3,670	3,920
● Standard triple shoe (700 mm)	4,030	4,300
● Wide triple shoe (800 mm)	–	–
● Load liner (Rubber pad type) (600 mm)	–	–
Boom assembly	2,450	2,450
Arm assembly	1,211	1,211
Bucket assembly	1,508	1,508
Boom cylinder assembly	254 x 2	254 x 2
Arm cylinder assembly	382	382
Bucket cylinder assembly	228	228
Link (large) assembly	316	316
Link (small) assembly	–	–
Boom pin	76 + 15x2 + 56 + 17 + 42	76 + 15x2 + 56 + 17 + 42
Arm pin	13 + 17	13 + 17
Bucket pin	30 x 2	30 x 2
Link pin	27 x 2	27 x 2

Table of fuel, coolant and lubricants

★ For details of the notes (Notes 1, Note 2...) in the table, see Operation and Maintenance Manual.

Reservoir	Fluid Type	Ambient Temperature, degrees Celsius -22 -4 14 32 50 68 86 104 122°F -30 -20 -10 0 10 20 30 40 50°C	Recommended Komatsu Fluids
Engine oil pan	Engine oil	(Note.1)	Komatsu EOS0W30
		(Note.1)	Komatsu EOS5W40
			Komatsu EO10W30-DH
			Komatsu EO15W40-DH
			Komatsu EO30-DH
Swing machinery case Final drive case Damper case	Powertrain oil (Note.2)		TO30
Hydraulic system	Powertrain oil		TO10
	Hydraulic oil		HO46-HM
Grease fitting	Hyper grease (Note.3)		G2-T, G2-TE
	Lithium EP grease		G2-LI
Cooling system	Supercoolant AF-NAC (Note.4)		AF-NAC
Fuel tank	Diesel fuel		ASTM Grade No.1-D S15 ASTM Grade No.1-D S500
			ASTM Grade No.2-D S15 ASTM Grade No.2-D S500

Unit: ℓ

Reservoir	PC300/300LC-8, PC350/350LC-8	
	Specified (ℓ)	Refill (ℓ)
Engine oil pan	40	35
Swing machinery case	16.5	16.5
Final drive case (each)	9	9
Damper case	1.3	1.3
Hydraulic system	365	188
Fuel tank	605	—
Cooling system	42	—

PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN01988-00

HYDRAULIC EXCAVATOR

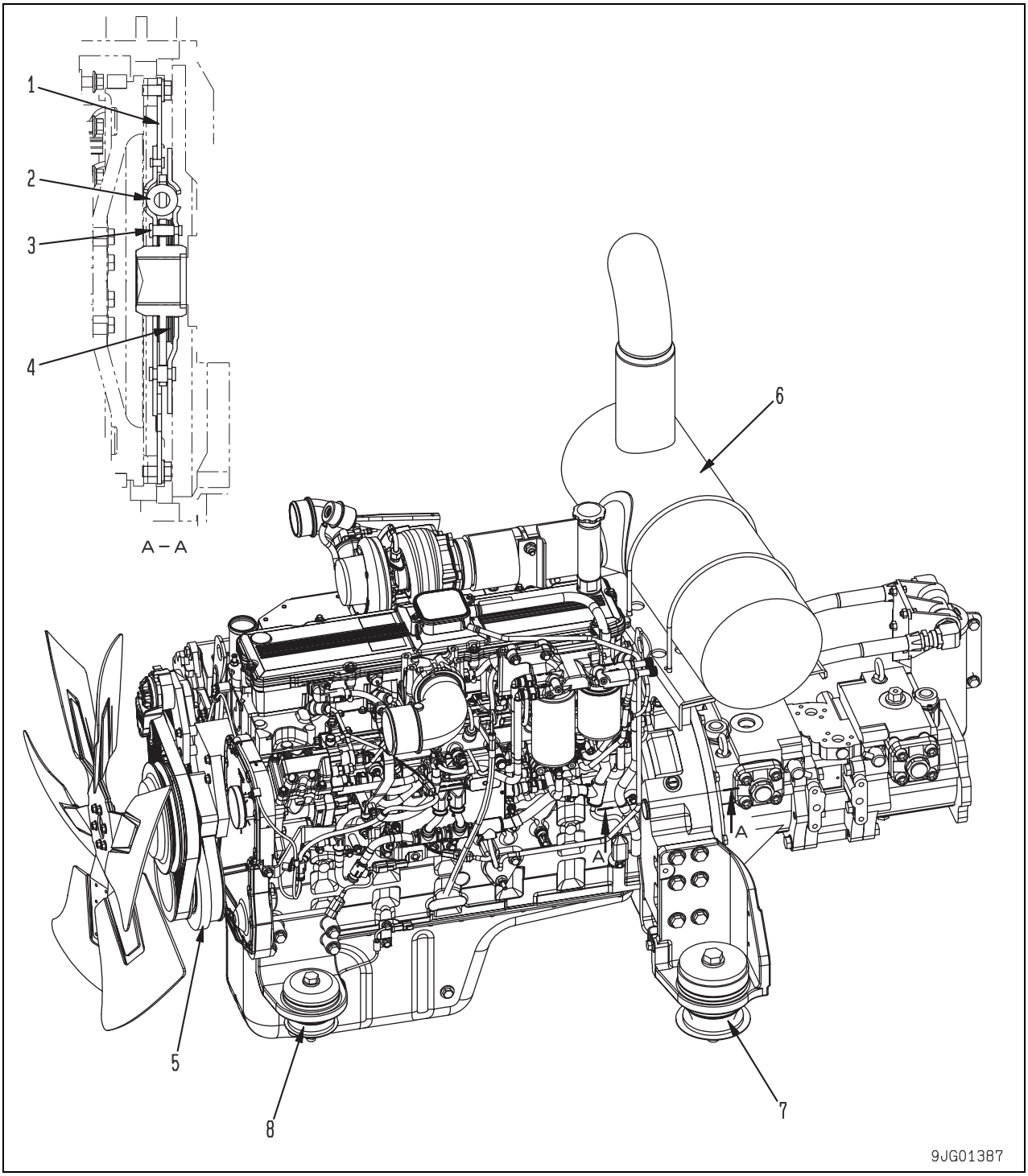
PC300-8
PC300LC-8
PC350-8
PC350LC-8

Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

10 Structure, function and maintenance standard

Engine and cooling system

Engine related parts

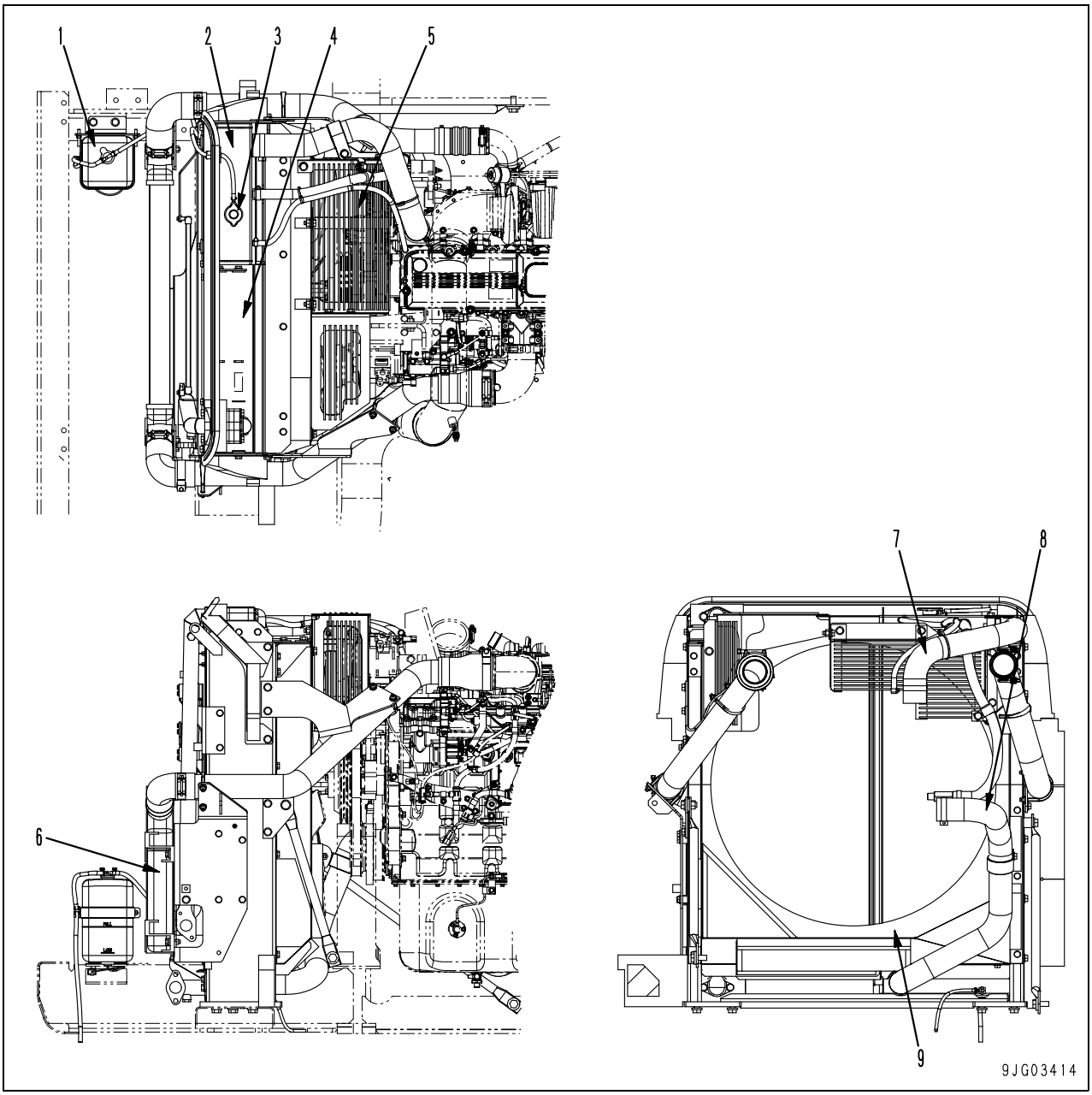


1. Drive plate
2. Torsion spring
3. Stopper pin
4. Friction plate
5. Damper assembly
6. Muffler
7. Rear engine mount
8. Front engine mount

Outline

A wet type damper assembly is used.
Oil capacity: 1.3 ℓ

Radiator, oil cooler and aftercooler



1. Reservoir tank
2. Radiator
3. Radiator cap
4. Oil cooler
5. Guard
6. Aftercooler
7. Radiator inlet hose
8. Radiator outlet hose
9. Shroud

Specifications

Radiator: Aluminum wave type, 4th row
Oil cooler: CF40-1

PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN01990-00

HYDRAULIC EXCAVATOR

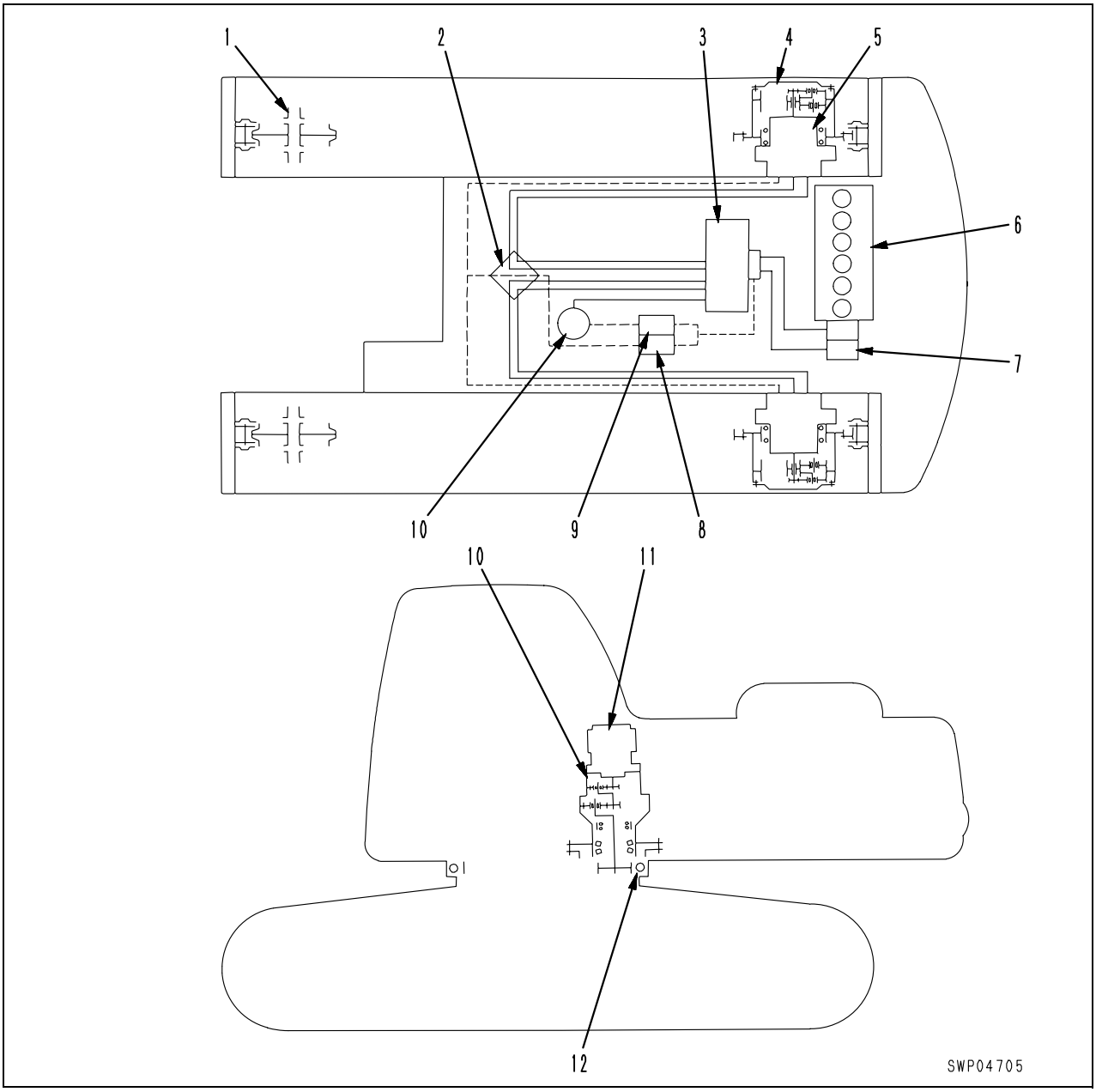
PC300-8
PC300LC-8
PC350-8
PC350LC-8

Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

10 Structure, function and maintenance standard

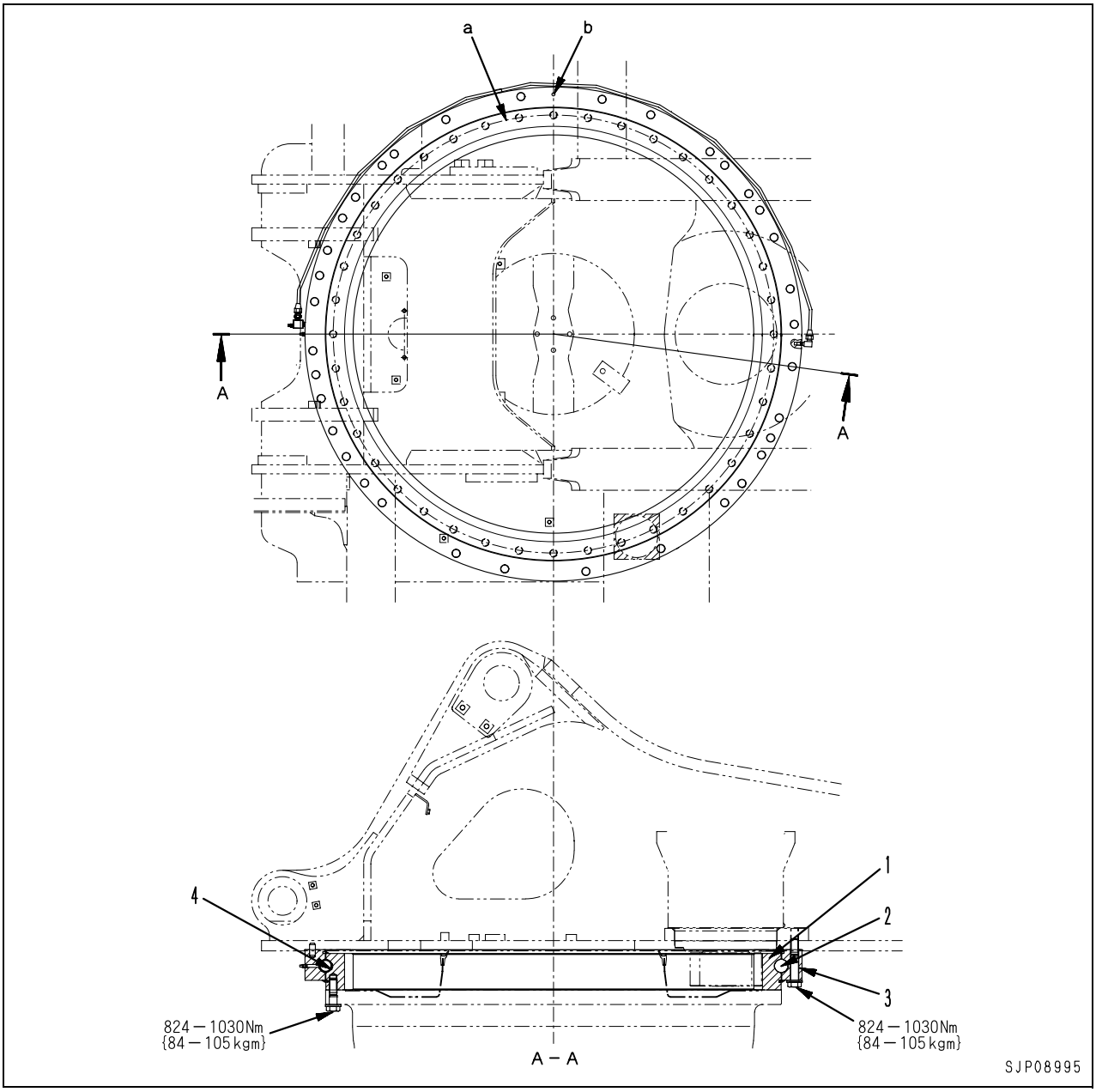
Power train

Power train



1. Idler
2. Center swivel joint
3. Control valve
4. Final drive
5. Travel motor (HMV160ADT-2)
6. Engine (SAA6D114E)
7. Hydraulic pump (HPV125+125)
8. Travel speed solenoid valve
9. Swing brake solenoid valve
10. Swing machinery
11. Swing motor (HMF230ABE-5)
12. Swing circle

Swing circle



1. Swing circle inner race (No. of teeth: 90)
2. Ball
3. Swing circle outer race

a. Inner race soft zone “S“ position
b. Outer race soft zone “S“ position

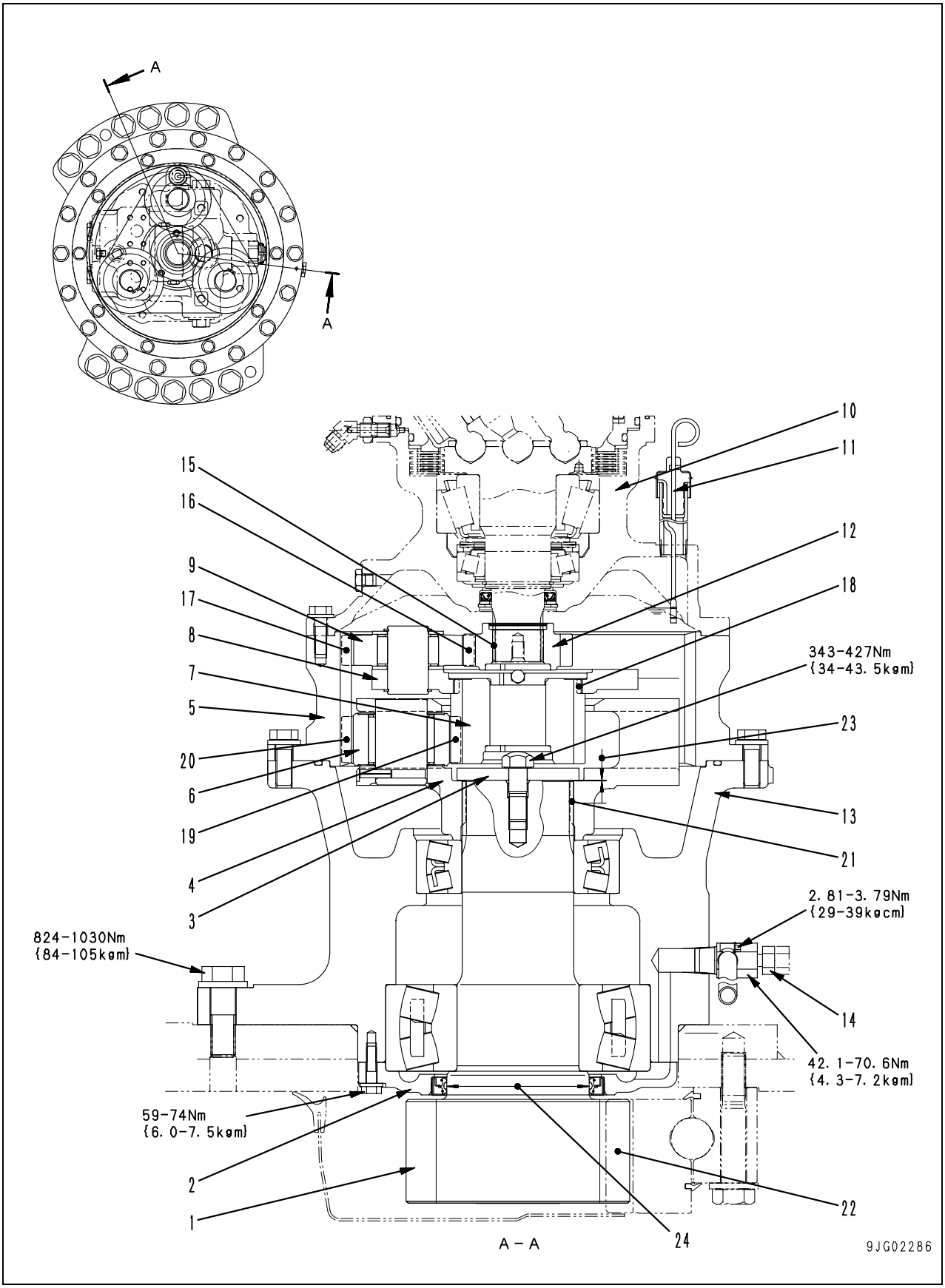
Specifications

Reduction ratio: –90/13 = –6.923
Amount of grease: 33 ℓ (G2-LI)

Unit: mm

No.	Check Item	Criteria		Remedy
4	Axial clearance of bearing (when mounted on chassis)	Standard clearance	Clearance limit	Replace
		0.5 – 1.6	3.2	

Swing machinery



1. Swing pinion (No. of teeth: 13)
2. Cover
3. Plate
4. No. 2 planetary carrier
5. Ring gear
6. No.2 planetary gear
7. No.2 sun gear
8. No. 1 planetary carrier
9. No. 1 planetary gear
10. Swing motor
11. Oil level gauge
12. No. 1 sun gear
13. Case
14. Drain plug

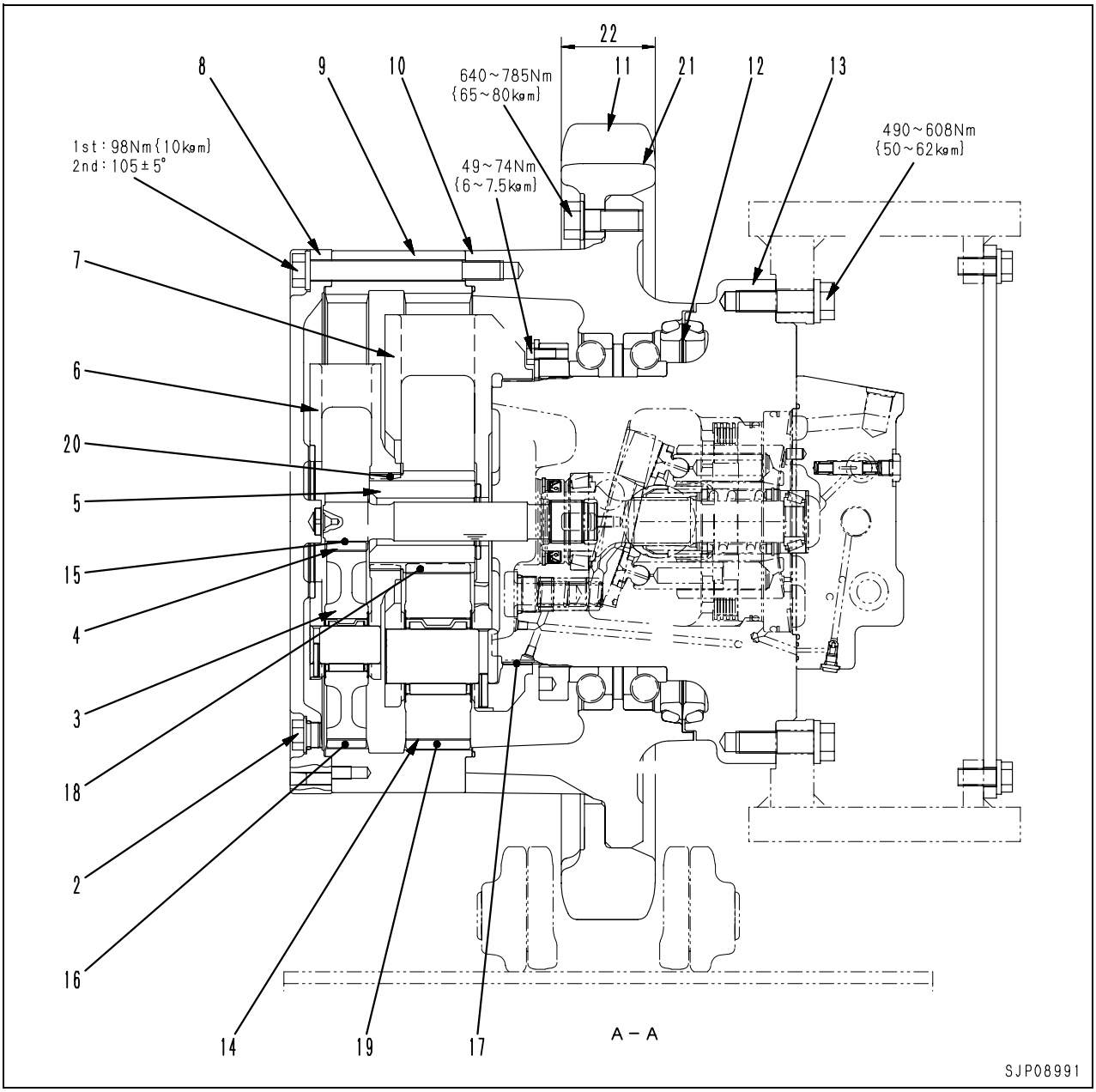
Specifications

Reduction ratio: ((19+68)/19) x ((24+68)/24) = 17.553

Unit: mm

No.	Check Item	Criteria		Remedy
15	Backlash between swing motor shaft and No. 1 sun gear	Standard clearance	Clearance limit	Replace
		0.18 – 0.28	–	
16	Backlash between No. 1 sun gear and No.1 planetary gear	0.15 – 0.51	1.00	
17	Backlash between No. 1 planetary gear and ring gear	0.17 – 0.60	1.10	
18	Backlash between No. 1 planetary carrier and No. 2 sun gear	0.40 – 0.75	1.20	
19	Backlash between No. 2 sun gear and No.2 planetary gear	0.16 – 0.55	1.00	
20	Backlash between No. 2 planetary gear and ring gear	0.17 – 0.60	1.10	
21	Backlash between No. 2 planetary carrier and swing pinion	0.07 – 0.23	–	
22	Backlash between swing pinion and swing circle	0 – 1.21	2.00	
23	Clearance between plate and No. 2 planetary carrier	0.57 – 1.09	–	
24	Wear of swing pinion surface contacting with oil seal	Standard size	Repair limit	Reapply hard chrome plating or replace
		$145\ ^{0}_{-0.100}$	–	

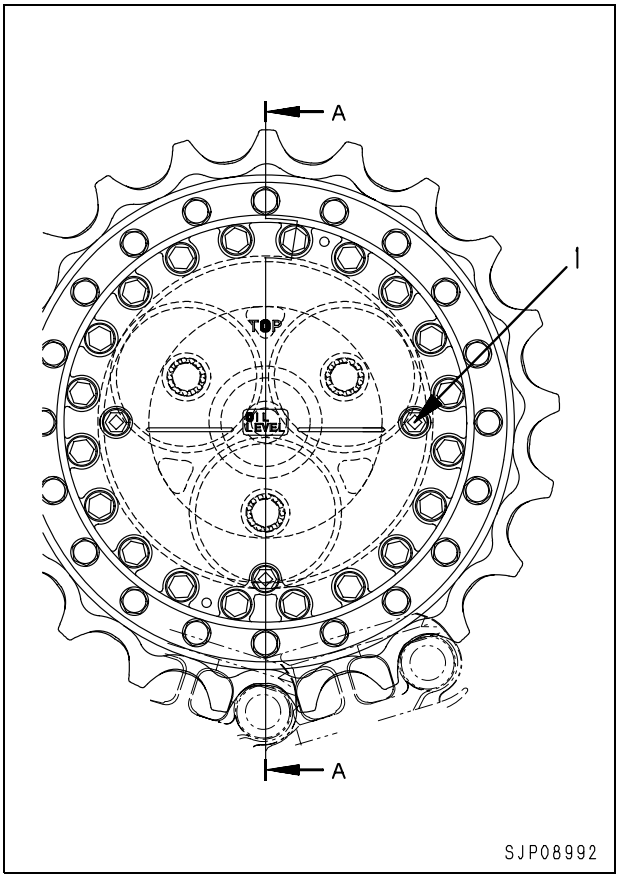
Final drive



1. Level plug
2. Drain plug
3. No.1 planetary gear (No. of teeth: 42)
4. No.1 sun gear (No. of teeth: 11)
5. No. 2 sun gear (No. of teeth: 19)
6. No.1 planetary carrier
7. No. 2 planetary carrier
8. Cover
9. Ring gear (No. of teeth: 97)
10. Hub
11. Sprocket
12. Floating seal
13. Travel motor
14. No. 2 planetary gear (No. of teeth: 38)

Specifications

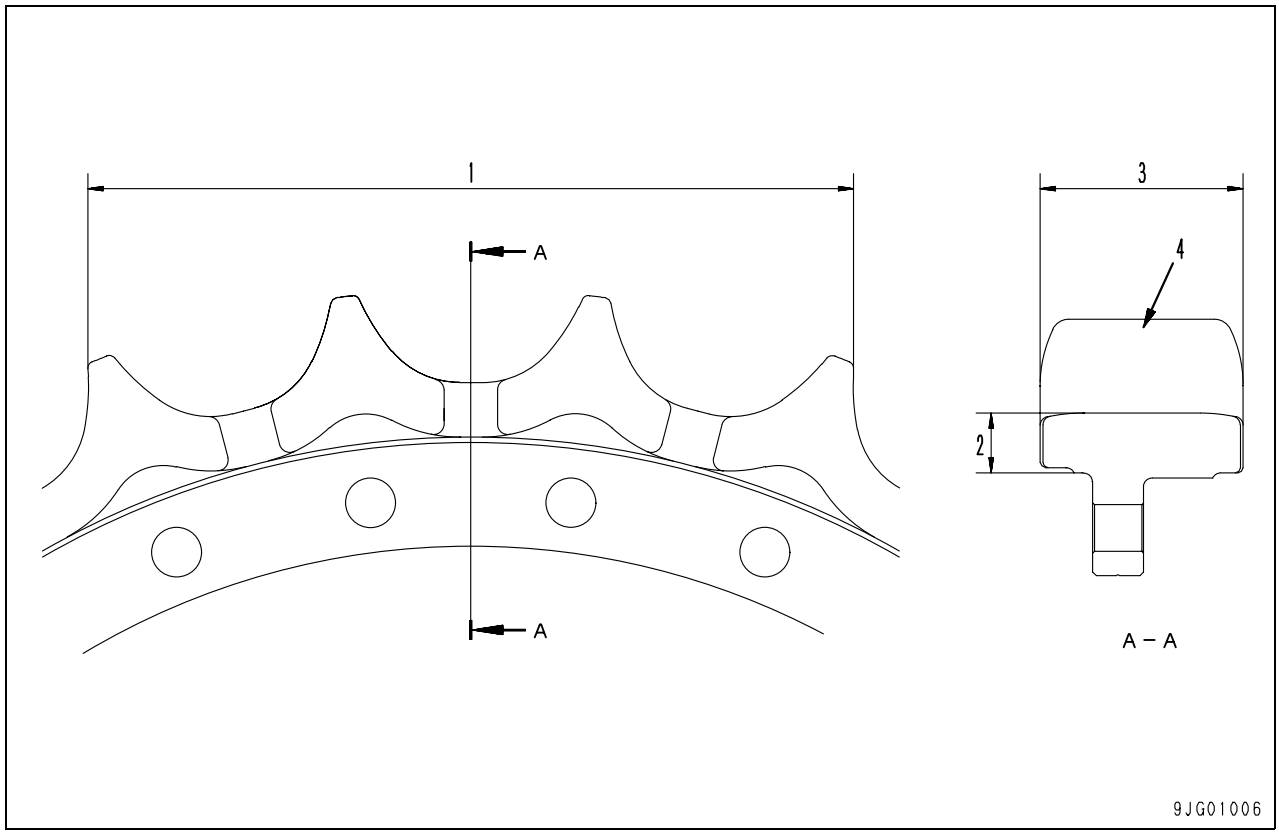
Reduction ratio: –((11+97)/11) x ((19+97)/19) = –58.943



Unit: mm

No.	Check Item	Criteria		Remedy
15	Backlash between No. 1 sun gear and No.1 planetary gear	Standard clearance	Clearance limit	Replace
		0.12 – 0.44	0.9	
16	Backlash between No. 1 planetary gear and ring gear	0.18 – 0.62	1.2	
17	Backlash between No. 2 planetary carrier and motor	0.06 – 0.25	–	
18	Backlash between No. 2 sun gear and No.2 planetary gear	0.15 – 0.51	1.00	
19	Backlash between No. 2 planetary gear and ring gear	0.19 – 0.66	1.3	
20	Backlash between No. 2 planetary carrier and No. 2 sun gear	0.39 – 0.80	1.6	
21	Amount of wear on sprocket tooth	Repair limit: 6		Build-up welding for rebuilding or replace
22	Width of sprocket tooth	Standard size	Repair limit	
		87	84	

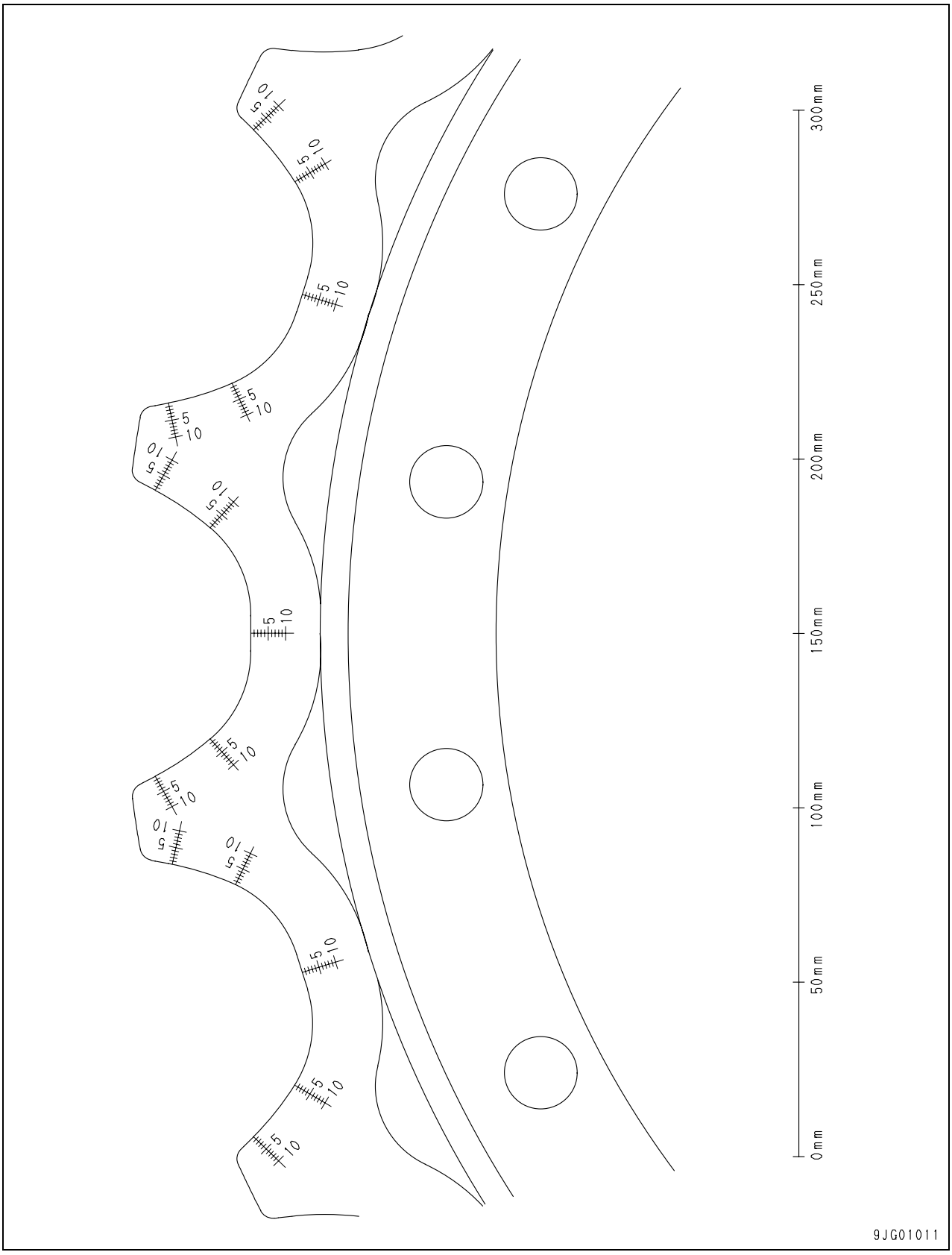
Sprocket



Unit: mm

No.	Check Item	Criteria		Remedy
1	Wear of tooth tip	Standard size	Repair limit	Build-up welding for rebuilding or replace
		336.5	324.5	
2	Thickness of tooth root	20	14	
3	Width of tooth	87	84	
4	Wear of tooth shape	Repair limit: 6 (measure with the full-size drawing of sprocket tooth shape)		

Full-size drawing of sprocket tooth shape



★ The above drawing is reduced to 62%. Enlarge it to 160% to return it to the full scale and make a copy on an OHP sheet.

PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN01991-00

HYDRAULIC EXCAVATOR

PC300-8
PC300LC-8
PC350-8
PC350LC-8

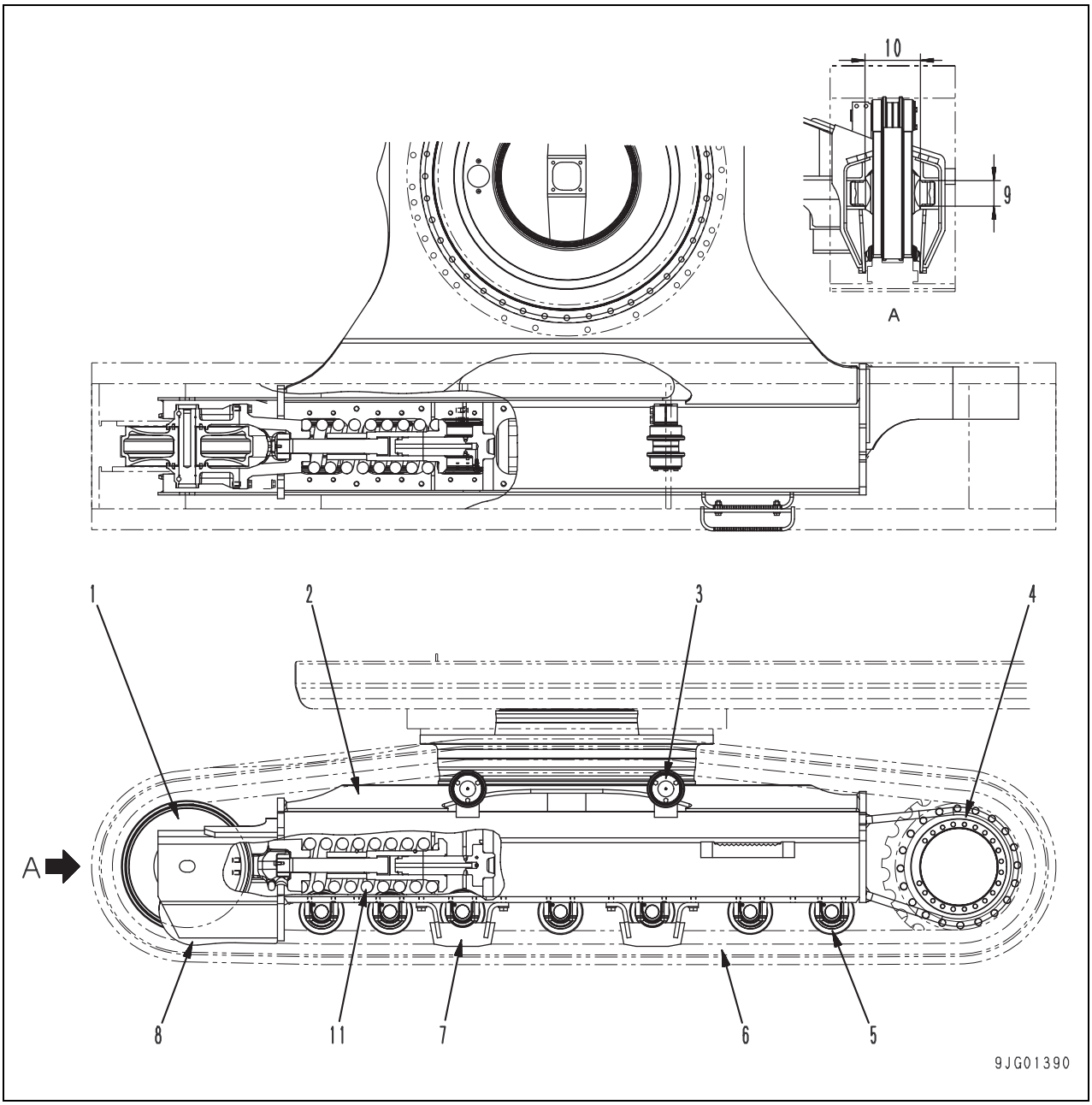
Machine model	Serial No.
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

10 Structure, function and maintenance standard

Undercarriage and frame

Track frame and recoil spring

★ The following drawing indicates PC300-8.



1. Idler
2. Track frame
3. Carrier roller
4. Final drive
5. Track roller
6. Track shoe
7. Center guard
8. Front guard

- The dimensions and the number of track rollers depend on the model, but the basic structure is not different.
- Number of track rollers

Model	Q'ty (one side)
PC300, 350-8	7
PC300LC-8, PC350LC-8	8

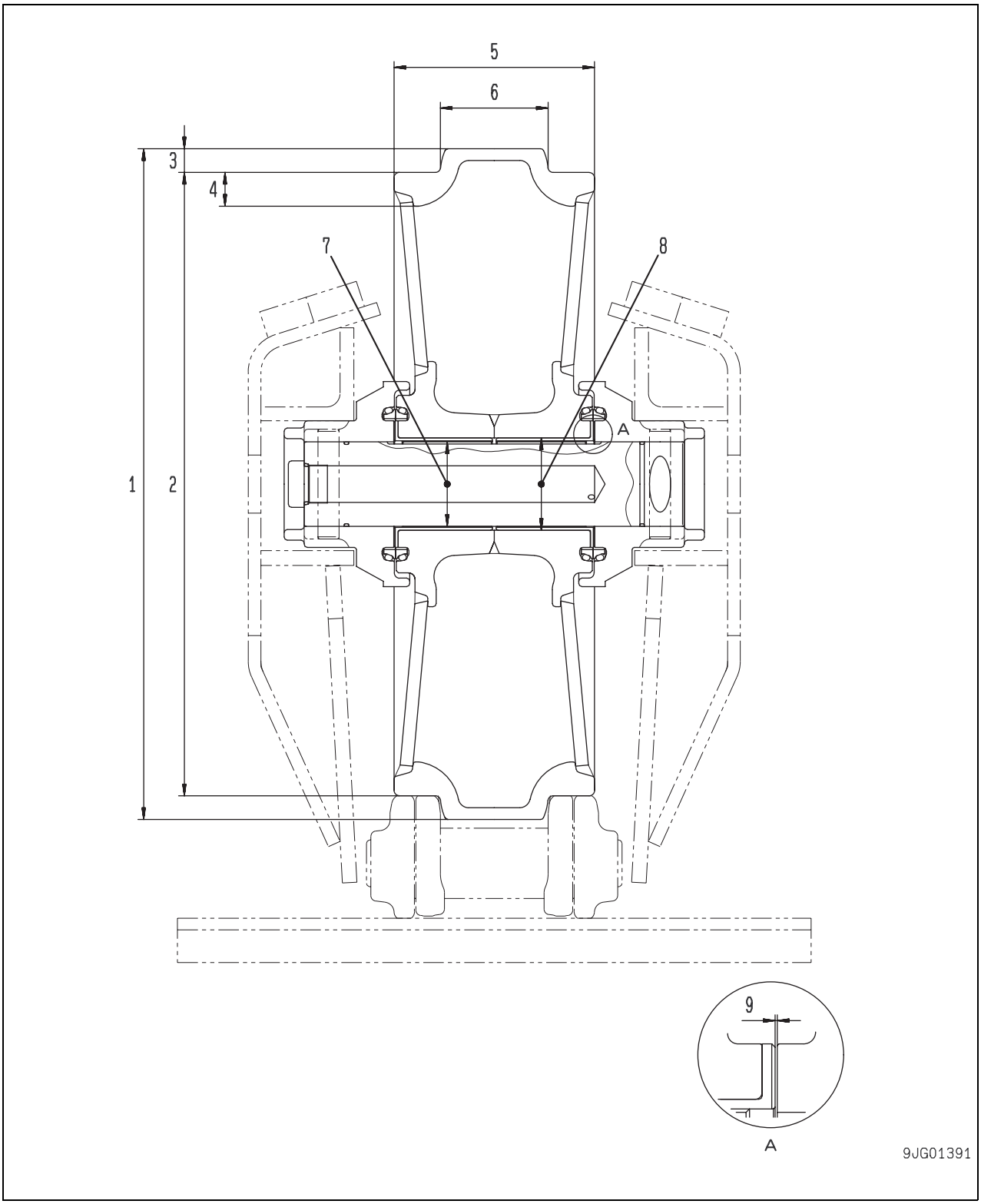
Standard shoe

Item \ Models	PC300-8	PC350-8	PC300LC-8	PC350LC-8
Shoe width (triple shoe) (mm)	600	600	600	600
Link pitch (mm)	216	216	216	216
No. of shoes (one side)	45	45	48	48

Unit: mm

No.	Check Item		Criteria					Remedy
9	Vertical width of idler guide	Track frame	Standard size: 123	Tolerance: +2 –1	Rapair limit: 127			Build-up welding for rebuilding or replace
		Idler support	Standard size: 120	Tolerance: ±0.5	Rapair limit: 118			
10	Horizontal width of idler guide	Track frame	Standard size: 266	Tolerance: +3 –1	Rapair limit: 271			
		Idler support	Standard size: 261	Tolerance: —	Rapair limit: 259			
11	Recoil spring		Standard size			Rapair limit		Replace
			Free length x O.D.	Installation length	Installation load	Free length	Installation load	
			811 x 261	655	208.7 kN {21,290 kg}	—	167.0 kN {17,030 kg}	

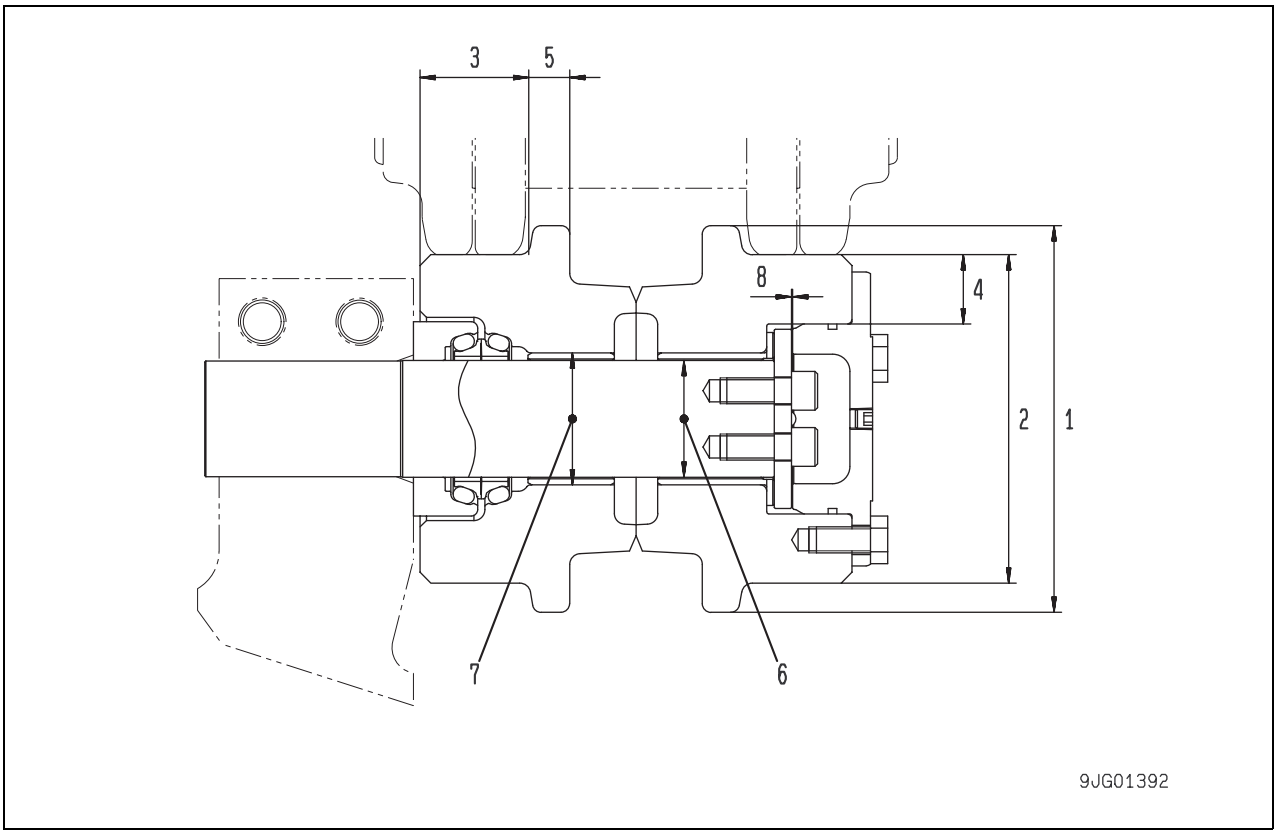
Idler



Unit: mm

<table>
<tr><th>No.</th><th>Check Item</th><th colspan="6">Criteria</th><th>Remedy</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Outside diameter of protrusion</td><td colspan="3">Standard size</td><td colspan="2">Rapair limit</td><td rowspan="6">Build-up welding for rebuilding or replace</td></tr>
<tr><td colspan="3">635</td><td colspan="2">—</td></tr>
<tr><td>2</td><td>Outside diameter of tread</td><td colspan="3">590</td><td colspan="2">578</td></tr>
<tr><td>3</td><td>Difference of tread</td><td colspan="3">22.5</td><td colspan="2">28.5</td></tr>
<tr><td>4</td><td>Thickness of tread</td><td colspan="3">—</td><td colspan="2">—</td></tr>
<tr><td>5</td><td>Total width</td><td colspan="3">190</td><td colspan="2">—</td></tr>
<tr><td>6</td><td>Width of tread</td><td colspan="3">44</td><td colspan="2">50</td></tr>
<tr><td rowspan="2">7</td><td rowspan="2">Clearance between shaft and bushing</td><td rowspan="2">Standard size</td><td colspan="2">Tolerance</td><td rowspan="2">Standard clearance</td><td rowspan="2">Clearance limit</td><td rowspan="4">Replace bushing</td></tr>
<tr><td>Shaft</td><td>Hole</td></tr>
<tr><td>80</td><td>–0.225
–0.325</td><td>+0.130
–0.024</td><td>0.201 –
0.455</td><td>—</td></tr>
<tr><td rowspan="2">8</td><td rowspan="2">Interference between idler and bushing</td><td rowspan="2">Standard size</td><td colspan="2">Tolerance</td><td rowspan="2">Standard interference</td><td rowspan="2">Interference limit</td></tr>
<tr><td>Shaft</td><td>Hole</td></tr>
<tr><td>87.6</td><td>+0.087
+0.037</td><td>–0.027
–0.079</td><td>0.064 –
0.166</td><td>—</td></tr>
<tr><td rowspan="2">9</td><td rowspan="2">Clearance between bushing and support
(Sum of clearance at both sides)</td><td colspan="3">Standard size</td><td colspan="2">Clearance limit</td></tr>
<tr><td colspan="3">0.68 – 1.22</td><td colspan="2">—</td></tr>
</table>

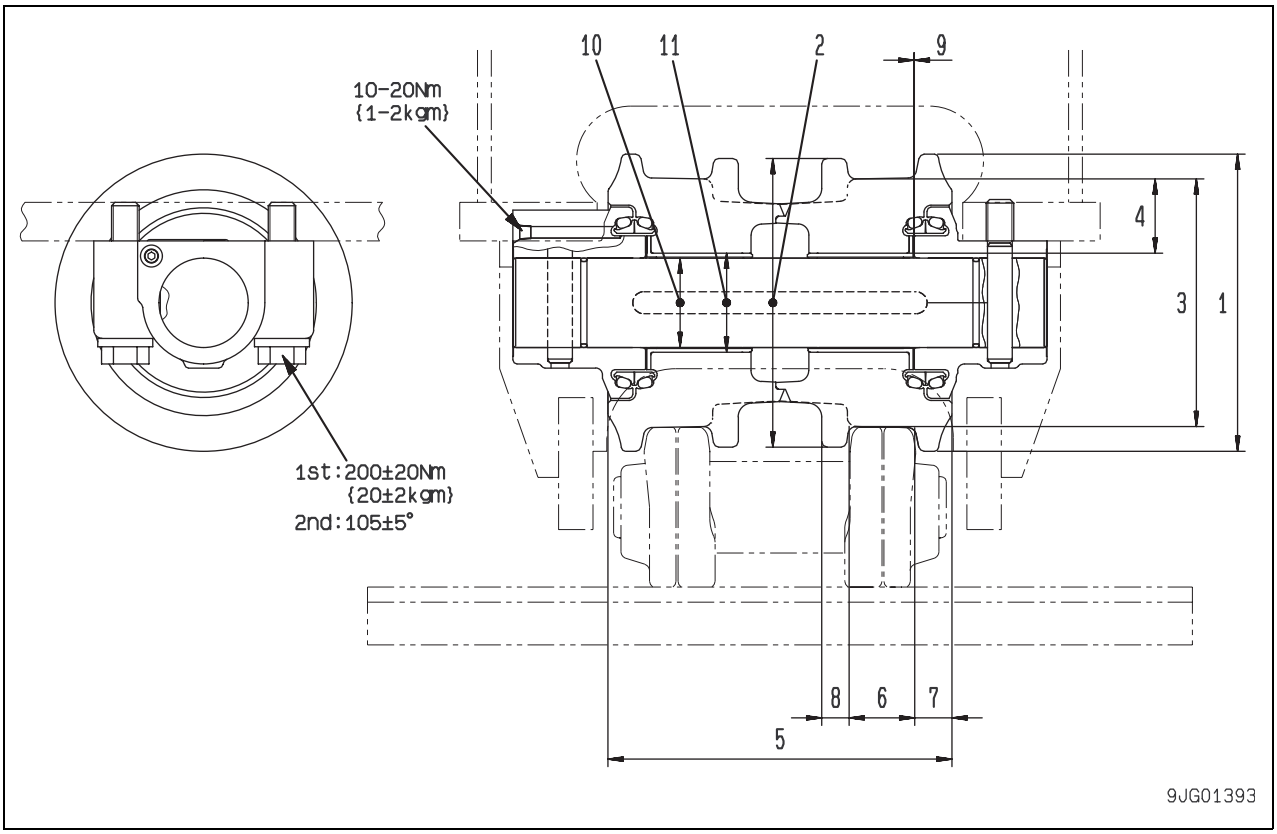
Carrier roller



Unit: mm

No.	Check Item	Criteria					Remedy
1	Outside diameter of flange	Standard size			Rapair limit		Replace
		179			—		
2	Outside diameter of tread	152			138		
3	Width of tread	50.3			—		
4	Thickness of tread	32			25		
5	Width of flange	19			—		
6	Clearance between shaft and bushing	Standard size	Tolerance		Standard clearance	Clearance limit	
			Shaft	Hole			
		54	–0.250 –0.280	+0.074 0	0.250 – 0.354	—	
7	Interference between roller and bushing	Standard size	Tolerance		Standard interference	Interference limit	
			Shaft	Hole			
		61	+0.117 +0.087	+0.030 0	0.057 – 0.117	—	
8	Axial clearance of roller	Standard clearance			Clearance limit		
		0.5 – 0.7			—		

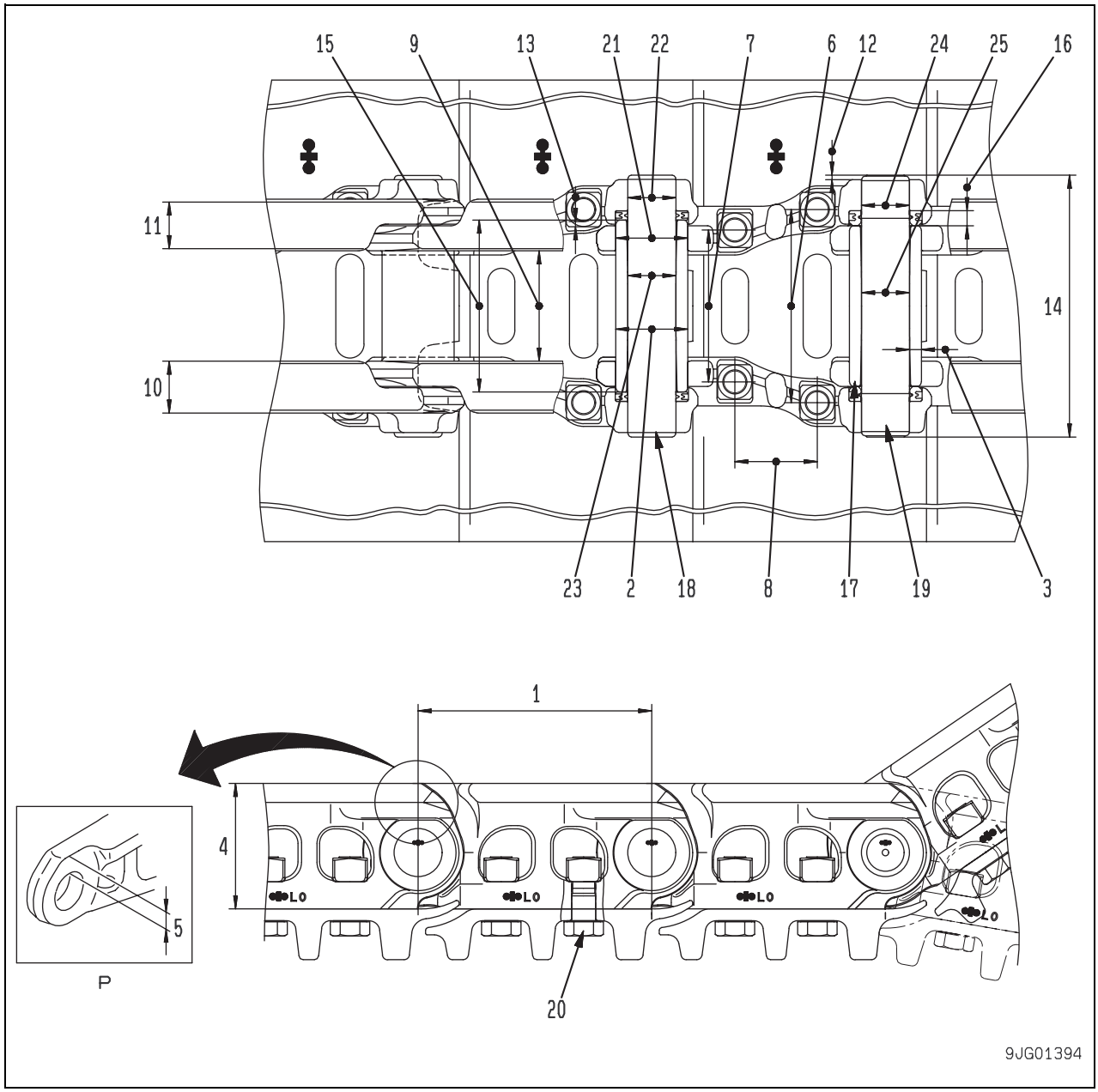
Track roller



Unit: mm

No.	Check Item		Criteria					Remedy
1	Outside diameter of outer flange		Standard size		Rapair limit			Build-up welding for rebuilding or replace
			216		—			
2	Outside diameter of inner flange (Double flange)		210		—			
3	Outside diameter of tread		180		168			
4	Thickness of tread		54		48			
5	Overal width		250		—			
6	Width of tread	Single flange	49		—			
		Double flange	47.7					
7	Width of flange	Single flange	27		—			
		Double flange						
8	Width of inner frange (Double frame)		98		—			
9	Clearance between bushing and collar (Sum of clearance at both sides)		0.44 – 0.97		—			Replace bushing
10	Clearance between shaft and bushing		Standard size	Tolerance		Standard clearance	Clearance limit	
				Shaft	Hole			
			65	–0.250 –0.350	+0.186 –0.064	0.186 – 0.536	—	
11	Interference between roller and bushing		Standard size	Tolerance		Standard interference	Interference limit	
				Shaft	Hole			
			72	+0.108 +0.008	–0.006 –0.036	0.014 – 0.144	—	

Track shoe



★ P portion shows the link of bushing press fitting end.

Unit: mm

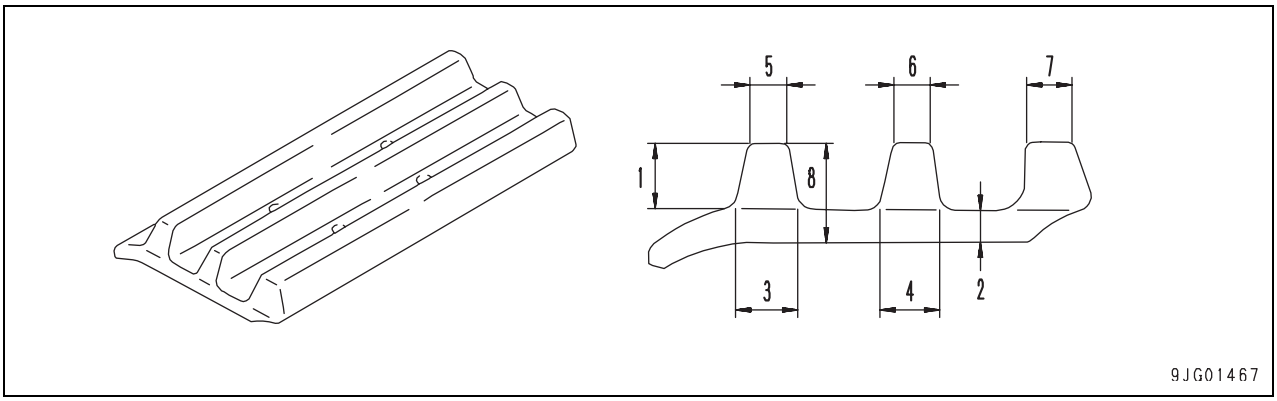
No.	Check Item	Criteria		Remedy
1	Link pitch	Standard size	Repair limit	Reverse or replace
		216.3	219.3	
2	Outside diameter of bushing	Standard size	Repair limit	
		66.9	61.9	
3	Thickness of bushing metal	10.8	5.8	Adjust or replace
4	Link height	Standard size	Repair limit	Repair or replace
		116	107	
5	Thickness of link metal (bushing press-fitting portion)	30.7	21.7	

Unit: mm

No.	Check Item		Criteria			Remedy
6	Shoe bolt pitch		178.4			Replace
7			140.4			
8			76.2			
9	Link	Inside width	102			Repair or replace
10		Overall width	47.8			
11		Tread width	42.6			
12	Protrusion of pin		4.2			Adjust or replace
13	Protrusion of regular bushing		5.25			
14	Overall length of pin		242			
15	Overall length of bushing		148.4			
16	Thickness of spacer		Standard size	Reverse		
			10.8	5.8		
17	Press-fitting force	Bushing	98 – 264.6 kN {10 – 27 ton}			—
18		Regular pin	147 – 362.6 kN {15 – 37 ton}			
19 (*)		Master pin	98 – 215.6 kN {10 – 22 ton}			
20	Shoe bolt	a. Regular link	Tightening torque (Nm {kgm})		Retightening angle (deg.)	Retighten
			Triple grouser shoe	393±39 {40±4}	120±10	
		b. Master link	Tightening torque (Nm {kgm})	Retightening angle (deg.)	Lower limit torque (Nm {kgm})	
			—	—	—	
21	Interference between bushing and link		Standard size	Tolerance		Standard interference
				Shaft	Hole	
			66.5	+0.464 +0.424	+0.074 0	0.350 – 0.464
22	Interference between regular pin and link		44.6	+0.235 +0.085	–0.188 –0.250	0.273 – 0.485
23	Clearance between regular pin and bushing		Standard size	Tolerance		Standard clearance
				Shaft	Hole	
			44.6	+0.235 +0.085	+0.915 +0.415	0.180 – 0.830
24 (*)	Interference between master pin and link		Standard size	Tolerance		Standard interference
				Shaft	Hole	
			44.6	+0.03 0	–0.188 –0.250	0.188 – 0.280
25 (*)	Clearance between master pin and bushing		Standard size	Tolerance		Standard clearance
				Shaft	Hole	
			44.3	+0.050 –0.050	+0.915 +0.415	0.365 – 0.965

* Dry type track link

Triple grouser shoe



Unit: mm

No.	Check Item		Criteria		Remedy
1	Height		Standard size	Repair limit	Build-up welding for rebuilding or replace
			36	24	
		(*)	30	18	
2	Thickness		11		
3	Length of base		32		
		(*)	29		
4			26		
		(*)	24		
5	Length at tip		24		
		(*)	22		
6			18		
		(*)	16		
7			18		
		(*)	22		
8	Thickness		Standard size	Repair limit	
			47	35	
		(*)	41	29	

*: PC300-8, PC350-8, PC350LC-8: 600 mm width shoe

PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN01992-00

HYDRAULIC EXCAVATOR

PC300-8
PC300LC-8
PC350-8
PC350LC-8

Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

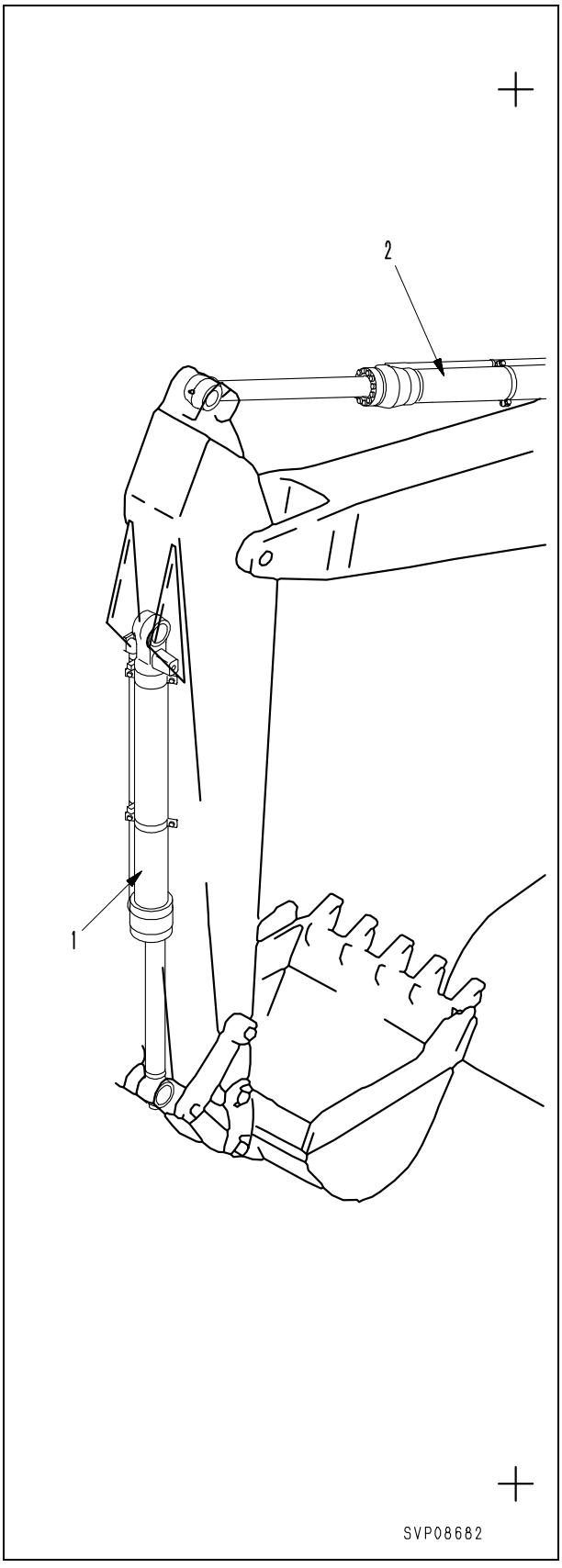
10 Structure, function and maintenance standard

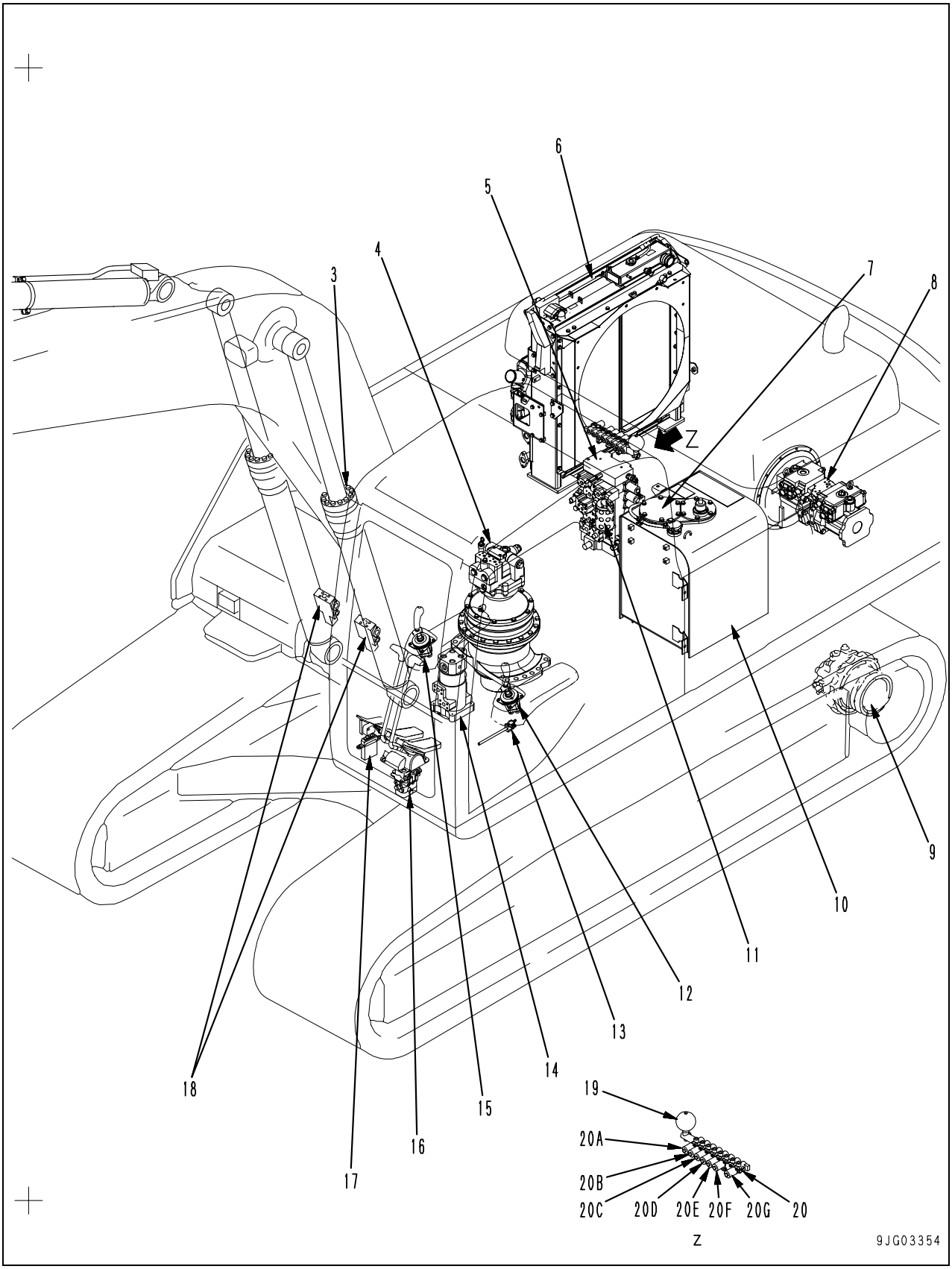
Hydraulic system, Part 1

Hydraulic equipment layout drawing

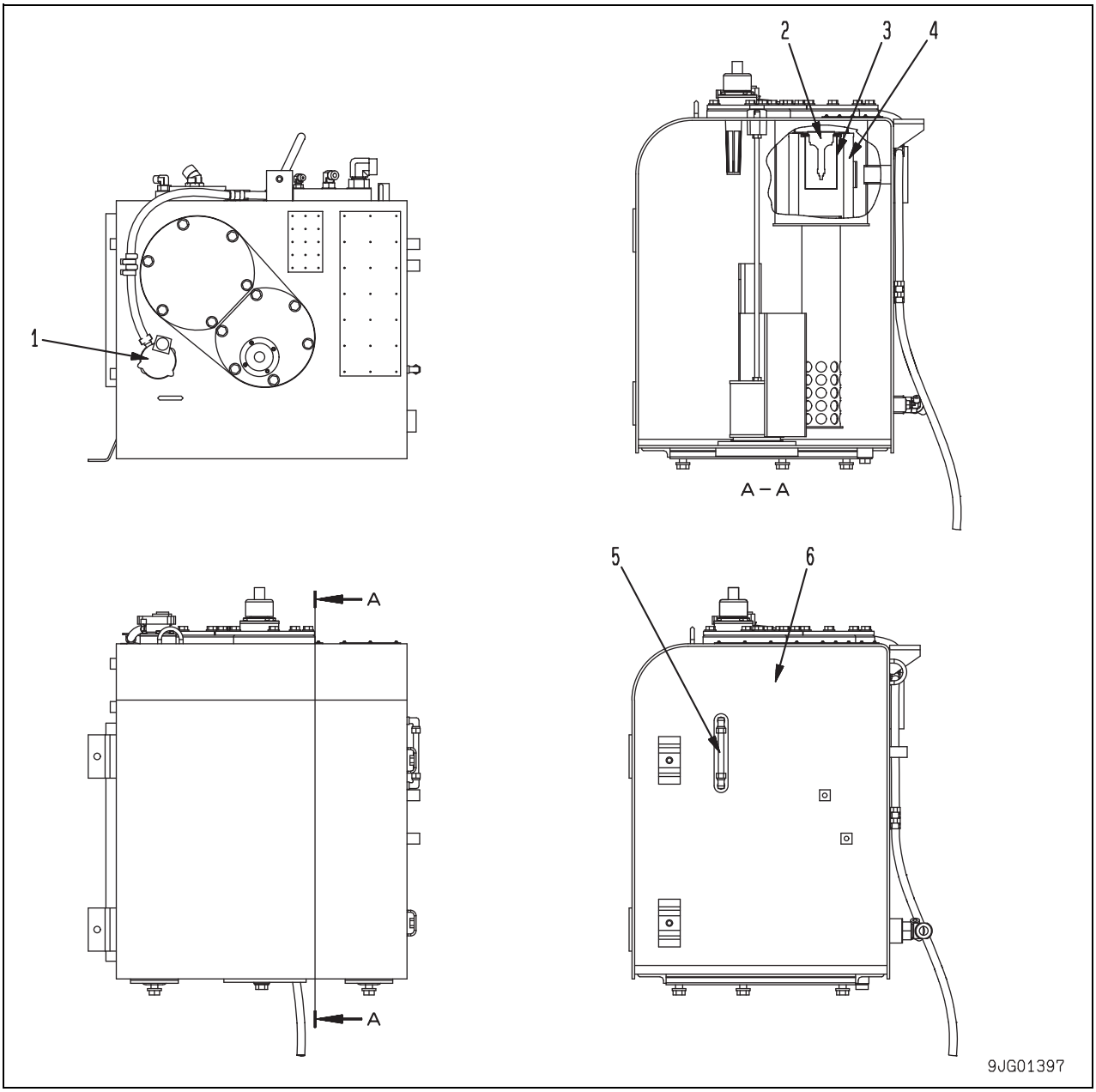
1. Bucket cylinder
2. Arm cylinder
3. Boom cylinder
4. Swing motor
5. Control valve
6. Oil cooler
7. Hydraulic filter
8. Hydraulic pump
9. L.H. travel motor
10. Hydraulic tank
11. Multi-pattern selector valve
12. L.H. PPC valve
13. Work equipment lock lever (electric type)
14. Center swivel joint
15. R.H. PPC valve
16. Travel PPC valve
17. Attachment circuit selector valve
18. Hydraulic drift prevention valve
19. Accumulator
20. Solenoid valve assembly

20A. PPC lock solenoid
20B. Travel junction solenoid
20C. Pump merge-divider solenoid
20D. Travel speed solenoid
20E. Swing brake solenoid
20F. Machine push-up solenoid
20G. 2-stage relief solenoid




6
5
4
3
7
8
Z
9
10
11
12
13
14
15
16
17
18
19
20A
20B
20C
20D
20E
20F
20G
20
Z
9JG03354

Hydraulic tank and filter



1. Oil filler cap
2. Bypass valve
3. Strainer
4. Filter element
5. Sight gauge
6. Hydraulic tank

Specifications

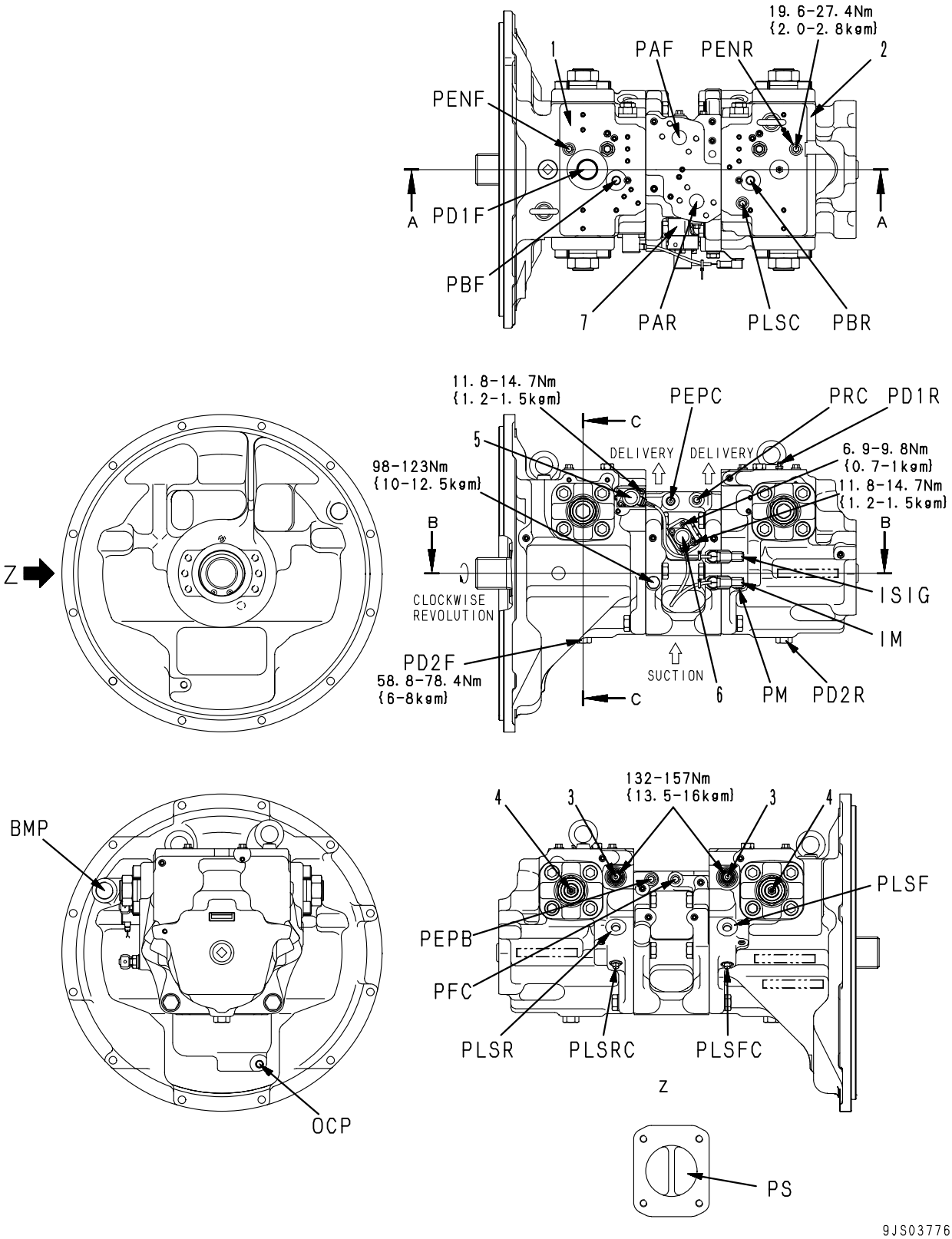
Tank capacity: 275 ℓ
Amount of oil inside tank: 188 ℓ

Safety valve

Relief cracking pressure:
16.7 ± 6.9 kPa {0.17 ± 0.07 kg/cm^2}
Suction cracking pressure:
0 – 0.49 kPa {0 – 0.005 kg/cm^2}
Bypass valve set pressure:
150 ± 30 kPa {1.5 ± 0.3 kg/cm^2}

Hydraulic pump

Type: HPV125+125

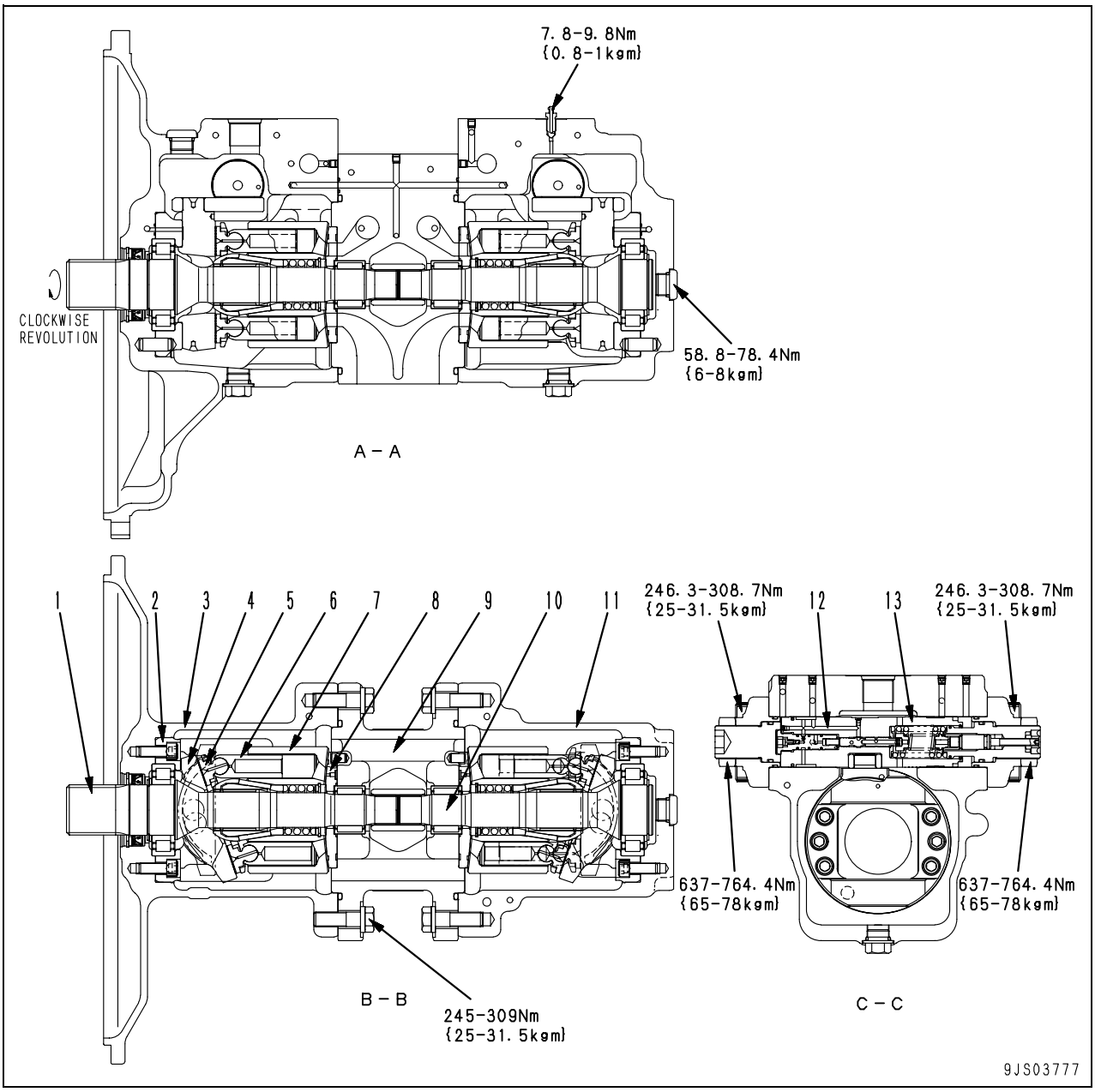


Outline

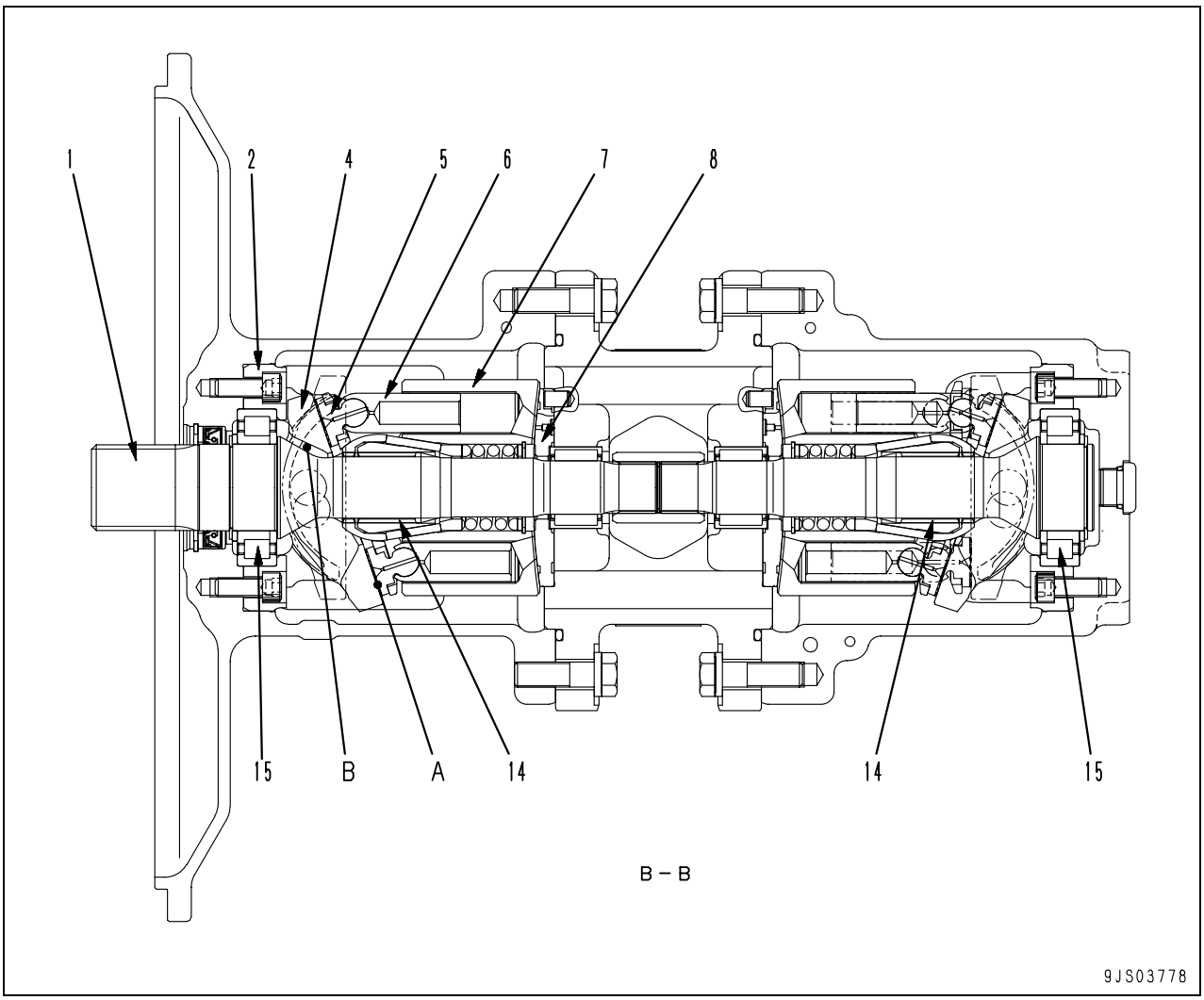
- This pump consists of 2 variable capacity swash plate piston pumps, PC valve, LS valve, EPC valve and variable volume valve.

BMP: Breather fitting port
IM: PC mode selector current
ISIG: LS set pressure selector current
OCP: Oil level detection port
PAF: Front pump delivery port
PAR: Rear pump delivery port
PBF: Front pump pressure input port
PBR: Rear pump pressure input port
PD1F: Case drain port
PD1R: Air breeder
PD2F: Drain plug
PD2R: Drain plug
PENF: Front control pressure detection port
PENR: Rear control pressure detection port
PEPC: EPC basic pressure port
PEPB: EPC basic pressure detection port
PFC: Front pump delivery pressure detection port
PLSC: LS set selector pressure detection port
PLSF: Front load pressure input port
PLSFC: Front load pressure detection port
PLSR: Rear load pressure input port
PLSRC: Rear load pressure detection port
PM: PC mode selector pressure detection port
PRC: Rear pump delivery pressure detection port
PS: Pump suction port

1. Front pump
2. Rear pump
3. LS valve
4. PC valve
5. LS-EPC valve
6. PC-EPC valve
7. Variable volume valve



1. Front shaft
2. Cradle
3. Front case
4. Rocker cam
5. Shoe
6. Piston
7. Cylinder block
8. Valve plate
9. End cap
10. Rear shaft
11. Rear case
12. Servo piston
13. PC valve



Function

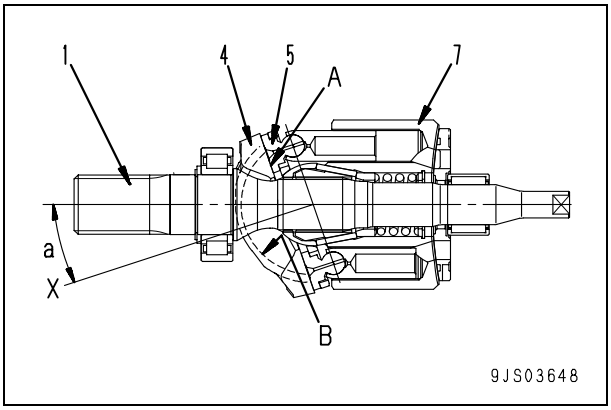
- The pump converts the engine rotation transmitted to the shaft to oil pressure and delivers pressurized oil corresponding to the load.
- It is possible to change the discharge amount by changing the swash plate angle.

Structure

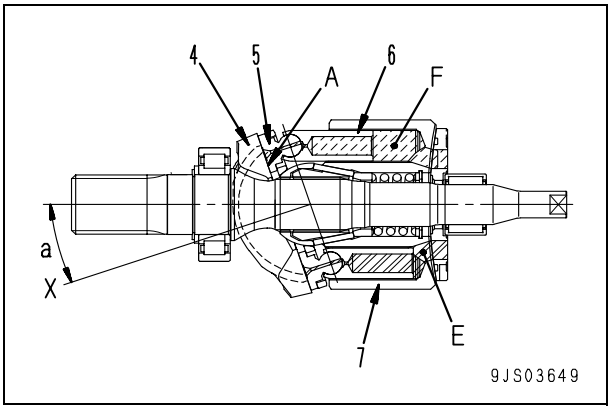
- Cylinder block (7) is supported to shaft (1) by spline (14).
- Shaft (1) is supported by front and rear bearings (15).
- Tip of piston (6) is shaped as a concave ball and shoe (5) is caulked to it to form one unit.
- Piston (6) and shoe (5) constitute the spherical bearing.
- Rocker cam (4) has flat surface (A), and shoe (5) is always pressed against this surface while sliding in a circular movement.
- Rocker cam (4) conducts high pressure oil to cylinder surface (B) with cradle (2), which is secured to the case, and forms a static pressure bearing when it slides.
- Piston (6) carries out relative movement in the axial direction inside each cylinder chamber of cylinder block (7).
- Cylinder block (7) seals the pressurized oil to valve plate (8) and carries out relative rotation.
- This surface is designed so that the oil pressure balance is maintained at a suitable level.
- The oil inside each cylinder chamber of cylinder block (7) is suctioned and discharged through valve plate (8).

Operation of pump

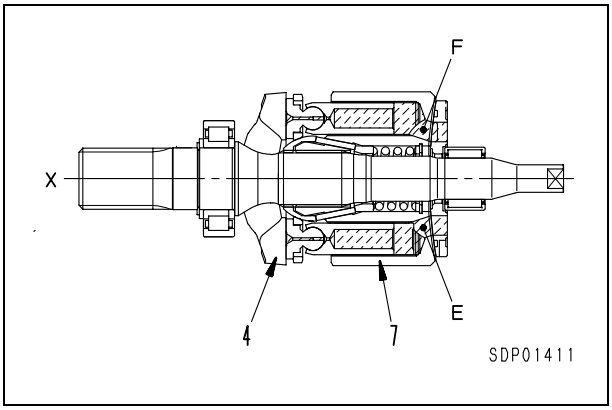
- Cylinder block (7) rotates together with shaft (1), and shoe (5) slides on flat surface (A).
- When this happens, rocker cam (4) moves along cylindrical surface (B), so angle (a) between center line (X) of rocker cam (4) and the axial direction of cylinder block (7) changes.
- (a) is named the swash plate angle.



- With center line (X) of rocker cam (4) at a swash plate angle (a) in relation to the axial direction of cylinder block (7), flat surface (A) acts as a cam in relation to shoe (5).
- In this way, piston (6) slides on the inside of cylinder block (7), so a difference between volumes (E) and (F) is created inside cylinder block (7).
- A single piston (6) sucks and discharges the oil by the amount (F) – (E).
- As cylinder block (7) rotates and the volume of chamber (E) becomes smaller, the pressurized oil is discharged.
- On the other hand, the volume of chamber (F) grows larger and, in this process, the oil is suctioned.

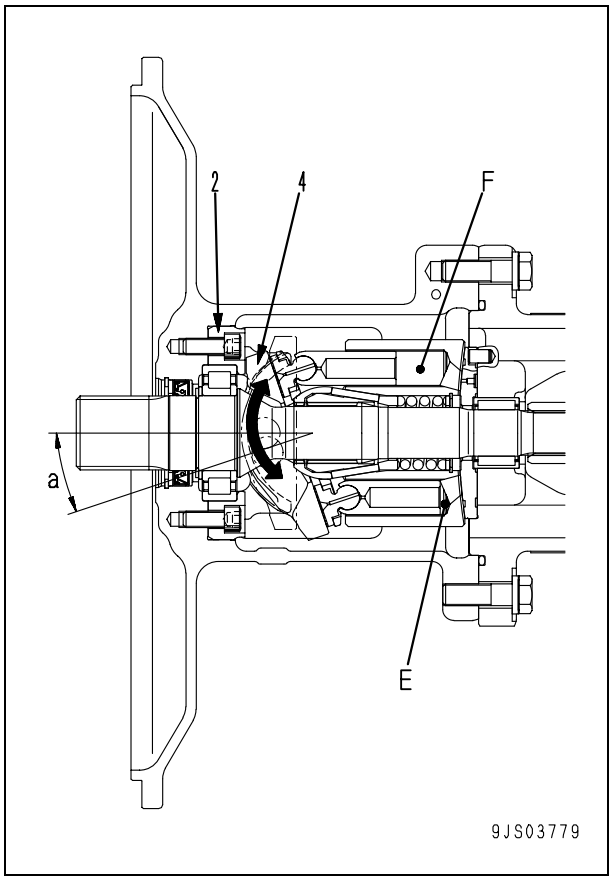


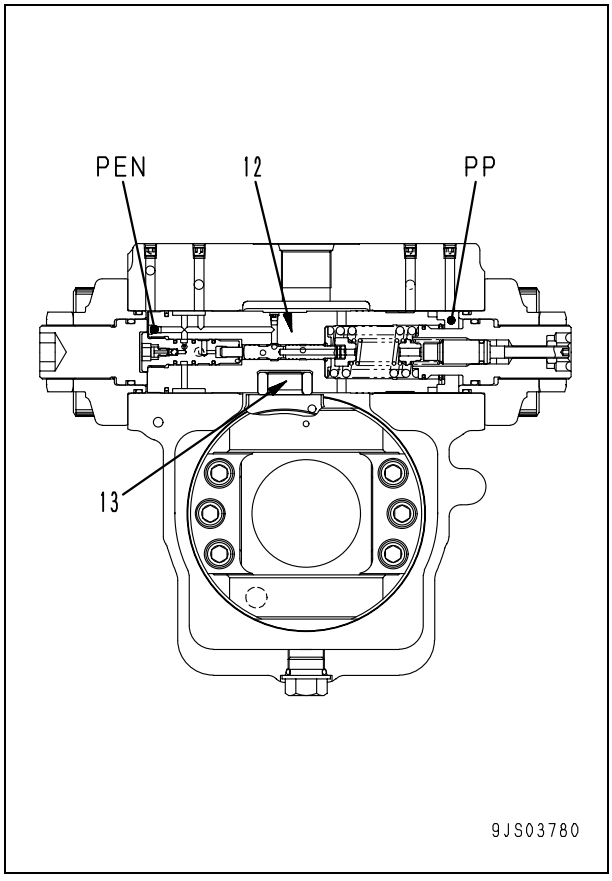
- As center line (X) of rocker cam (4) matches the axial direction of cylinder block (7) (swash plate angle (a) = 0), the difference between volumes (E) and (F) inside cylinder block (7) becomes 0.
- Suction and discharge of pressurized oil is not carried out in this state. Namely pumping action is not performed. (Actually, however, the swash plate angle is not set to 0)



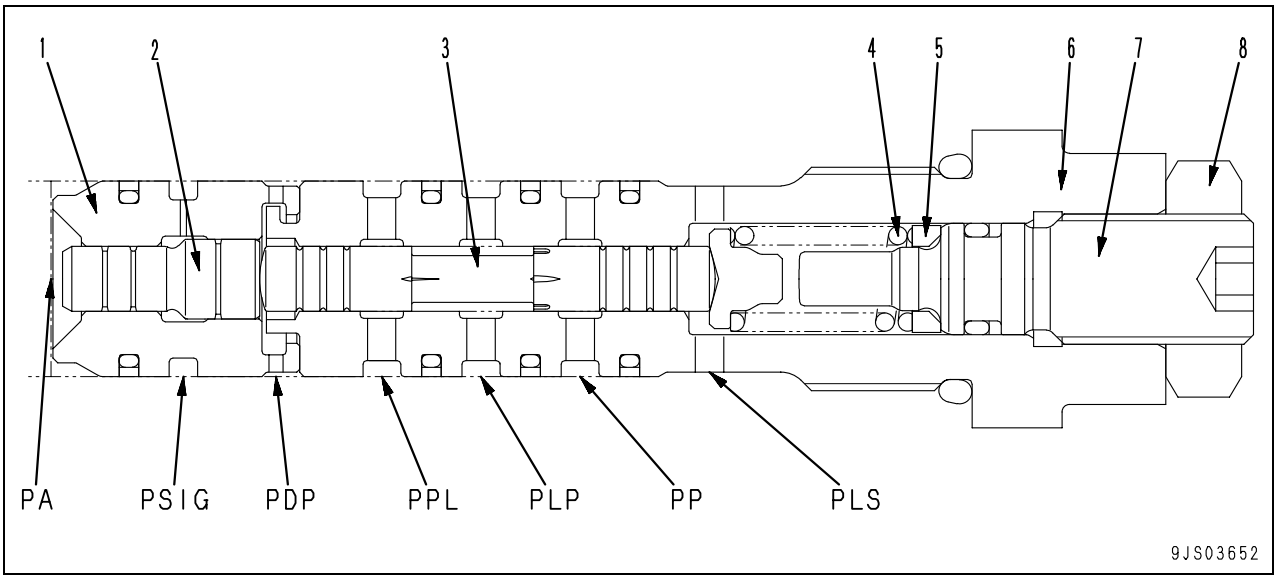
Control of discharge amount

- If the swash plate angle (a) becomes larger, the difference between volumes (E) and (F) becomes larger and pump delivery (Q) increases.
- Servo piston (12) is used for changing swash plate angle (a).
- Servo piston (12) carries out linear reciprocal movement according to the signal pressure from the PC and LS valves.
- This linear movement is transmitted to rocker cam (4) via slider (13).
- Being supported by cradle (2) on the cylindrical surface, rocker cam (4) slides on the surface while continuing revolving movement.
- Space of the pressure receiving area of servo piston (12) are not identical on the left side and right side. Main pump discharge pressure (self pressure) (PP) is always brought to the pressure chamber of the small diameter piston side.
- Output pressure (PEN) of the LS valve is brought to the chamber receiving the pressure at the large diameter piston end.
- The relationship in the size of pressure (PP) at the small diameter piston end and pressure (PEN) at the large diameter piston end, and the ratio between the area receiving the pressure of the small diameter piston and the large diameter piston controls the movement of servo piston (12).





1. LS valve



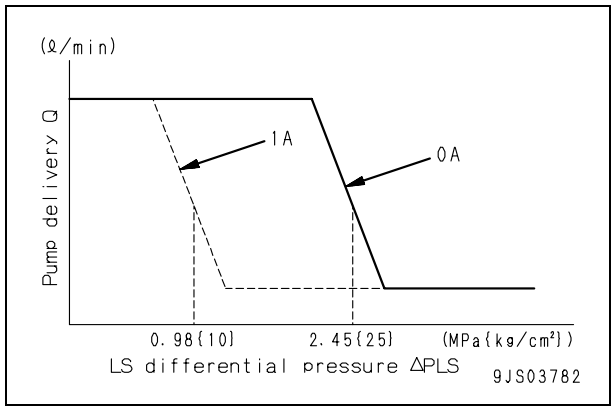
PA: Pump port
PDP: Drain port
PLP: LS control pressure output port
PLS: LS pressure input port
PP: Pump port
PPL: Control pressure input port
PSIG: LS mode selector pilot port

1. Sleeve
2. Piston
3. Spool
4. Spring
5. Seat
6. Sleeve
7. Plug
8. Locknut

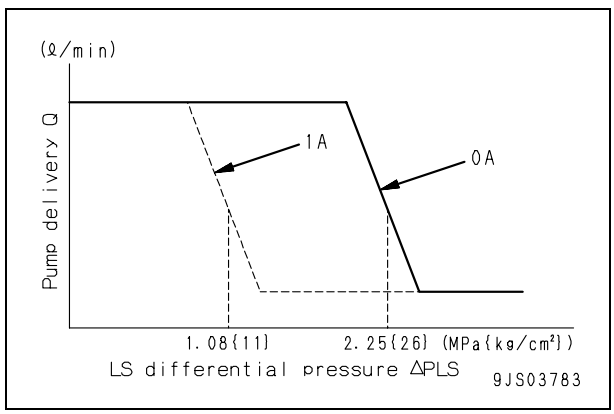
Function

- The LS (load sensing) valve detects the load and controls the discharge amount.
- This valve controls main pump delivery (Q) according to differential pressure (△PLS)[= PP – LS], called the LS differential pressure (the difference between main pump pressure PP and control valve outlet port pressure PLS).
- Main pump pressure (PP), pressure (PLS) (called the LS pressure) coming from the control valve output, and pressure (PSIG) (called the LS selector pressure) from the proportional solenoid valve enter this valve.
- The relationship between the LS differential pressure between the main pump pressure (PP) and LS pressure (PLS) (△PLS) [= (PP) – (PLS)] and the pump delivery (Q) changes as shown in the diagram according to LS selector current (ISIG) of the LS-EPC valve.
- If (ISIG) changes from 0 to 1A, setting force the spring changes, too. As the result, the specified median of the pump delivery volume switching point changes as shown in the diagram. As for the front pump side, it will change in the range of 0.98 to 2.45 MPa {in the range of 10 to 25 kg/cm^2] and as for the rear pump side, it will change in the range of 1.08 to 2.55 MPa {in the range of 11 to 26 kg/cm^2}.

Front pump

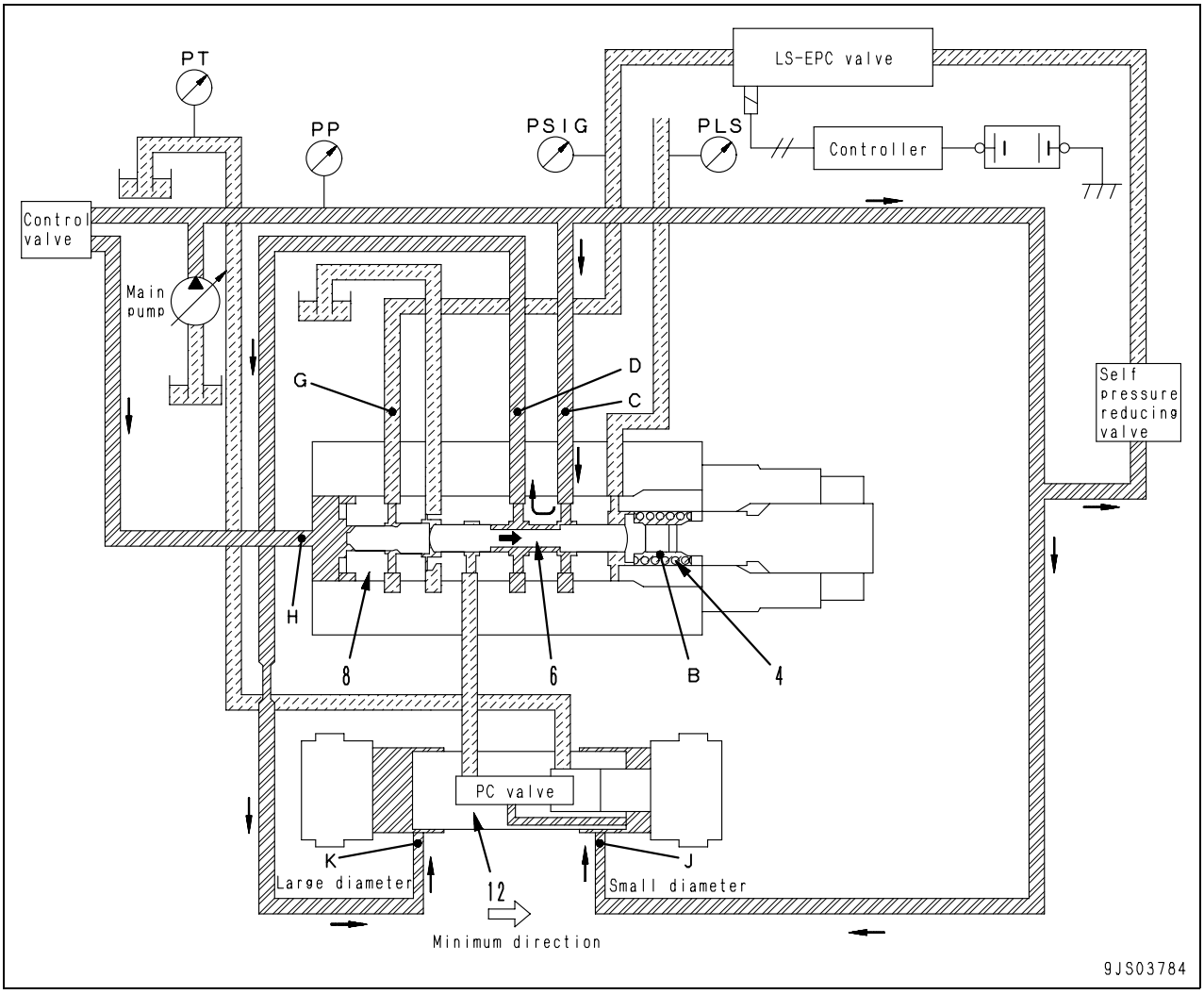


Rear pump

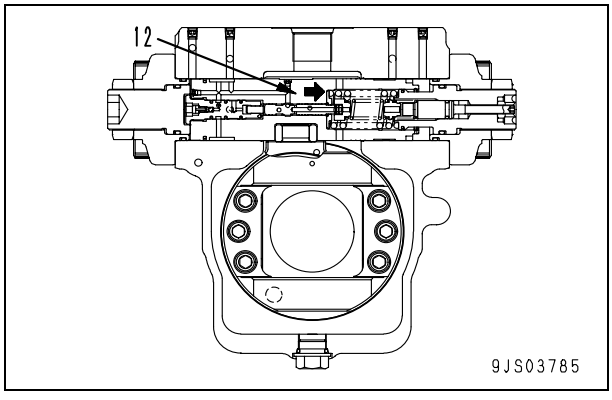


Operation

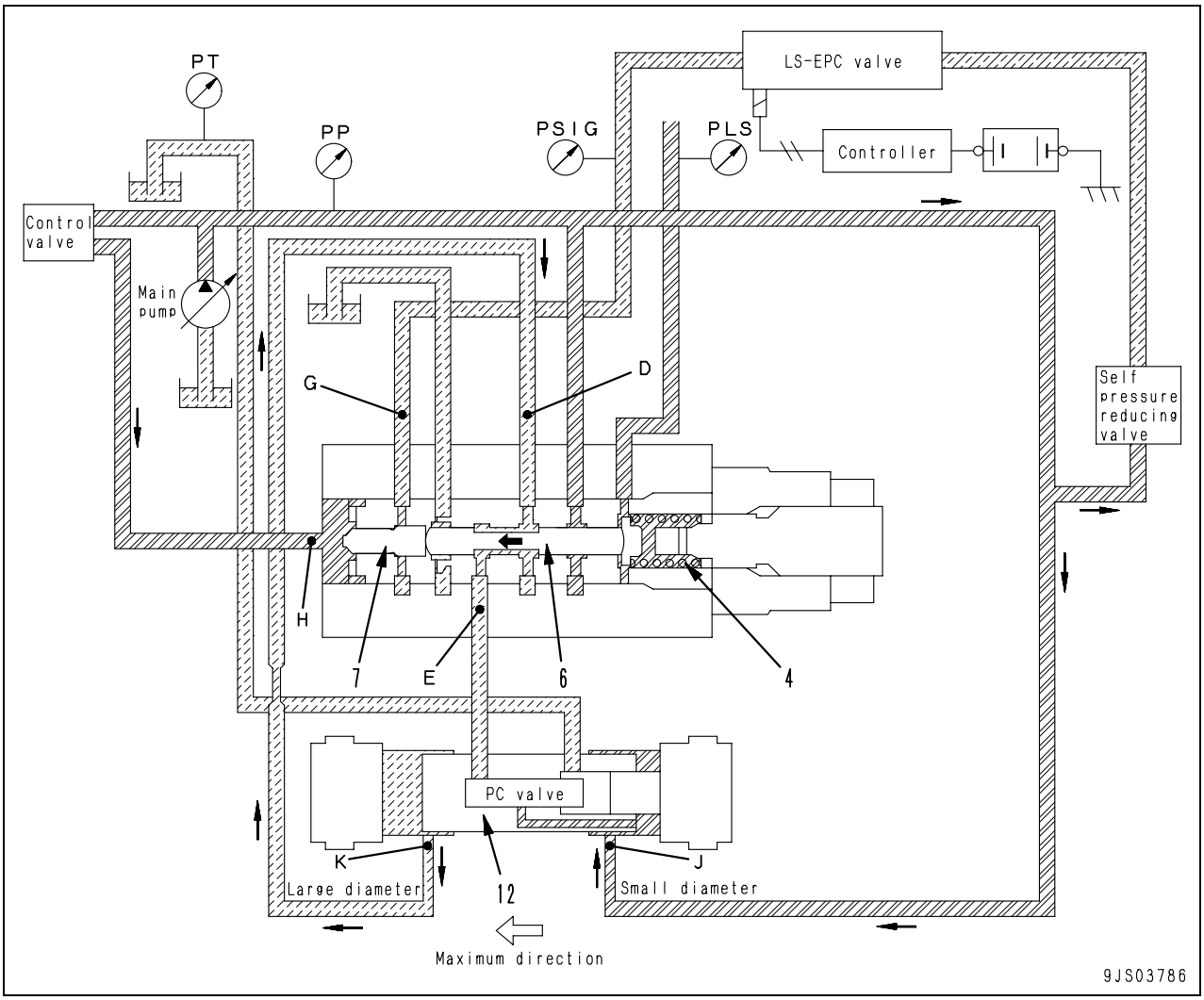
1) When the control valve is situated at neutral



- The LS valve is a 3-way selector valve, with pressure (PLS) (LS pressure) from the outlet port of the control valve brought to spring chamber (B), and main pump discharge pressure (PP) brought to port (H) of sleeve (8).
- Magnitude of the force resulting from this LS pressure (PLS), force of spring (4) and the pump delivery pressure (self pressure) (PP) determine the position of spool (6).
- However, magnitude of the output pressure (PSIG) (called the LS selector pressure) of the EPC valve for the LS valve entering port (G) also changes the position of spool (6). (Setting force of the spring is changed)
- Before the engine is started, servo piston (12) is pushed to the right. (See the figure)
- If the control lever is at the neutral position when the engine is started, LS pressure (PLS) will be set to 0 MPa {0 kg/cm^2}. (It is interconnected to the drain circuit via the control valve spool)
- Spool (6) is pushed to the right, and port (C) and port (D) will be connected.
- Pump pressure (PP) is conducted to the larger diameter end from the port (K).
- The same pump pressure (PP) is conducted to the smaller diameter end from the port (J).
- According to the difference in the areas on servo piston (12), the pressure moves in such that the swash plate angle may be minimized.

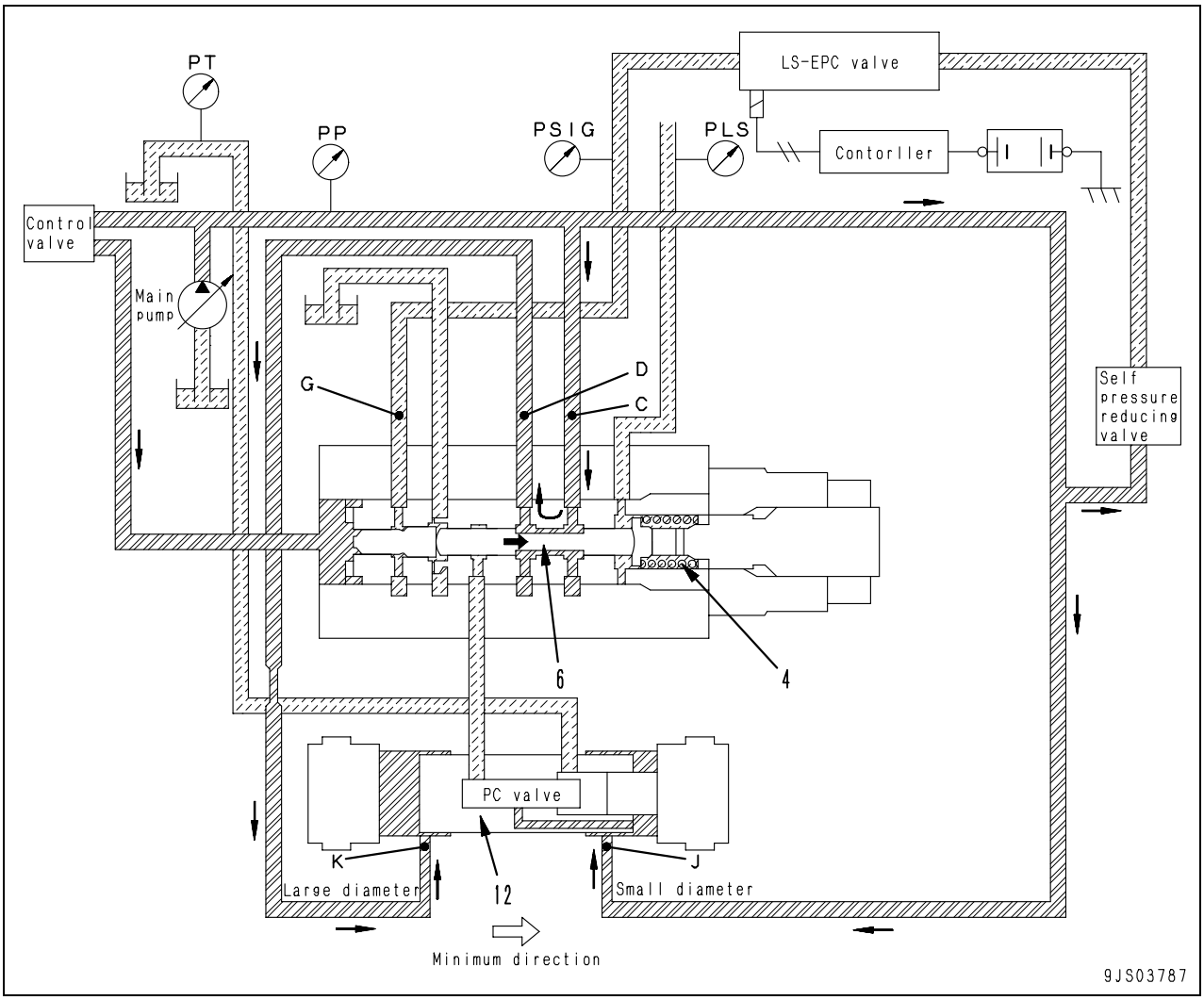


2) Action for the direction of maximizing the pump delivery



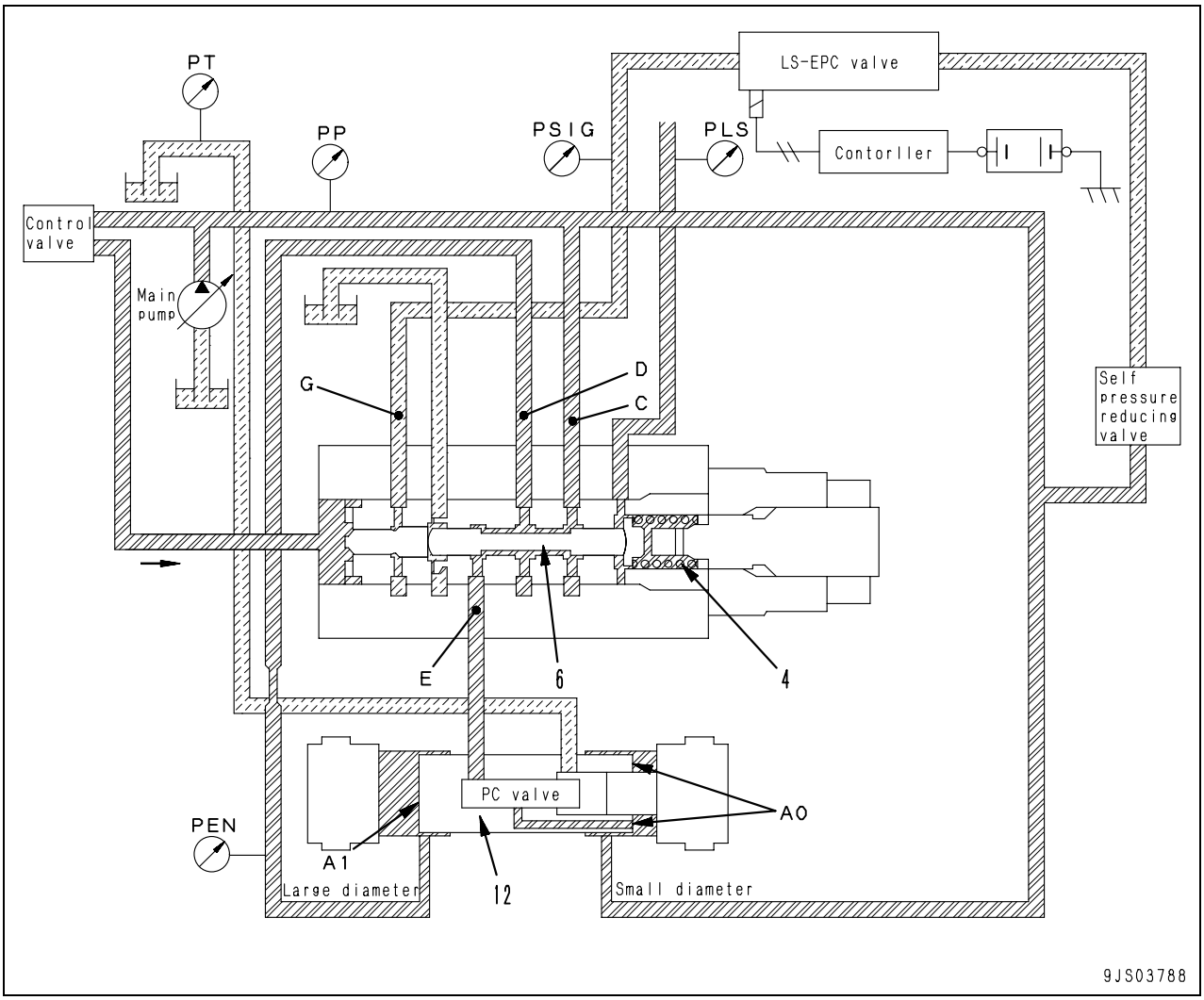
- When the difference between the main pump pressure (PP) and LS pressure (PLS), in other words, LS differential pressure (△PLS) becomes smaller (for example, when the area of opening of the control valve becomes larger and pump pressure PP drops), spool (6) is pushed to the left by the combined force of LS pressure (PLS) and the force of spring (4).
- When spool (6) moves, port (D) and port (E) are interconnected and connected to the PC valve.
- The PC valve is connected to the drain port, so the pressure across circuits (D) and (K) becomes drain pressure (PT). (The operation of the PC valve is explained later.)
- The pressure at the large diameter end of servo piston (12) becomes drain pressure (PT), and pump pressure (PP) enters port (J) at the small diameter end, so servo piston (12) is pushed to the left side. Therefore, the swash plate is moved in the direction to make the discharge amount larger.
- If the output pressure of the EPC valve for the LS valve enters port (G), rightward force is generated on piston (7).
- If piston (7) is pushed to the right, setting force of spring (4) is weakened, changing the LS differential pressure (△PLS) [Difference between oil pressures (PLS) and (PP)] when ports (D) and (E) of spool (6) are connected.

3) Action for the direction of minimizing the pump delivery



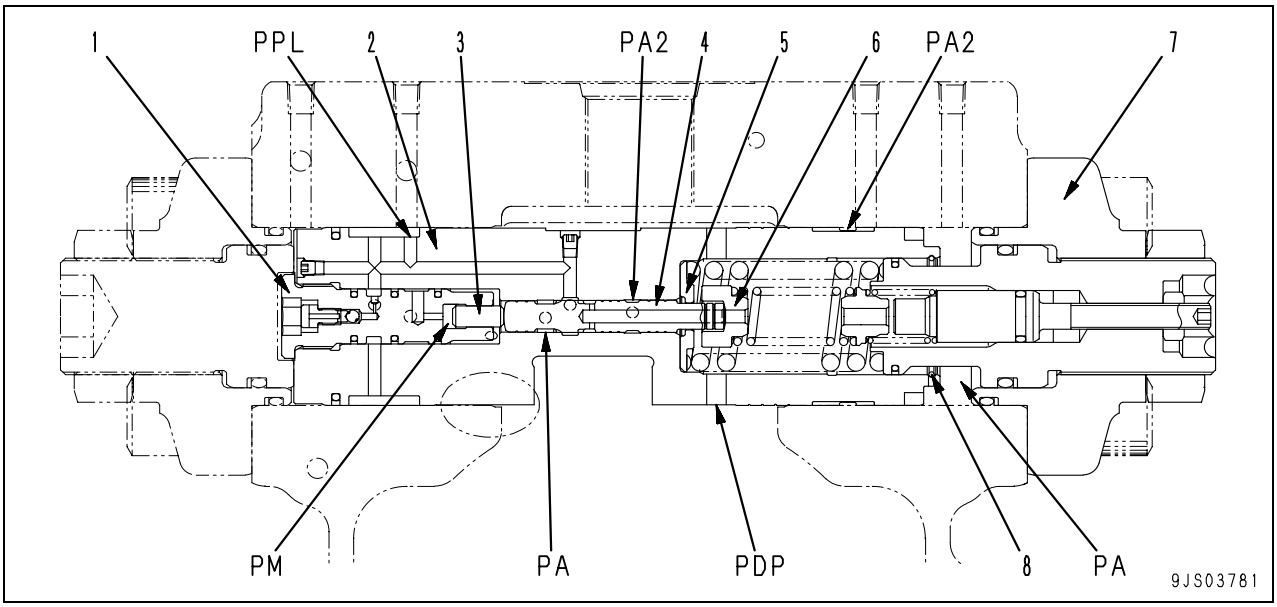
- When LS differential pressure (△PLS) becomes larger (for example, when the area of opening of the control valve becomes smaller and pump pressure (PP) rises) because of the rightward move (it reduces discharge amount) of servo piston (12), pump pressure (PP) pushes spool (6) to the right.
- When spool (6) moves, main pump pressure (PP) flows from port (C) to port (D) and from port (K), it enters the large diameter end of the piston.
- Main pump pressure (PP) also enters port (J) of the small diameter end of the piston, but because of the difference in area between the large diameter end and the small diameter end on servo piston (12), it is pushed to the right. As the result, servo piston (12) moves into the direction of reducing the swash plate angle.
- As LS selector pressure (PSIG) is input to port (G), setting force of spring (4) is reduced.

4) When servo piston is balanced



- Let us take the area receiving the pressure at the large diameter end of the piston as (A1), the area receiving the pressure at the small diameter end as (A0), and the pressure flowing into the large diameter end of the piston as (PEN).
- If the main pump pressure (PP) of the LS valve and the combined force of spring (4) and LS pressure (PLS) are balanced, and the relationship is (A0) x (PP) = (A1) x (PEN), servo piston (12) will stop in that position.
- And the swash plate of the pump will be held in an intermediate position. [Spool (6) will be stopped at a position where the distance of the opening from port (D) to port (E) and the distance from port (C) to port (D) is almost the same.]
- At this point, the relationship between the pressure receiving areas across servo piston (12) is (A0) : (A1) = 3 : 5, so the pressure applied across the piston when it is balanced becomes (PP) : (PEN) ≒ 5 : 3.
- Force of spring (4) is adjusted in such that the position of the balanced stop of this spool (6) may be determined when (PP) – (PLS) = 2.45 MPa {25 kg/cm^2} on the front pump side and (PP) – (PLS) = 2.55 MPa {26 kg/cm^2} on the rear pump side at the median of the specified value.
- If (PSIG) [Output pressure of LS-EPC valve, 0 to 2.9 MPa {0 to 30 kg/cm^2}] is input to port (G), the position of the balanced stop is changed. The front pump side will be moved in the range of (PP) –(PLS) = 2.45 to 0.98 MPa {25 to 0 kg/cm$_2$} and the rear pump will be moved in the range of (PP) – (PLS) = 2.55 to 1.08 MPa {26 to 11 kg/cm^2} in proportion to (PSIG) pressure.

2. PC valve

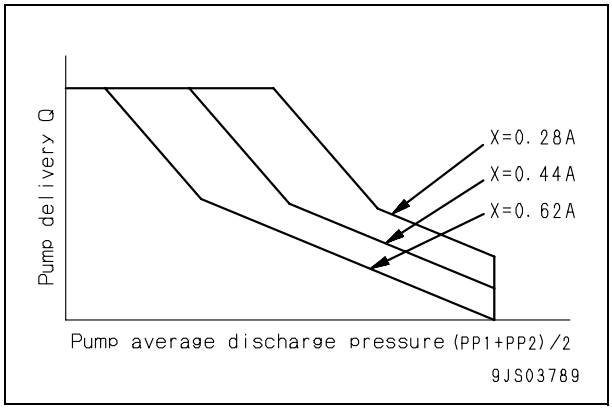


PA: Pump port
PA2: Pump pressure pilot port
PDP: Drain port
PM: Mode selector pressure pilot port
PPL: Control pressure output port (to LS valve)

1. Plug
2. Servo piston assembly
3. Pin
4. Spool
5. Retainer
6. Seat
7. Cover
8. Wiring

Function

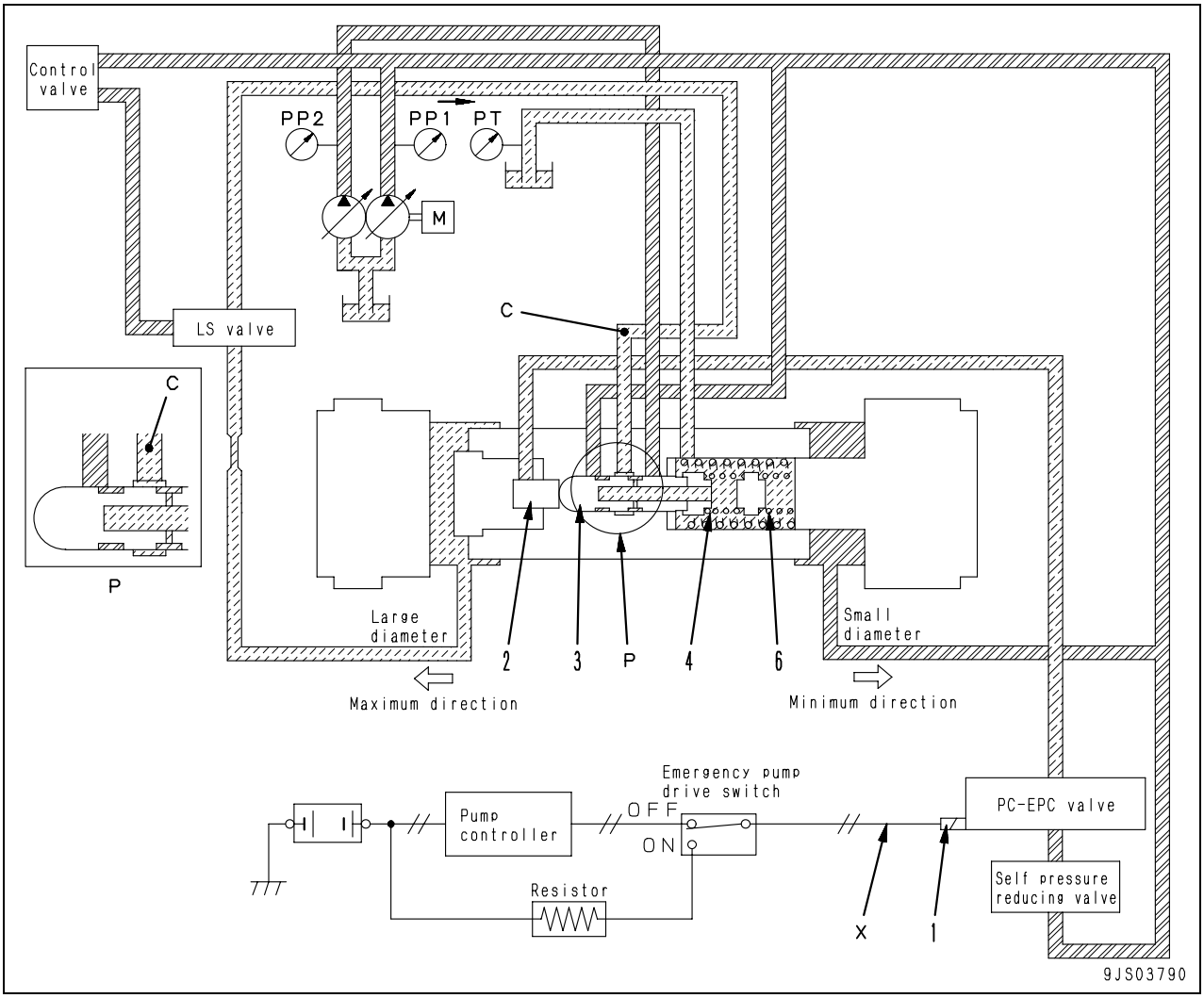
- When the pump discharge pressure (PP1) (self-pressure) and (PP2) (other pump pressure) are high, the PC valve controls the pump so that the volume of oil beyond the discharge pressure-based specific flowrate may not be conducted however you may increase the control valve stroke. Namely it is intended at controlling the horse power for the pumps so that it may not exceed the engine hose power.
- If the pump discharge pressure increases due to increased load during operation, this valve decreases the pump delivery.
- And if the pump delivery pressure goes low, it increases the pump delivery.
- In this case, relation between the mean discharge pressure of the front and rear pumps [(PP1) + (PP2)]/2 and the pump delivery (Q) will becomes as shown in the diagram if the relation is represented as the parameter the current value (X) to be given to PC-EPC valve solenoid.
- The controller continues counting the actual engine speed.
- If the engine speed is slowed down due to increased load, the controller reduces the pump delivery to recover the speed.
- If the engine speed goes below the specified value because of increased load, the controller sends a command current to PC-EPC valve solenoid in order to reduce the slope angle in proportion to reduction in the engine speed.



Operation

1) When pump controller is normal

(1) When the load on the actuator is small and pump discharge pressures (PP1) and (PP2) are low



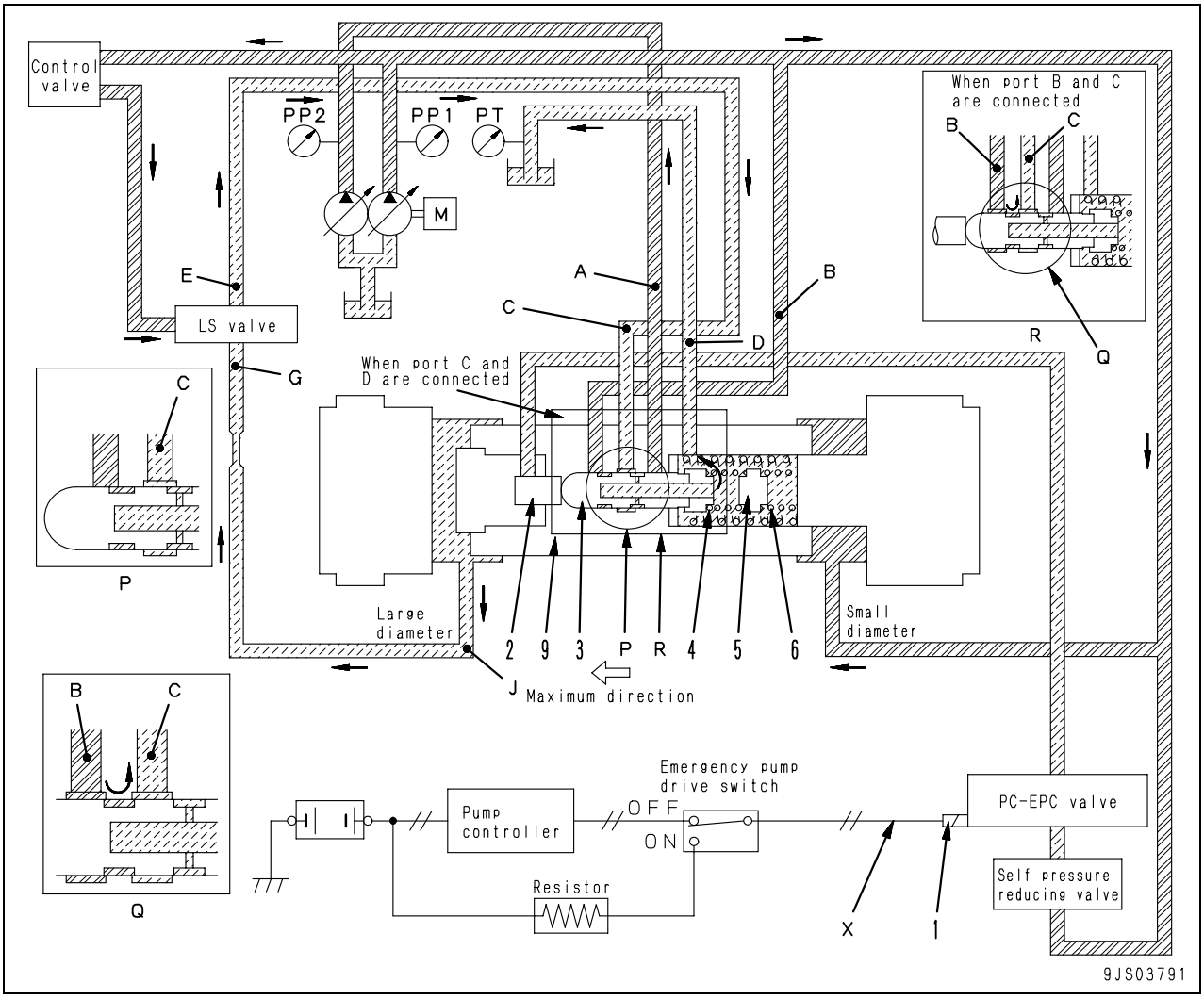
Action of PC-EPC valve solenoid (1)

- Command current (X) is being sent to PC-EPC valve solenoid (1) from the pump controller.
- This command current acts on PC-EPC valve to output the signal pressure in order to modify the force pushing piston (2).
- Spool (3) stops at a position where the combined spool-pushing force is balanced by the setting force of springs (4) and (6) as well as the pump pressures (PP1) (self-pressure) and (PP2) (another pump's pressure).
- The pressure [port (C) pressure] output from PC valve is changed depending on the above position.
- The size of command current (X) is determined by the nature of the operation (lever operation), the selected working mode, and the set value and actual value of the engine speed.

★ Other pump's pressure denotes the pressure of the pump situated on the opposite side.

For the front pump pressure, the other pump's pressure is that of the rear pump.

And for the rear pump pressure, the other pump's pressure is that of the front pump.

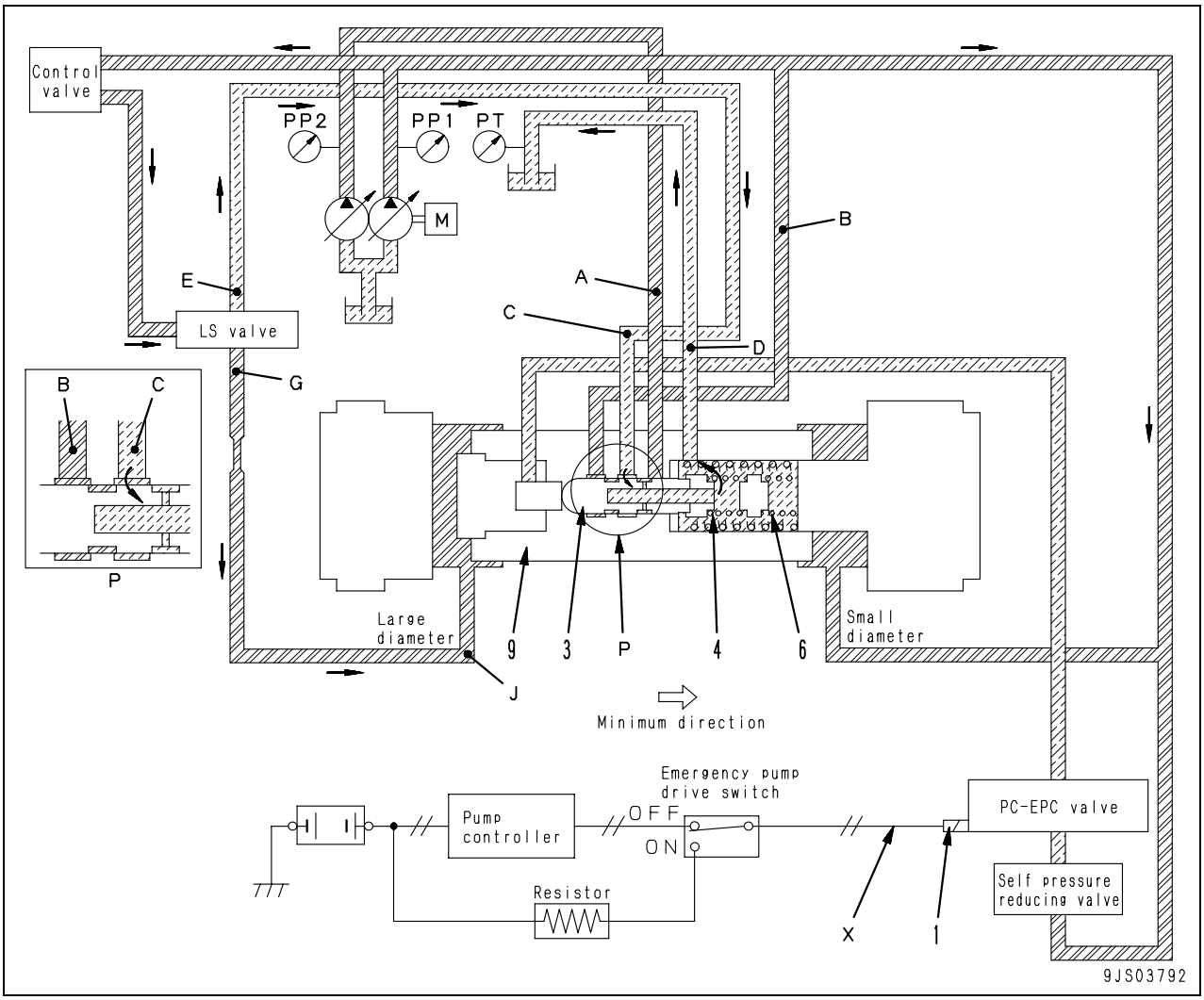


Action of spring

- Load of springs (4) and (6) on the PC valve is determined by the swash plate position.
- As servo piston (9) moves to right, spring (6) is retracted.
- If the servo piston moves further, it will be contacted again seat (5) and spring (6) will be fixed.
- After that, spring (4) alone will operate.
- The spring load is changed by servo piston (9) as it extends or compresses springs (4) and (6).
- If the command current (X) to PC-EPC valve solenoid (1) changes, so does the force pushing piston (2).
- Spring load of springs (4) and (6) is also affected by the command current (X) to PC-EPC valve solenoid.
- Port (C) of the PC valve is connected to port (E) of the LS valve.
- Self pressure (PP1) enters port (B) and the small diameter end of servo piston (9), and other pump pressure (PP2) enters port (A).
- When pump pressures (PP1) and (PP2) are small, spool (3) will be positioned in the left side.
- Port (C) and (D) are connected, and the pressure entering the LS valve becomes drain pressure (PT).
- If port (E) and port (G) of the LS valve are connected, the pressure entering the large diameter end of the piston from port (J) becomes drain pressure (PT), and servo piston (9) moves to the left side.
- The pump delivery will be set to the increasing trend.
- Accompanied with move of servo piston (9), springs (4) and (6) will be expanded and the spring force becomes weaker.
- As the spring force is weakened, spool (3) moves to the right, the connecting between port (C) and port (D) is shut off and the pump discharge pressure ports (B) and (C) are connected.

- As a result, the pressure on port (C) rises and the pressure on the large diameter end of the piston also rises. Thus, the leftward move of servo piston (9) is stopped.
- Servo piston (9) stop position (= Pump delivery) is decided by the position where the pushing force generated from the pressures (PP1) and (PP2) applied to spool (3), the pushing force of the solenoid in PC-EPC valve generates and the pushing force of springs (4) and (6) are balanced.

(2) When load on actuator is large and pump discharge pressure is high



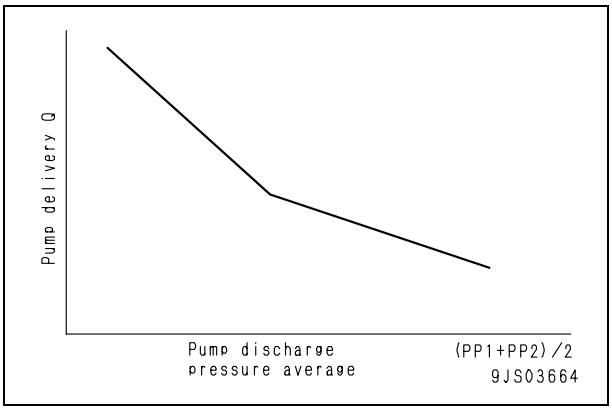
Outline

- When the load is large and pump discharge pressures (PP1) and (PP2) are high, the force pushing spool (3) to the right becomes larger and spool (3) will be moved to the position shown in above figure.
- Part of the pressure to be conducted from port (C) to LS valve flows from port (B) to port (C) and (D) via LS valve. At the end this flow, level of this pressure becomes approximately half of the main pump pressure (PP2).

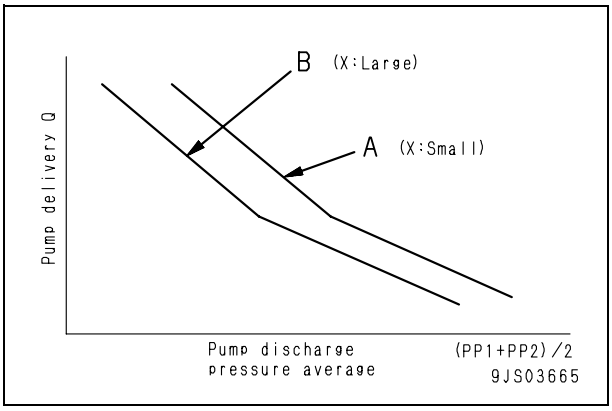
Operation

- When port (E) and port (G) of the LS valve are connected, this pressure from port (J) enters the large diameter end of servo piston (9), stopping servo piston (9).
- If main pump pressure (PP2) increases further and spool (3) moves further to the right, main pump pressure (PP1) flows to port (C) and acts to make the pump delivery the minimum.
- When servo piston (9) moves to the right, springs (4) and (6) are compressed and push back spool (3).
- When spool (3) moves to the left, the opening of port (C) and port (D) becomes larger.
- As a result, the pressure on port (C) (= J) is decreased and the rightward move servo piston (9) is stopped.
- The position in which servo piston (9) stops at this time is further to the right than the position when pump pressures (PP1) and (PP2) are low.

- The relationship between the average pump pressure (PP1 + PP2)/2 and servo piston (9) in terms of their positions can be represented by the broken line in the figure springs (4) and (6) form the double springs.
- The relationship between the average pump pressure (PP1 + PP2)/2 and average pump delivery (Q) becomes as shown below.

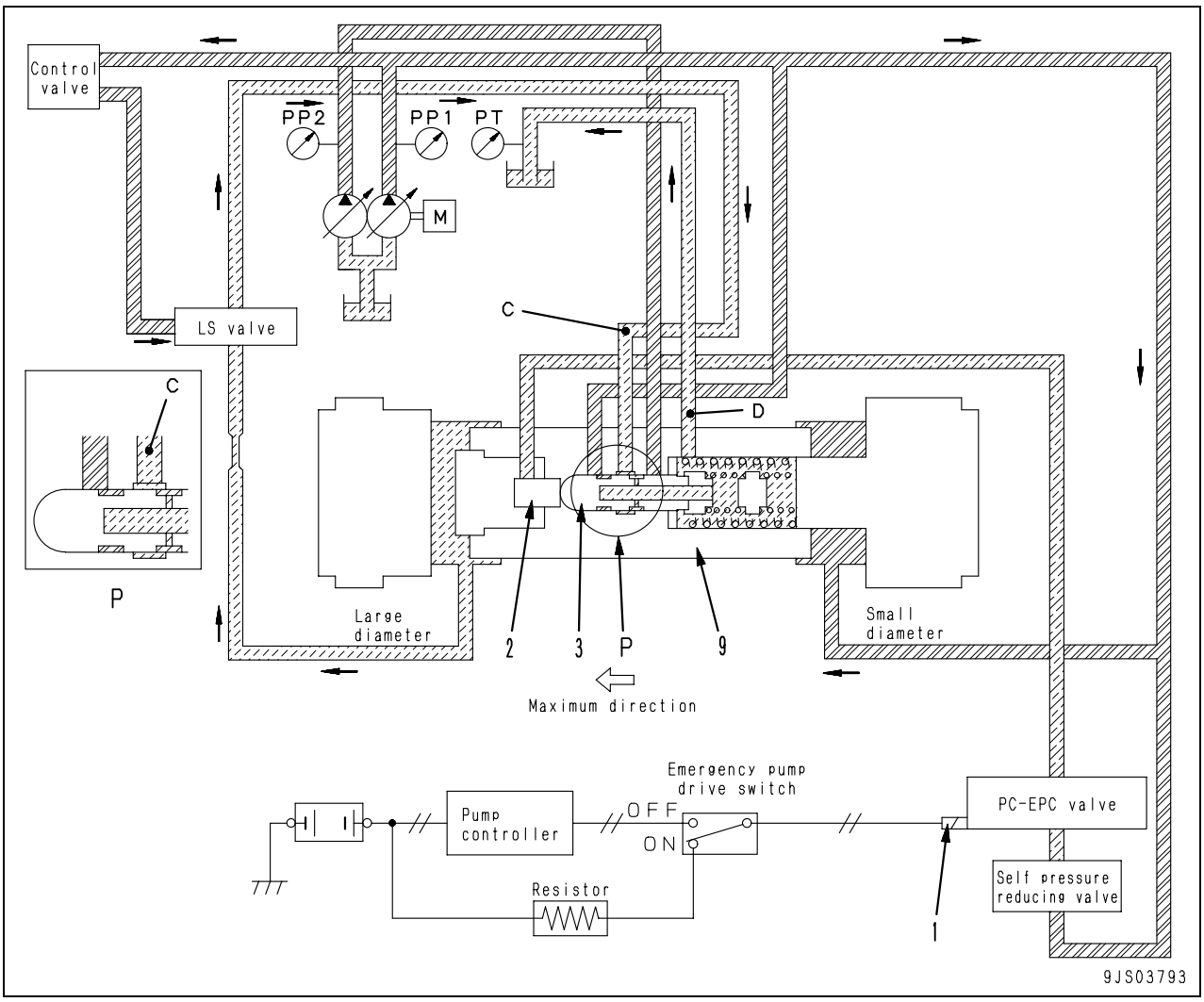


- If command voltage (X) sent to PC-EPC valve solenoid (1) increases further, the relationship between average pump pressure (PP1 + PP2)/2, and pump delivery (Q) is proportional to the force of the PC-EPC valve solenoid and moves in parallel.
- Namely, the force of PC-EPC valve solenoid (1) is added to the pushing force to the right because of the pump pressure applied to the spool (3), so the relationship between the average pump pressure (PP1 + PP2)/2 and the pump delivery (Q) moves from (A) to (B) as the command current (X) is increased.



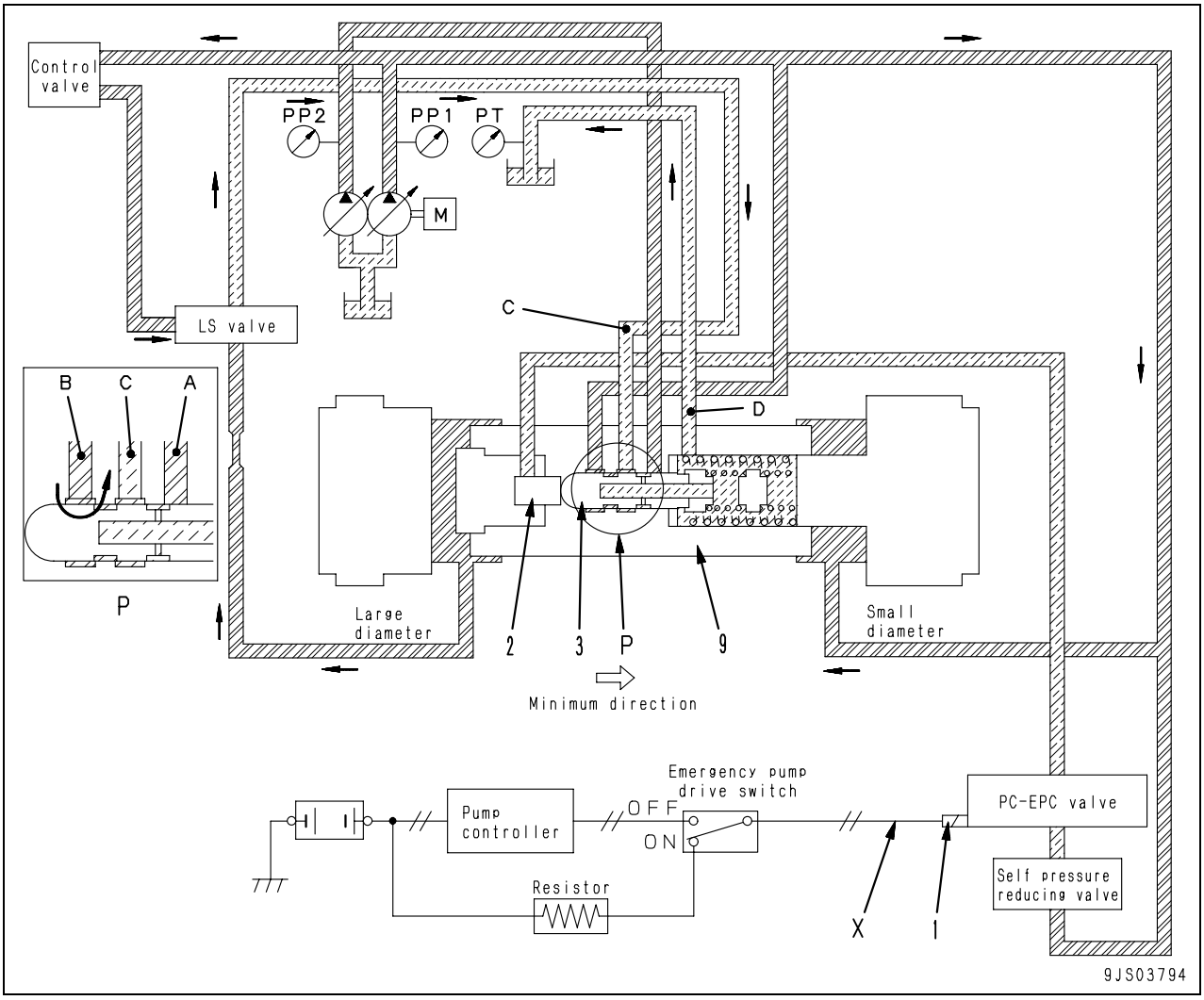
2) As the emergency pump drive switch is turned on due to failure on the pump controller

(1) When the main pump is under light load

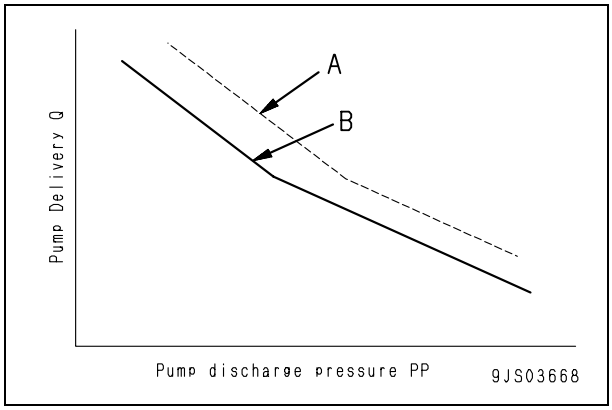


- If there is a failure in the pump controller, the emergency pump drive switch is turned on to hand the control to the resistor side.
- In this case, the power is directly supplied from the battery. The current, however, is too large as is, so the resistor is set in between to control the current flowing to PC-EPC valve solenoid (1).
- The current becomes constant, so the force pushing piston (2) is also constant.
- If the main pump pressures (PP1) and (PP2) are low, the combined force of the pump pressure and the PC-EPC valve solenoid (1) is weaker than the spring set force, so spool (3) is balanced at a position to the left.
- At this point, port (C) is connected to the drain pressure of port (D), and the large diameter end of the piston of servo piston (9) also becomes the drain pressure (PT) through the LS valve.
- Since the pressure on the small diameter end of the piston large, servo piston (9) moves in the direction to make the discharge amount larger.

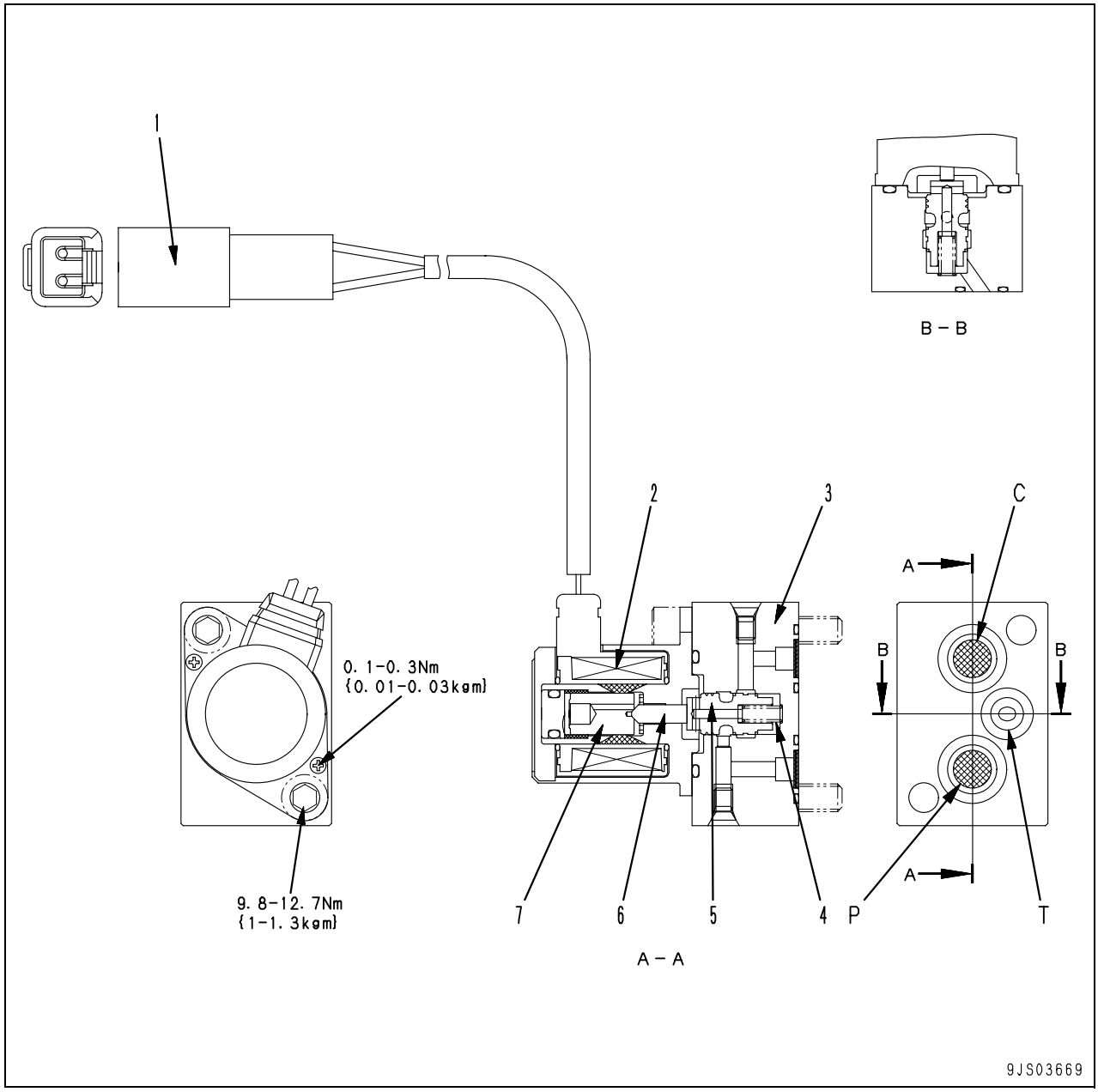
(2) When the main pump is under heavy load



- If the emergency pump drive switch is turned on In the same way as in above, the command current (X) sent to PC-EPC valve solenoid (1) becomes constant.
- For this reason, the force of piston (2) pushing spool (3) is constant.
- If main pump pressures (PP1) and (PP2) increase, spool (3) moves further to the right than when the main pump load is light, and is balanced at the position in the diagram above.
- In this case, the pressure from port (B) flows to port (C), so servo piston (9) moves to the right (smaller pump delivery) and stops at a position to the further to the right then when the load on the pump is light.
- When the emergency pump drive switch is turned on, too, the pump pressure (PP) and pump delivery (Q) have a relationship as shown with the curve in the figure corresponding to the current sent to the PC-EPC valve solenoid through the resistor.
- The curve resulting when the emergency pump drive switch is ON is situated further to the left (B) than when the pump controller is normal (A).



3. LS(PC)-EPC Valve

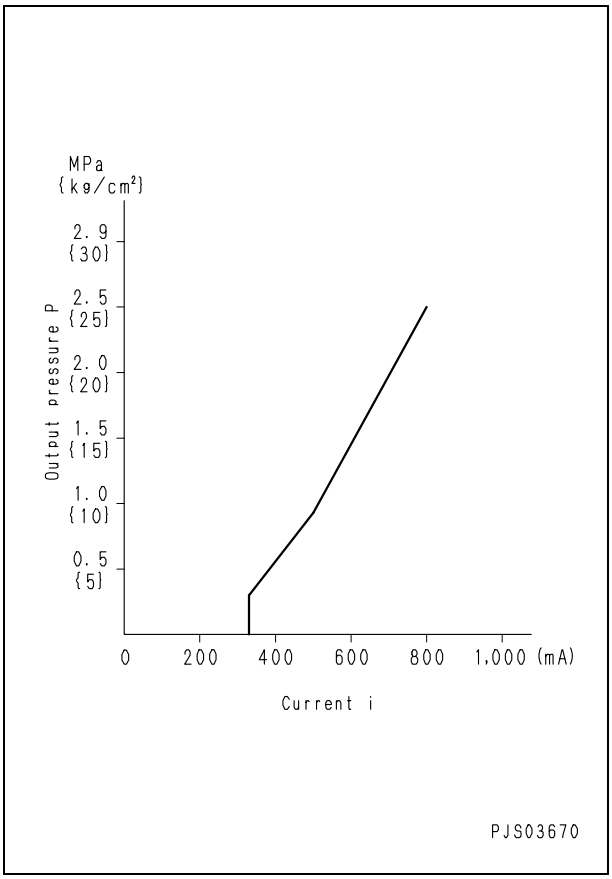


C: To LS(PC) valve
P: From self pressure reducing valve
T: To tank

1. Connector
2. Coil
3. Body
4. Spring
5. Spool
6. Rod
7. Plunger

Function

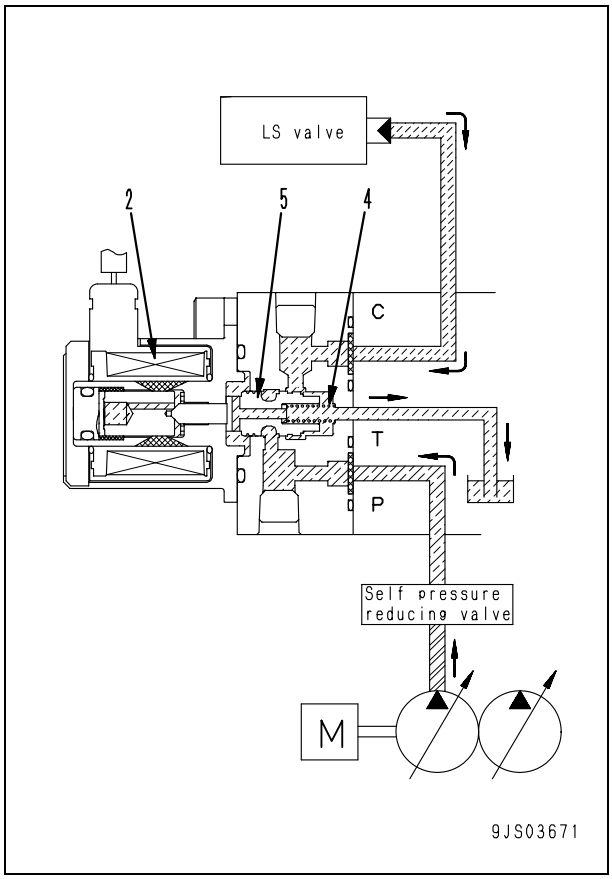
- The EPC valve consists of the proportional solenoid portion and the hydraulic valve portion.
- When it receives signal current (i) from the controller, it generates the EPC output pressure in proportion to the size of the signal, and outputs it to the LS (PC) valve.



Operation

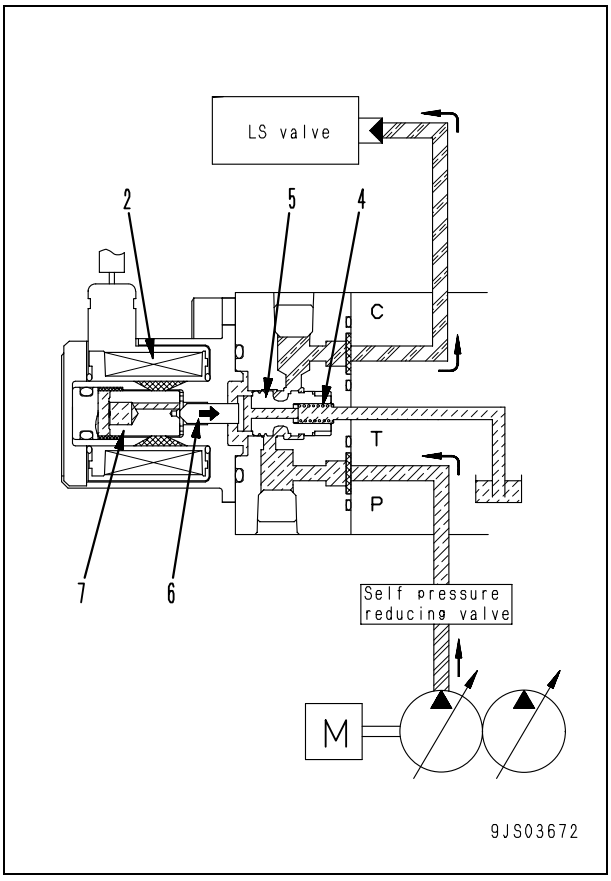
1) When signal current is 0 (coil is deenergized)

- When there is no signal current flowing from the controller to coil (2), coil (2) is deenergized.
- Spool (5) is pushed to the left by spring (4).
- Port (P) closes and the pressurized oil from the self pressure reducing valve does not flow to the LS (PC) valve.
- The pressurized oil from the LS (PC) valve is drained to the tank via port (C) and port (T).



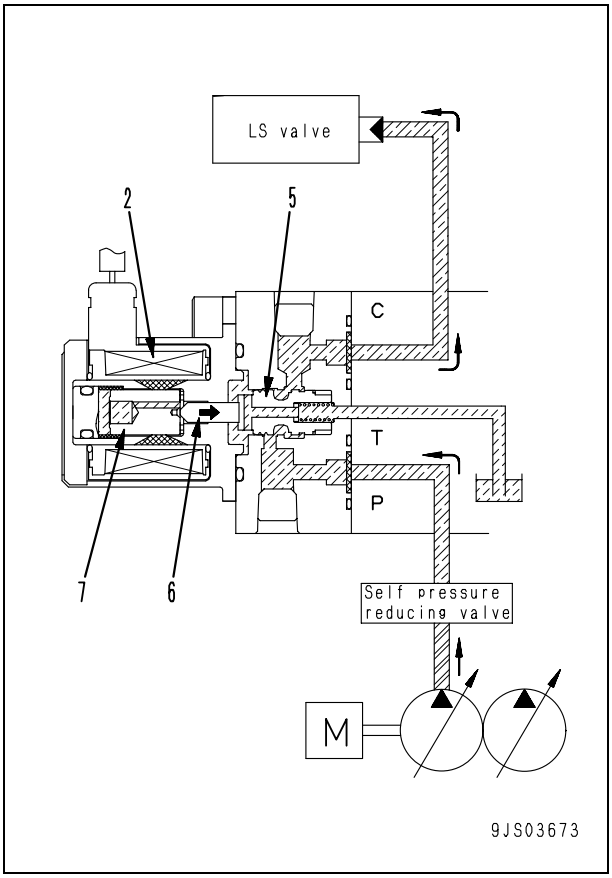
2) When signal current is very small (coil is energized)

- When a very small signal current flows to coil (2), coil (2) is energized, and a propulsion force is generated on the right side of plunger (7).
- Rod (6) pushes spool (5) to the right, and pressurized oil flows from port (P) to port (C).
- Pressures on port (C) increases and the force to act on spool (5) surface and the spring load on spring (4) become larger than the propulsion force of plunger (7).
- Spool (5) is pushed to the left, and port (P) is shut off from port (C).
- Port (C) and port (T) are connected.
- Spool (5) moves up and down so that the propulsion force of plunger (7) may be balance with pressure of port (C) + spring load of spring (4).
- The circuit pressure between the EPC valve and the LS (PC) valve is controlled in proportion to the size of the signal current.

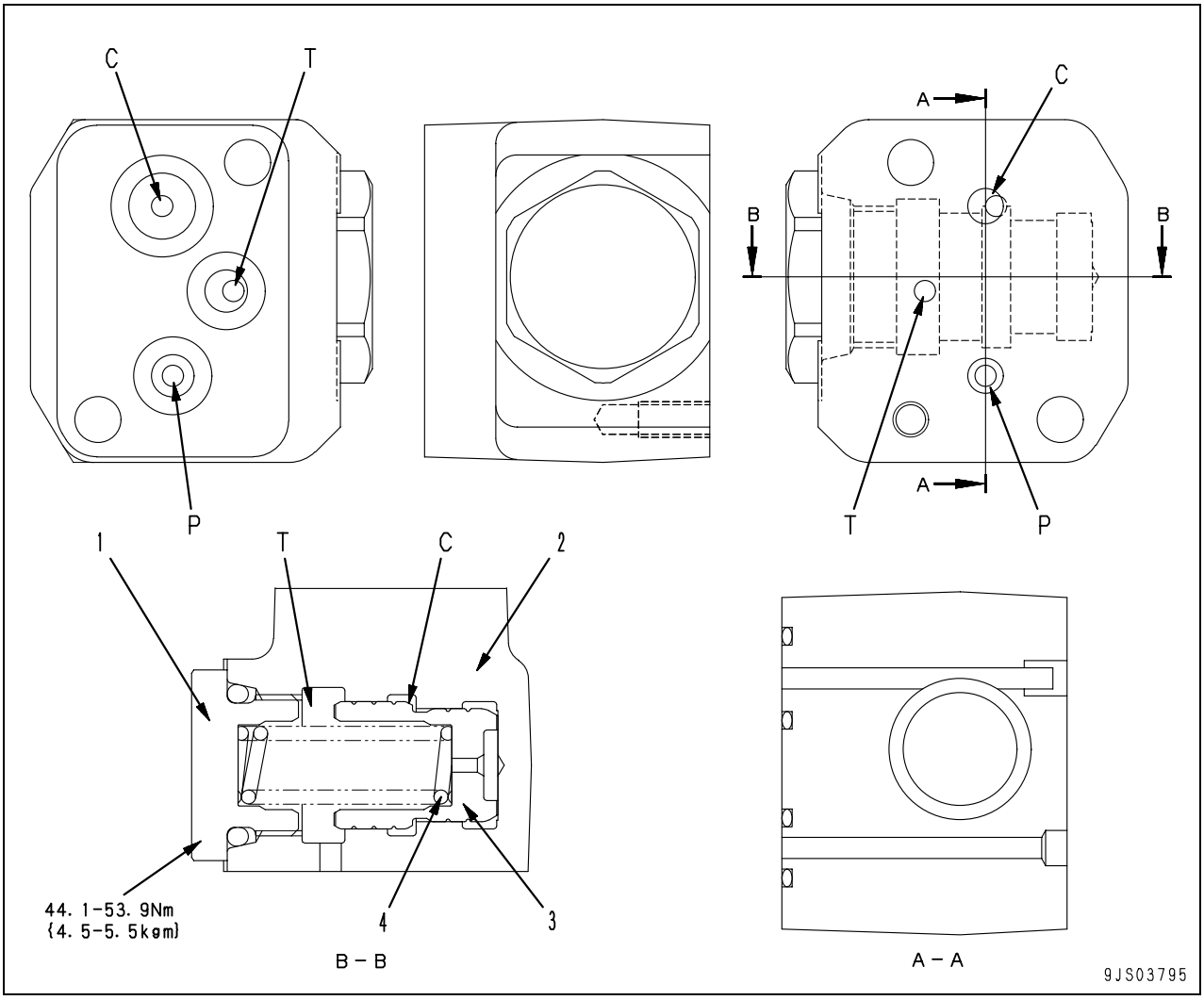


3) When signal current is maximum (coil is energized)

- As the signal current flows to coil (2), coil (2) is energized.
- When this happens, the signal current is at its maximum, so the propulsion force of plunger (7) is also at its maximum.
- Spool (5) is pushed toward right side by rod (6).
- The maximum volume of pressurized oil is conducted from port (P) to port (C), increasing the circuit pressure across EPC valve and LS (PC) valve to the maximum level.
- Since port (T) is closed, pressurized oil does not flow to the tank.



4. Variable Volume Valve



C1: To PC valve
P1: From self pressure reducing valve
T1: To tank

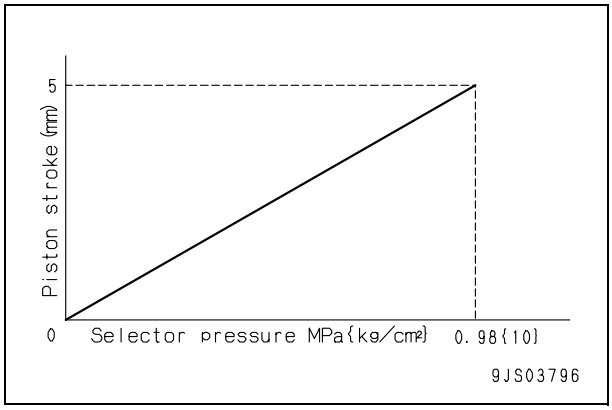
1. Plug
2. Block
3. Piston
4. Spring

Function

- The variable volume valve stabilizes the EPC valve's output pressure.

Operation

- Output pressure from EPC valve is conducted to port (C) and as the result propulsion force of piston (3) is increased by the load of spring (4).
- Piston (3) is pushed to the left, and volume of port (C) is increased.
- The propulsion force of piston (3) becomes smaller than the load of spring (4).
- Piston (3) is pushed toward right, and volume of port (C) is decreased.



PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN01993-00

HYDRAULIC EXCAVATOR

PC300-8
PC300LC-8
PC350-8
PC350LC-8

Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

10 Structure, function and maintenance standard

Hydraulic system, Part 2

Control valve

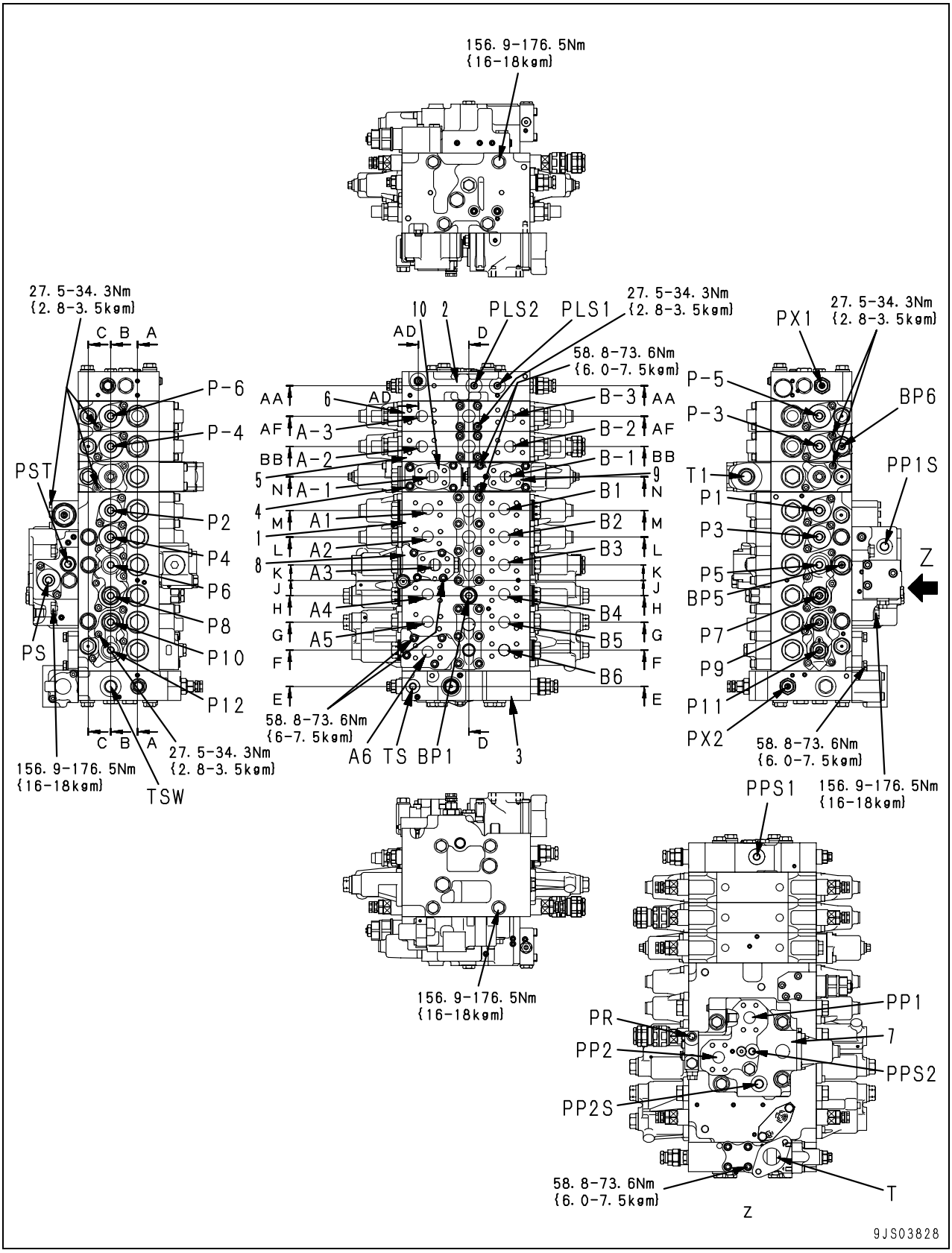
Outline

- The control valve consists of a 7-spool valve (6-spool valve + boom Hi, arm Hi valve) and a set of service valves. A merge-divider valve, a back pressure valve, a boom drift prevention valve are installed to it.
- Since all the valves are assembled together with connecting bolts and their passes are connected to each other inside the assembly, the assembly is compact and easy to maintain.

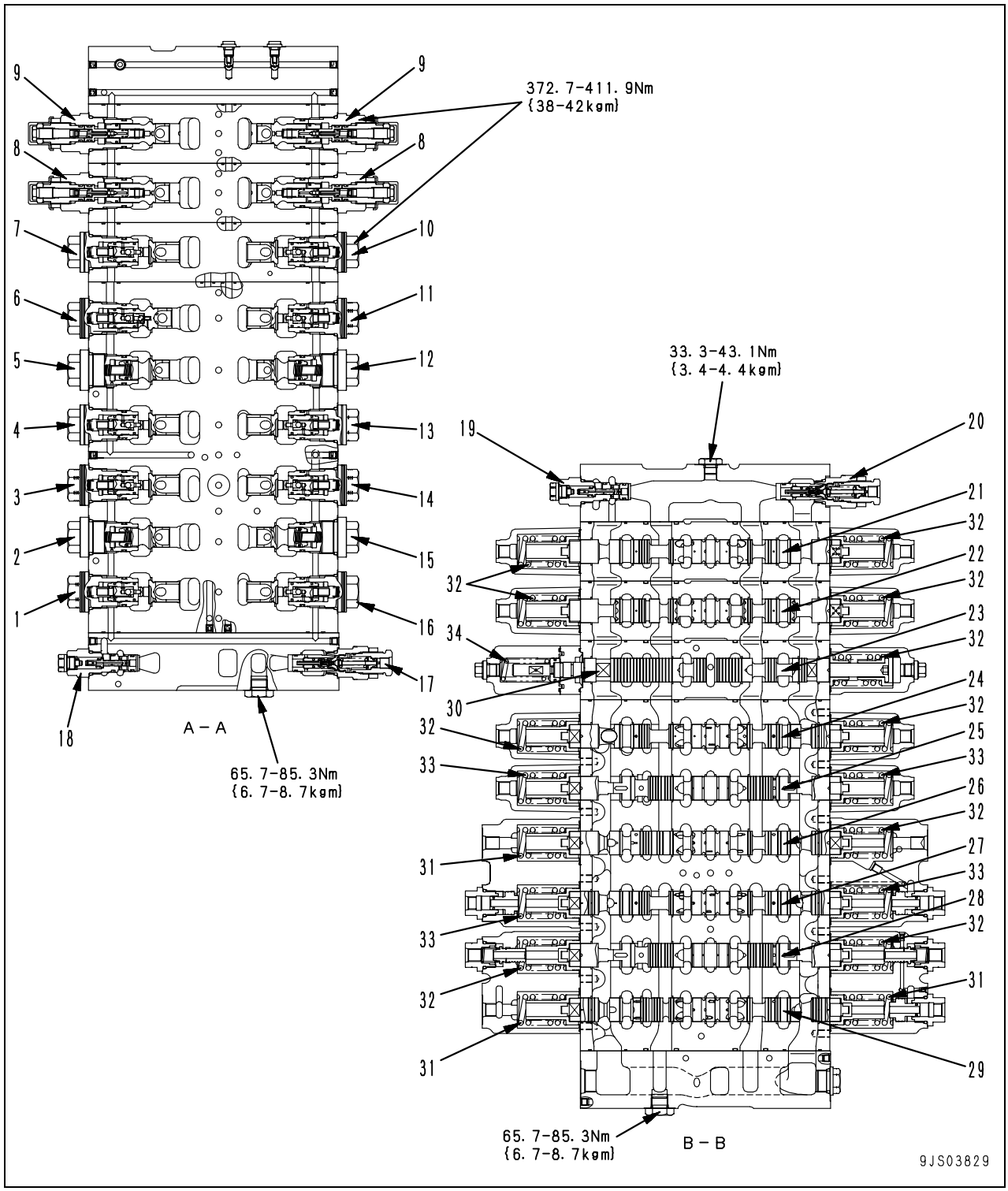
A1: To bucket cylinder bottom
A2: To L.H. travel motor
A3: To boom cylinder bottom
A4: To swing motor
A5: To R.H. travel motor
A6: To arm cylinder head
A-1: To boom cylinder bottom
A-2: To Attachment 1
A-3: To Attachment 2
B1: To bucket cylinder head
B2: To L.H. travel motor
B3: To boom cylinder head
B4: To swing motor
B5: To R.H. travel motor
B6: To arm cylinder bottom
B-1: To arm cylinder bottom
B-2: To Attachment 1
B-3: To Attachment 2
BP1: Boom raising PPC output pressure
BP5: From 2-stage safety valve solenoid valve
BP6: From attachment select solenoid valve
P1: From bucket PPC and EPC valves
P2: From bucket PPC and EPC valves
P3: From L.H. Travel PPC valve
P4: From L.H. Travel PPC valve
P5: From boom PPC and EPC valves
P6: From boom PPC and EPC valves
P7: From swing PPC and EPC valves
P8: From swing PPC and EPC valves
P9: From R.H. Travel PPC valve
P10: From R.H. Travel PPC valve
P11: From arm PPC and EPC valves
P12: From arm PPC and EPC valves
P-3: From Service 1 and PPC valves
P-4: From Service 1 and PPC valves
P-5: From Service 2 and PPC valves
P-6: From Service 2 and PPC valves
PLS1: To front pump control
PLS2: To rear pump control
PP1: From front pump
PP2: From rear pump
PP1S: Pressure sensor mounting port
PP2S: Pressure sensor mounting port
PPS1: To front pump control
PPS2: To rear pump control
PR: To solenoid valve, PPC valve, and EPC valve
PS: From merge-divide solenoid valve
PST: From travel junction valve solenoid valve
PX1: From 2-stage relief solenoid valve
PX2: From 2-stage relief solenoid valve
T: To tank
T1: To tank
TS: To tank
TSW: To swing motor S-port (suction side)

1. 6-spool valve
2. Cover A
3. Cover B
4. Boom Hi and arm Hi valve
5. Service valve 1
6. Service valve 2
7. Merge-divider valve
8. Boom drift prevention valve
9. Quick return valve
10. Boom Hi valve check valve

General view



Sectional view
(1/5)

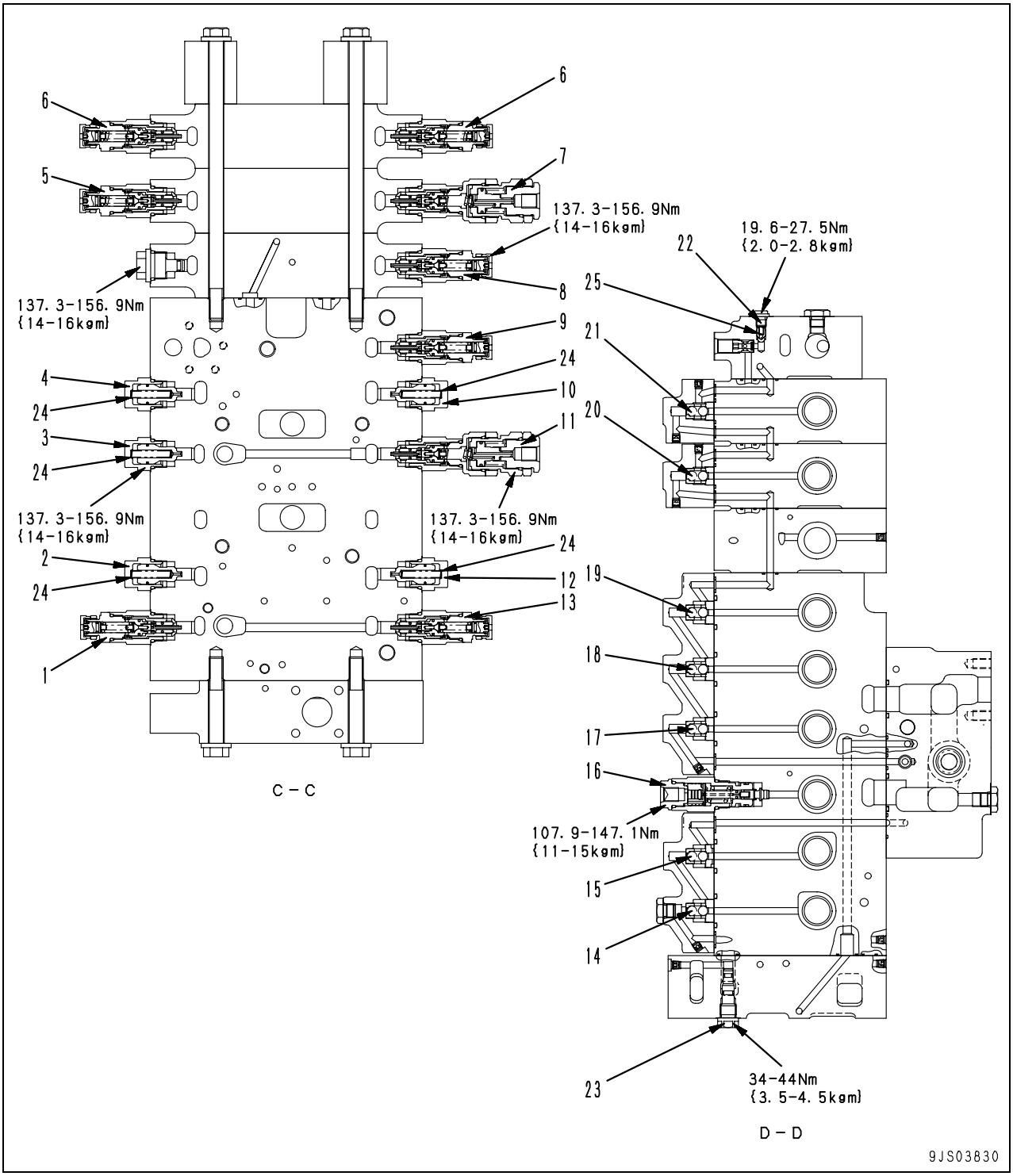


1. Pressure compensation valve (Arm out)
2. Pressure compensation valve (R.H. travel reverse)
3. Pressure compensation valve (Left swing)
4. Pressure compensation valve (Boom raise)
5. Pressure compensation valve (L.H. travel reverse)
6. Pressure compensation valve (Bucket dump)
7. Pressure compensation valve (Boom Hi raise)
8. Variable pressure compensation valve (Service 1)
9. Variable pressure compensation valve (Service 2)
10. Pressure compensation valve (Arm Hi in)
11. Pressure compensation valve (Bucket curl)
12. Pressure compensation valve (L.H. travel forward)
13. Pressure compensation valve (Boom lower)
14. Pressure compensation valve (Right swing)
15. Pressure compensation valve (R.H. travel forward)
16. Pressure compensation valve (Arm in)
17. Main relief valve
18. Unload valve
19. Unload valve
20. Main relief valve
21. Spool (Service 2)
22. Spool (Service 1)
23. Spool (Boom Hi)
24. Spool (Bucket)
25. Spool (L.H. travel)
26. Spool (Boom)
27. Spool (Swing)
28. Spool (R.H. travel)
29. Spool (Arm)
30. Spool (Arm Hi)

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
31	Spool return spring	Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring.
		54.2 x 34.8	51.2	417 N {42.5 kg}	—	333 N {34.0 kg}	
32	Spool return spring	54.5 x 34.8	51.2	393 N {40.1 kg}	—	315 N {32.1 kg}	
33	Spool return spring	54.6 x 34.8	51.2	421 N {42.9 kg}	—	336 N {34.3 kg}	
34	Spool return spring	54.9 x 24.2	52.0	251 N {25.6 kg}	—	201 N {20.5 kg}	

(2/5)

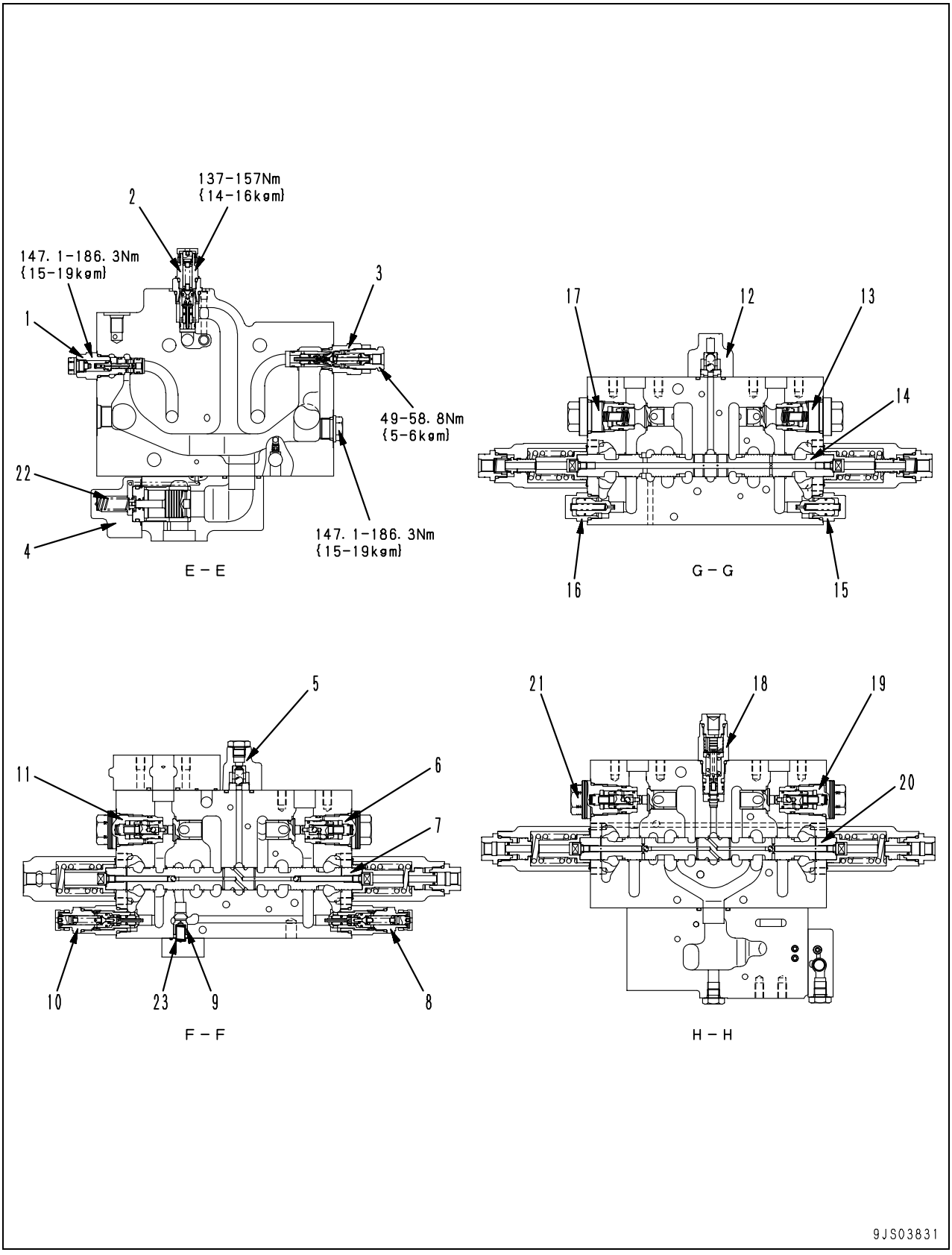

6
6
7
5
137. 3-156. 9Nm
{14-16kgm}
19. 6-27. 5Nm
{2. 0-2. 8kgm}
22
8
25
137. 3-156. 9Nm
{14-16kgm}
9
21
24
4
10
24
20
3
11
24
137. 3-156. 9Nm
{14-16kgm}
137. 3-156. 9Nm
{14-16kgm}
24
2
19
12
24
13
18
1
17
16
107. 9-147. 1Nm
{11-15kgm}
15
14
23
34-44Nm
{3. 5-4. 5kgm}
C - C
D - D
9JS03830

1. Safety-suction valve (Arm out)
2. Suction valve (R.H. travel reverse)
3. Suction valve (Boom raise)
4. Suction valve (L.H. travel reverse)
5. Safety-suction valve (Service 1)
6. Safety-suction valve (Service 2)
7. 2-stage safety-suction valve (Service 1)
8. Safety-suction valve (Arm Hi in)
9. Safety-suction valve (Bucket curl)
10. Suction valve (L.H. travel forward)
11. 2-stage safety-suction valve (Boom lower)
12. Suction valve (R.H. travel forward)
13. Safety-suction valve (Arm in)
14. LS shuttle valve (Arm)
15. LS shuttle valve (R.H. travel)
16. LS select valve
17. LS shuttle valve (Boom)
18. LS shuttle valve (L.H. travel)
19. LS shuttle valve (Bucket)
20. LS shuttle valve (Service 1)
21. LS shuttle valve (Service 2)
22. LS check valve
23. Pressure relief plug

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
24	Suction valve spring	Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring.
		46.8 x 7.5	40.6	5.5 N {0.56 kg}	—	4.4 N {0.45 kg}	
25	Check valve spring	11.5 x 4.6	8.5	1.5 N {0.15 kg}	—	1.2 N {0.12 kg}	

(3/5)


137-157Nm
{14-16kgm}
2
147. 1-186. 3Nm
{15-19kgm}
1
3
49-58. 8Nm
{5-6kgm}
22
4
147. 1-186. 3Nm
{15-19kgm}
E - E
17
12
13
14
16
15
G - G
5
11
6
7
10
23
9
8
F - F
21
18
19
20
H - H
9JS03831

1. Unload valve
2. Safety valve (Boom raise)
3. Main relief valve
4. Lift check valve

Arm valve

5. LS shuttle valve
6. Pressure compensation valve (IN)
7. Spool
8. Safety-suction valve (IN)
9. Regeneration circuit check valve
10. Safety-suction valve (OUT)
11. Pressure compensation valve (OUT)

R.H. travel valve

12. LS shuttle valve
13. Pressure compensation valve (Forward)
14. Spool
15. Suction valve (Forward)
16. Suction valve (Reverse)
17. Pressure compensation valve (Reverse)

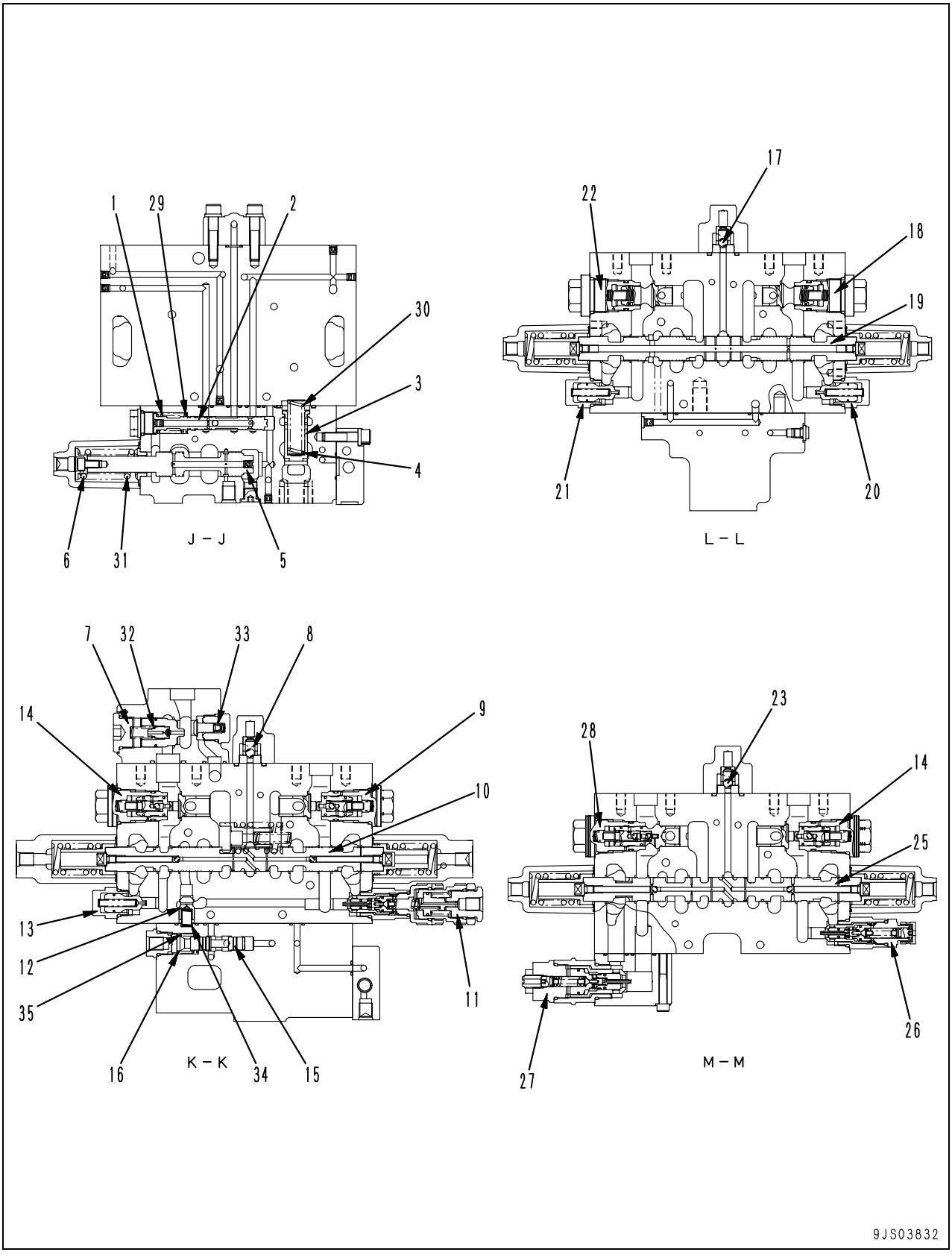
Swing valve

18. LS select valve
19. Pressure compensation valve (R.H.)
20. Spool
21. Pressure compensation valve (L.H.)

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
22	Spool return spring	Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring.
		50.0 x 14.4	42.0	19.6 N {2.0 kg}	—	15.7 N {1.6 kg}	
23	Check valve spring	31.5 x 10.3	19.5	5.9 N {0.6 kg}	—	4.71 N {0.48 kg}	

(4/5)


1
29
2
30
3
4
6
31
5
J – J
17
22
18
19
21
20
L – L
7
32
33
8
14
9
10
13
12
35
16
34
15
11
K – K
23
28
14
25
26
27
M – M
9JS03832

1. Return spring
2. Merge-divide valve (for LS)
3. Valve (Sequence valve)
4. Spring (Sequence valve)
5. Merge-divide valve (Main)
6. Return spring

Boom valve

7. Drift prevention valve
8. LS shuttle valve
9. Pressure compensation valve (Lower)
10. Spool
11. 2-stage safety-suction valve (Lower)
12. Regeneration circuit check valve
13. Suction valve (Raise)
14. Pressure compensation valve (Raise)

L.H. travel valve

15. Merge-divider valve (travel junction valve)
16. Return spring
17. LS shuttle valve
18. Pressure compensation valve (Forward)
19. Spool
20. Suction valve (Forward)
21. Suction valve (Reverse)
22. Pressure compensation valve (Reverse)

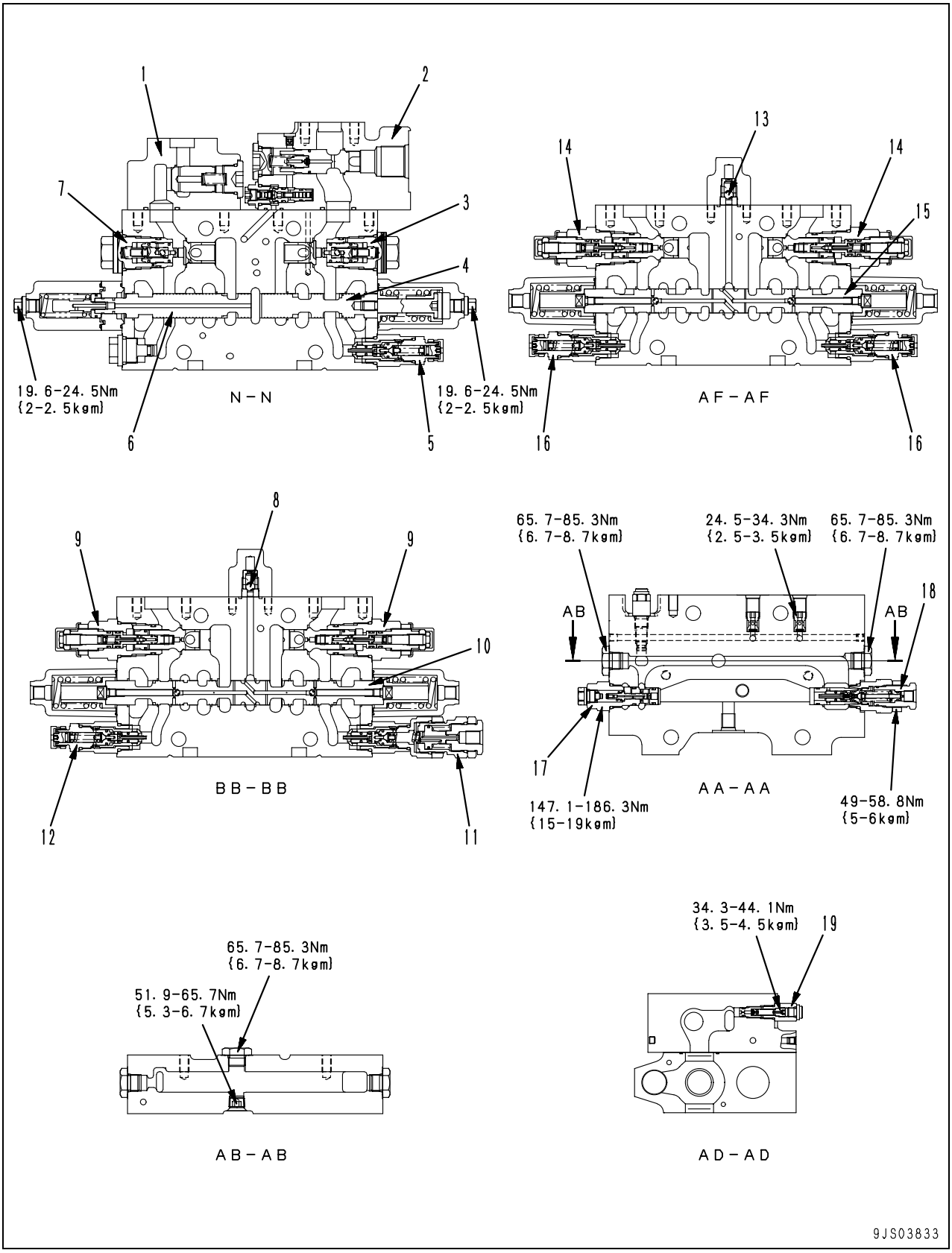
Bucket valve

23. LS shuttle valve
24. Pressure compensation valve (Curl)
25. Spool
26. Safety-suction valve (Curl)
27. Safety-suction valve (Dump)
28. Pressure compensation valve (Dump)

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
29	Spool return spring	Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring.
		46.6 x 21.8	33.0	157 N {16.0 kg}	—	126 N {12.8 kg}	
30	Check valve spring	70.9 x 18.0	56.0	250 N {25.5 kg}	—	200 N {20.4 kg}	
31	Spool return spring	64.5 x 32.3	63.0	178 N {18.1 kg}	—	142 N {14.5 kg}	
32	Check valve spring	33.0 x 12.0	26.0	35.3 N {3.6 kg}	—	28.2 N {2.88 kg}	
33	Check valve spring	16.4 x 8.9	11.5	13.7 N {1.4 kg}	—	11.0 N {1.12 kg}	
34	Check valve spring	31.5 x 10.3	19.5	5.9 N {0.6 kg}	—	4.71 N {0.48 kg}	
35	Piston return spring	30.7 x 20.5	23.0	50.0 N {5.1 kg}	—	40.0 N {4.08 kg}	

(5/5)


1
2
7
3
4
19. 6-24. 5Nm
{2-2. 5kgm}
N－N
19. 6-24. 5Nm
{2-2. 5kgm}
6
5
13
14
14
15
AF－AF
16
16
8
9
9
10
BB－BB
12
11
65. 7-85. 3Nm
{6. 7-8. 7kgm}
24. 5-34. 3Nm
{2. 5-3. 5kgm}
65. 7-85. 3Nm
{6. 7-8. 7kgm}
AB
AB
18
17
AA－AA
147. 1-186. 3Nm
{15-19kgm}
49-58. 8Nm
{5-6kgm}
65. 7-85. 3Nm
{6. 7-8. 7kgm}
51. 9-65. 7Nm
{5. 3-6. 7kgm}
AB－AB
34. 3-44. 1Nm
{3. 5-4. 5kgm}
19
AD－AD
9JS03833

Boom Hi and arm Hi valve

1. Boom Hi check valve
2. Quick return valve
3. Pressure compensation valve (Arm Hi in)
4. Arm Hi spool
5. Safety-suction valve (Arm Hi in)
6. Boom Hi spool
7. Pressure compensation valve (Boom Hi raise)

Service valve 1

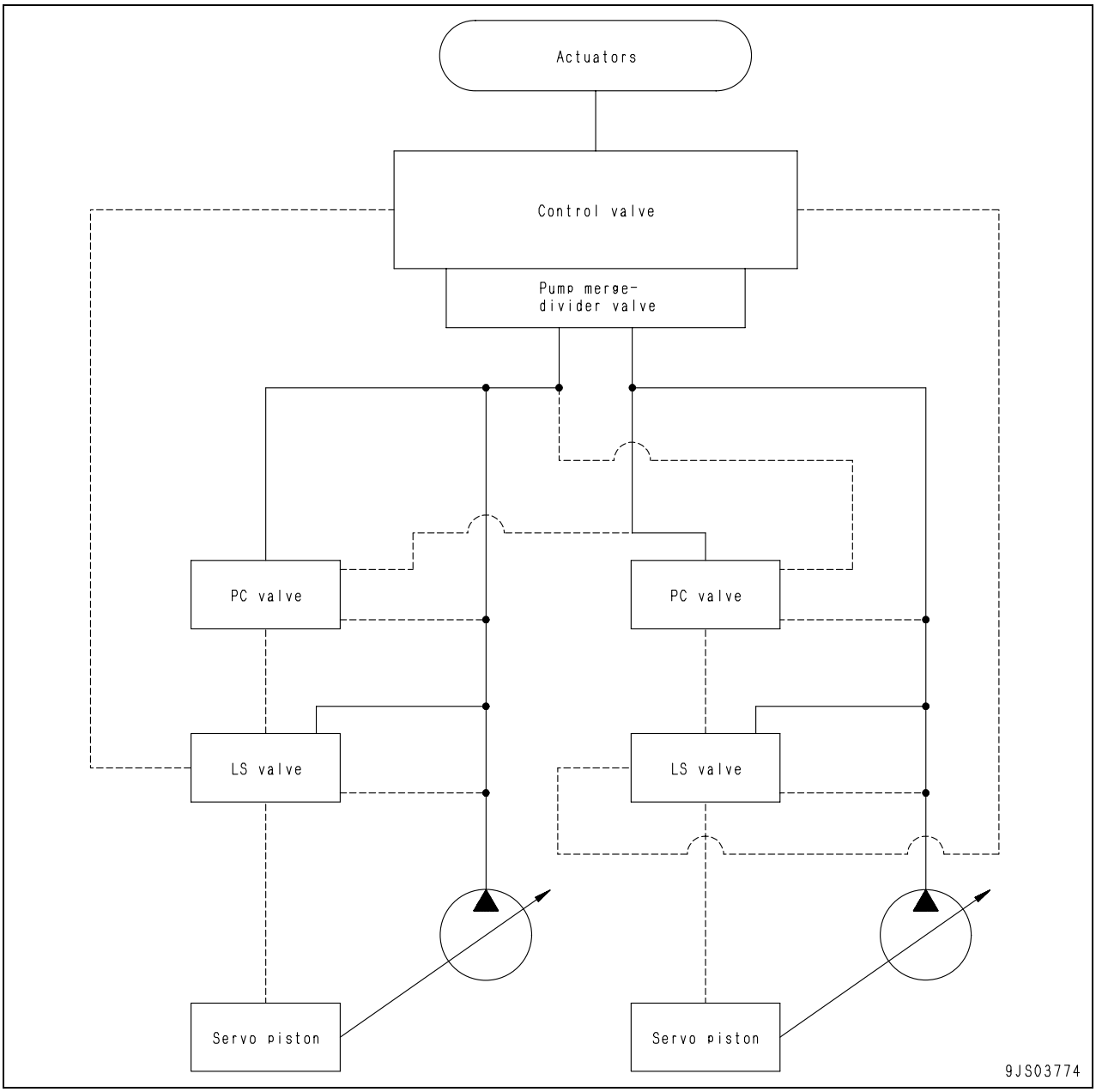
8. LS shuttle valve
9. Pressure compensation valve
10. Spool
11. 2-stage safety-suction valve
12. Safety-suction valve

Service valve 2

13. LS shuttle valve
14. Pressure compensation valve
15. Spool
16. Safety-suction valve
17. Unload valve
18. Main relief valve
19. LS bypass plug

CLSS

Outline of CLSS



Features

CLSS stands for Closed center Load Sensing System, which has the following characteristics:

- Fine control not influenced by load
- Controllability enabling digging even with fine control
- Ease of compound operation ensured by flow divider function using area of opening of spool during compound operations
- Energy saving using variable pump control

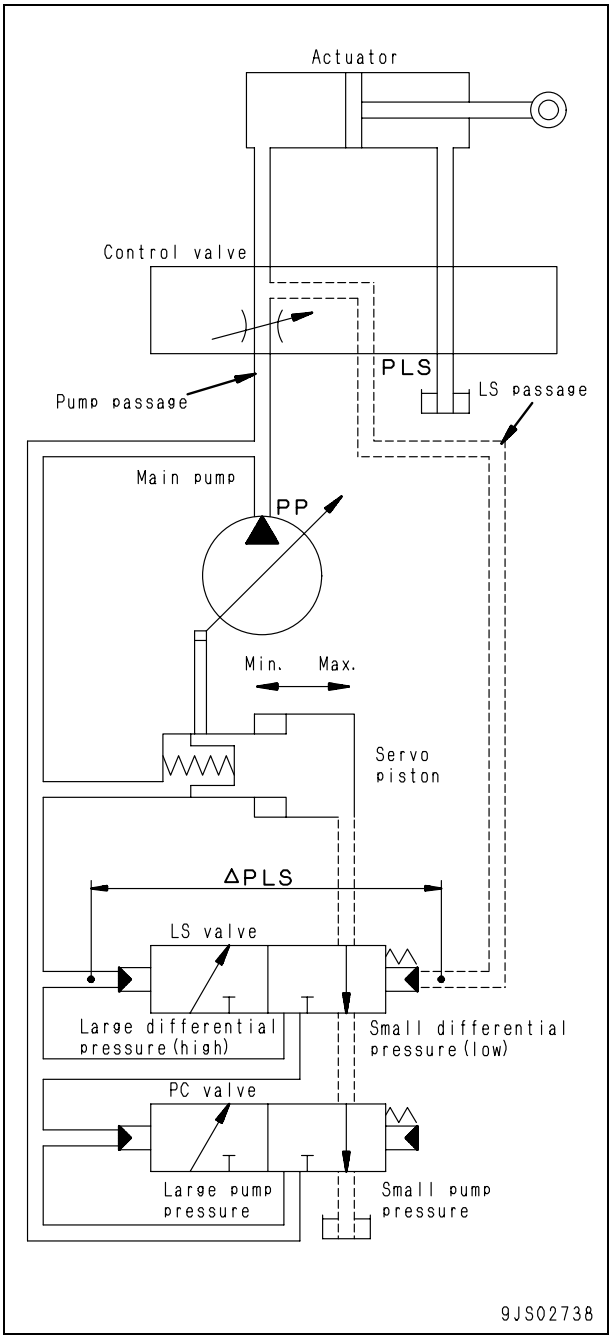
Configuration

- CLSS is configured with variable capacity piston pumps, control valves, and respective actuators.
- The hydraulic pump is configured with pump body, PC valve and LS valve.

Basic principle

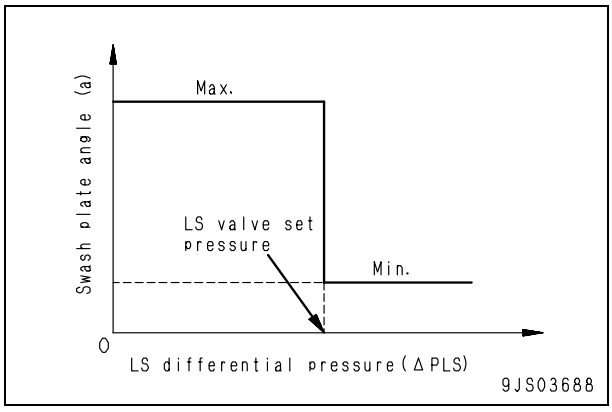
1. Pump swash plate angle control

- The pump swash plate angle (pump delivery) is controlled so that LS differential pressure (△PLS) (the difference between pump pressure PP and control valve outlet port LS pressure PLS) (load pressure of actuator) is constant.
- [LS differential pressure (△PLS) = Pump discharge pressure (PP) – LS pressure (PLS)]



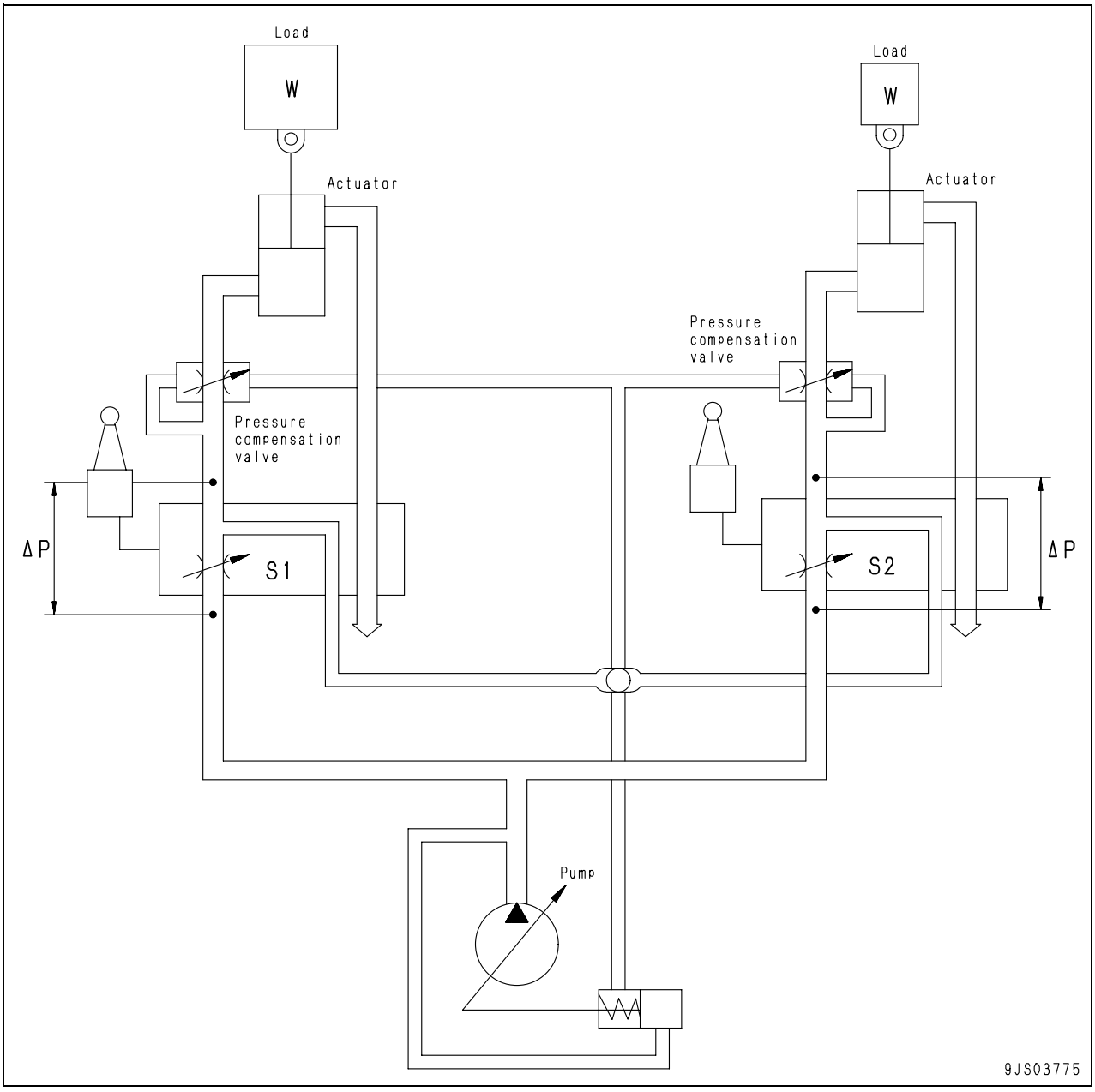
- The pump swash plate angle shifts toward the maximum position if LS differential pressure (△PLS) is lower than the set pressure of the LS valve (when the actuator load pressure is high).
- If it becomes higher than the set pressure (when the actuator load pressure is low), the pump swash plate angle shifts toward the minimum position.

LS differential pressure (△PLS) and pump swash plate angle



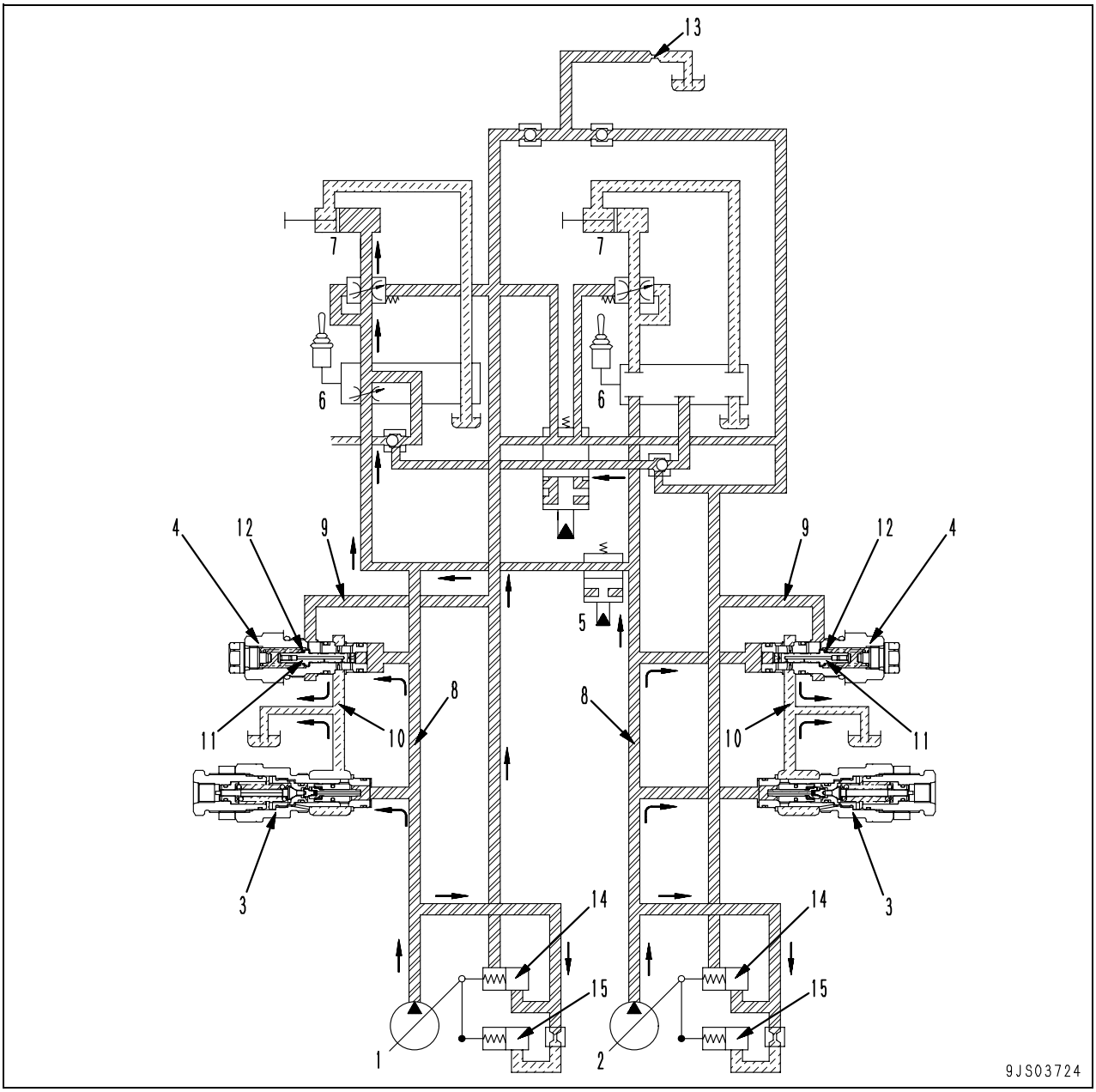
★ For details of functions, see the “Hydraulic pump” paragraph.

2. Pressure compensation control



- A pressure compensation valve is installed to the outlet port side of the control valve to balance the load.
- When actuators are operated together, the pressure difference (△P) between the upstream (inlet port) and downstream (outlet port) of the spool of each valve becomes the same regardless the size of the load (pressure).
- The flow of oil from the pump is divided (compensated) in proportion to the area of opening (S1) and (S2) of each valve.

3. System diagram

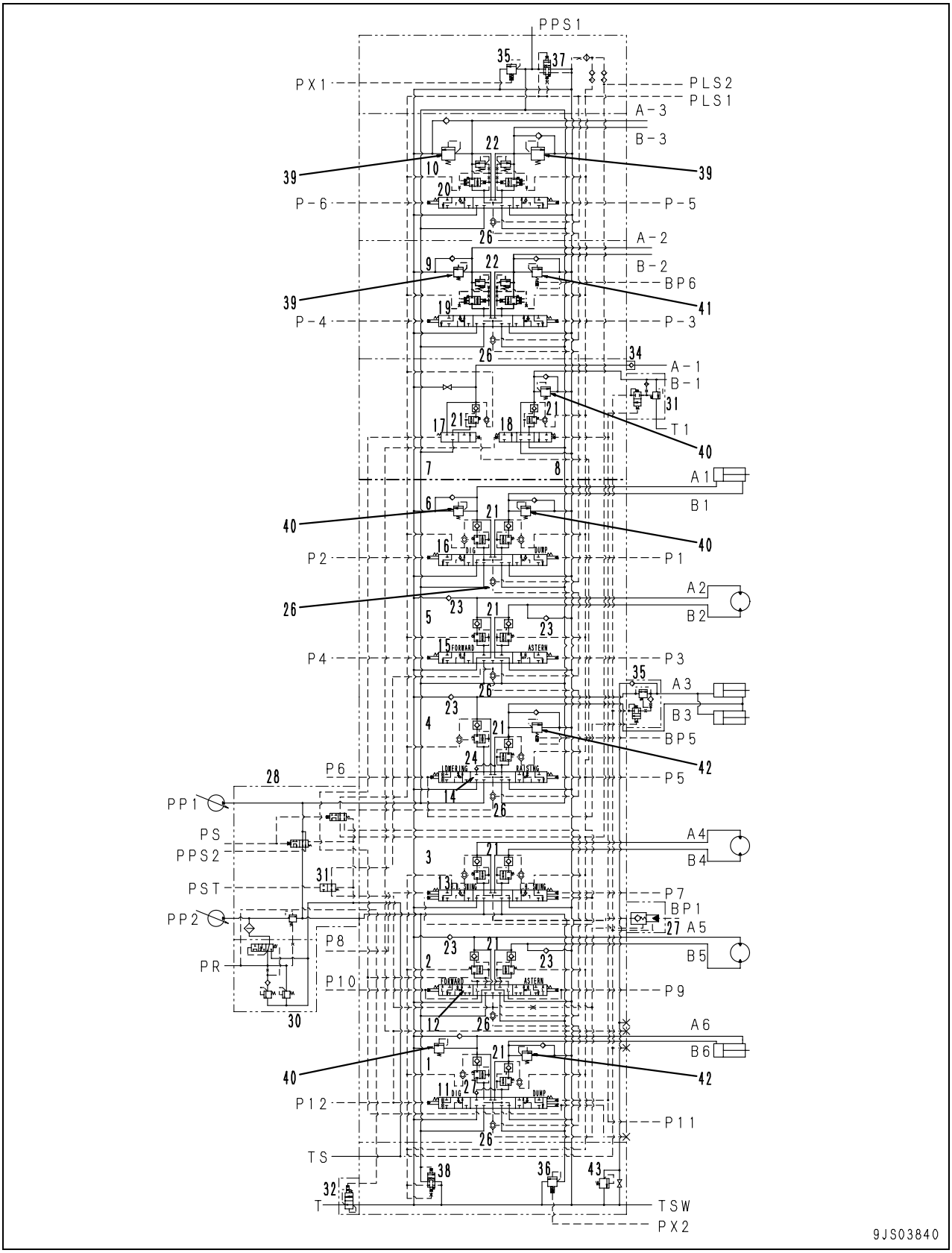


★ The illustration shows actuator (7) in the merge mode with stroke end at the time of relief.

1. Front pump
2. Rear pump
3. Main relief valve
4. Unload valve
5. Merge-divider valve
6. Control valve
7. Actuator
8. Pump circuit
9. LS circuit
10. Tank circuit
11. Valve
12. Spring
13. LS bypass valve
14. LS valve
15. PC valve

Functions and operation by valve

Hydraulic circuit diagram and the name of valves



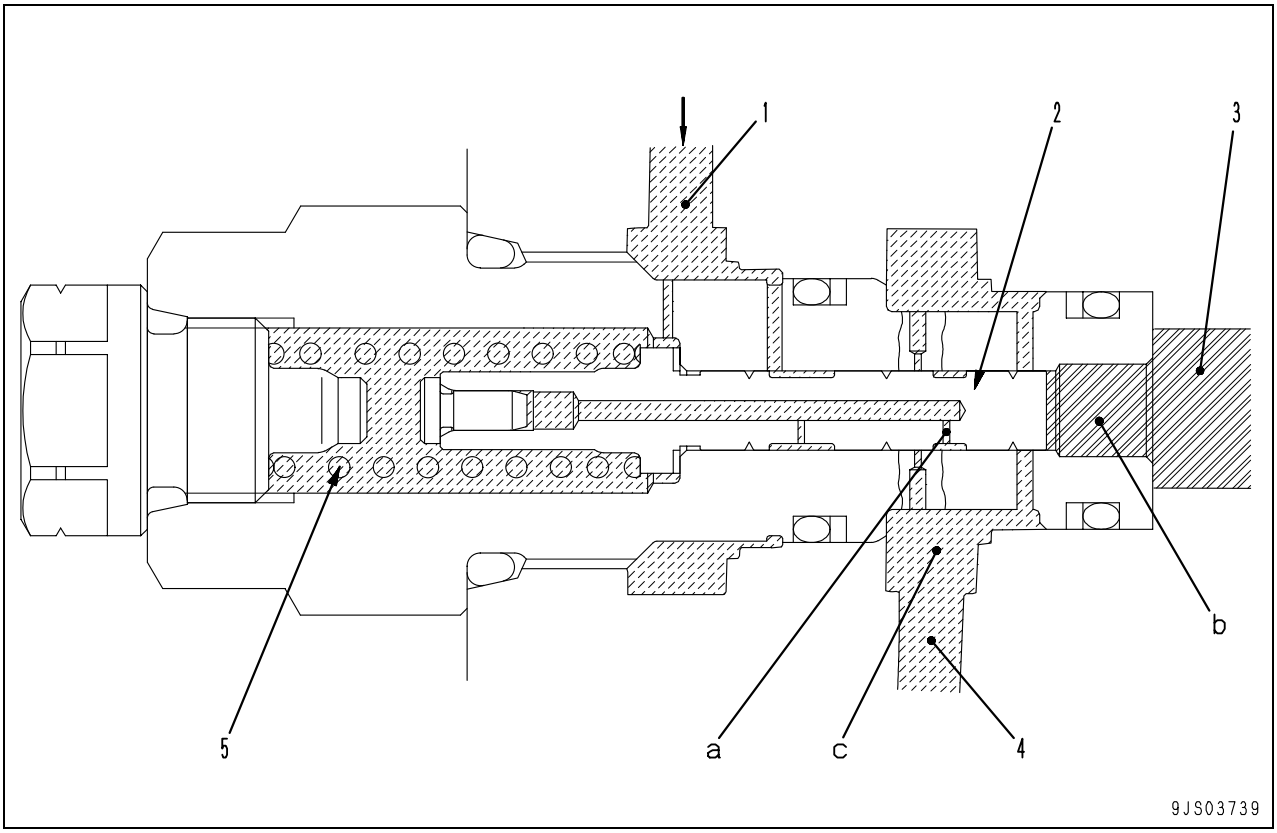
1. Arm valve
2. R.H. travel valve
3. Swing valve
4. Boom valve
5. L.H. travel valve
6. Bucket valve
7. Boom Hi valve
8. Arm Hi valve
9. Service valve 1
10. Service valve 2
11. Arm spool
12. R.H. travel spool
13. Swing spool
14. Boom spool
15. L.H. travel spool
16. Bucket spool
17. Boom Hi spool
18. Arm Hi spool
19. Service spool 1
20. Service spool 2
21. Pressure compensation valve
22. Variable pressure compensation valve
23. Suction valve
24. Check valve (for boom regeneration circuit)
25. Check valve (for arm regeneration circuit)
26. LS shuttle valve
27. LS select valve
28. Merge-divider valve
29. Arm quick return valve
30. Self pressure reducing valve
31. Travel junction valve
32. Back pressure valve
33. Boom drift prevention valve
34. Boom Hi check valve
35. Main relief valve (bucket side)
    Set pressure:
    36.1 ± 0.25 MPa {367.5 ± 2.5 kg/cm^2}
    (112 ℓ/min)

    When digging force increased:
    38.2 ± 0.25 MPa {389.5.5 ± 2.5 kg/cm^2}
    (110 ℓ/min)
36. Main relief valve (arm side)
    Set pressure:
    36.1 ± 0.25 MPa {367.5 ± 2.5 kg/cm^2}
    (112 ℓ/min)

    When digging force increased:
    38.2.1 ± 0.25 MPa {389.5.5 ± 2.5 kg/cm^2}
    (110 ℓ/min)
37. Unload valve (bucket side)
    Cracking pressure:
    3.1 ± 0.5 MPa {32 ± 5 kg/cm^2}
38. Unload valve (arm side)
    Cracking pressure:
    3.1 ± 0.5 MPa {32 ± 5 kg/cm^2}
39. Safety-suction valve
    Set pressure:
    17.2 ± 0.5 MPa {175 ± 5 kg/cm^2}
40. Safety-suction valve
    Set pressure:
    38.2 ± 0.5 MPa {390 ± 5 kg/cm^2}
41. 2-stage safety-suction valve
    Set pressure:
    1 stage: 21.1 ± 0.5 MPa {205 ± 5 kg/cm^2}
    2 stage: 17.2 ± 0.5 MPa {175 ± 5 kg/cm^2}
42. 2-stage safety-suction valve
    Set pressure:
    1 stage: 28.4 ± 0.5 MPa {290 ± 5 kg/cm^2}
    2 stage: 14.7 ± 0.5 MPa {150 ± 5 kg/cm^2}
43. Safety valve
    Set pressure:
    38.2 ± 0.5 MPa {390 ± 5 kg/cm^2}

Unload valve

1. When the unload valve is actuating



1. LS circuit
2. Valve
3. Pump circuit
4. Tank circuit
5. Spring

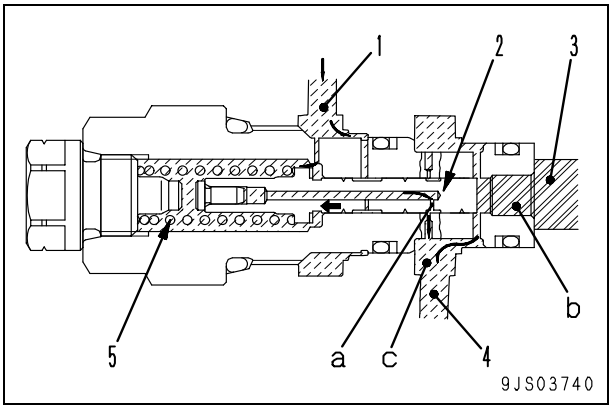
Function

- Drains an oil discharge for the portion of the minimum pump swash plate angle while all control valves are in the holding.
- The pump pressure will correspond to a set load of spring (5) inside the valve (this pressure will be P1).
- Since LS pressure is drained from the LS bypass valve, LS pressure ≒ tank pressure ≒ 0 MPa{0 kg/cm2}.

Operation

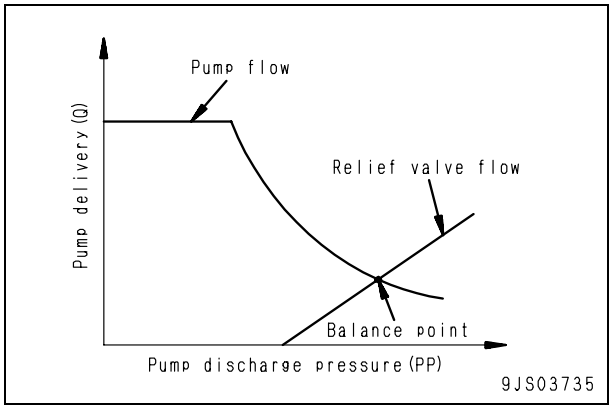
- Pressure of pump circuit (3) is received by the end of valve (2).
- Since the control valve is in neutral position, pressure of LS circuit (1) is 0 MPa{0 kg/cm^2}.
- Pressurized oil of pump circuit (3) stops at valve (2), and the pressure rises as no relief is available.
- When this pressure becomes larger than the force of spring (5), valve (2) moves to the left.
- Ports (b) and (c) are interconnected and the pump pressure flows to tank circuit (4).
- The pressurized oil of LS circuit (1) passes from orifice (a) via port (c) and is drained to the tank circuit (4).
- When actuated, LS pressure ≒ tank pressure.
- Since the pump discharge pressure - LS circuit pressure during unloading is larger than the pump LS control pressure, the signal is output to minimize the pump swash plate angle.

- During operation (a work within a scope of discharge by a minimum swash plate angle), the discharge pressure for the portion of minimum pump swash plate angle is set to LS pressure + P1 pressure.
- LS control differential pressure (△PLS) of discharge for the portion of minimum swash plate angle will be equal to P1 pressure.

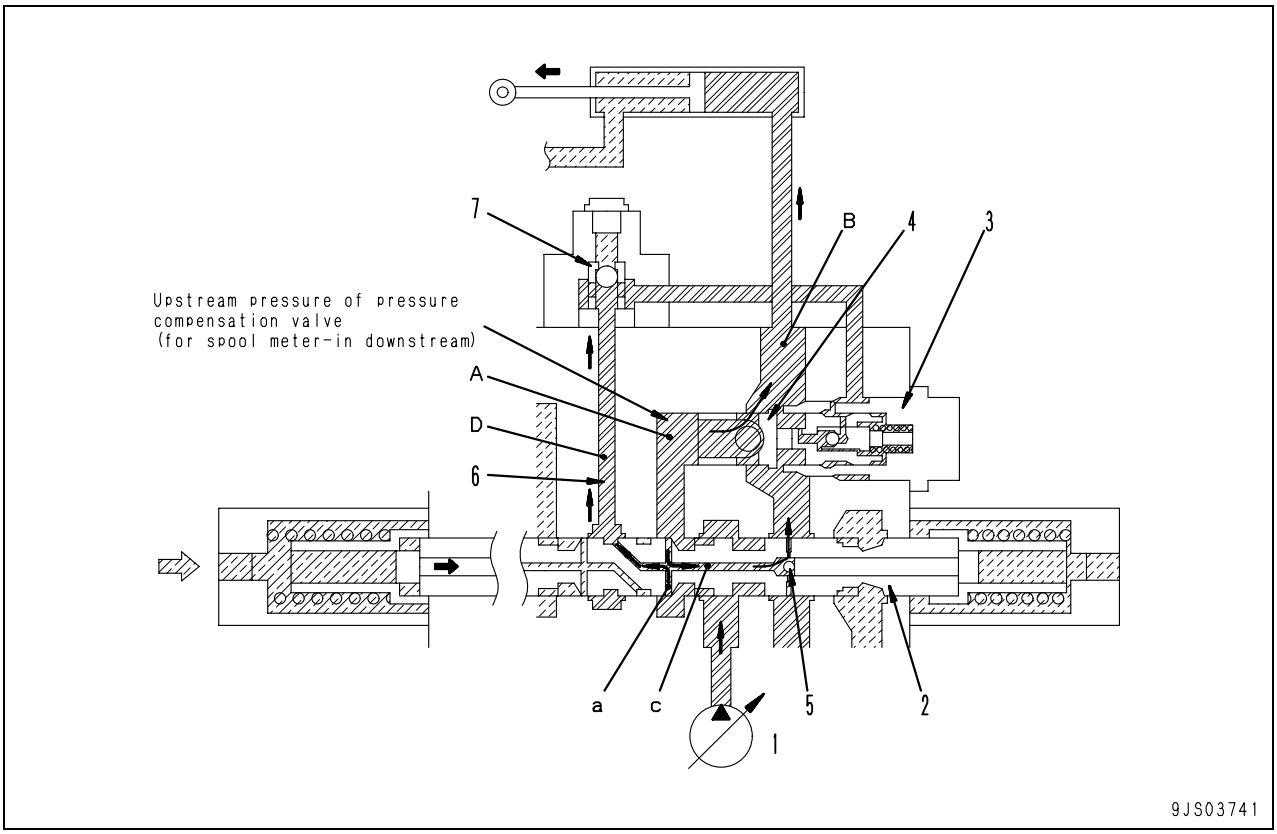


2. Operation of relief valve

- When the cylinder reaches the stroke end, the main relief valve opens.
- The pump delivery (Q) is relieved to the tank.(See the system diagram)
- The pump discharge pressure (PP) and LS pressure (PLS) become approximately the same as each has not flow at the upstream and downstream of the spool, and LS differential pressure (△PLS) becomes 0 kg/cm^2.
- As LS differential pressure (△PLS) is lower than the LS set pressure of LS valve, LS valve is actuated to maximize the pump swash plate angle.
- Mechanically, operation of PC valve have the prevalence to that of LS valve.
- The pump is held at a minimum swash plate angle by the cut-off function of PC valve.



Introduction of LS pressure



1. Hydraulic pump
2. Main spool
3. Pressure compensation valve
4. Valve
5. Check valve
6. LS circuit
7. LS shuttle valve

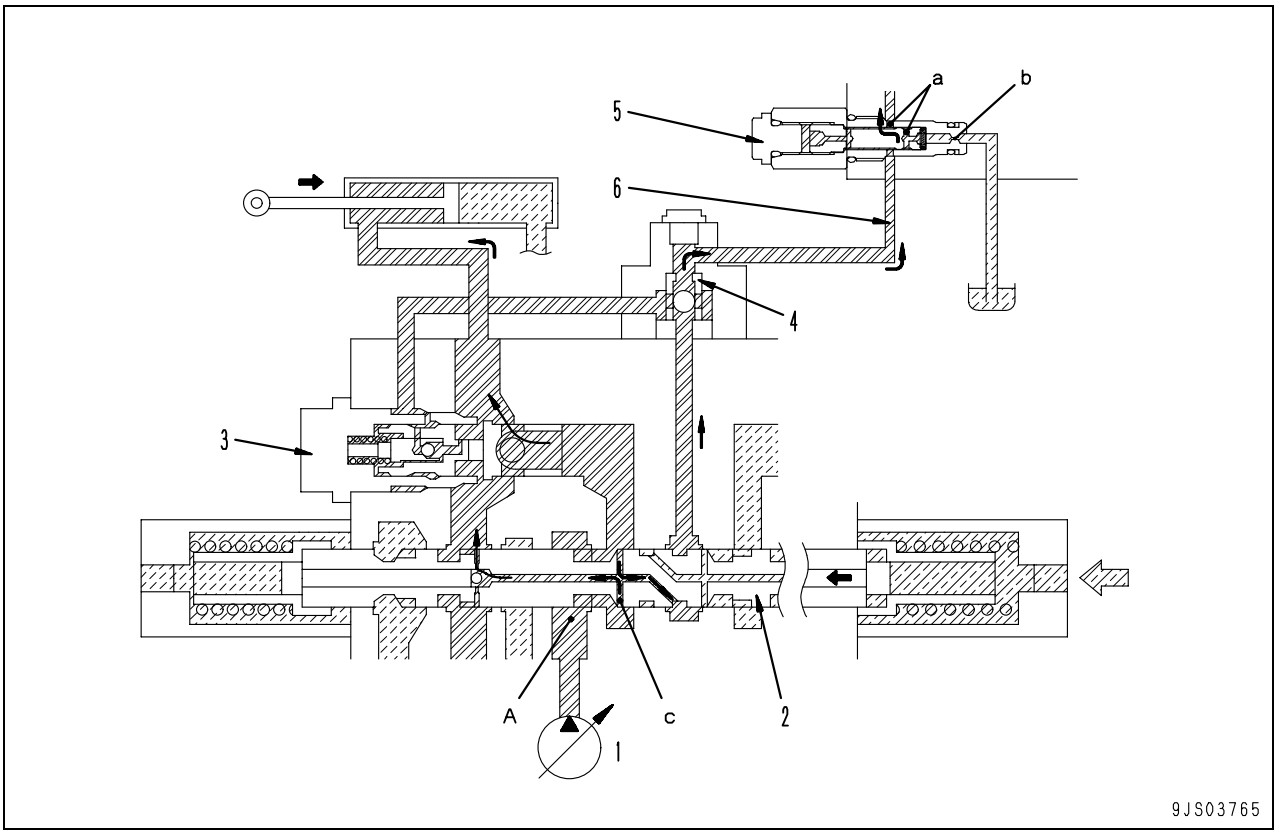
Function

- Introduces the upstream pressure (downstream pressure of the spool meter-in) of pressure compensation valve (3) and leads to LS shuttle valve (7) as the LS pressure.
- Connected to actuator port (B) via valve (4), and makes LS pressure ≒ actuator load pressure.
- Inlet pore (a) inside main spool (2) has a small diameter concurrently serving as a throttle.

Operation

- When main spool (2) is operated, the pump pressure enters port (c) via inlet pore (a) and is led to the LS circuit.
- When the pump pressures rises to reach the load pressure of port (B), check valve (5) opens.

LS bypass plug



1. Hydraulic pump
2. Main spool
3. Pressure compensation valve
4. LS shuttle valve
5. LS bypass plug
6. LS circuit

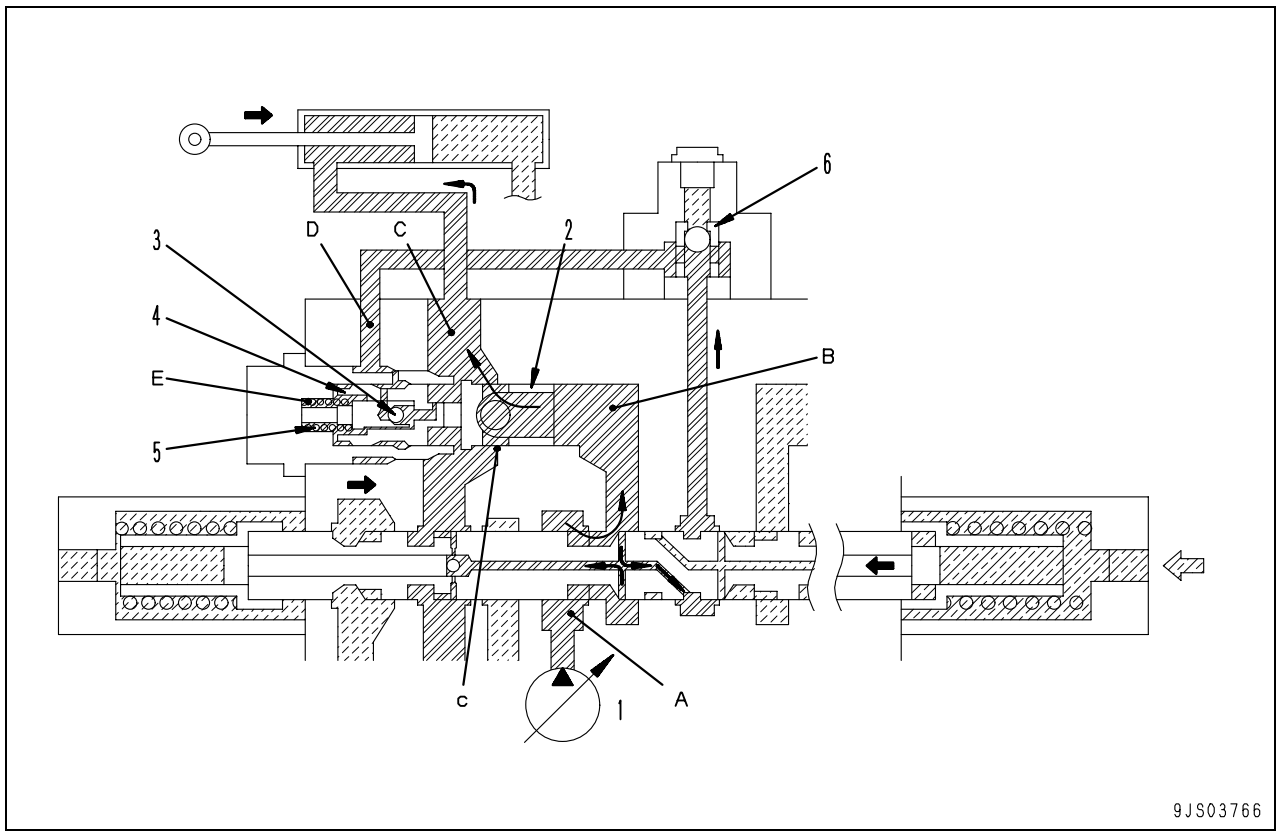
Function

- Releases the residual pressure in LS pressure circuit (6) from orifices (a) and (b).
- Slows down the rising rate of LS pressure to prevent a sudden change of hydraulic pressure.
- Bypass flow from LS bypass plug (5) causes a pressure loss to be generated due to the circuit resistance between throttle (c) of main spool (2) and LS shuttle valve (4).
- Effective LS differential pressure drops to improve a dynamic stability of the actuator.

Pressure compensation valve

1. During independent operation and under maximum load pressure

(If the load pressure is higher than other work equipment during a combined operation)



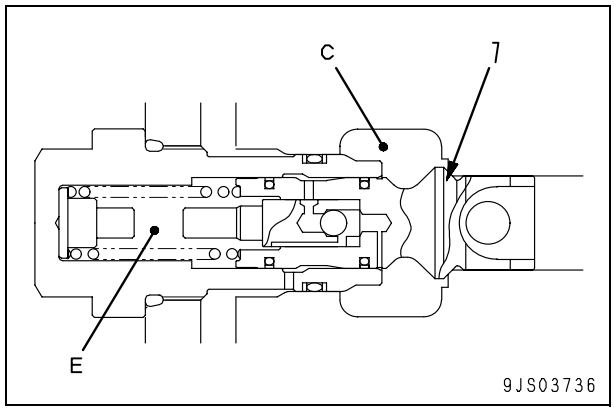
1. Hydraulic pump
2. Valve
3. Shuttle valve
4. Piston
5. Spring
6. LS shuttle valve

Function

- Pressure compensation valve works as the load check valve.
- If the pump pressure (LS pressure) is lower than the load at port (c), shuttle valve (3) in pressure compensation valve piston (4) interconnects spring chamber (E) and port (C).
- The force of spring (5) operates piston (4) and valve (2) to the closing direction.

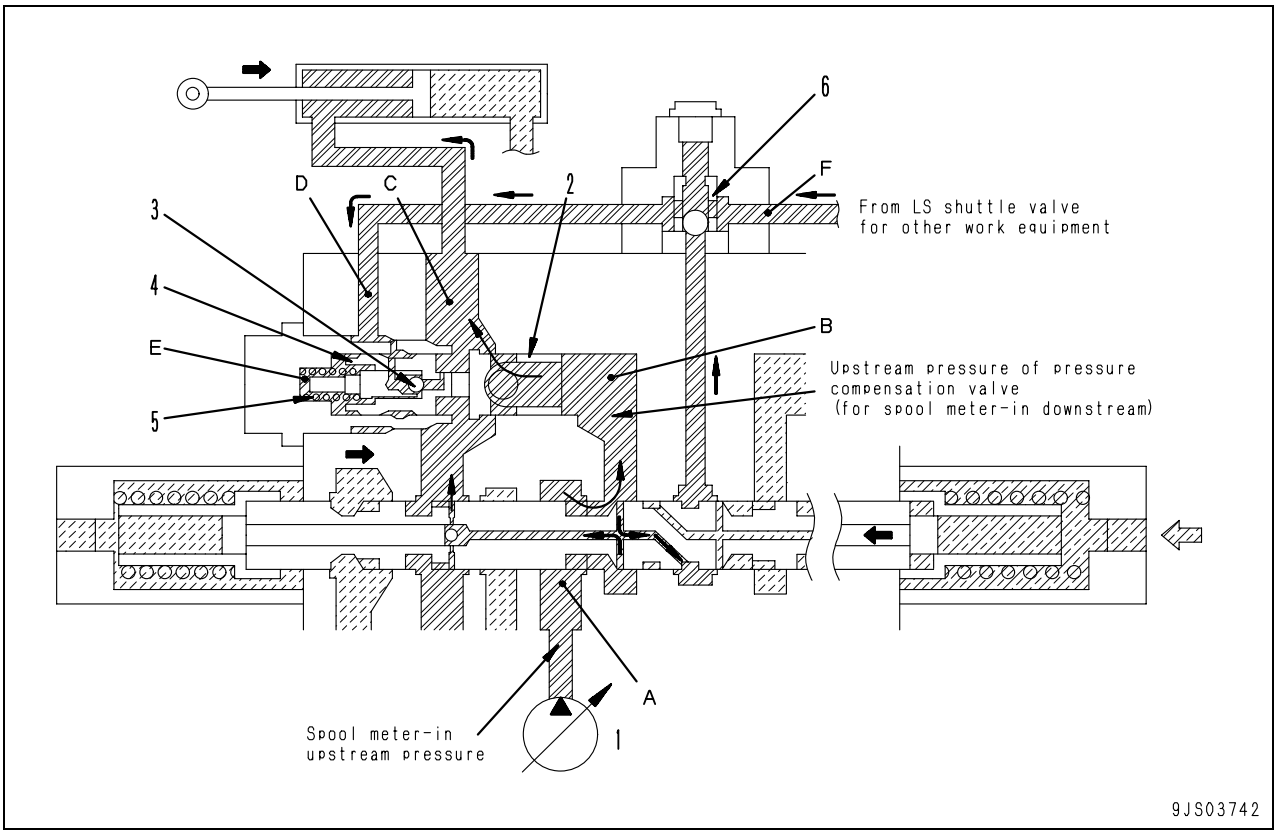
Integrated pressure compensation valve

- High stress may occur when valve (2) collides with valve chamber seat portion (C) if a high peak pressure is generated in the actuator circuit or repetitive peak pressure occurs continuously (example: when using the breaker).
- To prevent this, a pressure compensation valve with integrated valve (2) and piston (4) is used.
- With the present machine, this device is adopted for the bucket valve (cylinder bottom) and the service valve.
- As principle, port (C) and spring chamber (E) are not interconnected in an integrated pressure compensation valve.
- If high peak pressure is generated at port (C), valve (7) does not collide with the valve chamber.
- With a bucket valve, etc., port (C) and spring chamber (E) are designed to interconnect before valve (7) is seated.



2. When compensated

(If the load pressure is lower than other work equipment during a combined operation)



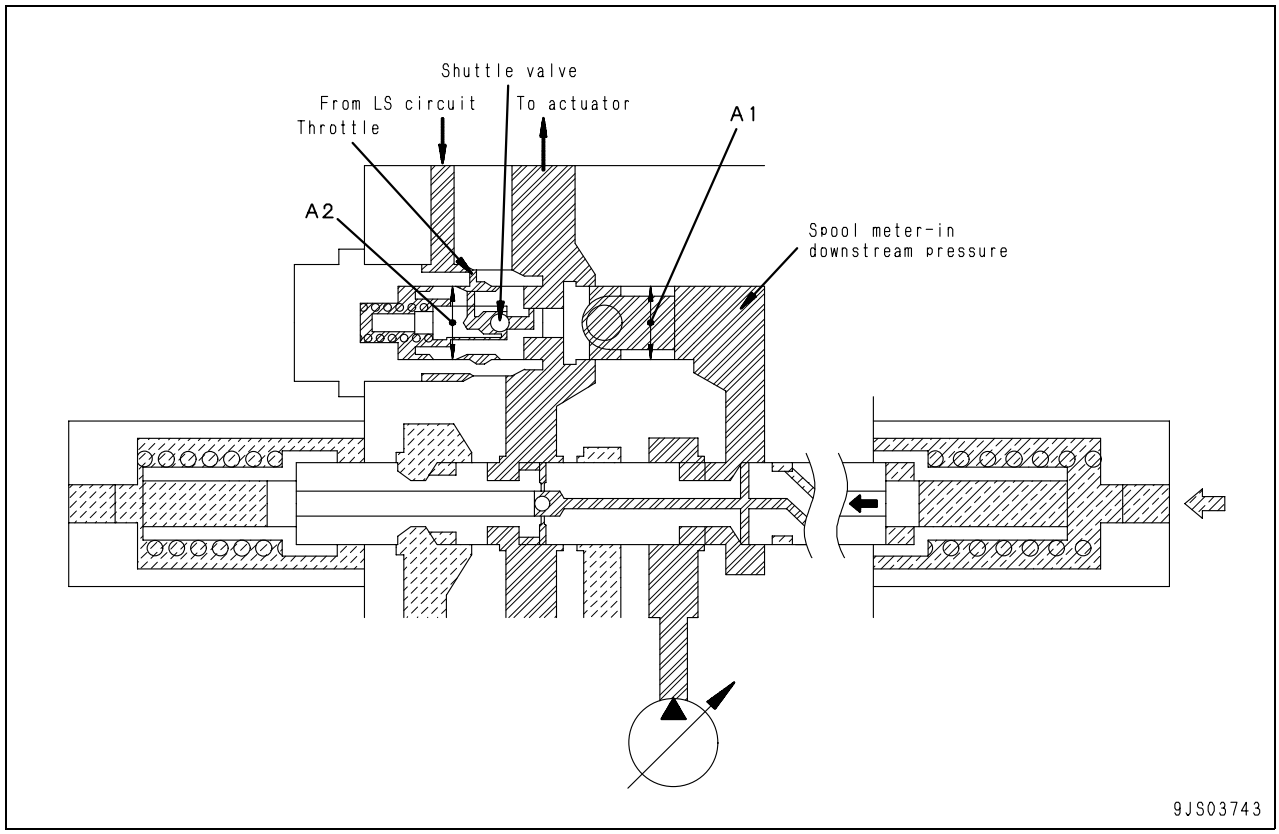
Function

- The pressure compensation valve closes under LS pressure of port (D), and the spool meter-in downstream pressure of port (B) becomes equivalent to the maximum pressure of other work equipment.
- Since the spool meter-in upstream pressure of port (A) is the pump pressure, the spool meter-in differential pressure [upstream pressure port (A) pressure] - downstream pressure [port (B) pressure] becomes equivalent to all the spools in operation.
- Pump flow is divided according to the ratio of the meter-in opening area.

Operation

- Spring chamber (E) is interconnected to port (D).
- Piston (4) and valve (2) operate in the closing direction (to the right) under the LS circuit pressure from other work equipment of port (F).
- Valve upstream pressure (= spool meter-in downstream pressure) of port (B) is controlled with LS pressure.

3. Pressure compensation valve area ratio

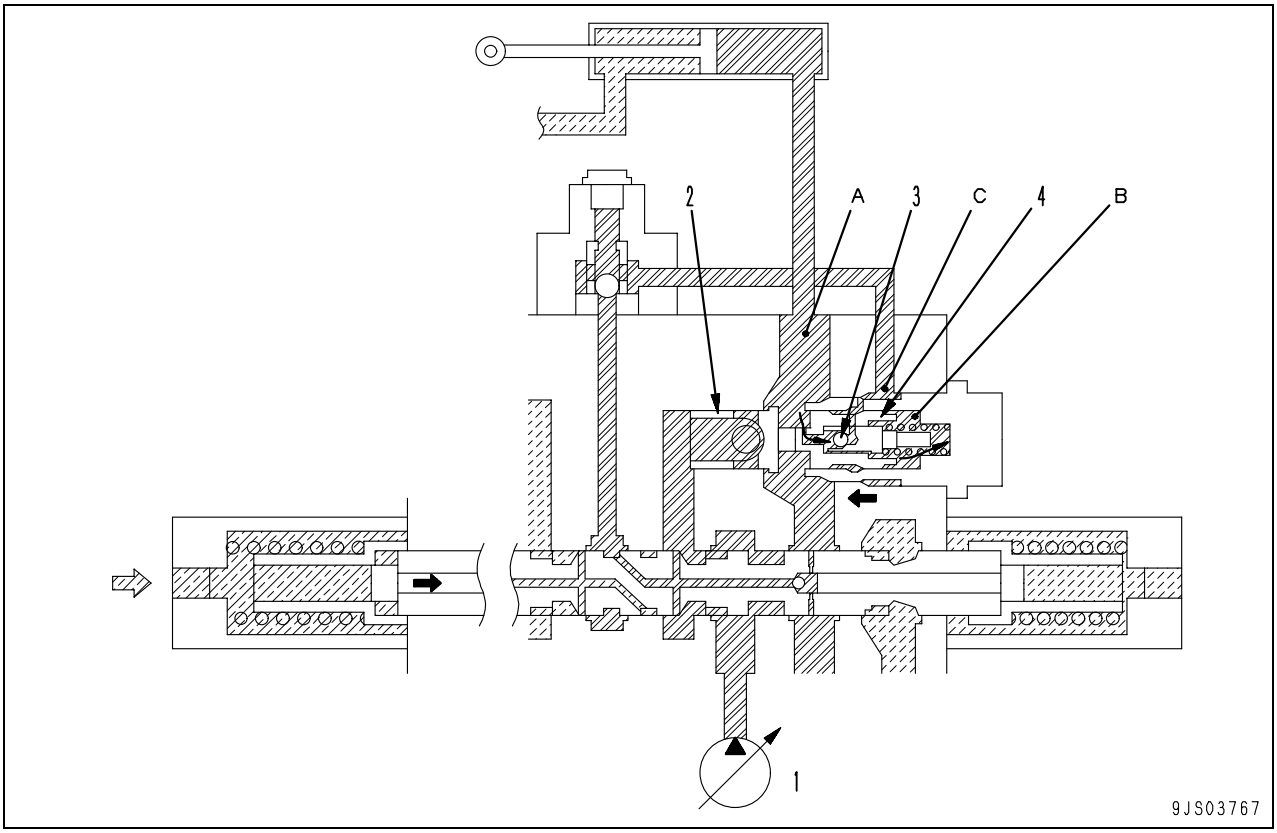


Function

- The state of division changes according to the area ratio of pressure compensation portion (A1) and (A2). Area ratio = (A2)/(A1)
- If area ratio = 1 : the spool meter-in downstream pressure will be equal to the maximum load pressure, and the pressure will be divided according to the opening area ratio.
- If area ratio = 1 or over : the spool meter-in downstream pressure will be greater than the maximum load pressure, and the pressure will be divided smaller than the opening area ratio.
- If area ratio = 1 or under : the spool meter-in downstream pressure will be smaller than the maximum load pressure, and the pressure will be divided greater than the opening area ratio.

Pressure compensation valve inner shuttle valve

1. If holding pressure at port (A) is larger than LS pressure in the springing chamber (B)

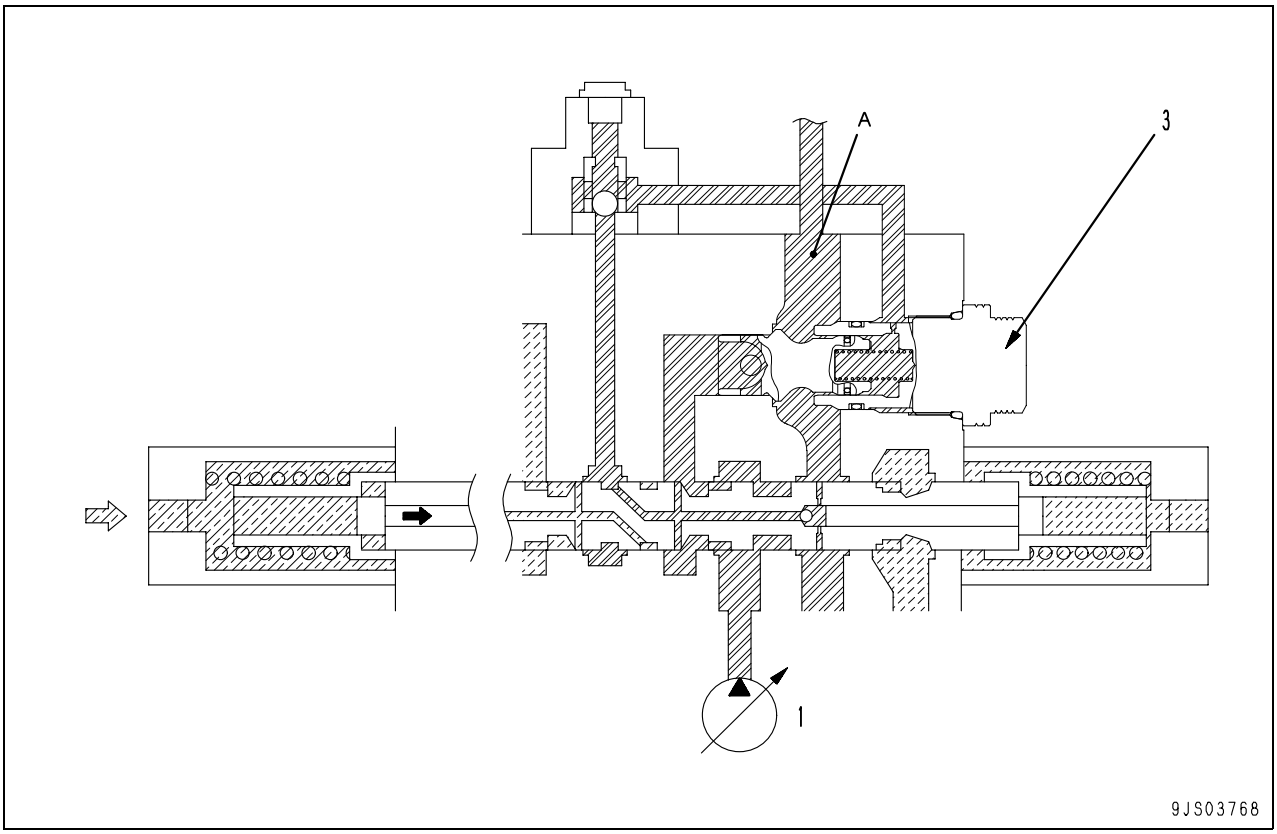


1. Hydraulic pump
2. Valve
3. Pressure compensation valve inner shuttle valve
4. Piston

Function

- Shuttle valve (3) is pushed to the right by port (A) pressure and cuts off interconnection between ports (A) and (C).
- Holding pressure at port (A) is led to the spring chamber (B) to push piston (4) to the left so that piston (4) and valve (2) will not be separated.

2. In the case of travel

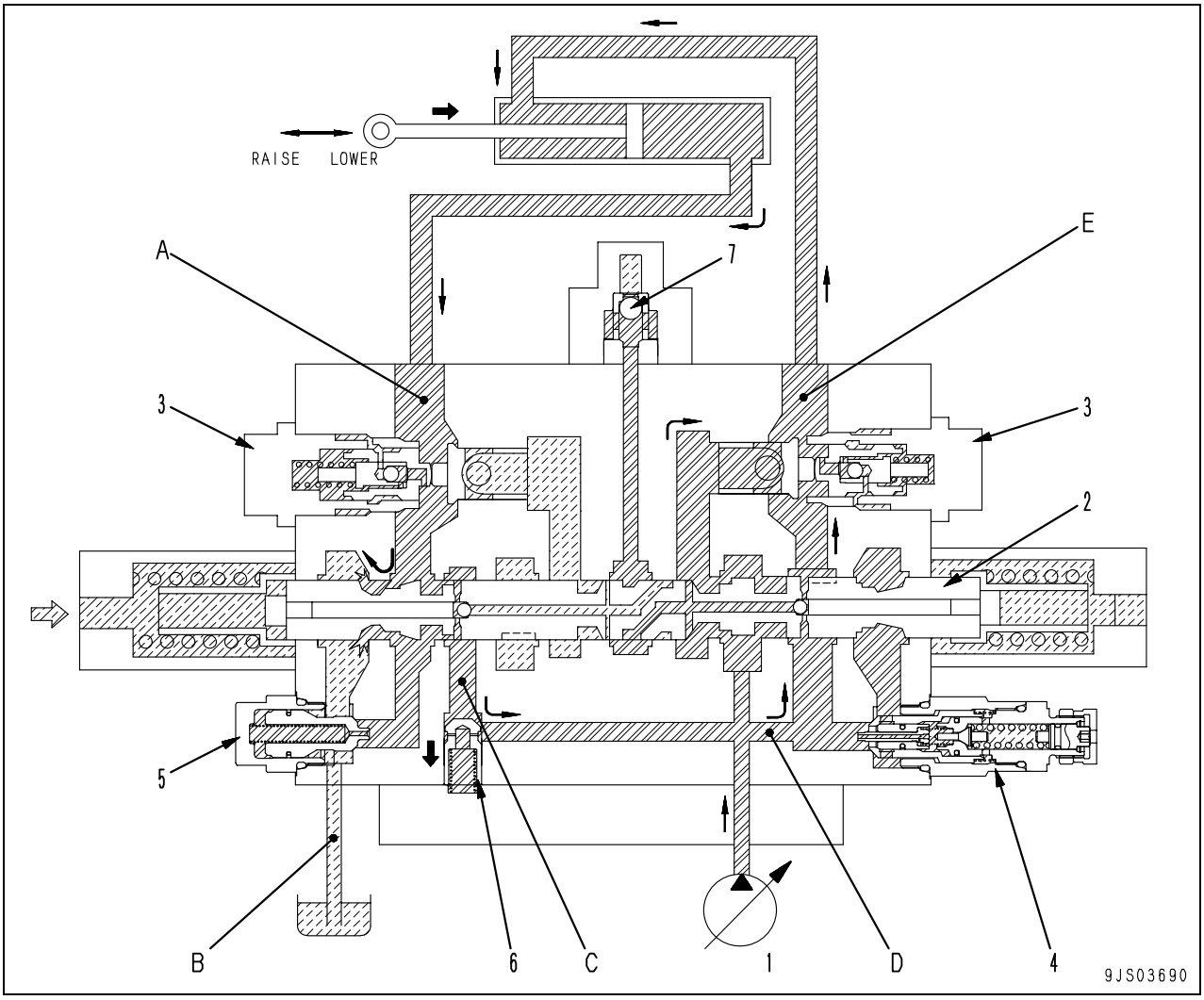


Outline

- Since no holding pressure is generated at port (A) of the travel circuit, a pressure compensation valve without shuttle valve (3) is adopted.

Boom regeneration circuit

1. If the cylinder head pressure is lower than the bottom pressure (free fall, etc.)



1. Hydraulic pump
2. Boom spool
3. Pressure compensation valve
4. Safety-suction valve
5. Suction valve
6. Check valve
7. LS shuttle valve

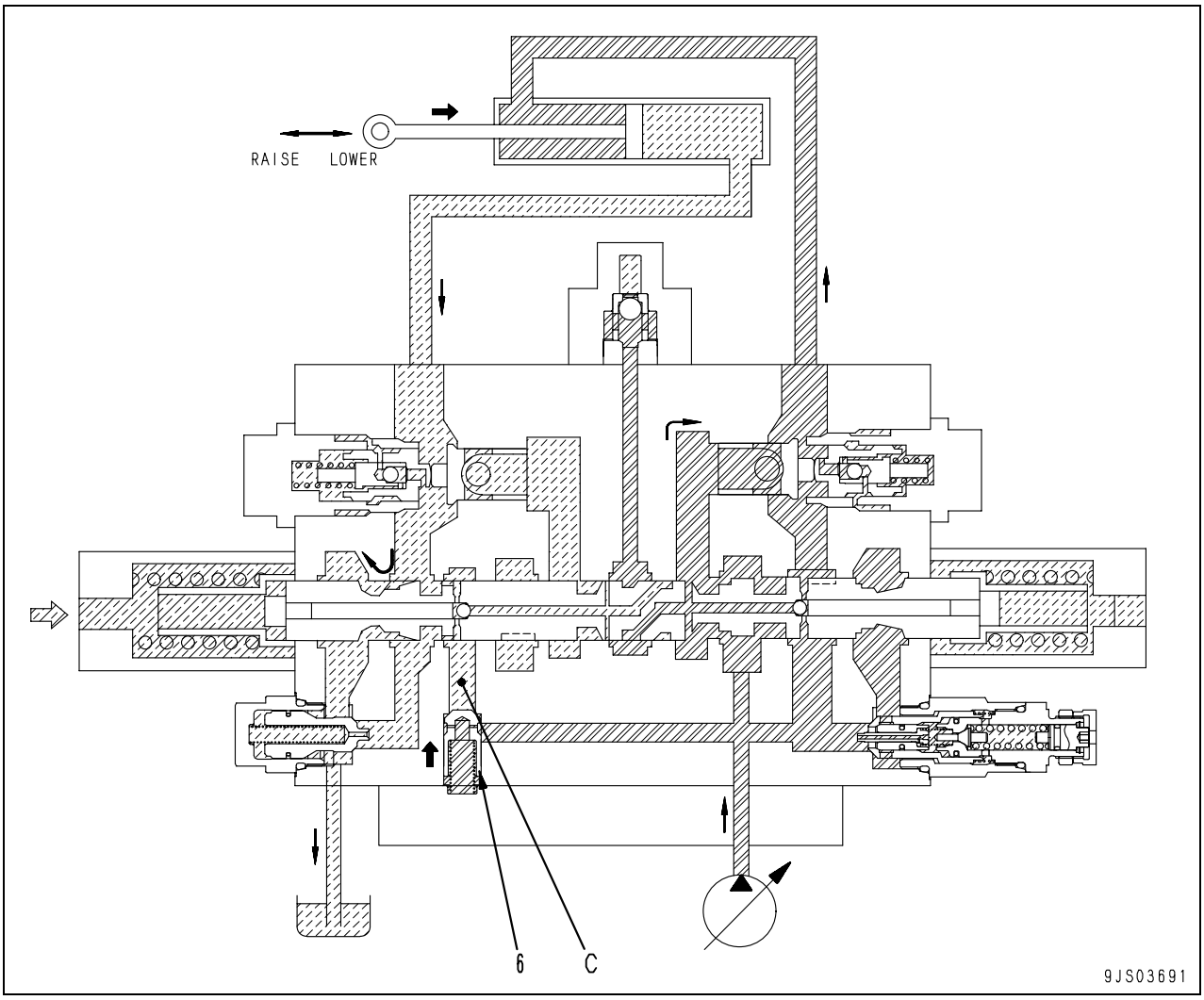
Function

- Provides the regeneration circuit from the cylinder bottom to the cylinder head when the boom is lowered and increases flow to the cylinder bottom.

Operation

- If the cylinder head pressure is lower than the bottom pressure, pressurized oil (A) from the cylinder bottom flows to drain circuit (B) from the notch of boom spool (2).
- On the other hand, remaining oil flows to regeneration circuit (C), opens check valve (6) and flows to the cylinder head via circuit (D).
- Flow from regeneration circuit (C) and pump (1) merges in circuit (E).

2. If the cylinder head pressure is higher than the bottom pressure (digging work, etc.)

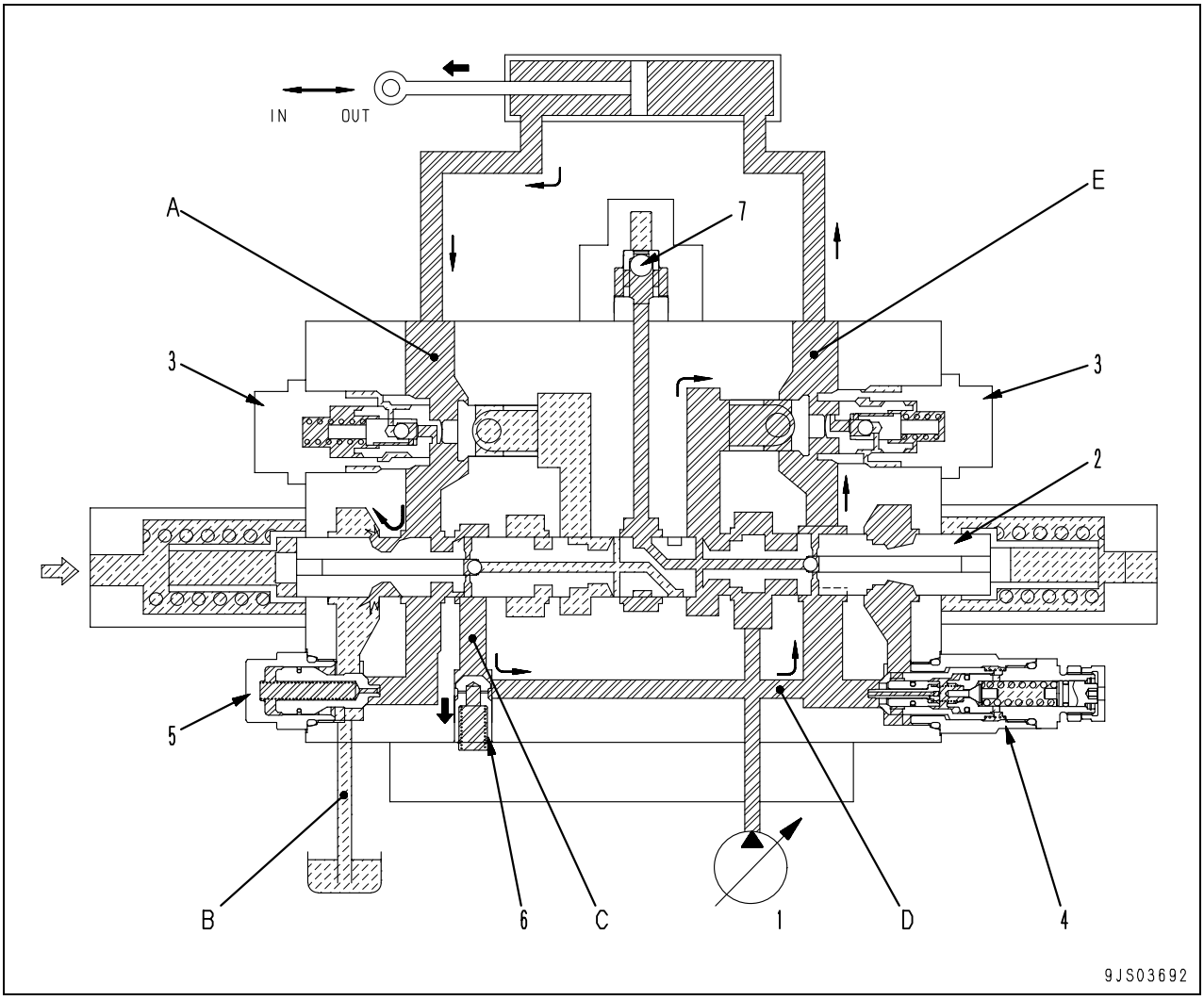


Function

- Check valve (6) provided to regeneration circuit (C) closes to shut off the flow from the cylinder bottom to the head.

Arm regeneration circuit

1. If the cylinder head pressure is higher than the bottom pressure



1. Hydraulic pump
2. Arm spool
3. Pressure compensation valve
4. Safety-suction valve
5. Suction valve
6. Check valve
7. LS shuttle valve

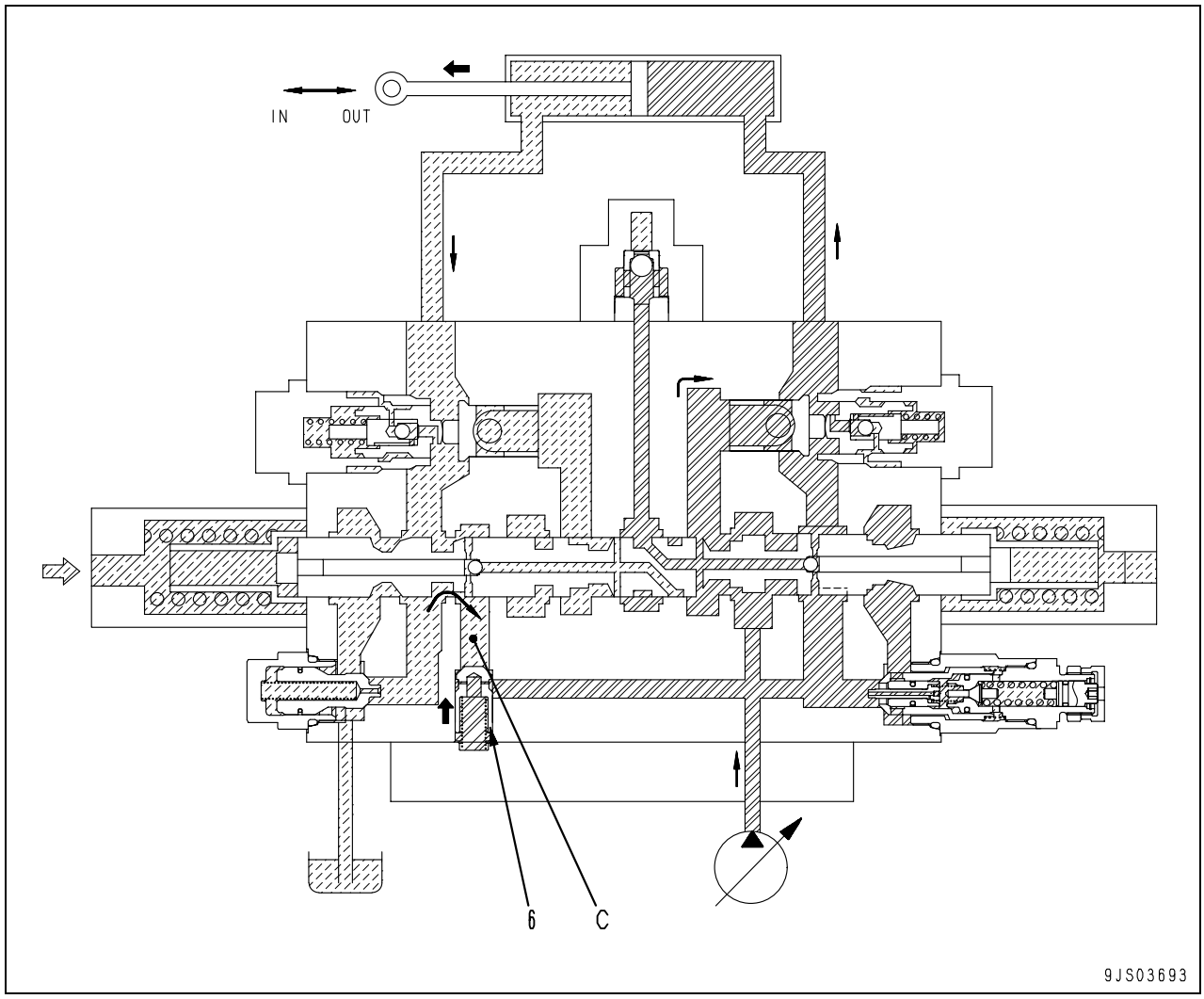
Function

- During arm digging, regeneration circuit provided from the cylinder head to the bottom increases the cylinder speed as the cylinder flow involves the pump delivery plus regenerated flow.

Operation

- If the cylinder head pressure is lower than the bottom pressure, pressurized oil (A) from the cylinder bottom flows to drain circuit (B) from the notch of arm spool (2).
- On the other hand, remaining oil flows to regeneration circuit (C), opens check valve (6) and flows to the cylinder head via circuit (D).
- Flow from regeneration circuit (C) and pump (1) merges in circuit (E).

2. If the cylinder head pressure is lower than the bottom pressure

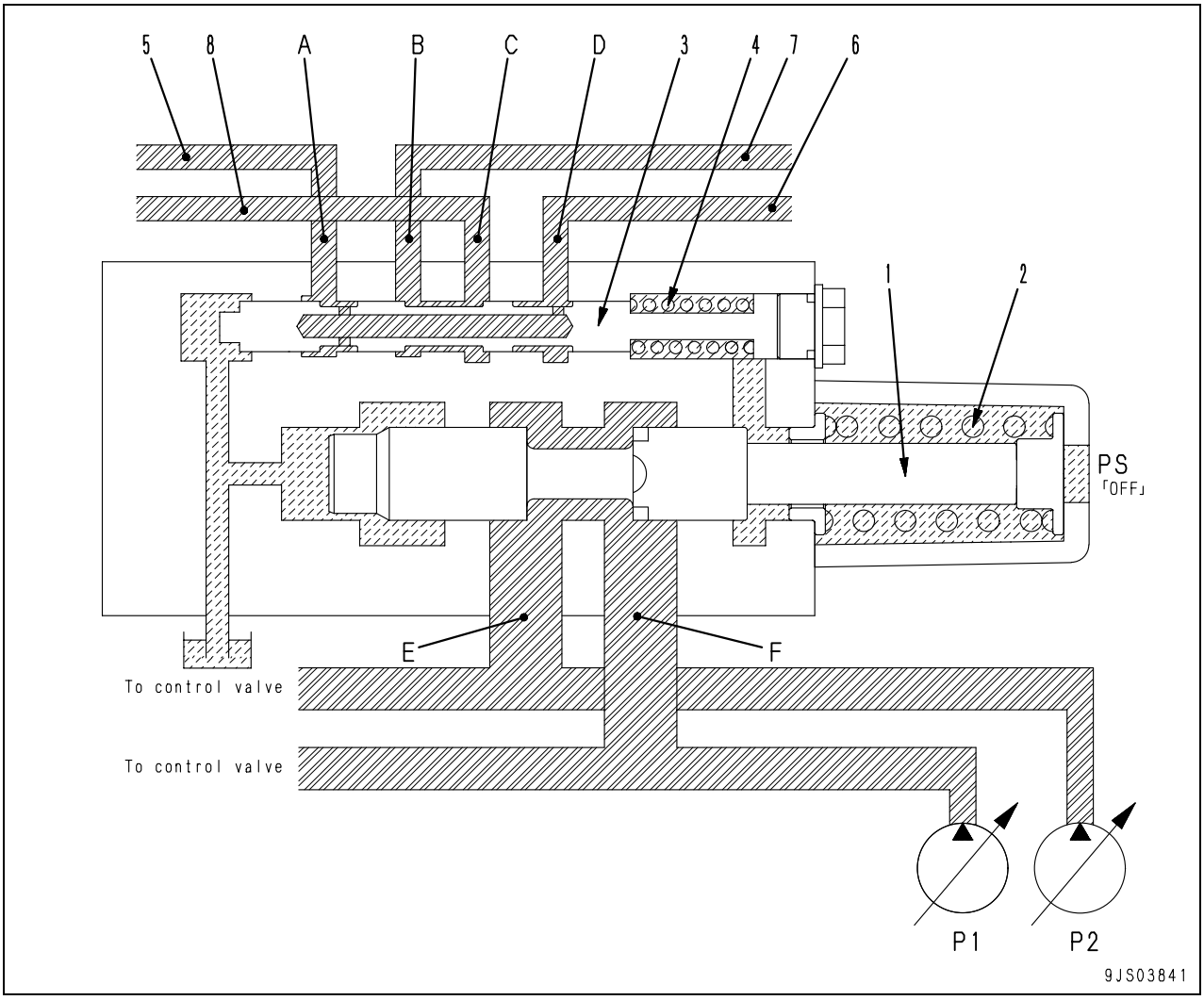


Function

- Check valve (6) provided to regeneration circuit (C) closes to shut off the flow from the cylinder bottom to the head.

Merge-divider valve

1. When flows from the pumps merge [if pilot pressure (PS) is OFF]



1. Main spool
2. Spring
3. LS spool
4. Spring
5. LS circuit (bucket side)
6. LS circuit (bucket side)
7. LS circuit (arm side)
8. LS circuit (arm side)

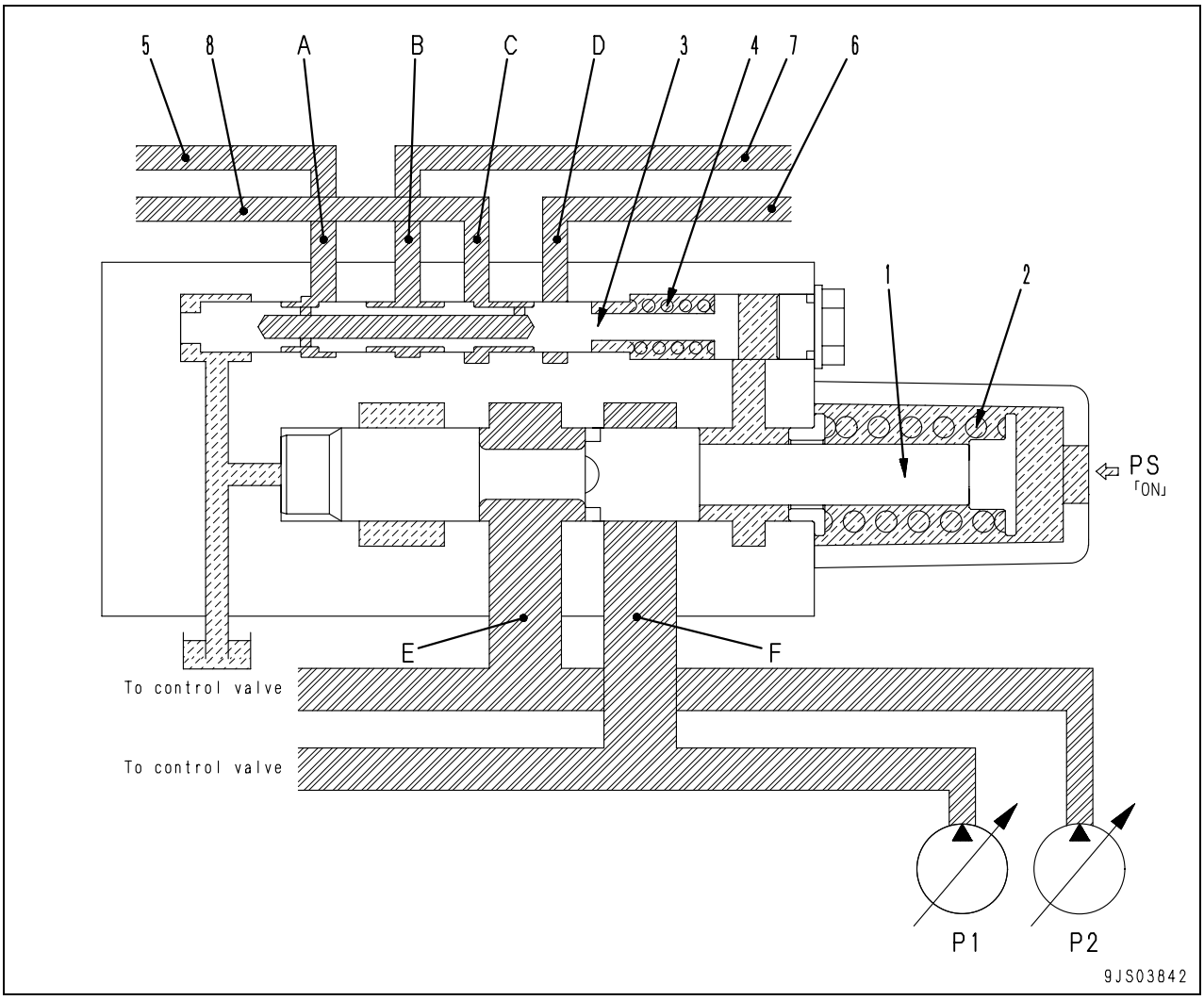
Function

- Merges pressurized oil (P1) and (P2) discharged from the two pumps or divides (to respective control valve group).
- Merges and divides LS circuit pressure.

Operation

- Since pilot pressure (PS) is OFF, output pressure from PPC valve is 0 kg/cm^2.
- Main spool (1) is pressed to the right by spring (2) and ports (E) and (F) are interconnected.
- Merges pressurized oil (P1) and (P2) discharged from the two pumps at ports (E) and (F) and sends to necessary control valve.
- Since pilot pressure (PS) is OFF for LS spool (3), it is pressed to the right by spring (4), and ports (A) - (D) and ports (B) - (C) are interconnected.
- Forwards LS pressure led from respective control valve spools to LS circuits (5), (6), (7) and (8) to all the pressure compensation valves.

2. When flows from the pumps are divided [if pilot pressure (PS) is ON]



Operation

- Pilot pressure (PS) turns ON, and output pressure from the PPC valve shifts main spool (1) to the left, and ports (E) and (F) are divided.
- Pressurized oil discharged from the two pumps are sent to respective control valves.

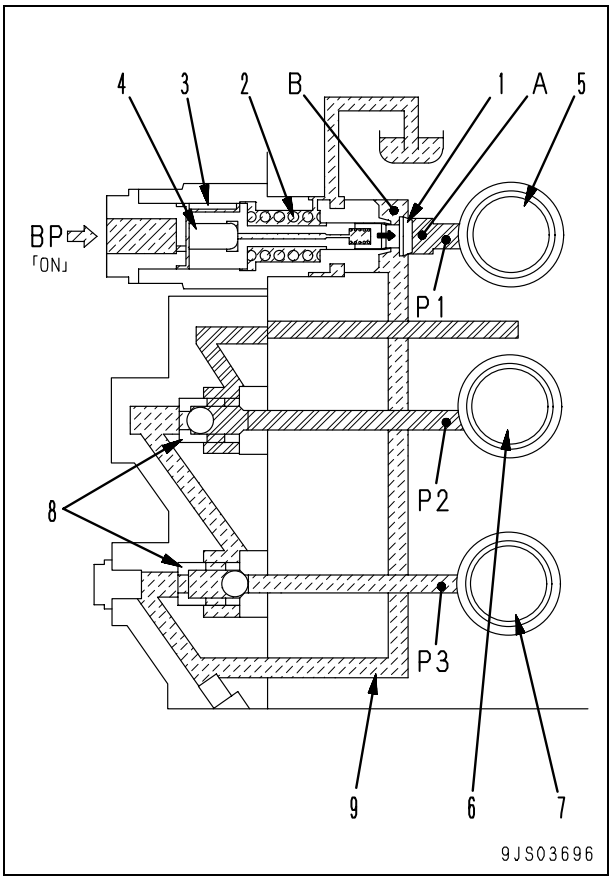
  P1 pressure: To bucket, L.H. travel, and boom
  P2 pressure: To swing, R.H. travel, and arm

- LS spool (3) too shifts to the left under the output pressure from the PPC valve, interconnects ports (A) and (C) and divides other ports.
- Forwards LS pressure led from each control valve spool to LS circuits (5), (6), (7) and (8) to respective control valves.

LS select valve

Function

- Prevents high LS pressure from the swinging from entering the LS circuit of work valves while the swinging and work equipment are in combined operation.
- Prevents high pressure generated during swing drive and improves operability of work equipment.



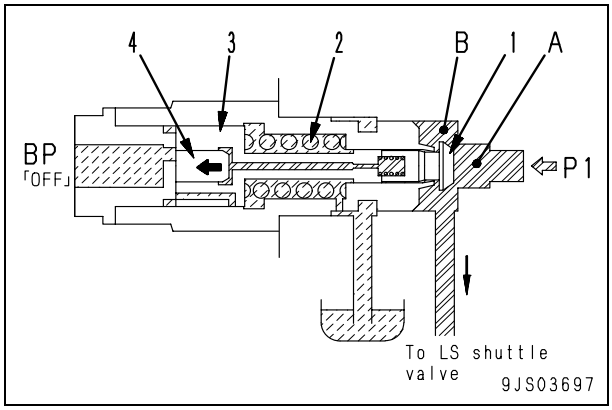
★ The illustration shows the state of simultaneous operation of swinging and R.H. travel. [(BP) pressure ON]

1. Valve
2. Spring
3. Piston
4. Piston
5. Swing spool
6. L.H. travel spool
7. Arm spool
8. LS shuttle valve
9. LS circuit

Operation

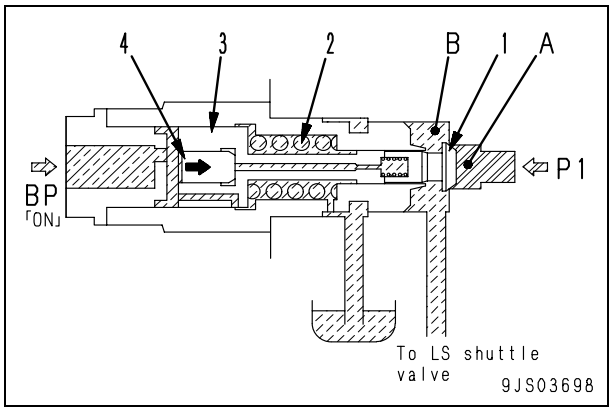
1. If pilot pressure (BP) is OFF

- Since pilot pressure (BP) is OFF, piston (3) is pressed to the left by spring (2).
- When swing-operated, swing LS pressure (P1) enters port (A) after passing swing spool (5).
- Valve (1) is pressed to the left and ports (A) and (B) are interconnected.
- Swing LS pressure (P1) flows to LS shuttle valve (8).



2. If pilot pressure (BP) is ON

- If pilot pressure (BP) is ON, BP pressure contracts spring (2), and piston (3) shifts to the right.
- Valve (1) is pressed to the right and interconnection between ports (A) and (B) is closed.
- Swing LS pressure (P1) stops flowing to LS shuttle valve (8).
- If swing LS pressure (P1) rises, other LS circuits are not affected.



Self pressure reducing valve

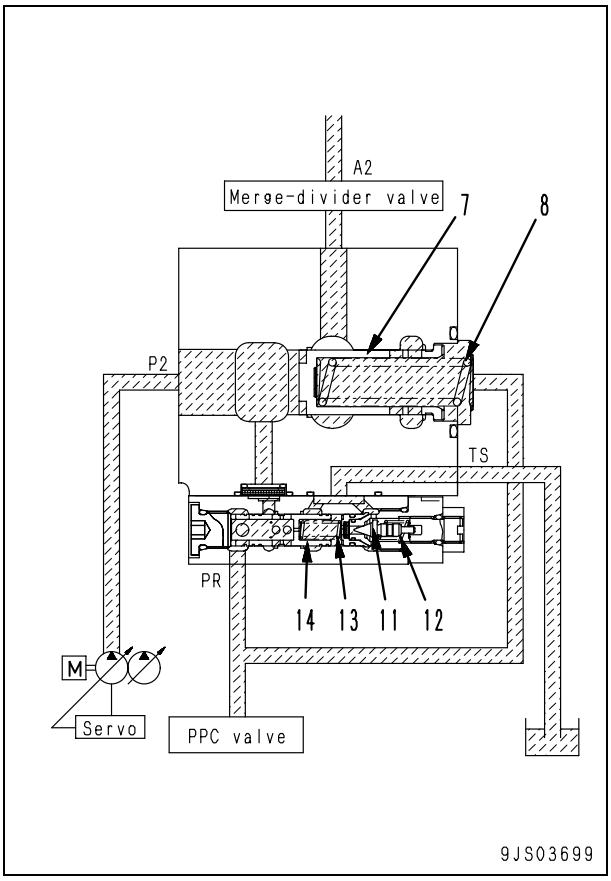
Function

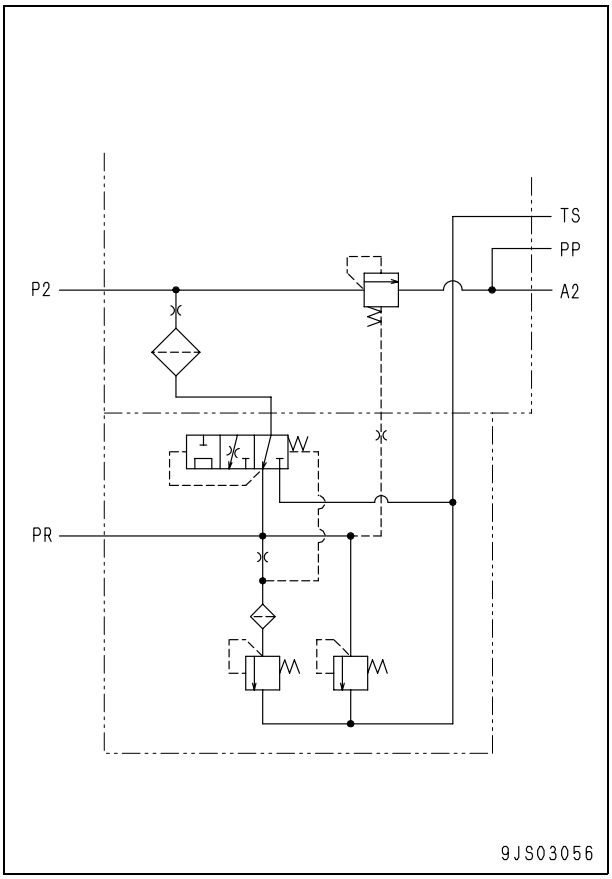
- Reduces the discharge pressure of the main pump and supplies it as control pressure for the solenoid valves, EPC valves, etc.

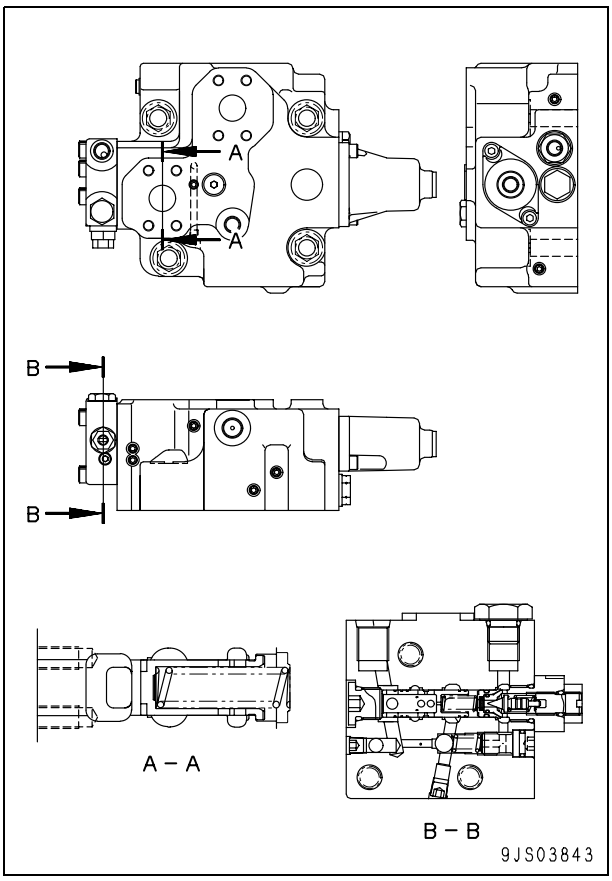
Operation

1. While engine is stopped

- Poppet (11) is pressed by spring (12) against the seat and port (PR) is not connected to (TS).
- Valve (14) is pressed by spring (13) against the left side and port (P2) is connected to (TS).
- Valve (7) is pressed by spring (8) against the left side and port (P2) is closed to (A2).



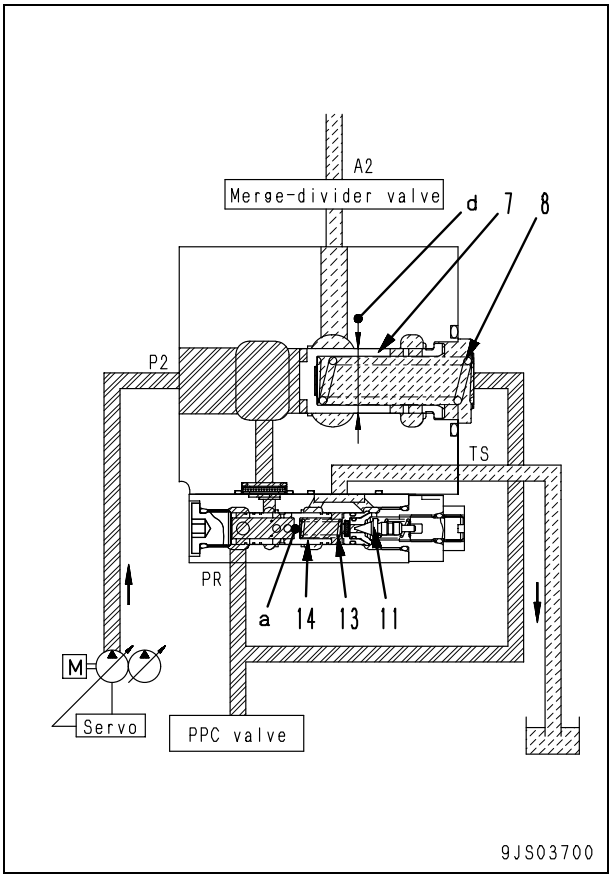




2. During neutral and when load pressure (P2) is low

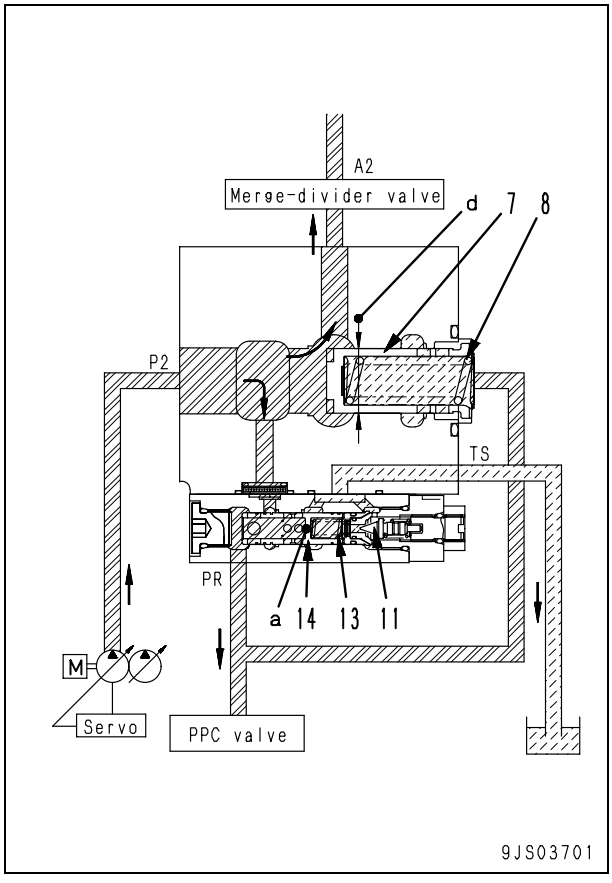
★ When load pressure (A2) is lower than self pressure reducing valve output pressure (PR)

- Valve (7) is pressed to the closing direction of circuit between ports (P2) and (A2) by spring (8) and under pressure (PR) (which is 0 MPa {0 kg/cm^2}).
- When pressurized oil flows in from port (P2), a balance is reached due to [(ϕd area x P2 pressure) = force of spring (8) + (ϕd area x PR pressure)].
- Adjusts valve (7) opening to keep pressure (P2) at a constant level over pressure (PR).
- When pressure (PR) rises above the set pressure, poppet (11) opens.
- Pressurized oil flows from port (PR) to orifice (a) in spool (14), then flows to seal drain port (TS) from poppet (11) opening.
- Differential pressure is generated before and after orifice (a) in spool (14) and then spool (14) moves to close the pass between ports (P2) and (PR).
- Pressure (P2) is reduced by the opening at this time and adjusted to a constant pressure (the set pressure) and supplied as pressure (PR).



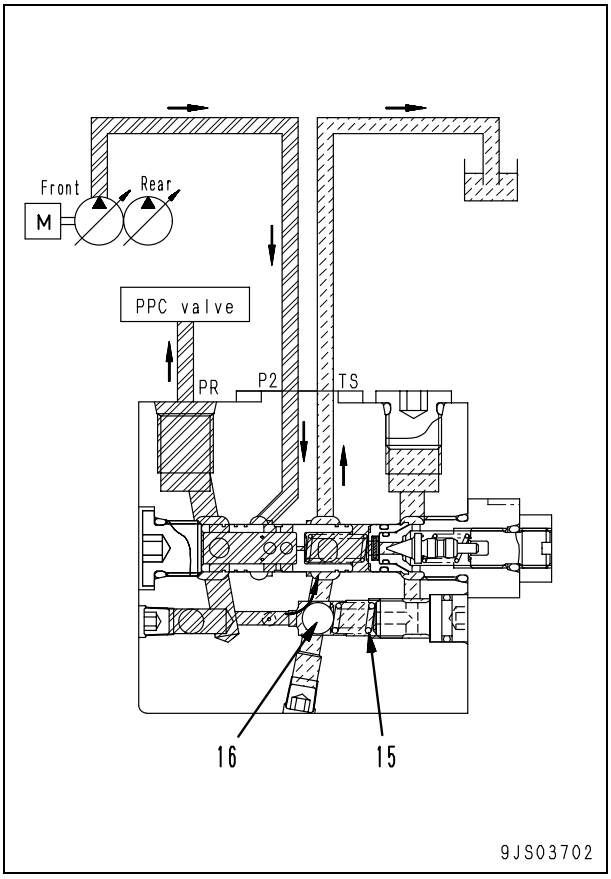
3. When load pressure (P2) is high

- Load pressure (A2) increases with the operation of digging, etc., and the pump discharge increases accordingly.
- Pressure (P2) increases to [(ϕd area x P2 pressure) = force of spring (8) + (ϕd area x PR pressure)]., and valve (7) moves to the right to the stroke end.
- As a result, opening between ports (P2) and (A2) increases, and the pass resistance reduces, reducing the engine horsepower loss.
- When pressure (PR) rises above the set pressure, poppet (11) opens.
- Pressurized oil flows from port (PR) to orifice (a) in spool (14), then flows to seal drain port (TS) from poppet (11) opening.
- Differential pressure is generated before and after orifice (a) in spool (14) and then spool (14) moves to close the pass between ports (P2) and (PR).
- Pressure (P2) is reduced by the opening at this time and adjusted to a constant pressure (the set pressure) and supplied as pressure (PR).



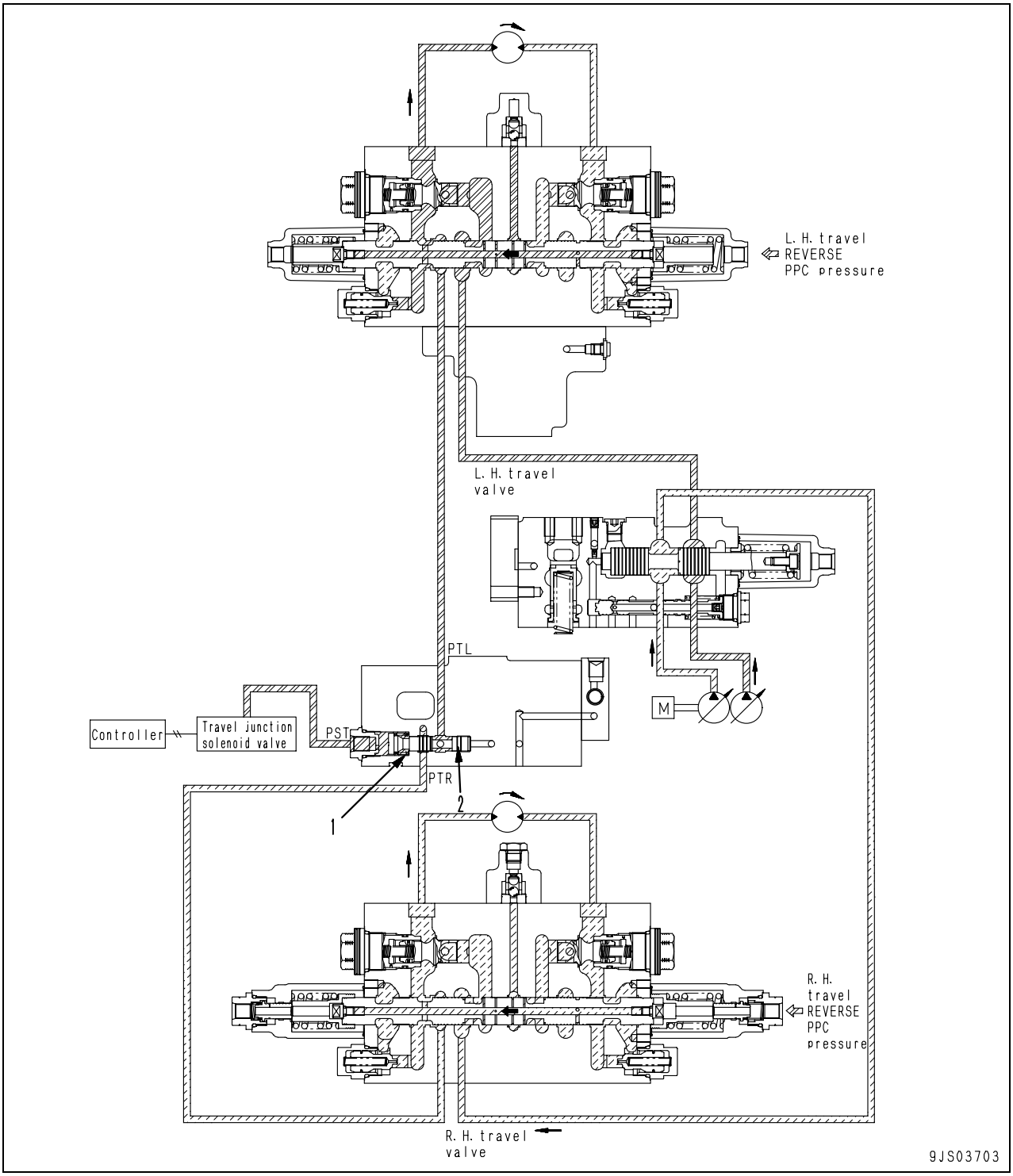
4. When abnormally high pressure is generated

- If pressure (PR) of self pressure reducing valve becomes abnormally high, ball (16) contracts spring (15) and becomes separated from the seat.
- Allows the pressurized oil to (TS) from port (PR) and lowers pressure (PR).
- Protects PPC valve, solenoid valve and other devices from abnormal pressure.



Travel junction valve

1. When pilot pressure is turned ON



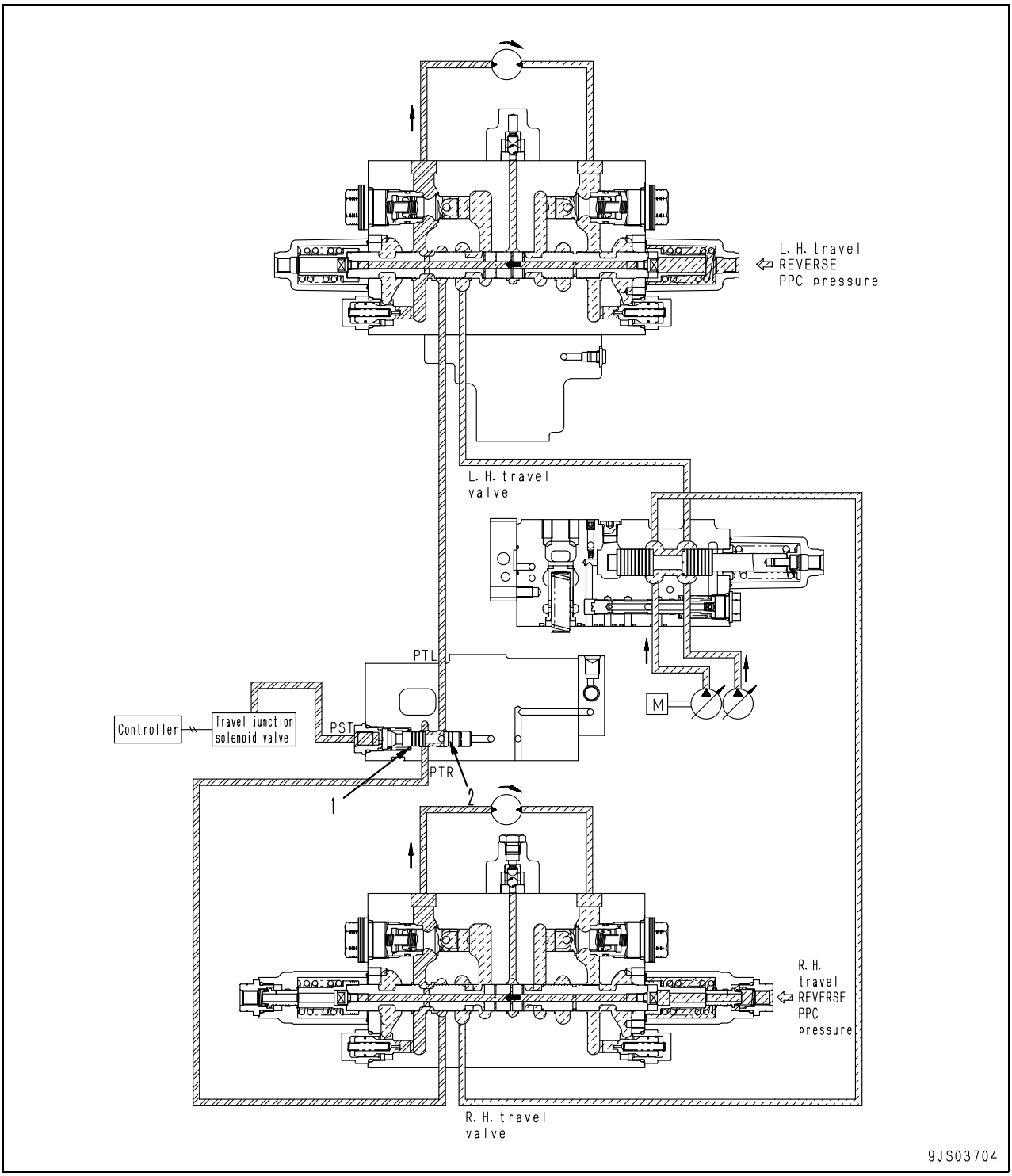
Function

- This valve connects the L.H. and R.H. travel circuits via travel junction valve so that the hydraulic oil will be supplied evenly to both travel motors to improve machine's straight travel performance.
- When the machine is steered, outside pilot pressure (PST) closes the travel junction valve to improve steering performance.

Operation

- Pilot pressure from the travel junction solenoid valve contracts spring (1), and travel junction spool (2) moves to the left to the stroke end.
- Junction circuit between port (PTL) (L.H. travel circuit) and port (PTR) (R.H. travel circuit) is closed.

2. When pilot pressure is turned OFF

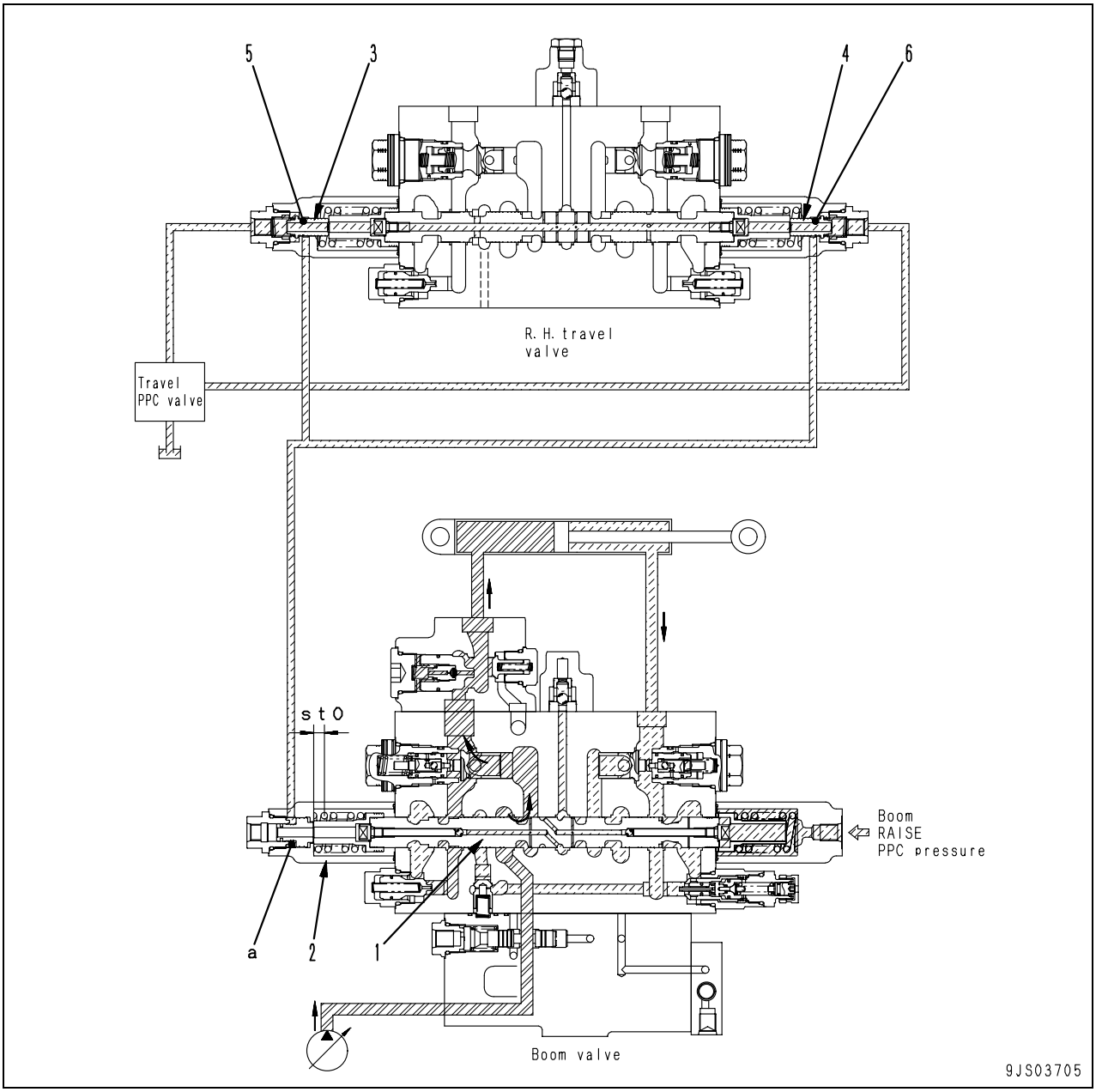


Operation

- If pilot pressure (PST) from the solenoid valve is 0, travel junction spool (2) is pressed by the force of spring (1) against the right side and the pass between ports (PTL) and (PTR) is open.
- If the oil flow rates to the L.H. and R.H. travel motors become different from each other, the oil flows through the route between port (PTL), travel junction spool (2), and port (PTR) so that the oil flow rates to both motors will be equalized again.

Travel PPC shuttle valve

1. When travel lever is in neutral



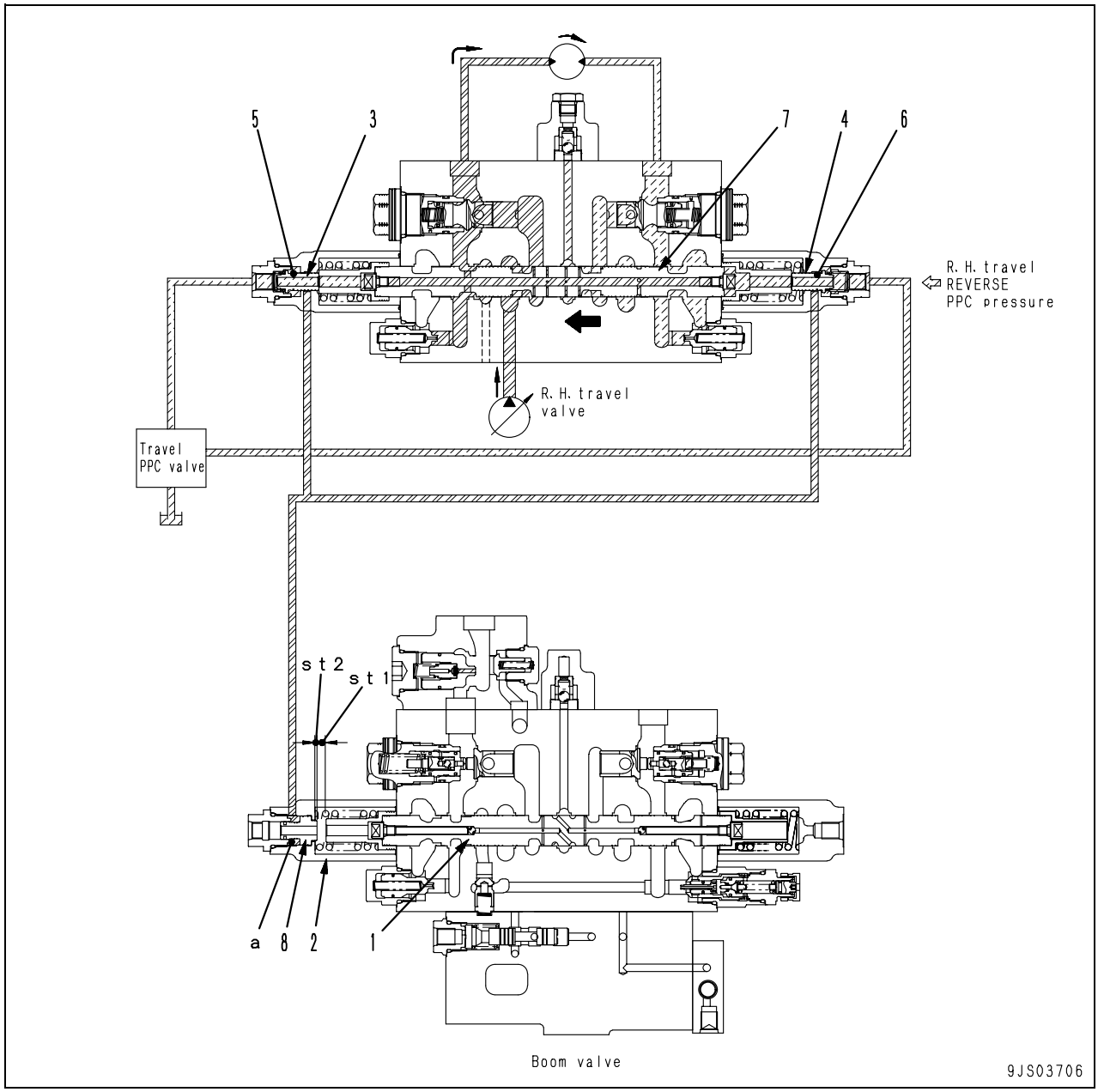
Function

- Regulates flow to each cylinder by controlling the stroke of each spool of the boom, arm, and bucket using the pilot pressure of travel PPC valve while climbing a steep grade, raising the boom, digging with arm, dumping, bucket-digging or operating dump.
- When controlling the stroke of the boom, arm and/or bucket, pilot pressure of travel PPC valve passes through the circuit inside the control valves to actuate the system.

Operation

- The oil in stroke regulation signal chamber (a) is drained through orifices (5) and (6) of pistons (3) and (4) in the travel spring case and the travel PPC valve.
- When operated for boom raising (or arm digging, dumping, bucket digging, dumping), spool (1) moves to the left until it makes contact with the end face of spring casing (2) (st0).

2. When traveling

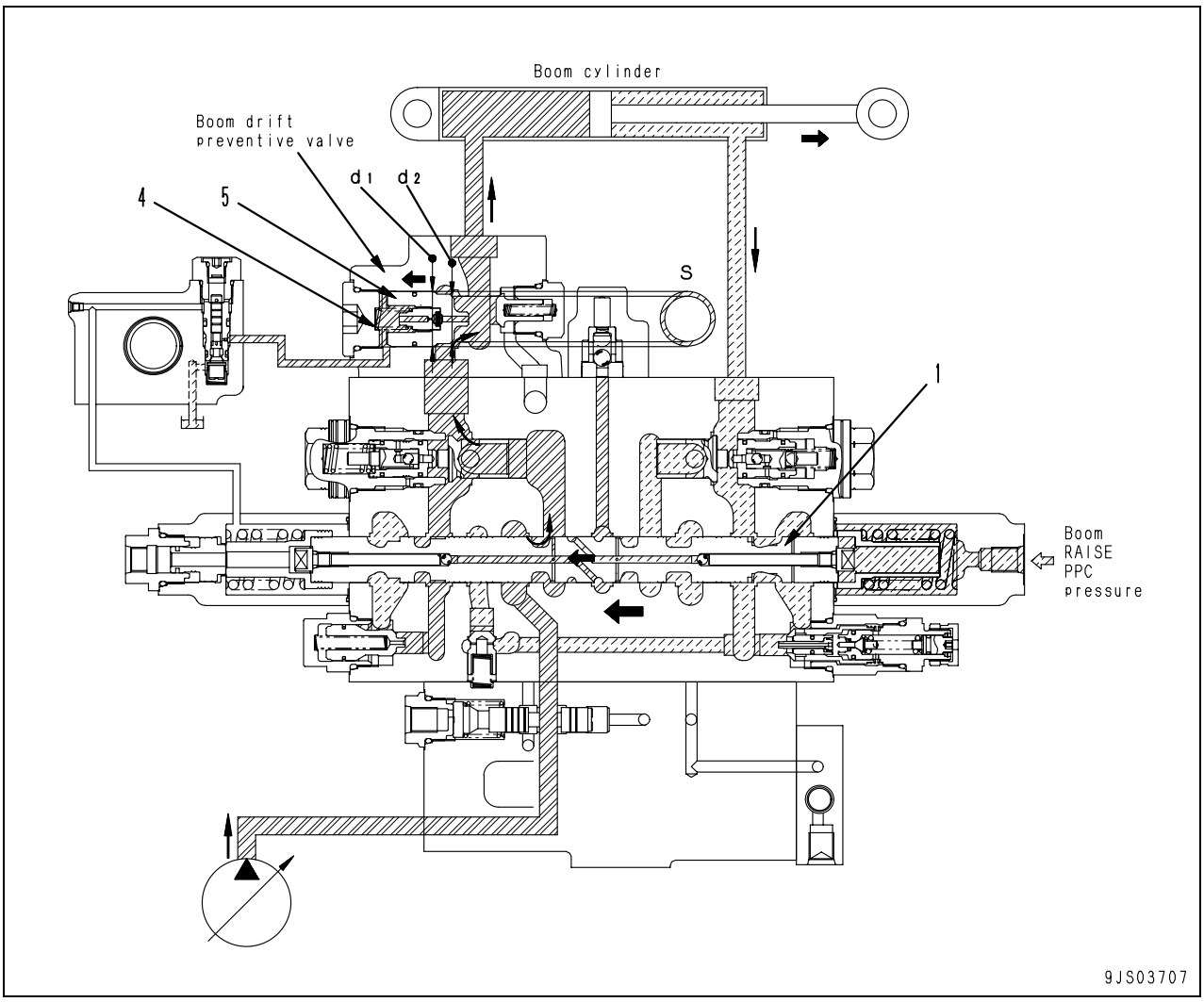


Operation

- If the right travel lever is set in the reverse (or forward) direction, pilot pressure from the PPC valve presses spool (7) to the left (or right).
- Spool (7) pushes piston (3) to close orifice (5) and shut off stroke regulation signal chamber (a) and the drain circuit of the travel PPC valve.
- At this time, the right travel reverse (or forward) lever is set, PPC pressure is applied through orifice (6) of piston (4) to the left end of piston (8) to push piston (8) to the right.
- When operated for boom raising (or arm IN, OUT, bucket CURL, DUMP), spool (1) moves to the left.
- Maximum stroke of the spool is limited to (st1) for the amount of movement (st2) of piston (8) to the right.

Boom drift prevention valve

1. When raising boom



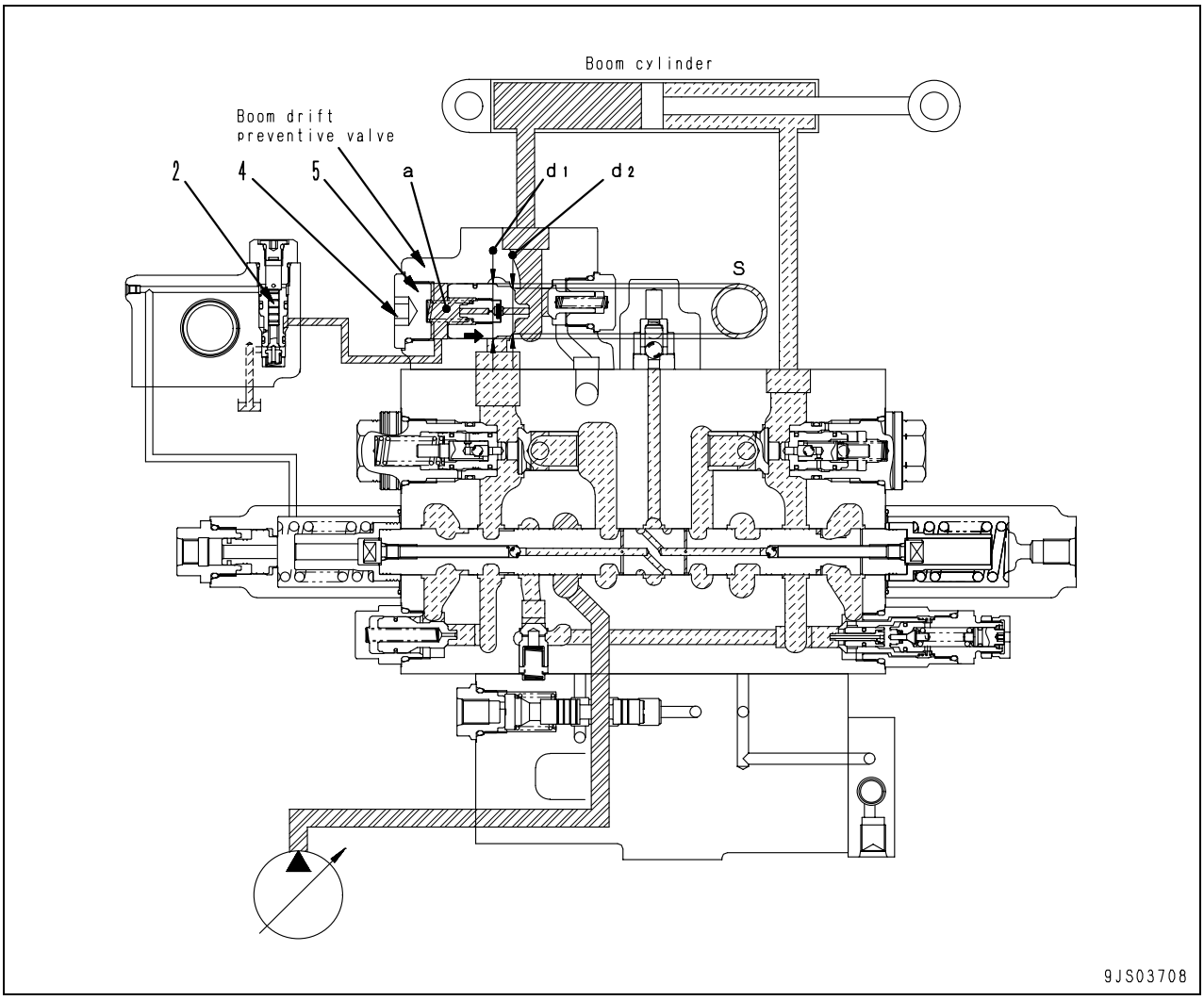
Function

- This valve prevents the oil in the boom cylinder bottom from leaking through spool (1) and the boom from lowering under its weight while the boom lever is not operated.

Operation

- When the boom is raised, pressurized oil from the control valve works on the ring-shaped area (S)[= ϕ(d1) area – ϕ(d2) area] caused by the difference between outside diameter (d1) of poppet (5) and seat diameter (d2) to move it to the left.
- Contracts spring (4) and poppet (5) moves to the left.
- As a result, pressurized oil from the control valve passes through the opening of poppet (5) and flows to the bottom end of the boom cylinder.

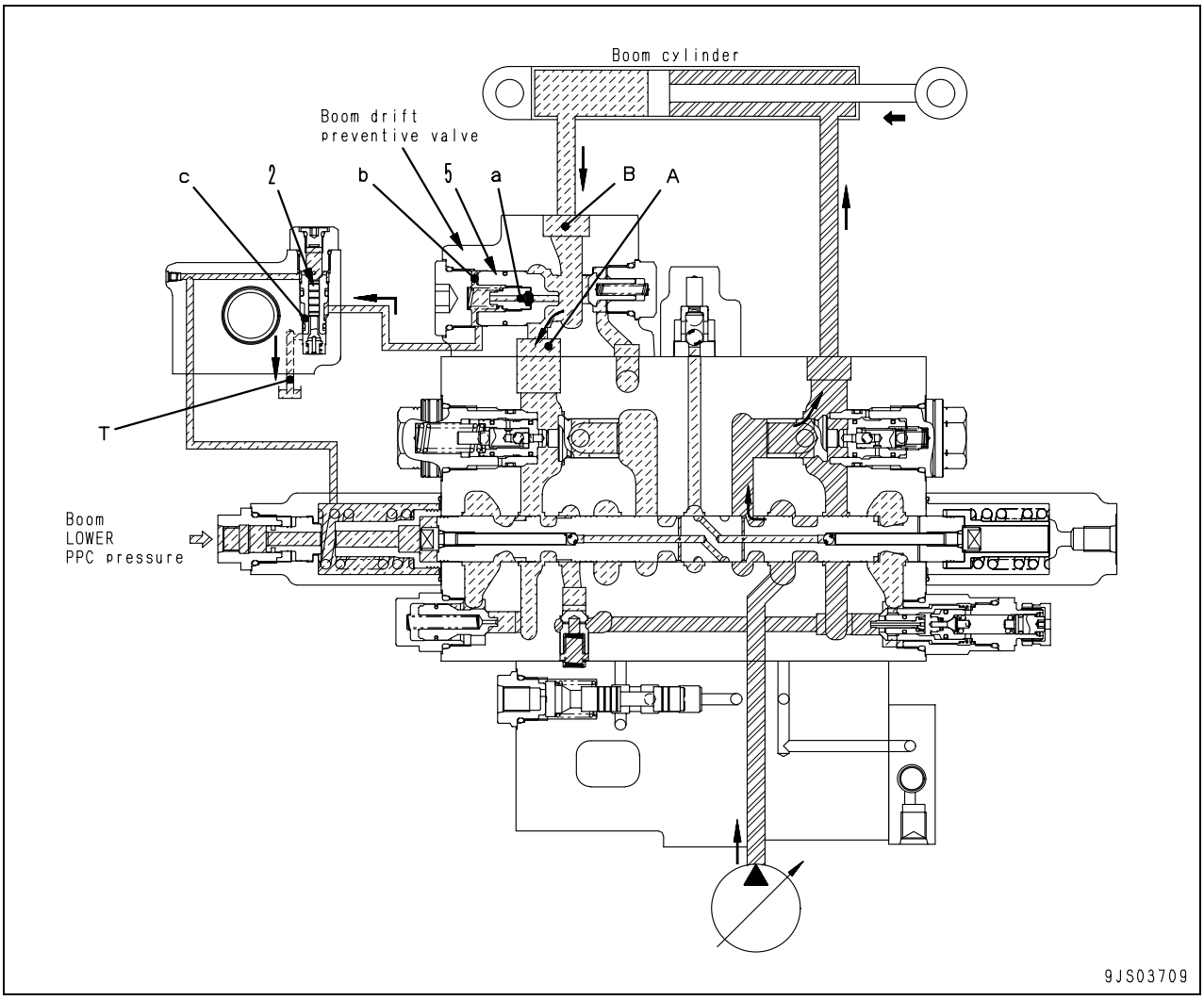
2. When the boom is in neutral



Operation

- Moves the lever to neutral with the boom raised.
- Pressurized oil flown inside poppet (5) from orifice (a) of poppet (5) is closed by pilot piston (2).
- Pressurized oil from the control valve and the holding pressure of the boom cylinder bottom are shut off.
- The holding pressure of boom cylinder bottom works on the ring-shaped area (S) caused by the difference between outside diameter (d1) of poppet (5) and seat diameter (d2) to move it to the right.
- The sum of this force and the force of spring (4) closes poppet (5).
- Pressurized oil from the control valve and the holding pressure of the boom cylinder bottom are shut off.

3. When lowering boom

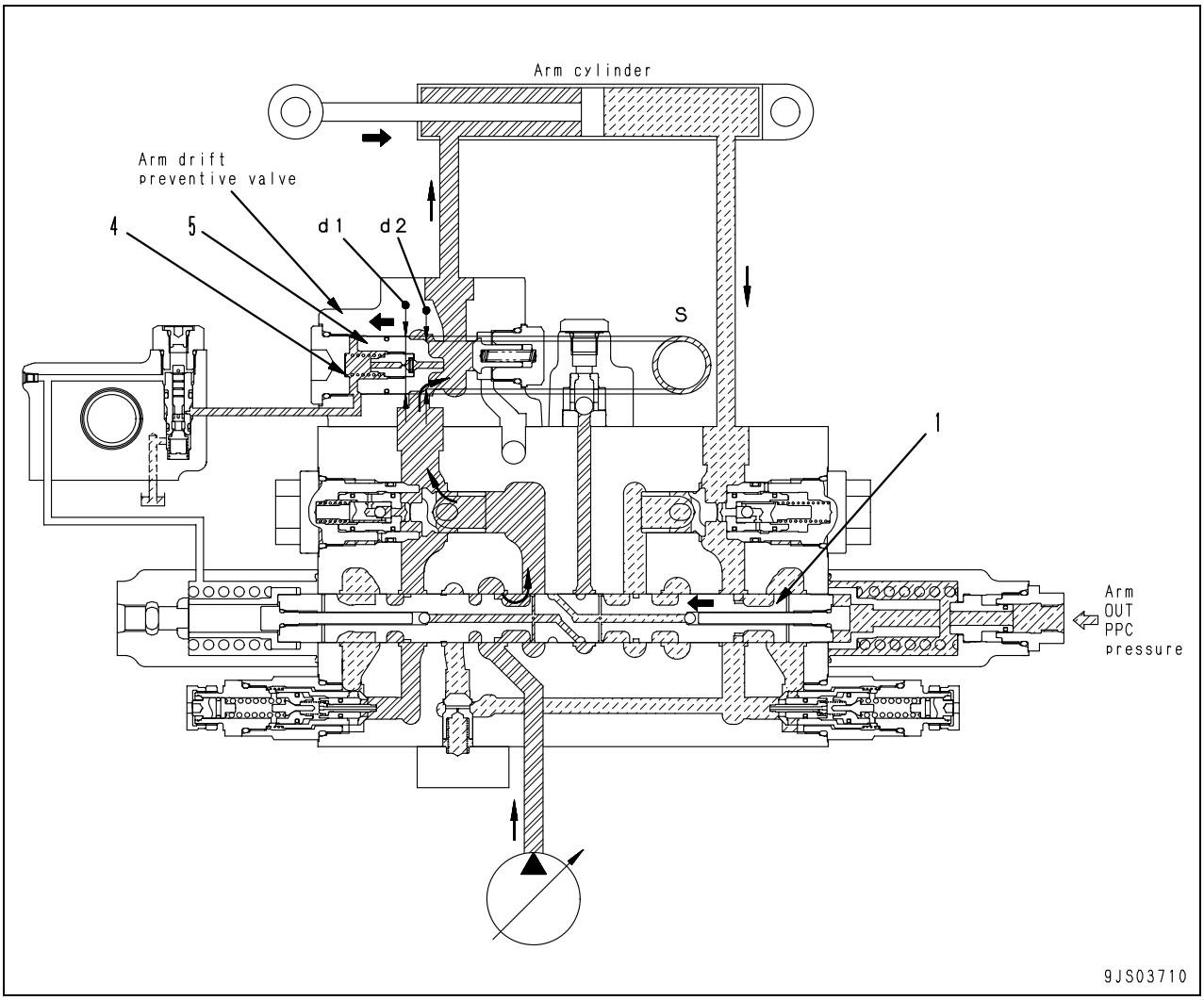


Operation

- When the boom is lowered, pilot pressure from the PPC valve presses pilot spool (2).
- Pressurized oil in chamber (b) inside the poppet is drained via orifice (c).
- Pressurized oil of the boom bottom flows to orifice (a) → chamber (b) → orifice (c) → drain (T), and the pressurized oil in chamber (b) lowers.
- As the pressure of chamber (b) lowers under the pressure of port (B), poppet (5) opens.
- Pressurized oil from port (B) is led to port (A) and then flows to the control valve.

Arm drift prevention valve
(if equipped)

1. When arm OUT



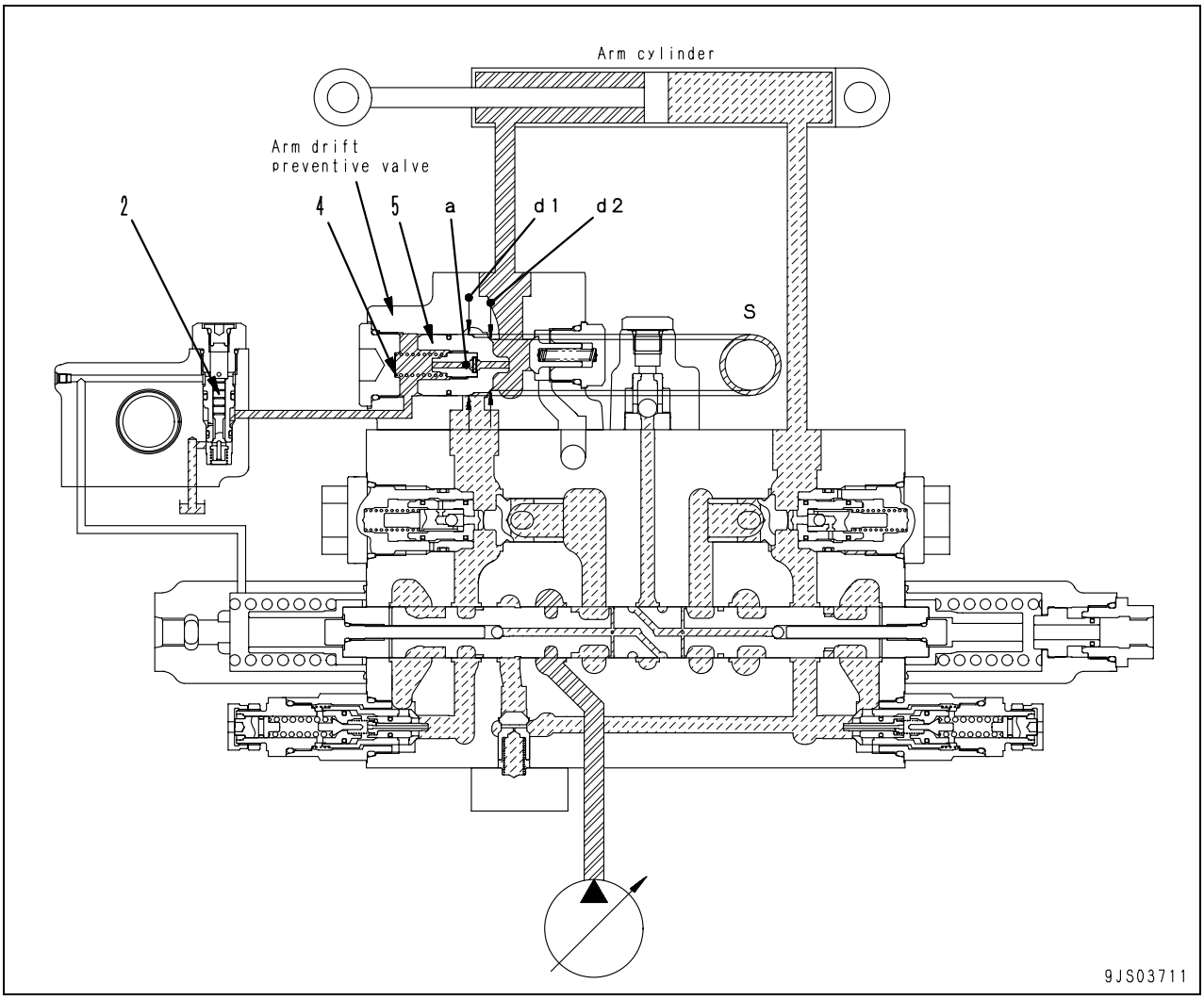
Function

- This valve prevents the oil in the arm head from leaking through spool (1) and the boom from lowering under its weight while the arm lever is not operated.

Operation

- When the arm OUT is operated, pressurized oil from the control valve works on the ring-shaped area (S)[= ϕ(d1) area – ϕ(d2) area] caused by the difference between the outside diameter (d1) of poppet (5) and the seat diameter (d2) to move it to the left.
- Contracts spring (4) and poppet (5) moves to the left.
- As a result, pressurized oil from the control valve passes through the opening of poppet (5) and flows to the arm cylinder head.

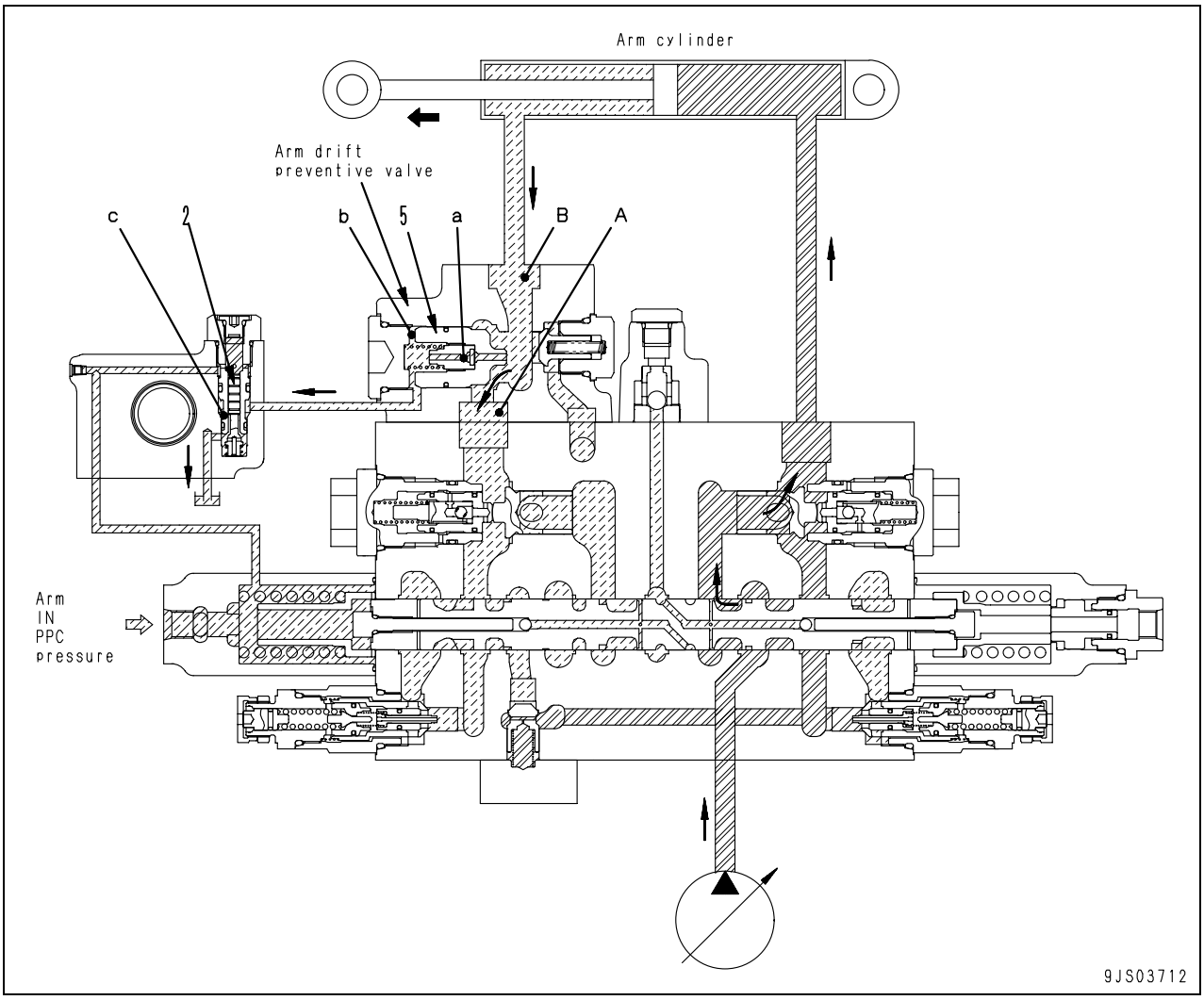
2. When the arm is in neutral



Operation

- Moves the lever to neutral with the arm dumped.
- Pressurized oil flown inside poppet (5) from orifice (a) of poppet (5) is closed by pilot piston (2).
- Pressurized oil from the control valve and the holding pressure of the arm cylinder head are shut off.
- The holding pressure of arm cylinder head works on ring-shaped area (S) caused by the difference between outside diameter (d1) of poppet (5) and seat diameter (d2) to move it to the right.
- The sum of this force and the force of spring (4) closes poppet (5).
- Pressurized oil from the control valve and the holding pressure of the arm cylinder head are shut off.

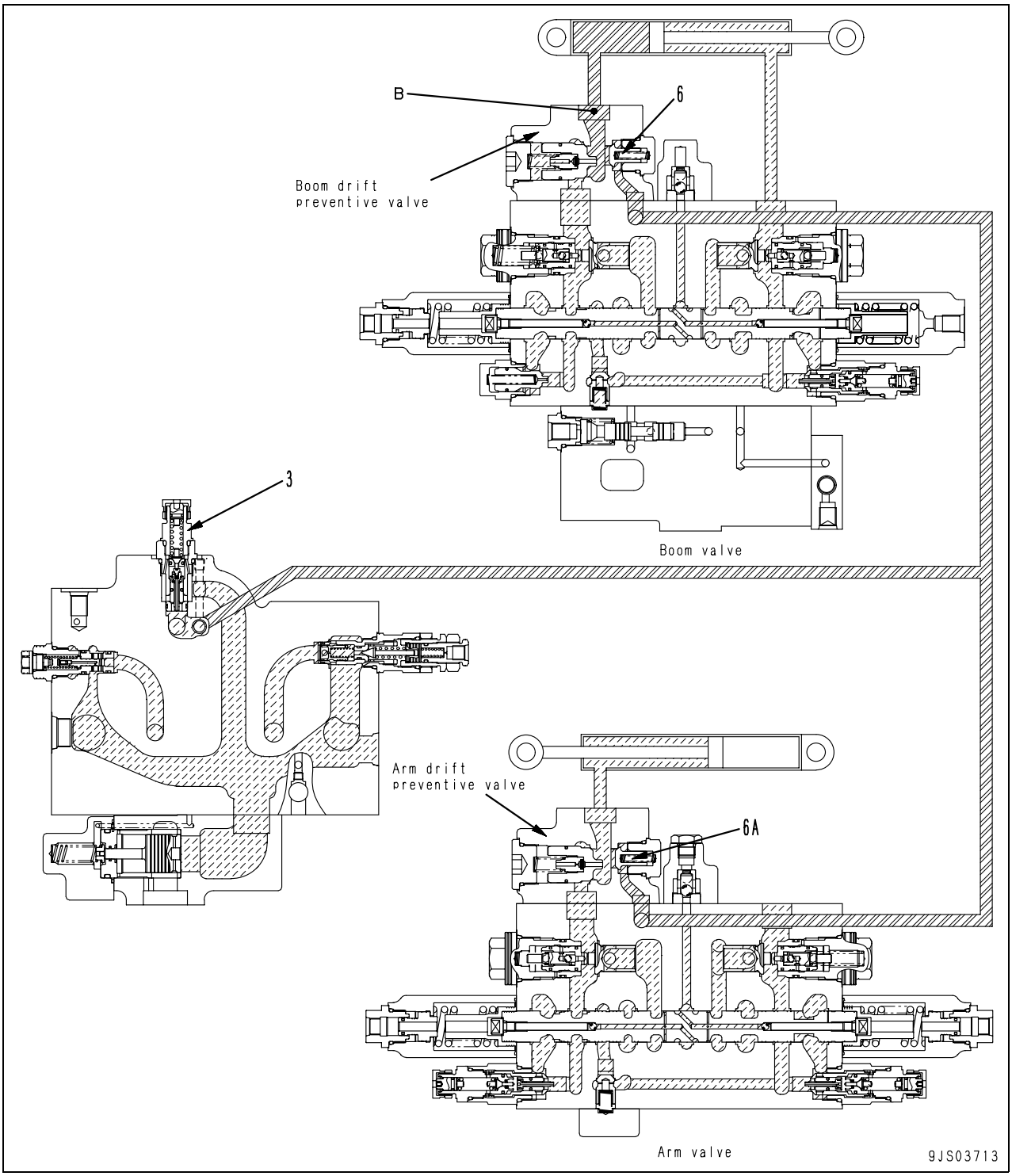
3. When arm IN



Operation

- When the arm IN is operated, pilot spool (2) is pushed under the pilot pressure from the PPC valve.
- Pressurized oil in chamber (b) inside the poppet is drained via orifice (c).
- Pressurized oil of the arm head flows to orifice (a) → chamber (b) → orifice (c) → drain (T), and the pressurized oil in chamber (b) lowers.
- As the pressure of chamber (b) lowers under the pressure of port (B), poppet (5) opens.
- Pressurized oil from port (B) is led to port (A) and then flows to the control valve.

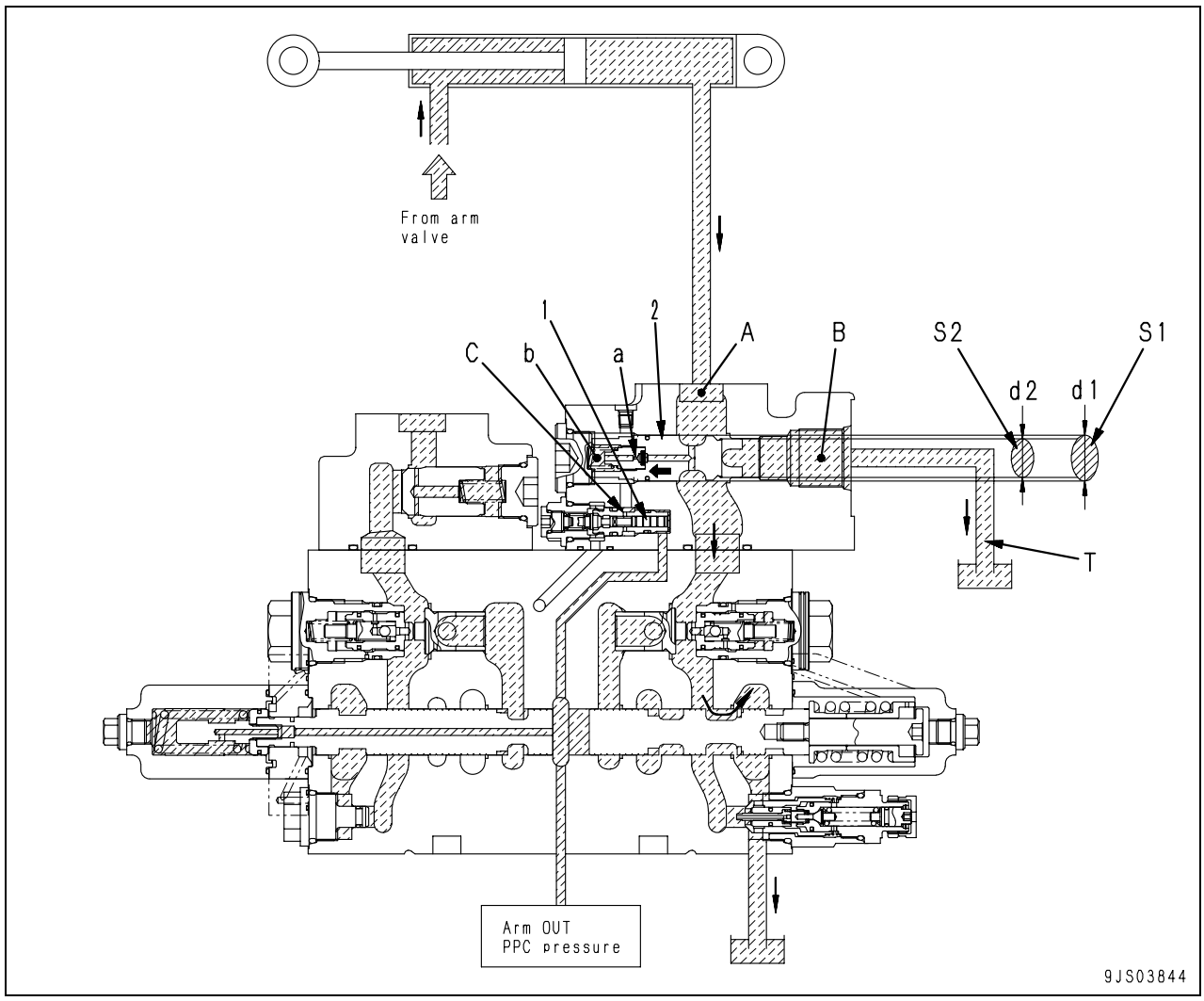
4. When abnormally high pressure is generated



- If abnormally high pressure is generated in the boom cylinder bottom circuit, the pressurized oil in port (B) pushes check valve (6) open, then safety valve (3) operates.
- If arm drift prevention valve (optional) is installed to the arm cylinder head circuit, the boom cylinder bottom circuit pressure force or arm cylinder head circuit pressure force, whichever having higher pressurized oil, pushes check valve (6) or (6A) open to actuate safety valve (3).

Quick return valve

1. When arm OUT



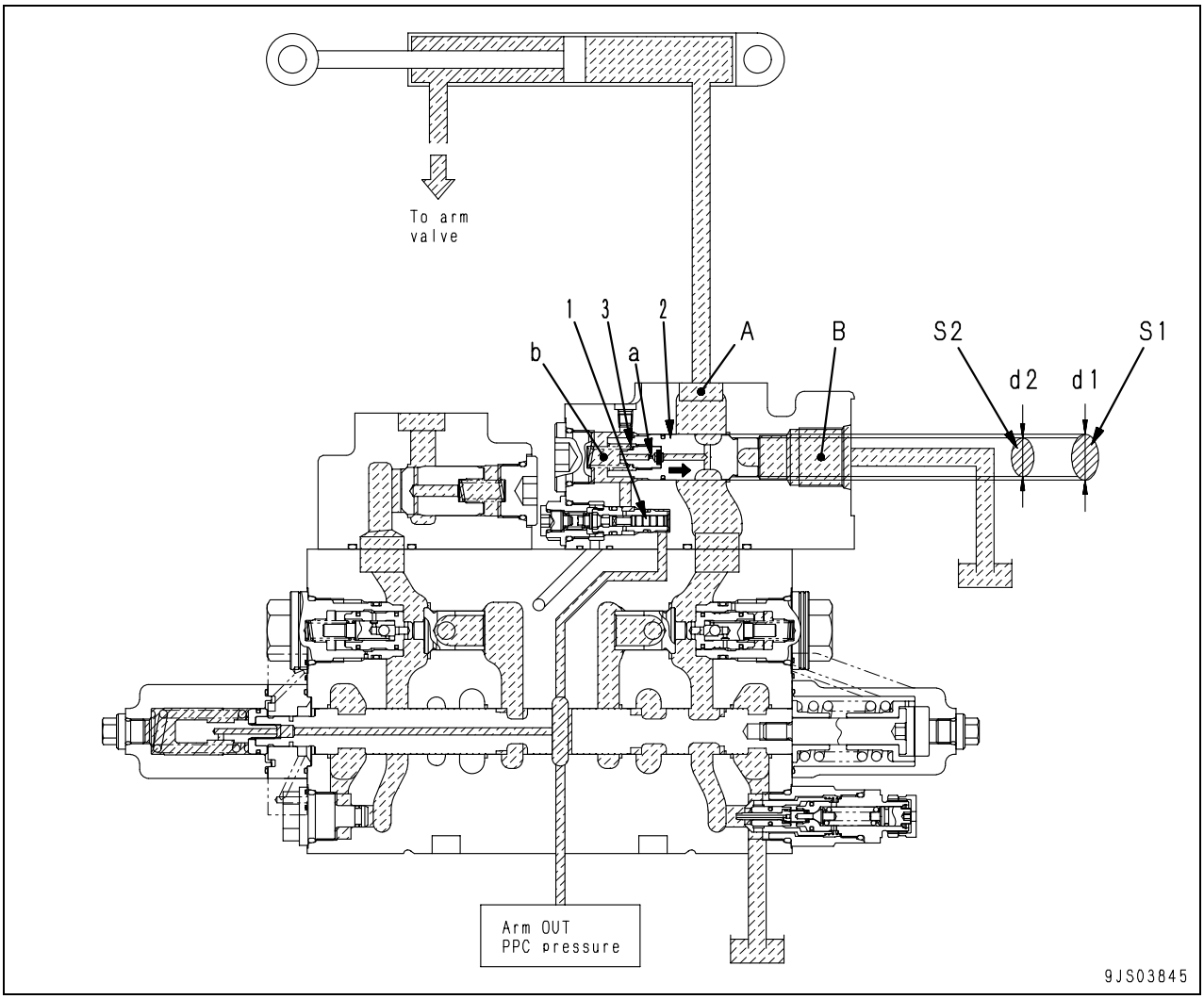
Function

- When arm OUT, large volume of oil returns from the cylinder bottom.
- Reduces this pressure loss.

Operation

- When the arm OUT is operated, pilot spool (1) is pushed under the pilot pressure from the PPC valve.
- Pressurized oil in chamber (b) inside the valve is drained via orifice (c).
- Pressurized oil of the arm bottom side flows to orifice (a) → chamber (b) → orifice (c) → drain (T), and the pressure in chamber (b) lowers.
- If the pressure of chamber (b) drops lower than that of port (A), pressure receiving force of the pressure receiving portion [ϕd2 area (S2) (seat diameter area)] on the side of port (A) increases by the sum of the pressure receiving force of pressure receiving portion[ϕd1 area (S1)] on the chamber (b) side of valve (2) and the spring force.
- Or (ϕd2 pressure receiving force > ϕd1 pressure receiving force + spring force)
- Valve (2) is pressed to the left and pressurized oil is led from port (A) to (B).
- From port (B), pressurized oil is drained directly to the tank.

2. When the arm is in neutral



Operation

- Returning the lever to neutral reduces the pilot pressure from the PPC valve to 0 kg/cm^2.
- The pressurized oil that has flowed and been drained through orifice (a) in valve (2) is closed by pilot piston (1).
- The holding pressure on the arm bottom side works on the difference between areas (S2) and (S1) of valve (2) to the right.
- Valve (2) is closed by the total of this force and the force of spring (3), so ports (A) and (B) are shut off.

Lift check valve

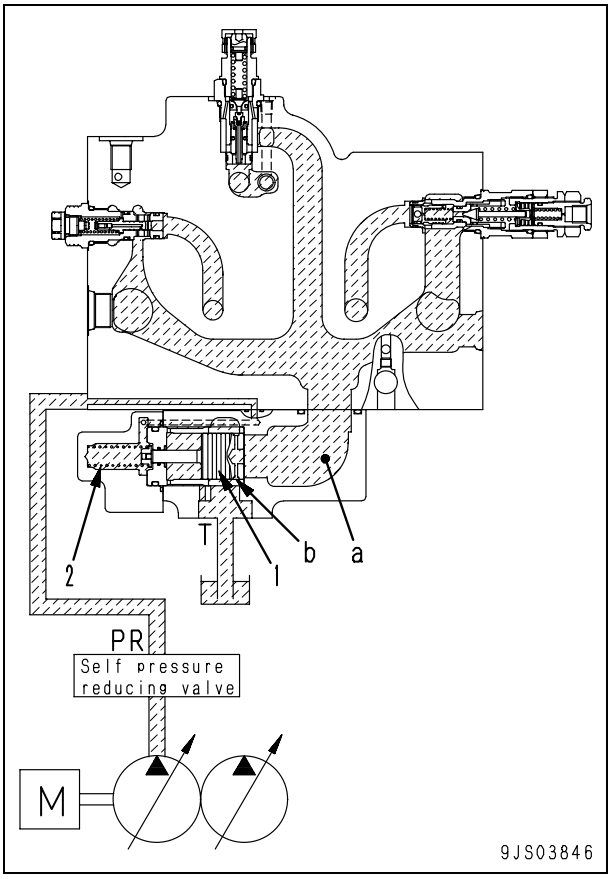
Function

- This valve applies back pressure to the drain circuit to prevent generation of negative pressure on each actuator (motors, cylinders, etc.).

Operation

1. While engine is stopped

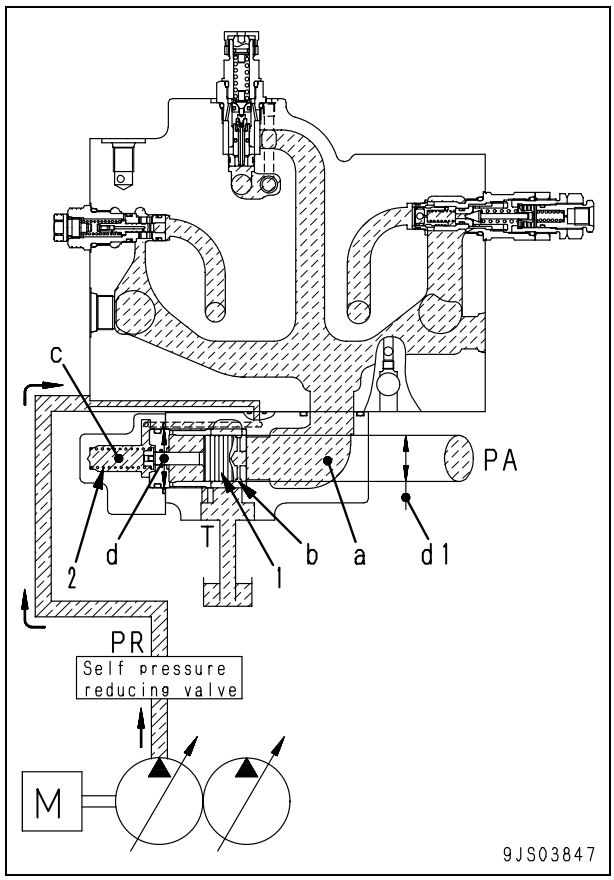
- Pressurized oil is not fed to the self pressure reducing valve from the pump, and valve (1) is pressed to the right by the force of spring (2).
- Drain circuit (a) of the control valve is connected with port (T) through orifice (b) of valve (1).



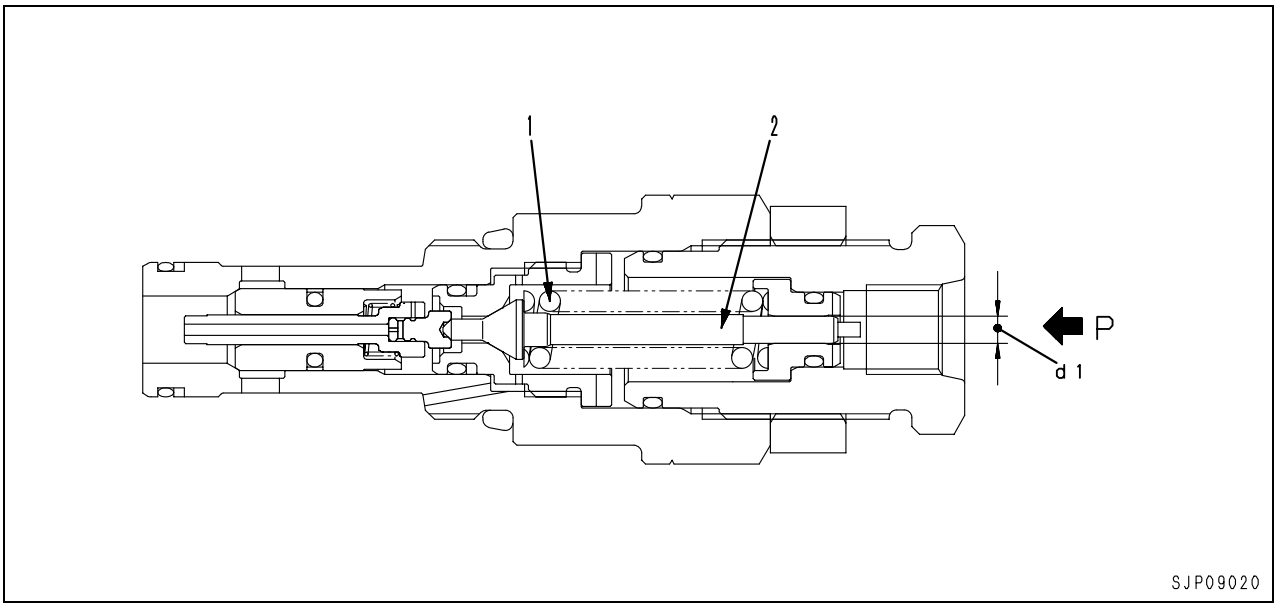
2. While engine is running

- Output pressure (PR) of the self pressure reducing valve is applied via the control valve to spring chamber (c) of back pressure valve (3).
- Output pressure (PR) applied to spring chamber (c) is applied to the left end of valve (1) (area of ϕd) to push valve (1) to the right.
- At this time, pressure (PA) of drain circuit (a) of the control valve is applied to the right end of valve (1) (area of ϕd1) to push valve (1) to the left.
- Valve (1) strikes balance to make the back pressure equal to (PA) in the equation below.

$$PA = \frac{(\text{Area of } \phi d) \times PR + \text{force of spring (2)}}{\text{Area of } \phi d1}$$



Main relief valve



1. Spring
2. Poppet

Function

- Set pressure of the relief valve is in two stages.
- When power is needed, pilot pressure (P) is turned ON and the set pressure becomes higher.

Operation

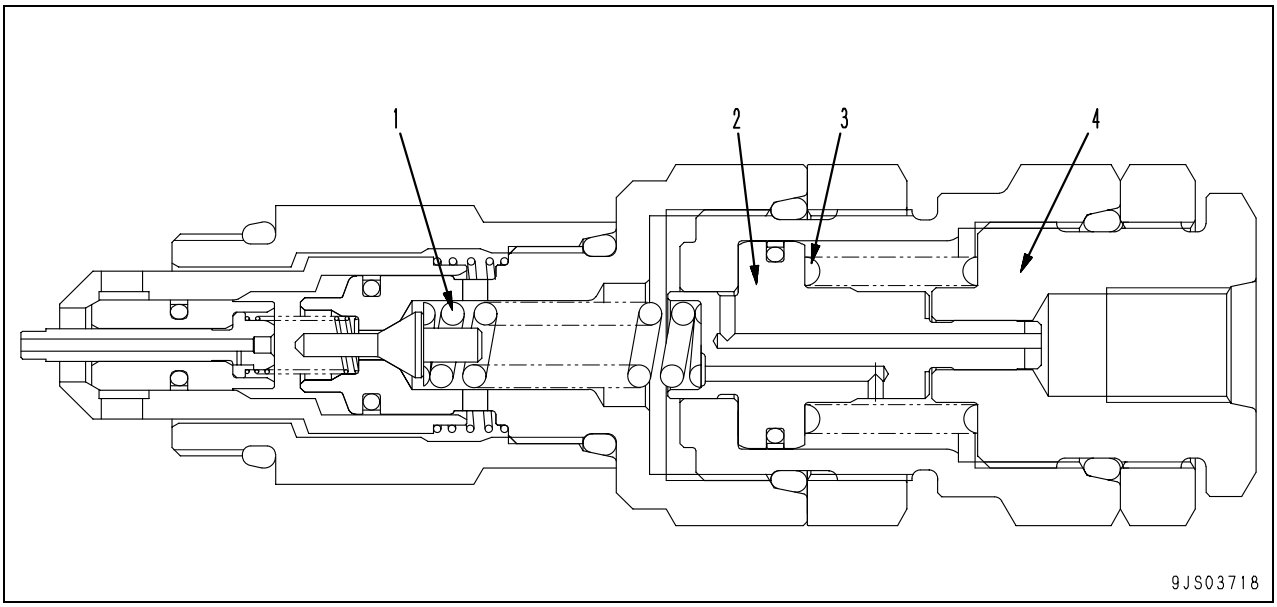
- The set pressure of relief valve is determined by spring (1) installed load. (1st stage)
- Respective setting is not required for both the 1st and 2nd stages. Setting the 1st stage completes the setting of the 2nd stage.

1. **If pilot pressure (P) is OFF: Low-pressure setting**
   Set pressure is determined by spring (1) installed load.

2. **If pilot pressure (P) is ON: High-pressure setting**
   Spring (1) installed load is added with pilot pressure (P) applied to the area of poppet diameter (d1), raising the set pressure to higher level.

2-stage safety-suction valve

[Installed to port (B) on the boom cylinder head side and port (B) of the service valve]



1. Spring
2. Piston
3. Spring
4. Holder

Function

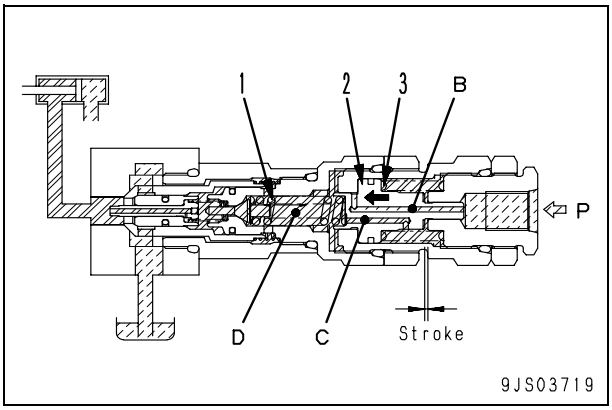
- Enables to provide the safety valve set pressure in two stages, and make the low-pressure setting smaller.
- Enables to relieve a load without lever operation if high load is applied to the cylinder.
- Improves work efficiency and reduces machine body vibration.

Operation

- The safety set pressure is determined by spring (1) installed load.

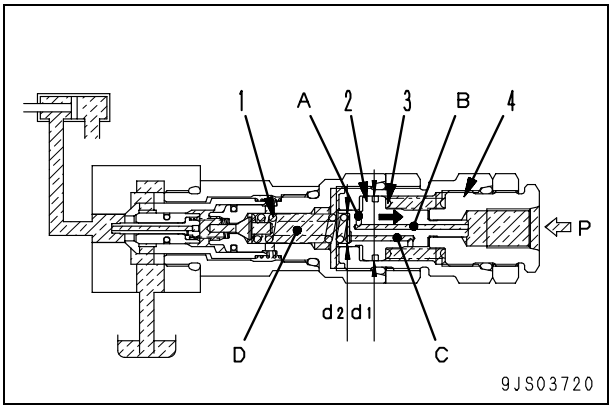
1. If pilot pressure is OFF (high-pressure setting)

- Since pilot pressure (P) is OFF, piston (2) is pressed to the left by spring (3). [Spring (1) installed load < spring (3) installed load]
- Spring (1) installed load becomes maximum and the set pressure rises.
- Passage (B) is interconnected to the drain circuit via passage (C) and chamber (D).



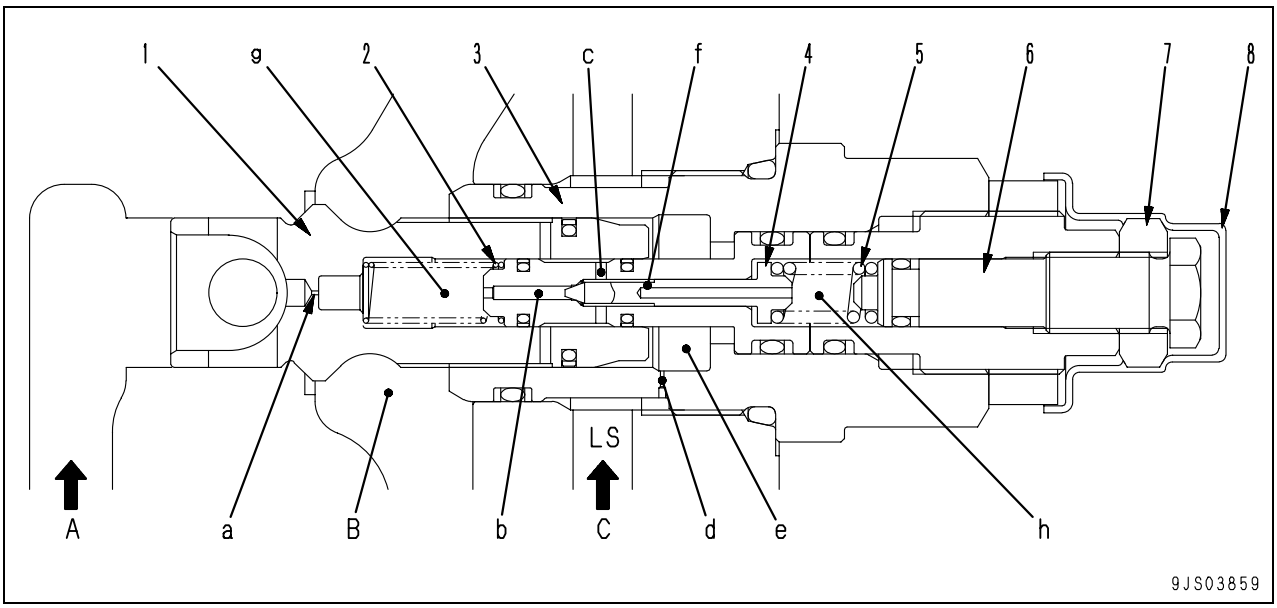
2. If pilot pressure is ON (low-pressure setting)

- If the pilot pressure (P) is ON, the pilot pressure is led to section (A) via passage (B).
- Piston (2) works on the pressure-receiving bore portion [(d2) – (d1)] of section A.
- This pilot pressure contracts spring (3), and piston (2) moves to the right until making contact with holder (4).
- Spring (1) stretches, installed load is reduced, and the set pressure lowers.
- Pressurized oil proportionate to the piston stroke is drained via passage (C) and chamber (D).



Variable pressure compensation valve

(Installed to the service valve)



A. Pump discharge pressure (P) (From service valve spool)
B. Cylinder port
C. Load pressure of other work equipment

1. Valve
2. Spring
3. Sleeve
4. Poppet
5. Spring
6. Screw
7. Locknut
8. Cap

Function

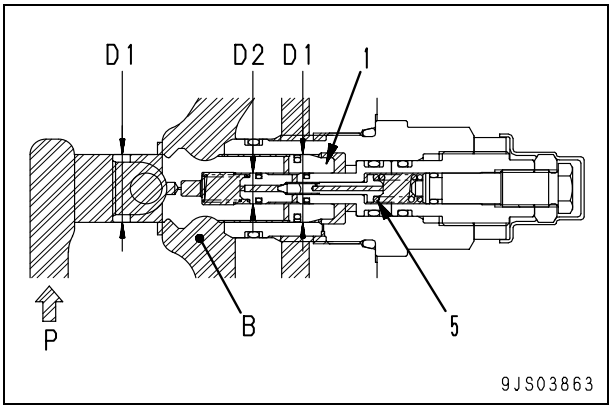
- Regulates flow distribution to the service valve when the service valve (attachment) and the work equipment valve (boom raising, etc.) are operated together. (Equivalent surface area ratio variable)
- Pressurized oil from the service valve spool is applied to the left side of valve (1) and is led to chamber (g) via orifice (a).
- LS pressure is led to chamber (e) via orifice (d).
- Pressurized oil of cylinder port is led to chamber (h) via passage (c) and orifice (f).
- The force of spring (2) acts on valve (1), and the force of spring (5) acts on poppet (4).
- The force of spring (5) can be adjusted with screw (6).

Operation when jointly operated with a high-load work equipment (such as the boom raising)

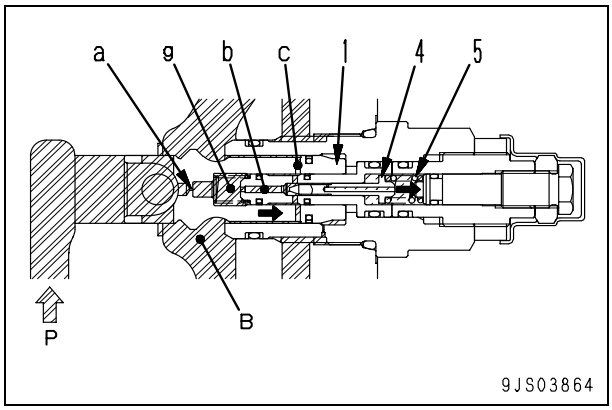
- Both of the pump discharge pressure (P) and LS pressures are determined by other equipment's pressure, while cylinder port pressure causes the attachment to operate.
- If the difference between the pump discharge pressure (P) and cylinder pressure is smaller than the force of spring (5), the balance of forces applying to valve (1) may be expressed with the following equation:

  $P \times A1 = P \times A2 + LS(A2 - 1) + F$

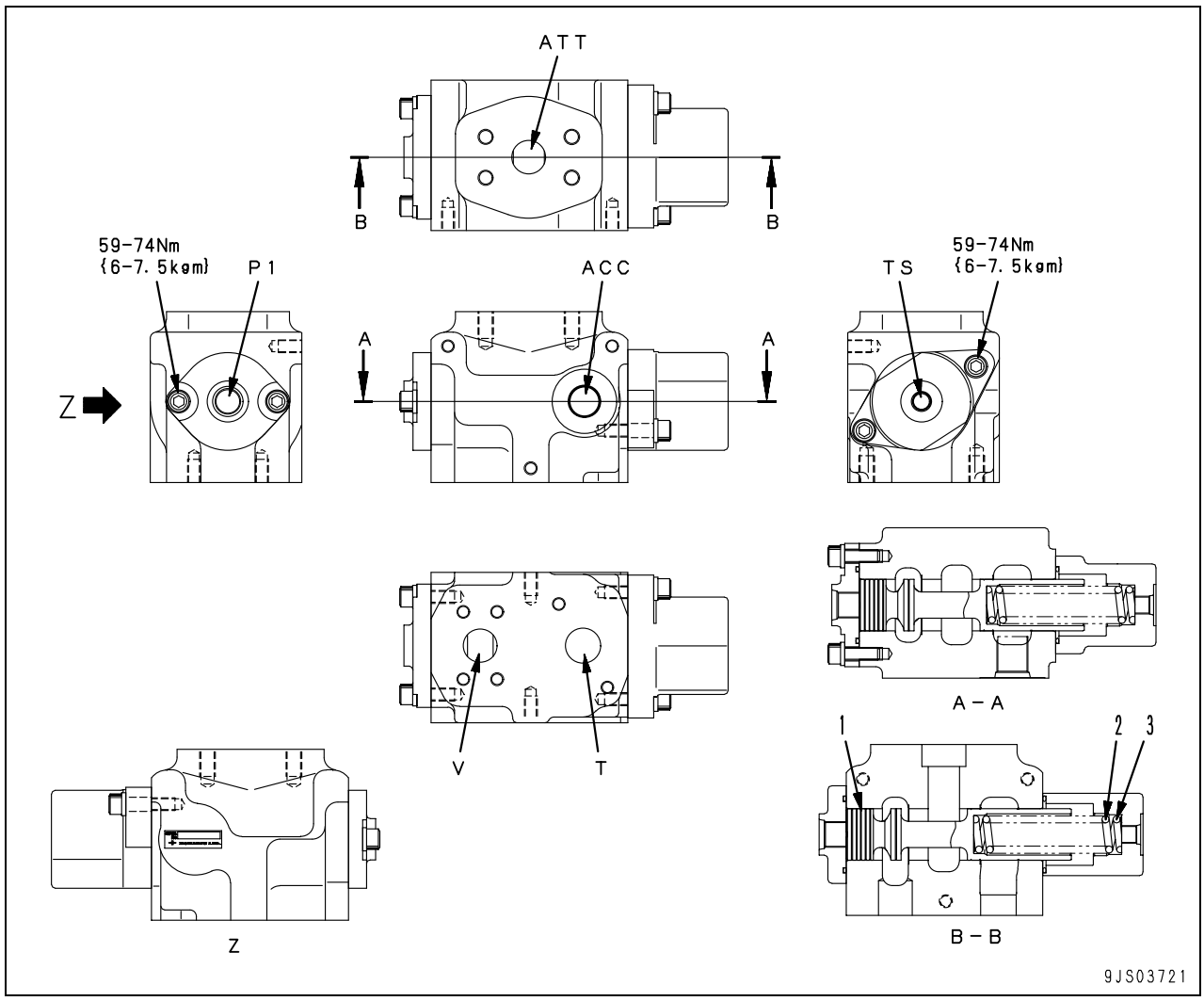
  A1: Area of ϕD1
  A2: Area of ϕD2
  F: Force of spring
  P: Pump discharge oil pressure



- If the difference between the pump discharge pressure (P) and cylinder port pressure (B) is larger than the force of spring (5), poppet (4) is pressed to the right.
- Pump discharge pressure (P) flows to orifice (a) and chamber (g) and is interconnected to cylinder port via passages (b) and (c).
- Differential pressure is generated between the upstream and downstream of orifice (a), which reduces the pressure force in chamber (g).
- Force that presses valve (1) to the left is reduced.
- A state is reached where the area ratio has become smaller.
- Valve (1) moves to the right, and the flow increases from the pump to the cylinder.



Attachment circuit selector valve



ACC: To accumulator
ATT: To attachment
P1: From attachment selector solenoid valve
T: To hydraulic oil tank
TS: To hydraulic oil tank
V: To control valve

1. Spool
2. Spring

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
3	Spool return spring	Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring.
		132 x 29	114.5	834 N {85.0 kg}	—	667 N {68.0 kg}	

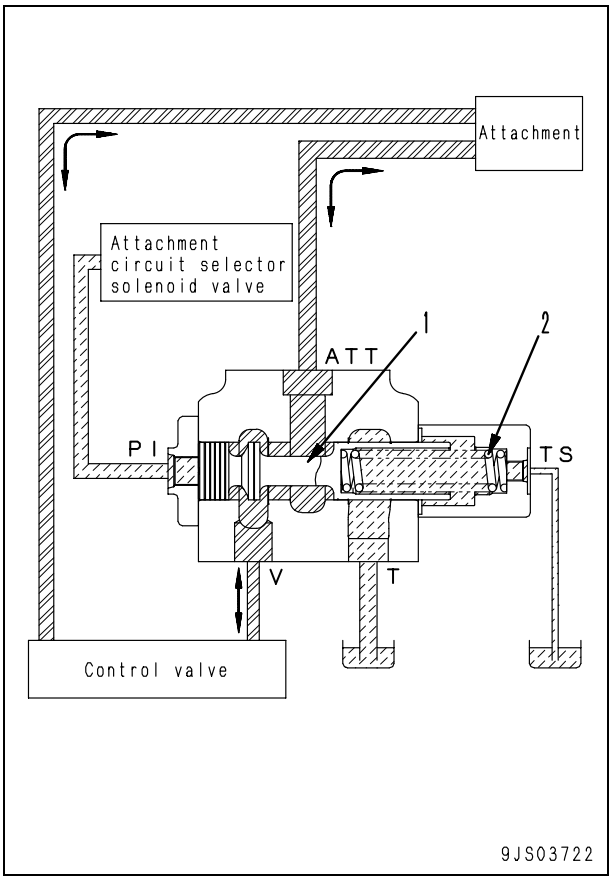
Function

- When a breaker is installed, the return oil from the breaker does not pass through the main valve, but returns directly to the hydraulic tank.
- When other attachments (crusher, etc.) are installed, the attachment and the main valve are interconnected.

Operation

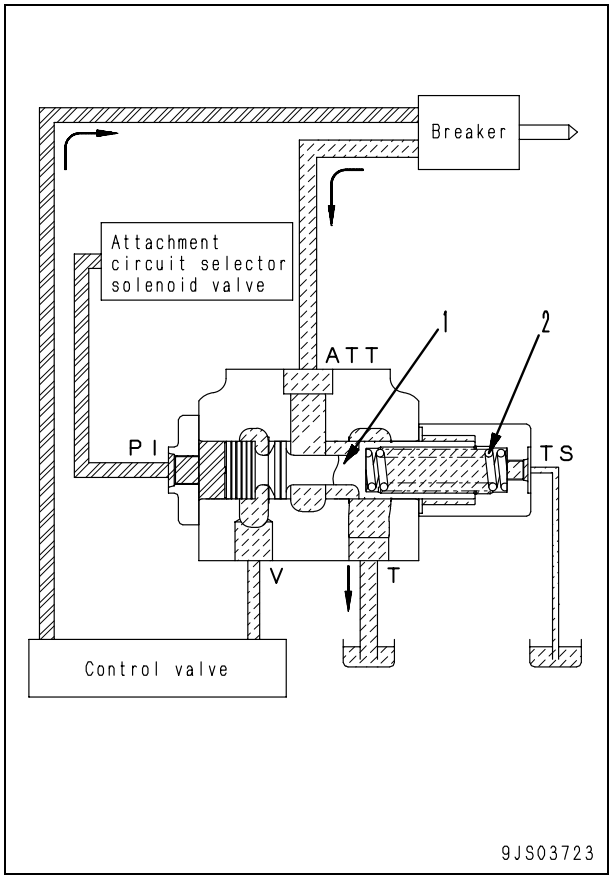
1. When attachment other than breaker is installed

- Spool (1) is pressed to the left by the force of spring (2).
- Ports (ATT) and (V) are interconnected and ports (ATT) and (T) are shut off. Attachment is thus interconnected to the control valve.



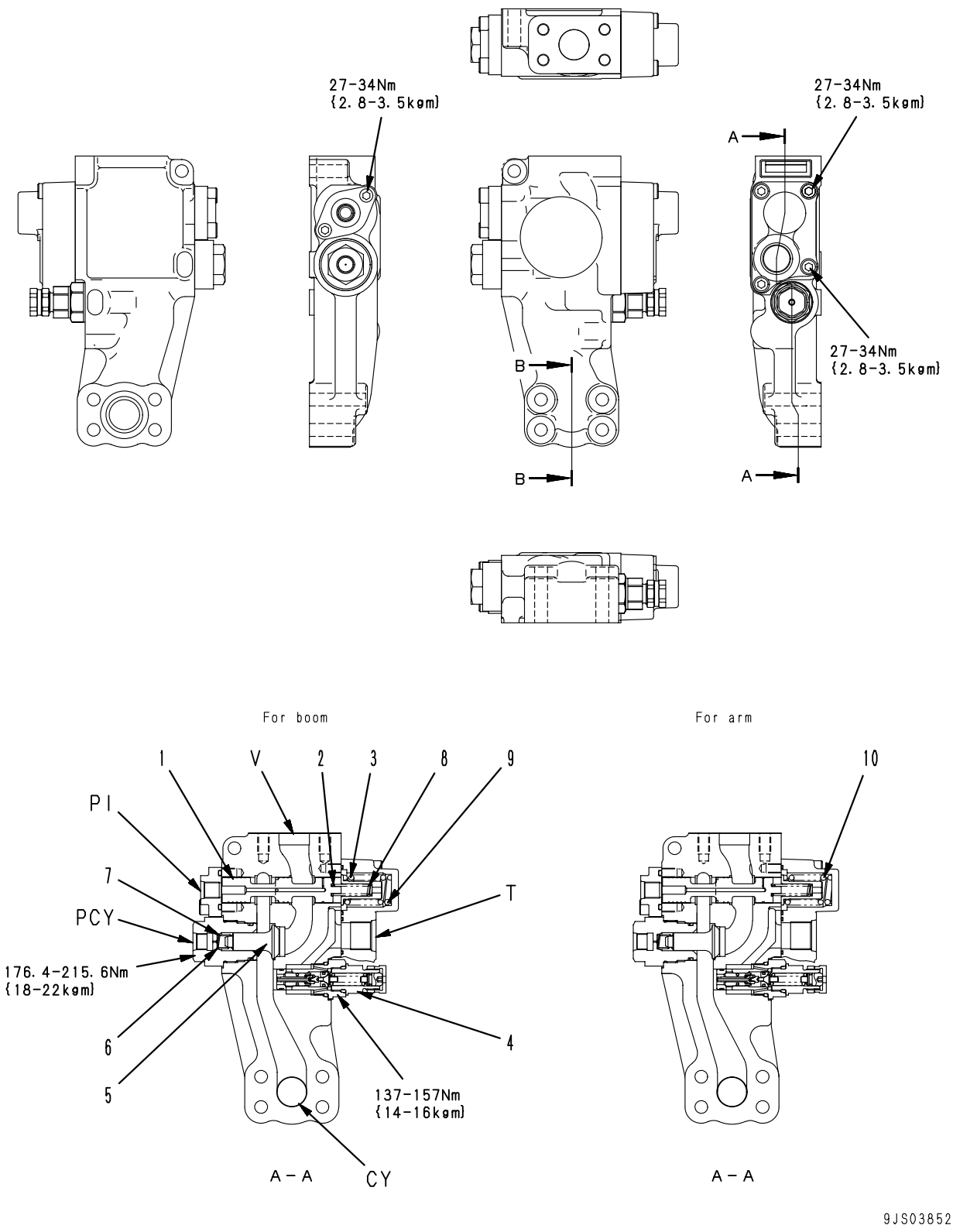
2. When breaker is installed

- Pilot pressure from the attachment circuit selector solenoid valve contracts spring (2), and spool (1) moves to the right to the stroke end.
- Ports (ATT) and (V) are shut off and ports (ATT) and (T) are interconnected.
- Pressurized oil returning from the breaker returns directly to the hydraulic tank via port (T) without passing through the control valve.



Hydraulic drift prevention valve

(For the boom and arm)



CY: To work equipment cylinder
PCY: For pressure pickup port and equalizer circuit
PI: From PPC valve
T: To tank
V: From control valve

1. Pilot spool
2. Spring (1st stage spool)
3. Spring (2nd stage spool)
4. Safety valve
5. Check valve
6. Spring

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
7	Check valve spring	Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring.
		20.8 x 12.2	13.5	12.7 N {1.3 kg}	—	10.2 N {1.04 kg}	
8	Spool return spring	41.1 x 9.6	35.0	58.8 N {6.0 kg}	—	47.1 N {4.8 kg}	
9	Spool return spring	41.9 x 25.8	41.0	78.5 N {8.0 kg}	—	62.8 N {6.4 kg}	
10	Spool return spring	44.6 x 25.6	41.0	181 N {18.5 kg}	—	145 N {14.8 kg}	

Function

- Prevents the pressurized oil from reversing from the work equipment cylinder and the latter from a sudden drop if the piping bursts between the control valve and the work equipment cylinder.

Operation

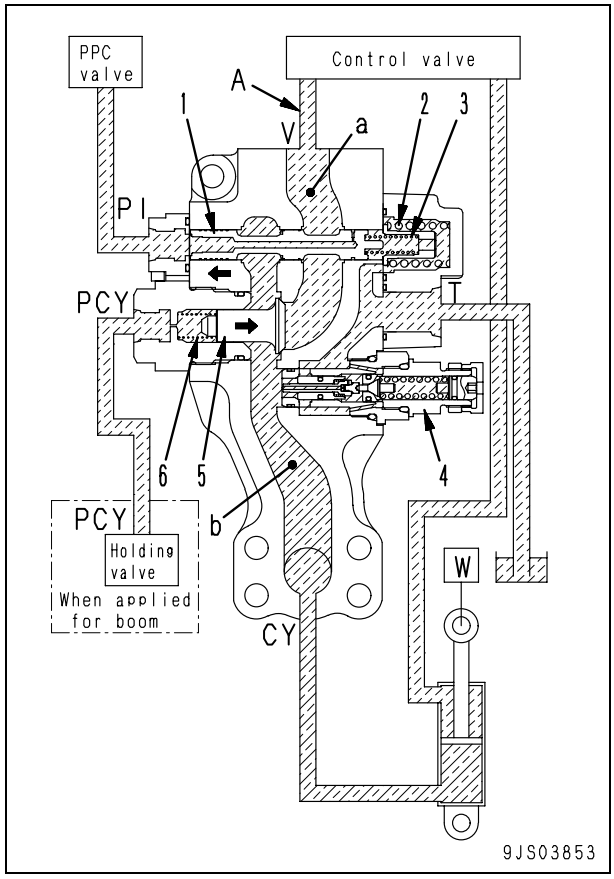
1. When the work equipment lever is in neutral

When the piping is free of burst

- Check valve (5) is closed under the holding pressure of the cylinder led from port (CY) to chamber (b).
- Pilot pressure led to port (PI) from the PPC valve when in neutral is 0 MPa {0 kg/cm^2}.
- Spool (1) is pressed to the left by the force of springs (2) and (3)
- Chambers (a) and (b) are shut off.
- No pressurized oil flows between the control valve and the work equipment cylinder.
- Accordingly, the work equipment is held in position.
- If the work equipment cylinder has abnormally high pressure, safety valve (4) is actuated by the holding pressure of the work equipment cylinder.
- Chambers (b) of L.H. and R.H. hydraulic drift prevention valve for the boom are interconnected by port (PCY).
- Chambers (b) will have the same pressure if the L.H. and R.H. hydraulic drift prevention valves have a difference in leakage.

If the piping is bursted

- If piping (A) bursts between the control valve and the work equipment cylinder, chambers (a) and (b) are shut off same as when the piping has no burst.
- Pressure for the work equipment cylinder is held to prevent a sudden drop of the work equipment.



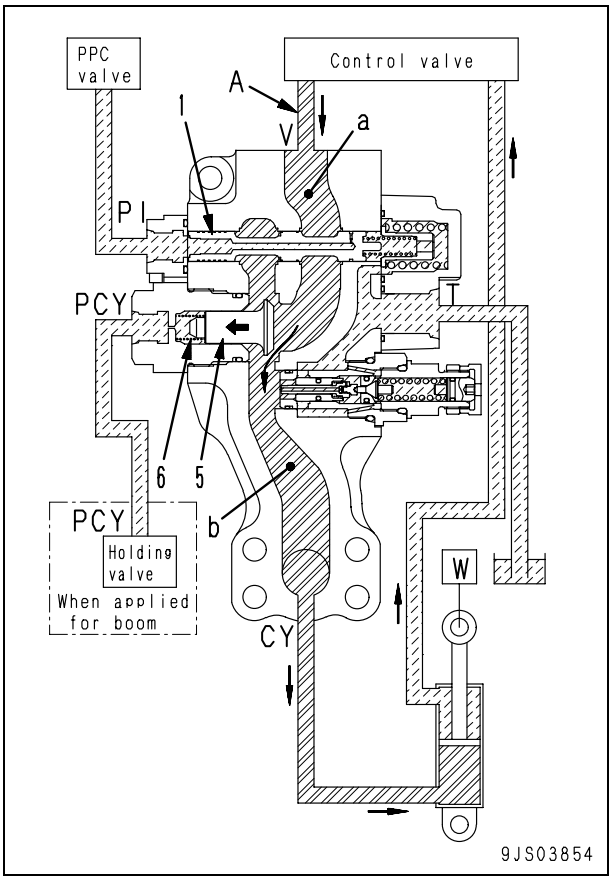
2. When pressurized oil flows from the main valve to the cylinder

When the piping is free of burst

- Pressurized oil led to chamber (a) from the control valve becomes higher than the combined force of pressure from work equipment cylinder circuit chamber (b) and spring (6).
- Check valve (5) opens and chambers (a) and (b) are interconnected.
- Pressurized oil flows from the control valve to the work equipment cylinder.

If the piping is bursted

- If piping (A) bursts between the control valve and the work equipment cylinder, pressurized oil in chamber (a) flows outside from the bursted portion.
- Pressure force in chamber (a) drops.
- Pressure force in chamber (a) drops lower than the combined pressure force of chamber (b) and spring (6).
- Check valve (5) closes and chambers (a) and (b) are cut off.
- Pressure for the work equipment cylinder is held to prevent a sudden drop of the work equipment.



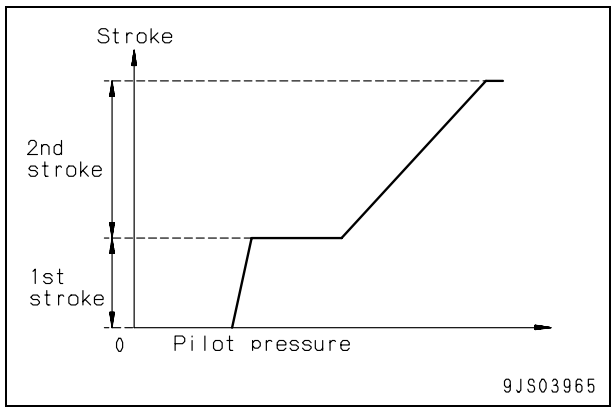
3. When returning pressurized oil to the main valve from the work equipment cylinder

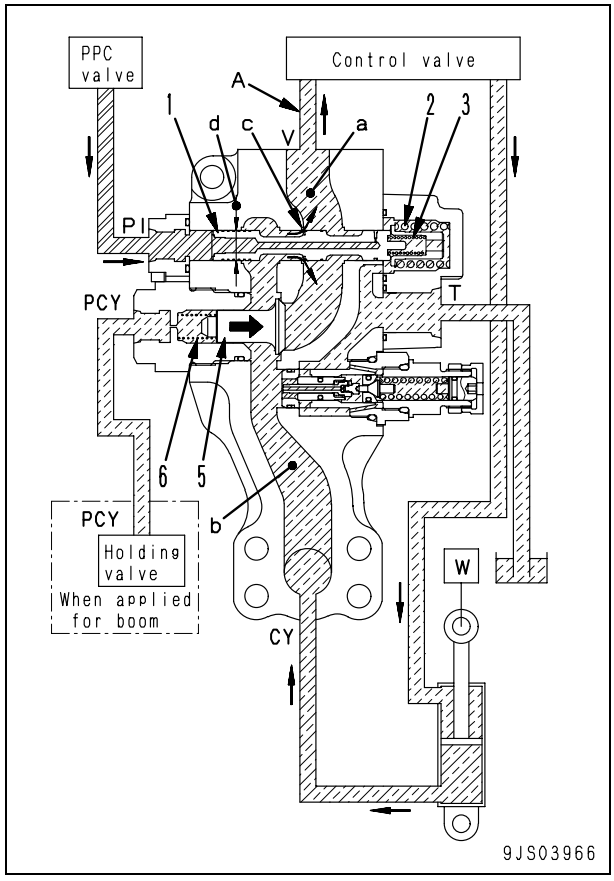
When the piping is free of burst

- Holding pressure of the work equipment cylinder is led to chamber (b) and check valve (5) closes.
- Pilot pressure from the PPC valve is led to port (PI) and reaches [Pilot Pressure > Force of Spring (3)] (area of d).
- Spool (1) moves to the right to the standby position. (1st stage stroke)
- At this point, chambers (a) and (b) are not interconnected.
- Pilot pressure further rises, and reaches [Pilot pressure > Force of spring (2)] (area of d).
- Spool (1) moves further to the right, and chambers (a) and (b) are interconnected. (2nd stage stroke)
- Pressurized oil returns to the control valve from the work equipment cylinder.

If the piping is bursted

- If piping (A) bursts between the control valve and the work equipment cylinder.
- Pressurized oil in chamber (a) flows out to the bursted portion but resupplied from chamber (b).
- Since pressurized oil flows via opening (c) of spool (1), a sudden drop of the cylinder is prevented.





PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN01994-00

HYDRAULIC EXCAVATOR

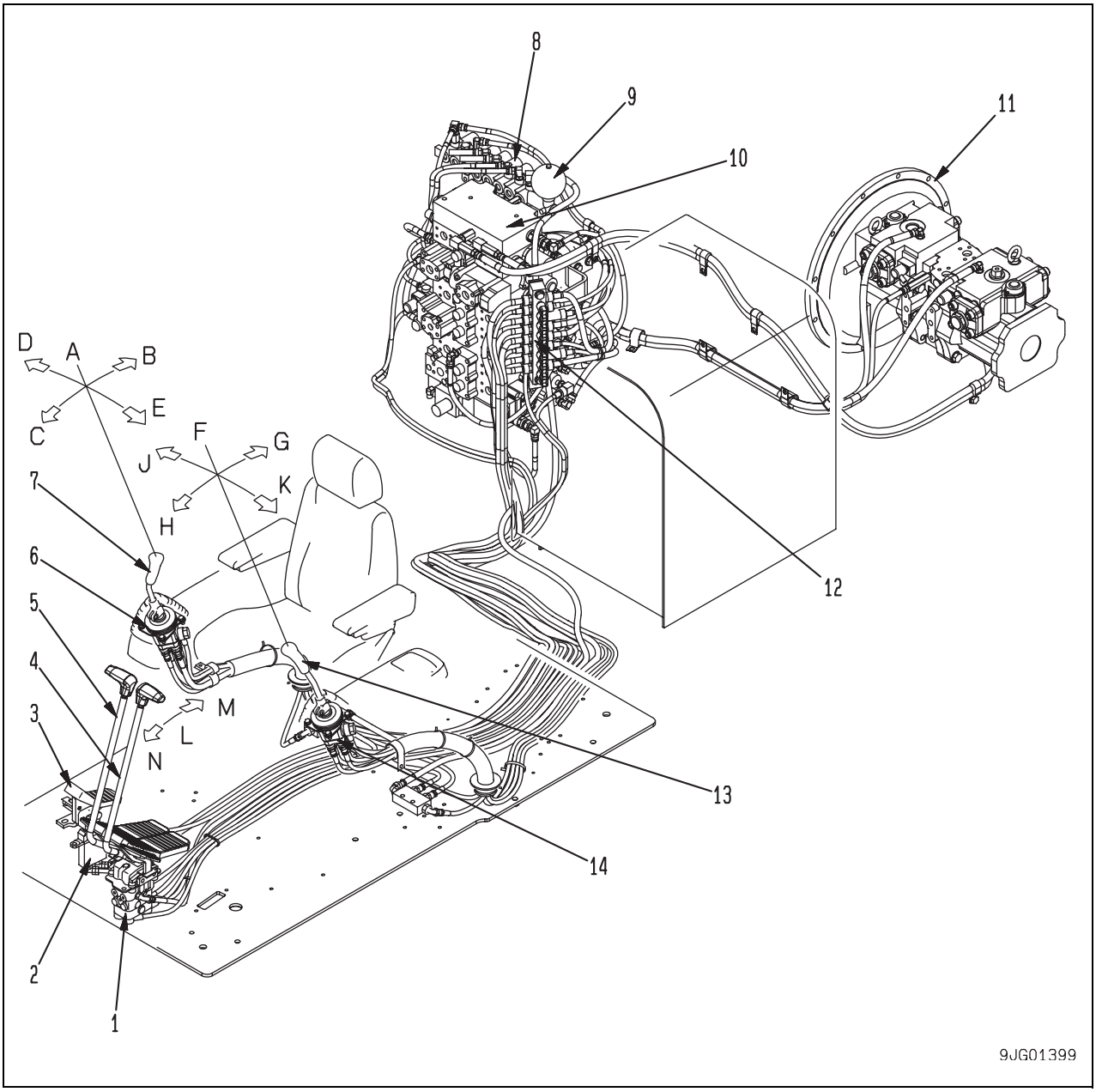
PC300-8
PC300LC-8
PC350-8
PC350LC-8

Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

10 Structure, function and maintenance standard

Hydraulic system, Part 3

Valve control



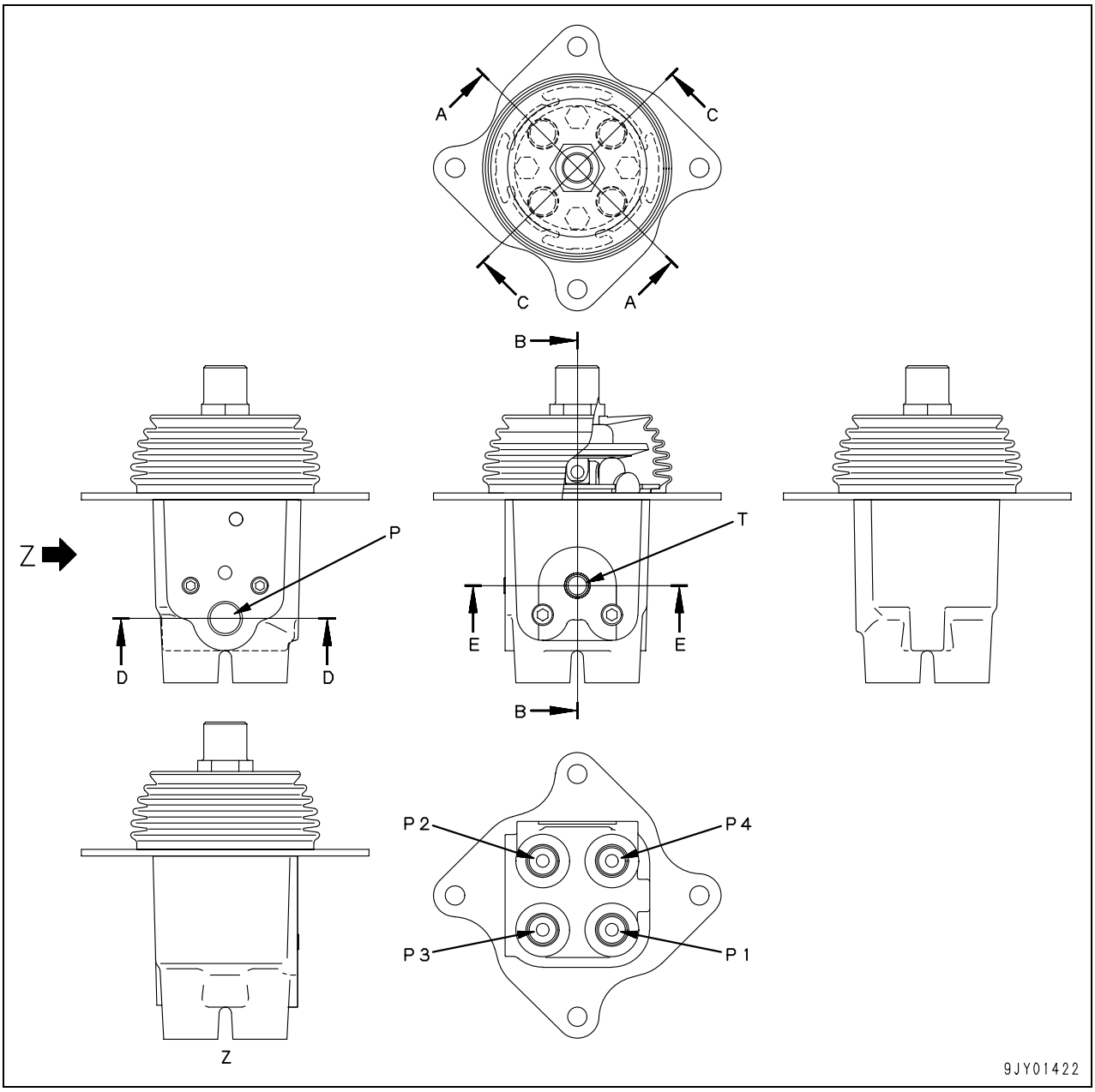
1. Travel PPC valve
2. Service PPC valve
3. Service pedal
4. L.H. travel lever
5. R.H travel lever
6. R.H. PPC valve
7. R.H. work equipment control lever
8. Solenoid block
9. Accumulator
10. Control valve
11. Hydraulic pump
12. Junction box
13. L.H. work equipment control lever
14. L.H. PPC valve

Lever positions

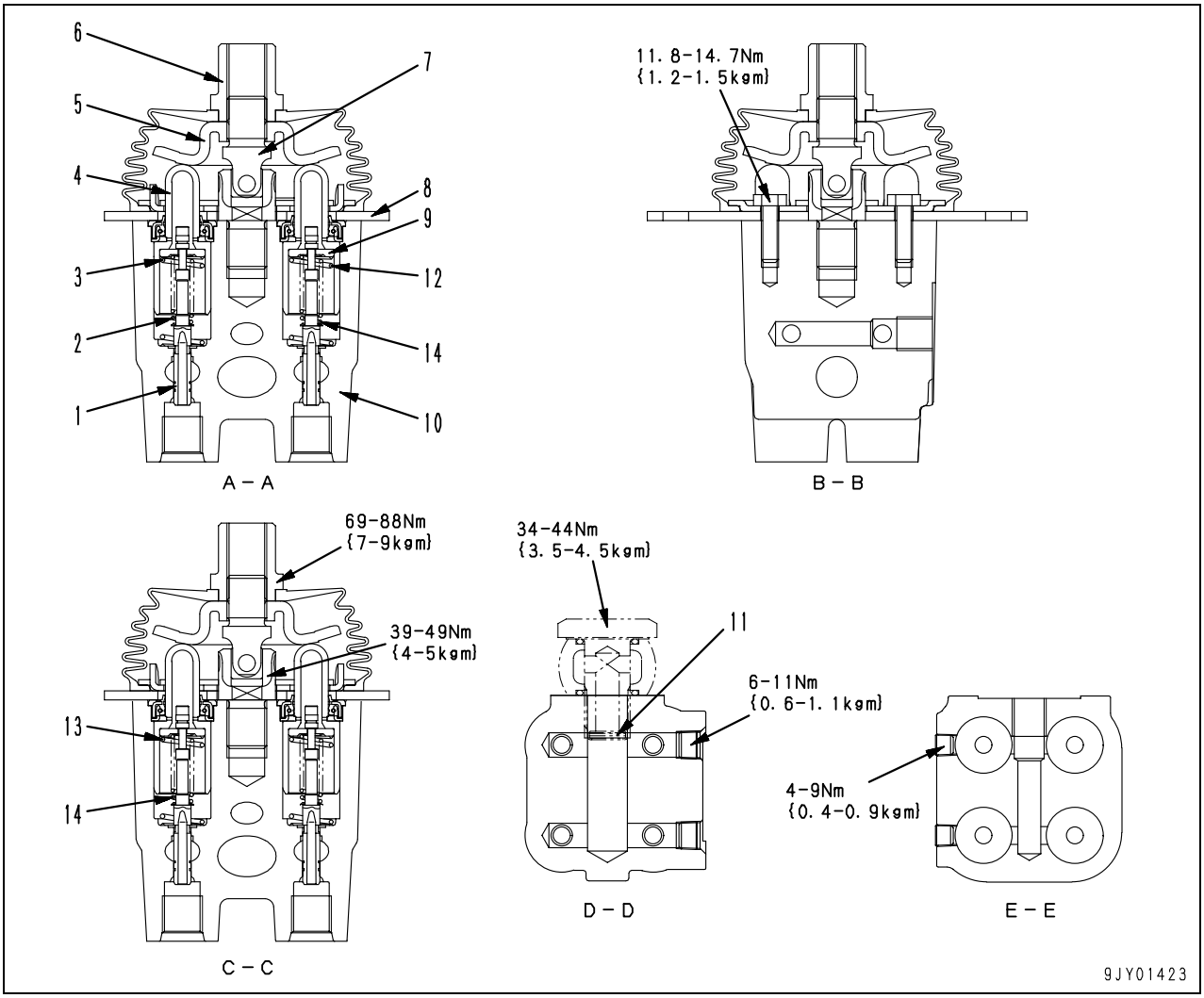
A. Hold
B. Boom (RAISE)
C. Boom (LOWER)
D. Bucket (DUMP)
E. Bucket (CURL)
F. Hold
G. Arm (IN)
H. Arm (OUT)
J. Swing (RIGHT)
K. Swing (LEFT)
L. Neutral
M. Travel (REVERSE)
N. Travel (FORWARD)

PPC valve

Work equipment and swing PPC valve



P: From self pressure reducing valve
P1: L.H. PPC: Arm out/R.H. PPC: Boom lower
P2: L.H. PPC: Arm in/R.H. PPC: Boom raise
P3: L.H. PPC: Swing left/R.H. PPC: Bucket curl
P4: L.H. PPC: Swing right/R.H. PPC: Bucket dump
T: To tank



1. Spool
2. Metering spring
3. Centering spring
4. Piston
5. Disc
6. Nut (for lever connection)
7. Joint
8. Plate
9. Retainer
10. Body
11. Filter

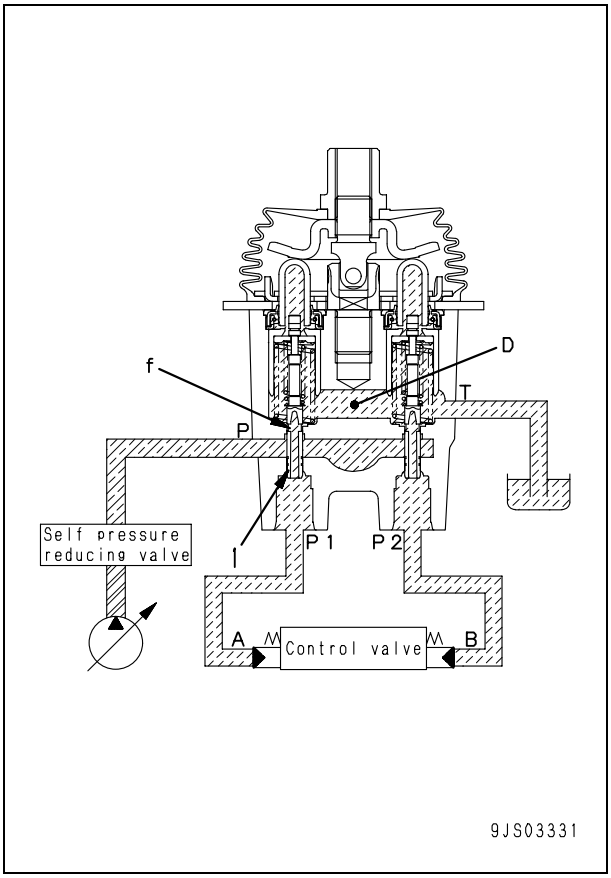
Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
12	Centering spring (for ports P3 and P4)	Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring.
		42.5 x 15.5	34.0	17.7 N {1.80 kg}	—	13.7 N {1.40 kg}	
13	Centering spring (for ports P1 and P2)	44.5 x 15.5	34.0	29.4 N {3.0 kg}	—	23.5 N {2.40 kg}	
14	Metering spring	26.5 x 8.15	24.9	16.7 N {1.70 kg}	—	13.7 N {1.40 kg}	

Operation

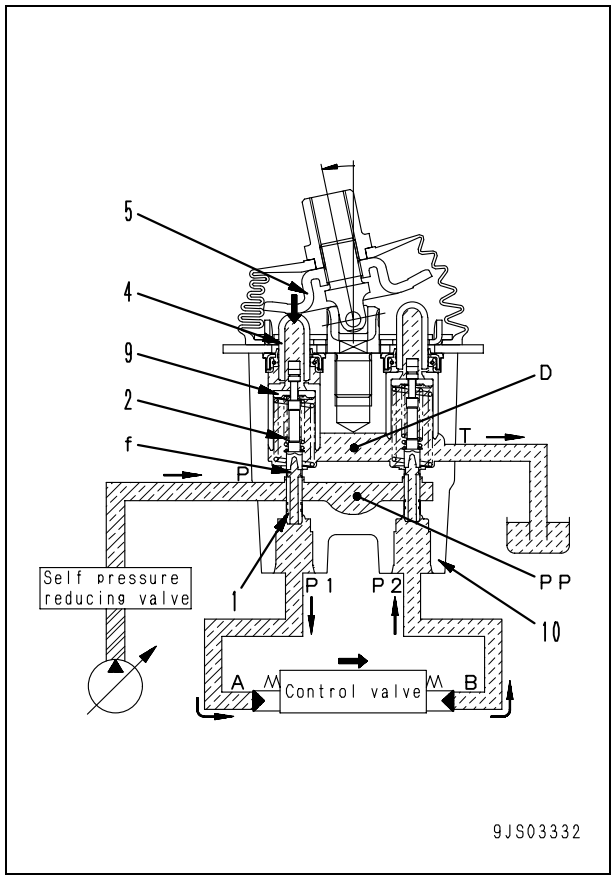
1. When in neutral

- Ports (A) and (B) of the control valve and ports (P1) and (P2) of the PPC valve are connected to drain chamber (D) via fine control hole (f) in spool (1).



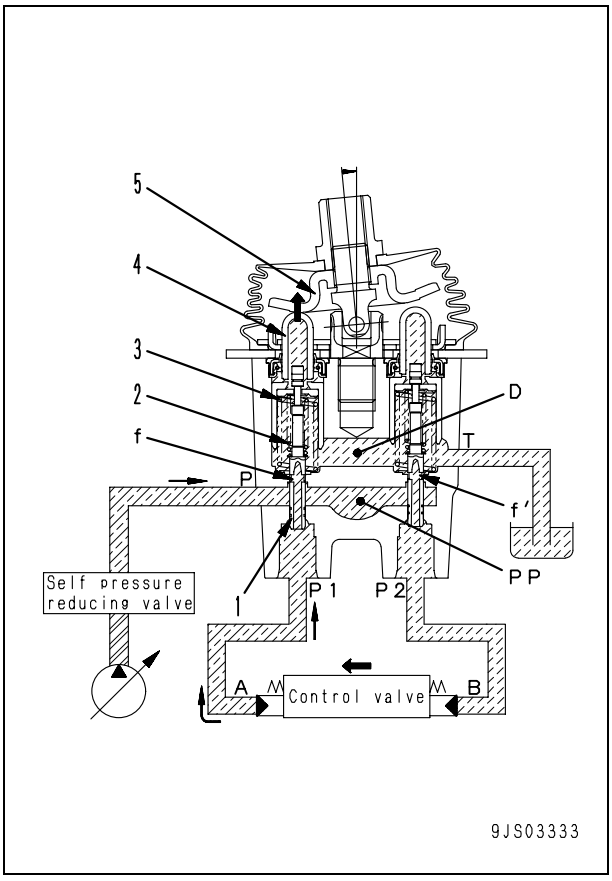
2. During fine control (Neutral → fine control)

- When piston (4) is pushed by disc (5), retainer (9) is pushed, spool (1) is also pushed by metering spring (2), and moves down.
- When fine control hole (f) is shut off from drain chamber (D), it is almost simultaneously interconnected to pump pressure chamber (PP).
- Pilot pressurized oil of the control pump is led to port (A) from port (P1) via fine control hole (f).
- When the pressure at port (P1) becomes higher, spool (1) is pushed back and fine control hole (f) is shut off from pump pressure chamber (PP). At almost the same time, it is connected to drain chamber (D) to release the pressure at port (P1).
- As a result, spool (1) moves up and down until the force of metering spool (2) is balanced with the pressure at port (P1).
- The relationship of the position of spool (1) and body (10) [fine control hole (f) is in the middle between drain chamber (D) and pump pressure chamber (PP)] does not change until retainer (9) contacts spool (1).
- Metering spring (2) contracts in proportion to the stroke of the control lever.
- Pressure at port (P1) also rises in proportion to the stroke of the control lever.
- In this way, the control valve spool moves to a position where the pressure of chamber (A) (same as pressure at port (P1)) and the force of the return spring of the control valve spool are balanced.



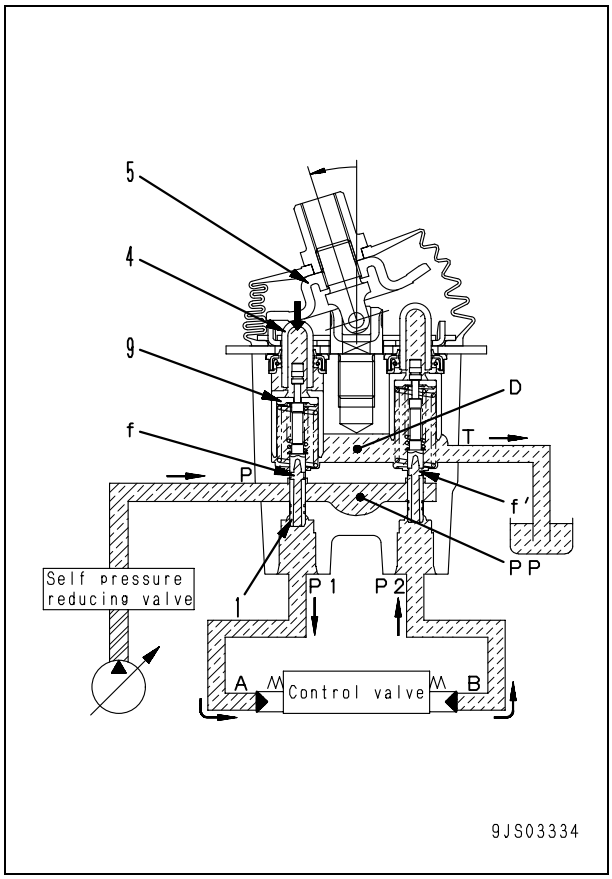
3. During fine control
(When control lever is returned)

- When disc (5) starts to be returned, spool (1) is pushed up by the force of centering spring (3) and the pressure at port (P1).
- Because of this, fine control hole (f) is connected to drain chamber (D), and the pressurized oil at port (P1) is released.
- If the pressure of port (P1) is lowered excessively, spool (1) is pushed down by metering spring (2).
- Fine control hole (f) is shut off from drain chamber (D), and it is almost simultaneously interconnected to pump pressure chamber (PP).
- Pump pressure is supplied until the pressure at port (P1) recovers to the level equivalent to the lever position.
- When the spool of the control valve returns, the oil in drain chamber (D) flows in from fine control hole (f') in the valve on the side that is not working. The oil passes through port (P2) and enters chamber (B) to replenish the chamber with pressurized oil.

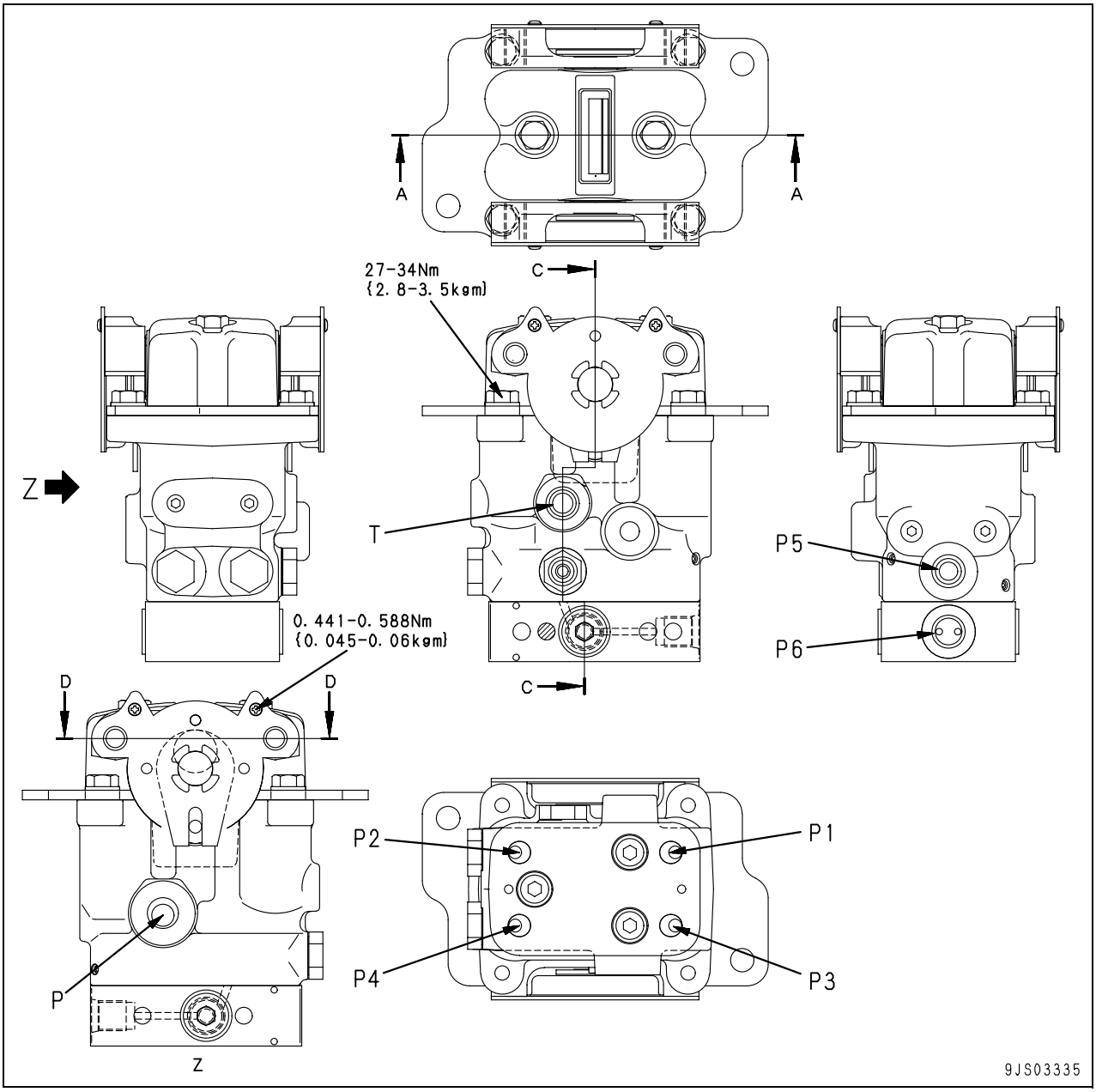


4. At full stroke

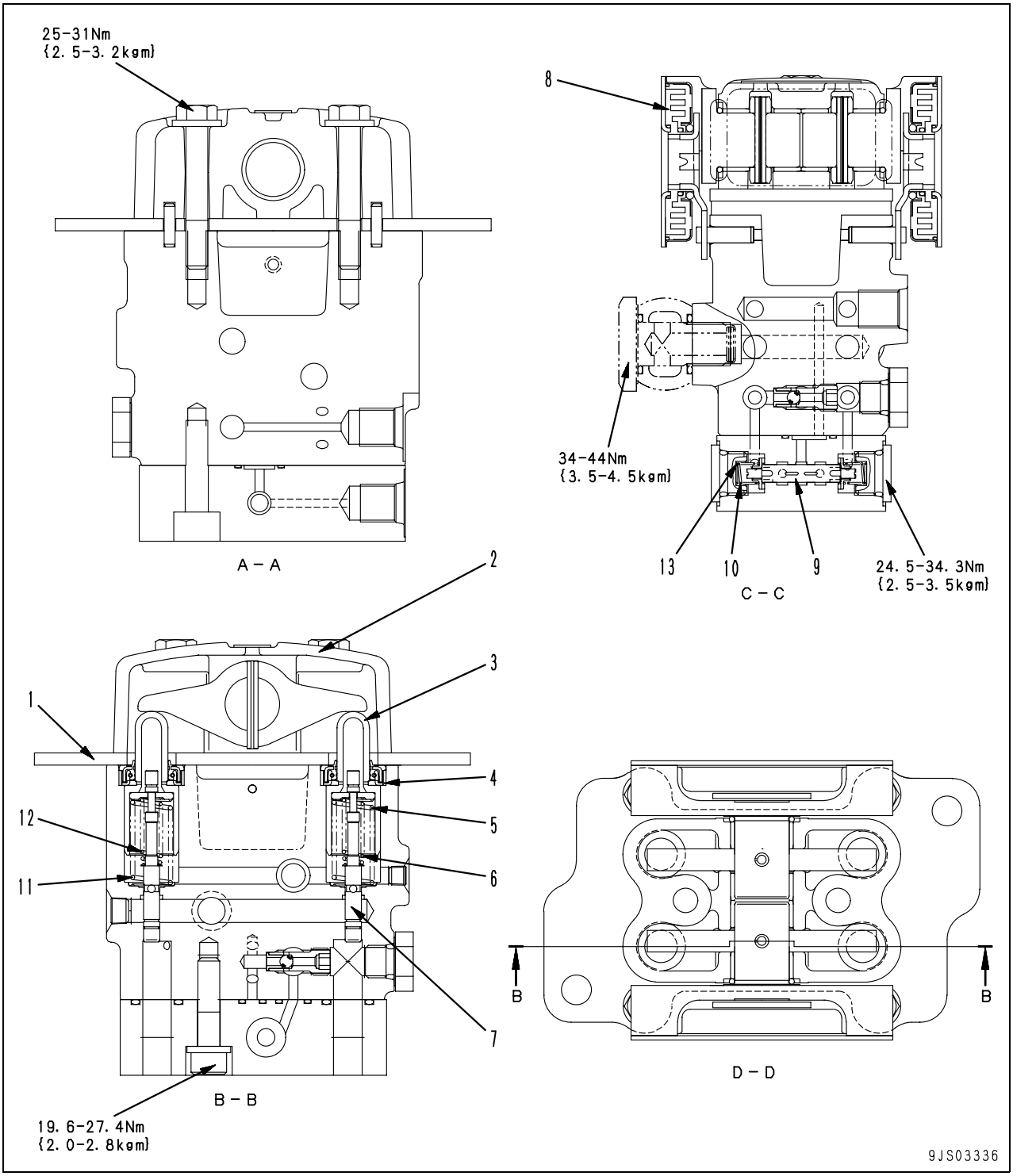
- Disc (5) pushes down piston (4), and retainer (9) pushes down spool (1).
- Fine control hole (f) is shut off from drain chamber (D), and is interconnected to pump pressure chamber (PP).
- Therefore, the pilot pressure oil from the self pressure reducing valve passes through fine control hole (f) and flows to chamber (A) from port (P1) to push the control valve spool.
- The oil returning from chamber (B) passes from port (P2) through fine control hole (f') and flows to drain chamber (D).



Travel PPC valve



P: From self pressure reducing valve
P1: L.H. reverse
P2: L.H. forward
P3: R.H. reverse
P4: R.H. forward
P5: Travel signal
P6: Steering signal
T: To tank


25-31Nm
{2. 5-3. 2kgm}
A - A
8
34-44Nm
{3. 5-4. 5kgm}
13
10
9
24. 5-34. 3Nm
{2. 5-3. 5kgm}
C - C
2
3
1
4
12
5
11
6
7
19. 6-27. 4Nm
{2. 0-2. 8kgm}
B - B
B
B
D - D
9JS03336

1. Plate
2. Body
3. Piston
4. Collar
5. Centering spring
6. Metering spring
7. Valve
8. Dumper
9. Steering signal spool
10. Steering signal spool spring

Unit: mm

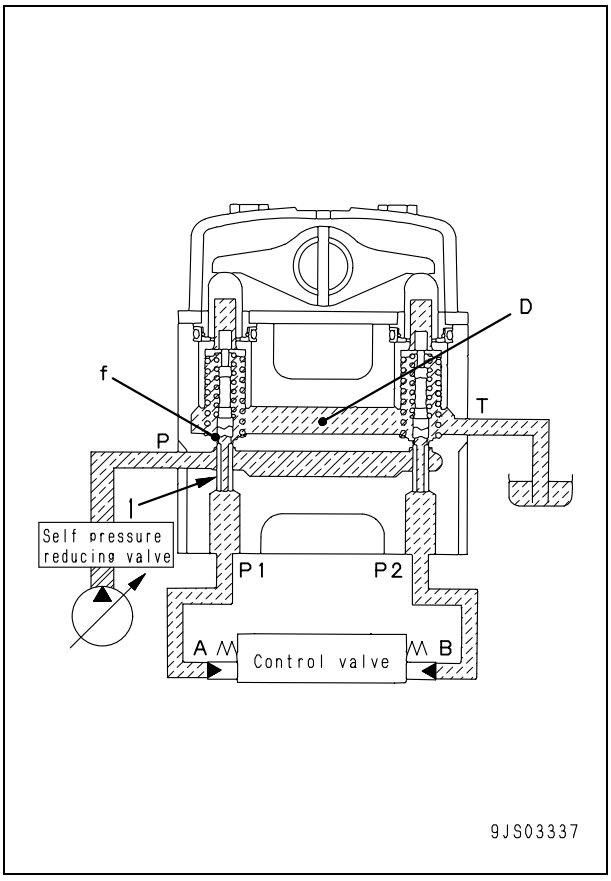
No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
11	Centering spring	Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring.
		47.6 x 15.5	32.5	108 N {11.0 kg}	—	86.3 N {8.8 kg}	
12	Metering spring	26.5 x 8.15	24.9	16.7 N {1.7 kg}	—	13.7 N {1.4 kg}	
13	Steering signal spring	12.8 x 7.3	8.5	8.8 N {0.9 kg}	—	7.1 N {0.72 kg}	

1. Pressure reducing valve

Operation

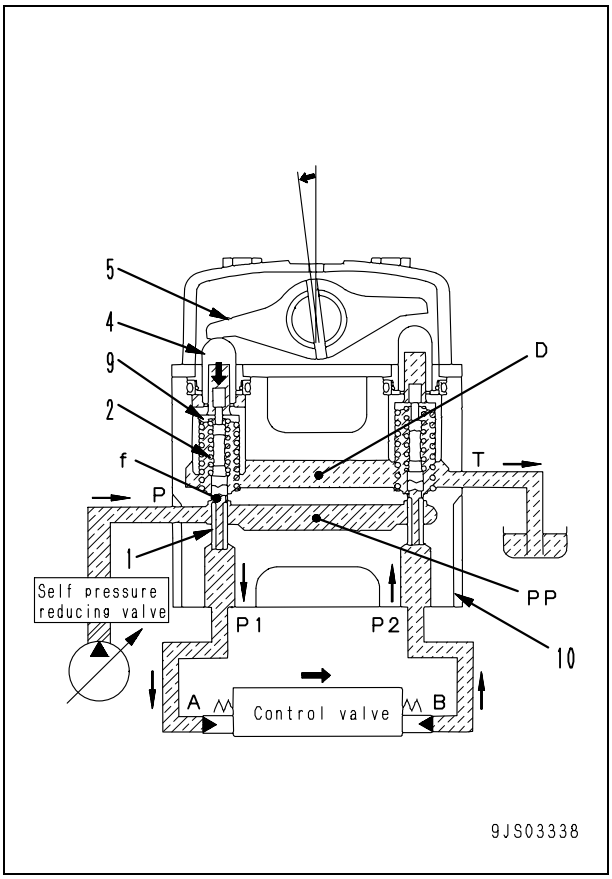
1) When in neutral

- Ports (A) and (B) of the control valve and ports (P1) and (P2) of the PPC valve are connected to drain chamber (D) via fine control hole (f) in spool (1).



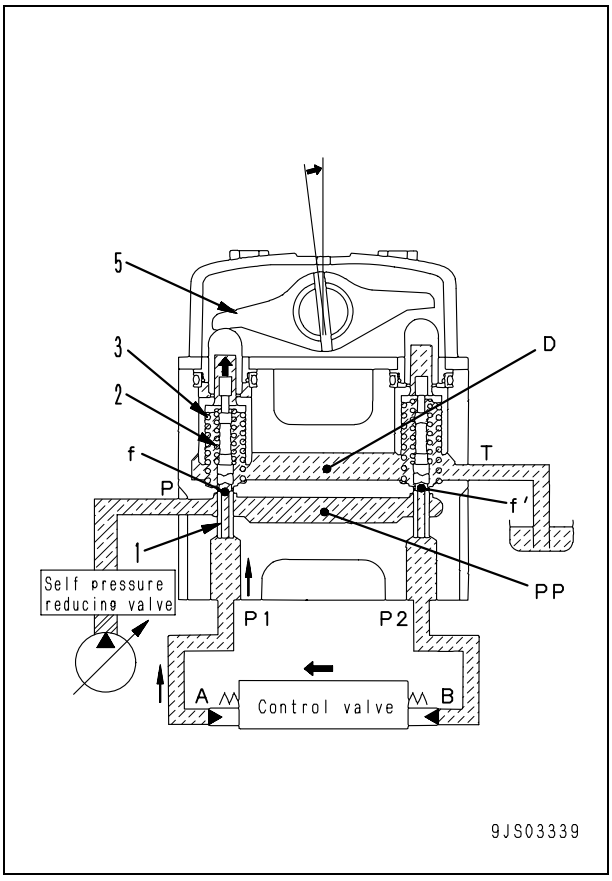
2) During fine control (Neutral → fine control)

- When piston (4) is pushed by disc (5), retainer (9) is pushed, spool (1) is also pushed by metering spring (2), and moves down.
- When fine control hole (f) is shut off from drain chamber (D), it is almost simultaneously interconnected to pump pressure chamber (PP).
- Pilot pressurized oil of the control pump is led to port (A) from port (P1) via fine control hole (f).
- When the pressure at port (P1) becomes higher, spool (1) is pushed back and fine control hole (f) is shut off from pump pressure chamber (PP). At almost the same time, it is connected to drain chamber (D) to release the pressure at port (P1).
- As a result, spool (1) moves up and down until the force of metering spool (2) is balanced with the pressure at port (P1).
- The relationship of the position of spool (1) and body (10) [fine control hole (f) is in the middle between drain chamber (D) and pump pressure chamber (PP)] does not change until retainer (9) contacts spool (1).
- Metering spring (2) contracts in proportion to the stroke of the control lever.
- Pressure at port (P1) also rises in proportion to the stroke of the control lever.
- In this way, the control valve spool moves to a position where the pressure of chamber (A) (same as pressure at port (P1)) and the force of the return spring of the control valve spool are balanced.



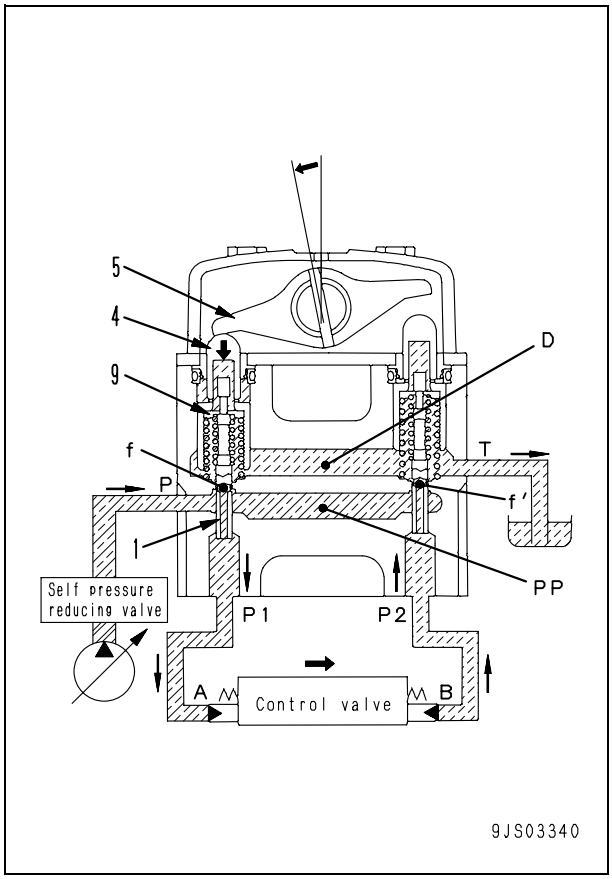
3) During fine control
(When control lever is returned)

- When lever (5) starts to be returned, spool (1) is pushed up by the force of centering spring (3) and pressure at port (P1).
- Because of this, fine control hole (f) is connected to drain chamber (D), and the pressurized oil at port (P1) is released.
- If the pressure of port (P1) is lowered excessively, spool (1) is pushed down by metering spring (2).
- Fine control hole (f) is shut off from drain chamber (D), and it is almost simultaneously interconnected to pump pressure chamber (PP).
- Pump pressure is supplied until the pressure at port (P1) recovers to the level equivalent to the lever position.
- When the spool of the control valve returns, the oil in drain chamber (D) flows in from fine control hole (f') in the valve on the side that is not working. The oil passes through port (P2) and enters chamber (B) to replenish the chamber with pressurized oil.



4) At full stroke

- Lever (5) pushes down piston (4), and retainer (9) pushes down spool (1).
- Fine control hole (f) is shut off from drain chamber (D), and is interconnected to pump pressure chamber (PP).
- Therefore, the pilot pressure oil from the self pressure reducing valve passes through fine control hole (f) and flows to chamber (A) from port (P1) to push the control valve spool.
- The oil returning from chamber (B) passes from port (P2) through fine control hole (f') and flows to drain chamber (D).



2. Travel signal/Steering function

Travel signal

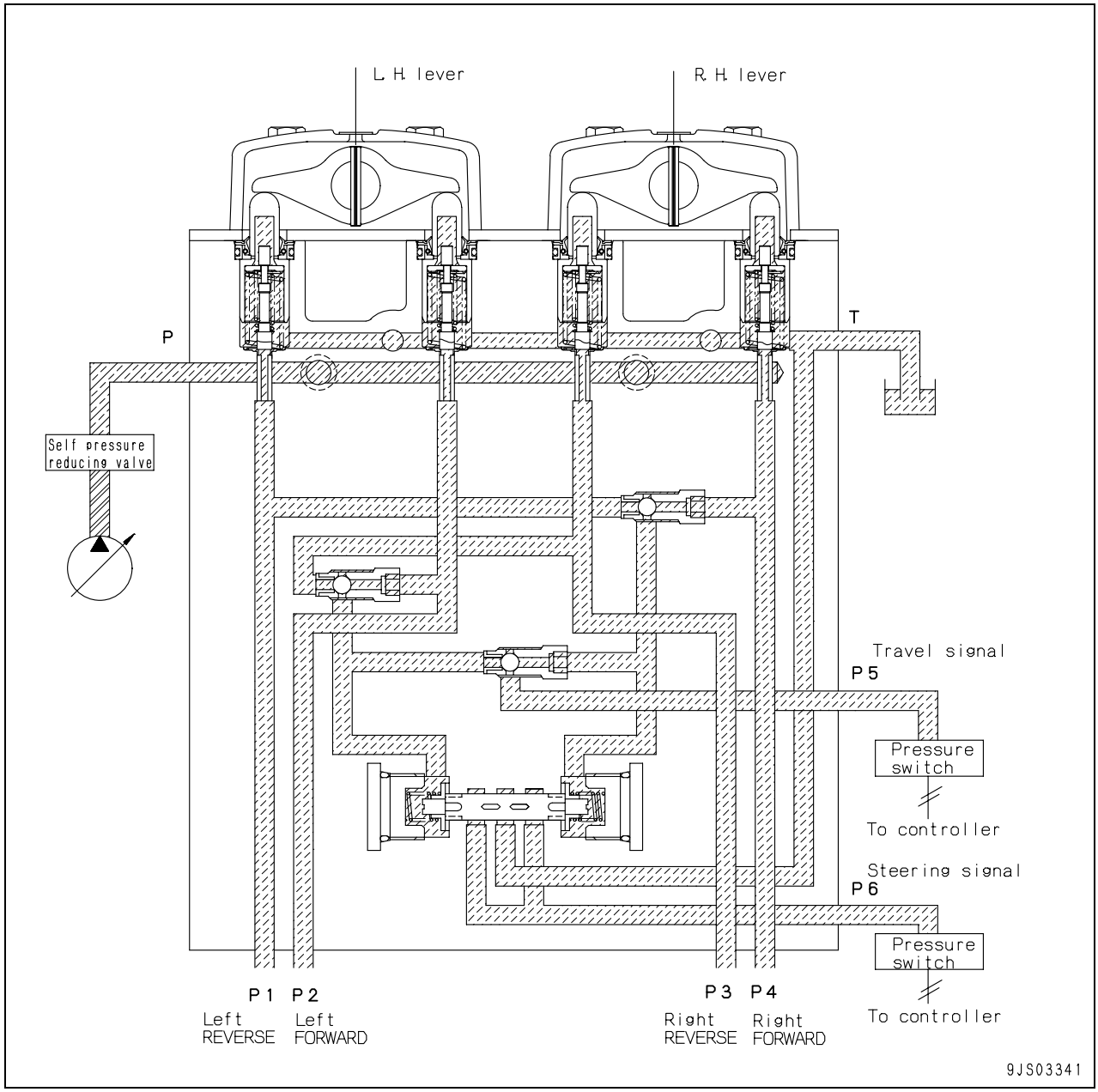
- Travel signal if either of the L.H. or R.H. travel levers is operated, the higher PPC output pressure of both sides is output as the travel signal.
- Accordingly, whether the machine is travelling is judged by the signal of port (P5).

Steering signal

- If the operation quantities of both levers are different from each other as in the steering operation, the higher one of the PPC output pressures of both sides is output as the steering signal.
- Any signal is not output from port (P6) while the machine is travelling straight (forward or reverse) or in neutral.
- Accordingly, whether the machine is being steered is judged by the signal of port (P6).

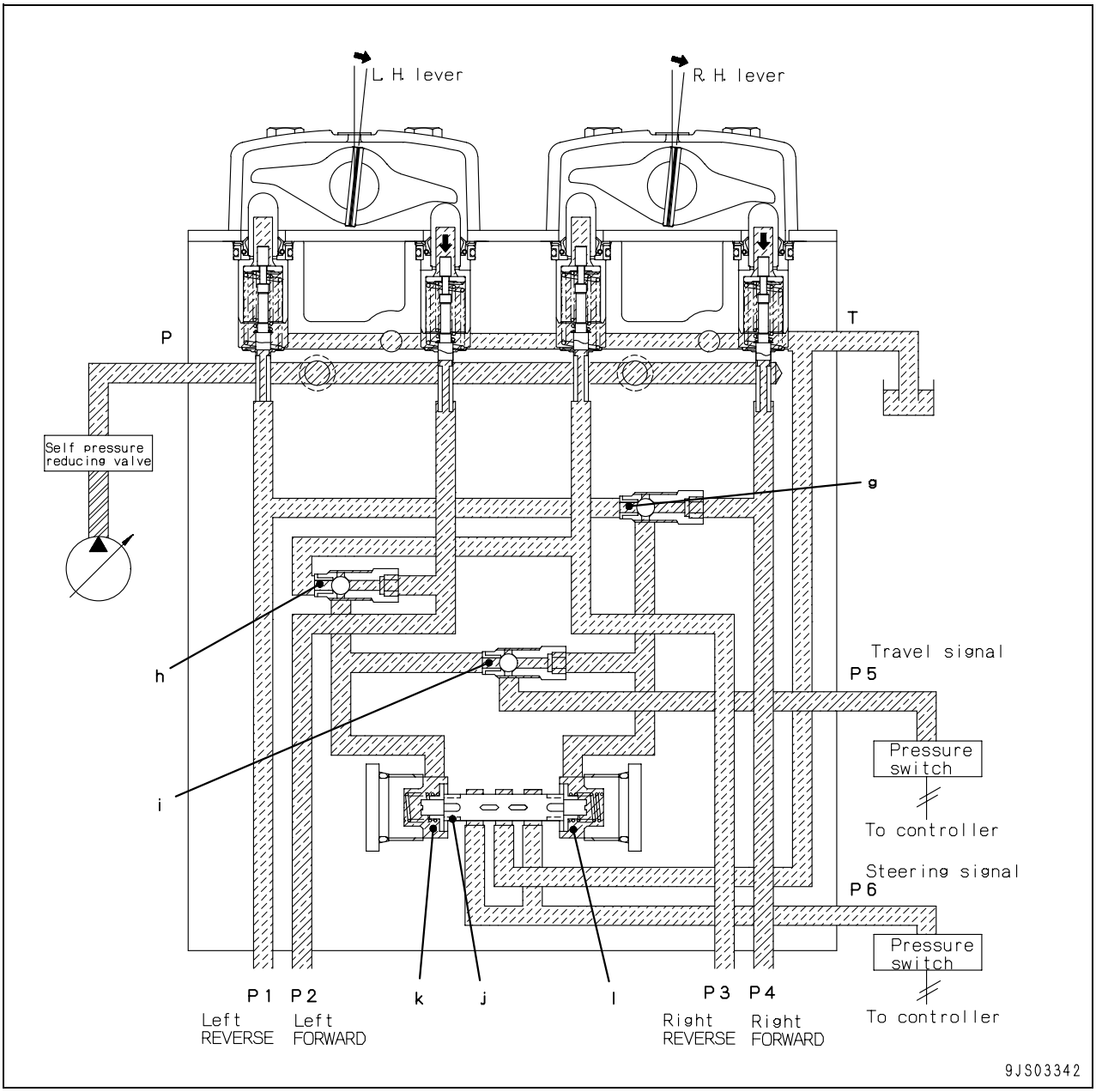
Operation

1) When in neutral



- No output is made from respective output ports [from port (P1) to (P4)], travel signal [port (P5)] and steering signal [port (P6)].

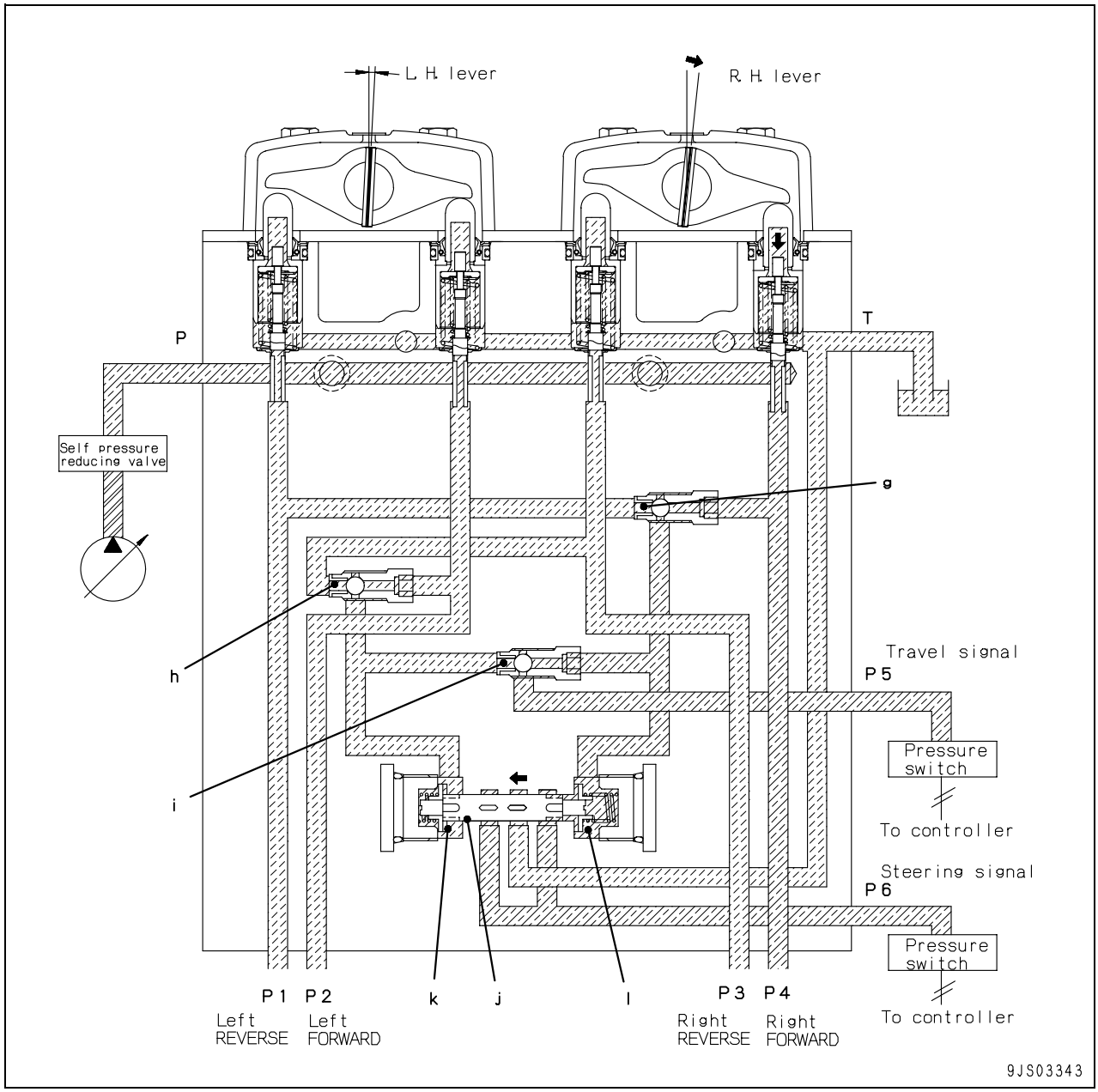
2) During straight travel



★ The Illustration shows the circuit for travelling straight forward.

- When operating L.H. motor forward [port (P2) output] and R.H. motor forward [port (P4) output], pressure of both L.H. spring chamber (k) and R.H. spring chamber (l) rises high.
- Steering signal spool (j) remains at neutral position and does not output a steering signal to port (P6).

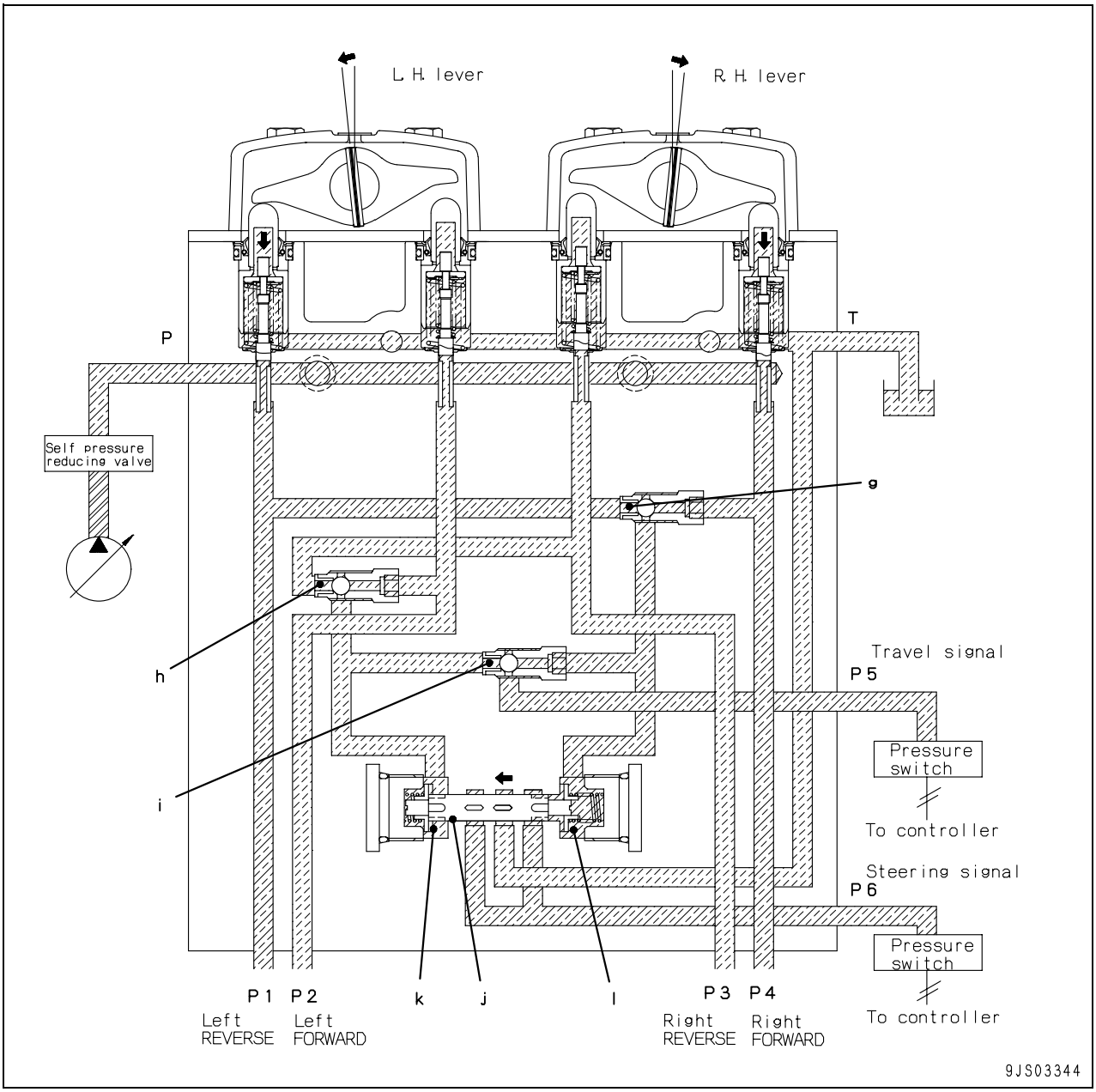
3) When steered or pivot-turned



★ The Illustration shows the circuit for left forward (slow) and right forward (fast) operation.

- If the operation quantities of both levers are different from each other as in the steering operation (if the difference of the pilot pressure between both sides is higher than a certain level), the pilot pressure is output as the steering signal.
- The pressure in left spring chamber (k) of steering signal spool (j) is (P2).
- The pressure in right spring chamber (l) is (P4).
- When the pressure state reaches [(P4 - P2) x (Spool section) > Spring set load], the spool is switched to the direction of the arrow.
- Port (P4) pressure of the L.H. or R.H. PPC valves, whichever having a higher output pressure, is output to port (P6) as the steering signal.

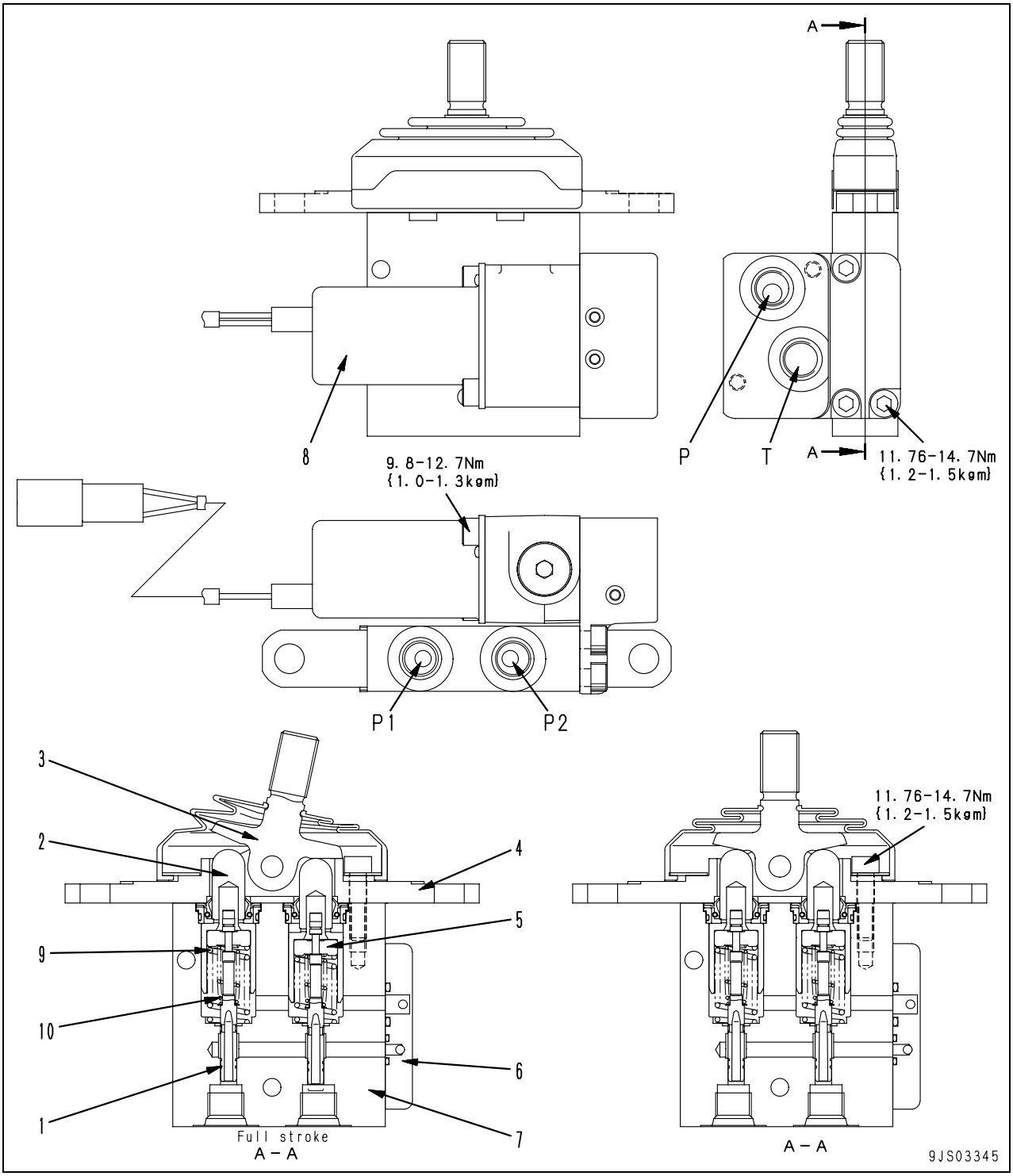
4) When counter-rotated



★ The illustration shows the circuit for travelling left reverse and right forward.

- When operating L.H. motor reverse [port (P1) output] and R.H. motor forward [port (P4) output], pressure of the R.H. spring chamber (l) only rises high.
- Steering signal spool (j) strokes to the left to output the steering signal to port (P6).

Service PPC valve (with EPC valve)



★ For the details of operation, see the paragraph of “Work equipment swing PPC valve.”

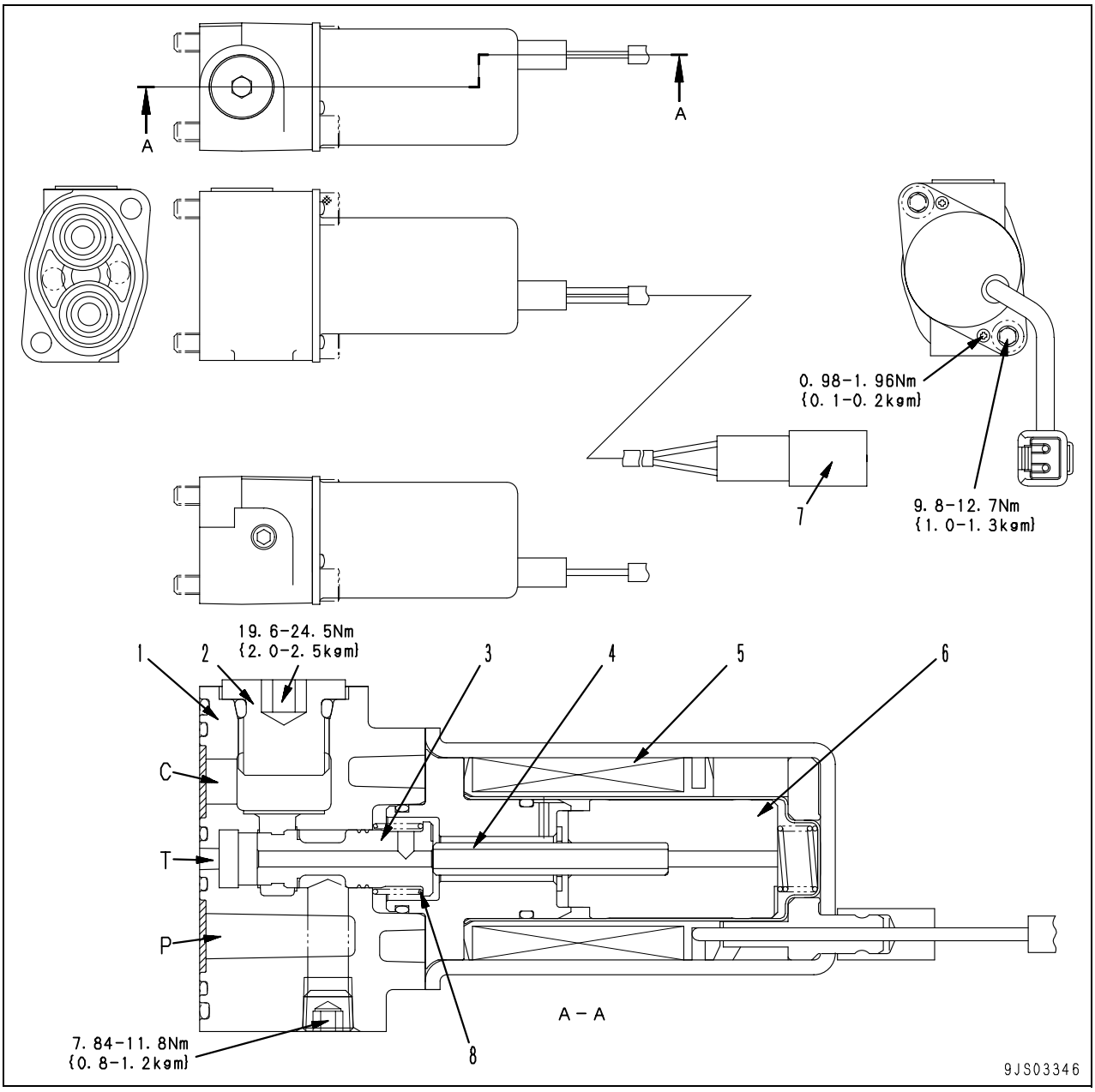
P: From self pressure reducing valve
P1: To service valve
P2: To service valve
T: To tank

1. Spool
2. Piston
3. Lever
4. Plate
5. Retainer
6. Block
7. Body
8. EPC valve

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
9	Centering spring	Free length x Outside diameter	Installation length	Installation load	Free length	Installation load	If damaged or deformed, replace spring.
		33.9 x 15.3	28.4	125 N {12.7 kg}	—	100 N {10.2 kg}	
10	Metering spring	22.7 x 8.10	22.0	16.7 N {1.70 kg}	—	13.3 N {1.36 kg}	

1. EPC valve



C: To control valve
P: From self pressure reducing valve
T: To hydraulic tank

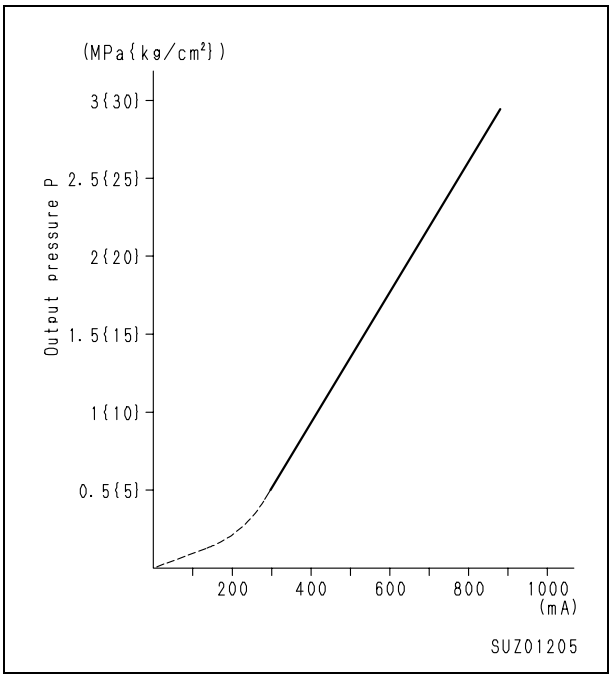
1. Body
2. Plug
3. Spool
4. Push pin
5. Coil
6. Plunger
7. Connector

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
8	Return spring	Free length	Installation length	Installation load	Free length	Installation load	If damaged or deformed, replace EPC valve assembly.
		9.0	8.4	3.1 N {0.32 kg}	—	—	

Function

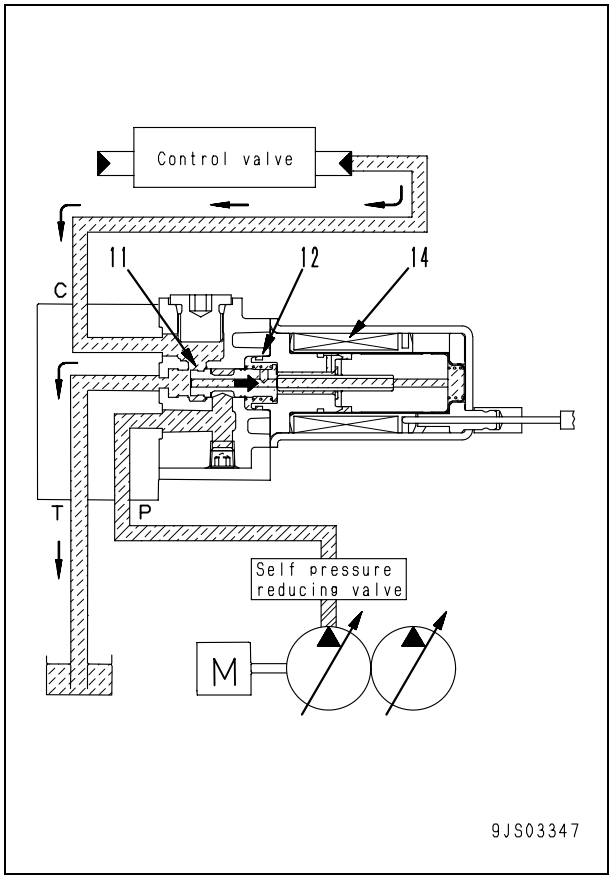
- The EPC valve consists of the proportional solenoid portion and the hydraulic valve portion.
- When it receives signal current (i) from the pump controller, it generates the EPC output pressure in proportion to the size of the signal, and outputs it to the control valve.



Operation

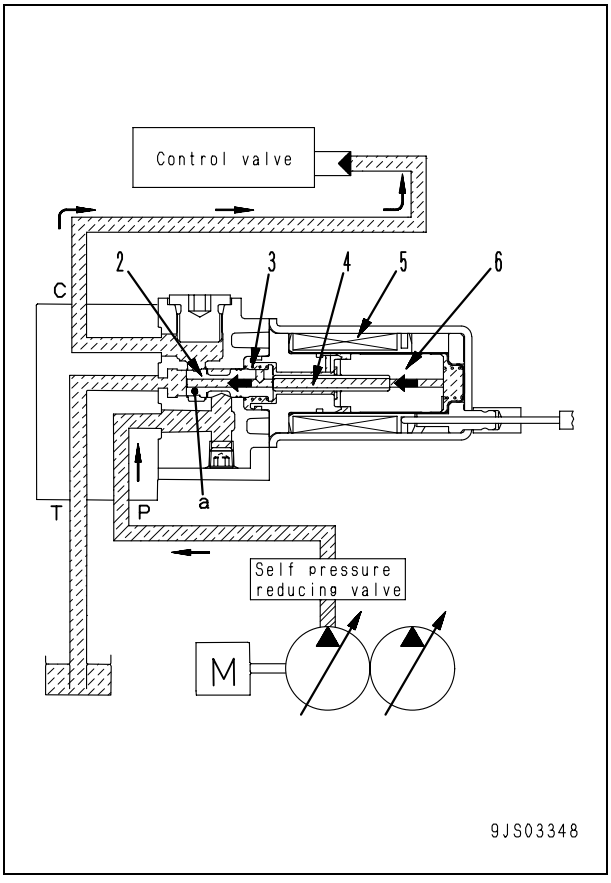
1) When signal current is 0 (coil is de-energized)

- When there is no signal current flowing from the controller to coil (14), coil (14) is deenergized.
- Spool (11) is pushed to the right by spring (12).
- Port (P) closes and the pressurized oil from the front pump does not flow to the control valve.
- The pressurized oil from the control valve is drained to the tank via port (C) and port (T).



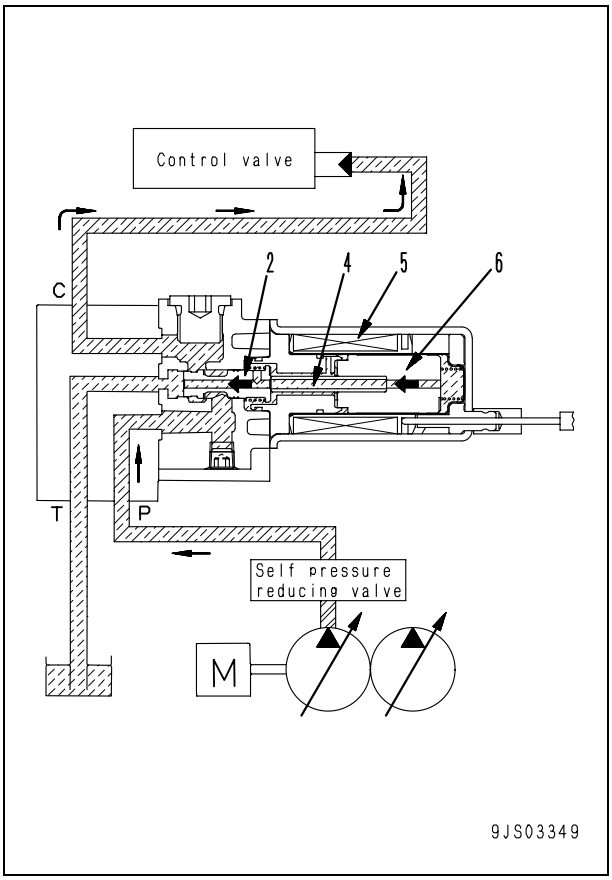
2) When signal current is very small (coil is energized)

- When a very small signal current flows to coil (5), coil (5) is energized, and a propulsion force is generated on the left side of plunger (6).
- Push pin (4) pushes spool (2) to the left, and pressurized oil flows from port (P) to port (C).
- Pressures on port (C) increases and the force to act on surface (a) of spool (2) and the spring load on spring (3) become larger than the propulsion force of plunger (6).
- Spool (2) is pushed to the right, port (P) is shut off from port (C) and ports (C) and (T) are connected.
- Spool (2) moves up and down so that the propulsion force of plunger (6) may be balance with pressure of port (C) + spring load of spring (3).
- The circuit pressure between the EPC valve and the control valve is controlled in proportion to the size of the signal current.

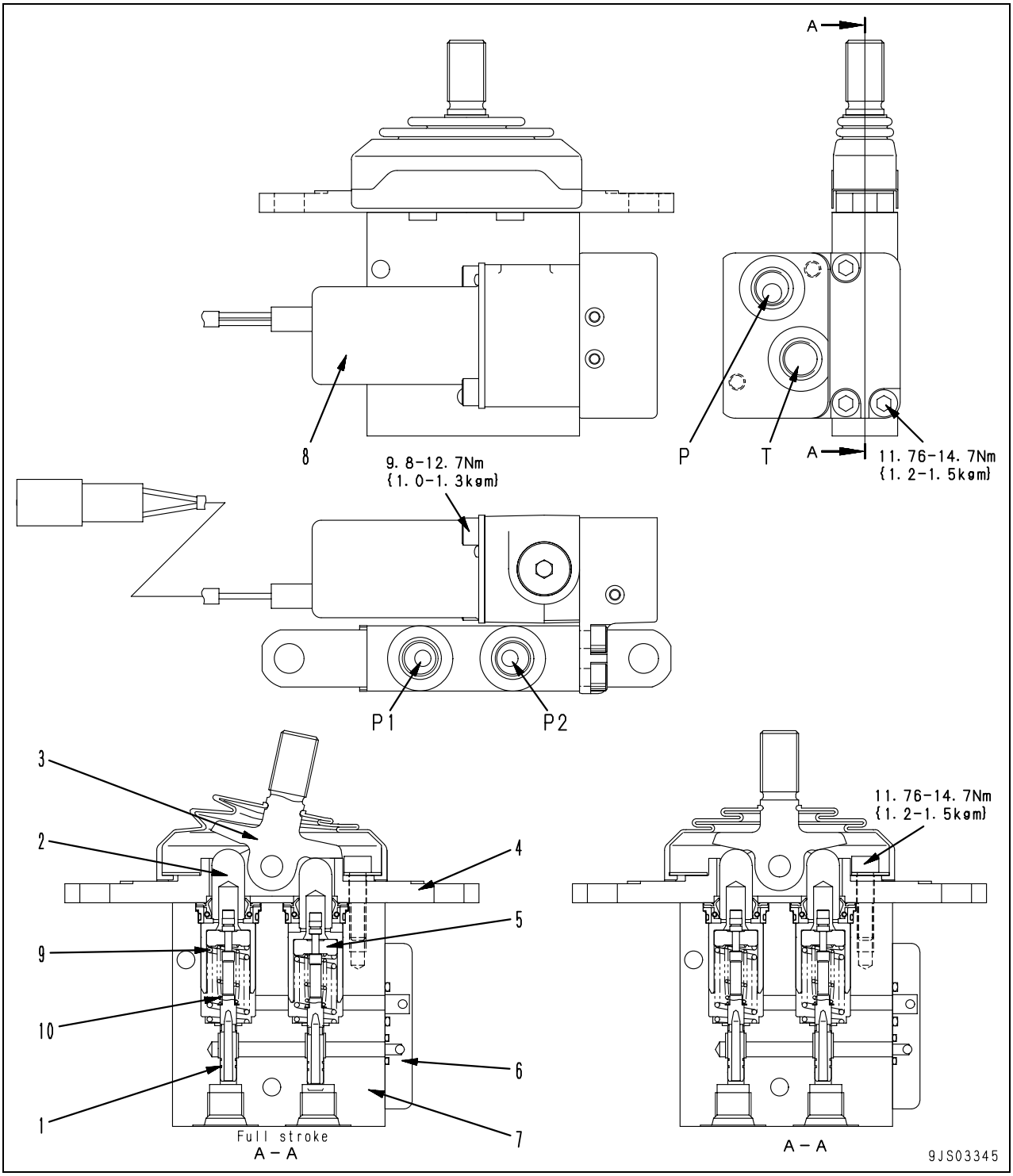


3) When signal current is maximum (coil is energized)

- As the signal current flows to coil (5), coil (5) is energized.
- When this happens, the signal current is at its maximum, so the propulsion force of plunger (6) is also at its maximum.
- Spool (2) is pushed to the left by push pin (4).
- The maximum volume of pressurized oil is conducted from port (P) to port (C), increasing the circuit pressure across EPC valve and the control valve to the maximum level.
- Since port (T) is closed, pressurized oil does not flow to the hydraulic tank.



Service PPC valve (with EPC valve)



★ For the details of operation, see the paragraph of “Work equipment swing PPC valve.”

P: From self pressure reducing valve
P1: To service valve
P2: To service valve
T: To tank

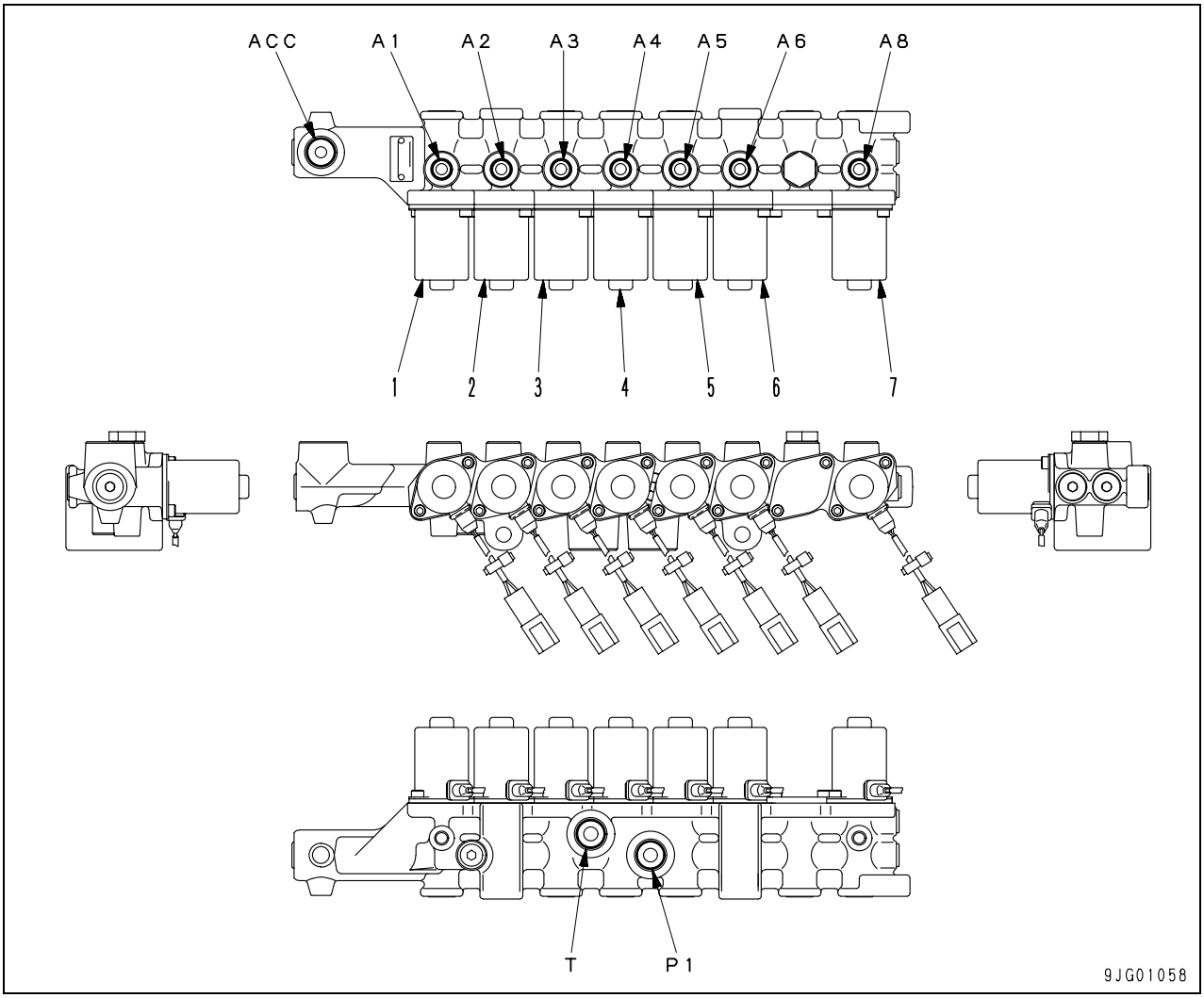
1. Spool
2. Piston
3. Lever
4. Plate
5. Retainer
6. Block
7. Body
8. EPC valve

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
9	Centering spring	Free length x Outside diameter	Installation length	Installation load	Free length	Installation load	If damaged or deformed, replace spring.
		33.9 x 15.3	28.4	125 N {12.7 kg}	—	100 N {10.2 kg}	
10	Metering spring	22.7 x 8.10	22.0	16.7 N {1.70 kg}	—	13.3 N {1.36 kg}	

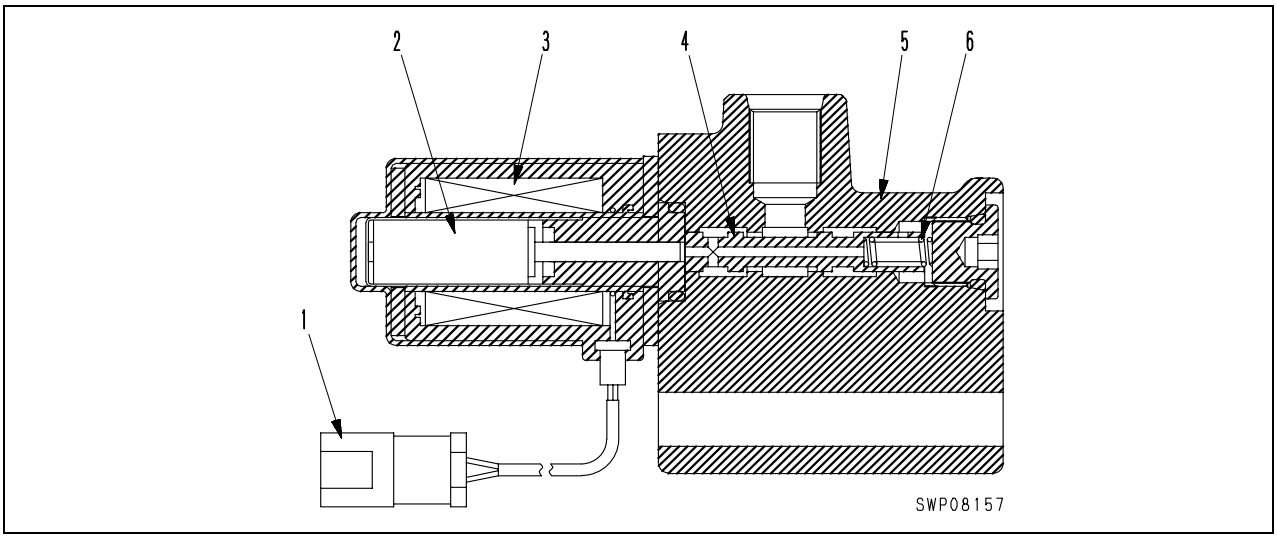
Solenoid valve

PPC lock, travel junction, merge-divider, travel speed, swing brake, machine push-up and 2-stage relief solenoid valves



1. PPC lock solenoid valve
2. Travel junction solenoid valve
3. Merge-divider solenoid valve
4. Travel speed solenoid valve
5. Swing brake solenoid valve
6. Machine push-up solenoid valve
7. 2-stage relief solenoid valve

T: To tank
A1: To PPC valve
A2: To main valve (Travel junction valve)
A3: To main valve (Merge-divider valve)
A4: To both travel motors
A5: To swing motor
A6: To main valve (2-stage safety valve at boom cylinder head)
A8: To main valve (2-stage relief valve)
P1: From main pump
ACC: To accumulator



1. Connector
2. Moving core
3. Coil
4. Spool
5. Block
6. Spring

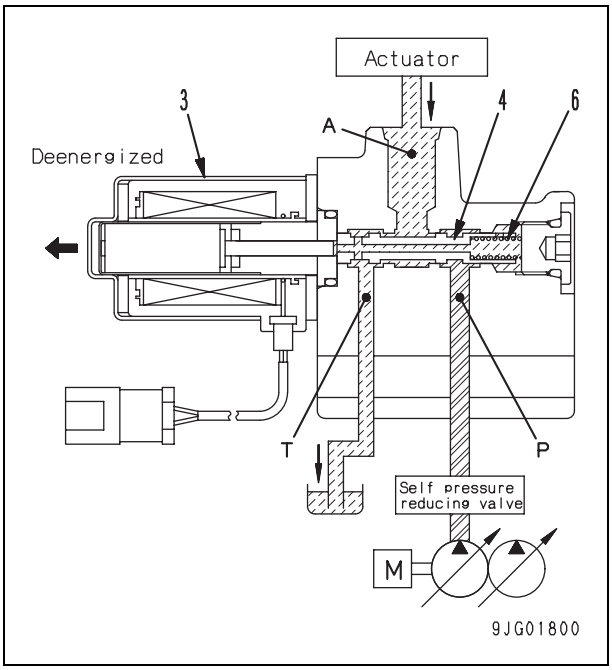
Operation

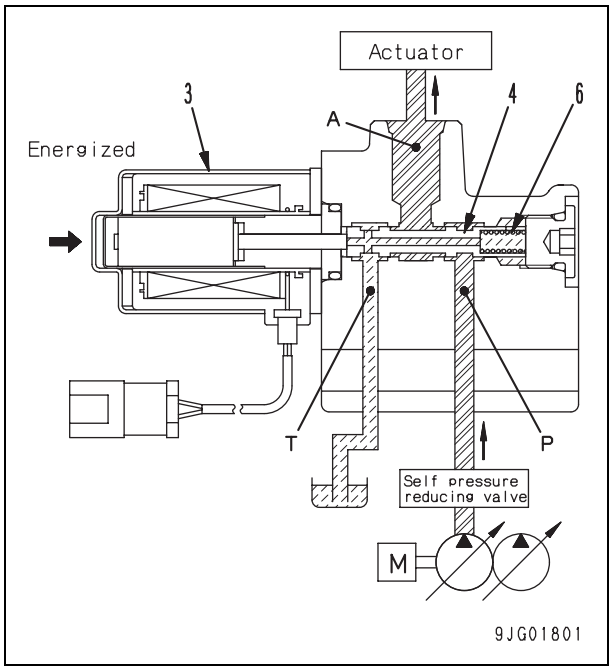
When solenoid is deenergized

- Since the signal current does not flow from the controller, solenoid (3) is deenergized. For this reason, spool (4) is pushed to the left by spring (6). By this operation, the pass from port (P) to port (A) is closed and the pressurized oil from the main pump does not flow into the actuator. At this time, the oil from the actuator is drained through ports (A) and (T) into the tank.

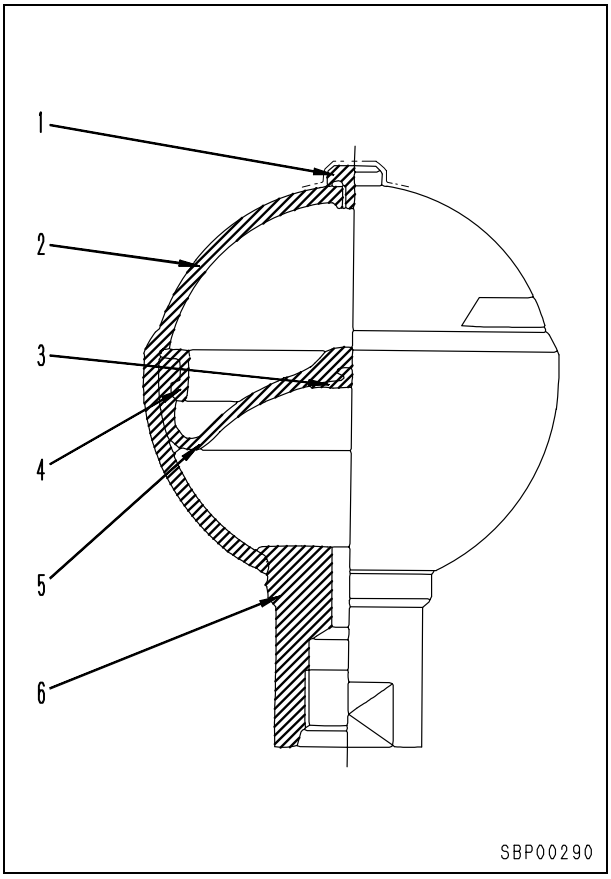
When solenoid is energized

- The signal current flows from the controller to solenoid (3), and the latter is energized. Accordingly, spool (4) is pressed against to the right side. By this operation, the pressurized oil from the main pump flows through port (P) and spool (4) to port (A), then flows into the actuator. At the same time, port (T) closes and stops the oil from flowing to the tank.





PPC accumulator



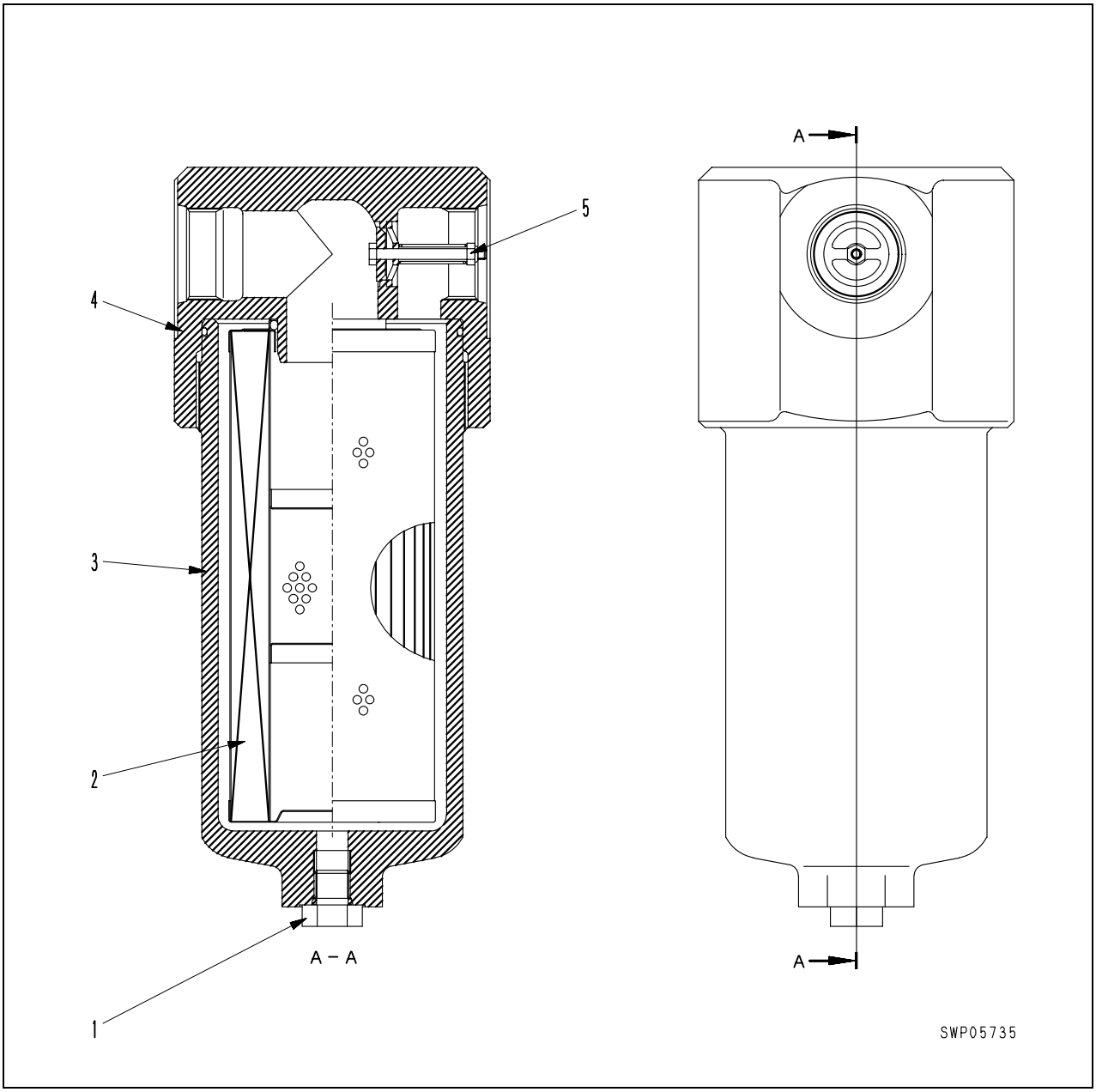
1. Gas plug
2. Shell
3. Poppet
4. Holder
5. Bladder
6. Oil port

Specifications

Gas capacity: 300 cc (for PPC)

Return oil filter

For breaker

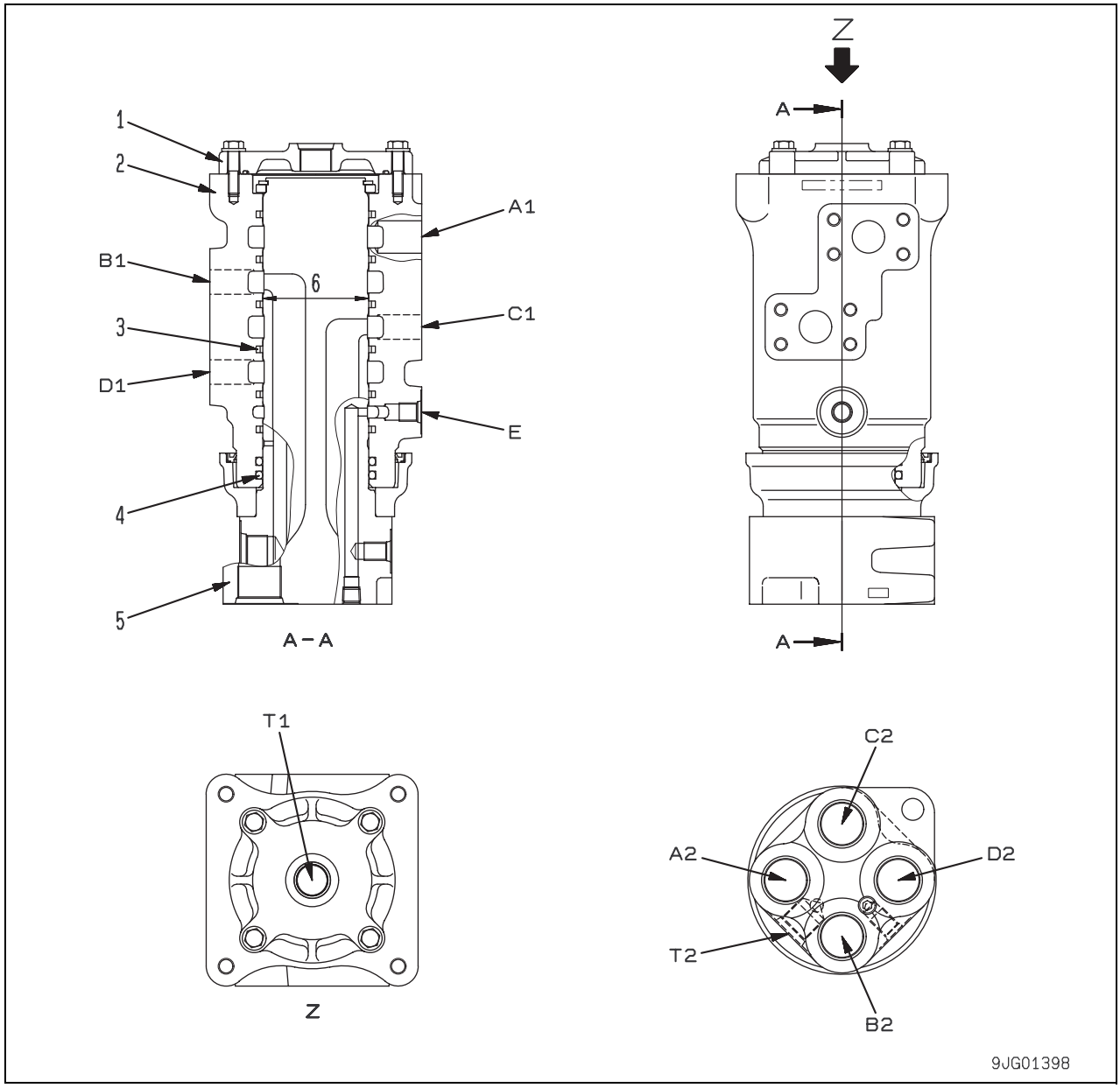


1. Drain plug
2. Filter
3. Case
4. Head cover
5. Relief valve

Specifications

Rated pressure: 6.9 MPa {70 kg/cm^2}
Flow: 200 ℓ/min
Relief valve cracking pressure:
0.34 ± 0.05 MPa {3.5 ± 0.5 kg/cm^2}
Filter mesh size: 6 µm
Filtering area: 4,570 cm^2

Center swivel joint



1. Cover
2. Body
3. Slipper seal
4. O-ring
5. Shaft

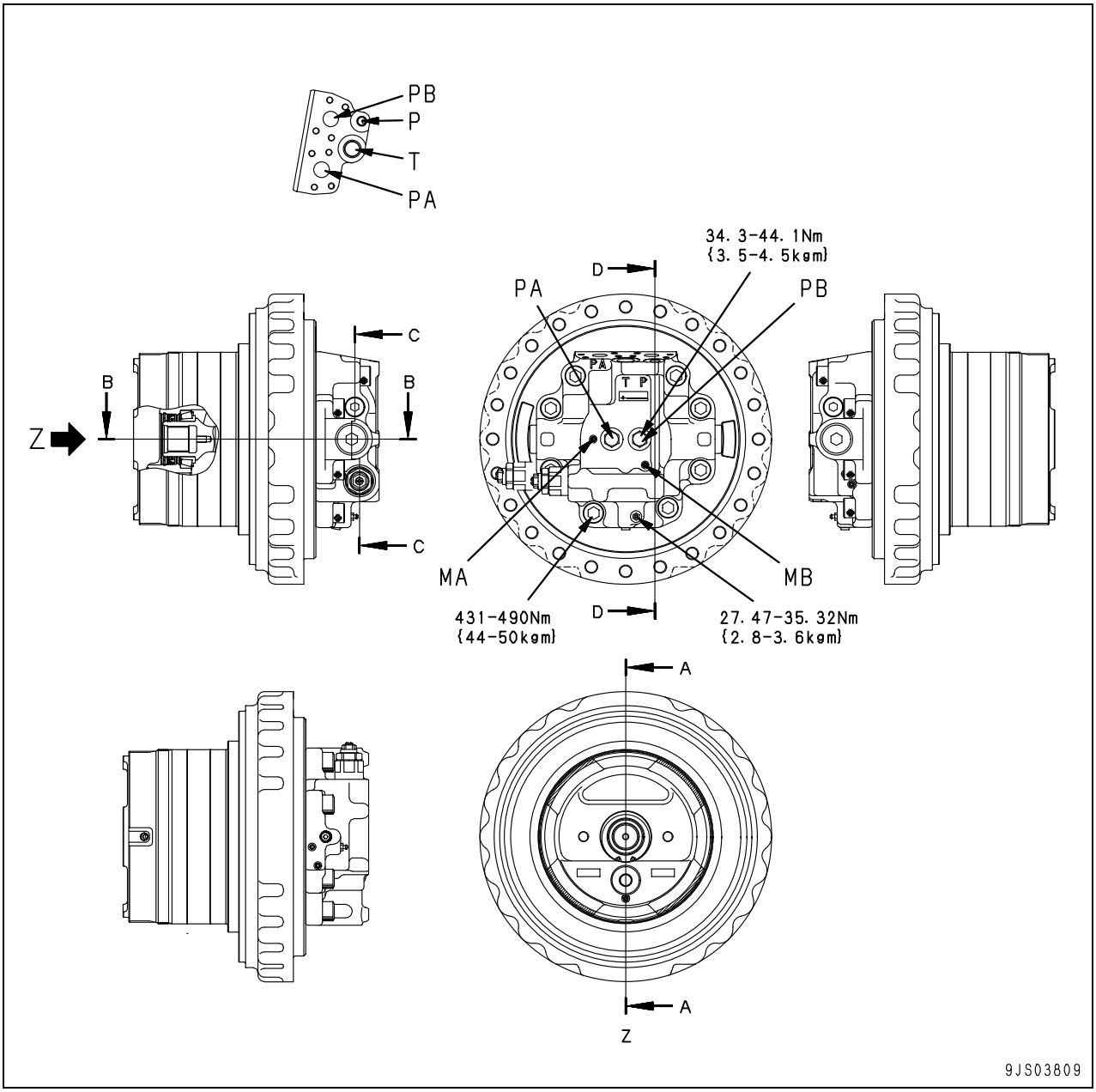
A1: To L.H. travel motor port PB
A2: From control valve port A2
B1: To L.H. travel motor port PA
B2: From control valve port B2
C1: To R.H. travel motor port PA
C2: From control valve port A5
D1: To R.H. travel motor port PB
D2: From control valve port B5
E: To L.H. and R.H. travel motors port P
T1: From L.H. and R.H. travel motors port T
T2: To tank

Unit: mm

No.	Check item	Criteria			Remedy
6	Clearance between rotor and shaft	Standard size	Standard clearance	Clearance limit	Replace
		80	—	—	

Travel motor

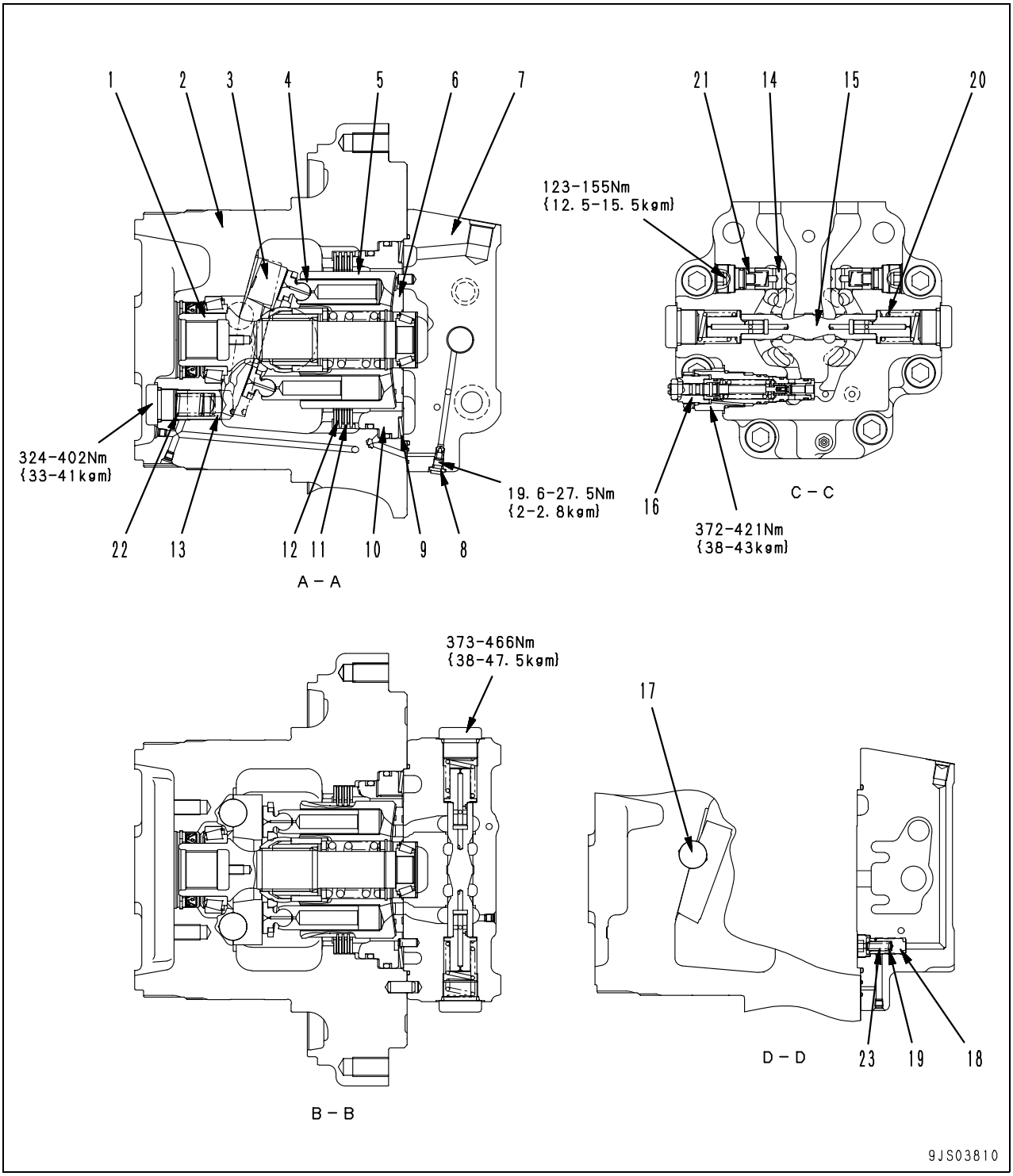
Type: HMV160ADT-2



MA: MA pressure detection port
MB: MB pressure detection port
P: From travel speed solenoid valve
PA: From control valve
PB: From control valve
T: To tank

Specifications

Type	:HMV160ADT-2
Theoretical displacement	
(Min.)	:103.5 cm^3/rev
(Max.)	:160.8 cm^3/rev
Rated pressure	: 37.3 MPa {380 kg/cm^2}
Rated speed	
(Capacity min.)	:2,638 rpm
(Capacity max.)	:1,590 rpm
Brake release pressure	:1.18 MPa {12 kg/cm^2}
Travel speed selector pressure	
(differential pressure)	:0.78 MPa {8 kg/cm^2}


1
2
3
4
5
6
7
324-402Nm
{33-41kgm}
19.6-27.5Nm
{2-2.8kgm}
22
13
12
11
10
9
8
A - A
21
14
15
20
123-155Nm
{12.5-15.5kgm}
16
372-421Nm
{38-43kgm}
C - C
373-466Nm
{38-47.5kgm}
B - B
17
D - D
23
19
18
9JS03810

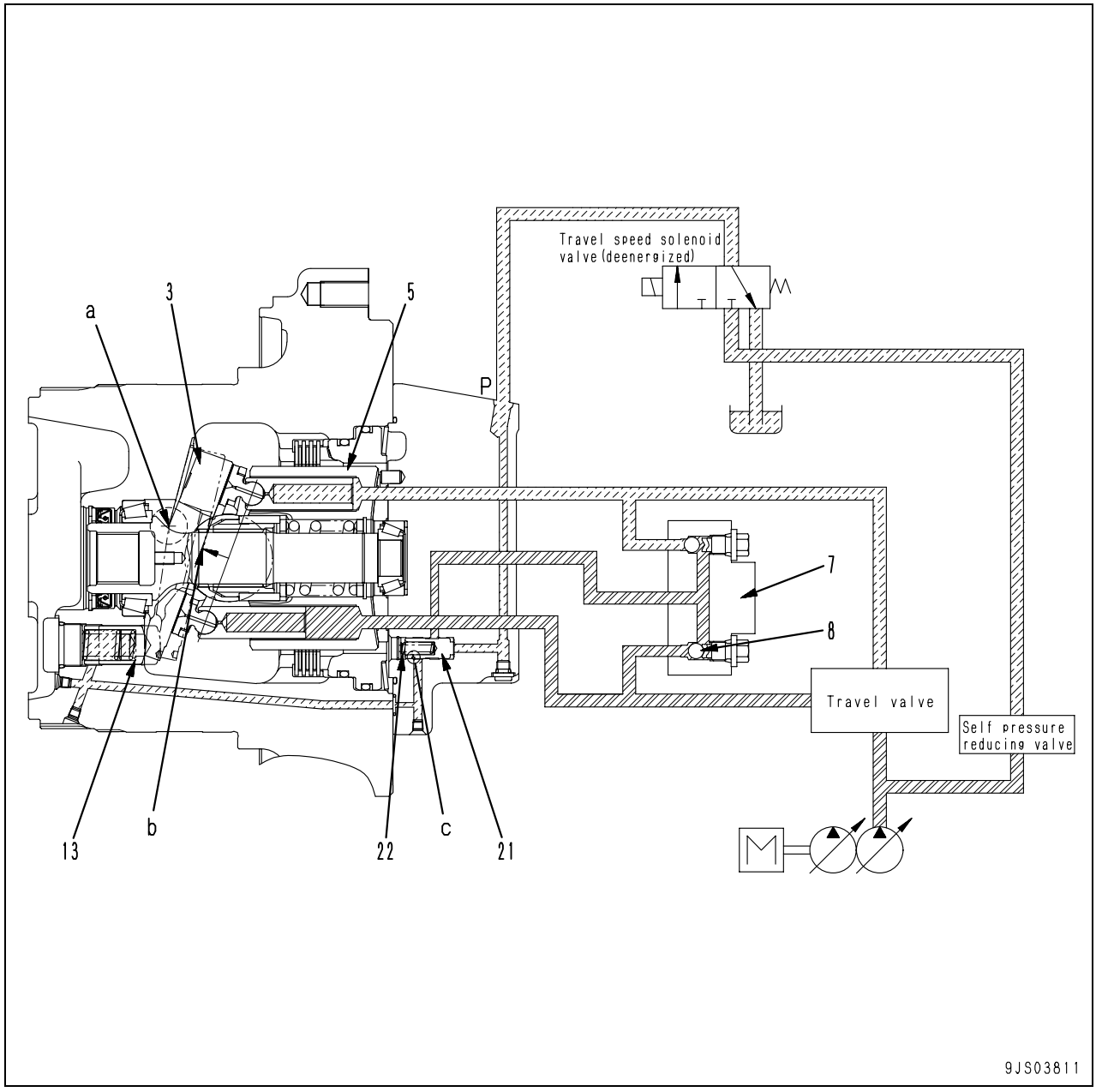
1. Output shaft
2. Motor case
3. Rocker cam
4. Piston
5. Cylinder block
6. Valve plate
7. End cover
8. Slow return valve
9. Brake spring
10. Brake piston
11. Plate
12. Disc
13. Regulator piston
14. Check valve
15. Counterbalance valve
16. Safety valve
17. Ball
18. Regulator valve
19. Spring

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
20	Spool return spring	Free length x Outside diameter	Installation length	Installed load	Free length	Installed load	If damaged or deformed, replace spring.
		58.43 x 30.0	42.0	427 N {43.5 kg}	—	341 N {34.8 kg}	
21	Check valve spring	33.0 x 13.8	23.0	1.27 N {0.13 kg}	—	0.98 N {0.10 kg}	
22	Regulator piston spring	61.1 x 23.2	43.9	221 N {22.5 kg}	—	177 N {18.0 kg}	
23	Regulator valve spring	29.6 x 9.0	26.0	98.1 N {10.0 kg}	—	78.5 N {8.0 kg}	

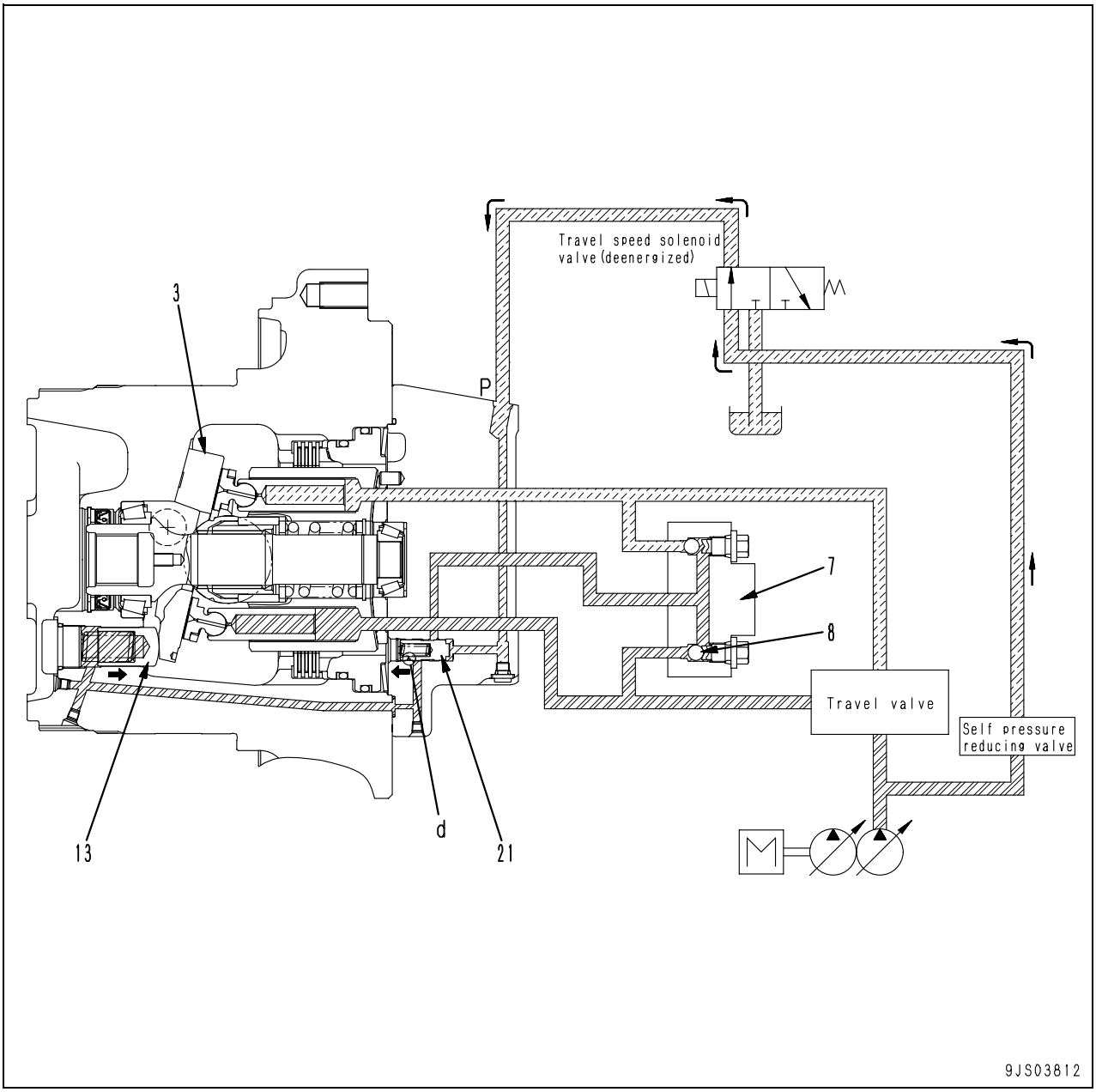
Operation of motor

1) At slow speed (motor swash plate angle at maximum)



- As the solenoid valve is deenergized, the pilot pressurized oil from the self pressure reducing valve does not flow to port (P).
- Regulator valve (21) is pushed to the right by spring (22).
- Pressurized oil being conducted from the control valve to end cover (7) by pressing slow return valve (8) is shut off by regulator valve (21).
- Fulcrum (a) of rocker cam (3) is eccentric to the working point (b) of the combined force of the propulsion force of cylinder (5).
- The combined force of the piston propulsion forces works as the moment of inclining rocker cam (3) toward the maximum swash plate angle.
- The pressurized oil at regulator piston (13) passes through orifice (c) of regulator valve (21) and is drained to the motor case.
- Rocker cam (3) is inclined in the maximum swash plate angle direction. The motor capacity becomes maximum, turning on the low speed travel.

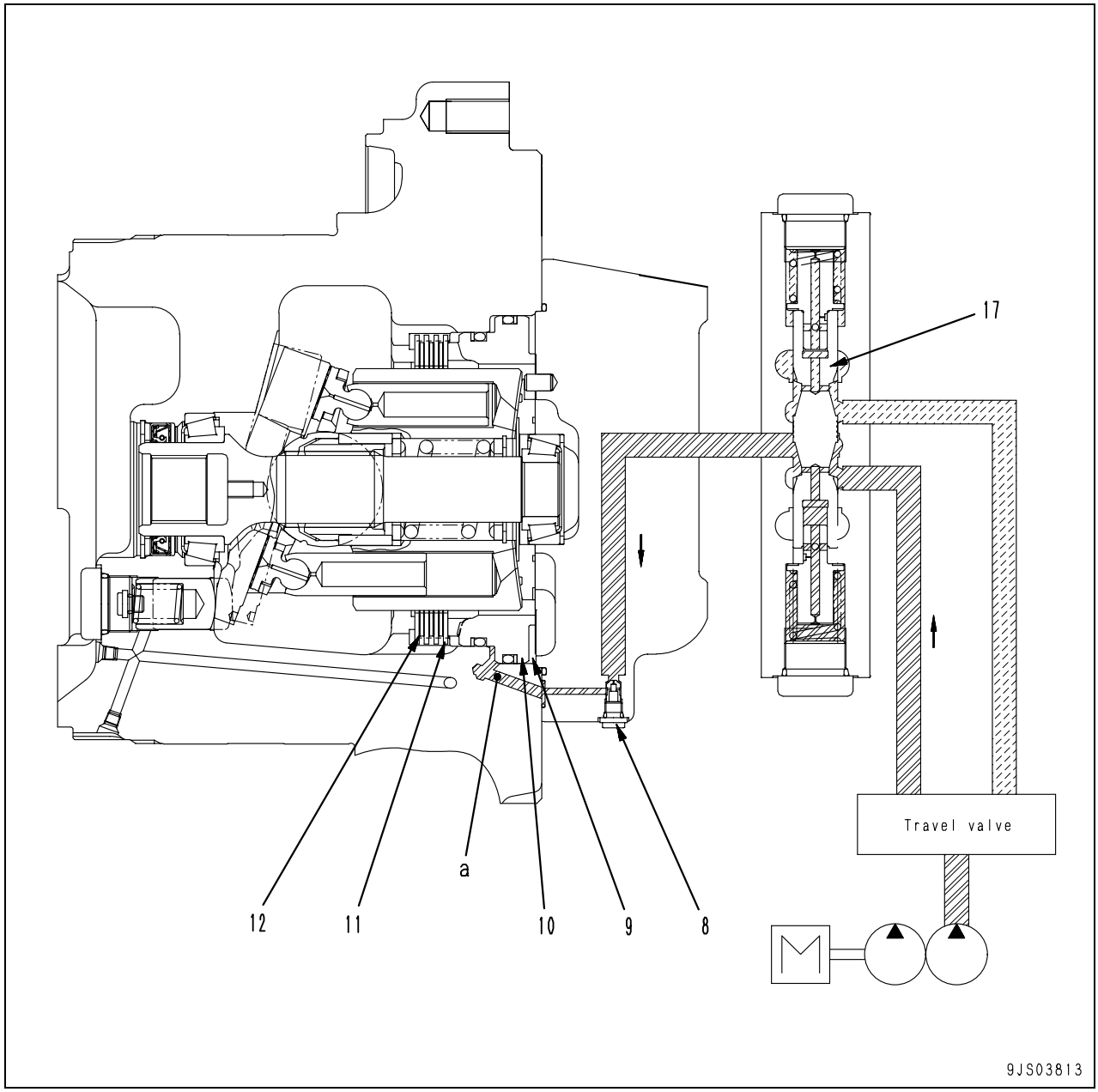
2) At high peed (motor swash plate angle at minimum)



- As the solenoid valve is energized, the pilot pressurized oil from the self pressure reducing valve flows to port (P).
- Regulator valve (21) is pushed to the left.
- The pressurized oil from the control valve passes through passage (d) in regulator valve (21) and enters regulator piston (13).
- Regulator piston (13) is pushed to the right.
- Rocker cam (3) is inclined in the minimum swash plate angle direction. The motor capacity becomes minimum, turning on the high speed travel.

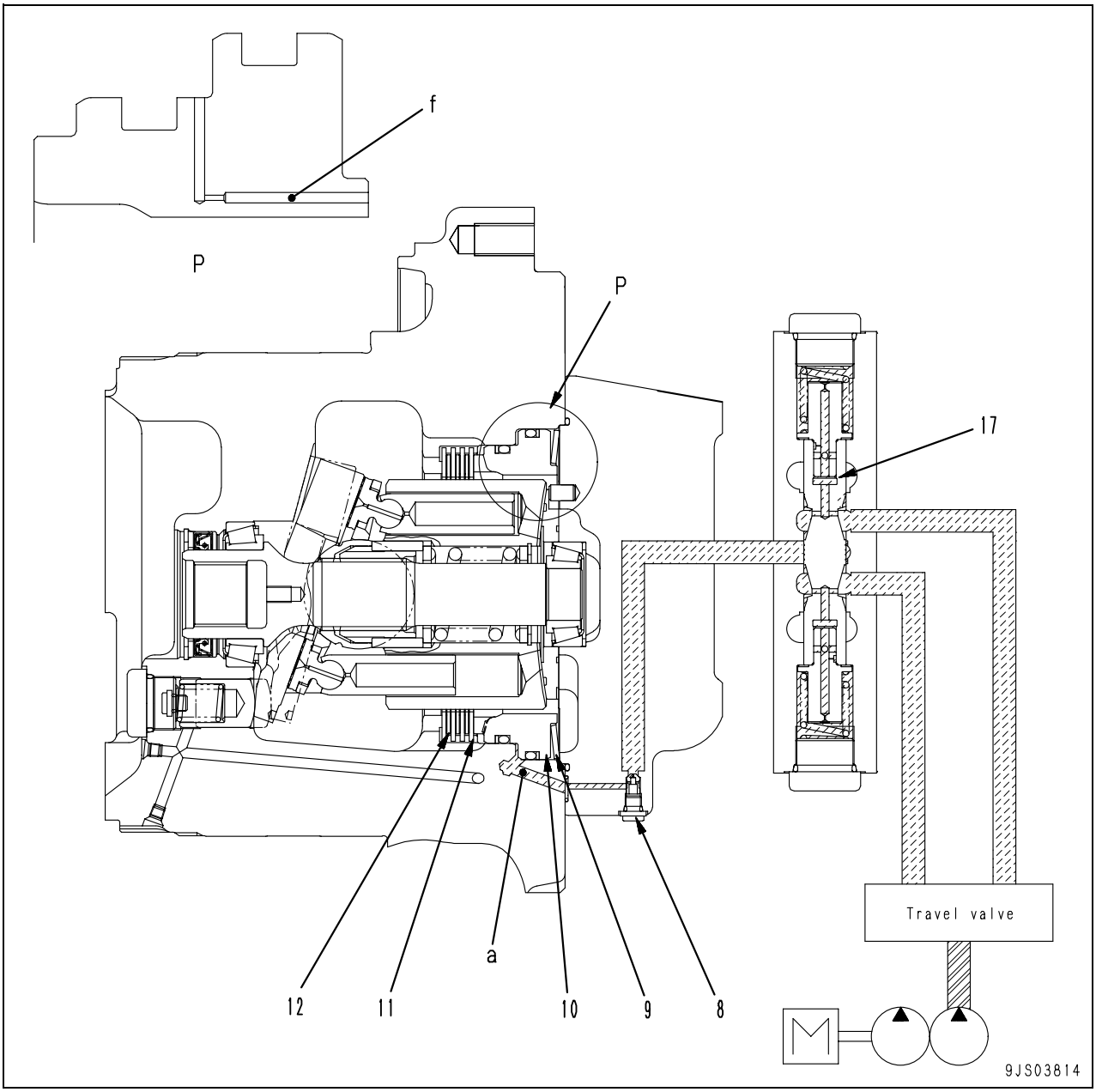
Operation of parking brake

1) When starting travel



- As the travel lever is operated, pressurized oil from the pump activates counterbalance valve spool (17), opening the parking brake circuit.
- The pressurized oil is conducted to chamber (a) of brake piston (10) and compresses spring (9), pushing piston (10) toward right.
- Since the pushing force to plate (11) and disc (12) disappears, plate (11) is separated from disc (12) and the brake is released.

2) When travel is stopped



- As the travel lever is placed in neutral, counterbalance valve spool (17) returns to the neutral position and closing the parking brake circuit.
- The pressurized oil in chamber (a) of brake piston (10) passes through orifice (f) of brake piston (10) and is drained to the motor case.
- Brake piston (10) is pushed to the right by spring (9).
- Plate (11) and disc (12) are pushed together, and the brake is applied.
- As brake piston (10) returns, flow of pressurized oil is reduced with slow return valve (8).
- The time delay will be set to activate the brake only after the machine has stopped.

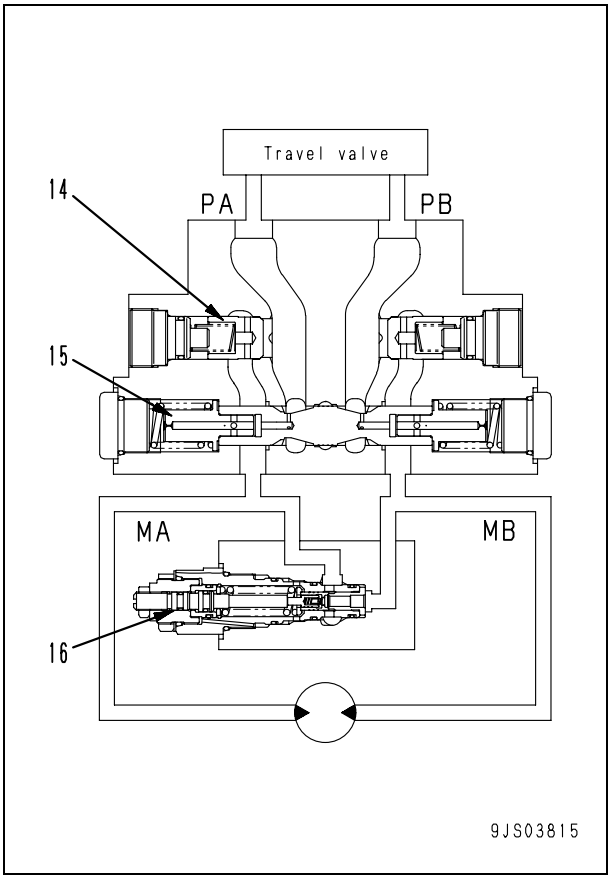
Brake valve

- The brake valve consists of check valves (14), counterbalance valve (15) and safety valve (16).
- Functions and operations of respective components shall conform to the following.

1. Counterbalance valve and check valve

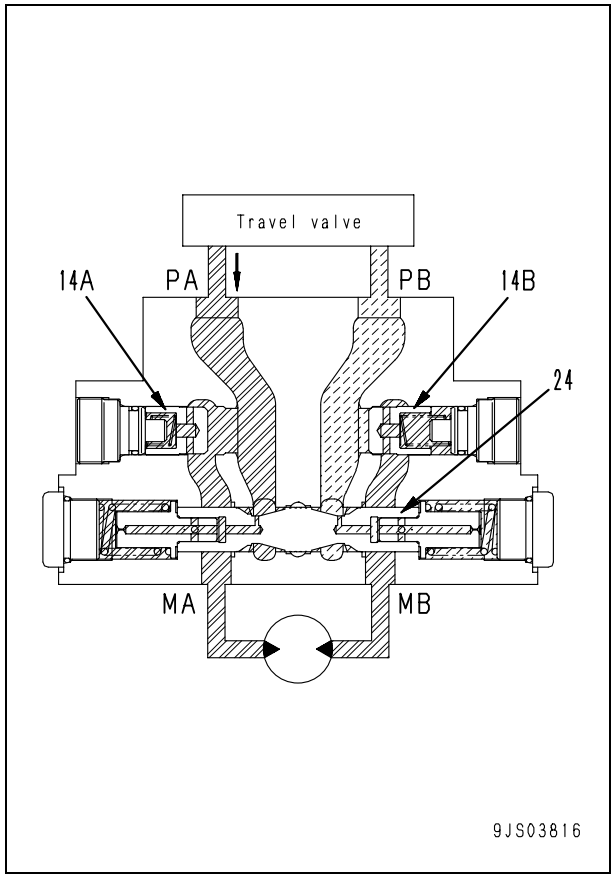
Function

- When traveling downhill, the machine travel speed tends to get faster than the motor (engine) speed because of the downward force generated from its own weight.
- If the machine travels with the engine at low speed, the motor may rotate without load, causing the machine to run away, resulting in a very dangerous situation.
- These valves are used to prevent above by controlling the machine to travel according to the engine speed (pump delivery).

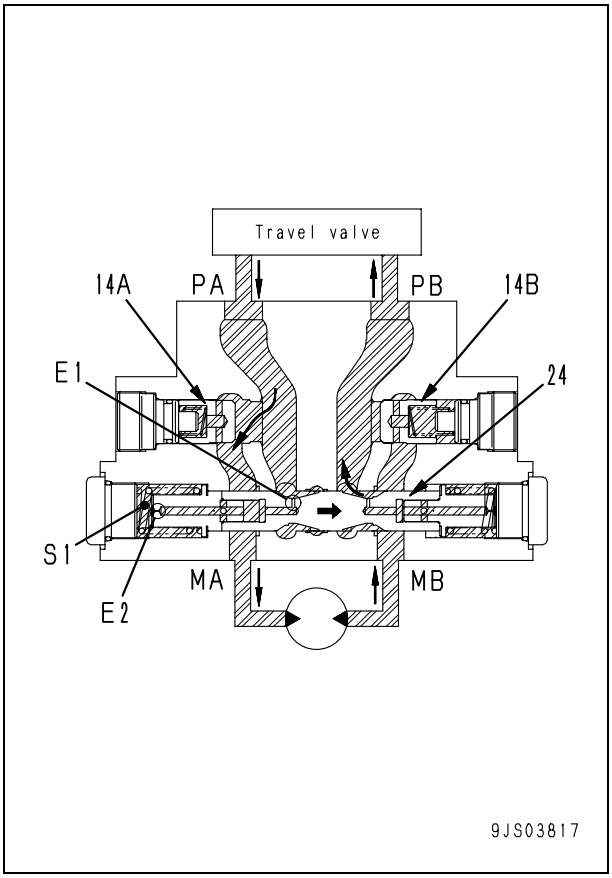


Operation when pressurized oil is supplied

- Operating the travel lever conducts the pressurized oil from the control valve to port (PA).
- The pressurized oil push-opens check valve (14A) and then flows to motor outlet port (MB) via motor inlet port (MA).
- The motor outlet side is closed by check valve (14B) and spool (24), so the pressure at the supply side rises.

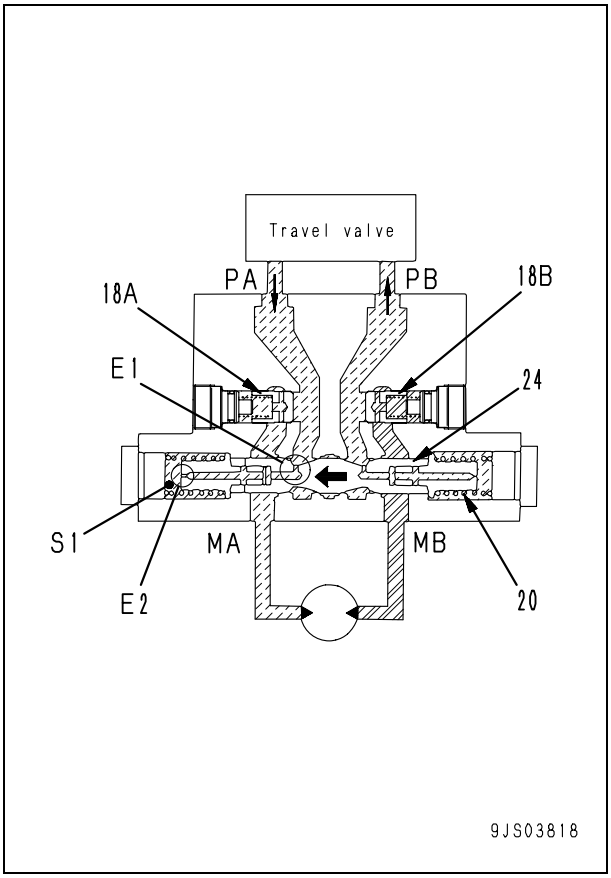


- The pressurized oil on the supply side flows to chamber (S1) via orifice (E1) and orifice (E2) of the spool (24).
- As the pressure in chamber (S1) goes above the spool selector pressure, spool (24) is pushed toward right.
- Port (MB) and port (PB) are connected, opening the motor outlet port side and starting the motor rotating.



Operation of brake during travelling downhill

- If indication of the machine runaway is sensed while travelling downhill, the motor will be caused to rotate without load to decrease the inlet side oil pressure.
- Pressure in chamber (S1) is released via orifices (E1) and (E2).
- As the pressure in chamber (S1) goes below the spool selector pressure, spool (24) is returned to the left by spring (20) and outlet port (MB) is throttled.
- The pressure at the outlet port side rises, generating rotation resistance on the motor to prevent the machine from running away.
- The spool moves to a position where the pressure on outlet port (MB) can be balanced against the machine's own weight and the inlet port pressure.
- Oil flow from the outlet circuit is reduced to ensure the travel speed corresponded to the pump delivery.



2. Safety valve (bidirectional 2-stage set safety valve)

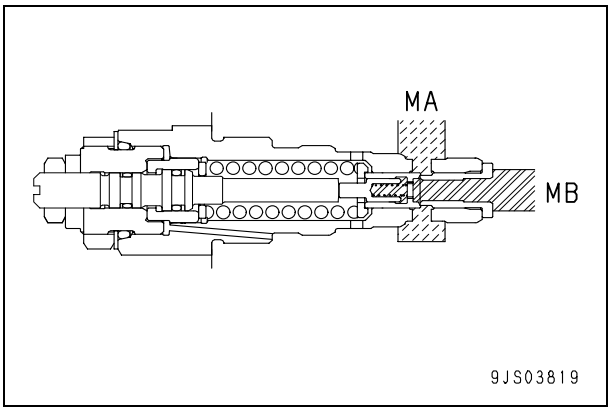
Function

- As long as the machine travel is stopped (or it is travelling downhill), the counterbalance valve closes the inlet and outlet circuits of the motor.
- Since the motor is rotated by inertial force, pressure in the motor outlet port side is abnormally increased, potentially resulting in damages on the motor and piping.
- The safety valve releases this abnormal pressure to the inlet port side of the motor in order to prevent damages to the equipment.

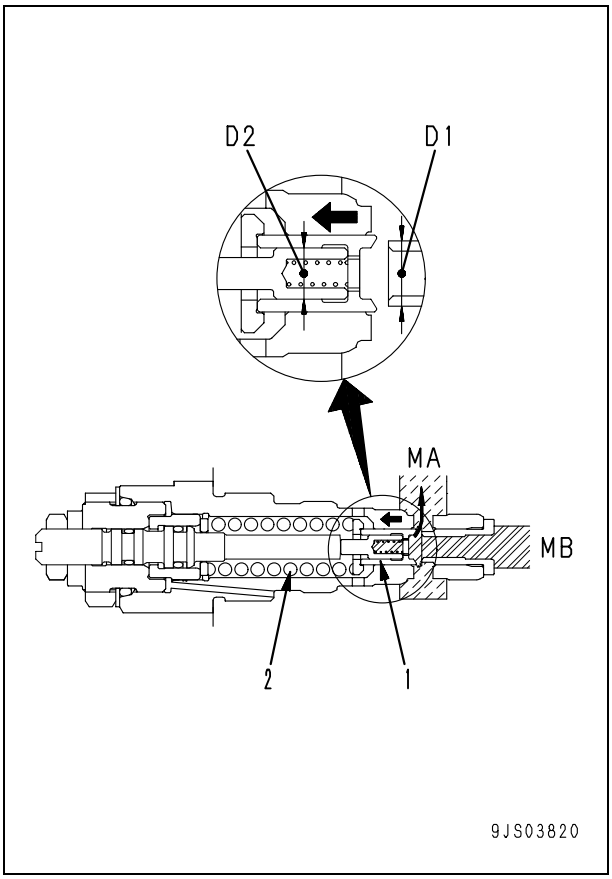
Bidirectional action

1) When pressure in chamber (MB) has become high (when rotating clockwise)

- As long as the machine travel is stopped (or it is travelling downhill), the check valve of counterbalance valve closes chamber (MB) of the outlet port circuit.
- The motor tries to continue rotation resorting to inertial force, thus pressure on the outlet port (MB) is increased.

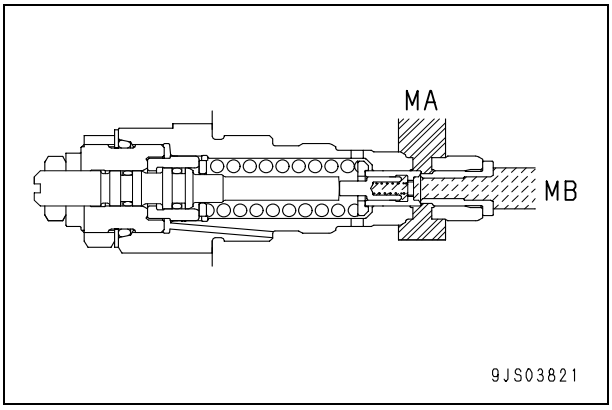


- As the pressure goes above the set pressure, [Difference in areas of circles (D1) and (D2) x Pressure] compresses spring (2).
- Poppet (1) is moved leftward and the pressurized oil flows into chamber (MA) of the opposite circuit.

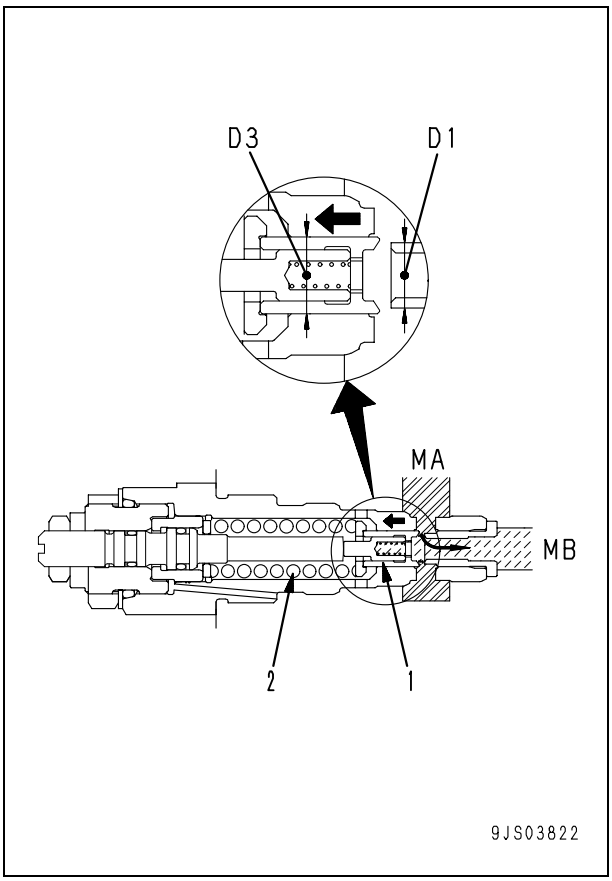


2) When pressure in chamber (MA) has become high (when rotating counterclockwise)

- As long as the machine travel is stopped (or it is travelling downhill), the check valve of counterbalance valve closes chamber (MA) of the outlet port circuit.
- The motor tries to continue rotation resorting to inertial force, thus pressure on the outlet port (MA) is increased.



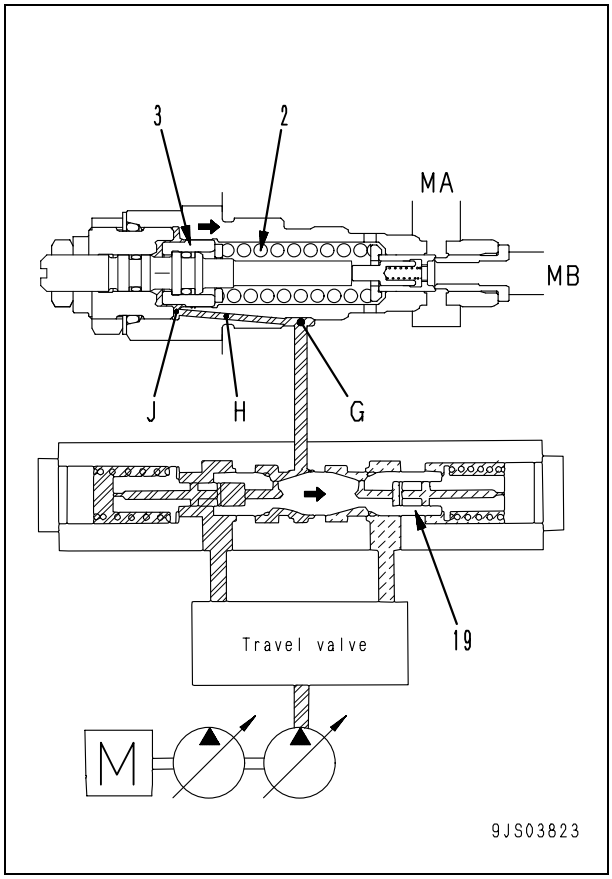
- As the pressure goes above the set pressure, [Difference in areas of circles (D1) and (D3) x Pressure] compresses spring (2).
- Popoppet (1) is moved leftward and the pressurized oil flows into chamber (MB) of the opposite circuit.



Operation of mechanism for varying set pressure

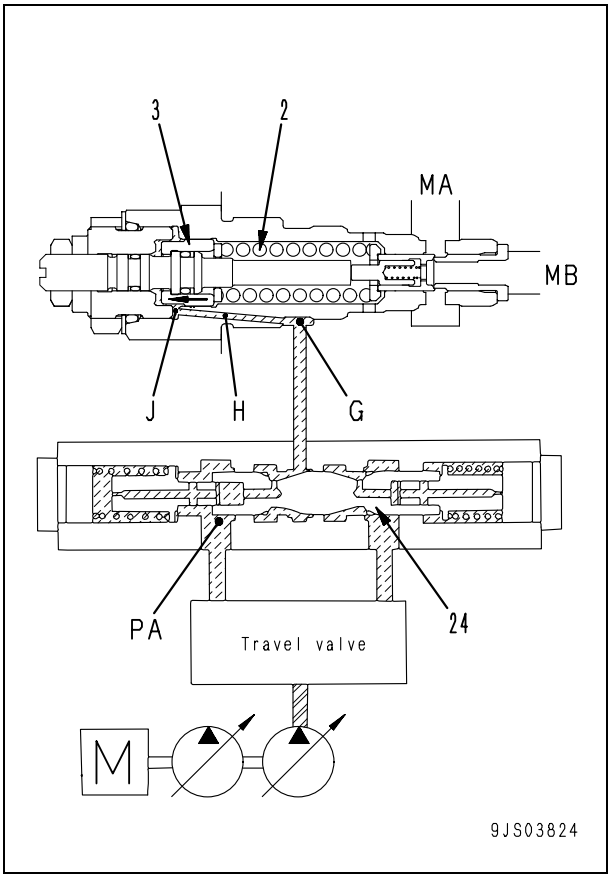
1) When starting travel (high-pressure setting)

- As the travel lever is operated, the pressurized oil from the pump moves spool (19) toward right.
- Above opens the pilot circuit to the safety valve, conducting the pressurized oil to chamber (J) via chamber (G) and passage (H).
- Piston (3) is pushed rightward, spring (2) is compressed and the set load is increased.
- High pressure is turned on the safety valve, providing a large tractional force to the valve.



2) When travel is stopped (low-pressure setting)

- When the travel lever is placed in neutral, the pressure in chamber (PA) drops and spool (24) returns to the neutral position.
- When spool (24) is in the process of returning to the neutral position, the pressurized oil in chamber (J) flows to chamber (PA) via passage (H) and chamber (G).
- Piston (3) moves to the left side, decreasing the set load.
- The safety valve is caused to the low pressure setting, thereby attenuating the shocks when the speed is reduced.

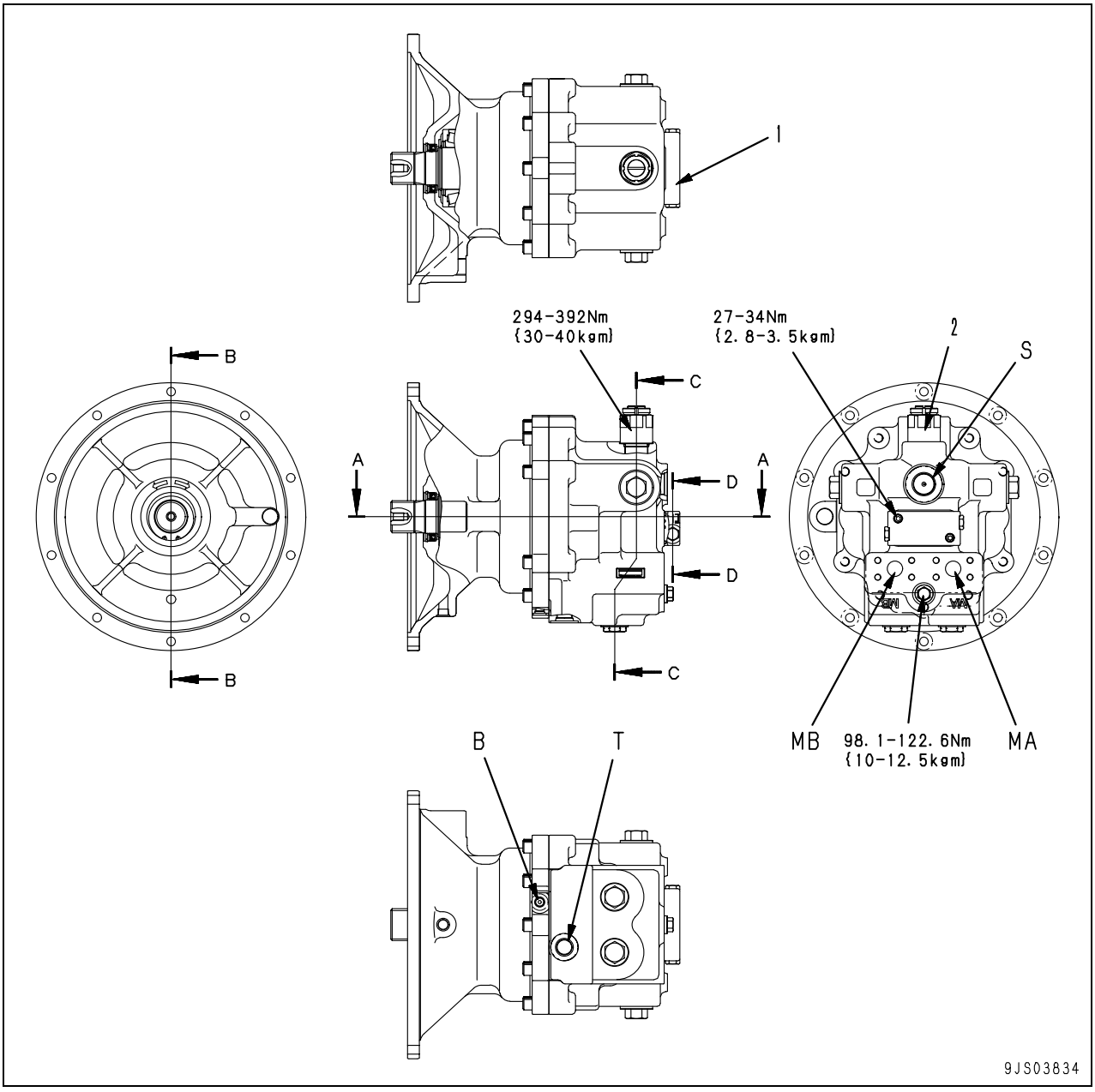


Set pressure of safety valve

High pressure setting:
40.2 MPa {410 kg/cm^2}
(at start of travel and during travel)
Low pressure setting:
27.5 MPa {280 kg/cm^2} (during stop)

Swing motor

Type: KMF230ABE-5

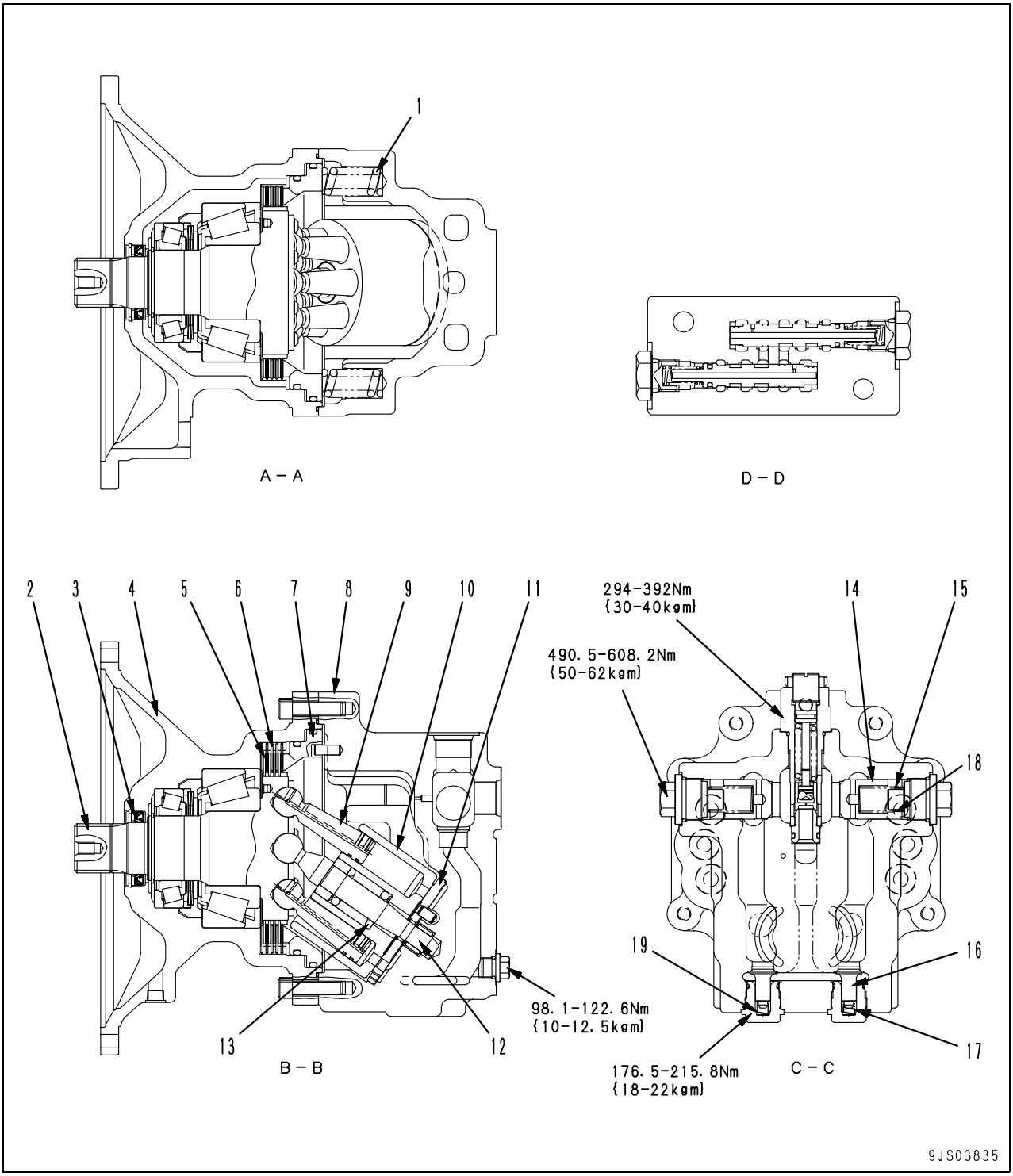


B: From swing holding brake solenoid
MA: From control valve
MB: From control valve
S: From control valve
T: To tank

1. Reverse prevention valve
2. Safety valve

Specifications

Type	: KMF230ABE-5
Theoretical displacement	: 229.4 cm^3/rev
Safety valve set pressure	: 27.9 MPa {285 kg/cm^2}
Rated engine speed	: 1,130 rpm
Brake release pressure	: 1.9 MPa {19 kg/cm^2}


1
A – A
D – D
2
3
4
5
6
7
8
9
10
11
294-392Nm
{30-40kgm}
490. 5-608. 2Nm
{50-62kgm}
14
15
18
19
16
17
98. 1-122. 6Nm
{10-12. 5kgm}
13
12
B – B
176. 5-215. 8Nm
{18-22kgm}
C – C
9JS03835

1. Brake spring
2. Drive shaft
3. Spacer
4. Case
5. Disc
6. Plate
7. Brake piston
8. Housing
9. Piston
10. Cylinder block
11. Valve plate
12. Center shaft
13. Center spring
14. Check valve
15. Check valve spring
16. Shuttle valve
17. Shuttle valve spring

Unit: mm

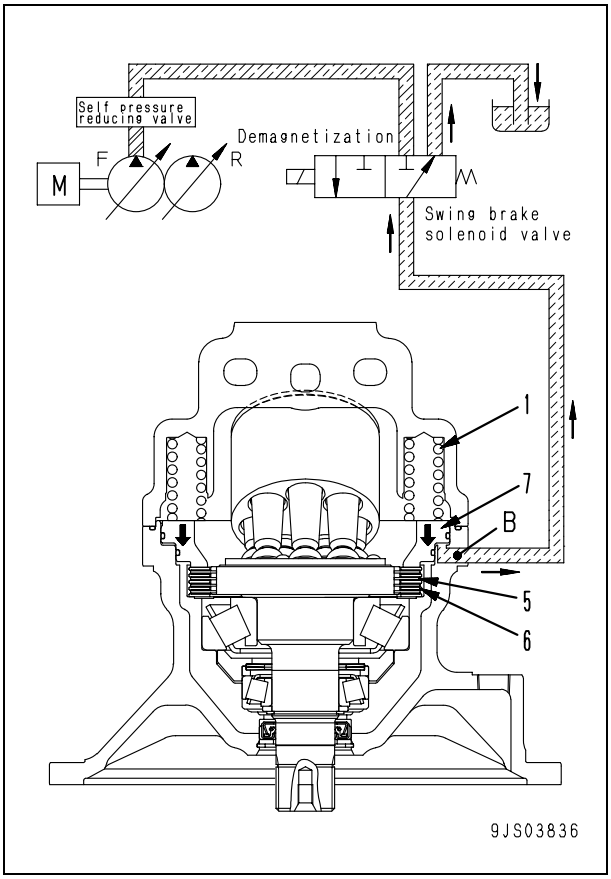
No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
18	Check valve spring	Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring.
		66.5 x 25.6	45.0	6.96 N {0.71 kg}	—	5.59 N {0.57 kg}	
19	Shuttle valve spring	24.5 x 11.6	14.5	7.45 N {0.76 kg}	—	5.98 N {0.61 kg}	

Swing holding brake

1. When solenoid valve is deenergized

Operation

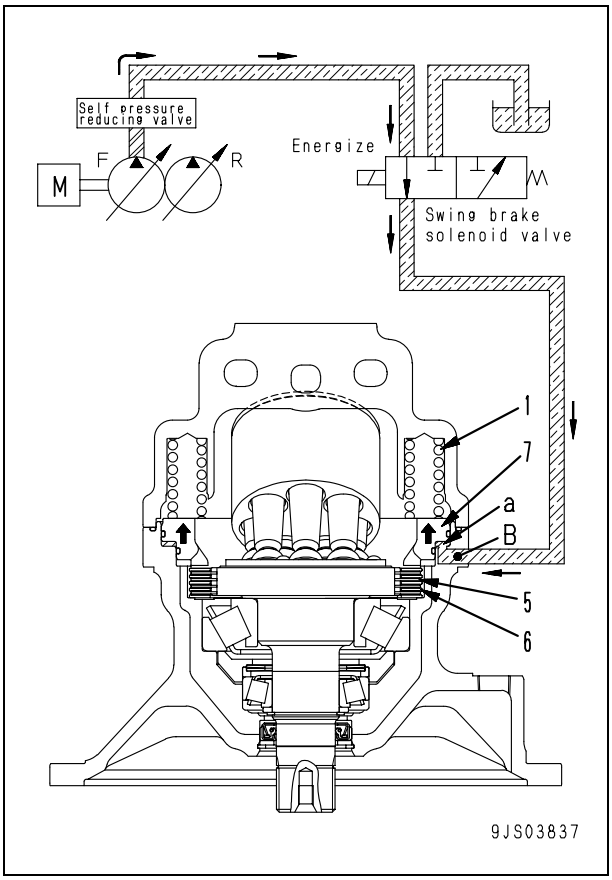
- As the swing holding brake is deenergized, the pressurized oil from the self pressure reducing valve is shut off.
- Port (B) is connected to tank circuit (T).
- Brake piston (7) is pushed down by brake spring (1).
- Disc (5) and plate (6) are pushed together, and the brake is applied.



2. When solenoid valve is energized

Operation

- As the swing brake solenoid valve is energized, the valve is switched.
- The pressurized oil from the self pressure reducing valve is conducted brake chamber (a) via port (B).
- After entering chamber (a), the pressurized oil compresses brake spring (1) and pushes brake piston (7) up.
- Disc (5) is separated from plate (6), releasing the brake.



Relief valve portion

Outline

- The relief valve portion consists of check valves (2) and (3), shuttle valves (4) and (5), and relief valve (1).

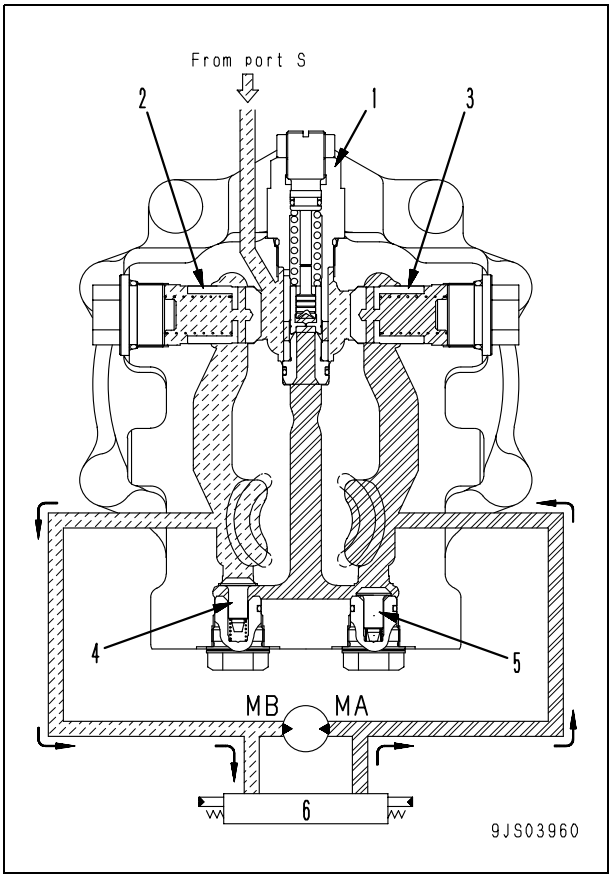
Function

- When the machine is in the swing holding mode, control valve (6) closes the motor outlet circuit, but the motor rotation is continued by inertial force.
- The motor output, therefore, is abnormally increased, resulting in damaging the motor.
- In order to prevent the motor damages, the relief valve relieves the abnormally high pressure to port (S) from the motor outlet side (high-pressure side) of the motor.

Operation

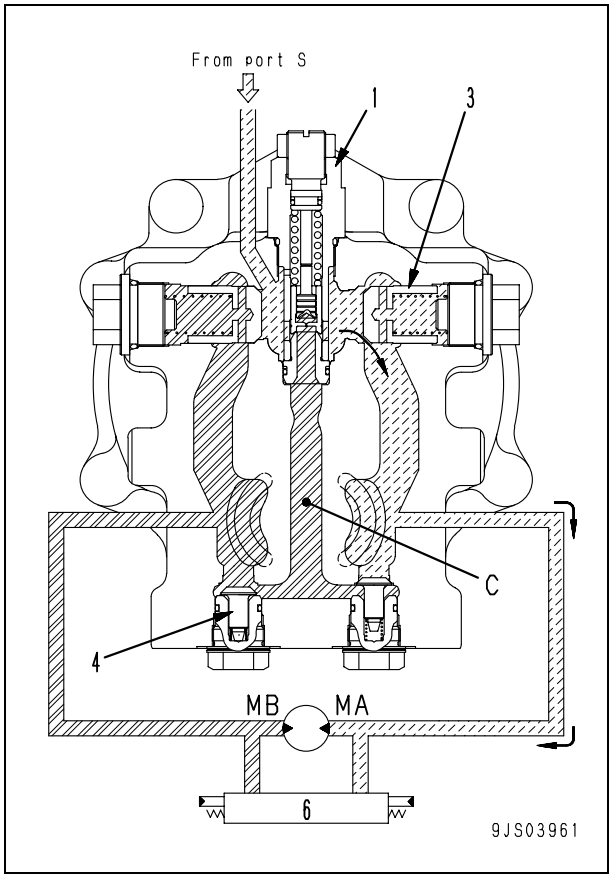
1. When starting swing

- When the swing control lever is operated to the right- swing, the pressurized oil from the pump is supplied to port (MA) via control valve (6).
- The pressure on port (MA) rises, the starting torque is generated in the motor, and the motor starts to rotate.
- The pressurized oil from the outlet port of the motor passes from port (MB) through the control valve (6) and returns to the tank.

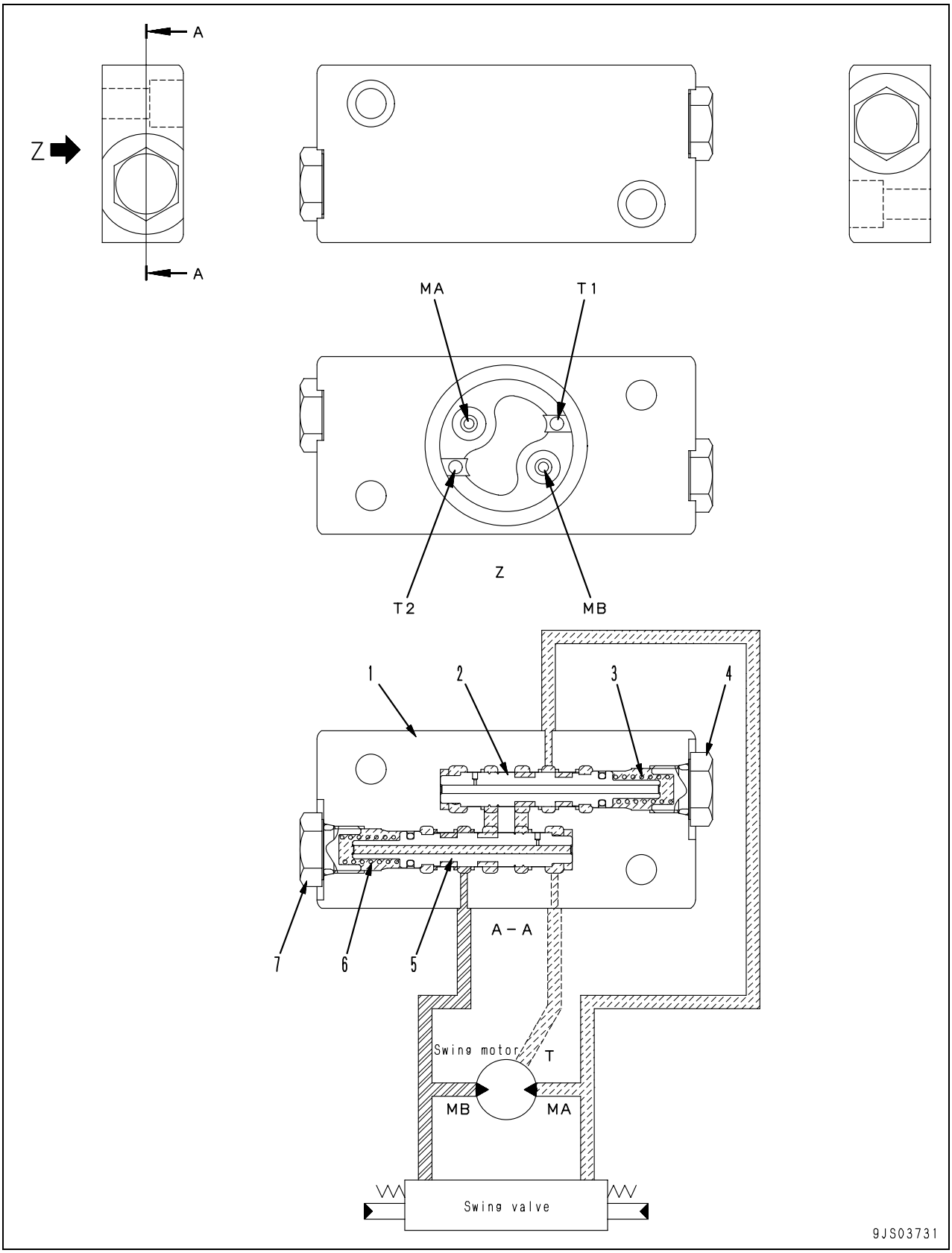


2. When swing is stopped

- When the swing control lever is returned to neutral, the supply of pressurized oil from the pump to port (MA) is stopped.
- The pressurized oil from the motor outlet can't return to the tank since the returning circuit to the tank is closed from control valve (6). Thus, pressure on port (MB) increases.
- Rotation resistance is generated on the motor and hence the brake starts working.
- Shuttle valve (4) is pressed as pressure on port (MB) goes above port (MA).
- The pressure on chamber (C) is increased to the set pressure of relief valve (1) and becomes the same as that of port (MB).
- A high braking torque works on the motor, thereby stopping the motor.
- When relief valve (1) is being actuated, the relieved pressurized oil and the pressurized oil from port (S) are fed to port (MA) via check valve (3).
- Above prevents cavitation on port (MA).



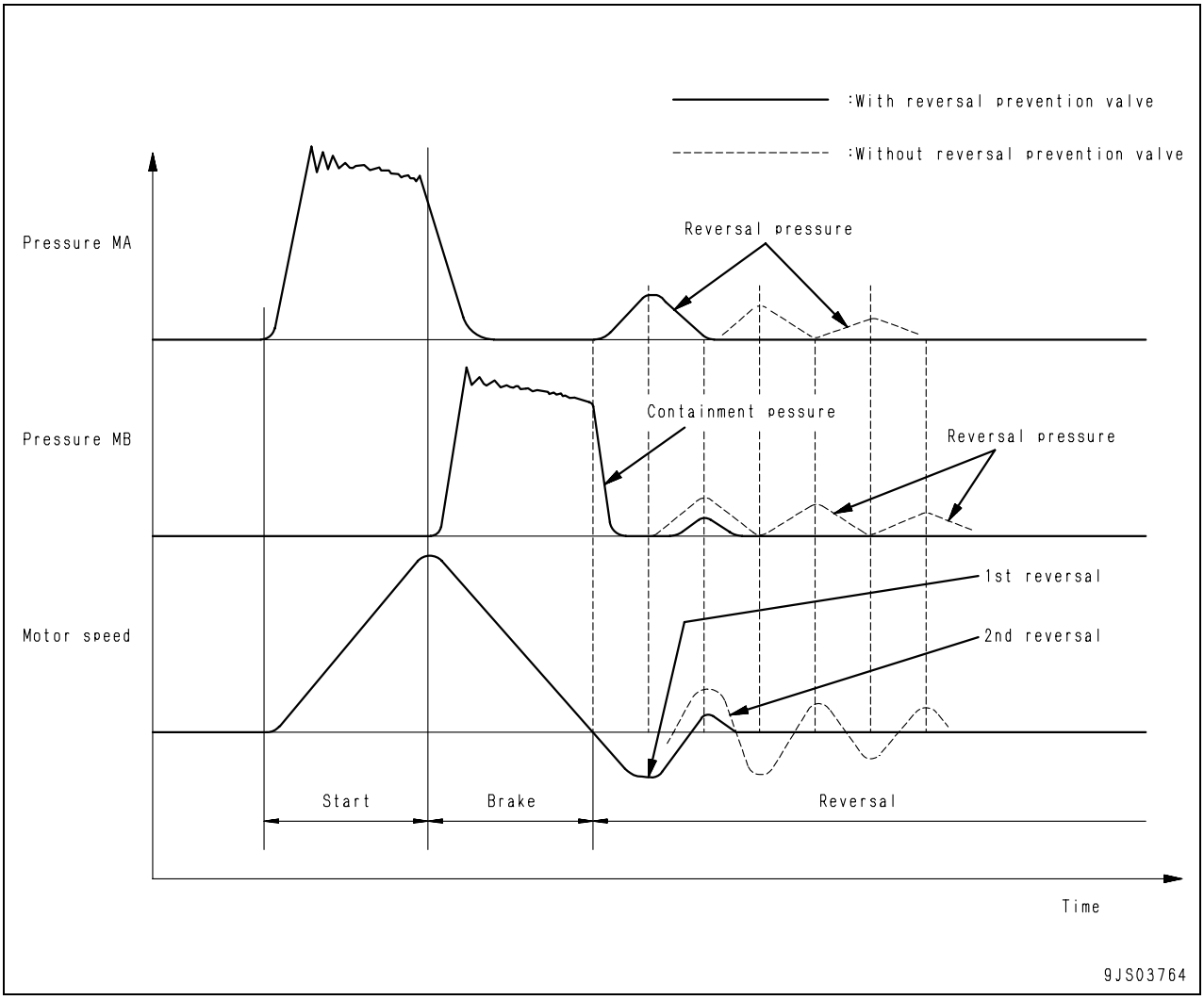
Reverse prevention valve



MA: From control valve
MB: From control valve
T1: To tank
T2: To tank

1. Valve body
2. Spool (MA side)
3. Spring (MA side)
4. Plug (MA side)
5. Spool (MB side)
6. Spring (MB side)
7. Plug (MB side)

Explanatory drawing of effects



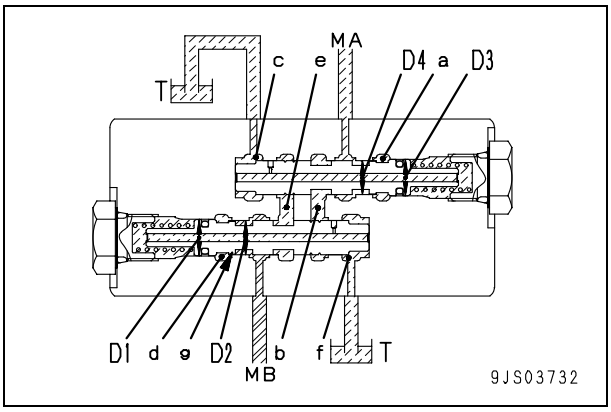
Function

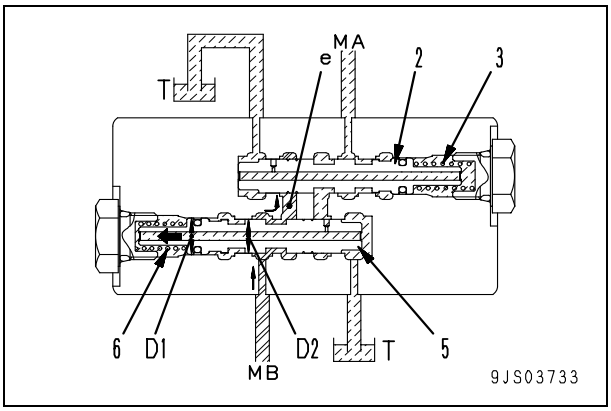
- This valve reduces the swing back generation in the swing body by the inertia of the swing body, the backlash and rigidity of the machinery system, and the compression of the hydraulic oil when the swing is stopped.
- The valve contributes in preventing collapsing of load when the swing is stopped and also contributes in reducing cycle time (enhances the positioning performance, enabling you to proceed to the next work quicker than ever).

Operation

1. When port (MB) brake pressure is generated

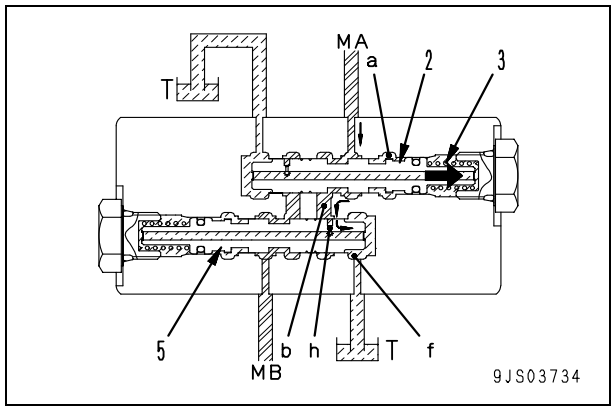
- Pressure (MB) is conducted to chamber (d) via notch (g).
- The pressure compresses spring (6) by use of the difference in areas of circles (ϕD1 > ϕD2) of spool (5) and moves spool (5) to the left side.
- Port (MB)→ chamber (e) will be interconnected.
- Since pressure (MA) is lower than the set pressure of spring (3), spool (2) does not move and the pressurized oil is kept in. Thus the braking force is ensured.





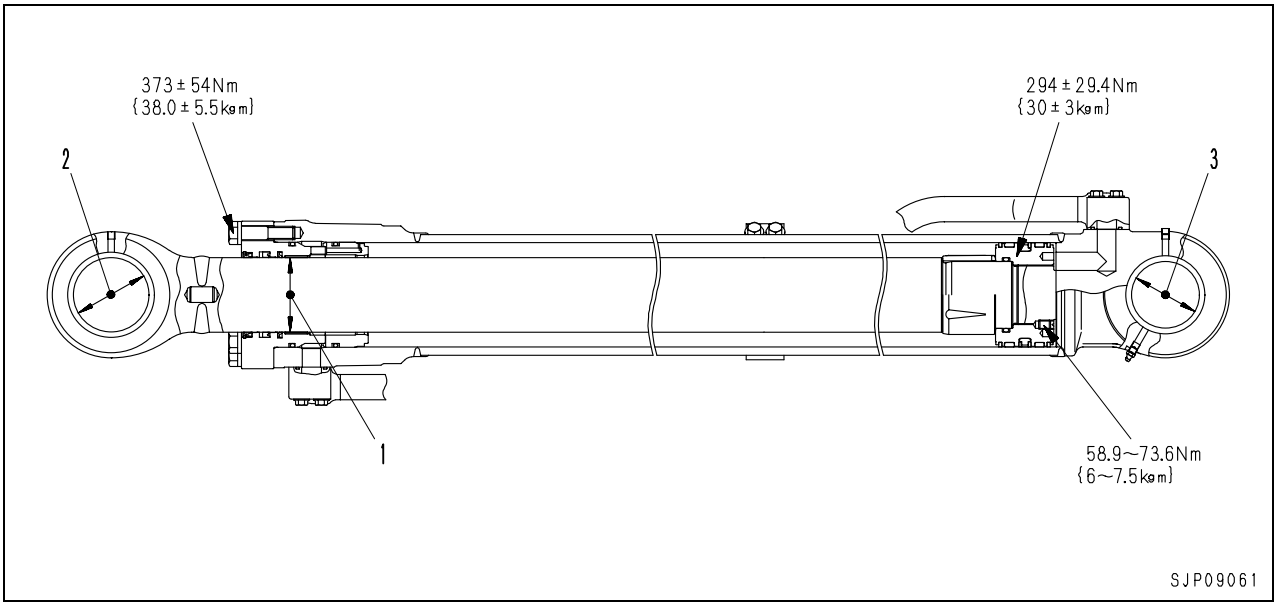
2. When motor is stopped temporarily

- The motor rotation is reversed by the closing pressure generated at port (MB). (1st time: reverse rotation)
- Reversing pressure is generated on port (MA). Pressure (MA) is conducted to chamber (a).
- The pressure compresses spring (3) by use of the difference in areas of circles (ϕD3 > ϕD4) of spool (2) and moves spool (2) to the right side.
- Port (MA) → chamber (b) will be interconnected.
- Then ports (b) and (f) will be interconnected through the drilled hole (h) on spool (5). This interconnection bypasses the reversing pressure on port (MA) to port (T), thereby preventing the reverse rotation of the 2nd time.

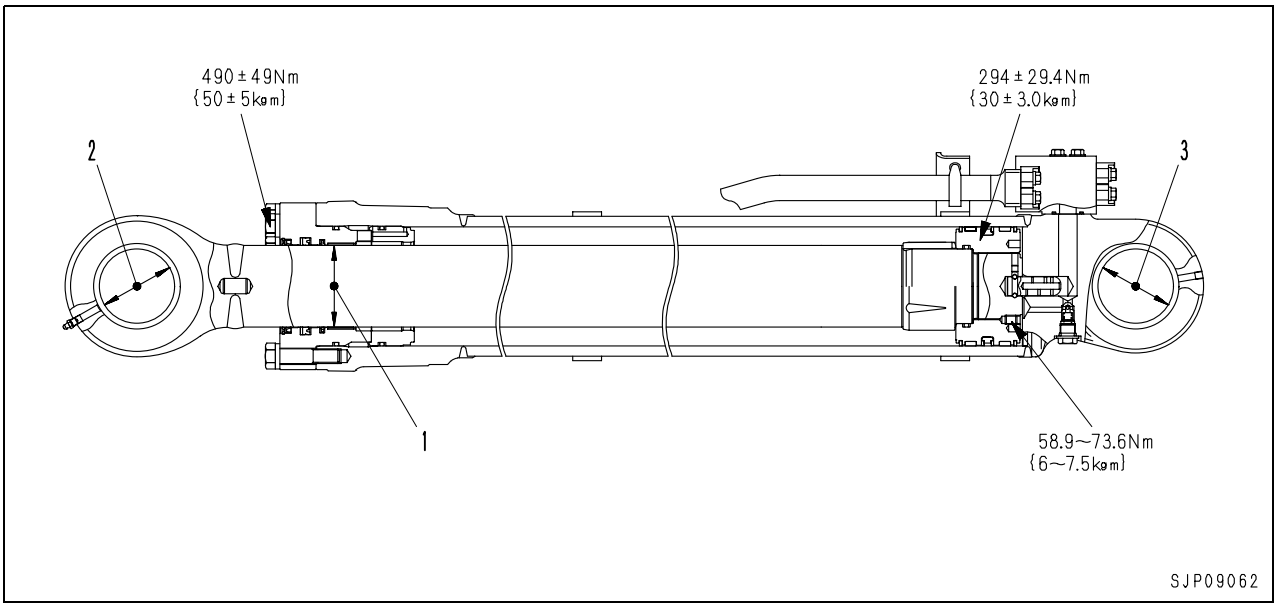


Hydraulic cylinder

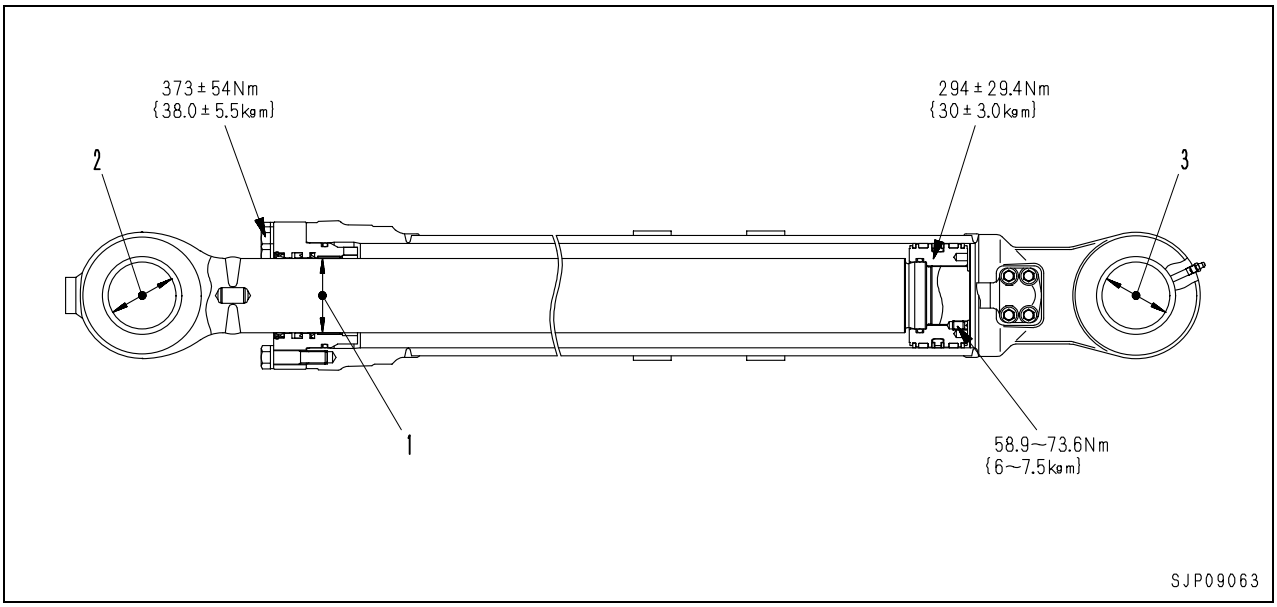
Boom cylinder



Arm cylinder



Bucket cylinder



Unit: mm

No.	Check item		Criteria					Remedy
		Cylinder	Standard size	Tolerance		Standard clearance	Clearance limit	
				Shaft	Hole			
1	Clearance between piston rod and bushing	Boom	100	-0.036 -0.090	+0.035 +0.005	0.041 – 0.125	0.412	Replace bushing
		Arm	110	-0.036 -0.090	+0.261 +0.047	0.083 – 0.351	0.412	
		Bucket	100	-0.030 -0.076	+0.257 +0.047	0.083 – 0.347	0.447	
2	Clearance between piston rod support shaft and bushing	Boom	100	-0.030 -0.060	+0.190 +0.070	0.100 – 0.250	—	Replace pin or bushing
		Arm	100	-0.030 -0.076	+0.190 +0.070	0.105 – 0.251	—	
		Bucket	90	-0.030 -0.076	+0.190 +0.070	0.100 – 0.246	—	
3	Clearance between cylinder bottom support shaft and bushing	Boom	90	-0.030 -0.060	+0.190 +0.070	0.075 – 0.225	—	
		Arm	100	-0.030 -0.076	+0.190 +0.070	0.105 – 0.251	—	
		Bucket	90	-0.030 -0.060	+0.190 +0.070	0.100 – 0.230	—	

PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN01995-00

HYDRAULIC EXCAVATOR

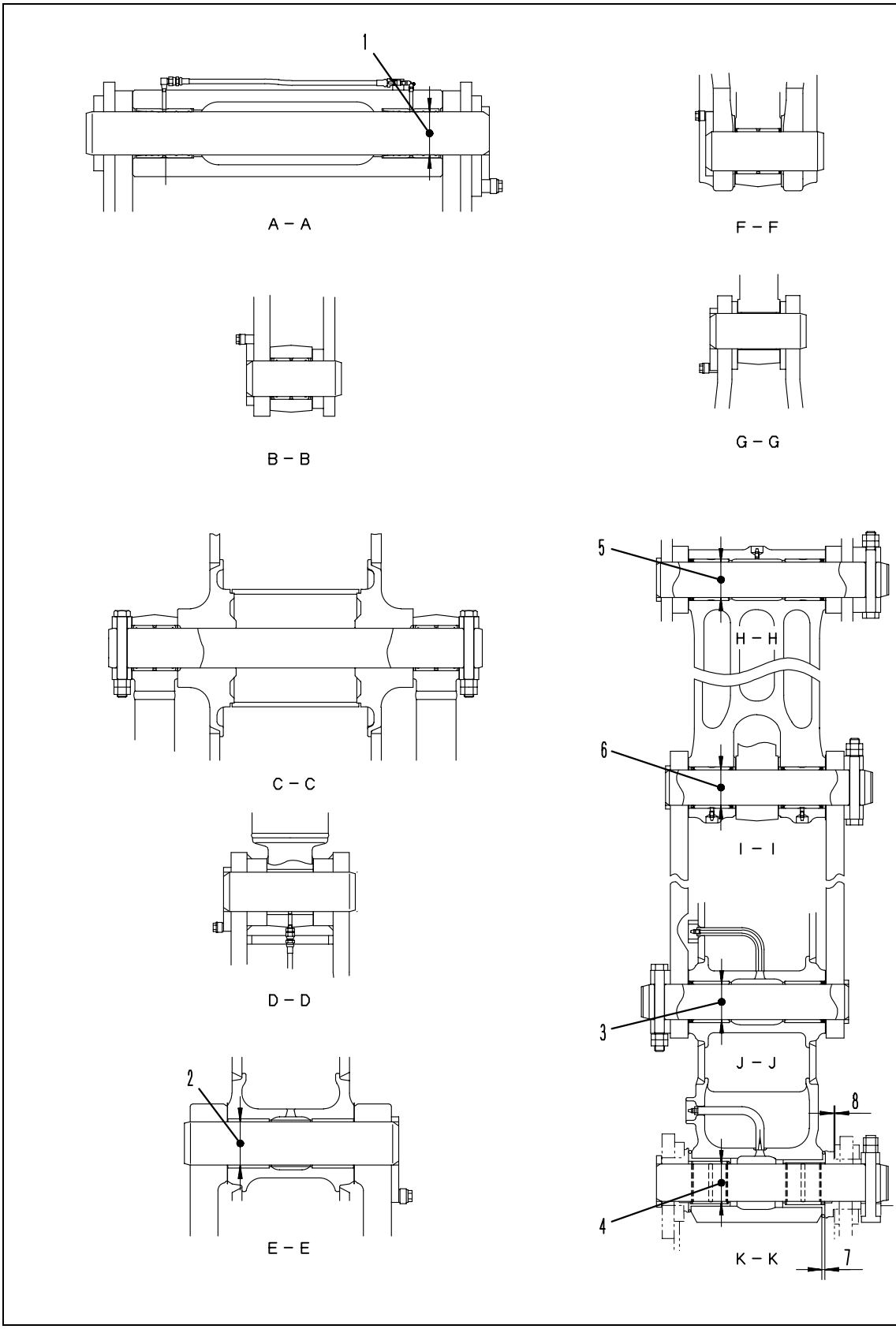
PC300-8
PC300LC-8
PC350-8
PC350LC-8

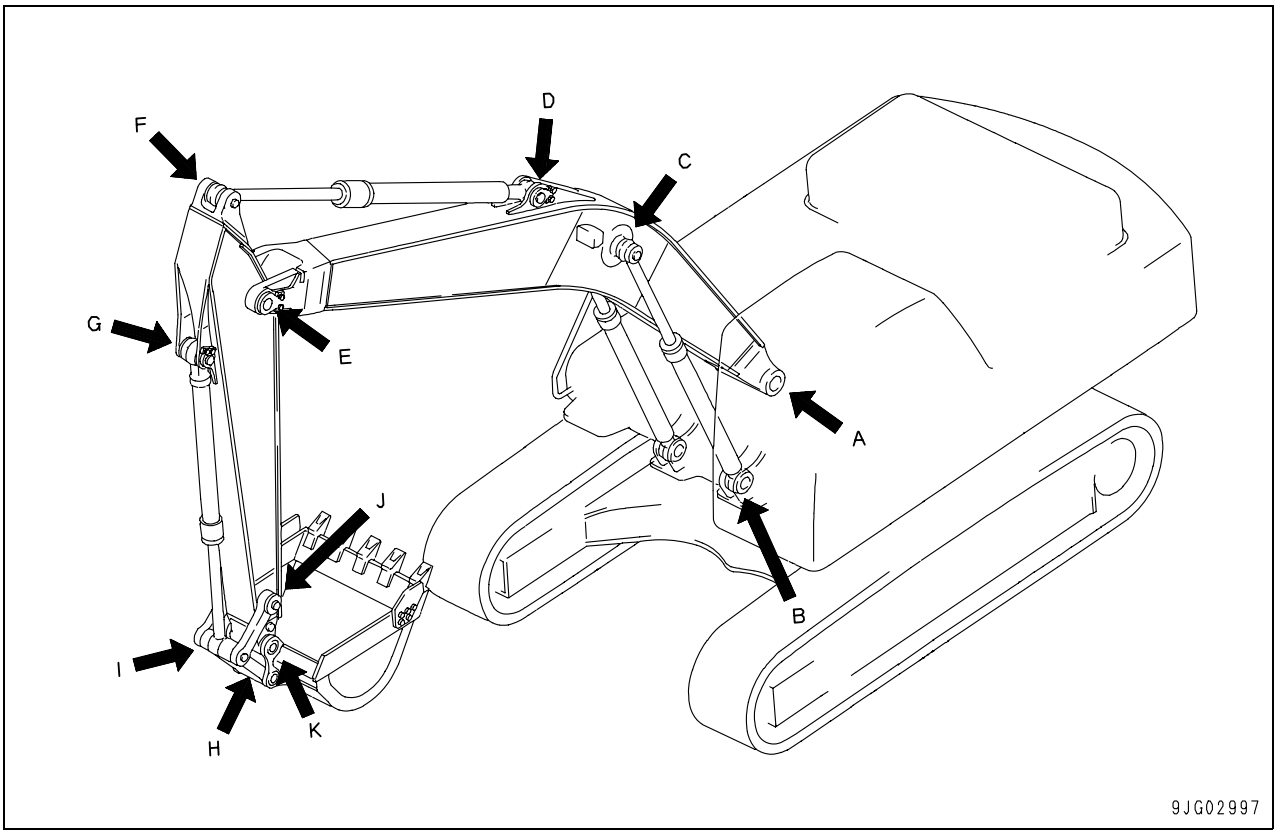
Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

10 Structure, function and maintenance standard

Work equipment

Work equipment



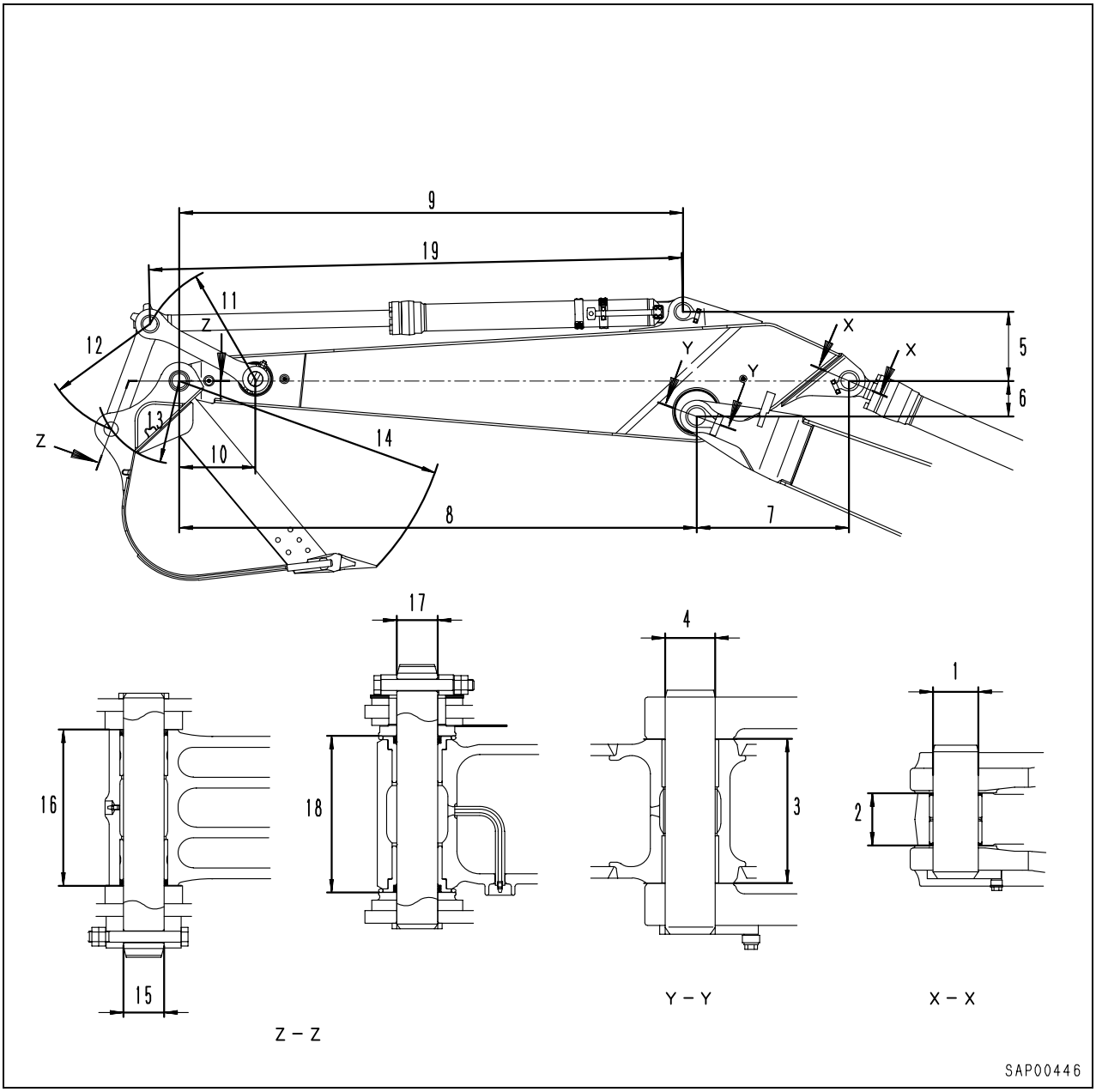


Unit: mm

No.	Check item	Criteria					Remedy
		Standard size	Tolerance		Standard clearance	Clearance limit	
			Shaft	Hole			
1	Clearance between pin connecting boom and revolving frame and bushing	110	–0.036 –0.090	+0.157 +0.079	0.115 – 0.247	1.0	Replace
2	Clearance between pin connecting boom and arm and bushing	110	–0.036 –0.090	+0.179 +0.081	0.117 – 0.269	1.0	
3	Clearance between pin connecting arm and link and bushing	90	–0.036 –0.090	+0.165 +0.072	0.108 – 0.255	1.0	
4	Clearance between pin connecting arm and bucket and bushing	90	–0.036 –0.090	+0.145 +0.083	0.119 – 0.235	1.0	
5	Clearance between pin connecting link and bucket and bushing	90	–0.036 –0.090	+0.165 +0.072	0.108 – 0.255	1.0	
6	Clearance between pin connecting links and bushing	90	–0.036 –0.090	+0.163 +0.069	0.105 – 0.253	1.0	
7	Bucket clearance (a)	0.5 – 1.0					Adjust shims
9	Bucket clearance (b)	2.0					

Dimensions of components

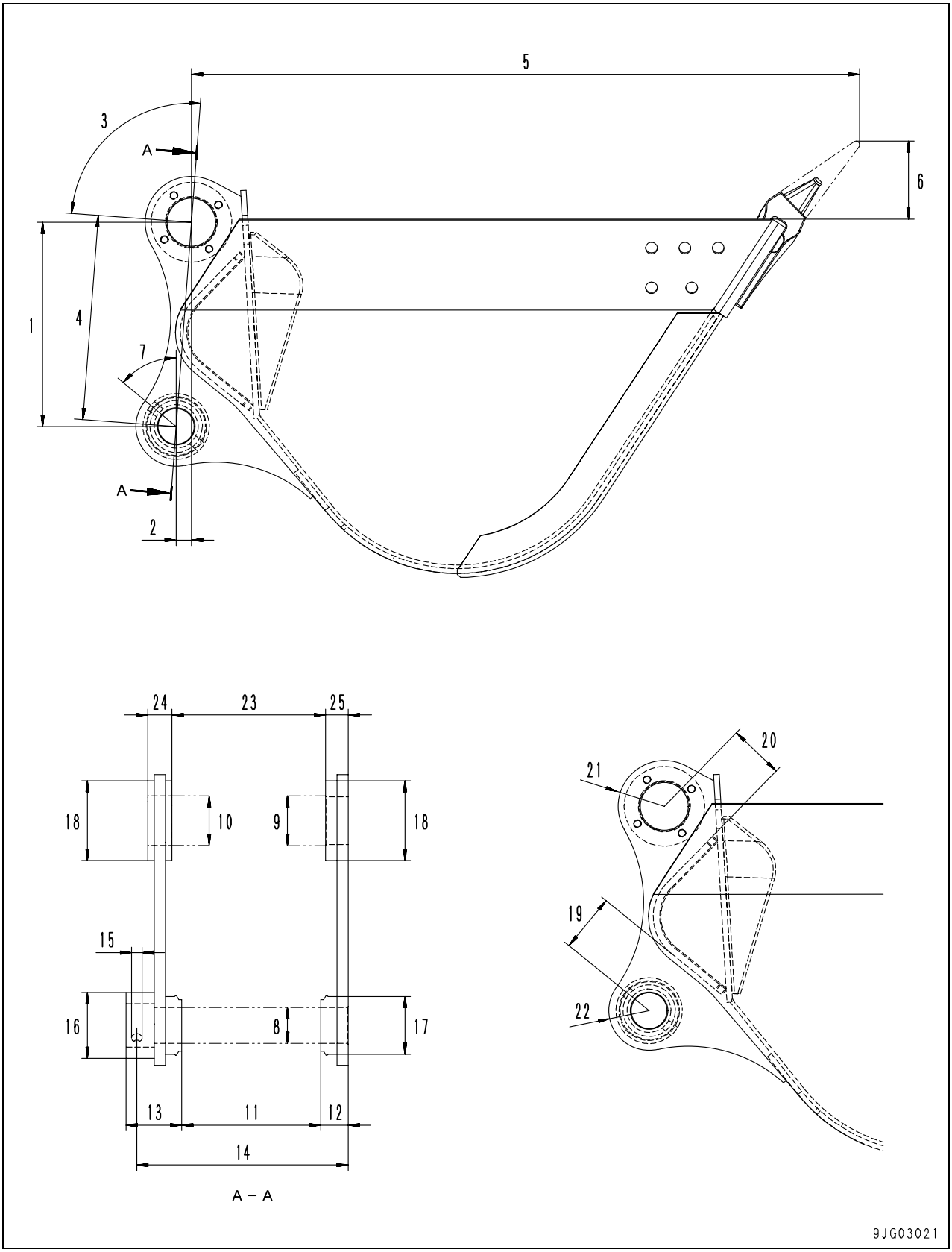
1. Dimension of arm



Unit: mm

No.	Measuring position	PC300-8			PC350-8		
		Standard size	Tolerance		Standard size	Tolerance	
			Shaft	Hole		Shaft	Hole
1	–	ϕ100	–0.036 –0.071	+0.1 0	ϕ100	–0.036 –0.071	+0.1 0
2	Arm side	119.3	+1.5 0		119.3	+1.5 0	
	Cylinder head side	116	±1.2		116	±1.2	
3	Boom side	320	+0.5 0		320	+0.5 0	
	Arm side	316	–0.3 –0.8		316	–0.3 –0.8	
4	–	ϕ110	–0.036 –0.090	+1.0 0	ϕ110	–0.036 –0.090	0 –0.5
5	–	470.6	±1		470.6	±1	
6	–	236.5	±0.5		236.5	±0.5	
7	–	1022.4	±1		1022.4	±1	
8	–	3178	±3		3178	±3	
9	–	2975.6	±1		2975.6	±1	
10	–	472.5	–		472.5	±1.0	
11	–	731.0	±0.2		731.0	±0.2	
12	–	728.0	±0.5		728.0	±0.5	
13	–	513.6	–		513.6	–	
14	–	1670	–		1670	–	
15	–	ϕ90	–0.036 –0.090	+0.2 0	ϕ90	–0.036 –0.090	+0.2 0
16	–	345.0	±0.5		345.0	±0.5	
17	–	ϕ80	–0.036 –0.090	+0.2 0	ϕ80	–0.036 –0.090	+0.2 0
18	Arm itself	330	0 –0.5		330	0 –0.5	
	When press fitting bushing	345	–		345	–	
19	Min.	1870	–		1870	–	
	Max.	3155	–		3155	–	

2. Dimension of bucket



Unit: mm

No.	Measuring position	PC300-8		PC350-8	
		Standard size	Tolerance	Standard size	Tolerance
1	–	512.2	±0.5	512.2	±0.5
2	–	37.9	±0.5	37.9	±0.5
3	–	94°19'	–	94°14'	–
4	–	513.6	–	513.6	–
5	–	1658	–	1666	–
6	–	193	–	208	–
7	–	50°	–	42°	–
8	–	ϕ120	+0.054 0	ϕ120	+0.054 0
9	–	ϕ125	+0.1 0	ϕ125	+0.1 0
10	–	ϕ90	+0.2 0	ϕ90	+0.2 0
11	–	346	+1 0	346	+1 0
12	–	68	–	68	–
13	–	138	–	138	–
14	–	525.5	+0.5 –0.25	525.5	+0.5 –0.25
15	–	ϕ26	–	ϕ26	–
16	–	ϕ165	–	ϕ165	–
17	–	ϕ150	–	ϕ150	–
18	–	ϕ200	–	ϕ200	–
19	–	145.8	–	137.9	–
20	–	138.2	–	140.4	–
21	–	R115	–	R115	–
22	–	R100	–	R100	–
23	–	382	+2 0	382	+2 0
24	–	60	–	60	–
25	–	56	–	56	–

PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN01996-00

HYDRAULIC EXCAVATOR

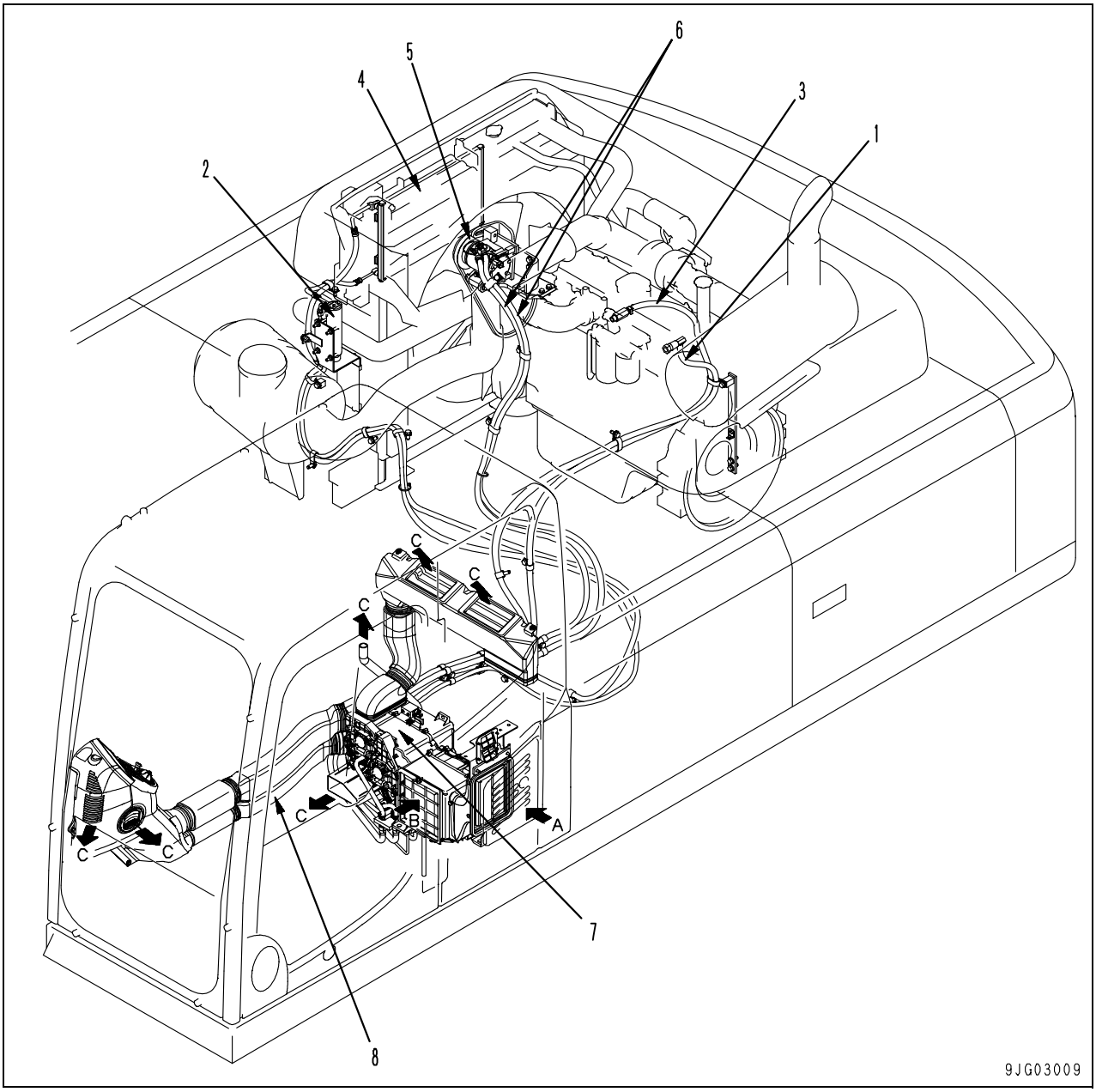
PC300-8
PC300LC-8
PC350-8
PC350LC-8

Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

10 Structure, function and maintenance standard

Cab and its attachments

Air conditioner piping



1. Hot water pickup piping
2. Receiver tank
3. Hot water return piping
4. Condenser
5. Air conditioner compressor
6. Refrigerant piping
7. Air conditioner unit
8. Duct

A: Fresh air
B: Recirculated air
C: Hot/cool air

PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN01997-00

HYDRAULIC EXCAVATOR

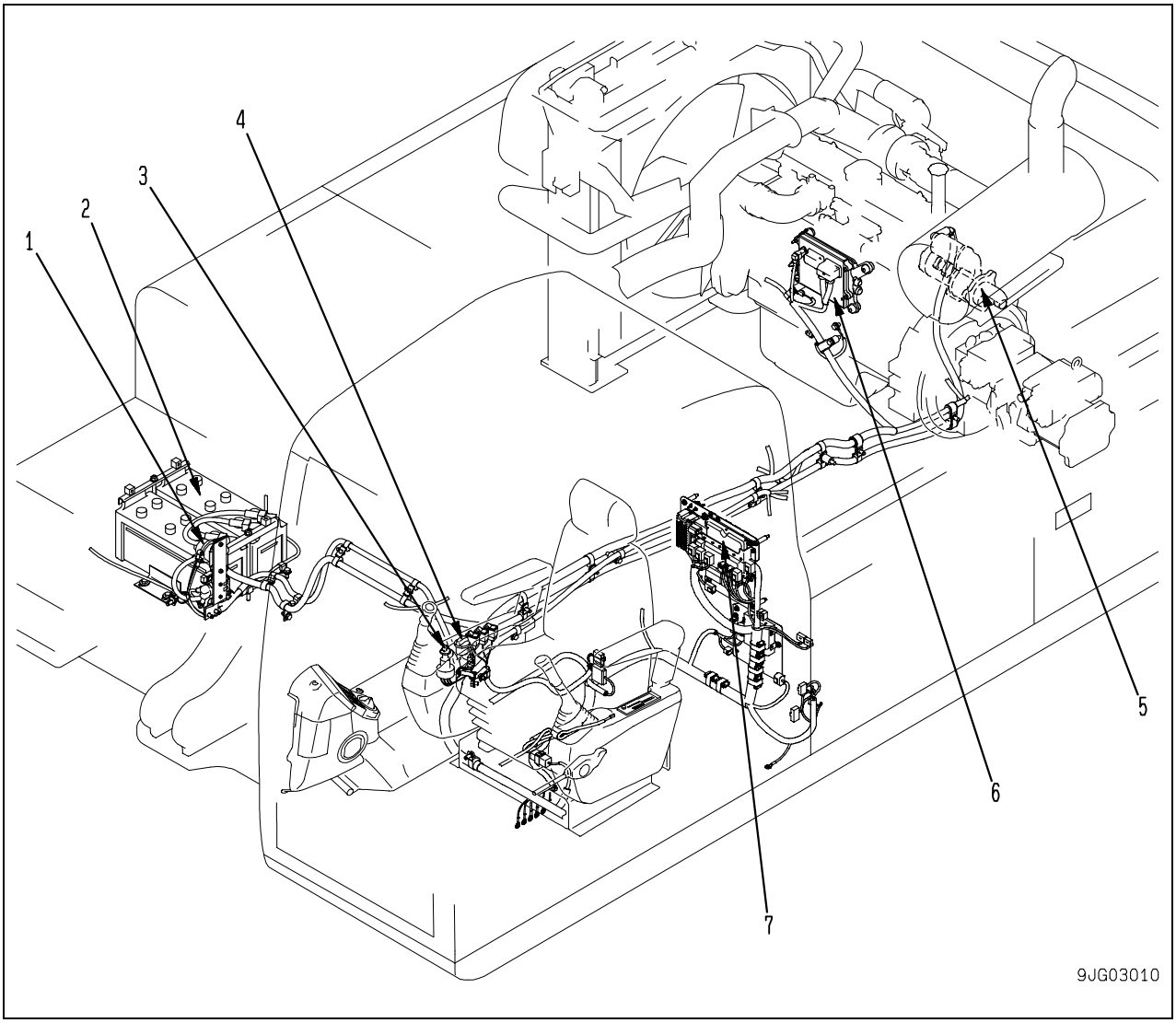
PC300-8
PC300LC-8
PC350-8
PC350LC-8

Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

10 Structure, function and maintenance standard

Electrical system

Engine control



1. Battery relay
2. Battery
3. Starting switch
4. Fuel control dial
5. Starting motor
6. Engine throttle controller
7. Pump controller

Outline

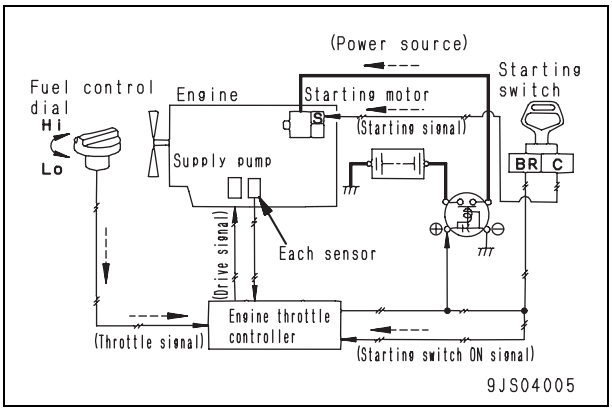
- The engine can be started and stopped with only starting switch (3).

Operation of system

Starting engine

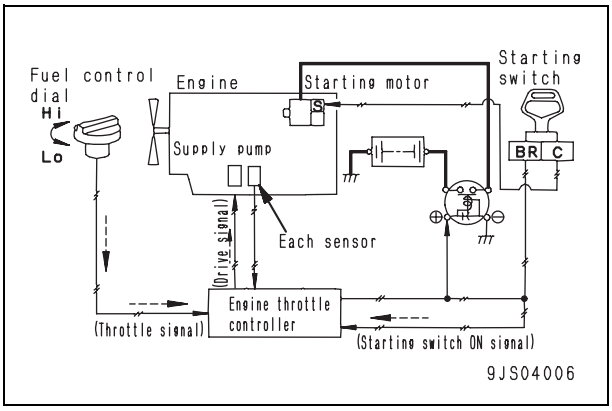
- When the starting switch is turned to the START position, the starting signal flows to the starting motor. Then, the starting motor turns to start the engine.

  When it happens, the engine controller checks the signal voltage from the fuel control dial and sets the engine speed to the speed set by the fuel control dial.



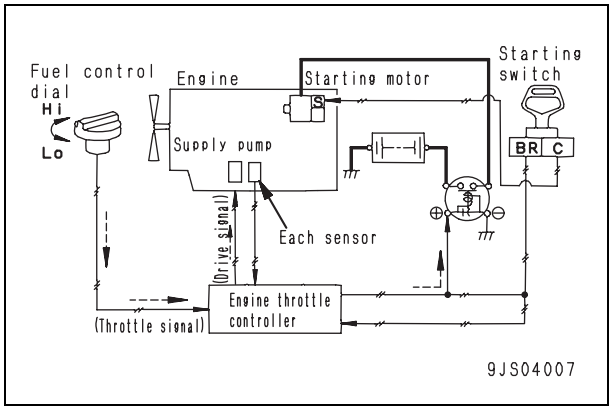
Engine speed control

- The fuel control dial sends a signal voltage corresponding to the rotation angle to the engine controller.
- The pump controller receives the fuel dial position information from the engine controller through the network.
- The pump controller calculates the engine speed in accordance with the working mode, the decelerate, and the like, and sends an instruction to the engine controller.
- The engine controller determines the fuel injection quantity based on the instruction received from the pump controller.



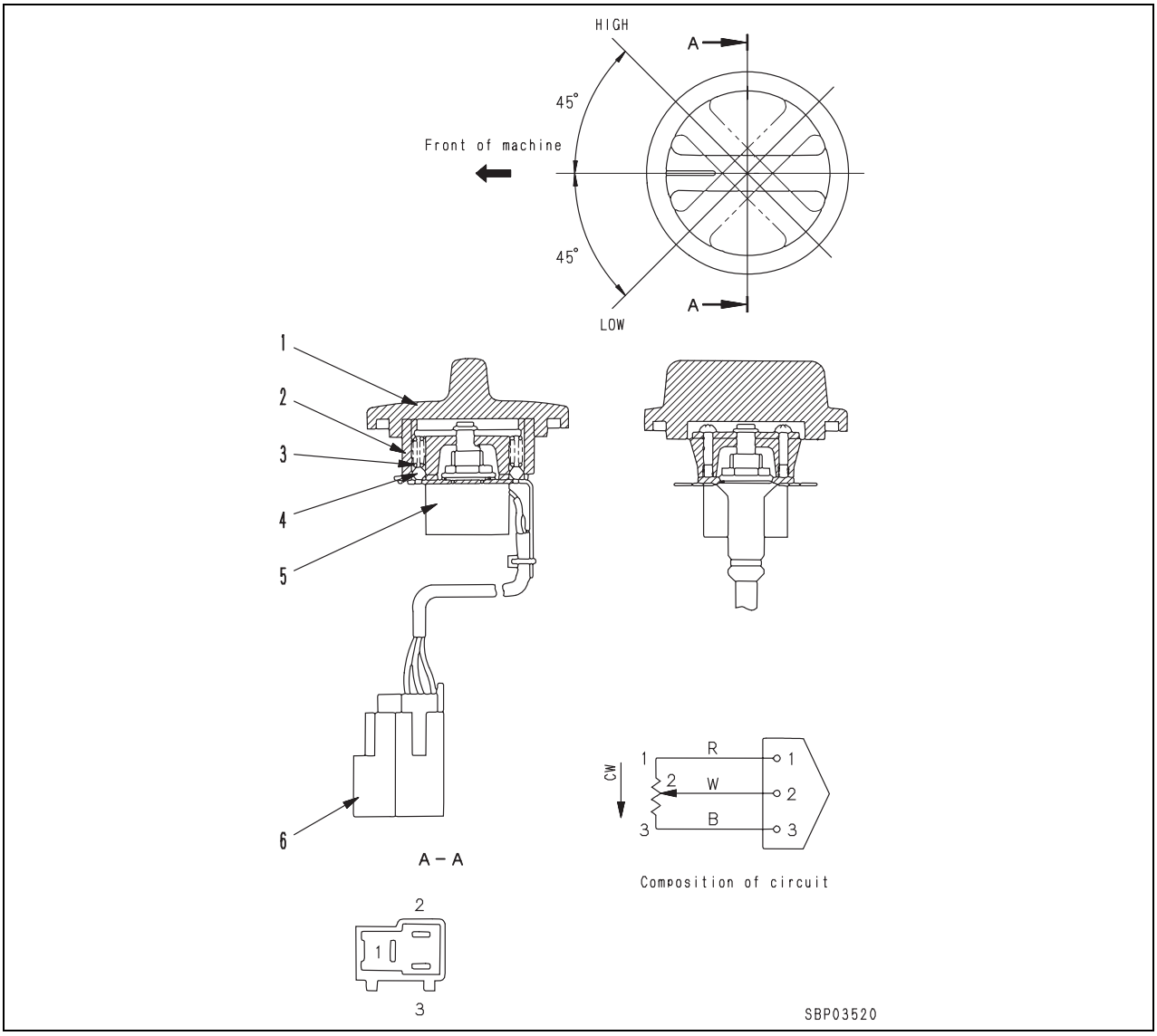
Stopping engine

- When detecting that the starting switch is set to the “STOP” position, the engine controller cuts the fuel injection to stop the engine.



Component

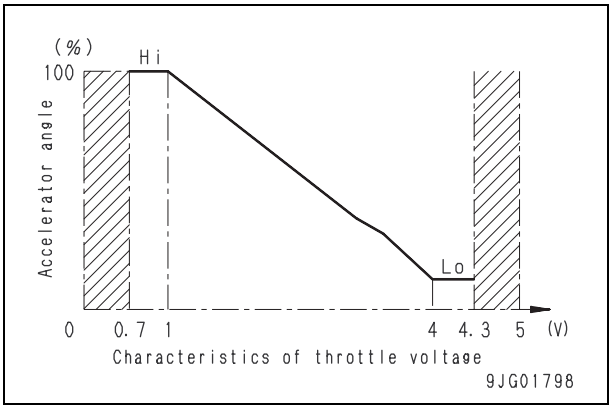
Fuel control dial



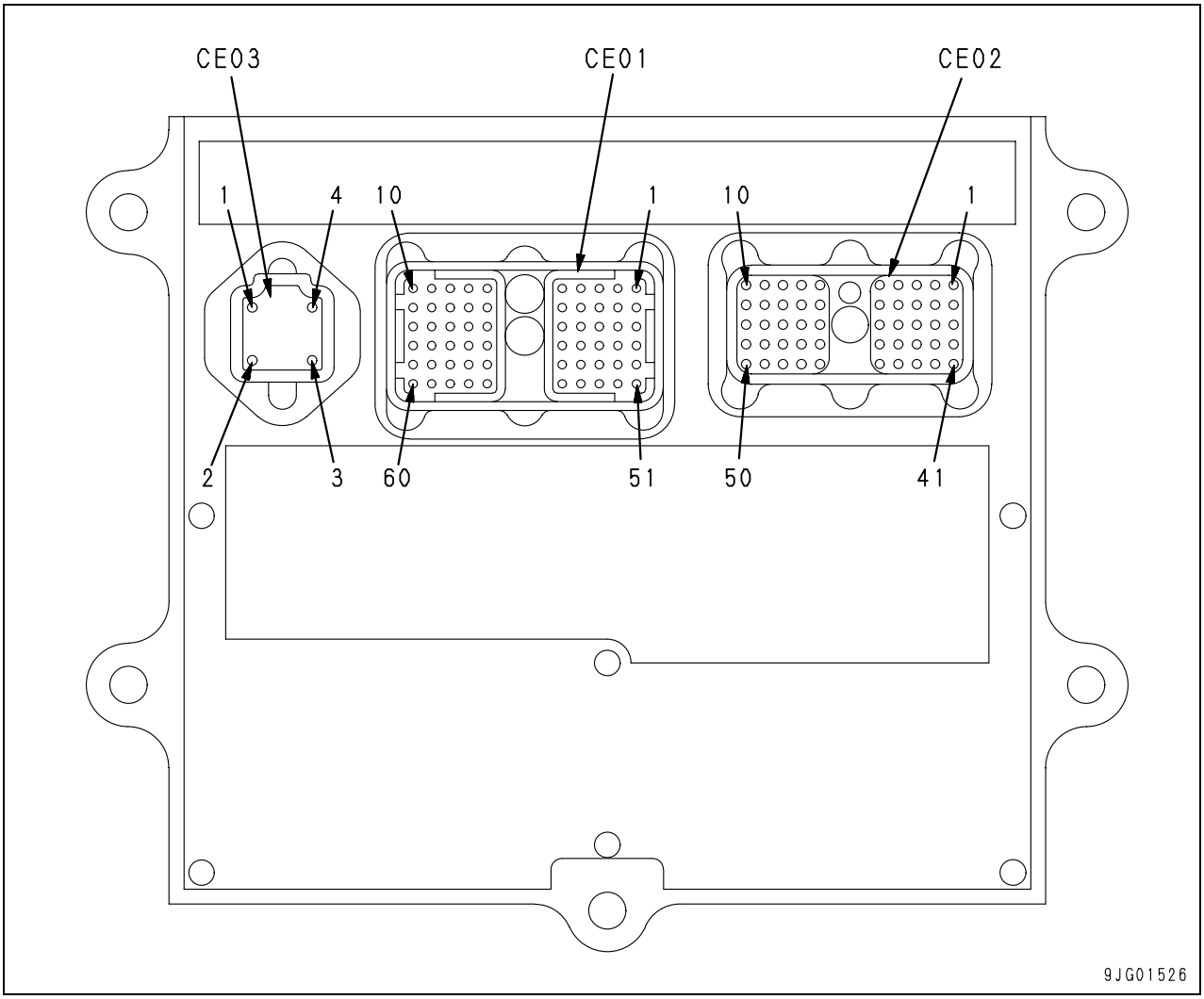
1. Knob
2. Dial
3. Spring
4. Ball
5. Potentiometer
6. Connector

Function

- A potentiometer is installed under the knob. As the knob is turned, the potentiometer shaft is turned.
- As the potentiometer shaft is turned, the resistance of the variable resistor in potentiometer (5) changes and a throttle signal is sent to the engine controller.
- The hatched area in the graph shown at right is the abnormality detection area.



Engine controller



- Meanings of signal classes in the terminal table shown below are as follows.
  A: Power Supply
  B: Input
  C: Ground/Shield/Return
  D: Output
  E: Communication

CN-CE01

Pin No.	Signal name	Input/ output
1	Electric power supply for fuel feed pump	D
2	Electric power supply for IMA	D
3	Atmosphere sensor	B
4	NC(*)	–
5	NC(*)	–
6	CAN(–)	E
7	NC(*)	–
8	CAN(+)	E
9	NC(*)	–
10	NC(*)	–

*: Never connect to NC or malfunctions or failures will occur.

CN-CE01

Pin No.	Signal name	Input/ output
11	Fuel feed pump return	C
12	NC(*)	–
13	NC(*)	B
14	WATER-IN-FUEL sensor	B
15	Coolant temperature sensor	B
16	5V electric power supply for sensor	A
17	Oil pressure switch	B
18	NC(*)	–
19	NC(*)	–
20	NC(*)	–
21	NC(*)	–
22	NC(*)	D
23	Boost temperature sensor	B
24	NC(*)	–
25	Common rail pressure sensor	B
26	Buckup sensor	B
27	NE sensor (+)	B

*: Never connect to NC or malfunctions or failures will occur.

CN-CE01

Pin No.	Signal name	Input/ output
28	NC(*)	–
29	NC(*)	–
30	NC(*)	–
31	NC(*)	D
32	NC(*)	C
33	GND	A
34	NC(*)	–
35	NC(*)	A
36	NC(*)	–
37	NC(*)	A
38	NC(*)	C
39	Key switch (ACC)	–
40	Electrical intake air heater relay drive	–
41	NC(*)	–
42	Electrical intake air heater relay return	C
43	NC(*)	–
44	Boost pressure sensor	B
45	Injector #1 (+)	D
46	Injector #5 (+)	D
47	Sensor GND	C
48	Ne sensor (–)	C
49	NC(*)	–
50	NC(*)	–
51	Injector #2 (–)	C
52	Injector #3 (–)	C
53	Injector #1 (–)	C
54	Injector #2 (+)	D
55	Injector #3 (+)	D
56	Injector #4 (+)	D
57	Injector #6 (+)	D
58	Injector #4 (–)	C
59	Injector #6 (–)	C
60	Injector #5 (–)	C

*: Never connect to NC or malfunctions or failures will occur.

CN-CE02

Pin No.	Signal name	Input/ output
1	NC(*)	B
2	NC(*)	B
3	NC(*)	B
4	NC(*)	B
5	NC(*)	B
6	NC(*)	B
7	NC(*)	B
8	NC(*)	B
9	Fuel control dial (+)	B
10	NC(*)	B
11	NC(*)	B
12	NC(*)	B

*: Never connect to NC or malfunctions or failures will occur.

CN-CE02

Pin No.	Signal name	Input/ output
13	NC(*)	B
14	NC(*)	B
15	NC(*)	B
16	NC(*)	B
17	NC(*)	B
18	NC(*)	B
19	NC(*)	B
20	NC(*)	E
21	NC(*)	A
22	Fuel control dial (+5V)	A
23	Fuel control dial (–)	C
24	NC(*)	B
25	NC(*)	B
26	NC(*)	B
27	NC(*)	B
28	NC(*)	B
29	NC(*)	C
30	NC(*)	B
31	NC(*)	B
32	NC(*)	C
33	GND	C
34	NC(*)	C
35	NC(*)	B
36	NC(*)	B
37	NC(*)	C
38	NC(*)	D
39	Key switch (ACC)	A
40	Electrical intake air heater relay drive	D
41	NC(*)	D
42	Electrical intake air heater relay return	C
43	NC(*)	D
44	NC(*)	D
45	NC(*)	–
46	CAN(+)	E
47	CAN(–)	E
48	NC(*)	D
49	PWM OUTPUT	D
50	NC(*)	D

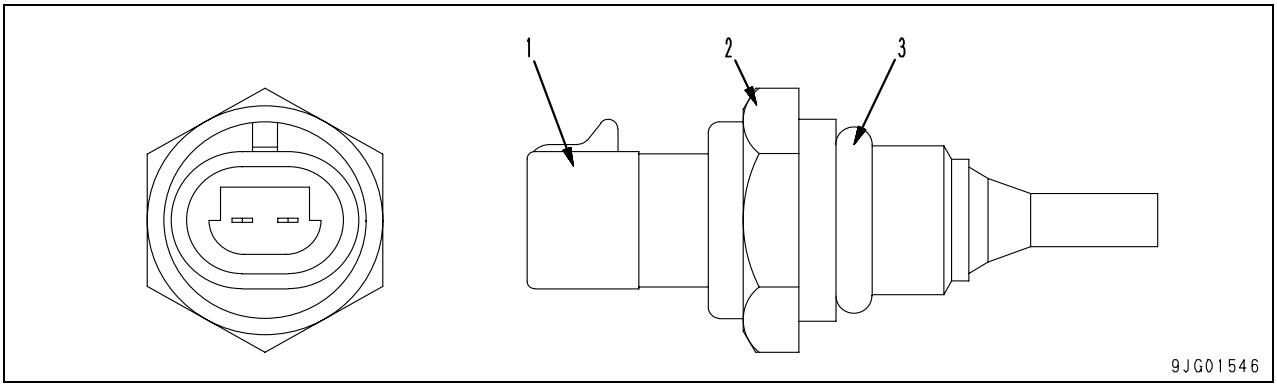
*: Never connect to NC or malfunctions or failures will occur.

CN-CE03

Pin No.	Signal name	Input/ output
1	GND	C
2	NC(*)	C
3	Electric power supply (+24V constantly)	A
4	NC(*)	A

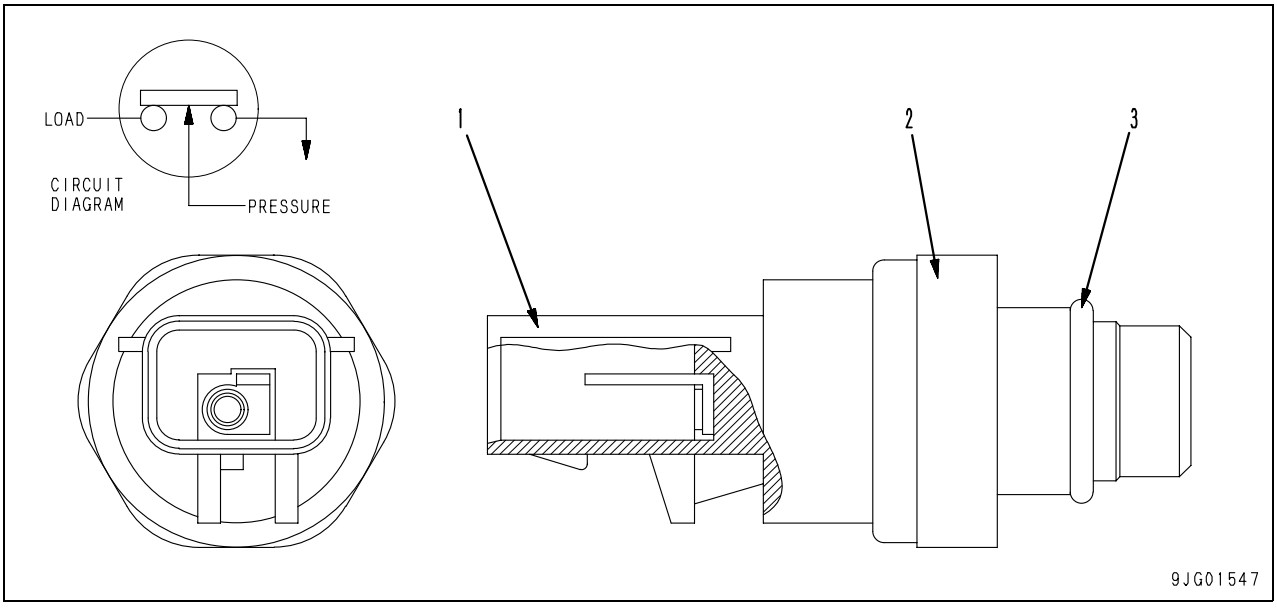
*: Never connect to NC or malfunctions or failures will occur.

Coolant temperature sensor



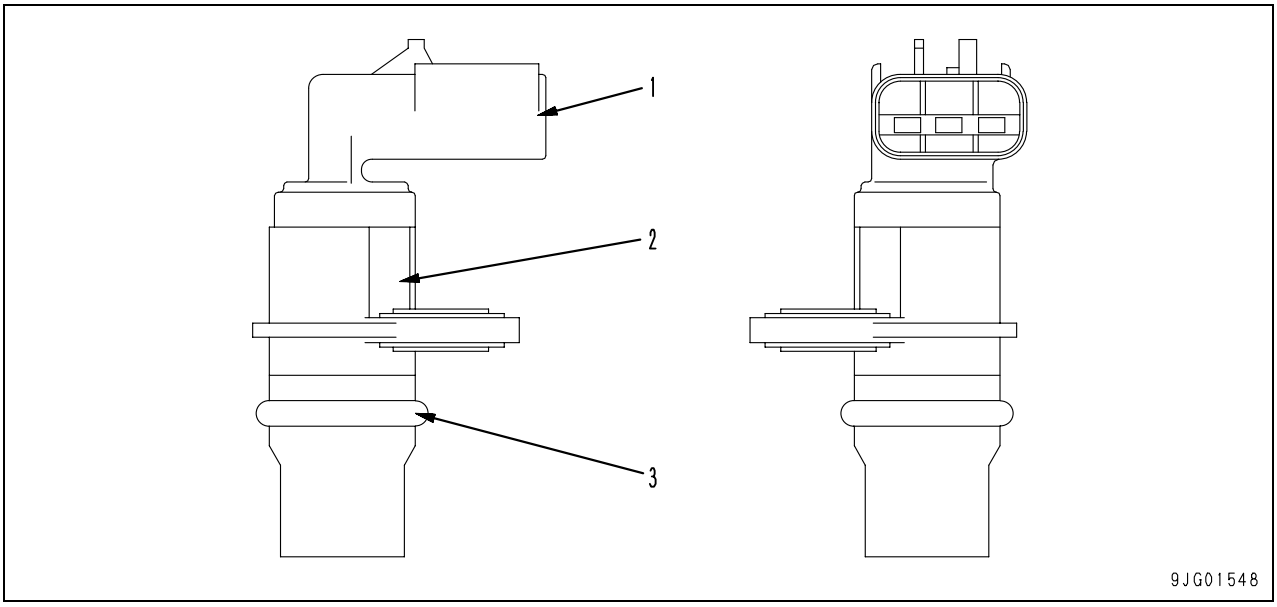
1. Connector
2. Sensor
3. O-ring

Oil pressure switch



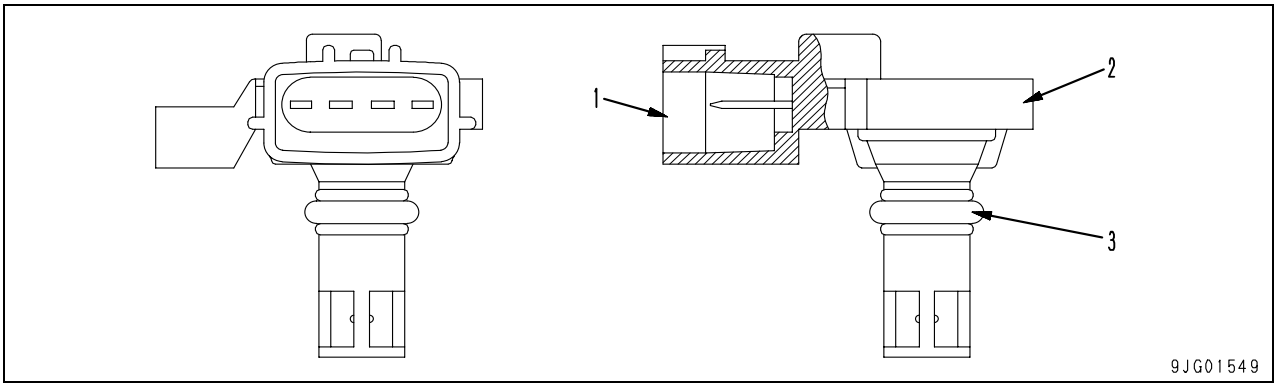
1. Connector
2. Sensor
3. O-ring

Rotation sensor



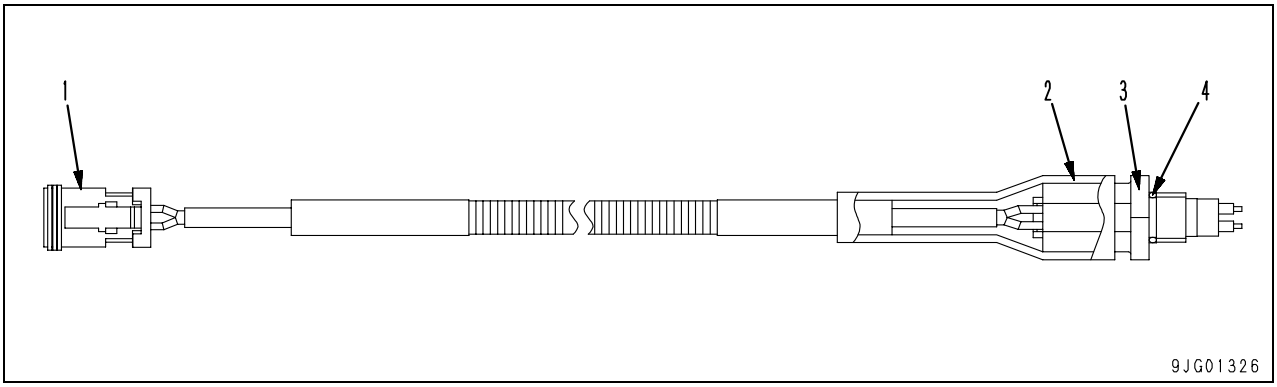
1. Connector
2. Sensor
3. O-ring

Boost pressure and temperature sensor



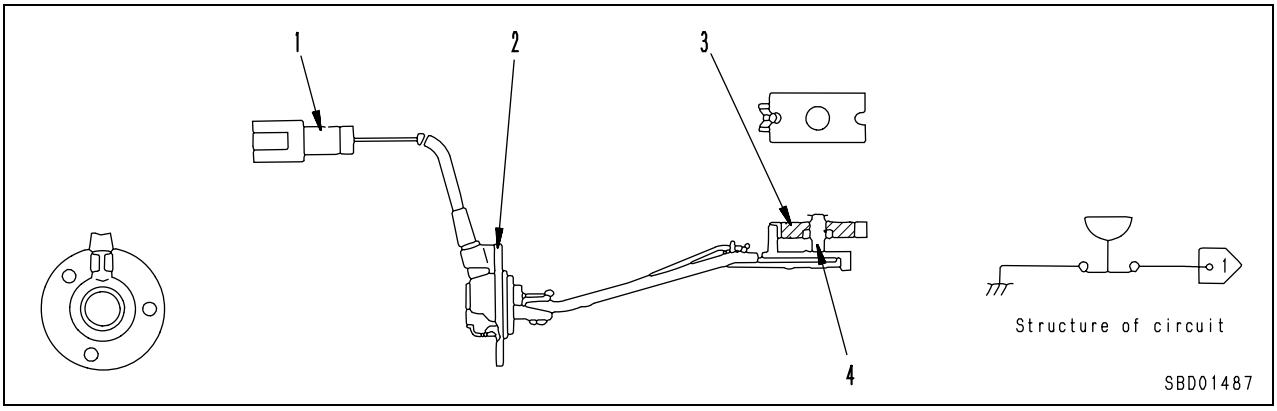
1. Connector
2. Sensor
3. O-ring

WIF (water-in-fuel detection) sensor



1. Connector
2. Tube
3. Sensor
4. O-ring

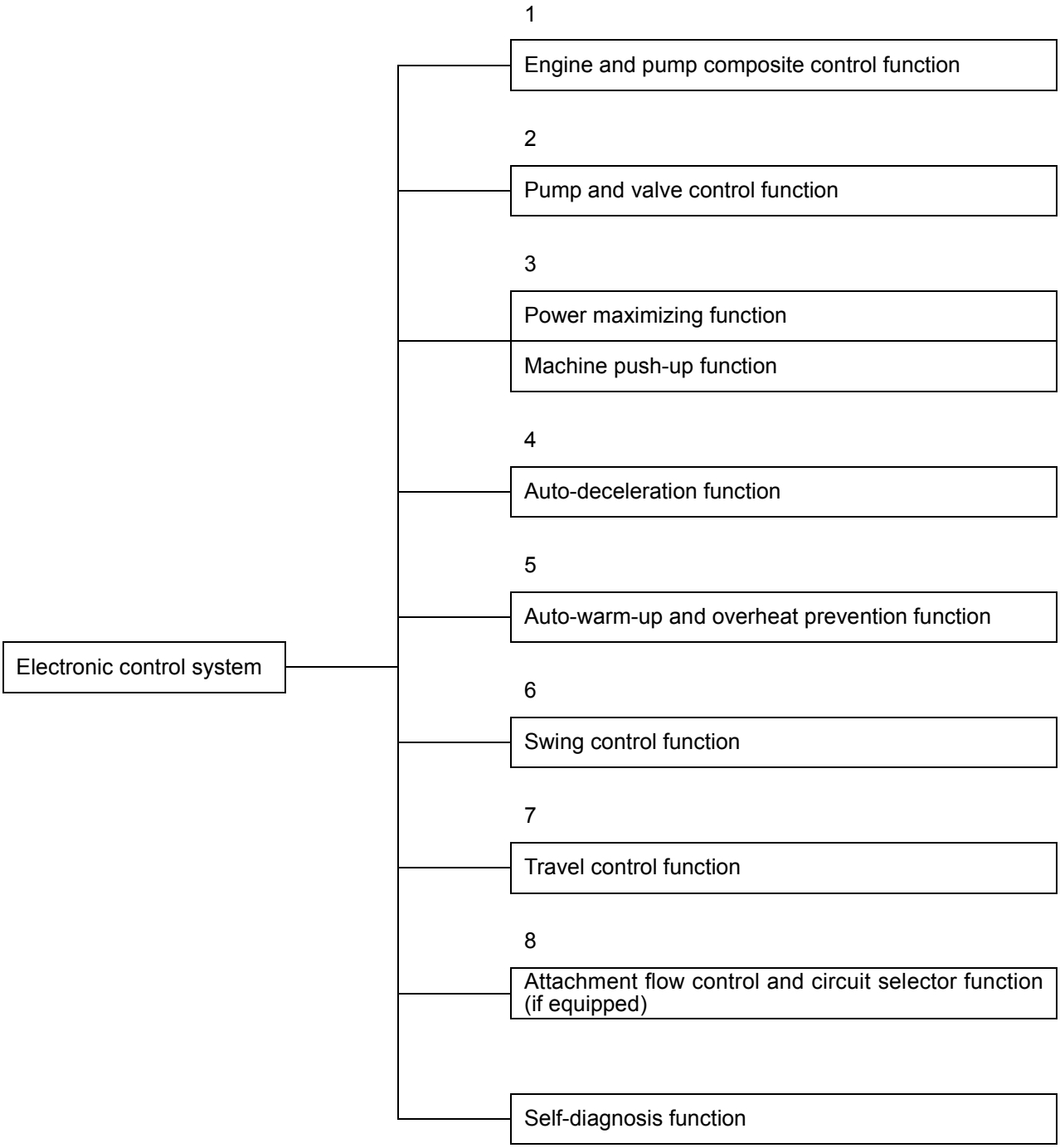
Engine oil level sensor



1. Connector
2. Bracket
3. Float
4. Switch

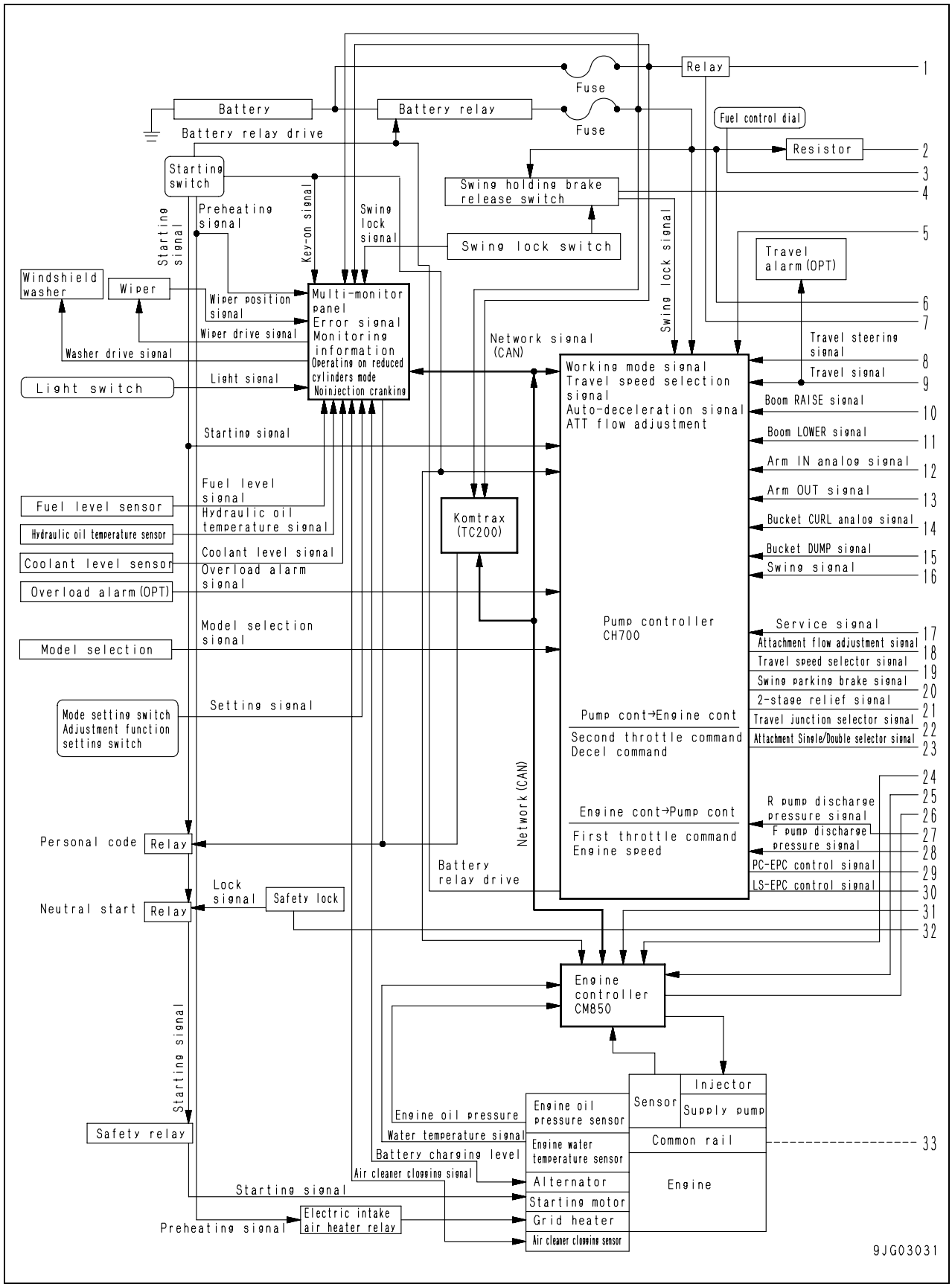
Electronic control system

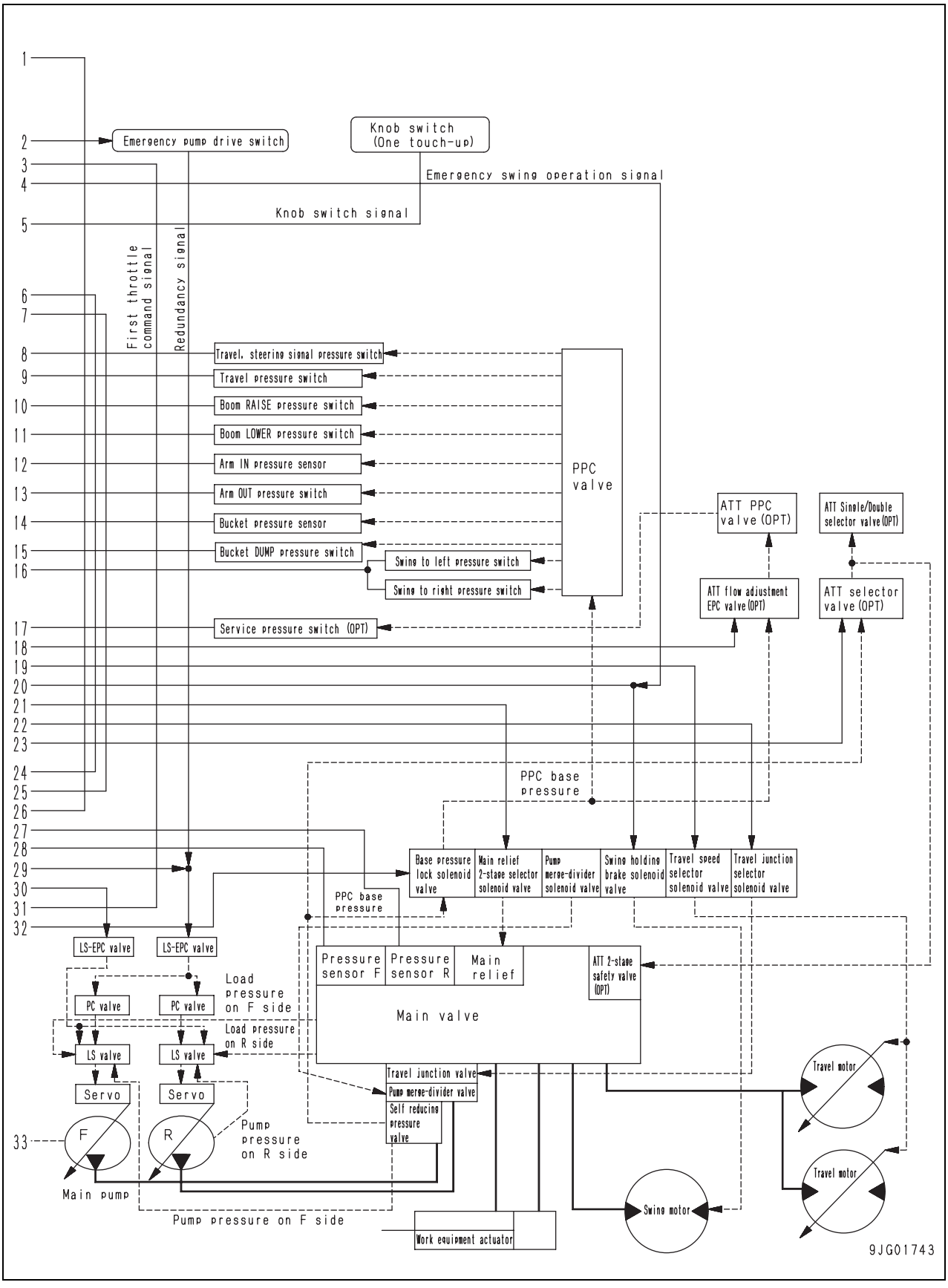
Control function



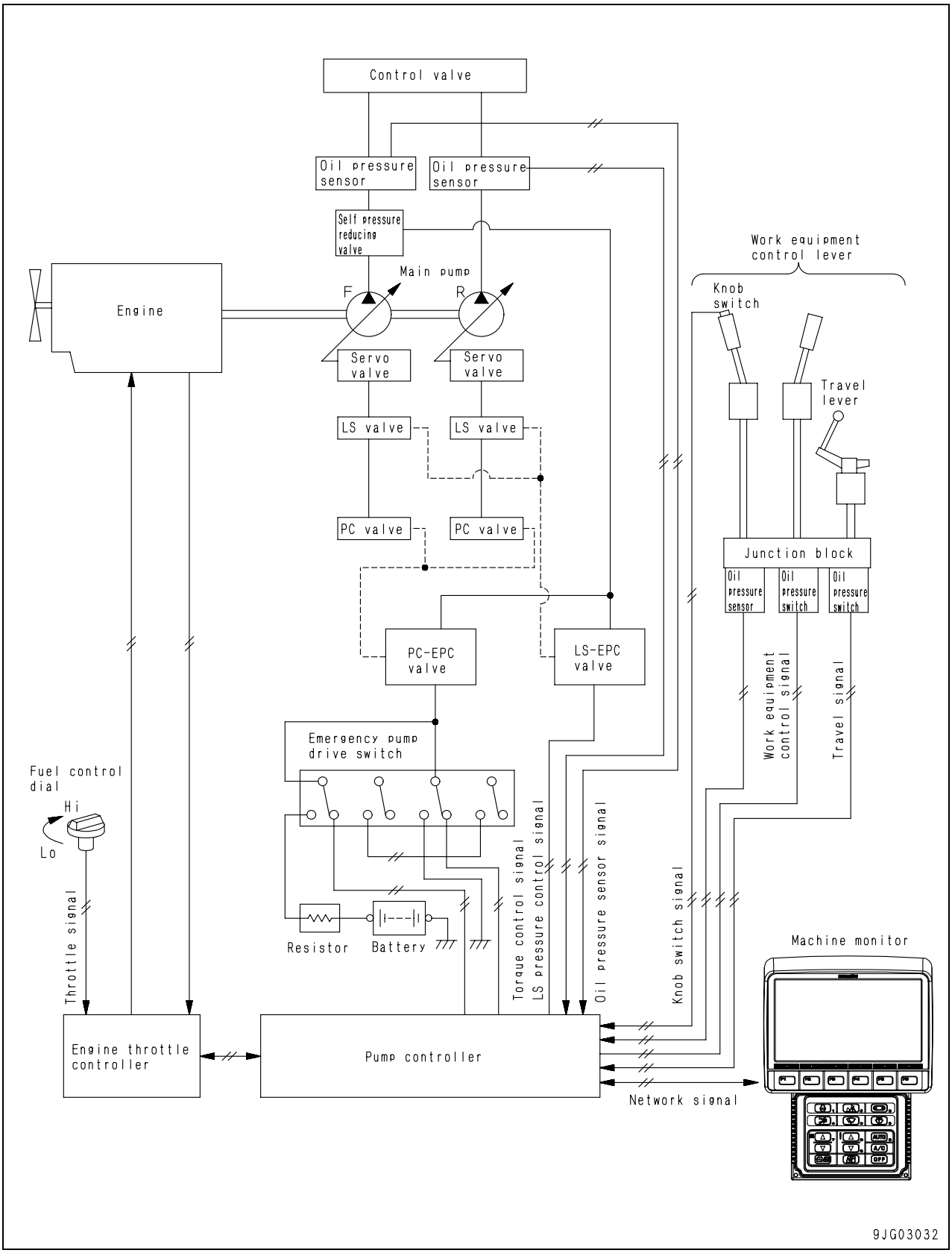
★ For the self-diagnosis function, see “Troubleshooting“.

Machine control system diagram



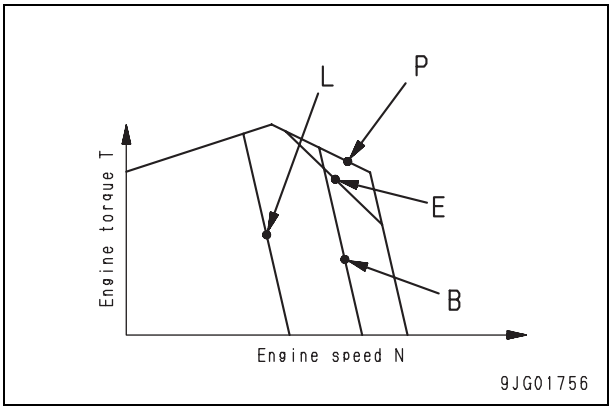

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
Emergency pump drive switch
Knob switch (One touch-up)
Emergency swing operation signal
Knob switch signal
First throttle command signal
Redundancy signal
Travel, steering signal pressure switch
Travel pressure switch
Boom RAISE pressure switch
Boom LOWER pressure switch
Arm IN pressure sensor
Arm OUT pressure switch
Bucket pressure sensor
Bucket DUMP pressure switch
Swing to left pressure switch
Swing to right pressure switch
Service pressure switch (OPT)
PPC valve
ATT PPC valve (OPT)
ATT Single/Double selector valve (OPT)
ATT flow adjustment EPC valve (OPT)
ATT selector valve (OPT)
PPC base pressure
PPC base pressure
Base pressure lock solenoid valve
Main relief 2-stage selector solenoid valve
Pump merge-divider solenoid valve
Swing holding brake solenoid valve
Travel speed selector solenoid valve
Travel junction selector solenoid valve
LS-EPC valve
LS-EPC valve
Pressure sensor F
Pressure sensor R
Main relief
ATT 2-stage safety valve (OPT)
Main valve
Load pressure on F side
Load pressure on R side
PC valve
PC valve
LS valve
LS valve
Servo
Servo
F
R
Pump pressure on R side
Travel junction valve
Pump merge-divider valve
Self reducing pressure valve
Travel motor
Travel motor
Swing motor
Main pump
Pump pressure on F side
Work equipment actuator
9JG01743

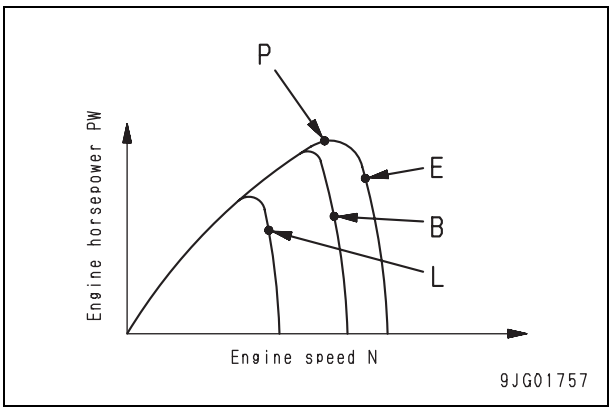
1. Engine and pump composite control function

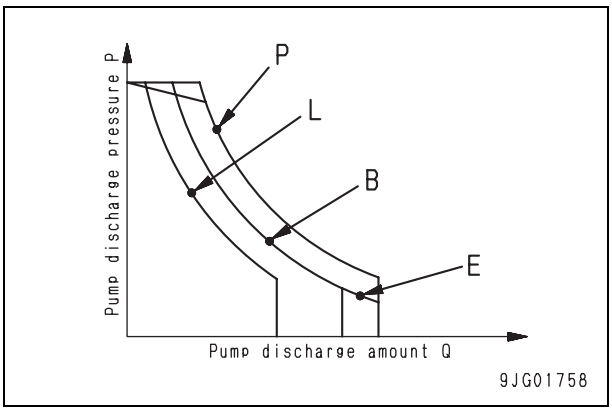


Function

- This function allows the operator to select proper engine torque and pump absorption torque according to the type of work. Four modes are provided: P, E, B and L. Using the work mode switch on the monitor panel, the operator is required to select one of them.
- The pump controller detects the speed of the engine governor set with the fuel control dial and the actual engine speed (N) and controls them so that the pump will absorb all the torque at each output point of the engine, according to the pump absorption torque set in each mode.







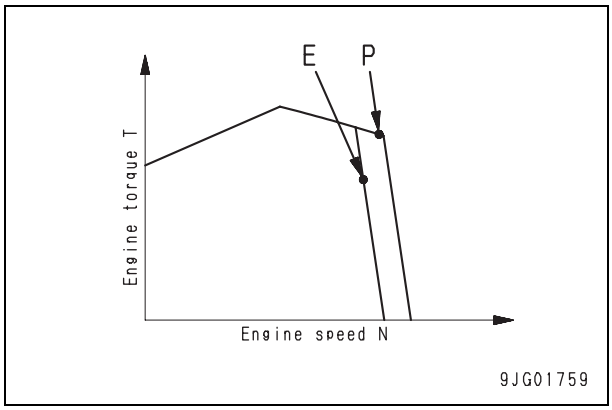
1) Control method in each mode

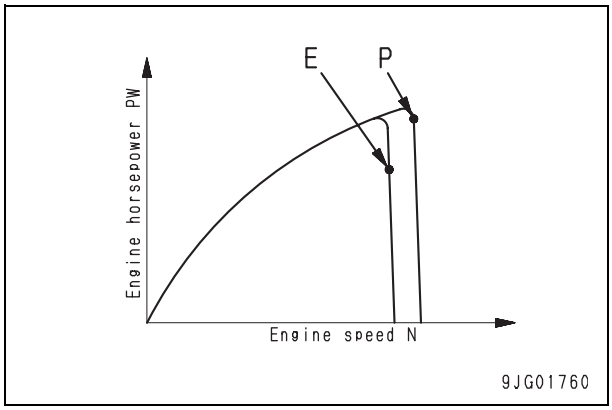
P and E modes

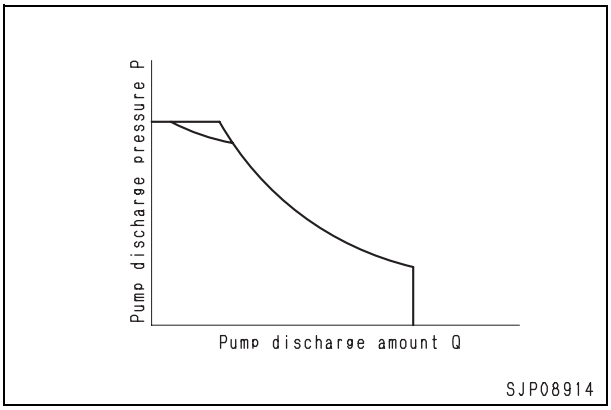
- Matching point in P mode: Rated speed

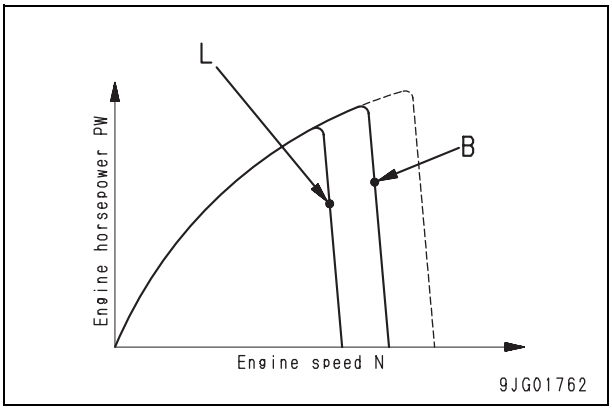
Mode	Matching point
P	183.9 kW/1,950 rpm {247 HP/1,950 rpm}
E	154.4 kW/1,750 rpm {207 HP/1,750 rpm}

- If the pump load increases and the pressure rises, engine speed (N) lowers. At this time, the controller lowers the pump discharge so that the engine speed will be near the maximum output point.
  If the pressure lowers, the controller increases pump discharge (Q) so that the engine speed will be near the maximum output point.
  By repeating these operations, the controller constantly uses the engine near the maximum output point.







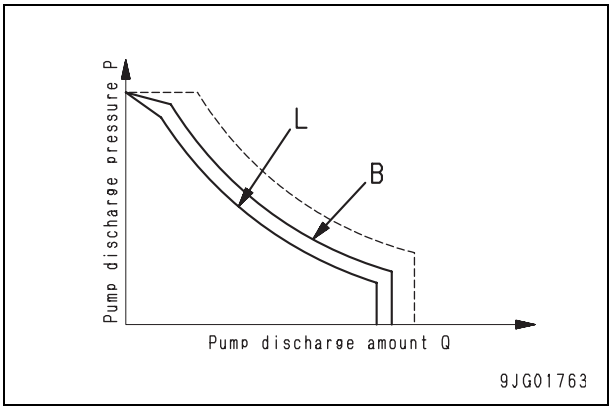


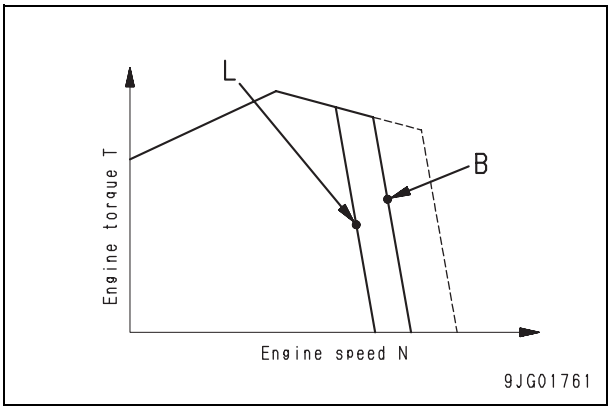
B and L modes

Mode	B mode	L mode
Partial output point	82%	61%

Mode	Matching point
B	147.1 kW/1,800 rpm {197 HP/1,800 rpm}
L	110.3 kW/1,550 rpm {148 HP/1,550 rpm}

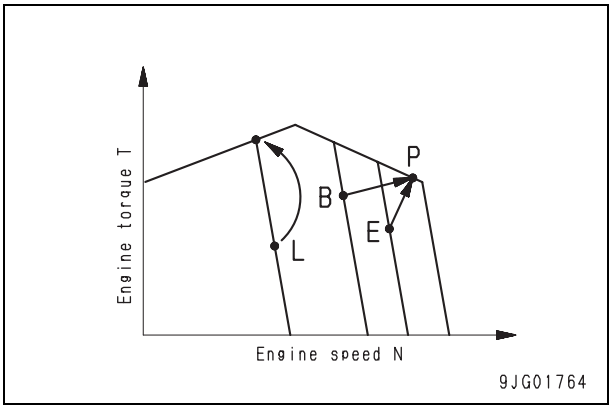
- In B or L mode, the controller controls the pump absorption torque through the pump and engine compound control function to decrease engine speed (N) while maintaining engine torque (T) constant along the constant horsepower curve. This ensures reduced fuel consumption.

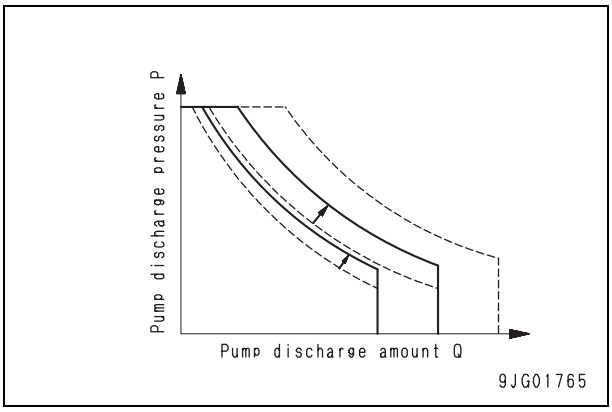




2) Function to control pump during travel

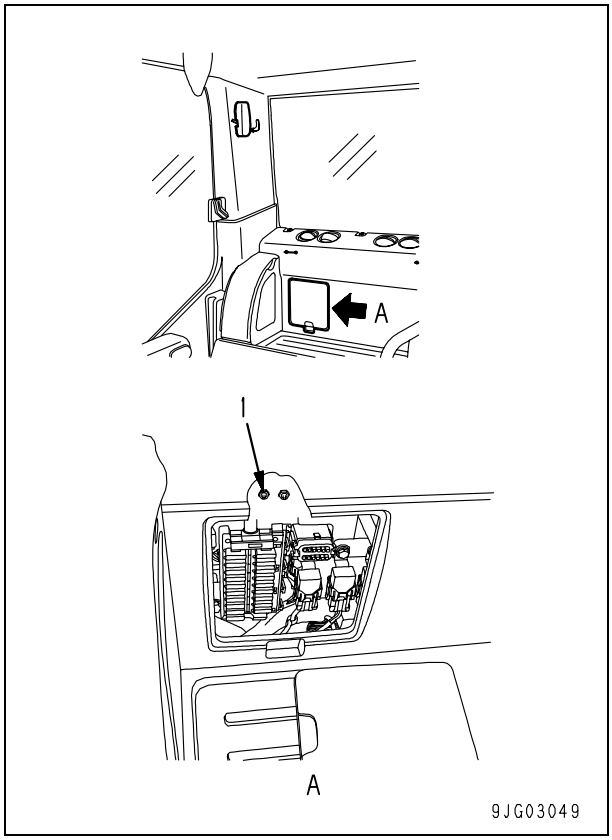
- Traveling the machine in E or B mode leaves the working mode unchanged, but raises the pump absorption torque and engine speed (N) to values same as those in P mode.
- If the machine travels in L mode, the working mode and engine speed (N) do not change, but the pump absorption torque is increased.

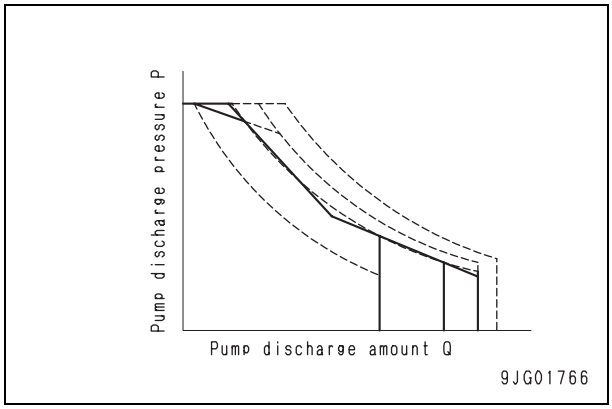




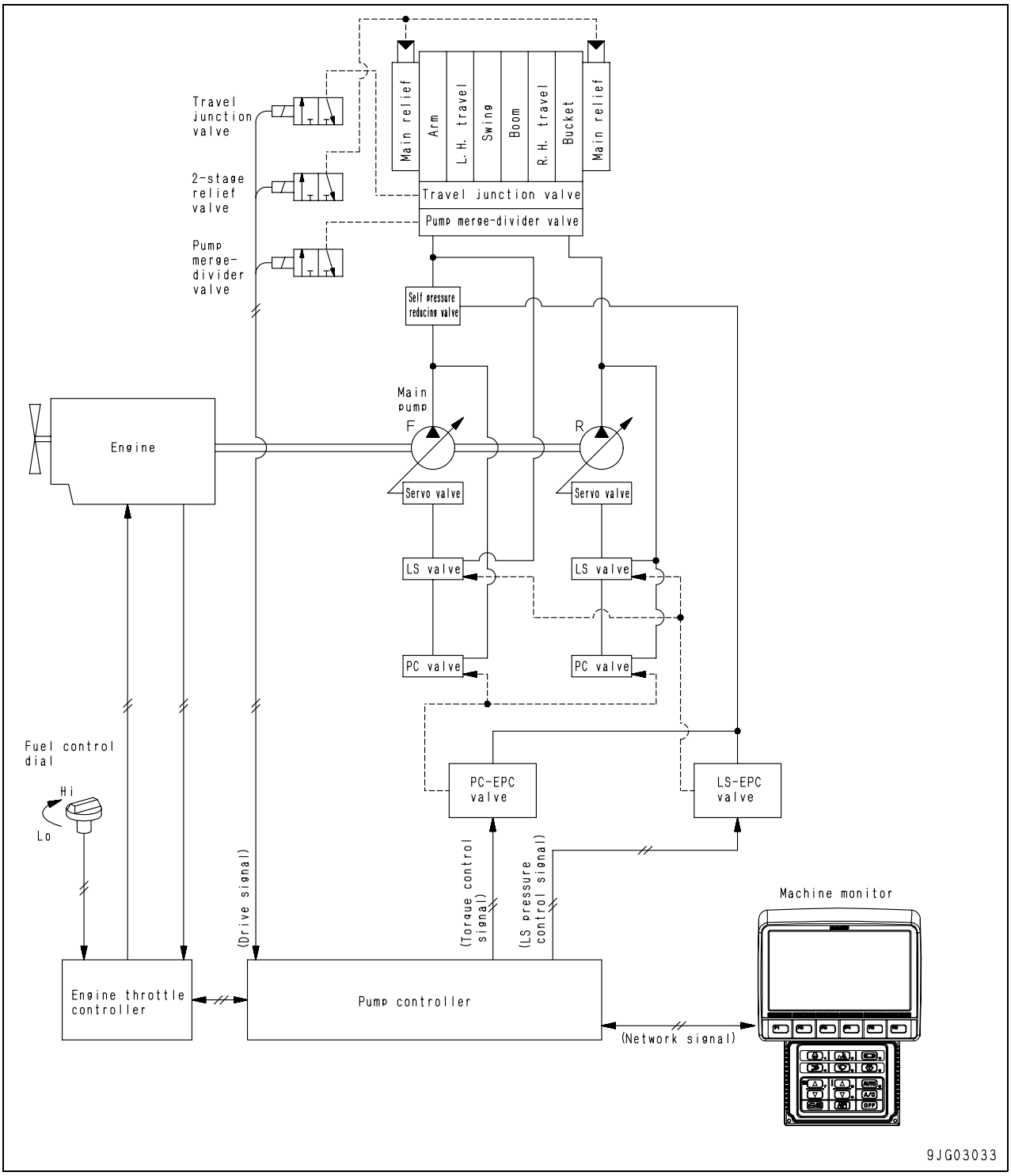
3) Function to control when emergency pump drive switch is turned on

- Even if any abnormality occurs in the controller or sensor, setting emergency pump drive switch (1) to the “ON” position activates the machine with an absorption torque approximately equivalent to that in E mode.
  In this case, a constant current flows from the battery to the EPC valve for PC and therefore, the oil pressure is sensed by only the EPC valve for PC.





2. Pump and valve control function

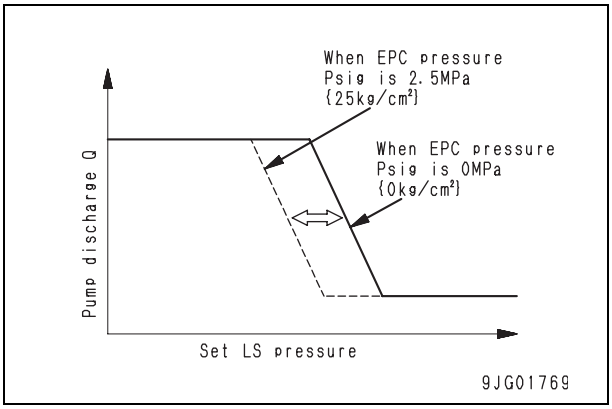


Function

- The machine is matched to various types of work properly with the 2-stage relief function to increase the digging force, etc.

1) LS control function

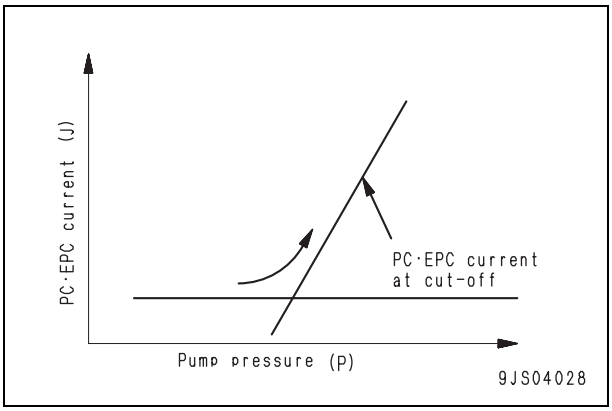
- Depending on the operation condition of the actuator, this function changes the pressure output from the LS-EPC valve to LS valve to change the change point (LS set differential pressure (DLS)) of the pump discharge in the LS valve.
- By this operation, the start-up time of the pump discharge is optimized and the composite operation and fine control performance is improved.



2) Cut-off function

- This function increases PC-EPC current (J) to reduce the flow rate in the relief state, improving fuel consumption.

Operating condition for turning on cut-off function
When the average value of the front and rear pressure sensors is above 27.9 MPa {285 kg/cm^2} with the power maximizing function off. The cut-off function does not work, however, while the machine is travelling in P mode, swing lock switch is in the “ON” position.

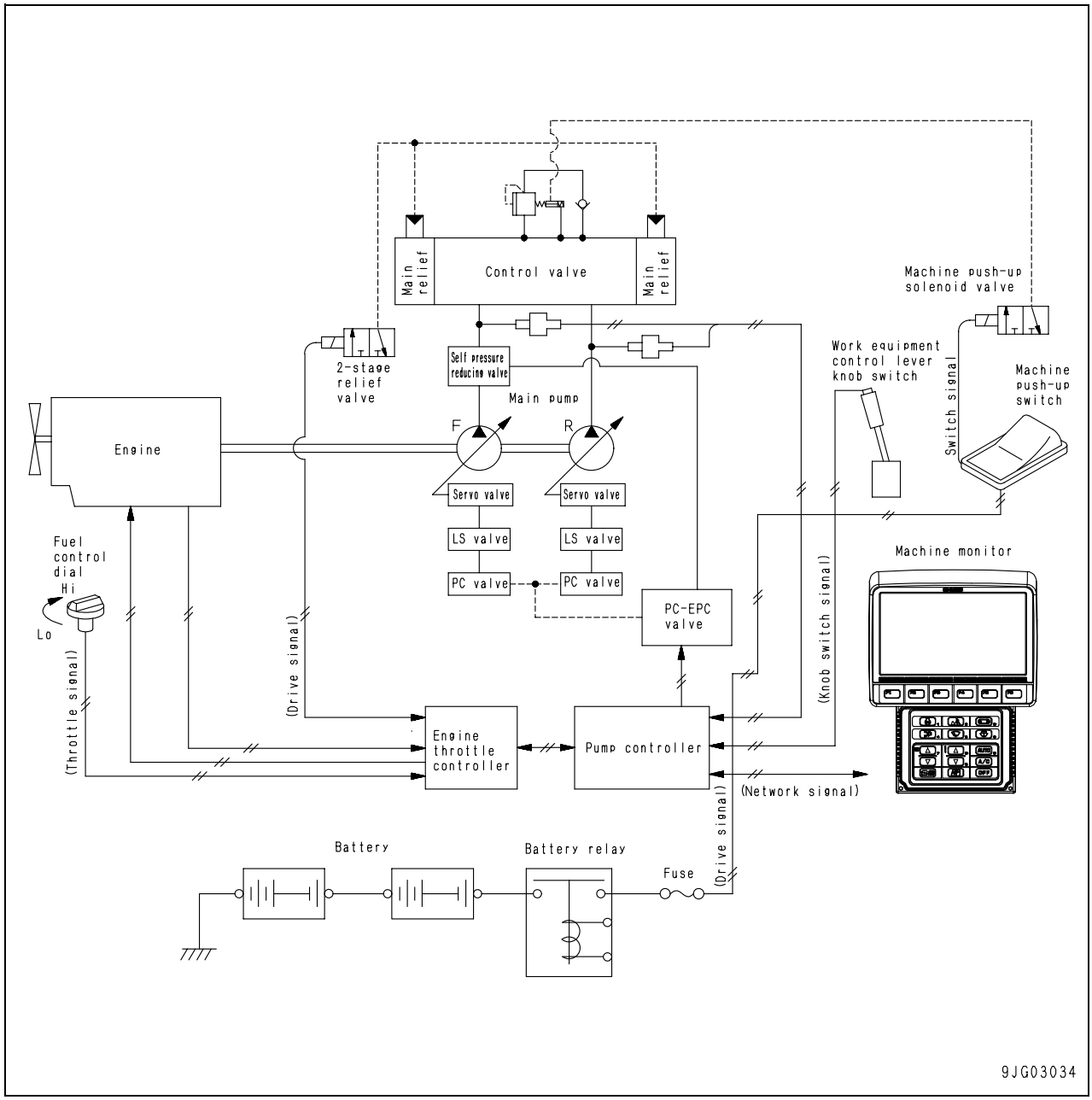


3) 2-stage relief function

- The relief pressure in the normal work is 34.8 MPa {355 kg/cm^2}. If the 2-stage relief function is turned on, however, the relief pressure rises to about 37.2 MPa {380 kg/cm^2}. By this operation, the hydraulic force is increased further.

Operating condition for turning on 2-stage relief function	Relief pressure
• During travel • When swing lock switch is turned to the ON position • When boom is lowered • When power maximizing function is turned on • When L mode is operated	34.8 MPa {355 kg/cm^2} ↓ 37.2 MPa {380 kg/cm^2}

3. Power maximizing and machine push-up function



Function

- The power maximizing function allows the operator to increase power for a certain time by operating the left knob switch.
- The machine push-up function allows the operator to increase the boom pushing force by operating the machine push-up switch.

1) Power maximizing function

- This function is used to increase digging force for a certain period of time (e.g., when digging up a large rock).
- If the left knob switch is pressed in P or E mode, the hydraulic force is increased about 7% to increase the digging force. Each function is set automatically as shown below.

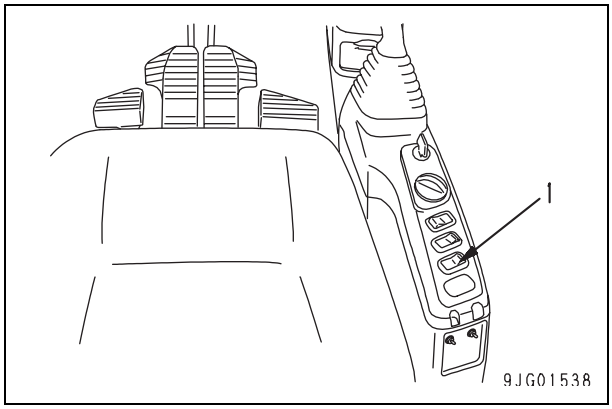
Function	Setting
Engine and pump control	Matching at rated output point
2-stage relief function	34.8 MPa {355 kg/cm^2} ↓ 37.2 MPa {380 kg/cm^2}
Software cut-off function	Cancel

- These settings are automatically reset after 8.5 seconds when the switch is pressed.

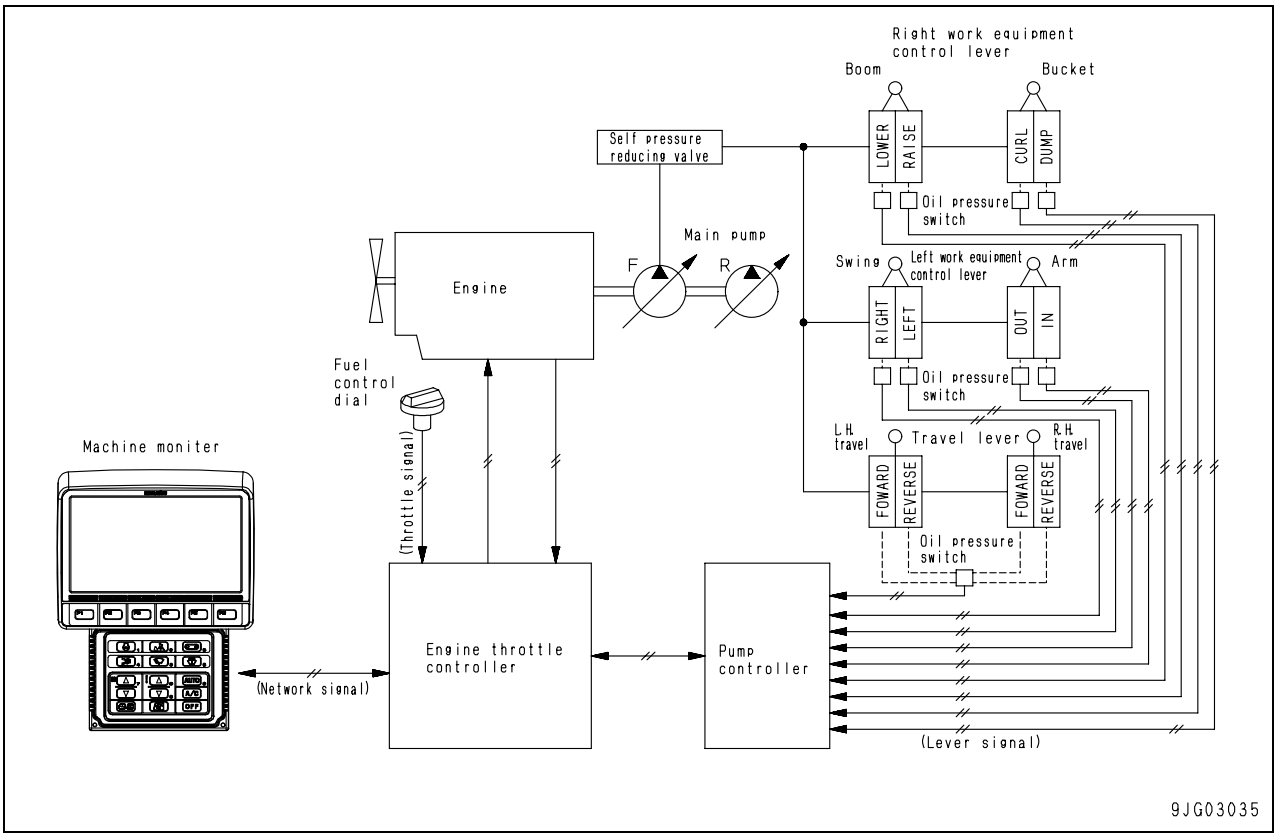
2) Machine push-up function

- The machine push-up function allows the operator to increase the boom pushing force that is required for ditching or mass excavation in hard ground by operating machine push-up switch (1).

Switch	2-stage safety valve function
OFF	Setting of safety valve at boom cylinder head 14.7 MPa {150 kg/cm^2}
ON	Setting of safety valve at boom cylinder head 28.4 MPa {290 kg/cm^2}

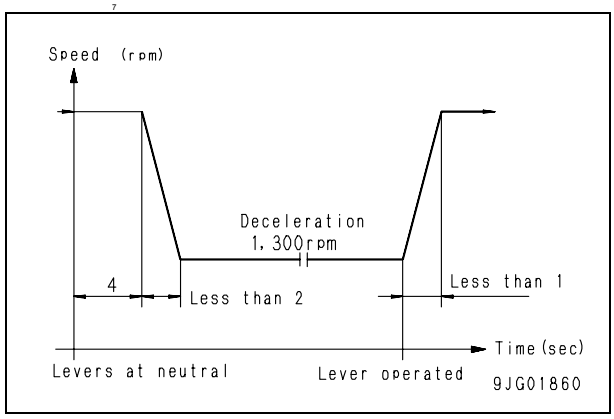


4. Auto-deceleration function



Function

- The auto-deceleration function automatically reduces the engine speed to its medium speed range when the all control levers are set in NEUTRAL while waiting for a dump truck or work to reduce the fuel consumption and noise.
- If any lever is operated, the engine speed instantly returns to the speed set with the fuel control dial.



Operation

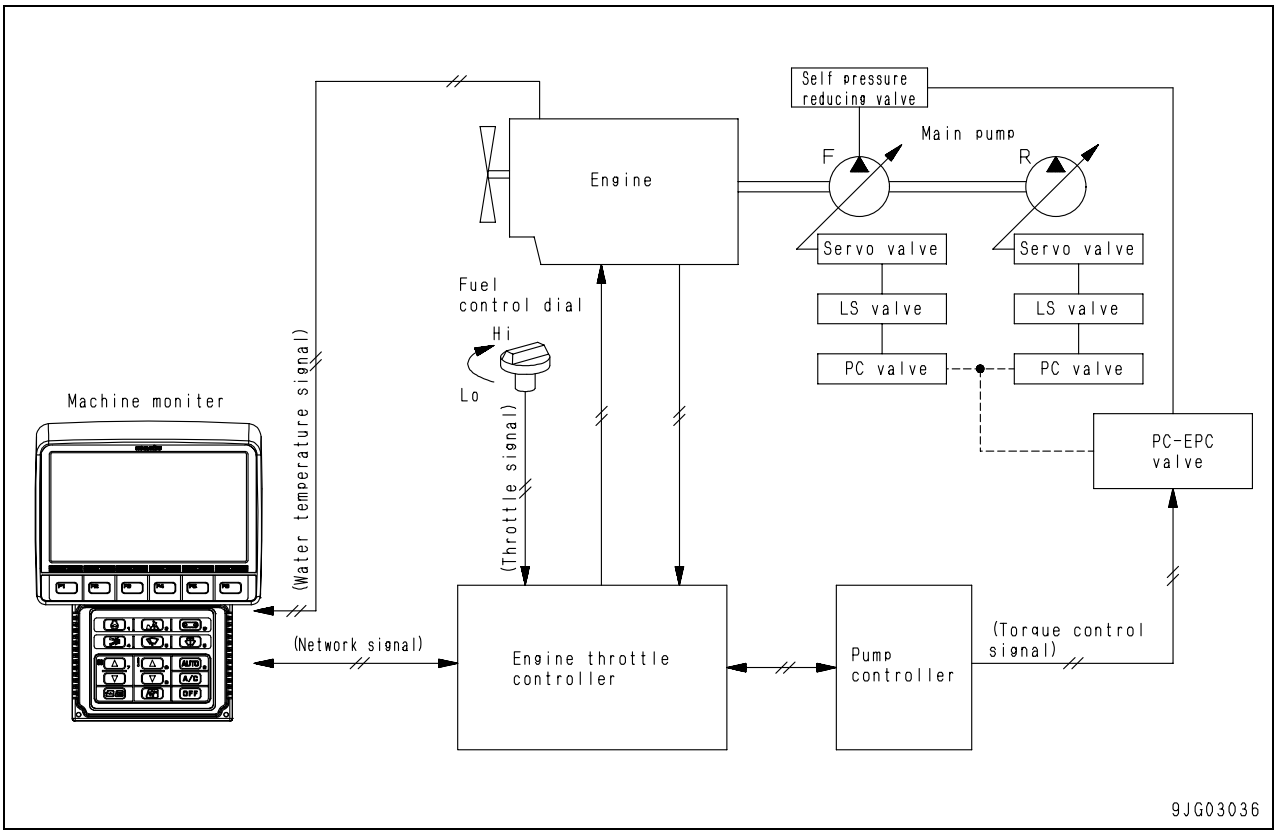
When control levers are set in neutral

- If all the control levers are kept to NEUTRAL for 4 sec. during operation at a engine speed above a decelerator operation level (approximately 1,300 rpm), this function lowers the engine speed to the deceleration operation level (approximately 1,300 rpm) and keeps it until you operate any lever.

When any control lever is operated

- If you operate any control lever while the engine speed is kept at the deceleration operation level, the engine speed instantly rises to the level set with the fuel control dial.

5. Auto-warm-up and overheat prevention function



Function

- The engine automatic warm-up function increases the engine speed to warm up the engine if coolant temperature is too low after the engine starts.
- The overheat prevention function reduces the pump load when coolant or hydraulic oil temperature is too high during operation to protect the engine from overheating.

1) Auto-warm-up function

- After the engine is started, if the engine coolant temperature is low, the engine speed is raised automatically to warm up the engine.

Operating condition (All)	⇒	Operated
Coolant temperature: Below 30°C. Engine speed: Max. 1,200 rpm		Engine speed: Max. 1,200 rpm

⇓

Resetting condition (Any one)		⇒	Reset
Auto	Coolant temperature: Above 30°C		Engine speed: Any level
	Auto-warm-up operation time: Min. 10 minutes		
Manual	Fuel control dial: Kept at 70% of full level for 3 sec. or longer		

2) Overheat prevention function

- If the engine coolant temperature rises too high during work, the pump load and engine speed are reduced to protect the engine from overheating.
- This function is turned on when the coolant temperature rises above 95°C.

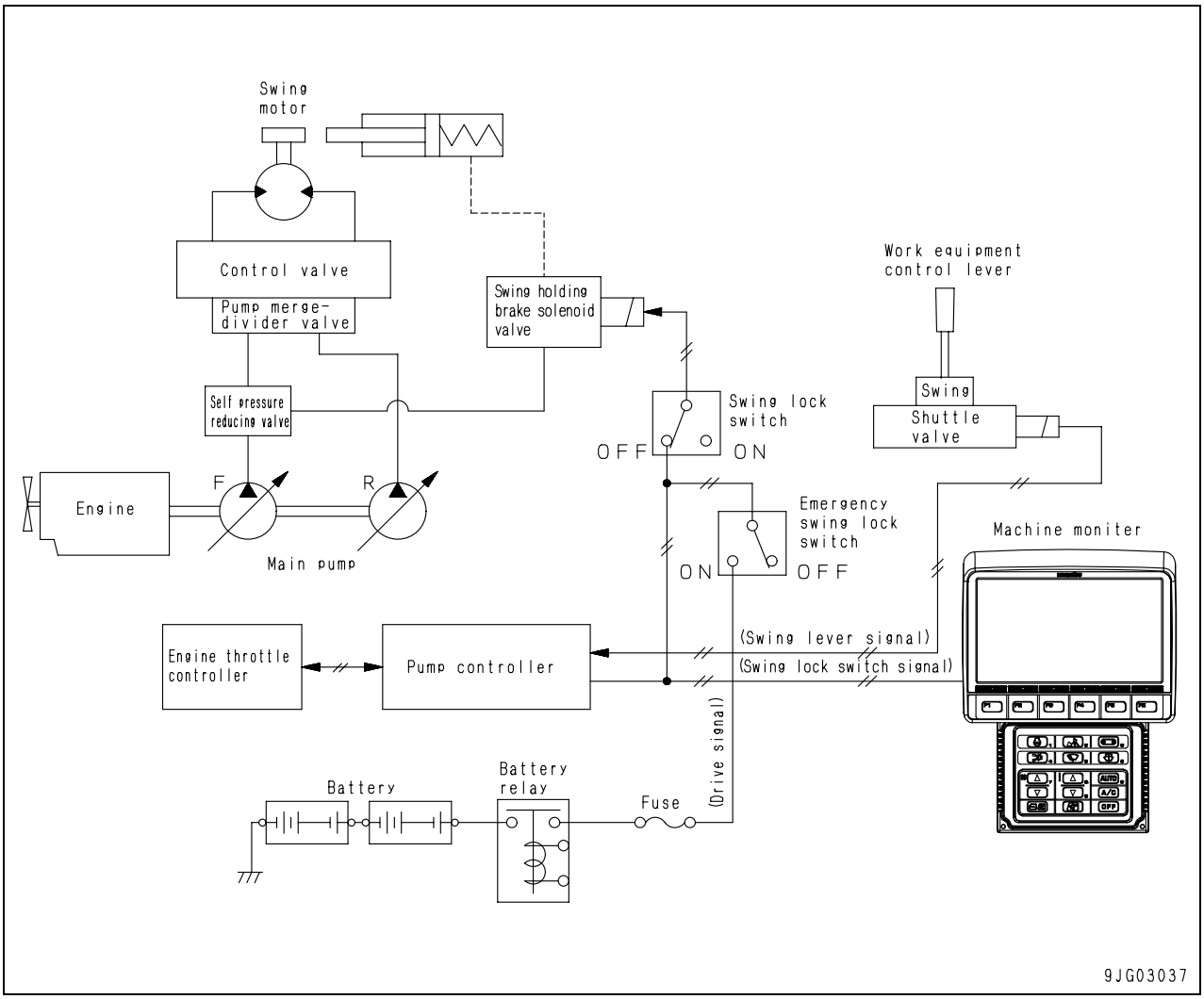
Operating condition	⇒	Operation/Remedy	⇒	Resetting condition
Hydraulic oil temperature: Above 95°C		Work mode: Travel Engine speed: Keep as is. Lower travel speed.		Hydraulic oil temperature: Below 95°C • Under above condition, controller is set to condition before operation of function. (Automatic reset)

Operating condition	⇒	Operation/Remedy	⇒	Resetting condition
Hydraulic oil or coolant temperature: Above 100°C		Work mode: P or E mode Engine speed: Keep as is. Lower pump discharge.		Hydraulic oil or coolant temperature: Below 100°C • Under above condition, controller is set to condition before operation of function. (Automatic reset)

Operating condition	⇒	Operation/Remedy	⇒	Resetting condition
Hydraulic oil or coolant temperature: Above 102°C		Work mode: P, E, B or L mode Engine speed: Keep as is. Monitor alarm lamp: Lights up. Lower pump discharge.		Hydraulic oil or coolant temperature: Below 102°C • Under above condition, controller is set to condition before operation of function. (Automatic reset)

Operating condition	⇒	Operation/Remedy	⇒	Resetting condition
Hydraulic oil or coolant temperature: Above 105°C		Work mode: Any mode Engine speed: Low idle Monitor alarm lamp: Lights up Alarm buzzer: Sounds		Hydraulic oil or coolant temperature: Below 105°C Fuel control dial: Return to low idle position once. • Under above condition, controller is set to condition before operation of function. (Manual reset)

6. Swing control function



Function

The swing lock and swing holding brake function are provided as a swing control function.

1) Swing lock and swing holding brake function

- The swing lock function (manual) is used to lock machine from swinging at any position. The swing holding brake function (automatic) is used to prevent hydraulic drift after the machine stops swinging.
- Operation of swing lock switch and swing lock/holding brake

Lock switch	Lock lamp	Function	Operation
OFF	OFF	Swing holding brake	If swing lever is set in neutral, swing brake operates in about 7 sec. If swing lever is operated, brake is released and machine can swing freely.
ON	ON	Swing lock	Swing lock operates and machine is locked from swinging. Even if swing lever is operated, swing lock is not reset and machine does not swing.

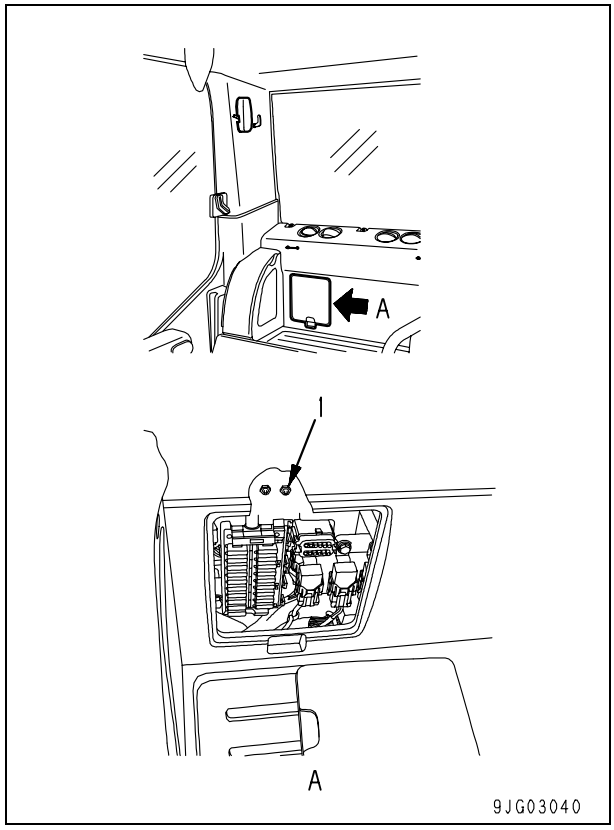
Swing holding brake release switch

- If the controller, etc. has a problem, the swing holding brake does not work normally, and the machine cannot swing, the swing lock can be reset with the swing holding brake release switch.
- Even if the swing holding brake release switch is turned on, if the swing lock switch is turned on, the swing brake is not released.
- If the swing lock is reset, only the hydraulic brake is applied by the safety valve. Note that if swinging is stopped on a slope, the upper structure may swing by its gravity.

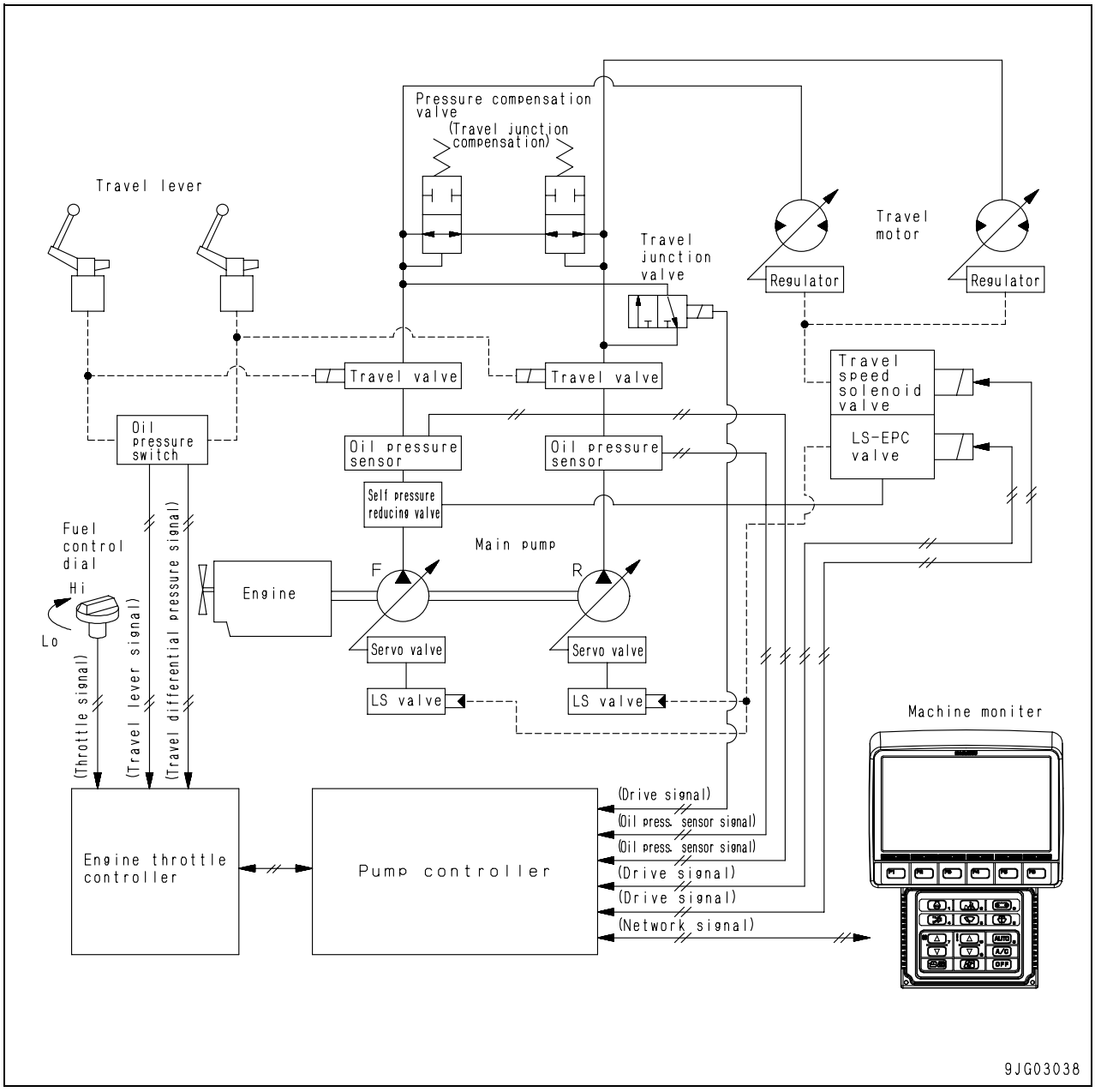
Swing holding brake release switch	ON (when controller has trouble)		OFF (when controller is normaly)	
Swing lock switch	ON	OFF	ON	OFF
Swing brake	Swing lock is turned on.	Swing lock is canceled.	Swing lock is turned on.	Swing holding brake is turned on.

2) Quick hydraulic oil warm-up function when swing lock switch is turned on

- If swing lock switch (1) is turned on, the pump cut-off function is cancelled and the relief pressure rises from 34.8 MPa {355 kg/cm^2} to 37.2 MPa {380 kg/cm^2}. If the work equipment is relieved under this condition, the hydraulic oil temperature rises quickly and the warm-up time can be shortened.



7. Travel control function



Function

- The machine is provided with a function that ensures travel performance best fit to the type of work and jobsite by controlling pumps during travel or allowing operator to change travel speed automatically or manually.

1) Pump control function during travel

- If the machine travels in a work mode other than P mode, the work mode and the engine speed are kept as they are and the pump absorption torque is increased.
- For details, see "Engine and pump composite control function."

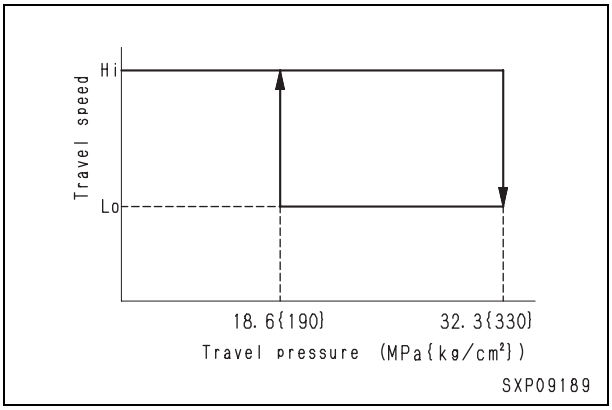
2) Travel speed change function

1] Manual change with travel speed switch
If one of Lo, Mi and Hi is selected with the travel speed switch, the pump controller controls the pump capacity and motor capacity at each gear speed as shown below to change the travel speed.

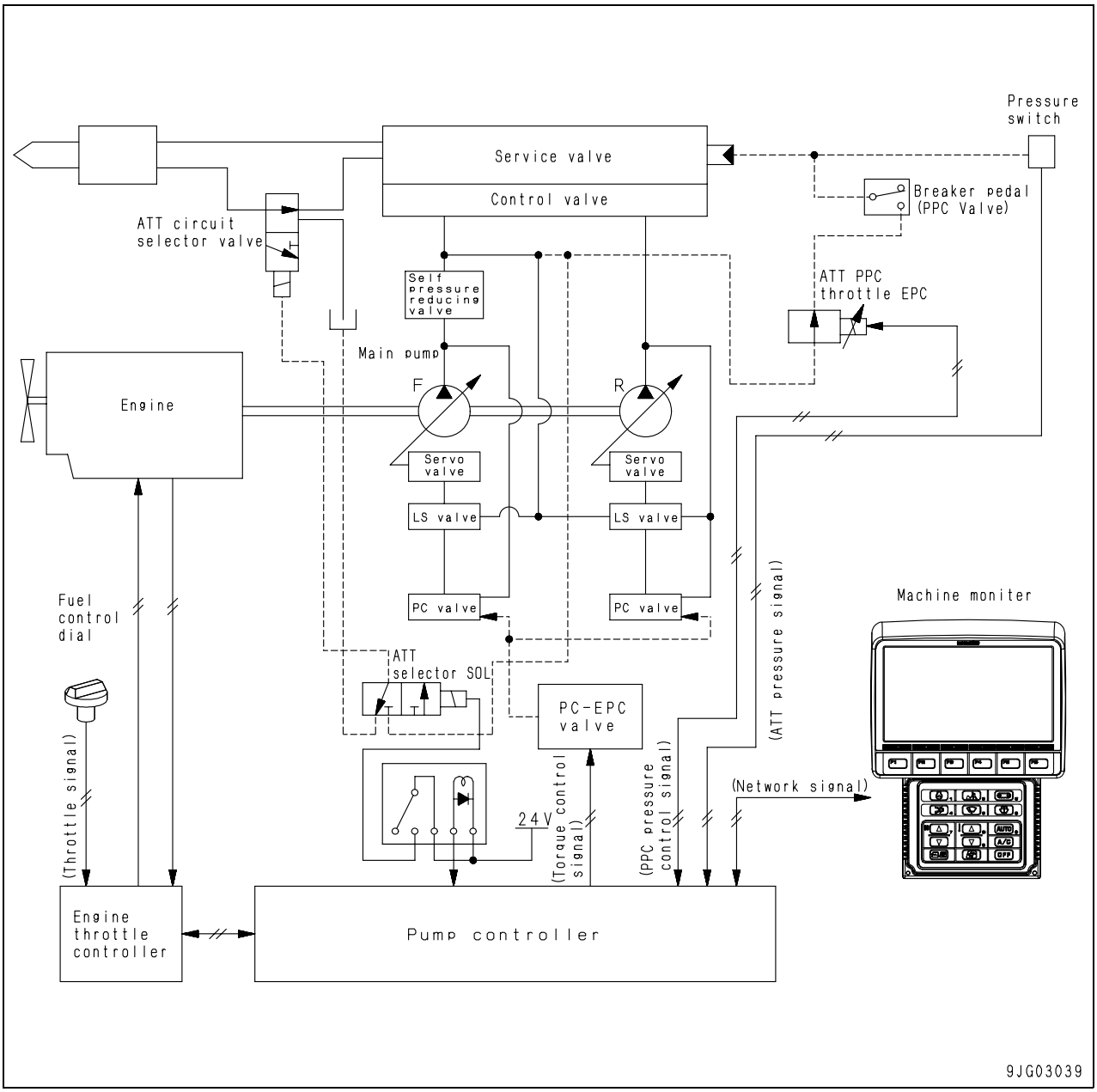
Travel speed switch	Lo (Low speed)	Mi (Midium speed)	Hi (High speed)
Pump capacity (%)	90	82	100
Motor capacity	Max.	Max.	Min.
Travel speed (km/h)	3.2	4.5	5.5

2] Automatic change by engine speed
If the fuel control dial is used to set the engine speed to less than 1,200 rpm, the travel speed changes to Lo when the machine is travelling in Mi or Hi, and the travel speed will not change to Mi or Hi.

3] Automatic change by pump discharge pressure
When traveling with the travel speed switch set to Hi or Mi, if the load increases, such as when travelling uphill, and the travel pressure goes above 32.3 MPa {330 kg/cm^2} for more than 0.5 sec, the travel motor capacity will automatically change to low speed (equivalent to Lo). (The travel speed switch will stay at Hi or Mi.)
If the load decreases, such as when travelling on level ground or travelling downhill, and the travel pressure goes below 18.6 MPa {190 kg/cm^2} for more than 0.5 sec, the travel motor capacity will automatically change and will return to Hi or Mi.



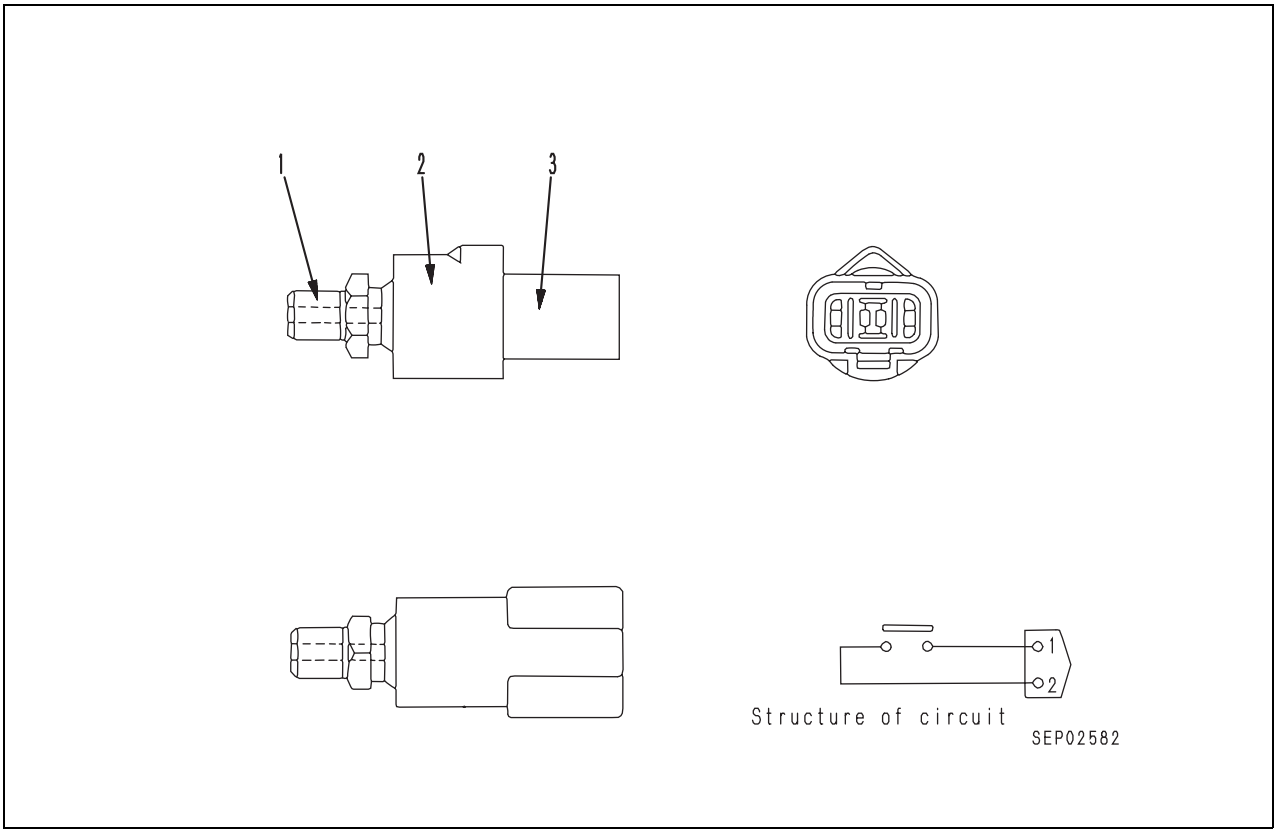
8. Attachment flow control and circuit selector function (if equipped)



Function

- This function is available only with the attachment specification.
- The function acts as follows according to the flow command and working mode from the monitor.
  1) It throttles the attachment PPC pressure and controls the flow when the pedal is depressed fully.
  2) In B mode and the other modes, it switches to attachment single acting (B) or double acting (other modes).

9. System component parts
1) PPC oil pressure switch



1. Plug
2. Switch
3. Connector

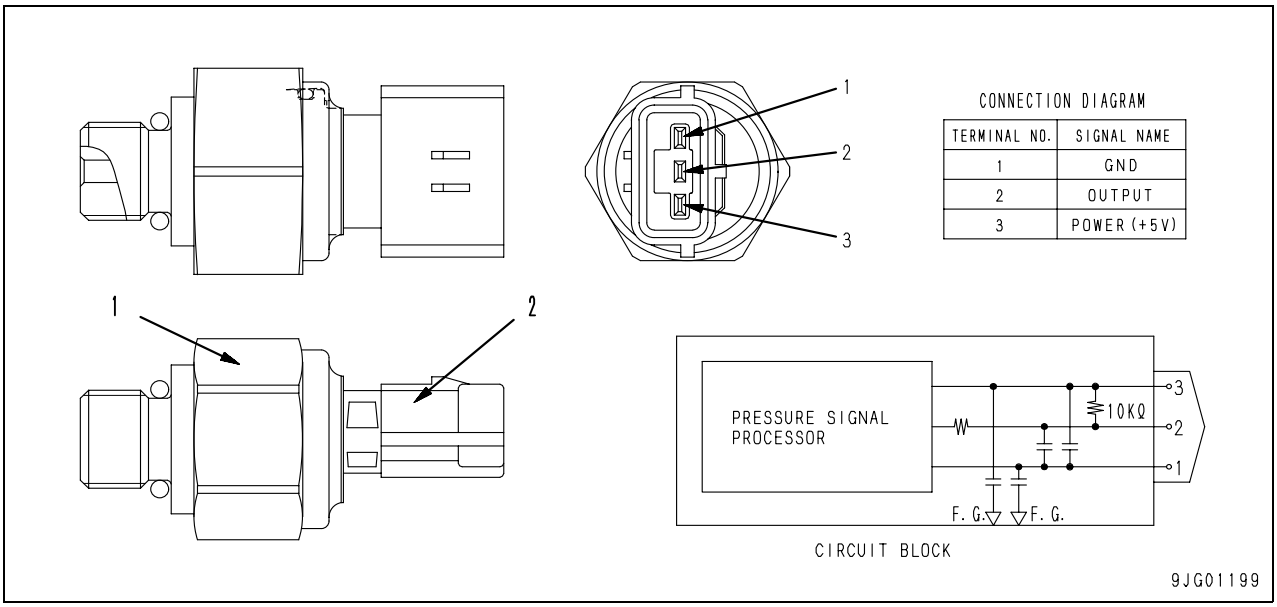
Specifications

Type of contacts: Normally open contacts
Operating (ON) pressure:
0.5 ± 0.1 MPa {5.0 ± 1.0 kg/cm^2}
Resetting (OFF) pressure:
0.3 ± 0.05 MPa {3.0 ± 0.5 kg/cm^2}

Function

- The junction block has 6 PPC oil pressure switches.
- This sensor detects the operating condition of each actuator by the PPC pressure and transmit it to the pump controller.

2) Oil pressure sensor



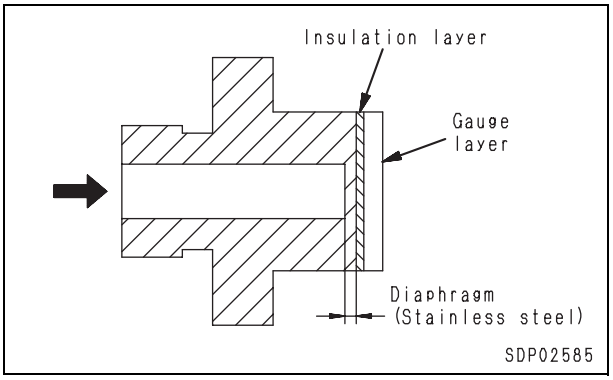
1. Sensor
2. Connector

Function

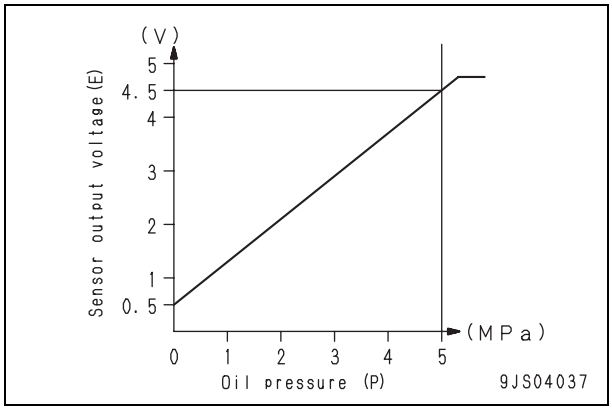
- The pump pressure sensor is installed to the input circuit of the control valve.
- It converts the pump discharge pressure into a voltage and transmits it to the pump controller.

Operation

- The oil pressure is applied to the diaphragm of the oil pressure sensor from the pressure intake part, the diaphragm is deformed.
- The deformation in the diaphragm causes the resistance of the gauge to change. This causes a change in the output voltage, which is transmitted to the amplifier (voltage amplifier).

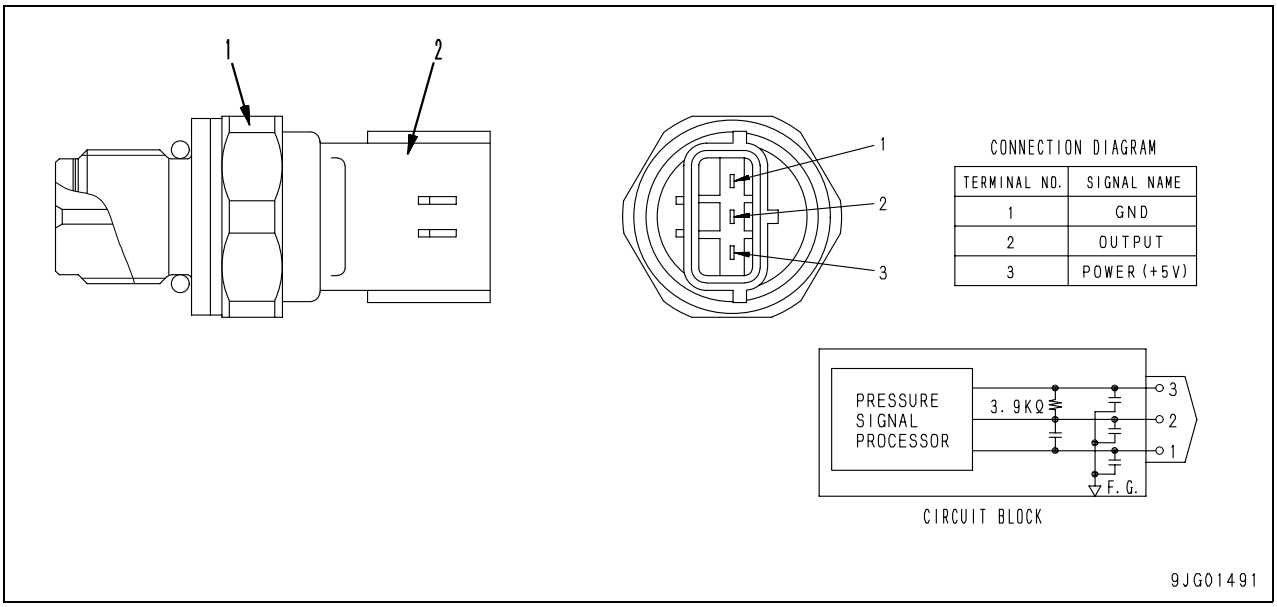


- The relationship between the pressure applied to sensors (P) and output voltage (E) is shown in the figure below.



- The amplifier magnifies output voltage (E) and transmits it to the pump controller.

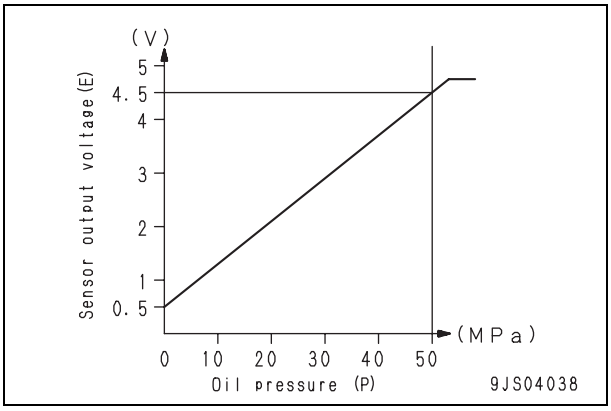
3) Pump pressure sensor (high pressure)



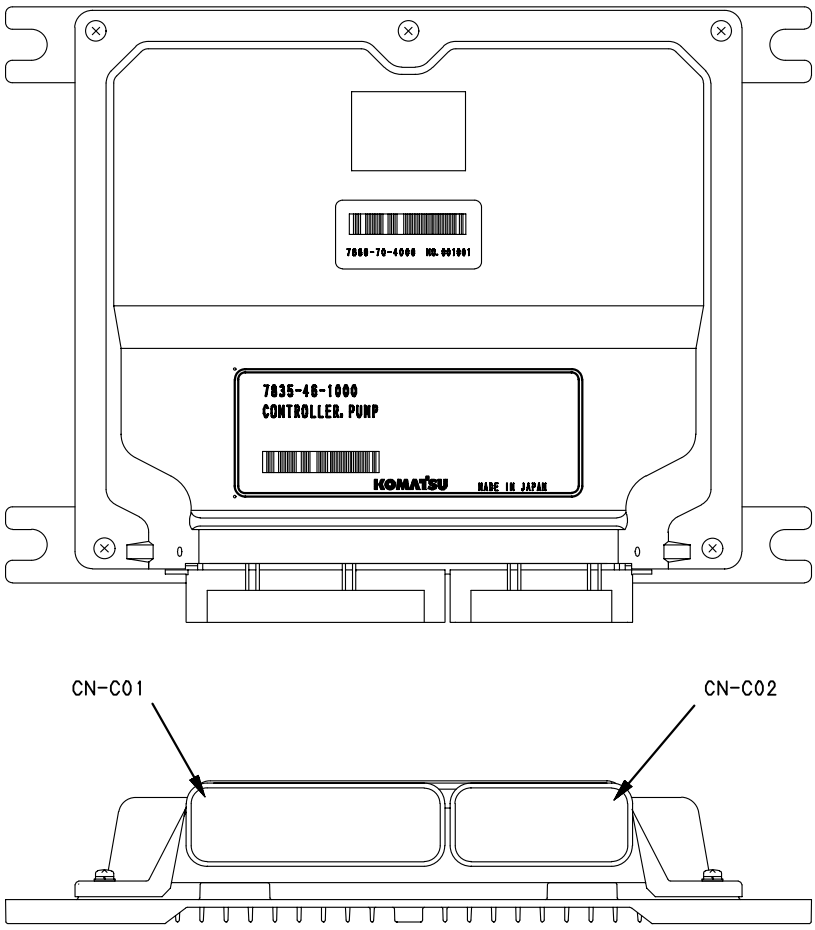
1. Sensor
2. Connector

Operation

- The relationship between the pressure applied to sensors (P) and output voltage (E) is shown in the figure below.



4) Pump controller



CN-C01

Pin No.	Signal name	Input/ output
1	PWR_IN_BATT	Input
2	GND_PWR	Input
3	Washer motor	output
4	PWR_IN_BATT	Input
5	GND_PWR	Input
6	NC(*)	—
7	NC(*)	—
8	NC(*)	—
9	PWR_OUT_5V_0	output
10	NC(*)	Input
11	NC(*)	—
12	NC(*)	—
13	NC(*)	—
14	Boom lower switch	Input
15	Arm dump switch	Input
16	Swing pressure switch	Input
17	Arm curl pilot sensor	Input
18	GND_SIG_A	Input
19	Swing lock switch	Input
20	NC(*)	—
21	Machin select 2	Input
22	NC(*)	—
23	NC(*)	—
24	PWR_CTR_KEY	Input
25	NC(*)	—
26	NC(*)	—
27	NC(*)	—
28	NC(*)	—
29	Hydraulic–oil temperature	Input
30	NC(*)	—
31	NC(*)	—
32	NC(*)	—
33	NC(*)	—
34	Bucket dump pressure switch	Input
35	NC(*)	—
36	Travel steering switch	Input
37	GND_SIG_D	—
38	Swing prolix switch	Input
39	Machin select 5	Input
40	Machin select 1	Input
41	Knob switch	Input
42	NC(*)	—
43	PWR_CTR_KEY	Input
44	GND_SIG_P	Input
45	COMM_CAN_H_0	Input/ output
46	GND_SIG_A	Input
47	GND_SIG_A	—
48	NC(*)	—
49	F pump pressure sensor	Input
50	NC(*)	—
51	NC(*)	—

CN-C01

Pin No.	Signal name	Input/ output
52	Service switch	Input
53	Boom raise pressure switch	Input
54	NC(*)	—
55	Travel switch	Input
56	Wiper limit switch	Input
57	Window limit switch	Input
58	Machin select 4	Input
59	NC(*)	—
60	Start switch	Input
61	NC(*)	—
62	NC(*)	Input
63	NC(*)	—
64	COMM_CAN_L_0	Input/ output
65	GND_SIG_A	—
66	NC(*)	—
67	NC(*)	—
68	R pump pressure sensor	Input
69	NC(*)	—
70	NC(*)	—
71	NC(*)	Input
72	NC(*)	—
73	Bucket curl pilot sensor	Input
74	Overload pressure sensor	—
75	Wiper limit switch (P)	Input
76	NC(*)	—
77	Machin select 3	Input
78	Overload caution enable switch	—
79	Start switch (ACC)	Input
80	NC(*)	—
81	GND_SIG_D	—

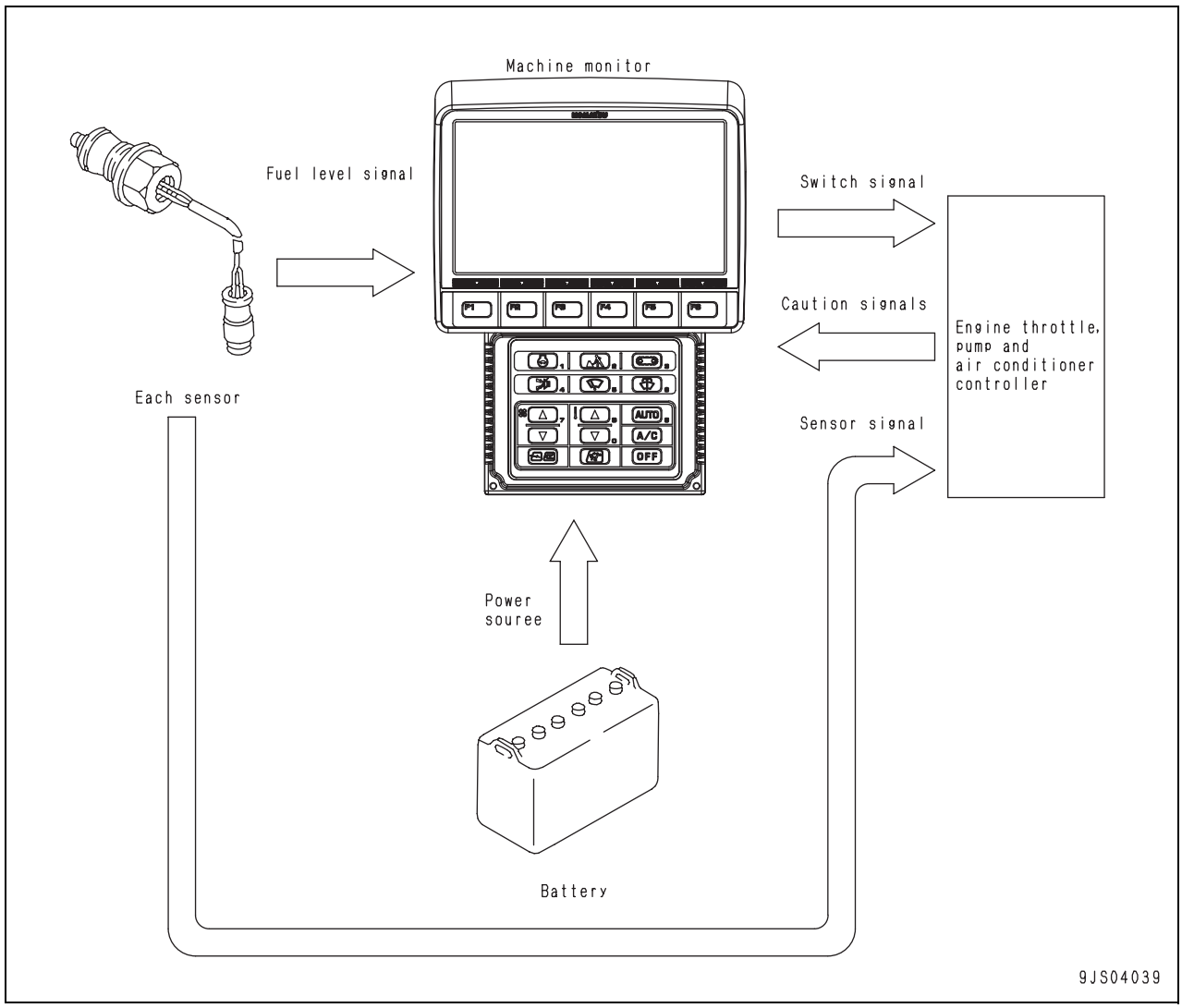
*: Never connect to NC or malfunctions or failures will occur.

CN-C02

Pin No.	Signal name	Input/ output
82	NC(*)	—
83	NC(*)	—
84	NC(*)	—
85	NC(*)	—
86	Att circuit change solenoid	output
87	Travel speed solenoid	output
88	NC(*)	output
89	NC(*)	—
90	NC(*)	—
91	NC(*)	—
92	NC(*)	—
93	NC(*)	—
94	NC(*)	—
95	NC(*)	output
96	PCQ–EPC (F)	output
97	Att flux limit EPC	output
98	NC(*)	—
99	NC(*)	—
100	NC(*)	—
101	Swing brake solenoid	output
102	NC(*)	—
103	NC(*)	—
104	NC(*)	—
105	NC(*)	—
106	NC(*)	—
107	NC(*)	—
108	Battery relay	output
109	2-stage relief solenoid	output
110	Travel valve solenoid	output
111	NC(*)	—
112	Merge-divider solenoid (Main)	output
113	NC(*)	—
114	Wiper motor (–)	output
115	GND_ACT	Input
116	Solenoid power supply	Input
117	GND_ACT	Input
118	Solenoid power supply	Input
119	Wiper motor (+)	output
120	GND_ACT	Input
121	Solenoid power supply	Input

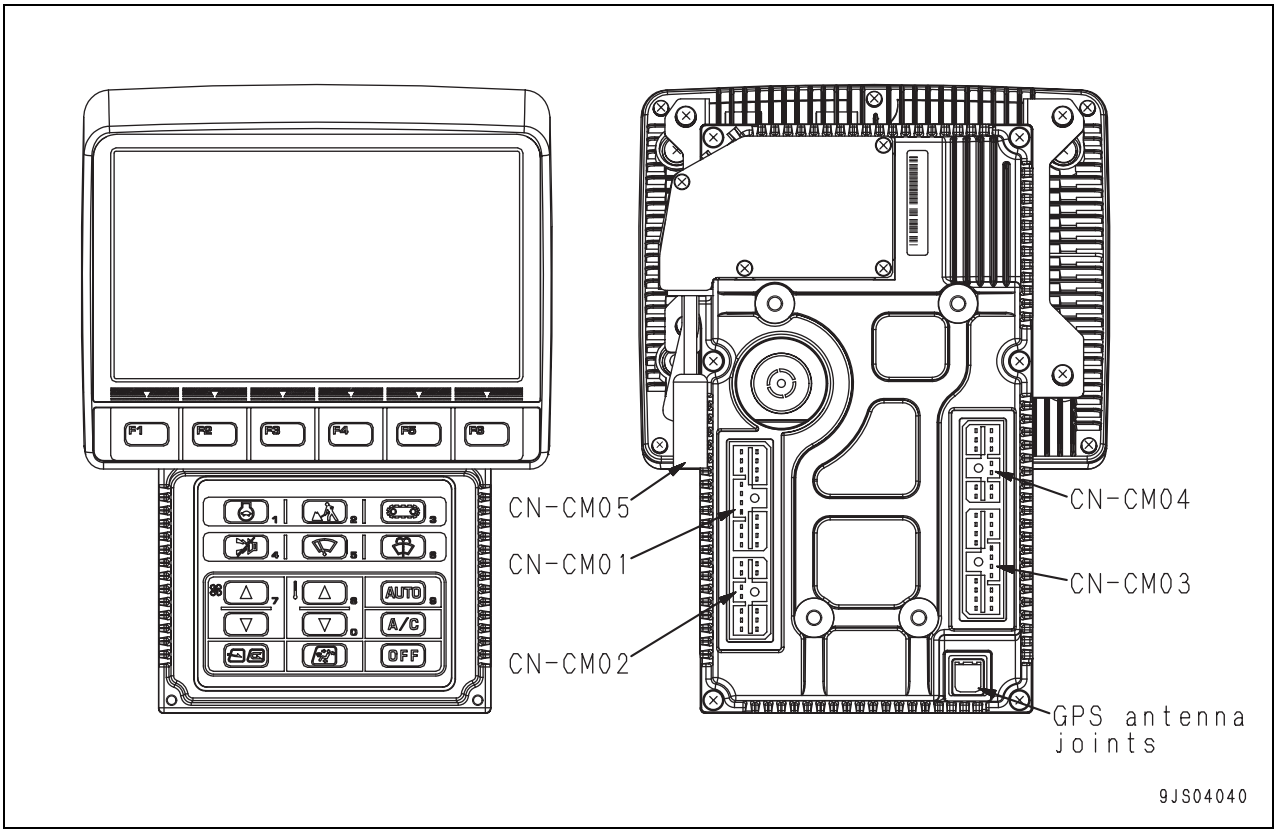
*: Never connect to NC or malfunctions or failures will occur.

Monitor system



- The monitor system notifies the operator of machine status. It monitors the condition of the machine with sensors installed on various parts of the machine, processes and immediately displays the obtained information on the panel. The information that appears on the panel is roughly divided as follows.
  1. Alarms that are issued when the machine has troubles
  2. Machine status, including coolant temperature, hydraulic oil temperature and fuel level
- The machine monitor also has various mode selector switches and functions to operate the machine control system.

Machine monitor



Outline

- The machine monitor has the functions to display various items and the functions to select modes and electric parts.
- The machine monitor has a CPU (Central Processing Unit) in it to process, display, and output the information.
- The monitor display employs an LCD (Liquid Crystal Display). The switches are flat sheet switches.

Input and output signals

CN-CM01

Pin No.	Signal name	Input/ output
1	Battery power (+24V constantly)	Input
2	Battery power (+24V constantly)	Input
3	Battery power GND	—
4	Battery power GND	—
5	Wake-up	Input/ Output
6	Relay output	Output
7	—	—
8	NC(*)	—
9	Fuel level	Input
10	NC(*)	—
11	Charge amount	Input
12	Chassis analog signal GND	—
13	Light switch	Input
14	Key switch (ACC)	Input
15	Key switch (C)	Input
16	Preheating	Input
17	NC(*)	—
18	NC(*)	—

*: Never connect to NC or malfunctions or failures will occur.

CN-CM02

Pin No.	Signal name	Input/ output
1	NC(*)	—
2	Engine oil level sensor	Input
3	Coolant level sensor	Input
4	Air cleaner clogging sensor	Input
5	Swing lock	Input
6	NC(*)	—
7	NC(*)	—
8	CAN terminating resistance	—
9	CAN_H	Input/ Output
10	CAN_L	Input/ Output
11	NC(*)	Input/ Output
12	NC(*)	Input/ Output

*: Never connect to NC or malfunctions or failures will occur.

CN-CM03

Pin No.	Signal name	Input/ output
1	RS232C CD for communication terminal	Input
2	RS232C RXD for communication terminal	Input
3	RS232C SG for communication terminal	—
4	Signal GND for communication terminal control	—
5	Communication terminal selection signal	Input
6	RS232C RTS for communication terminal	Output
7	RS232C TXD for communication terminal	Output
8	RS232C DTR for communication terminal	Output
9	RS232C DSR for communication terminal	Input
10	RS232C CTS for communication terminal	Input
11	RS232C RI for communication terminal	Input
12	Power GND for communication terminal	—
13	Input CH1 for communication terminal status	Input
14	Output for communication terminal power control	Output
15	Output CH1 for communication terminal control	Output
16	Output CH2 for communication terminal control	Output
17	Input CH2 for communication terminal status	Input
18	Electric power supply for communication terminal	Output

CN-CM04

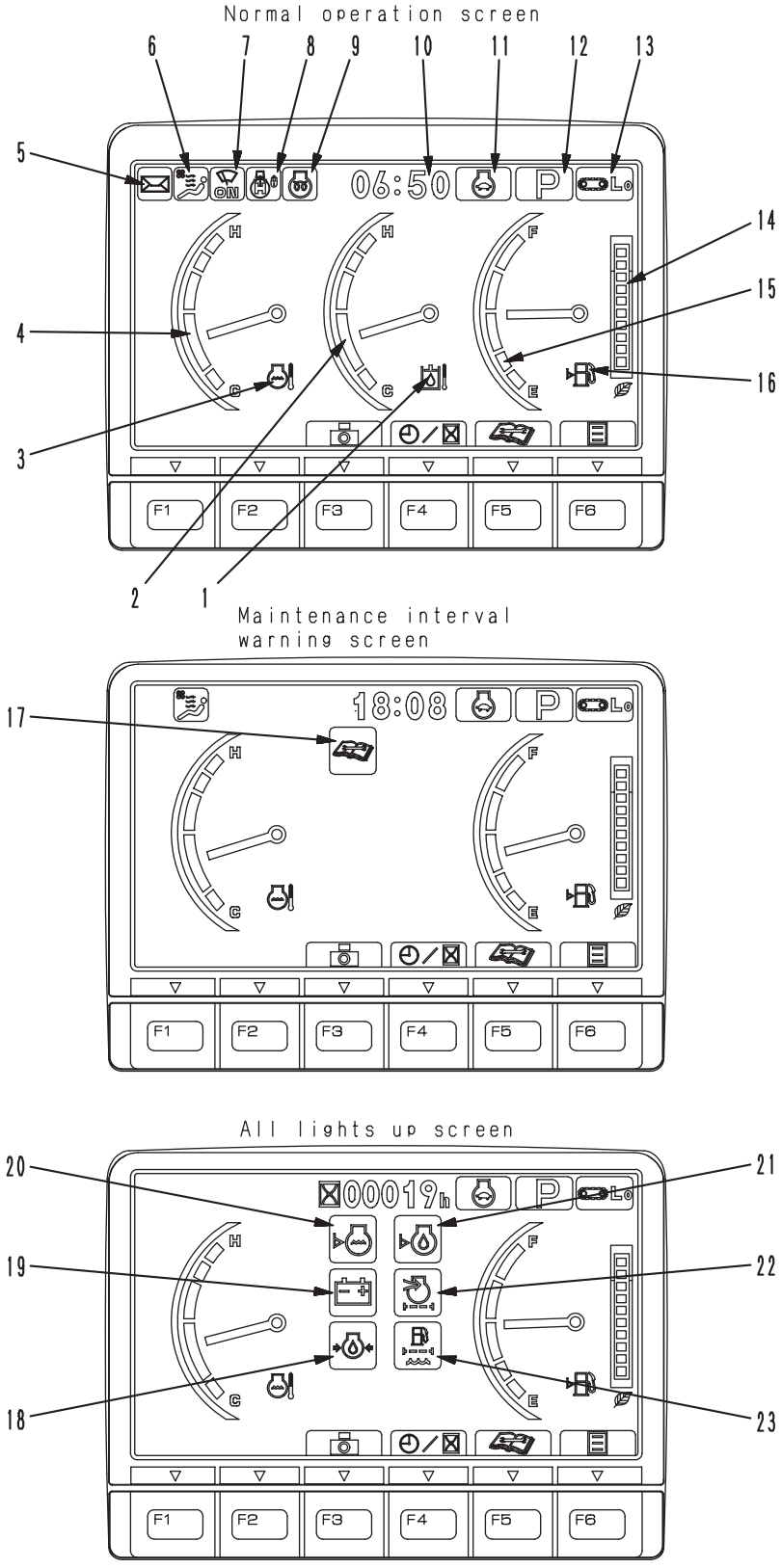
Pin No.	Signal name	Input/ output
1	NC(*)	—
2	NC(*)	—
3	NC(*)	—
4	NC(*)	—
5	NC(*)	—
6	NC(*)	—
7	NC(*)	—
8	NC(*)	—
9	NC(*)	—
10	NC(*)	—
11	NC(*)	—
12	NC(*)	—

*: Never connect to NC or malfunctions or failures will occur.

CN-CM05

Pin No.	Signal name	Input/ output
1	Electric power supply for camera	Output
2	Camera NTSC signal input 1	Input
3	Camera NTSC signal input 2	Input
4	Camera NTSC signal input 3	Input
5	Electric power supply GND for camera	—
6	Camera signal GND1	—
7	Camera signal GND2	—
8	Camera signal GND3	—

Monitor control, display portion

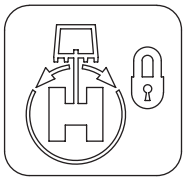
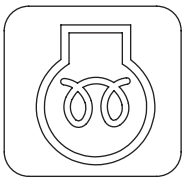
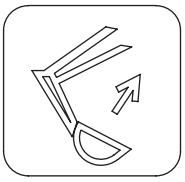


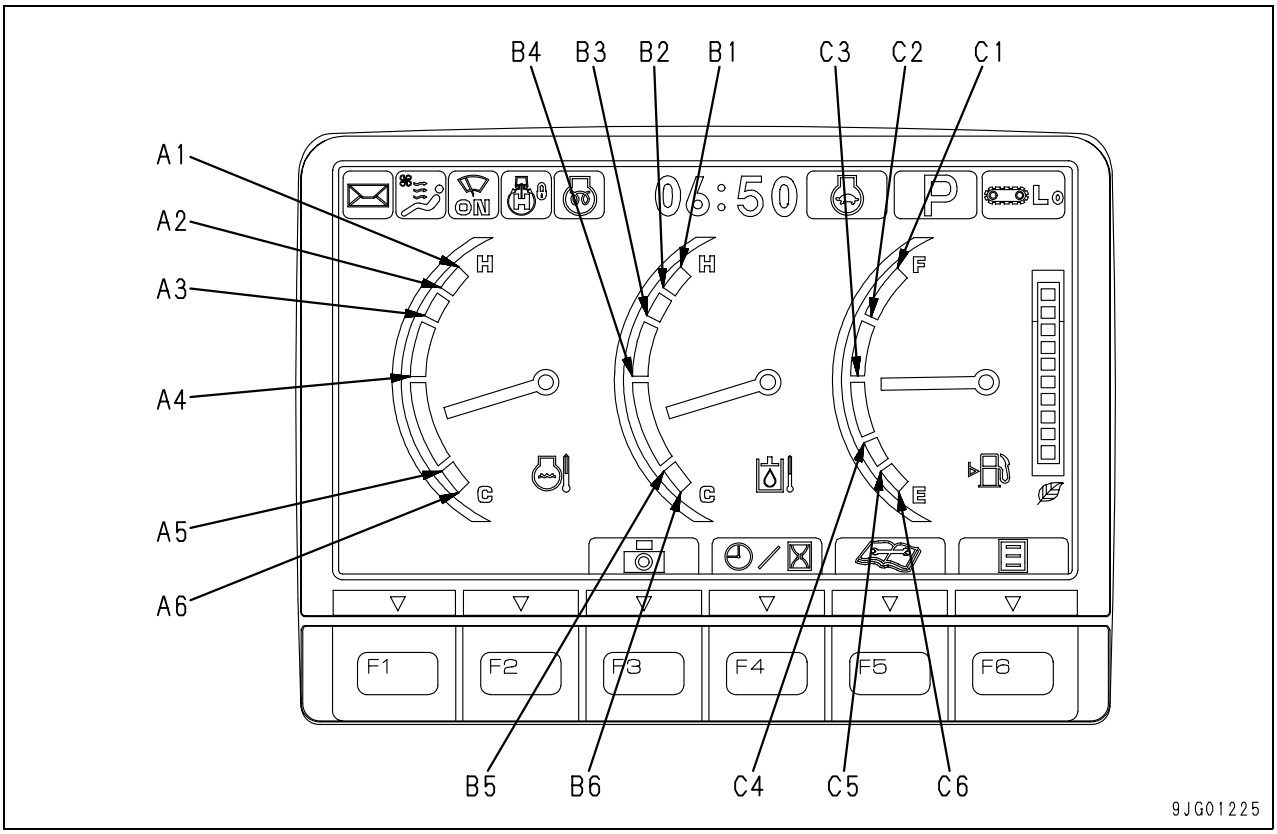
1. Hydraulic oil temperature monitor
2. Hydraulic oil temperature gauge
3. Engine coolant temperature monitor
4. Engine coolant temperature gauge
5. KOMTRAX message monitor
6. Air conditioner monitor
7. Wiper monitor
8. Swing lock monitor
9. Engine pre-heating monitor/power maximizing monitor
10. Time/service meter
11. Auto-deceleration monitor
12. Working mode monitor
13. Travel speed monitor
14. ECO indicator
15. Fuel gauge
16. Fuel level monitor
17. Maintenance interval monitor
18. Engine oil pressure monitor
19. Charge level monitor
20. Radiator coolant level monitor
21. Engine oil level monitor
22. Air cleaner clogging monitor
23. Water separator monitor

Precautions on the machine monitor display

- The liquid crystal display panel may have black spots (which do not light up) or bright spots (which stay on).
  Products having 10 or less black or bright spots conform the product specification; such the condition is quite normal.
- Battery voltage may suddenly drop at engine-start due to ambient temperature or the condition of the battery. The machine monitor display may temporarily disappear if it happens; it is quite normal.
- Continuous operation of the machine monitor may display blue bright spots on the screen having a black background; it is quite normal.
  The screen normally displayed on the monitor has a blue or white background. For this reason, blue spots will not cause any problem (since the liquid crystal lights up red, blue, and green spots when displaying white).

Monitor items and display

<table>
<tr><th>Symbol</th><th>Display item</th><th>Display method</th></tr>
<tr><td> 
9JG01222</td><td>Swing lock</td><td>
<table>
<tr><th>Swing lock switch</th><th>Swing holding brake release switch</th><th>Display of symbol</th></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td></tr>
<tr><td>ON</td><td>OFF</td><td>ON</td></tr>
<tr><td>OFF</td><td>ON</td><td>Flashes</td></tr>
<tr><td>ON</td><td>ON</td><td>Flashes</td></tr>
</table>
</td></tr>
<tr><td> 
9JG01223</td><td>Preheating</td><td>
<table>
<tr><td>Automatic preheating</td><td colspan="2">Preheater operates at low temperature and symbol keeps lighting up for up to about 30 seconds and then goes off after engine starts.</td></tr>
<tr><td rowspan="2">Manual preheating</td><td>Time after setting</td><td>Display of symbol</td></tr>
<tr><td>0 – 30 sec
30 – 40 sec
After 40 sec</td><td>ON
Flashes
OFF</td></tr>
</table>
</td></tr>
<tr><td> 
9JG01224</td><td>Power Max.</td><td>
<table>
<tr><th>Power Max. switch</th><th>Display of symbol</th></tr>
<tr><td>While pressed</td><td>Keeps lighting up.
Goes off after about 9 sec. if switch is kept pressed.</td></tr>
<tr><td>While released</td><td>Kept turned OFF.</td></tr>
</table>
</td></tr>
<tr><td></td><td>Engine coolant temperature</td><td rowspan="3">See gauge display on next page.</td></tr>
<tr><td></td><td>Hydraulic oil temperature</td></tr>
<tr><td></td><td>Fuel level</td></tr>
</table>

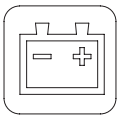


The gauge pointer disappears when information on coolant temperature or hydraulic oil temperature cannot be obtained due to disconnection of CAN.

Gauge	Range	Temperature or volume	Indicator	Buzzer sound
Engine coolant temperature (°C)	A1	105	Red	○
	A2	102	Red	
	A3	100	Off	
	A4	80	Off	
	A5	60	Off	
	A6	30	White	
Hydraulic oil temperature (°C)	B1	105	Red	
	B2	102	Red	
	B3	100	Off	
	B4	85	Off	
	B5	40	Off	
	B6	20	White	
Fuel level (ℓ)	C1	417	Off	
	C2	347.5	Off	
	C3	277.5	Off	
	C4	199	Off	
	C5	100	Off	
	C6	62	Red	

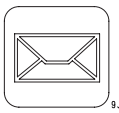
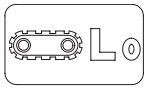
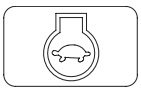
Checks before starting (all symbols light up), when maintenance interval is exceeded.

If the checks before starting or maintenance interval is exceeded items light up, the display of the hydraulic oil temperature gauge and the hydraulic oil temperature monitor disappear and the following symbols are displayed.

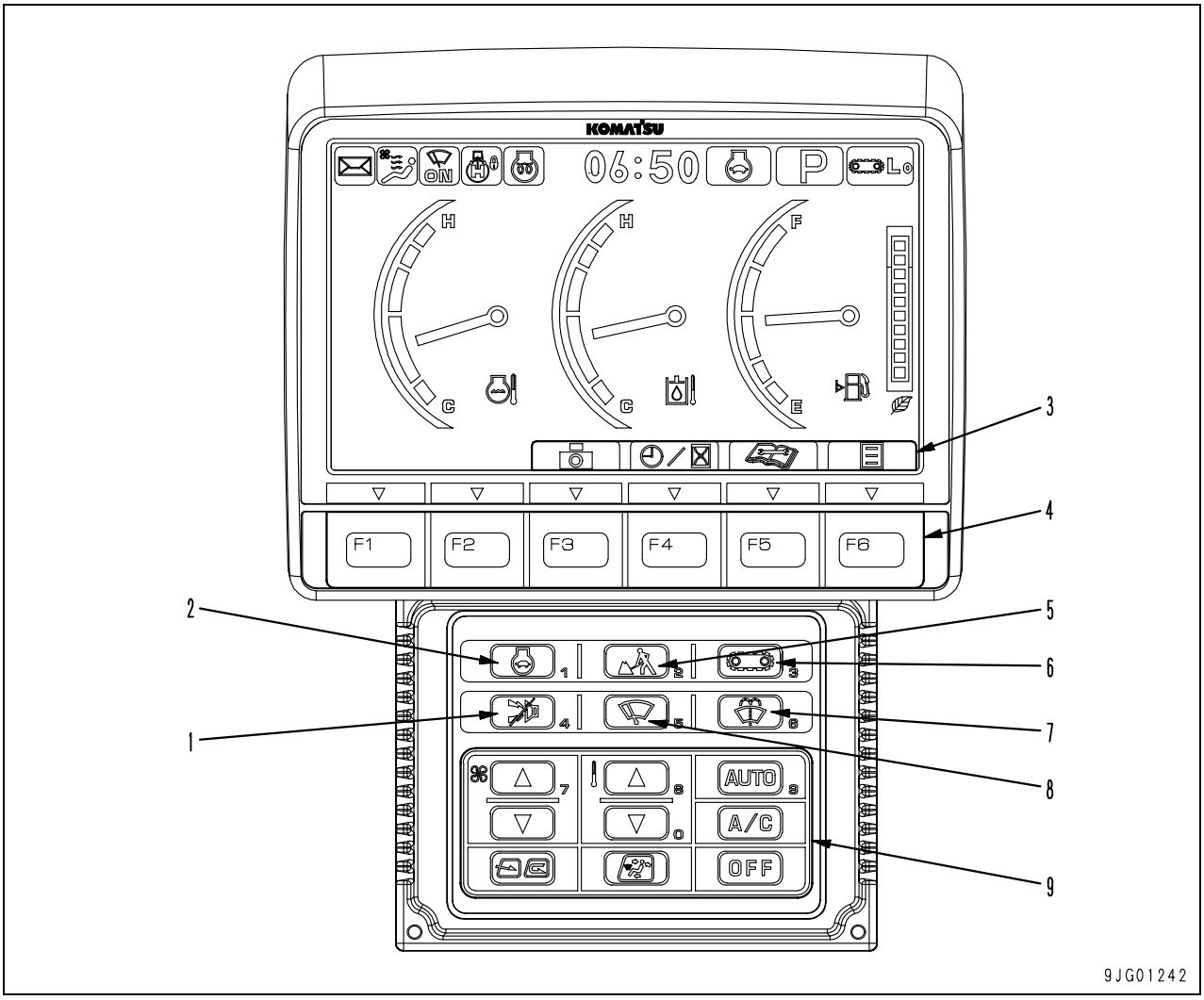
Symbol	Display item	Check before starting item	While engine is stopped	While engine is running
 9JG01376	Engine oil pressure	●	—	Lights up and buzzer sounds when abnormal.
 9JG01377	Battery charge	●	—	Lights up when abnormal.
 9JG01378	Radiator coolant level	●	Lights up and buzzer sounds when abnormal.	Lights up and buzzer sounds when abnormal.
 9JG01379	Engine oil level	●	Lights up when abnormal.	—
 9JG01380	Air cleaner clogging	●	—	Lights up when abnormal.
 9JG01232	Water separator	●	Lights up when abnormal.	Lights up when abnormal.
 9JG01381	Maintenance		Notice lamp (yellow)/Warning lamp (red). Lights up for only 30 seconds after starting switch is turned ON.	

Symbols appear in the order in which they occur from the upper left. When symbols are displayed, if the hydraulic oil temperature is high or low, only its symbol is displayed.

Condition of hydraulic oil	Color of symbol
Low temperature (below B6 or equivalent)	Black on white background
Normal (B6 – B2)	No display
High temperature (above B2)	White on red background

Display category	Symbol	Display item	Display range	Display method
Monitor	 9JG01240	KOMTRAX message	Green: There is unread message. Blue: There is unreturned message.	Displays state of message (for only machine equipped with KOMTRAX).
	 9JG01233	Air conditioner/ Heater	ON ⟷ OFF	Displays operating condition.
	 9JG01234	Wiper	→ INT → ON → OFF	Displays set condition.
	 9JG01235	Working mode	P, E, L, B, ATT	Displays set mode.
	 9JG01236	Travel speed	→ Lo → Mi → Hi	Displays set speed.
	 9JG01237	Auto-deceleration	ON ⟷ OFF	Displays operating condition.
ECO indicator	 9JG01241	ECO indicator	Green: Work load is light – medium. Orange: Work load is heavy.	Displays average work load in 1 minute on 10 levels. (Does not display if ECO display is set OFF in service menu.)
Service meter	 9JG01238	Service meter indicator	While service meter is working	Displays operating time. (Changes to clock if F4 is depressed.)
Clock	 9JG01239	Clock	12-hour display ⟷ 24-hour display	Displays time. (Changes to service meter if F4 is depressed.)

Switches



1. Buzzer cancel switch
2. Auto-deceleration switch
3. Guidance icon
4. Function switch
5. Working mode selector switch
6. Travel speed selector switch
7. Window washer switch
8. Wiper switch
9. Air conditioner control switch

Buzzer cancel switch

Pressing this switch when the alarm buzzer is making sound stops the alarm buzzer.
If a new abnormality is detected, the alarm buzzer sounds.
Depending on the alarm buzzer type, it does not stop even if you press the buzzer cancel switch.

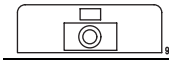
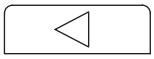
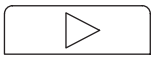
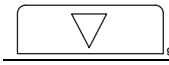
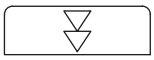
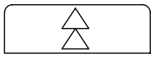
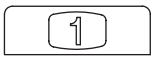
Auto-deceleration switch

The auto-deceleration switch toggles the auto-deceleration function on and off. When the working mode is switched, it is automatically set to ON. When it is set to ON, the auto-deceleration monitor appears.

★ The auto-deceleration function does not work in L mode.

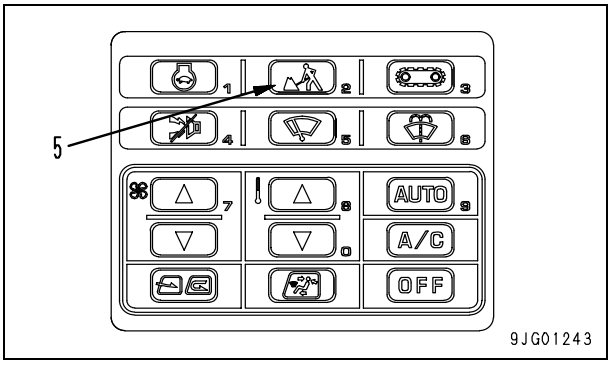
Guidance icon and function switch

The function switches differ depending on the screen display. Each guidance icon shows the function of the switch below it.
Switches with no guidance icon are disabled.
The functions shown by the guidance icons are as shown in the table below.

Symbol	Switch	Item	Function
	F6	Enter	Enters selected/set item.
	F5	Return	Returns to previous screen.
	F3	Select camera screen	Selects camera screen.
	F4	Select service meter/clock	Selects service meter and clock alternately.
	F5	Select maintenance screen	Selects maintenance screen.
	F6	Select user mode screen	Selects user mode screen.
	F3	Select item	Selects item on left side (Selects right end item after left end item).
	F4	Select item	Selects item on right side (Selects left end item after right end item).
	F3	Select item	Selects item on lower side (Selects top item after bottom item)/Resets holding of monitoring.
	F4	Select item	Selects item on upper side (Selects bottom item after top item)/Holds monitoring.
	F1	Select item	Selects page on lower side (Selects top page after bottom page).
	F2	Select item	Selects page on upper side (Selects bottom page after top page).
	F1	Display No. 1 camera screen	Selects No. 1 camera screen.
	F2	Display No. 2 camera screen	Selects No. 2 camera screen.
	F3	Display No. 3 camera screen	Selects No. 3 camera screen.
	F4	Display No. 1 and No. 2 camera screens	Displays No. 1 and No. 2 camera screens simultaneously.
	F2	Return to default setting	Returns selected item to default setting. (Used for adjustment of screen.)
	F1	Start	Starts operation. (Used to start measurement of split fuel consumption on fuel consumption display screen.)
	F1	Stop	Stops operation. (Used to stop measurement of split fuel consumption on fuel consumption display screen.)
	F1/F2	Clear	Clears selected/displayed item
	F1	Set	Executes setting.

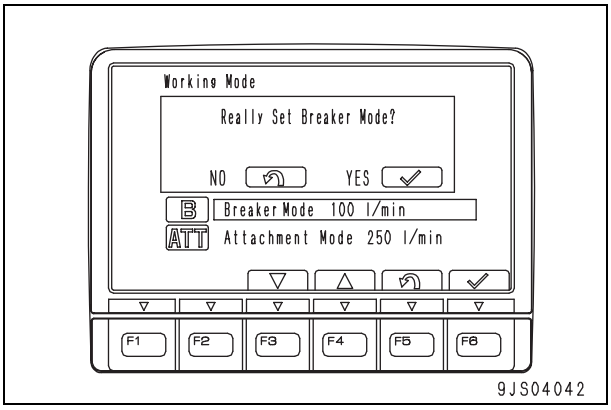
Working mode selector switch

Pressing working mode selector switch (5) switches among working modes.
Check the working mode on the working mode monitor.



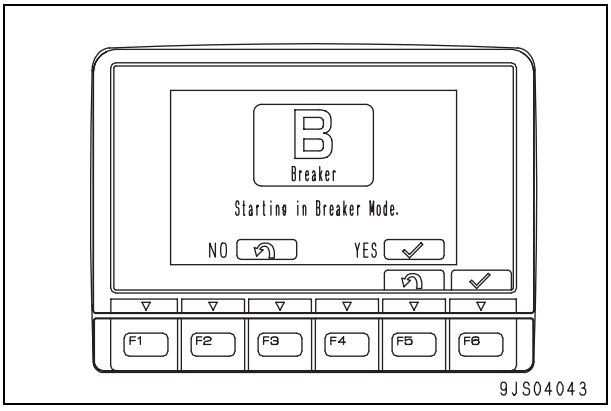
About B mode

- When you try specifying B mode as a working mode, the buzzer sounds for safety's sake and the following confirmation message appears.



F5 : Returns to the working mode selector screen.
F6 : Specifies the breaker mode.

- If B mode is specified as a working mode when you start the monitor, the buzzer sounds and the following message appears.



F5 : Starts up in E mode.
F6 : Starts up in B mode.

Travel speed selector switch

Each time you press the travel speed selector switch, the travel speed setting switches as shown below.
Lo → Mi → Hi → Lo ….
The travel speed setting is confirmable on the travel speed monitor.
The relationship between the speed setting and the monitor display is shown in the table below.

Display	Setting
Crawler symbol + Lo	Low speed (default)
Crawler symbol + Mi	Medium speed
Crawler symbol + Hi	High speed

Window washer switch

While the switch is being pressed, window washer liquid is sprayed out. There is a time delay before the wiper starts.

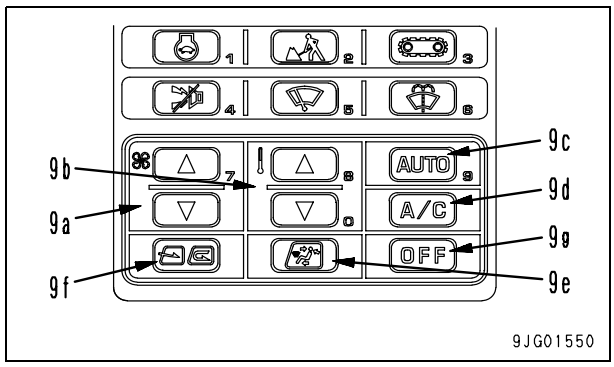
Wiper switch

Each time you press the wiper switch, the wiper settings switch as follows.
OFF → INT → ON → OFF → ….
The wiper operation setting is confirmable on the wiper monitor.
The relationship between the wiper setting and the monitor display is shown in the table below.

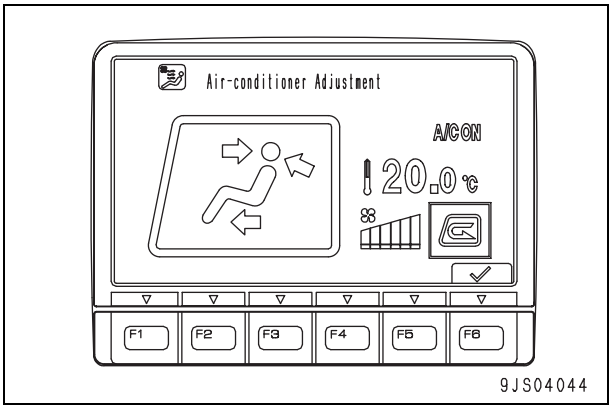
Display	Setting	Wiper actuation status
None	OFF	Stowing stopped or now stowing
Wiper symbol + INT	INT	Intermittent actuation
Wiper symbol + ON	ON	Continuous actuation

Air conditioner control switch

To operate the air conditioner, use the air conditioner control switches.

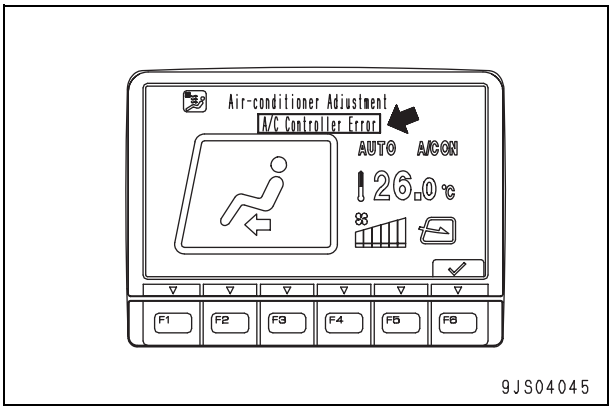


9a : Specifies airflow
9b : Specifies temperature
9c : AUTO
9d : A/C
9e : Switches among air blowing modes
9f : Switches between inside air and outside air
9g : OFF
9a to 9c : Enables entered information simultaneously with switching to the air conditioner control screen below.
9d to 9f : Switches to the air conditioner control screen below. Another pressing switches among modes.
9g : Turns OFF the air conditioner function without switching to the air conditioner screen.



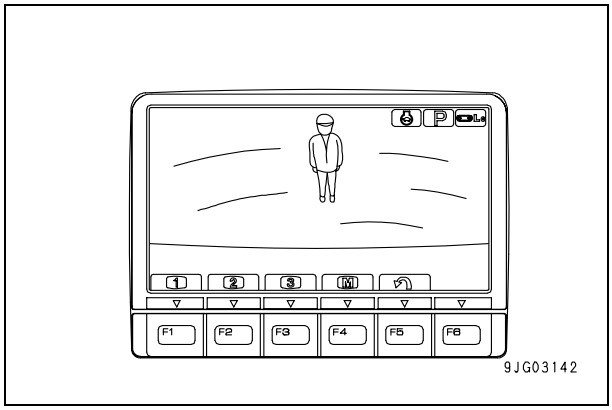
If you do no operation at least 5 sec. with the air conditioner control screen displayed, the window returns to the normal window.

★ When communication with the air conditioner is disconnected, or “spurting-out damper”, “A/M damper”, or “refrigerant” has a problem, the following screen appears.



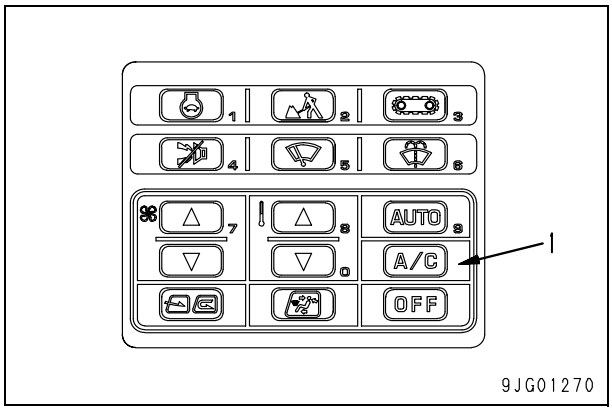
Camera screen display function

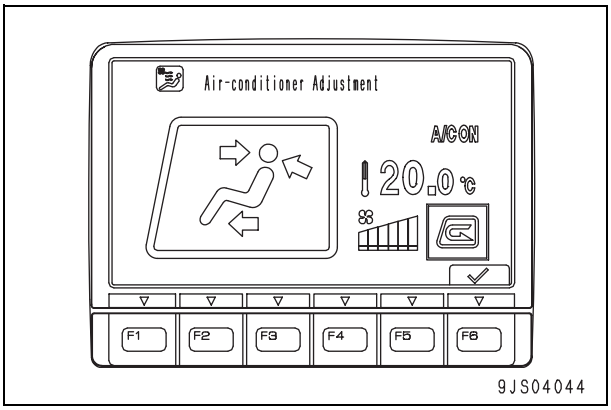
- For an optional-camera-equipped machine, pressing the F3 on the normal screen switches to the camera image.
- For a machine with no camera equipped, the guidance icon for switching to the camera screen does not appear; even if you press the switch, the screen does not switch to the camera image.
- Up to three cameras are mountable.



F1 : Displays the image of No. 1 camera full-screen.
F2 : Displays the image of No. 2 camera full-screen.
F3 : Displays the image of No. 3 camera full-screen.
F4 : Displays the images of No. 1 and No. 2 cameras at the same time.
F5 : Returns to the normal screen.

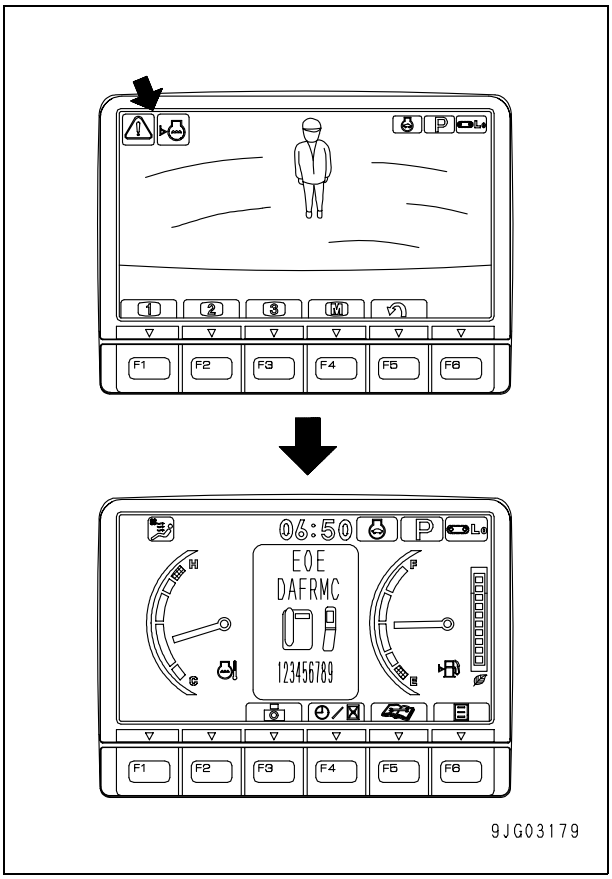
- Making operation of air conditioner button (1) with the camera screen displayed may switch to the air conditioner operation screen.





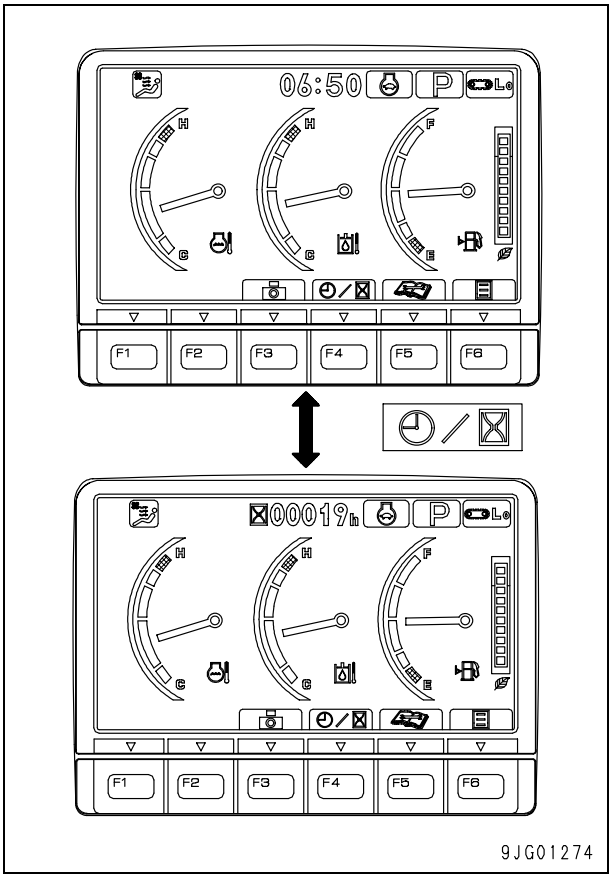
F6, or no operation for 5 sec.: Returns to the camera screen.

- Even when the camera screen is displayed, the working mode selector switch, travel speed selector switch, auto-deceleration switch, buzzer cancel switch, wiper switch, and window washer switch are enabled.
- Changing the working mode or travel speed returns to the normal screen.
- If an abnormality corresponding to an alarm item with the camera screen displayed, the alarm monitor appears on the upper left of the screen. If it appears, return to the normal screen with F5 to check the alarm display.
- If an abnormality corresponding to an error item with the camera screen displayed, the error monitor appears on the upper left of the screen. If it appears, you must move the machine to safe posture immediately and make inspections.
- If you do not operate the lever at least 10 sec. after the error monitor starts to blink, the screen switches to the normal screen.



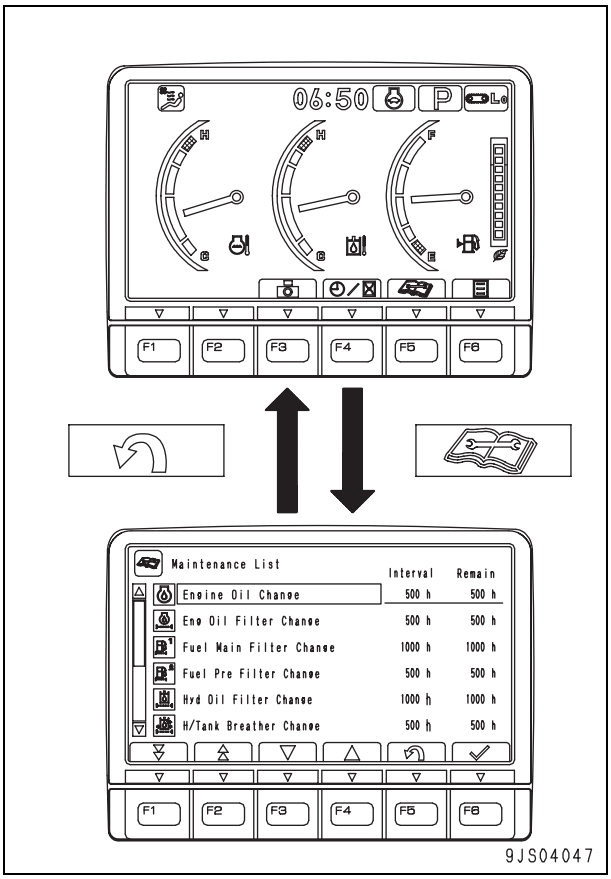
Service meter/time selector function

- Pressing F4 on the normal screen when the service meter is displayed in the top center of the screen switches the display to the time, and doing so when the time is displayed switches the display to the service meter.



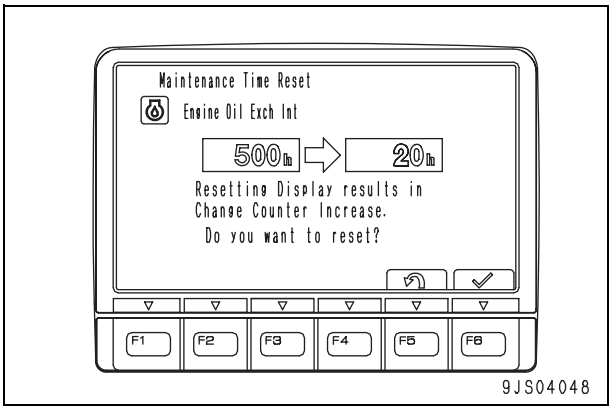
Maintenance function

- Pressing F5 on the normal screen switches to the maintenance screen.



F1 : Displays the next page.
Displays the top page when the last page is displayed.
F2 : Displays the previous page.
Displays the last page when the top page is displayed.
F3 : Selects (highlights) an item one down.
F4 : Selects (highlights) an item one up.
F5 : Returns to the normal screen.
F6 : Switches to the maintenance time reset screen.
No operation at least 30 sec. : Returns to the normal screen.

- If the remaining time on the maintenance table screen is less than 30 hours, the relevant items are highlighted in yellow, and if 0 hours, they are done in red.
- On the maintenance time reset screen, reset the remaining time for the selected item to return to the default.



F5 : Cancels the reset to return to the maintenance table screen.
F6 : Resets the remaining time to return to the normal screen.
No operation at least 30 sec. : Returns to the normal screen.

- The table below shows the maintenance items and replacement intervals. The time remaining to maintenance is reduced as the machine is operated.

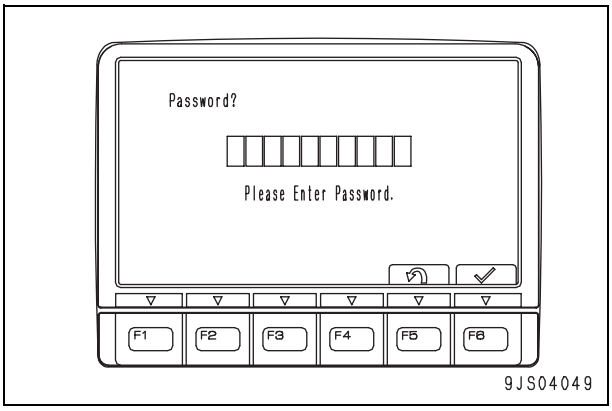
No.	Item	Replacement interval (Hours)
01	Engine oil	500
02	Engine oil filter	500
03	Fuel main filter	1000
41	Fuel prefilter	500
04	Hydraulic filter	1000
05	Hydraulic tank breather	500
06	Corrosion resistor	1000(*)
07	Damper case oil	1000
08	Final case oil	2000
09	Machinery case oil	1000
10	Hydraulic oil	5000

*: If equipped (To be determined)

- The content of the caution display differs according to the remaining time. The relationship is as shown in the table below.

Display	Condition
None	Remaining time for maintenance for all items is more than 30 hours.
Notice display (black symbol displayed on yellow background)	There is one or more items with less than 30-hour remaining time for maintenance.
Warning display (white symbol displayed on red background)	There is one or more items with less than 0-hour remaining time for maintenance.

- You can lock the maintenance time by a password to prevent it from carelessly being reset.

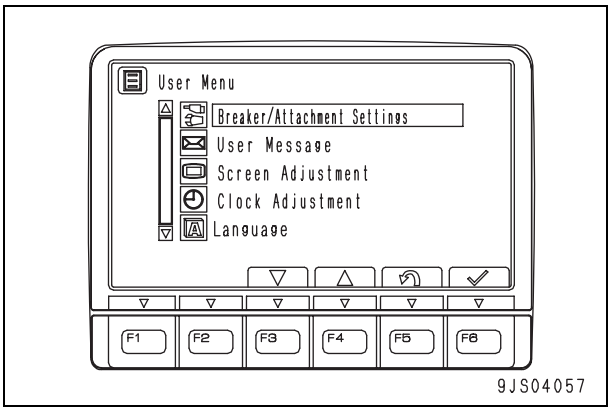


- The default password is “000000”.
- Enabling the password lock on an attachment-equipped machine locks the breaker/attachment setting screen at the same time.

★ For information on changing the attachment/maintenance password, see “Attachment/maintenance password change function” in the Testing and adjusting section.

User mode

- Pressing F6 on the normal screen enters the user mode, switching to the user menu screen.
- In user mode, you can specify items relating to the machine monitor and machine shown below.
  - Breaker/attachment setting
  - Message display
  - Screen adjustment
  - Time adjustment
  - Language setting
  - Economy mode adjustment

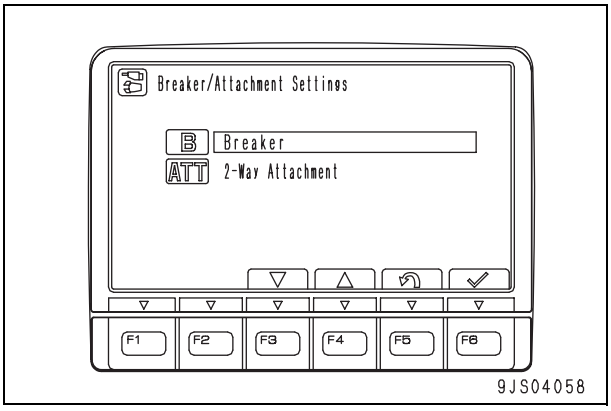


F3 : Selects (highlights) an item one down.
F4 : Selects (highlights) an item one up.
F5 : Returns to the normal screen.
F6 : Switches to the setting screen for the selected item.

No operation at least 30 sec. : Returns to the normal screen.
(In user mode, no switch operation at least 30 sec. returns to the previous screen.)

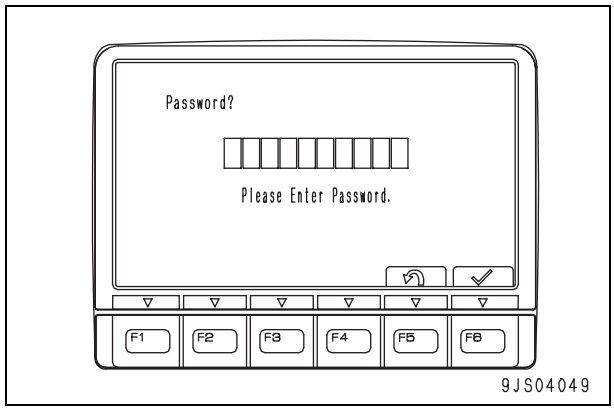
Breaker/attachment setting

- For an attachment-equipped machine, this menu allows you to adjust a flow rate in B mode and ATT mode.
- For a machine with no attachment, this menu does not appear.



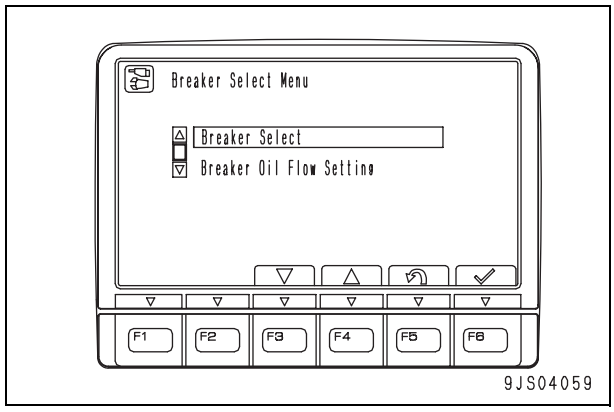
F3 : Selects (highlights) an item one down.
F4 : Selects (highlights) an item one up.
F5 : Cancels changes you made before confirming them with F6 to return to the menu screen.
F6 : Moves to the setup items of the selected (highlighted) item.

- Selecting B switches to the breaker setting menu, and selecting ATT switches to the attachment setting menu.
- You can lock this menu with a password. Enabling the password lock locks the maintenance reset screen at the same time.



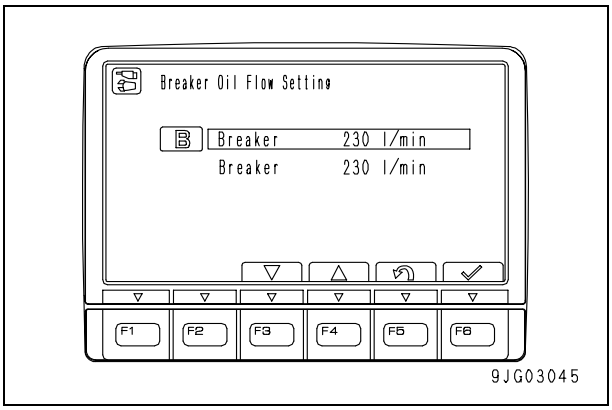
Changing breaker mode setting

- Selecting B on the breaker/attachment setting screen switches to the breaker setting screen. On this screen, select the breaker setting selection screen or breaker flow rate setting screen.



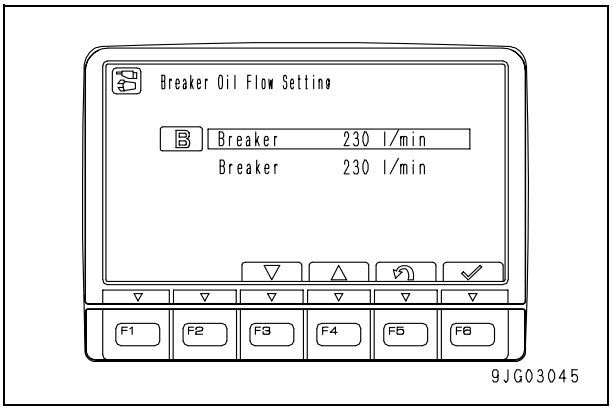
F3 : Selects (highlights) an item one down.
F4 : Selects (highlights) an item one up.
F5 : Returns to the breaker/attachment setting screen.
F6 : Switches to the setting screen for the selected (highlighted) item.

1. Breaker setting selection screen.
   - On this screen, you can allocate one of two set flow rates as a flow rate in breaker mode.
   - The B symbol is displayed before items specified to breaker mode.
   - ★ The defaults of both flow rates are 230 ℓ/min.



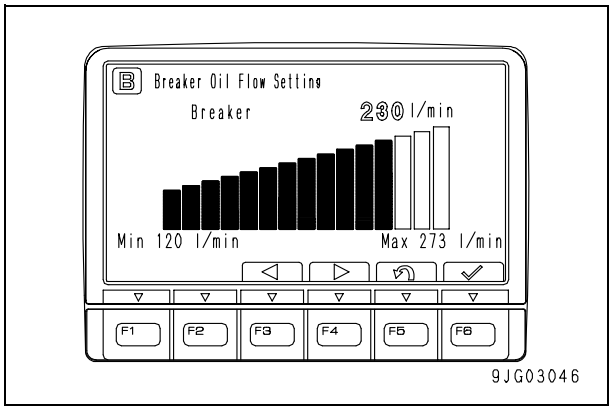
F3 : Selects (highlights) an item one down.
F4 : Selects (highlights) an item one up.
F5 : Returns to the breaker setting menu screen.
F6 : Specifies the selected (highlighted) item as a flow rate in breaker mode.

2. Breaker flow rate setting screen
   - On this screen, you can specify a flow rate.
   - The B symbol is displayed before items specified to breaker mode.



F3 : Selects (highlights) an item one down.
F4 : Selects (highlights) an item one up.
F5 : Returns to the breaker setting menu screen.
F6 : Switches to the flow rate level setting screen for the selected (highlighted) item.

   - On the flow rate level setting screen, change the set flow rate.

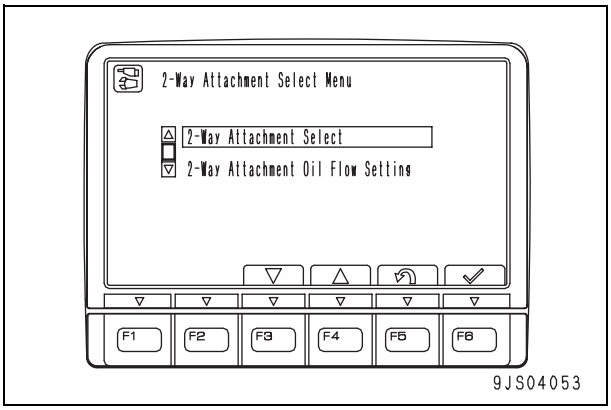


F3 : Decreases the flow rate.
F4 : Increases the flow rate.
F5 : Returns to the flow rate setting screen without changing the flow rate.
F6 : Returns to the flow rate setting screen after specifying the flow rate.

Flow level	Flow rate (ℓ/min)	Remarks
15	273	
14	250	
13	240	
12	230	Default
11	220	
10	210	
9	200	
8	190	
7	180	
6	170	
5	160	
4	150	
3	140	
2	130	
1	120	

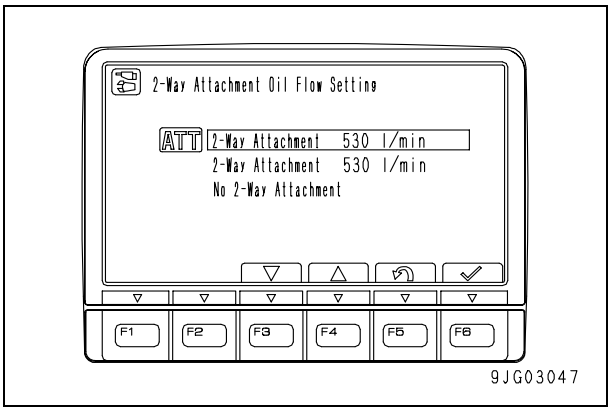
Changing attachment mode setting

- Selecting ATT on the breaker/attachment setting screen switches to the 2-way attachment setting menu. On this screen, select the attachment setting screen or breaker flow rate setting screen.



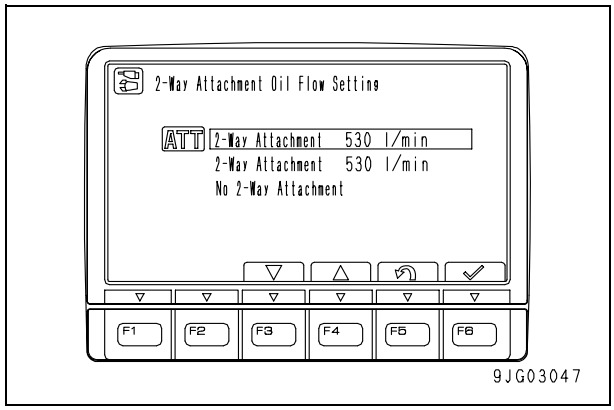
F3 : Selects (highlights) an item one down.
F4 : Selects (highlights) an item one up.
F5 : Returns to the breaker/attachment setting screen.
F6 : Switches to the setting screen for the selected (highlighted) item.

1. Attachment setting selection screen
   - On this screen, you can allocate one of two set flow rates as a flow rate in attachment mode.
   - The ATT symbol is displayed before items specified to attachment mode.
   - ★ The defaults of both flow rates are 530 ℓ/min.



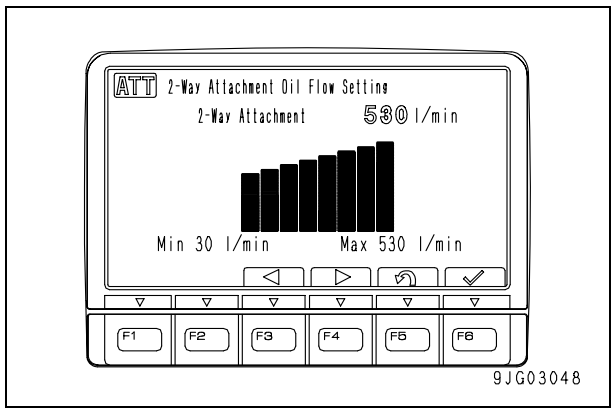
F3 : Selects (highlights) an item one down.
F4 : Selects (highlights) an item one up.
F5 : Returns to the attachment setting menu.
F6 : Specifies the selected (highlighted) item as a flow rate in attachment mode.
- Selecting “No attachment” disables selection of attachment mode on the working mode selection screen.

2. Attachment flow rate setting screen
   - On this screen, you can specify a flow rate.
   - The ATT symbol is displayed before items specified to attachment mode.



F3 : Selects (highlights) an item one down.
F4 : Selects (highlights) an item one up.
F5 : Returns to the breaker setting menu screen.
F6 : Switches to the flow rate level setting screen for the selected (highlighted) item.

- On the flow rate level setting screen, change the set flow rate.

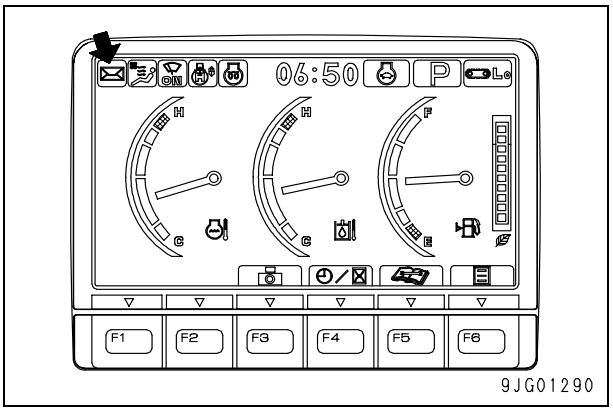


F3 : Decreases the flow rate.
F4 : Increases the flow rate.
F5 : Returns to the flow rate setting screen without changing the flow rate.
F6 : Returns to the flow rate setting screen after specifying the flow rate.

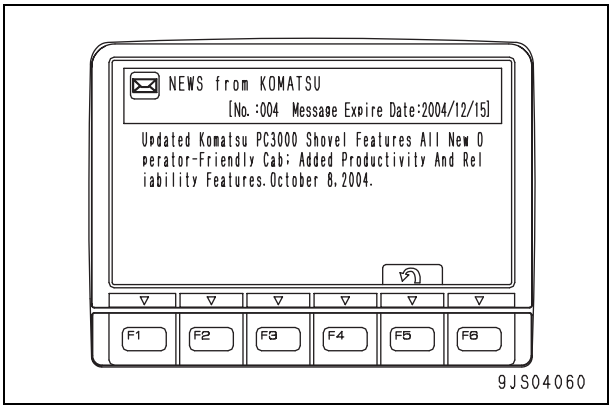
Flow level	Flow (ℓ/min)	Remarks
8	530	Default
7	430	
6	370	
5	300	
4	230	
3	165	
2	100	
1	30	

Message display

- For a KOMTRAX-equipped machine, you can view notification from the sales representative. When there is a message, the message monitor appears on the upper left of the normal screen.
- The lighting green monitor indicates that there are messages to be read.
- The lighting blue monitor appears when you have not sent replies yet after opening messages which accept replies.

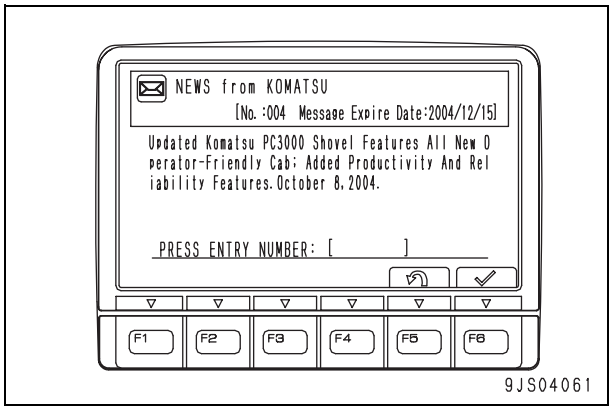


- Press F6 to enter user mode and select “Message display” and you can view (open) the messages.



F6 : Returns to the user mode screen.

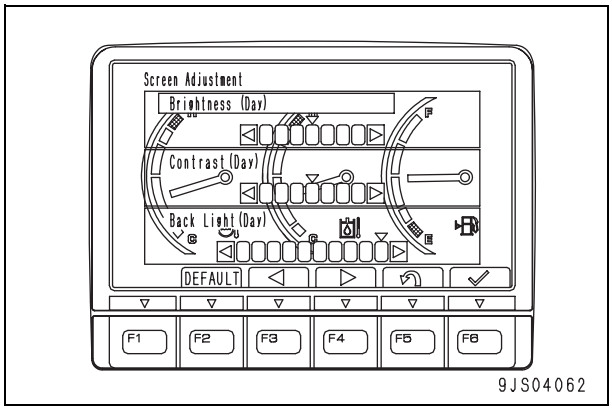
- Under messages that accept replies, “Value to be entered with 10-key: [ ]” appears.If it appears, enter the selected item number provided in the message using the switches of the machine monitor, and press F6.
- “Do you want to transmit the entered value?” appears under the message. Press F6 and the entered value will be sent.



- Messages will be deleted when their validity expire or a new message is received.
- When no message has not been received, “No message” appears at the blue part of the top of the screen.
- Separately from the message display for users above, the service menu is provided with message display for service.

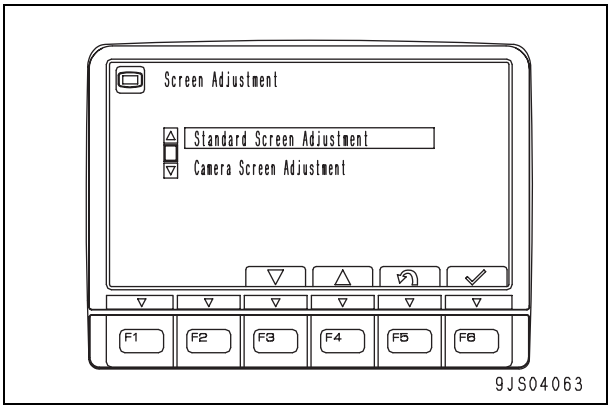
Screen adjustment

- Selecting the Screen adjustment from the user menu and pressing F6 switches to the screen adjustment screen.
- From this menu, you can adjust the brightness, contrast, and luminance of the machine monitor screen.
- When the light switch is in Night mode ON, the night mode screen is adjustable.
- When the light switch is in Daytime mode ON or OFF, the daytime mode screen is adjustable.



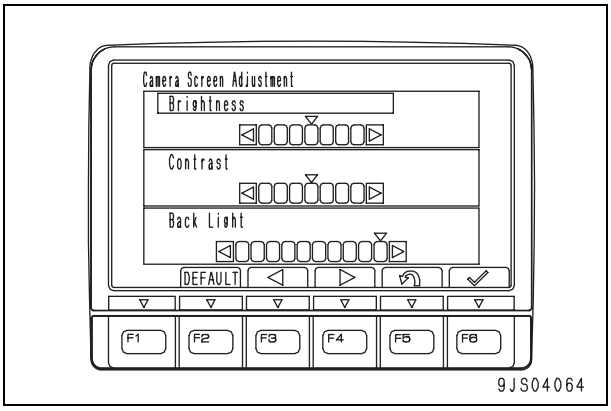
F2 : Returns all adjusted values to the defaults.
F3 : Decreases the value indicated by the indicator one graduation left.
F4 : Increases the value indicated by the indicator one graduation right.
F5 : Cancels changes you made before confirming them with F6 to return to the menu screen.
F6 : Confirms the changes and moves to the next item.

- For a camera-equipped machine, the brightness, contrast, and illuminance of the camera screen are also adjustable.
- For a camera-equipped machine, selecting Screen adjustment from the user menu switches to the screen for selecting a screen you want to adjust.



F3 : Selects (highlights) an item one down.
F4 : Selects (highlights) an item one up.
F5 : Cancels changes you made before confirming them with F6 to return to the menu screen.
F6 : Moves to the setup items of the selected (highlighted) item.

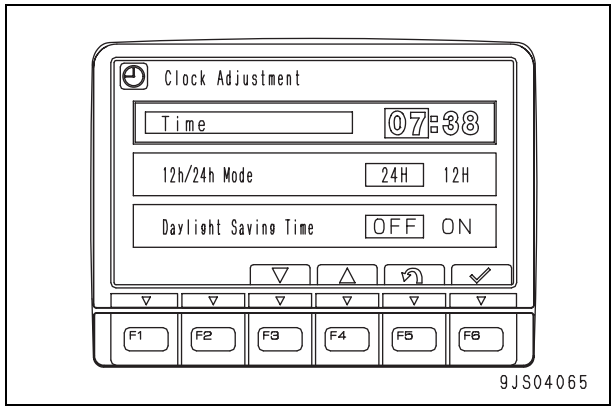
- The adjustment methods for the camera screen and normal screen are the same.
- The background when adjusting the camera screen is the No. 1 camera image.



F3 : Selects (highlights) an item one down.
F4 : Selects (highlights) an item one up.
F5 : Cancels changes you made before confirming them with F6 to return to the menu screen.
F6 : Moves to the setup items of the selected (highlighted) item.

Clock adjustment

- Selecting the Clock adjustment from the user menu and pressing F6 switches to the clock adjustment screen.
- On this screen, you can change the setting of the time displayed on the normal screen.



1) Time setting
Set the clock time. If the time setting item is not highlighted, press F6 to highlight it.

The time display part is highlighted.
F3 : Advances the clock one hour.
F4 : Sets the clock back one hour.
F5 : Cancels changes you made before confirming them with F6 to return to the user menu.
F6 : Confirms the changes and moves to minute setting.

The minute display part is highlighted.
F3 : Advances the clock one min.
F4 : Set the clock back one min.
F5 : Cancels changes you made before confirming them with F6 to return to the use menu.
F6 : Confirms the changes and moves to the 12/24 display mode.

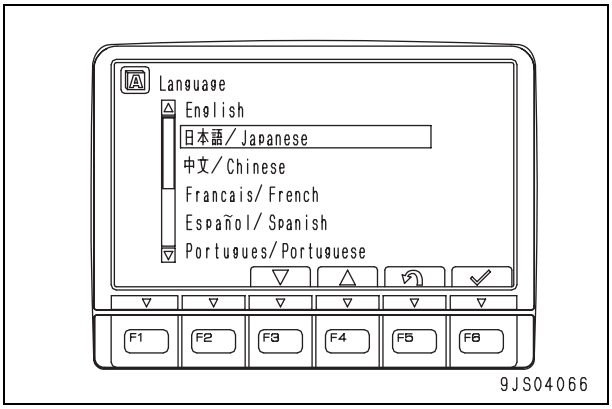
2) 12/24 display mode
Specify time display to 12-hour display (AM/PM) or 24-hour display. If the item of 12/24 display mode is not highlighted, press F6 to highlight it.
F3 : Moves to the item one right.
F4 : Moves to the item one left.
F5 : Cancels the changes to return to the user menu.
F6 : Confirms the changes and moves to summer time.

3) Summer time
Selecting ON for this sets the time forward one hour. Setting OFF returns to the ordinary time.
F3 : Moves to the item one right.
F4 : Moves to the item one left.
F5 : Cancels changes you made before confirming them with F6 to return to the user menu screen.
F6 : Confirms the changes and moves to the time setting.

★ Summer time (daylight saving time) is a system to lead a life according to the one-hour advanced time in order to make efficient use of daylight time.

Language setting

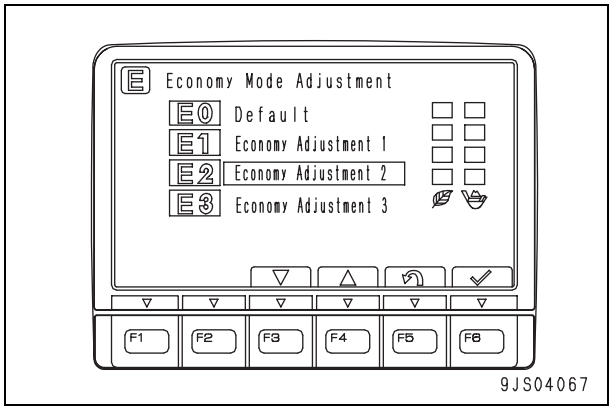
- Selecting the Language from the user menu screen and pressing F6 switches to the language setting screen.
- From this menu, you can change the language to be displayed on the monitor. Available languages are as follows.
  English, Japanese, Chinese, French, Spanish, Portuguese, Italian, German, Russian, Turkish, Indonesian, and Thai.



F3 : Selects (highlights) an item one down.
F4 : Selects (highlights) an item one up.
F5 : Cancels the changes to return to the user menu.
F6 : Cancels the changes to return to the user menu.

Economy mode adjustment

- Selecting the Economy mode adjustment from the user menu and pressing F6 switches to the Economy mode setting screen.
- From this menu, you can adjust engine output to improve fuel consumption in E mode.
- The fuel consumption level is specified to one of four levels from E0 to E3. The larger the value, the better the fuel consumption, but the smaller the work rate.

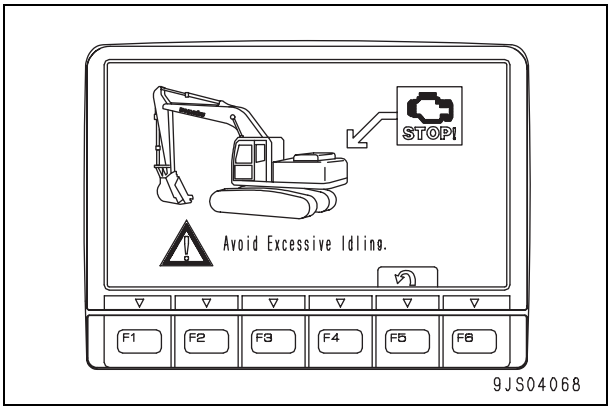


F3 : Selects (highlights) an item one down.
F4 : Selects (highlights) an item one up.
F5 : Cancels the changes to return to the user menu.
F6 : Cancels the changes to return to the user menu.

Idle stop guidance function

This function displays guidance to control unnecessary fuel consumption. It is displayed only when all the following conditions are met.

- Energy saving guidance display of the service menu is specified to ON.
- No operation is made at least 5 min. and the engine is running at idle.
- No error or caution (excluding low hydraulic oil temperature) is occurring.



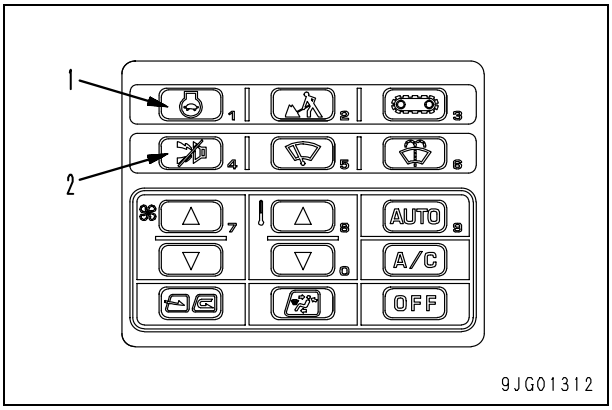
This screen switches to the normal screen if one of the following conditions occurs.

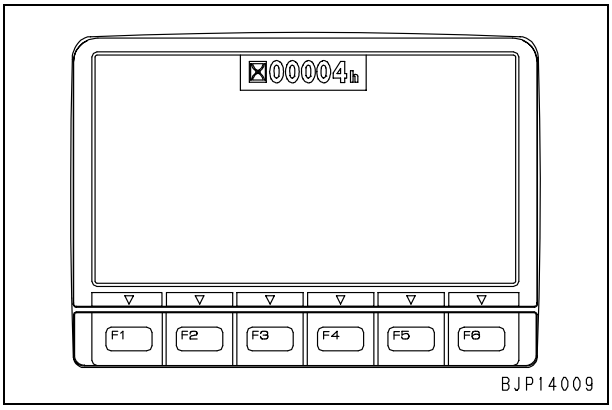
- When the lever is operated
- When F5 is pressed
- When an error or caution occurs

When you switch to the normal screen by pressing F5, this screen does not appear even if the engine continues to run at idle. If the engine continues to run at least five min. after operating the lever, this screen appears again.

Service meter check function

- If you continuously pressing auto-deceleration switch (1) and buzzer cancel switch (2) at the same time when setting the starting switch to the OFF position, the service meter will appear on the screen in 3 to 5 sec.



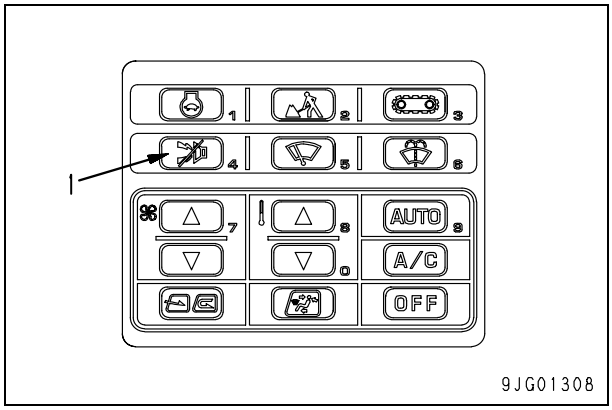


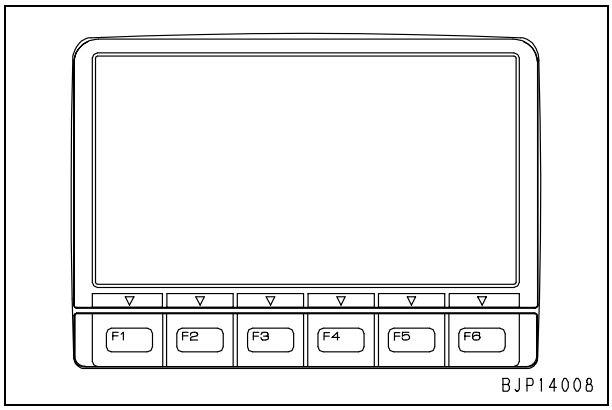
- When these switches are released, the LCD goes out.

★ Continuous operation of the machine monitor may display blue bright spots on this screen; it is quite normal.

Display LCD check function

- Continuously pressing the buzzer cancel switch (1) and F2 at the same time on the password input screen or normal screen causes the entire LCD to light in white. Release F2 and buzzer cancel switch in order. If any part of the display is black, the LCD is broken.

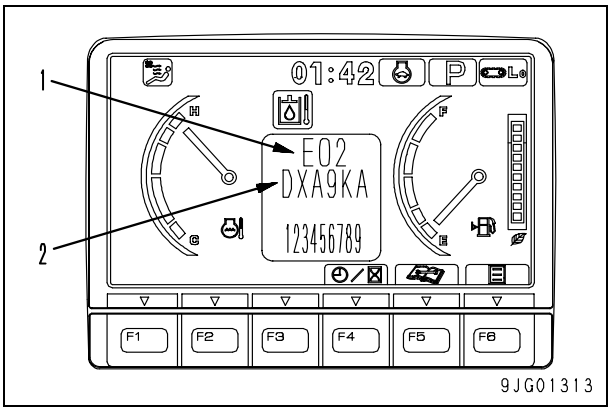




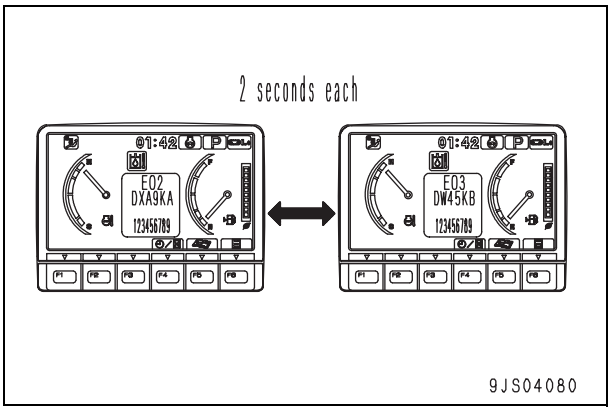
- Pressing any function switch returns to the previous screen.

User code/failure code display function

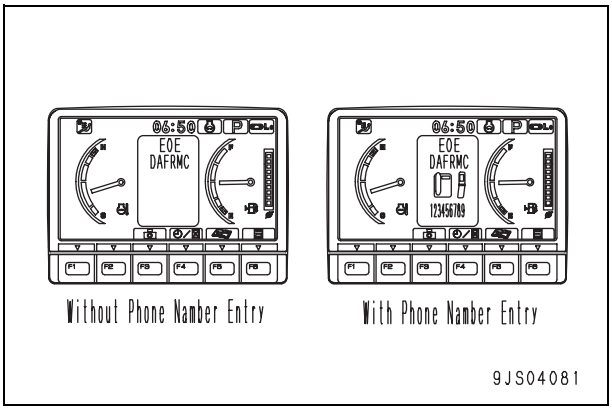
- If there is any problem in machine operation, the user code and failure code are displayed on the monitor to advise the operator of the steps to take.
- These codes appear on the normal screen.
- On the normal screen, user code (1) and failure code (2) are displayed on the portion for the hydraulic oil temperature gauge.



- If multiple user codes or failure codes are issued, they are displayed alternately every 2 sec. The drawing below shows the case two types of user codes and failure codes are displayed.



- If the telephone number has been set in the service menu, the screen shows the telephone symbol and telephone number simultaneously with the user code/failure code. (For information on how to input and set the telephone number, see “Special functions of monitor panel” in the Testing and adjusting section.)

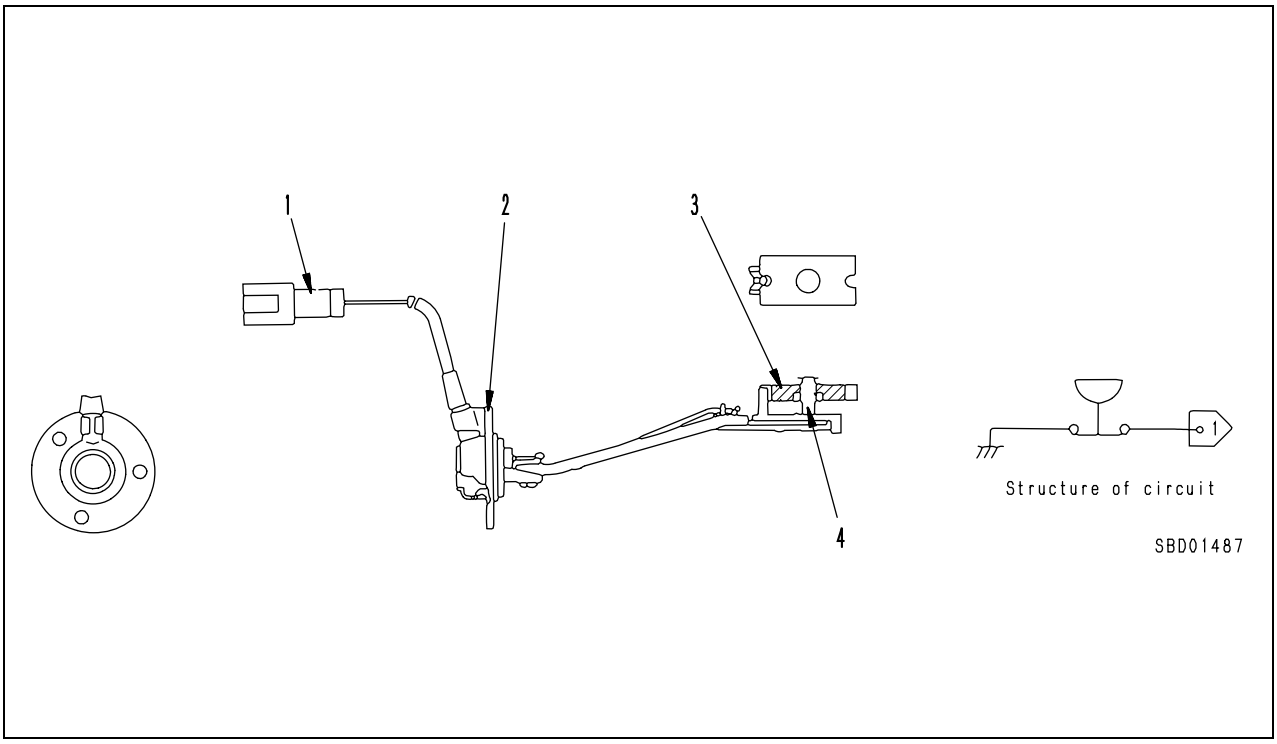


Sensor

- The signals from the sensors are input to the monitor panel directly.
- Either side of a sensor of contact type is always connected to the chassis ground.

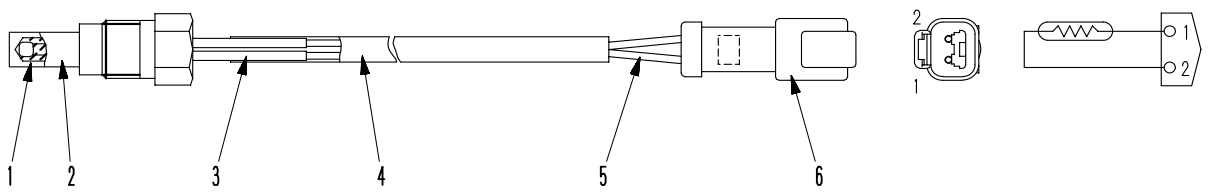
Sensor name	Type of sensor	When normal	When abnormal
Hydraulic oil level	Contact	ON (Closed)	OFF (Open)
Hydraulic oil temperature	Resis-tance	–	–
Coolant temperature	Resis-tance	–	–
Fuel level	Resis-tance	–	–
Air cleaner clogging	Contact	OFF (Closed)	ON (Open)

Hydraulic oil level sensor



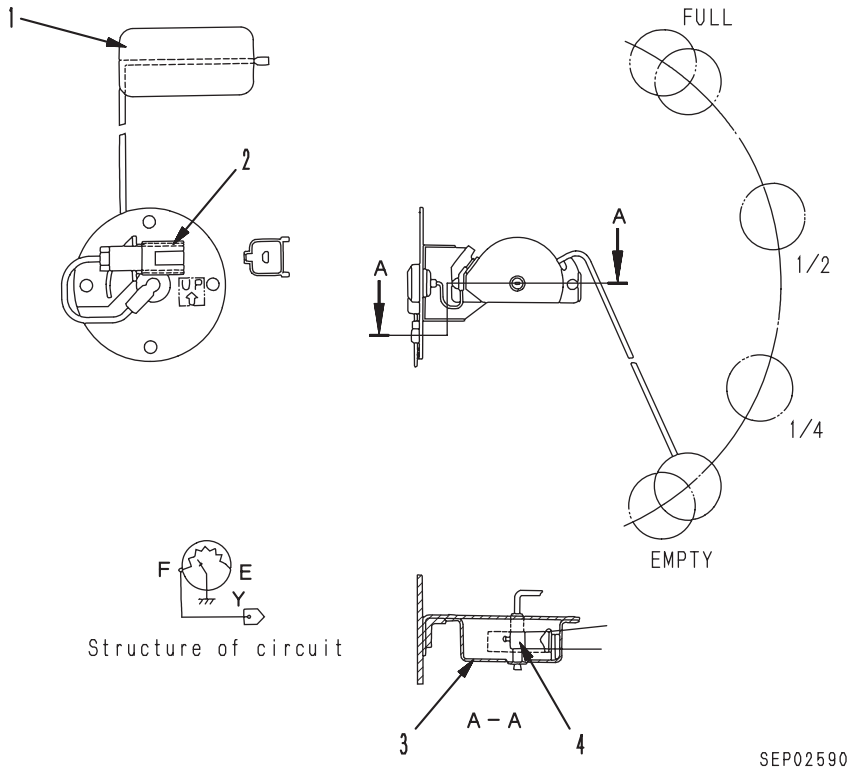
1. Connector
2. Bracket
3. Float
4. Switch

Hydraulic oil temperature sensor, coolant temperature sensor



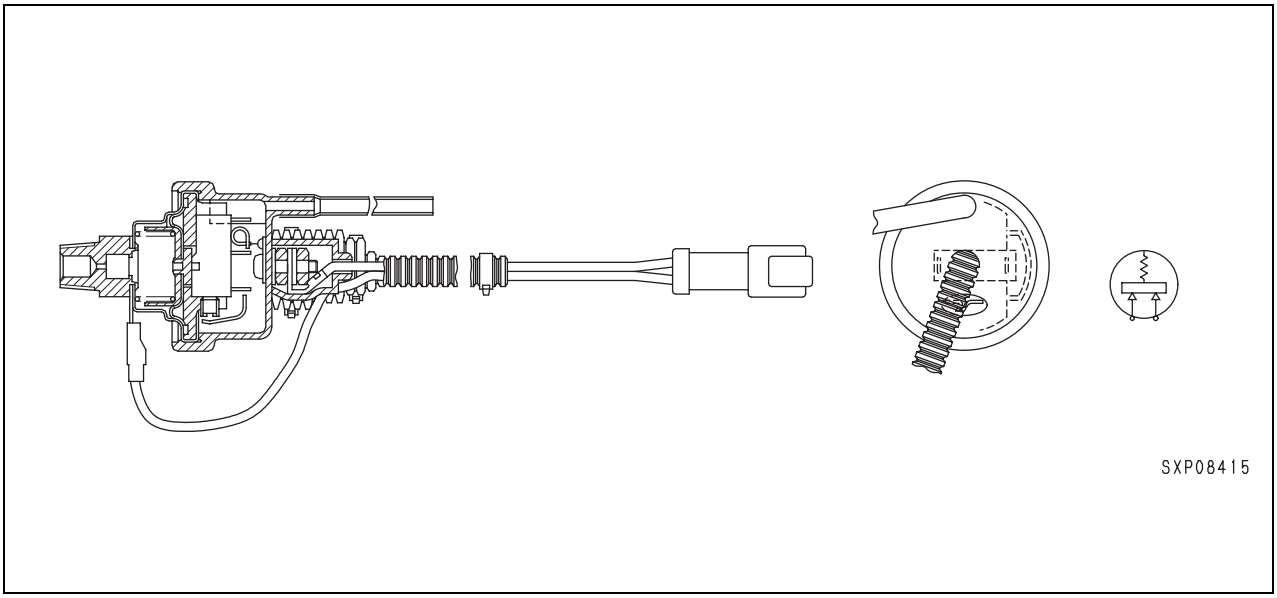
1. Thermistor
2. Body
3. Tube
4. Tube
5. Wire
6. Connector

Fuel level sensor

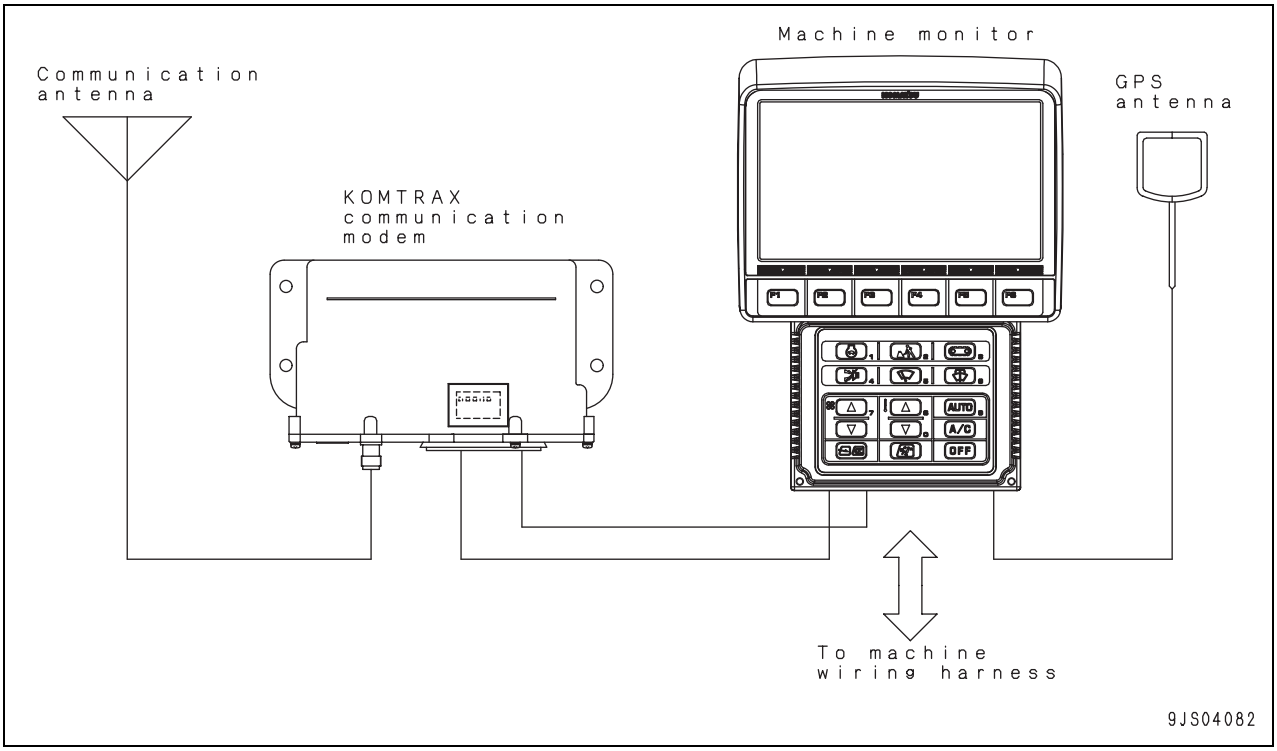


1. Float
2. Connector
3. Cover
4. Variable resistor

Air cleaner clogging sensor



KOMTRAX terminal system

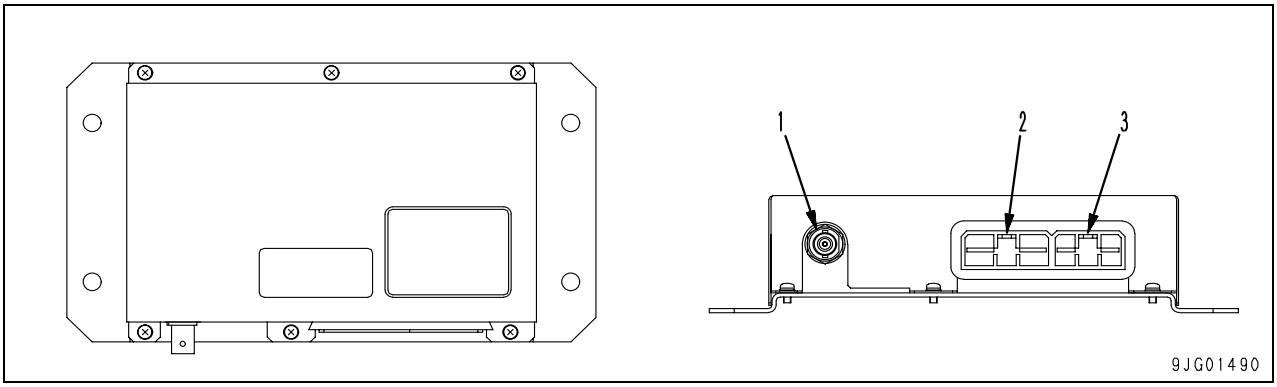


- The KOMTRAX terminal system consists of a KOMTRAX communication modem, communication antenna, machine monitor, and GPS antenna.
- This system transmits various kinds of machine information wirelessly. Persons to operate the KOMTRAX can refer to the information at office to provide various kinds of services for customers.
- Information transmittable from the KOMTRAX terminal system includes the following.
  1. Operation map
  2. Service meter
  3. Position information
  4. Error history

  and others.

★ To provide the services, you need to make an arrangement for starting the KOMTRAX service separately.

KOMTRAX communication modem
TH300



1. Communication antenna connection
2. Connector A (14 poles)
3. Connector B (10 poles)

Outline

- The KOMTRAX communication modem is a wireless communication device to transmit various kinds of machine information or GPS position information the monitor obtains from network signals or input signals in the machine. The communication modem can transmit information via the communication antenna.
- The modem is provided with a LED lamp as a display unit. The LED is used for maintenance.

Input and output signals

Connector A

Pin No.	Signal name	Input/ output
A-1	Electric power supply	Input
A-2	NC(*1)	—
A-3	NC(*1)	—
A-4	Electric power supply switching	Output
A-5	NC(*1)	—
A-6	NC(*1)	—
A-7	GND	Input
A-8	GND	Input
A-9	Modem power control 1 (*2)	Input
A-10	Modem power control 2 (*2)	Input
A-11	Modem serial control (*2)	Input
A-12	Electric field intensity 1 (*2)	Output
A-13	Electric field intensity 2 (*2)	Output
A-14	NC(*1)	—

*1: Never connect to NC or malfunctions or failures will occur.
*2: Signal used by TH200

Connector B

Pin No.	Signal name	Input/ output
B-1	Serial signal DCD	Output
B-2	Serial signal RXD	Output
B-3	Serial signal TXD	Input
B-4	Serial signal DTR	Input
B-5	Serial signal SGND	Input
B-6	Serial signal DSR	Output
B-7	Serial signal RTS (*2)	Input
B-8	Serial signal CTS (*2)	Output
B-9	Serial signal RI (*2)	Output
B-10	NC(*1)	—

*1: Never connect to NC or malfunctions or failures will occur.
*2: Signal used by TH200

PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN01998-00

HYDRAULIC EXCAVATOR

PC300-8
PC300LC-8
PC350-8
PC350LC-8

Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

20 Standard value table

Standard service value table

Standard value table for engine related parts

Applicable model					PC300, 300LC-8 PC350, 350LC-8	
Engine					SAA6D114E-3	
Category	Item	Measurement condition		Unit	Standard value for new machine	Judgement criteria
Engine	Engine speed	• Coolant temperature: operating range	High idle	rpm	2,050 ± 50	2,050 ± 50
			Low idle	rpm	1,000 ± 25	1,000 ± 25
			Rated speed	rpm	1,950	1,950
	Intake pressure (boost pressure)	• Coolant temperature: operating range • Arm IN relief + Power Max.	Inlet of aftercooler	kPa {mmHg}	147 – 187 {1,100 – 1,400}	120 {900}
			Outlet of aftercooler		135 – 175 {1,010 – 1,310}	100 {750}
	Exhaust gas color	• Coolant temperature: operating range	At sudden acceleration	%	Max. 25	Max. 35
			At high idle	%	Max. 1.0	Max. 2.0
	Valve clearance	• Normal temperature	Intake valve	mm	0.305	0.559
			Exhaust valve	mm	0.559	0.813
	Compression pressure	• Oil temperature: 40 – 60°C	Compression pressure	MPa {kg/cm^2}	—	—
			Engine speed	rpm	250 – 280	250 – 280
	Blow-by pressure	• Coolant temperature: operating range • Arm IN relief + power max.		kPa {mmH$_2$O}	Max. 1.57 {Max. 160}	2.25 {260}
	Oil pressure	• SAE0W30E0S, SAE5W40E0S, SAE10W30DH, SAE15W40DH, SAE30DH engine oil • Coolant temperature: operating range	High idle	kPa {kg/cm^2}	0.34 – 0.59 {3.5 – 6.0}	0.21 {2.1}
			Low idle	kPa {kg/cm^2}	Min. 0.15 {Min. 1.5}	0.08 {0.8}
	Oil temperature	• Whole speed range (inside oil pan)		°C	80 – 120	120
	Fan belt tension	• Between fan pulley and alternator pulley • Deflection when pressed with finger force of approx. 98 N{10 kg}		mm	Auto-tensioner	Auto-tensioner
	Air conditioner compressor belt tension	• Between fan pulley and compressor pulley • Deflection when pressed with finger force of approx. 98 N{10 kg}		mm	5 – 8	5 – 8

Standard value table for chassis related parts

Applicable model				PC300, 300LC-8 PC350, 350LC-8	
Category	Item	Measurement condition	Unit	Standard value for new machine	Judgement criteria
Engine speed	2 pumps at relief	• Engine coolant temperature: Within operating range • Hydraulic oil temperature: Within operating range • Engine at high idle • Arm IN relief condition	rpm	2,030 ± 100	2,030 ± 100
	At 2-pump relief + power max.	• Engine coolant temperature: Within operating range • Hydraulic oil temperature: Within operating range • Engine at high idle • Arm IN relief + Power max. switch ON	rpm	1,930 ± 100	1,930 ± 100
	Speed when auto-deceleration is operated	• Engine at high idle • Auto-deceleration switch in ON condition • All control levers in NEUTRAL condition	rpm	1,400 ± 100	1,400 ± 100
Spool stroke	Boom control valve	• Engine stopped • For measuring point, see Control valve.	mm	9.5 ± 0.5	9.5 ± 0.5
	Arm control valve				
	Bucket control valve				
	Swing control valve				
	Travel control valve				
Travel of control levers	Boom control lever	• Engine stopped • Control lever grip at center • Max. reading up to stroke end (except lever play in NEUTRAL position)	mm	85 ± 10	85 ± 10
	Arm control lever			85 ± 10	85 ± 10
	Bucket control lever			85 ± 10	85 ± 10
	Swing control lever			85 ± 10	85 ± 10
	Travel control lever			115 ± 12	115 ± 12
	Play of control lever			Max. 10	Max. 15
Operating force of control levers and pedal	Boom control lever	• Hydraulic oil temperature: Within operating range • Engine at high idle • Control lever grip at center • Pedal at tip • Max. reading up to stroke end	N {kg}	15.7 ± 3.9 {1.6 ± 0.4}	Max. 24.5 {Max. 2.5}
	Arm control lever		N {kg}	15.7 ± 3.9 {1.6 ± 0.4}	Max. 24.5 {Max. 2.5}
	Bucket control lever		N {kg}	12.7 ± 2.9 {1.3 ± 0.3}	Max. 21.6 {Max. 2.2}
	Swing control lever		N {kg}	12.7 ± 2.9 {1.3 ± 0.3}	Max. 21.6 {Max. 2.2}
	Travel control lever		N {kg}	24.5 ± 5.9 {2.5 ± 0.6}	Max. 39.2 {Max. 4.0}
	Travel control pedal		N {kg}	74.5 ± 18.6 {7.6 ± 1.9}	Max. 107.6 {Max. 11}

Applicable model					PC300, 300LC-8 PC350, 350LC-8	
Category	Item	Measurement condition		Unit	Standard value for new machine	Judgement criteria
Hydraulic pressure	Unload pressure	• Hydraulic oil temperature: Within operating range • Engine at high idle • Working mode: P mode • Hydraulic pump output pressure with all control levers in NEUTRAL position		MPa {kg/cm²}	3.9 ± 1.0 {40 ± 10}	3.9 ± 1.0 {40 ± 10}
	Boom relief	• Hydraulic oil temperature: Within operating range • Engine at high idle • Working mode: P mode • Hydraulic pump output pressure with all measurement circuits relieved • Values marked *: Hydraulic oil pressure with power max. switch in ON (reference only)	Raise	MPa {kg/cm²}	34.81(+1.47/–0.98) {355(+15/–10)}	33.34 – 37.23 {340 – 375}
					*37.26(+1.47/–0.98) {380(+15/–10)}	*35.80 – 39.23 {365 – 400}
			Lower (at low pressure setting)		18.13 ± 0.98 {185 ± 10}	16.66 – 19.6 {170 – 200}
			Lower (at high pressure setting)		31.36 ± 1.47 {320 ± 15}	29.4 – 33.32 {300 – 340}
	Arm relief				34.81(+1.47/–0.98) {355(+15/–10)}	33.34 – 37.23 {340 – 375}
	Bucket relief				*37.26(+1.47/–0.98) {380(+15/–10)}	*35.80 – 39.23 {365 – 400}
	Swing relief				30.87(+1.47/–2.45) {315(+15/–25)}	28.42 – 32.85 {285 – 335}
	Travel relief				37.27(+2.94/–0.98) {380(+30/–10)}	35.80 – 40.70 {365 – 415}
	Control circuit source pressure	• Hydraulic oil temperature: Within operating range • Engine at high idle • Self pressure reducing valve output pressure with all control levers in NEUTRAL position		MPa {kg/cm²}	3.23 ± 0.2 {33 ± 2}	2.84 – 3.43 {29 – 35}
	LS differential pressure	• Hydraulic oil temperature: Within operating range • Engine at high idle • Working mode: P mode • Traveling speed: Hi • Hydraulic oil pump pressure – LS pressure	When all control levers in NEUTRAL position	MPa {kg/cm²}	3.9 ± 1.0 {40 ± 10}	3.9 ± 1.0 {40 ± 10}
			When traveling at half stroke	MPa {kg/cm²}	2.45 ± 0.1 {25 ± 1}	2.45 ± 0.1 {25 ± 1}
	PPC valve output pressure	• Hydraulic oil temperature: Within operating range • Engine at high idle • Control lever in full stroke		MPa {kg/cm²}	2.9(+0.6/–0.2) {30(+5.5/–1.5)}	2.9(+0.6/–0.2) {30(+5.5/–1.5)}

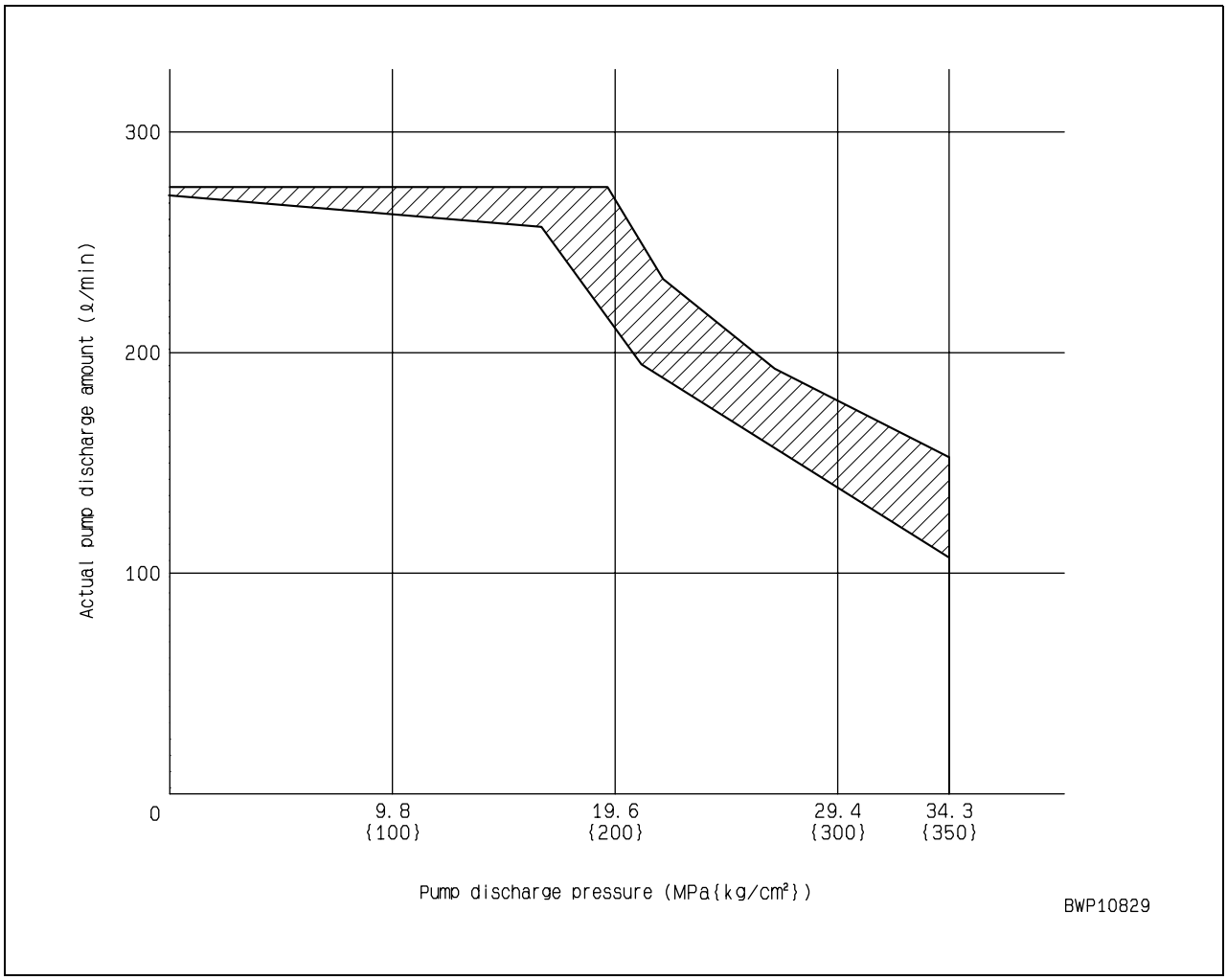
Applicable model					PC300, 300LC-8 PC350, 350LC-8	
Cate-gory	Item	Measurement condition		Unit	Standard value for new machine	Judgement criteria
Swing	Swing brake angle	• Hydraulic oil temperature: Within operating range • Engine running at high idle • Working mode: P mode • Swing circle misalignment amount when stopping after one turn • For measuring posture, see **Swing 1**		deg. (mm)	PC300: Max. 110 PC350: Max. 120	PC300: Max. 140 PC350: Max. 150
	Time taken to start swing	• Hydraulic oil temperature: Within operating range • Engine running at high idle • Working mode: P mode • Time required for passing points 90° and 180° from starting point • For measuring posture, see **Swing 1**	90°	sec.	3.3 ± 0.4	Max. 4.2
			180°	sec.	4.7 ± 0.5	Max. 5.7
	Time taken to swing	• Hydraulic oil temperature: Within operating range • Engine running at high idle • Working mode: P mode • Time required for 5 more turns after making initial one turn • For measuring posture, see **Swing 1**		sec.	31.6 ± 2.9	Max. 38
	Hydraulic drift of swing	• Hydraulic oil temperature: Within operating range • Engine stopped • Keeping upper structure transverse on slope of 15° • Notching a mating mark on inner and outer races of swing circle • Mating mark misalignment amount during 5 minutes • For measuring posture, see **Swing 2**		mm	0	0
	Leakage from swing motor	• Hydraulic oil temperature: Within operating range • Engine running at high idle • Swing lock switch: ON • Leakage amount for one minute during swing relief		ℓ/min	Max. 5.5	Max. 11

Applicable model					PC300, 300LC-8 PC350, 350LC-8	
Category	Item	Measurement condition		Unit	Standard value for new machine	Judgement criteria
Travel	Travel speed (without load)	• Hydraulic oil temperature: Within operating range • Engine at high idle • Working mode: P mode • Time required for track shoes to make 5 turns after making one initial idle turn • For measuring posture, see **Travel 1**	Lo	sec.	STD: 55.0 ± 11.0 LC: 58.0 ± 11.5	STD: 42.0 – 70.0 LC: 45.0 – 74.5
			Mi		STD: 39.0 ± 5.5 LC: 41.5 ± 6.0	STD: 31.5 – 48.5 LC: 34.0 – 51.5
			Hi		STD: 32.0 ± 2.0 LC: 34.0 ± 2.0	STD: 28.0 – 39.0 LC: 32.0 – 41.5
	Travel speed (actual run)	• Hydraulic oil temperature: Within operating range • Engine at high idle • Working mode: P mode • Flat ground • Time required for traveling 20 m after 10 m trial run • For measuring posture, see **Travel 2**	Lo	sec.	23.3 ± 4.4	18.9 – 31.0
			Mi		16.7 ± 2.2	14.4 – 21.0
			Hi		13.1 ± 0.7	12.1 – 15.1
	Travel deviation	• Hydraulic oil temperature: Within operating range • Engine at high idle • Working mode: P mode • Travel speed: Lo • Solid and flat ground • Swerving amount while traveling 20 m (X) after initial 10 m trial run • For measuring posture, see **Travel 2 and 3**		mm	Max. 200	Max. 300
	Hydraulic drift of travel	• Hydraulic oil temperature: Within operating range • Engine stopped • Parking machine on slope of 12° with sprocket facing upslope • Sliding distance for 5 minutes • For measuring posture, see **Travel 4**		mm	0	0
	Leakage of travel motor	• Hydraulic oil temperature: Within operating range • Engine at high idle • Traveling with sprocket locked • Oil leakage amount for one minute with traveling in relief condition		ℓ/min	Max. 15	Max. 30

Applicable model						PC300, 300LC-8 PC350, 350LC-8	
Cate-gory	Item		Measurement condition		Unit	Standard value for new machine	Judgement criteria
Work equipment	Hydraulic drift of work equipment	Whole work equipment	• Hydraulic oil temperature: Within operating range • Flat and level ground • Bucket load: 2,160 kg • Engine stopped • Work equipment control lever in NEUTRAL position • Fall amount for 15 minutes as measured every 5 minutes starting immediately after initial setting • Whole work equipment: Lowering distance of tooth tip • Boom cylinder: Retraction distance of cylinder • Arm cylinder: Extraction distance of cylinder • Bucket cylinder: Retraction distance of cylinder • For measuring posture, see **Work equipment 1**		mm	PC300: Max. 450 PC350: Max. 550	PC300: Max. 675 PC350: Max. 825
		Boom cylinder				PC300: Max. 25 PC350: Max. 30	PC300: Max. 38 PC350: Max. 45
		Arm cylinder				PC300: Max. 135 PC350: Max. 165	PC300: Max. 203 PC350: Max. 248
		Bucket cylinder				PC300: Max. 20 PC350: Max. 25	PC300: Max. 30 PC350: Max. 38
	Work equipment speed	Boom	• Hydraulic oil temperature: Within operating range • Engine running at high idle • Working mode: P mode • Time required from raise stroke end till bucket touches ground • For measuring posture, see **Work equipment 2**	RAISE	sec.	PC300: 3.7 ± 0.4 PC350: 3.8 ± 0.4	PC300: Max.4.5 PC350: Max.4.6
				LOWER		PC300: 2.9(+0.4/–0.1) PC350: 2.8(+0.4/–0.1)	Max. 3.0
		Arm	• Hydraulic oil temperature: Within operating range • Engine running at high idle • Working mode: P mode • Time required from dumping stroke end to digging stroke end • For measuring posture, see **Work equipment 3**	IN	sec.	3.8 ± 0.4	Max. 4.5
				OUT		PC300: 2.9 ± 0.3 PC350: 3.1 ± 0.4	PC300: Max. 3.5 PC350: Max. 3.7
		Bucket	• Hydraulic oil temperature: Within operating range • Engine running at high idle • Working mode: P mode • Time required from dumping stroke end to digging stroke end • For measuring posture, see **Work equipment 4**	CURL	sec.	3.2 ± 0.3	Max. 3.8
				DUMP		2.3 ± 0.3	Max. 2.9

Applicable model					PC300, 300LC-8 PC350, 350LC-8	
Category	Item		Measurement condition	Unit	Standard value for new machine	Judgement criteria
Work equipment	Time lag	Boom	• Hydraulic oil temperature: Within operating range • Engine at low idle • Working mode: P mode • Time required from raise stroke end till bucket touches ground and pushes up machine front • For measuring posture, see **Work equipment 5**	sec.	Max. 3.0	Max. 3.6
		Arm	• Hydraulic oil temperature: Within operating range • Engine at low idle • Working mode: P mode • Time required from dumping stroke end till bucket stops momentarily after control lever is tilted to digging and starts to move again • For measuring posture, see **Work equipment 6**	sec.	PC300: Max. 3.0 PC350: Max. 4.0	PC300: Max. 3.6 PC350: Max. 4.6
		Bucket	• Hydraulic oil temperature: Within operating range • Engine at low idle • Working mode: P mode • Time required from dumping stroke end till bucket stops momentarily after control lever is tilted to digging and starts to move again • For measuring posture, see **Work equipment 7**	sec.	Max. 3.0	Max. 5.0
	Internal leakage	Cylinders	• Hydraulic oil temperature: Within operating range • Engine at high idle • Working mode: P mode • Leakage amount for one minute with cylinder or travel to be measured in relief condition	cc/min	4.5	20
		Center swivel joint			10	50
Performance in compound operation	Swerving amount in simultaneous operation of work equipment and travel		• Hydraulic oil temperature: Within operating range • Engine at high idle • Working mode: P mode • Traveling speed: Lo • On hard and flat ground, make approach run of 10 m and then measure deviation (X) in the travel of 20 m • For measuring posture, see **Travel 2 and 3**	mm	Max. 400	Max. 440
—	Discharge amount of hydraulic pump		See performance of hydraulic pump (next page)	ℓ/min	See performance of hydraulic pump (next page)	

Discharge amount of hydraulic pump (P mode)



- Pump speed: At 1,950 rpm, PC current 280 mA

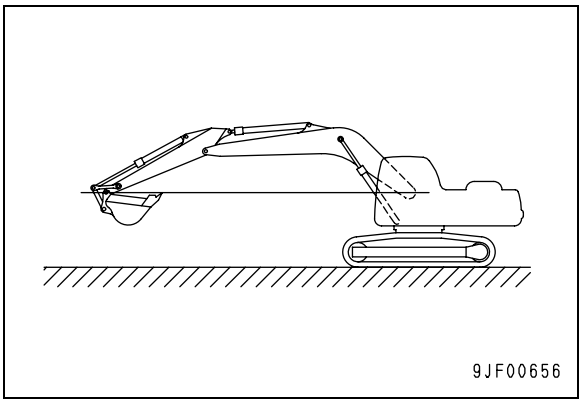
Check point	Test pump discharge pressure (MPa {kg/cm^2})	Discharge pressure of other pump (MPa {kg/cm^2})	Average pressure (MPa {kg/cm^2})	Standard value for discharge amount Q (ℓ/min)	Judgement standard lower limit Q (ℓ/min)
As desired	P1	P2	$\frac{P1+P2}{2}$	See graph	See graph

★ As far as possible, bring pump discharge pressure P1 and P2 as close as possible to the average pressure when measuring.
The error is large near the point where the graph curves, so avoid measuring at this point.

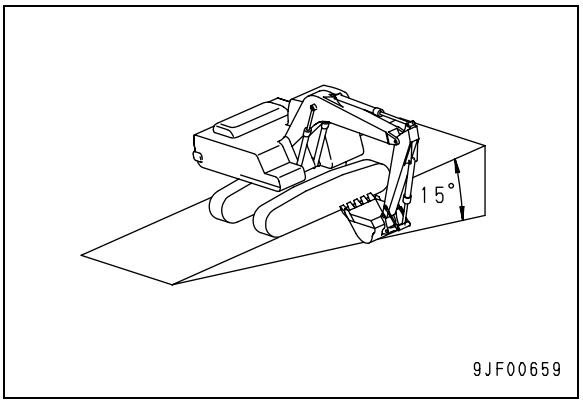
★ When measuring with the pump mounted on the machine, if it is impossible to set the engine speed to the specified speed with the fuel control dial, take the pump discharge amount and the engine speed at the point of measurement, and use them as a base for calculating the pump discharge amount at the specified speed.

For all models (Posture of machine for measuring performance and measurement procedure)

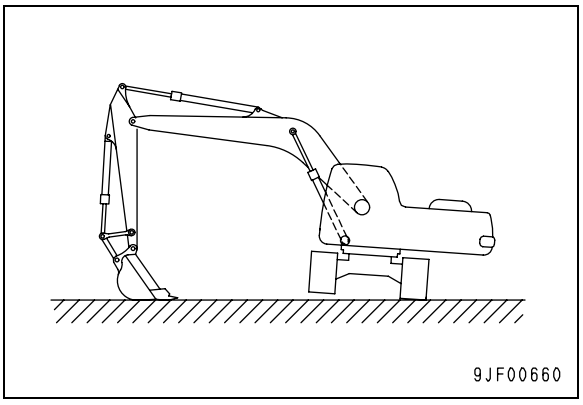
Swing 1: Swing brake angle, time taken to start swing, time taken to swing



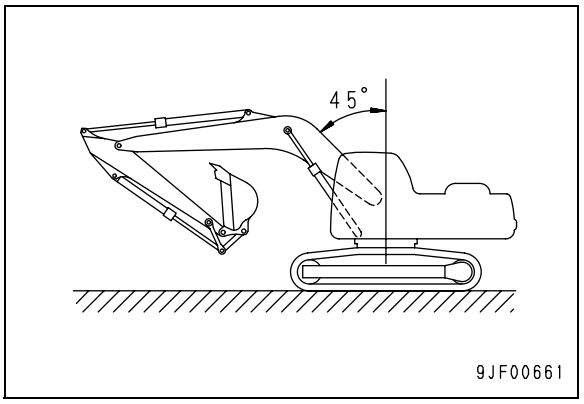
Swing 2: Hydraulic drift of swing



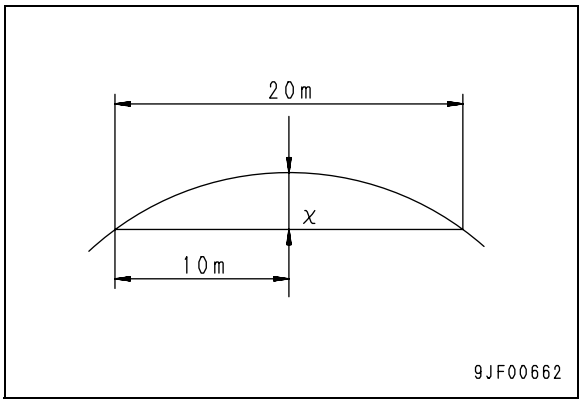
Travel 1: Travel speed (without load)



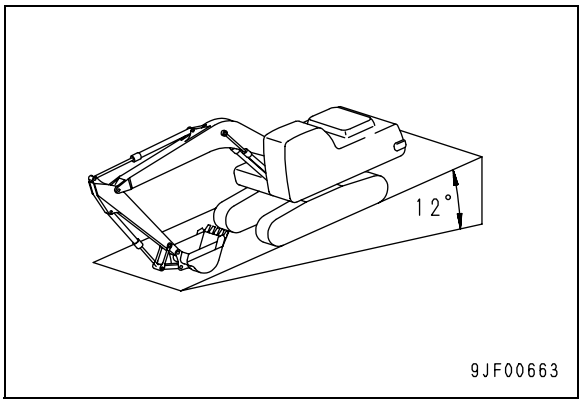
Travel 2: Travel speed (actual run), travel deviation



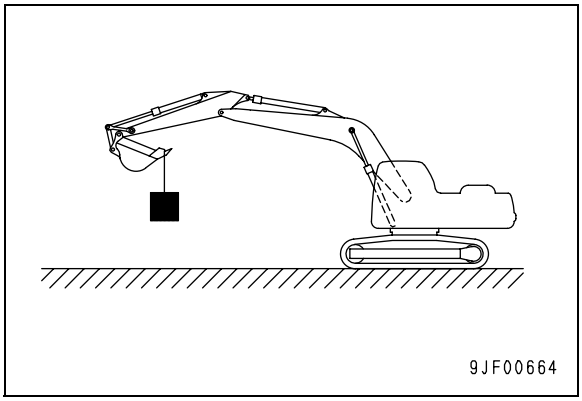
Travel 3: Travel deviation



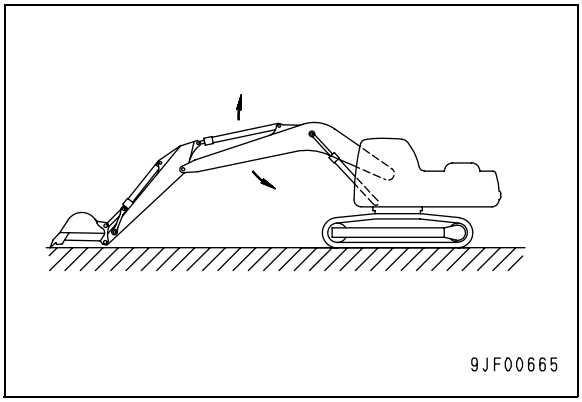
Travel 4: Hydraulic drift of travel



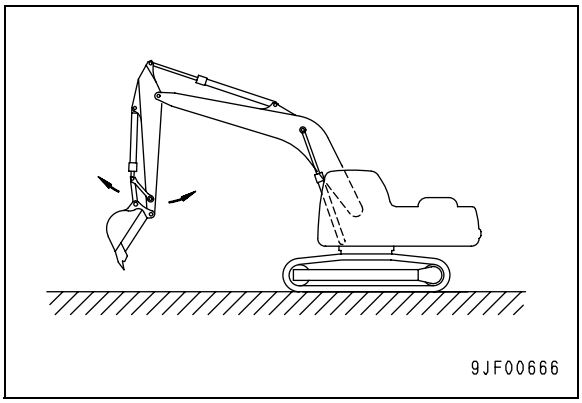
Work equipment 1: Hydraulic drift of work equipment



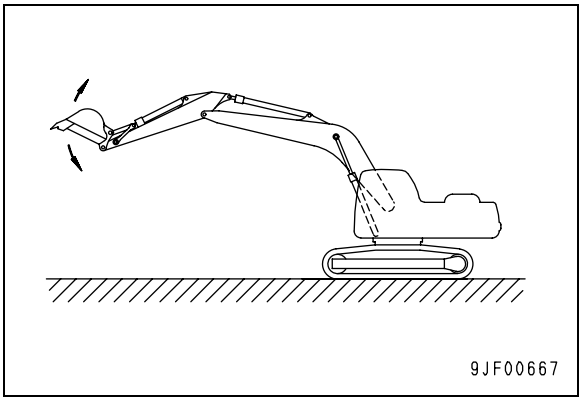
Work equipment 2: Boom speed



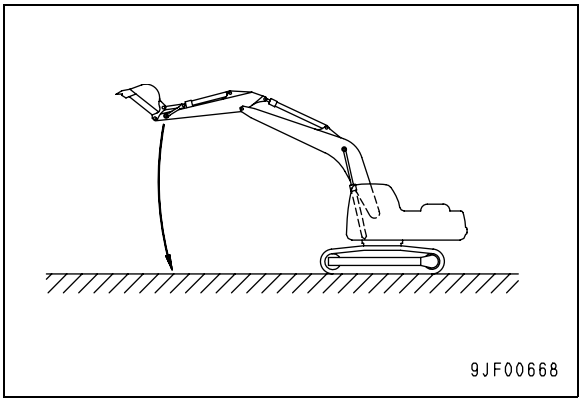
Work equipment 3: Arm speed



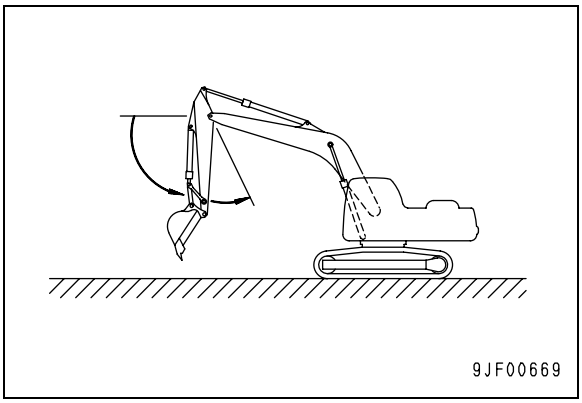
Work equipment 4: Bucket speed



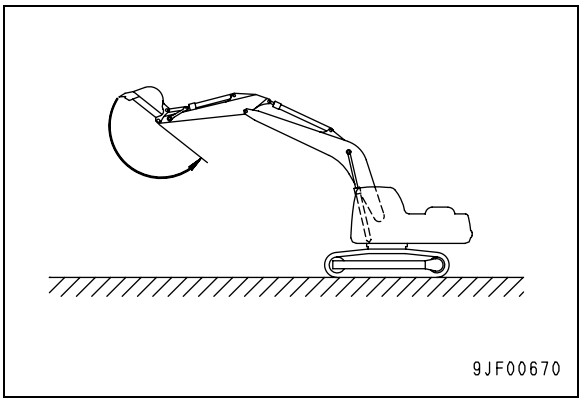
Work equipment 5: Boom time lag



Work equipment 6: Arm time lag



Work equipment 7: Bucket time lag



PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN02624-00

HYDRAULIC EXCAVATOR

PC300-8
PC300LC-8
PC350-8
PC350LC-8

Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

30 Testing and adjusting

Testing and adjusting, Part 1

Tools for testing, adjusting and troubleshooting

Testing and adjusting item	Symbol		Part No.	Part name	Q'ty	Remarks
Intake air pressure (boost pressure)	A	1	799-201-2202	Boost gauge kit	1	–101 – 200 kPa {–760 – 1,500 mmHg}
		2	799-401-2220	Hose	1	
Checking exhaust gas color	B	1	799-201-9001	Handy smoke checker	1	Degree of contamination 0 to 70% (with the standard color) (Degree of contamination x 1/10 ≒ Bosch index)
		2	Commercially available	Smoke meter	1	
Adjusting valve clearance	C	1	795-799-1131	Gear	1	
		2	Commercially available	Clearance gauge	1	
Measuring compression pressure	D	1	795-799-6700	Puller	1	
		2	795-502-1590	Compression gauge	1	0 – 7.0 MPa {0 – 70 kg/cm^2}
		3	795-790-6110	Adapter	1	
		4	6754-11-3130	Gasket	1	
Measuring blow-by pressure	E	1	799-201-1504	Blow-by checker	1	0 – 5.0 kPa {0 – 500mm H_2O}
		2	795-790-3300	Tool (nozzle)	1	
Measuring engine oil pressure	F	1	799-101-5002	Hydraulic tester	1	Pressure gauge: 2.5, 6.0, 40, 60 MPa {25, 60, 400, 600 kg/cm^2}
			799-261-1204	Digital hydraulic tester	1	Pressure gauge: 60 MPa {600 kg/cm^2}
		2	799-401-2320	Gauge	1	Pressure gauge: 1.0 MPa {10 kg/cm^2}
		3	6732-81-3170	Adapter	1	Size: 10 x 1.0 mm
			6215-81-9710	O-ring	1	
Measuring fuel pressure	G	1	799-101-5002	Hydraulic tester	1	Pressure gauge: 2.5, 6.0, 40, 60 MPa {25, 60, 400, 600 kg/cm^2}
			790-261-1204	Digital hydraulic tester	1	Pressure gauge: 60 MPa {600 kg/cm^2}
		2	6732-81-3170	Adapter	1	Size: 10 x 1.0 mm
			6215-81-9710	O-ring	1	
		3	799-401-2320	Gauge	1	Pressure gauge: 1.0 MPa {10 kg/cm^2}
		4	795-790-1500	Fuel vacuum gauge	1	Male: 7/8 – 14UNF Female: 7/8 – 14UNF Male: 3/4 – 16UNF Female: 3/4 – 16UNF
			799-201-1201		1	
Measuring fuel return rate and leakage	H	1	795-790-4800	Hose kit	1	
		2	795-790-6700	Adapter	1	
		3	Commercially available	Measuring cylinder	1	
Measuring swing circle bearing clearance	J		Commercially available	Dial gauge	1	

Testing and adjusting item	Symbol		Part No.	Part name	Q'ty	Remarks
Oil pressure in work equipment, swing and travel circuits, basic pressure of control circuit and oil pressure of pump PC control circuit	L	1	799-101-5002	Hydraulic tester	1	Pressure gauge: 2.5, 6.0, 40, 60 MPa {25, 60, 400, 600 kg/cm^2}
			790-261-1204	Digital hydraulic tester	1	Pressure gauge: 60 MPa {600 kg/cm^2}
		2	799-101-5220	Nipple	1	Size: 10 x 1.0 mm
			07002-11023	O-ring	1	
Oil pressure of pump LS control circuit	M	1	799-101-5002	Hydraulic tester	1	Pressure gauge: 2.5, 6.0, 40, 60 MPa {25, 60, 400, 600 kg/cm^2}
			799-261-1204	Digital hydraulic tester	1	Pressure gauge: 60 MPa {600 kg/cm^2}
		2	799-101-5220	Nipple	1	Size: 10 x 1.25 mm
			07002-11023	O-ring	1	
		3	799-401-1340	Differential pressure gauge	1	
Measuring solenoid valve output pressure	N	1	199-101-5002	Hydraulic tester	1	Pressure gauge: 2.5, 6.0, 40, 60 MPa {25, 60, 400, 600 kg/cm^2}
			790-261-1204	Digital hydraulic tester	1	Pressure gauge: 60 MPa {600 kg/cm^2}
		2	799-401-3100	Adapter	1	Size: 02
			02896-11008	O-ring	1	
		3	799-401-3200	Adapter	1	Size: 03
			02896-11009	O-ring	1	
PPC valve output pressure	P		199-101-5002	Hydraulic tester	1	Pressure gauge: 2.5, 6.0, 40, 60 MPa {25, 60, 400, 600kg/cm^2}
			790-261-1204	Digital hydraulic tester	1	Pressure gauge: 60 MPa {600 kg/cm^2}
Oil leakage in work equipment cylinder	Q		Commercially available	Measuring cylinder	1	
Troubleshooting for engine controller/sensors/ actuators	R		799-601-4100 or 799-601-4200	T-adapter assembly	1	
			799-601-4130	• T-adapter	1	Ne sensor
			799-601-4150	• T-adapter	1	For oil pressure sensor
			799-601-4211	• T-adapter	1	Engine controller
			799-601-4220	• T-adapter	1	Engine controller
			799-601-4240	• Socket	1	For ambient pressure sensor
			799-601-4250	• Socket	1	For boost pressure sensor
			799-601-4260	• T-adapter	1	Engine controller
			799-601-9420	• T-adapter	1	For injector
			799-601-9430	• Socket	1	For supply pump PCV

Testing and adjusting item	Sym-bol	Part No.	Part name	Q'ty	Remarks
Troubleshooting for chassis sensors/wiring harnesses	S	799-601-2500 or 9-601-2700 or 799-601-2800 or 799-601-2900 or 799-601-7100 or 799-601-7400 or 799-601-8000	T-adapter assembly	1	
		799-601-2600	• T-adapter box	1	For Econo
		799-601-2740	• MIC adapter	1	For MIC-5P
		799-601-4100 or 799-601-4200 or 799-601-9000 or 799-601-9200	T-adapter assembly	1	
		799-601-9020	• Adapter for DT	1	For DT2P
		799-601-9030	• Adapter for DT	1	For DT3P
		799-601-7000 or 9-601-7100 or 799-601-7400 or 799-601-8000	T-adapter assembly	1	
		799-601-7010	• Adapter for X	1	
		799-601-7020	• Adapter for X	1	
		799-601-7040	• Adapter for X	1	
		799-601-7050	• Adapter for SWP	1	
		799-601-7060	• Adapter for SWP	1	
		799-601-7070	• Adapter for SWP		
		799-601-7080	• Adapter for M	1	
		799-601-7090	• Adapter for M	1	
		799-601-7110	• Adapter for M	1	
		799-601-7120	• Adapter for M	1	
		799-601-7130	• Adapter for M	1	
		799-601-7140	• Adapter for S		
		799-601-7160	• Adapter for S		
		799-601-7170	• Adapter for S		
		799-601-7210	• Adapter for AMP040	1	
		799-601-7220	• Adapter for AMP040	1	
		799-601-7320	• Adapter for SWP	1	
		799-601-7340	• Adapter for M	1	
		799-601-7360	• Adapter for relay	1	
		799-601-7370	• Adapter for relay	1	
		799-601-7500	T-adapter assembly	1	

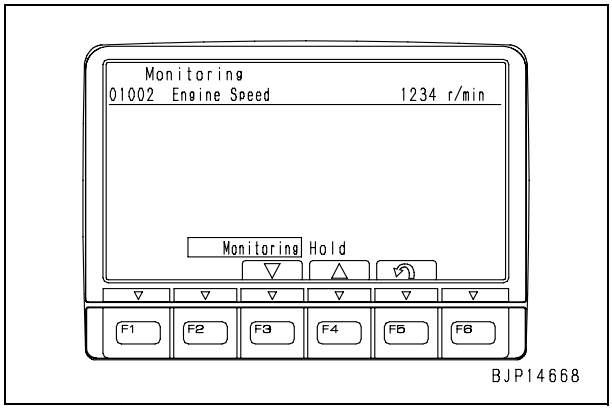
Testing and adjusting item	Sym-bol	Part No.	Part name	Q'ty	Remarks
Troubleshooting for chassis sensors/wiring harnesses	S	799-601-7520	• Adapter for 070	1	
		799-601-9000 or 799-601-9200	T-adapter assembly	1	
		799-601-9030	• Adapter for DT	1	
		799-601-9110	• Adapter for DT(GR)	1	
		799-601-9350	• Adapter for DRC	1	
		799-601-9360	• Adapter for DRC	1	
Water and oil temperature	—	799-101-1502	Digital thermometer	1	–99.9 – 1,299°C
Operating effort and depressing force	—	79A-264-0021	Push-pull scale	1	0 – 294 N {0 – 30 kg}
		79A-264-0091	Push-pull scale	1	0 – 490 N {0 – 50 kg}
Stroke and hydraulic drift	—	Commercially available	Ruler	1	
Work equipment speed	—	Commercially available	Stopwatch	1	
Voltage and resistance value	—	Commercially available	Circuit tester	1	

Measuring engine speed

★ Measure the engine speed with the monitoring function of the machine monitor.
★ Measure the engine speed under the following condition.
- Engine coolant temperature: Within operating range
- Hydraulic oil temperature: Within operating range

1. Preparation work

Operate the machine monitor so that the engine speed can be monitored.
★ For the operating method of the machine monitor, see “Special functions of machine monitor”.
★ Monitoring code: 01002 Engine speed



2. Measuring low idle speed

1) Start the engine and set the fuel control dial to the low idle (MIN) position.
2) Set all the control levers and pedals for work equipment, swing and travel to the neutral and measure the engine speed.

3. Measuring high idle speed

1) Start the engine and set the fuel control dial to the high idle (MAX) position.
2) Set the working mode in the power mode (P) and turn the auto-decelerator OFF.
3) Set all the control levers and pedals for work equipment, swing and travel to the neutral and measure the engine speed.

4. Measuring the engine speed when 2-pumps are relieved

1) Start the engine and move the arm cylinder to the IN stroke end.
2) Set the fuel control dial in the high idle (MAX) position and set the working mode in the power mode (P).
3) Operate the left work equipment control lever to relieve the arm circuit at the IN stroke end and measure the engine speed.

5. Measuring the engine speed when 2-pumps relief and power maximizing (near rated speed)

1) Start the engine and move the arm cylinder to the IN stroke end.
2) Set the fuel control dial in the high idle (MAX) position and set the working mode in the power mode (P).
3) While operating the left work equipment control lever to relieve the arm at the IN stroke end and depressing the power maximizing switch, measure the engine speed.
★ The power maximizing function is reset automatically in about 8.5 seconds even if the switch is being depressed. Thus measurement of the engine speed must be completed within that period.

6. Measuring the speed when auto-deceleration speed is in operation

1) Start the engine, set the fuel control dial in the high idle position (MAX), and turn the auto-decelerator ON.
2) Set all the control levers and pedals for work equipment, swing and travel to neutral and measure the engine speed when the auto-decelerator is operated.
★ The engine speed is slowed down to a certain level in about 5 seconds from setting all the control levers and pedals to the neutral. This level is the engine speed when operation of the auto-deceleration is turned on.

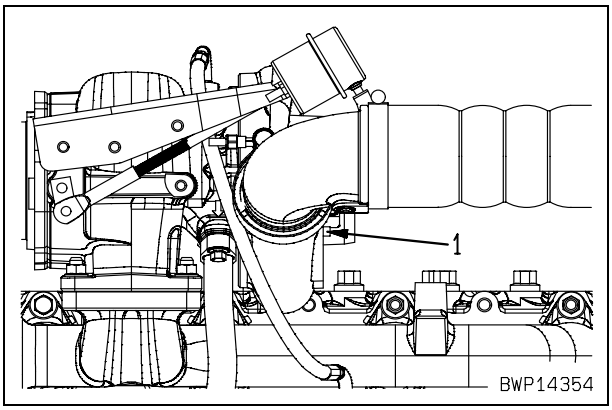
Measuring air boost pressure

★ Air boost pressure measuring tools

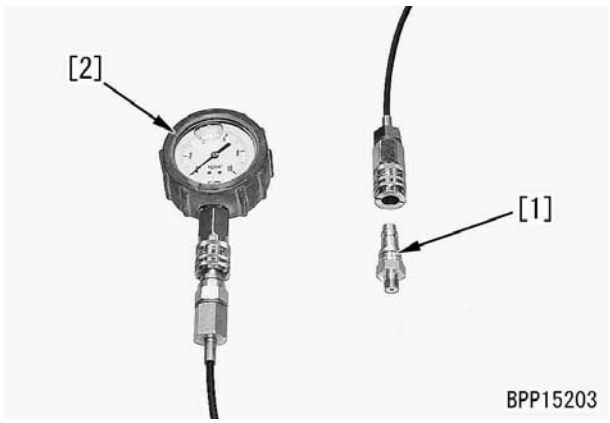
Symbol		Part No.	Part name
A	1	799-201-2202	Boost gauge kit

1. Open the engine hood.

2. Remove intake air pressure pickup plug (1) (R 1/8).



3. Install nipple [1] of boost gauge kit **A** and connect them to gauge [3].



4. Start the engine and keep it running until temperature of the engine coolant and hydraulic oil rise to the operating range.

5. Run the engine at middle or higher speed and drain oil from the hose.
   - ★ When draining the oil, open the self seal of the hose by insert approximately half of the gauge and hose connection. Repeat operation until the oil is drained out.
   - ★ If Pm kit (A) is available, you may use the air bleeding coupling (790-261-1130) in that kit.
   - ★ If oil is left in the hose, the gauge does not work. Accordingly, be sure to drain the oil.

6. Measure the air boost pressure at high idle under the following conditions.
   - Working mode: P-mode
   - Swing lock switch: ON (high pressure relief)
   - Work equipment, swing and travel: Arm IN relief position

7. Remove the measurement tools after the measurement, and make sure that the machine is back to normal condition.

Measuring exhaust gas color

★ Exhaust gas color measurement tools

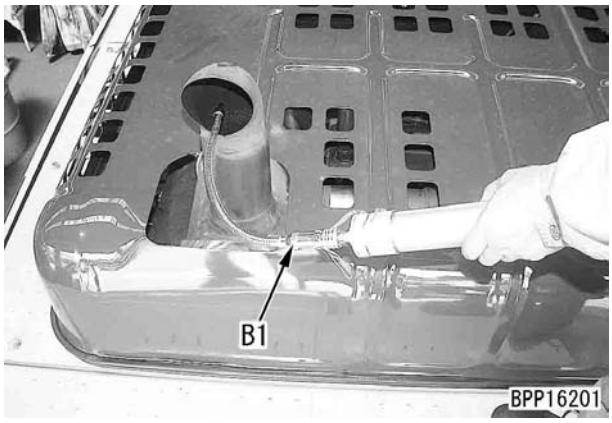
Symbol		Part No.	Part name
B	1	799-201-9001	Handy smoke checker
	2	Commercially available	Smoke meter

⚠ **Be careful not to touch any hot part when removing or installing the measuring instruments.**

★ If an air source and an electric power source are not available in the field, use handy smoke checker **B1**. When recording official data, use smoke meter **B2**.

1. Measuring with handy smoke checker B1

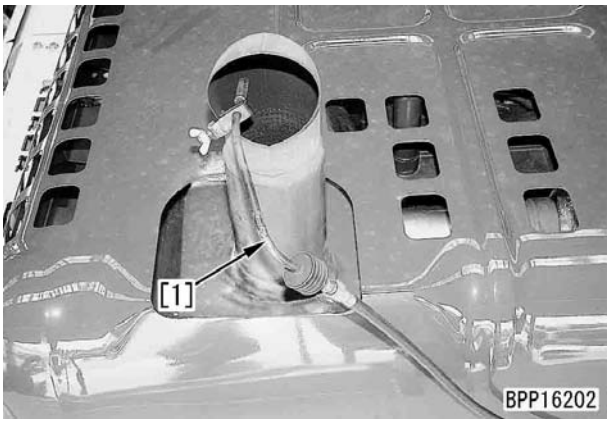
1) Fit a sheet of filter paper to smoke checker **B1**.
2) Insert the exhaust gas intake pipe into the exhaust pipe.
3) Start the engine and keep it running until the engine coolant temperature rises to the operating range.
4) Start the engine and accelerate it suddenly or run it at high idle and then operate the handle of smoke checker **B1** in order to suction exhaust gas to the filter paper.



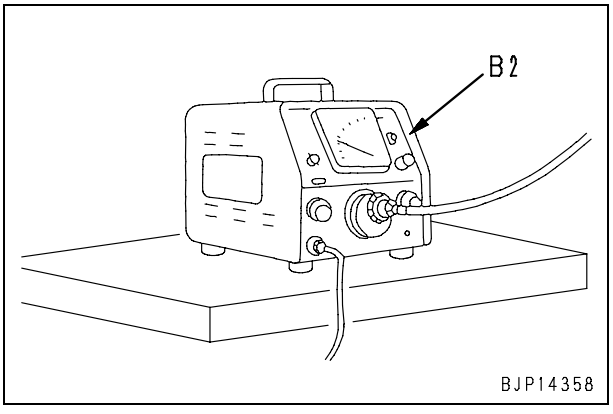
5) Take out the filtering paper and compare it with the attached scale for judgement.
6) Remove the measurement tool after the measurement, and make sure that the machine is back to normal condition.

2. Measuring with smoke meter B2

1) Insert probe [1] of smoke meter **B2** to the outlet of the exhaust pipe and fix it to the exhaust pipe with a clip.



2) Connect the probe hose, receptacle of the accelerator switch and air hose to smoke meter **B2**.
   ★ Limit the supplied air pressure to 1.5 MPa {15 kg/cm^2}.
3) Connect the power cable to an AC receptacle.
   ★ Confirm that the smoke meter power switch is in the OFF position, before connecting the power cable to an outlet.
4) Loosen the cap nut of the suction pump and fit in the filter paper.
   ★ Fit in the filter paper securely so that the exhaust gas may not leak.
5) Turn on the power switch of smoke meter **B2**.



6) Start the engine and keep it running until the engine coolant temperature rises to the operating range.

7) Start the engine and accelerate it suddenly or run it at high idle and then depress the accelerator pedal of smoke meter **B2** to collect the exhaust gas into the filter paper.
8) Put the polluted filtering paper on non-polluted filtering paper (more than 10 sheets) in the filtering paper holder, and read the indicated value.
9) Remove the measurement tools after the measurement, and make sure that the machine is back to normal condition.

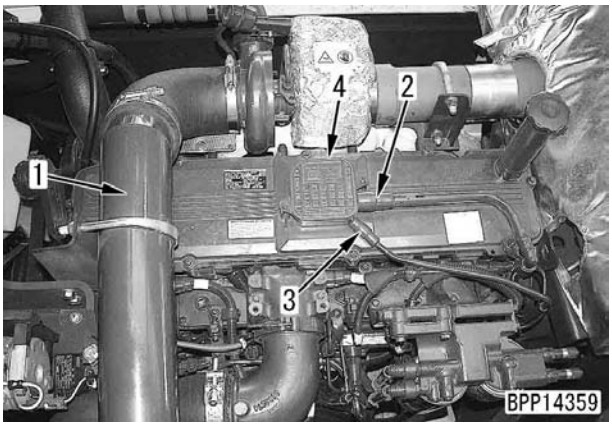
Adjusting valve clearance

★ Valve clearance adjustment tools

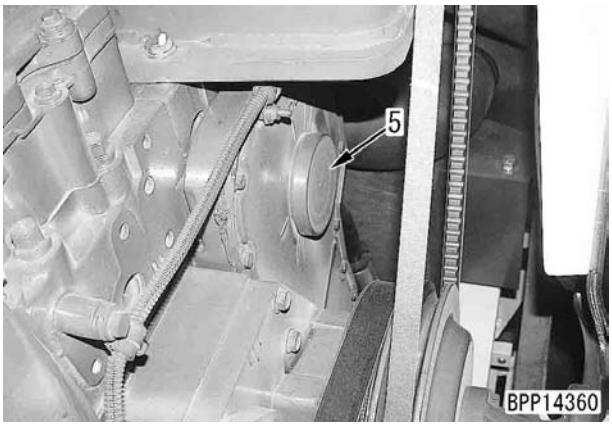
Symbol		Part No.	Part name
C	1	795-799-1131	Gear
	2	Commercially available	Clearance gauge

1. Remove air intake tube (1).

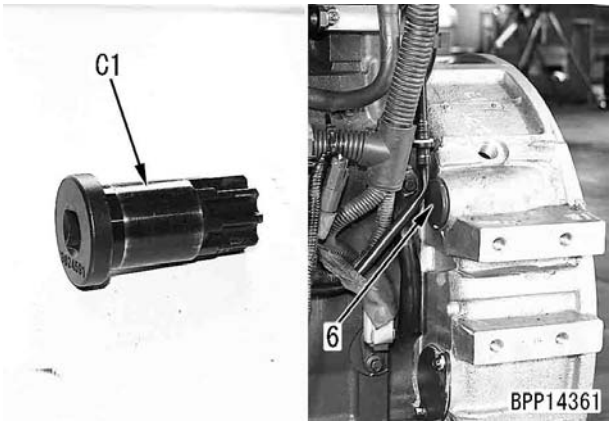
2. Disconnect blow-by tube (2) and breather tube (3) and remove cylinder head cover (4).



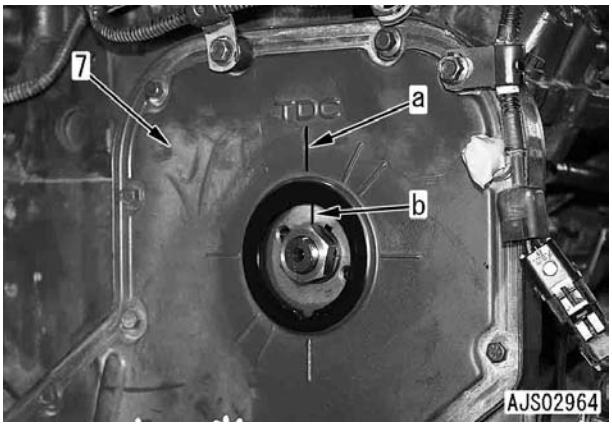
3. Remove cap (5).



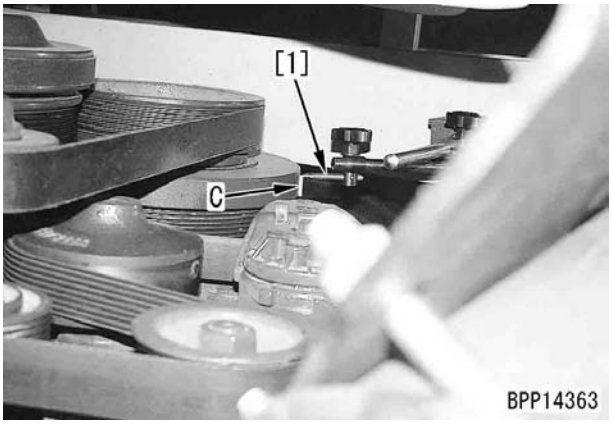
4. Remove cap (6), set gear **C1** and rotate the crank shaft forward to set No.1 cylinder to the compression top dead center.



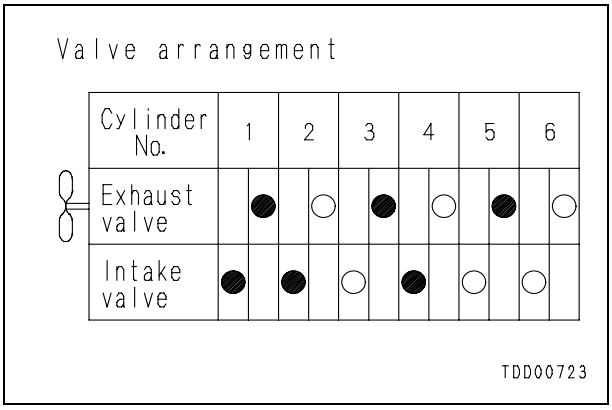
★ Aligning TDC stamp line (a) of gear cover (7) and supply pump gear stamp line (b), set No.1 cylinder to the compression top dead center.



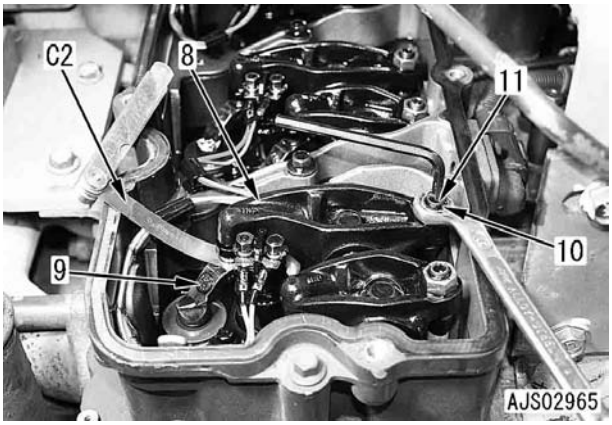
5. After setting No.1 cylinder to the compression top dead center, apply counter mark **C** to the damper and then install pointer [1] of the magnet base.



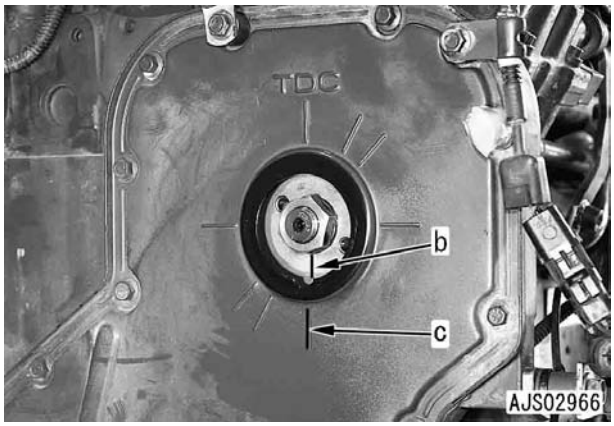
6. Adjust the valve clearance in the following procedure.
   ★ When No.1 cylinder is at the compression top dead center, adjust the valve clearance indicated with ● mark in the valve arrangement drawing.



   1) Insert clearance gauge **C2** to the clearance between rocker lever (8) and cross head (9).
   2) Loosen locknut (10) and adjust the valve clearance using adjustment screw (11).
      ★ With the clearance gauge being inserted, turn the adjustment screw until it allows clearance gauge **C2** to move slightly.
   3) Fix adjustment screw (11) and tighten locknut (10).
      Locknut:
      24 ± 4 Nm {2.45 ± 0.41 kgm}
      ★ After tightening the locknut, check the valve clearance again.



   4) Turn the crankshaft forward by 360° and align the counter mark applied in step 5 above accurately to the pointer.
      ★ This alignment moves the supply pump gear stamp line (b) to the position of stamp line (c) situated directly below.
   5) Adjust the valve clearance indicated with ○ mark in the above valve arrangement drawing.
      ★ Firing order: 1 – 5 – 3 – 6 – 2 – 4
      ★ The adjustment procedure is the same as that employed for adjustment of ● mark.



7. After finishing adjustment, return the removed parts.
   Cylinder head cover mounting bolt:
   11.8 ± 1.96 Nm {1.2 ± 0.2 kgm}

Measuring compression pressure

★ Testing tools for compression pressure

Symbol		Part No.	Part name
D	1	795-799-6700	Puller
	2	795-502-1590	Compression gauge
	3	795-790-6110	Adapter
	4	6754-11-3130	Gasket

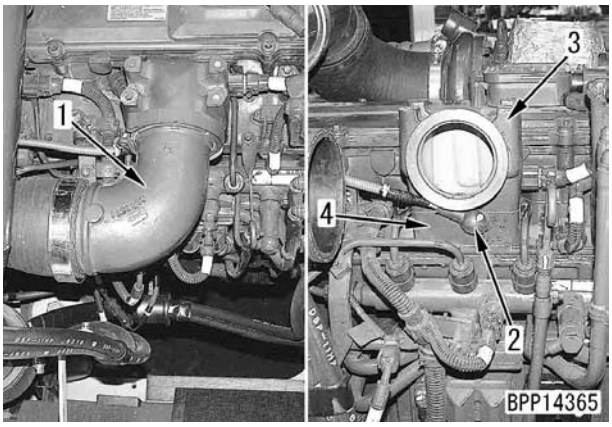
⚠ **Care must be exercised in measuring the compression pressure in order to avoid burn injury from touching the exhaust manifold or muffler, or pinching by rotating part.**

★ Measure the compression pressure after the engine is warmed up.
(Engine oil temperature: 40 – 60°C).

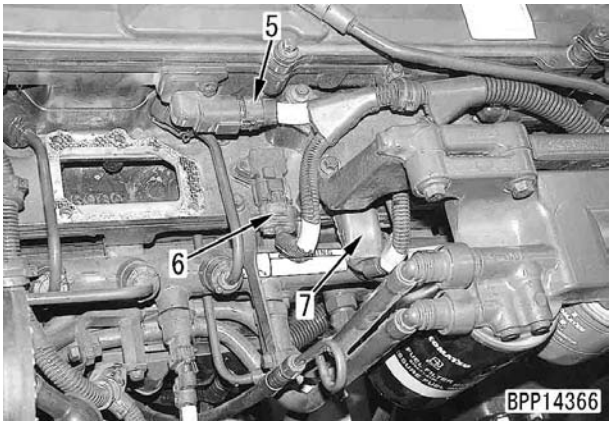
1. Open the engine hood.

2. Remove air intake connector (1).

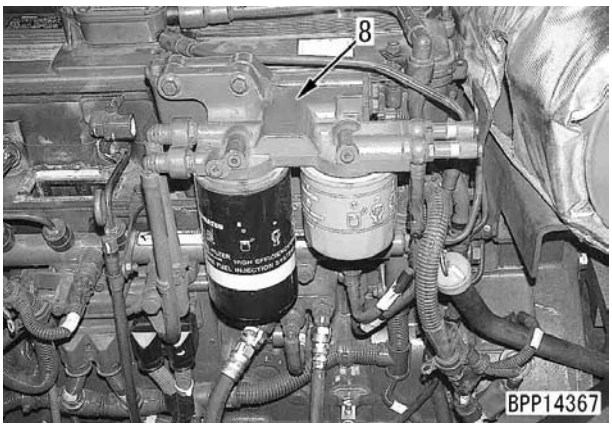
3. Disconnect harness (2) and remove bracket (3) and air heater (4).



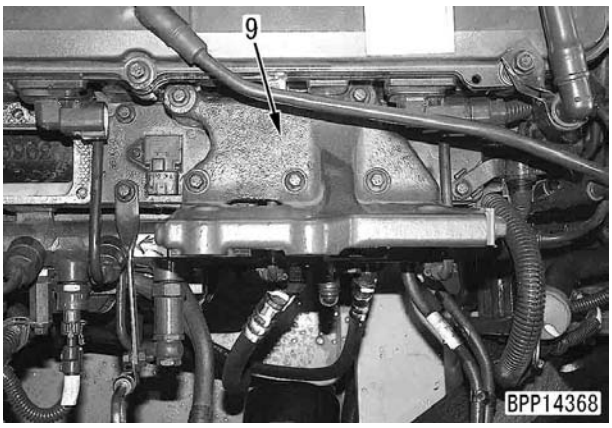
4. Disconnect wiring harness connectors (5), (6) and (7).



5. Move fuel filter and corrosion resistor assembly (8) to the control valve side along with the hose being connected to it.

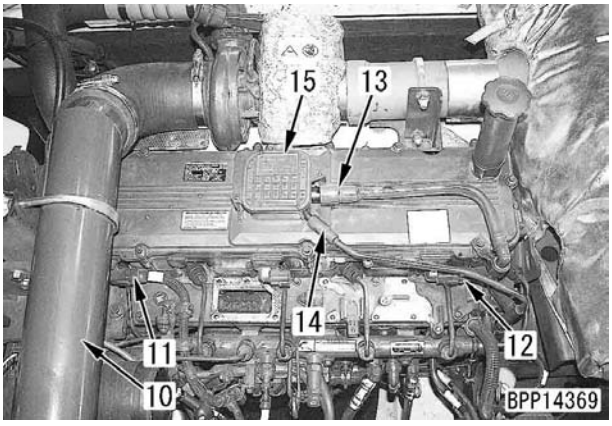


6. Remove bracket (9).

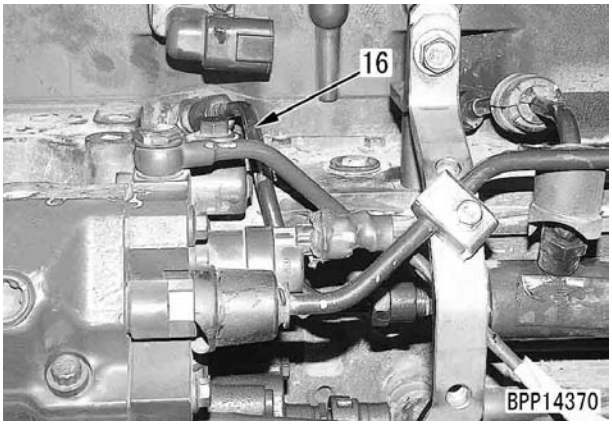


7. Disconnect air intake connector (10) and wiring harness connectors (11) and (12).

8. Remove blow-by hose (13) and breather hose (14) to remove cylinder head cover (15).



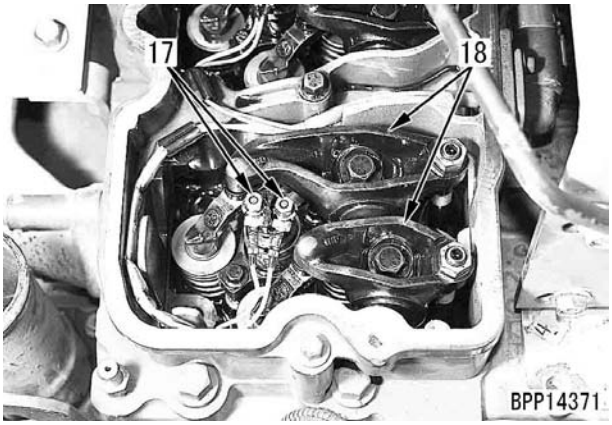
9. Disconnect high-pressure fuel tube (16).



10. Loosen injector terminal nuts (17) and remove the terminal from the injector.

11. Move the cylinder to be tested to the compression top dead center.
    ★ For the adjustment, refer to the section, “Adjusting valve clearance”.

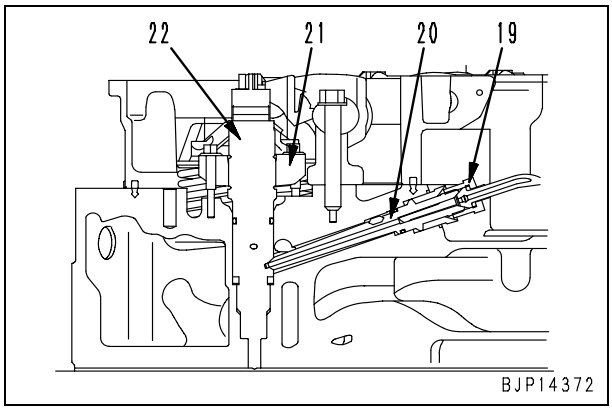
12. Remove rocker arm assemblies (18).

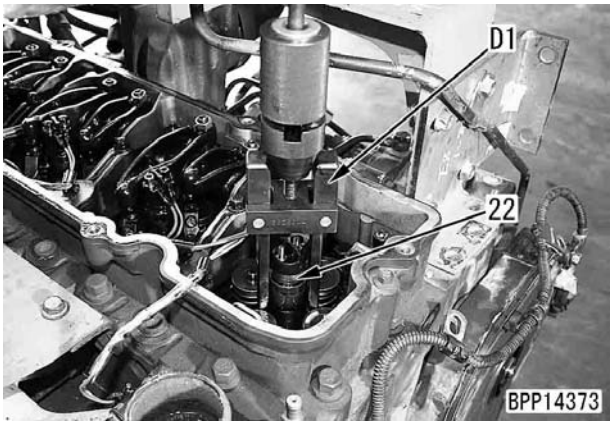


13. Remove retainer (19) and remove fuel inlet connector (20).

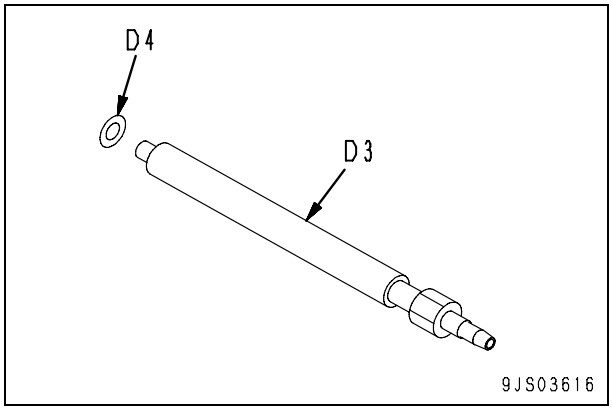
14. Remove holder (21).

15. Remove injector (22).
    ★ Remove the injector by use of impacts of the tool, slide hammer **D1**.
    ★ Do not unclench the upper part of the injector.





16. Install gasket **D4** to the tip of adapter **D3** and connect it to the injector mount.



17. Fix adapter **D3** with the injector holder.
    Holder mounting bolt:

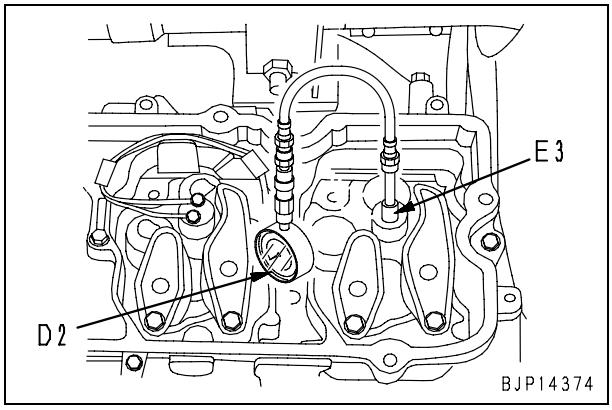
    1st time: **9.8 ± 2.0 Nm {1.0 ± 0.2 kgm}**

    2nd time: **40.2 ± 3.9 Nm {4.1 ± 0.4 kgm}**

18. Connect compression gauge **D2** to adapter **D3**.
    ★ Apply a little amount of engine oil to the connecting parts of the adapter and gauge so that air will not leak easily.

19. Install rocker arm assembly.
    Rocker arm assembly mounting bolt:
    64.7 ± 4.9 Nm {6.6 ± 0.5 kgm}

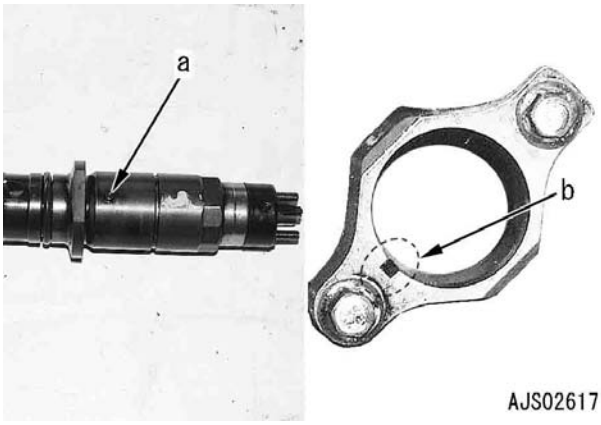
20. Adjust the valve clearance.
    ★ For the adjustment, refer to the section, “Adjusting valve clearance”.



21. Select the no-injection cranking operation from the machine monitor.
    ★ See the section of “Special functions of machine monitor”.
    ⚠ **Be sure to select the no-injection cranking operation. Otherwise, the engine can be started during the inspection, potentially inducing risks to the inspecting personnel.**

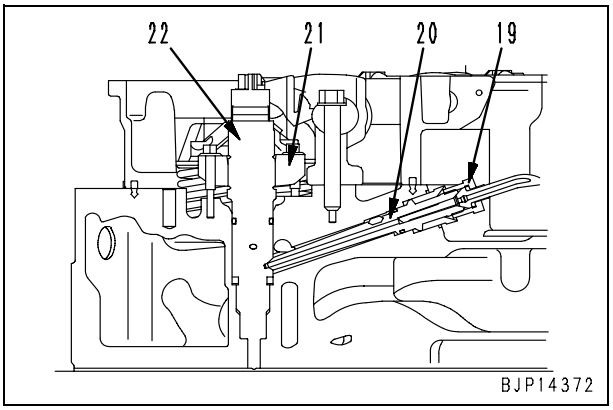
22. Rotate the engine with cranking the starting motor and measure the compression pressure.
    ★ Read the pressure gauge pointer when it is stabilized.

23. After finishing testing, remove the testing tools and return the removed parts.
    ★ Install the injector and fuel high-pressure tube according to the following procedure.
    1) Mate the injector's projection (a) to notch (b) of the holder and then set them to the cylinder head.
       ★ Set the injector with the above mating position toward the fuel inlet connector insertion side.

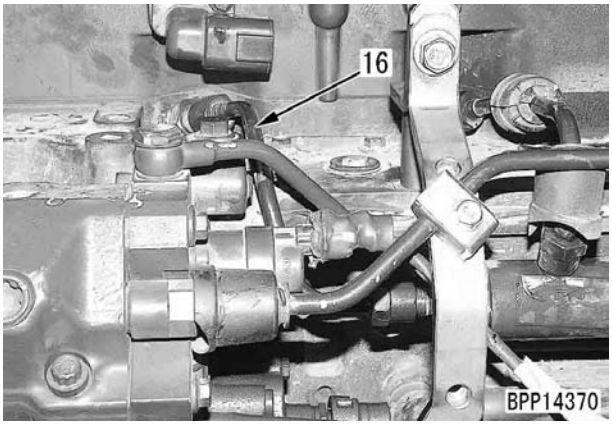


    2) Tighten the injector holder mounting bolt by 3 or 4 threads.
    3) Set fuel inlet connector (20).
       ★ Press it in until you feel the O-ring clicks in.
       ★ Install it in place temporarily using retainer (19).
       Retainer:
       14.7 ± 5.0 Nm {1.5 ± 0.51 kgm}
    4) Tighten the injector holder mounting bolt.
       Holder mounting bolt:

       1st time:
       9.8 ± 2.0 Nm {1.0 ± 0.2 kgm}
       2nd time:
       40.2 ± 3.9 Nm {4.1 ± 0.4 kgm}
    5) Tighten retainer (19) of the fuel inlet connector.
       Retainer:
       40.2 ± 3.9 Nm {4.1 ± 0.4 kgm}



6) Tighten the sleeve nut of high-pressure fuel hose (16) sequentially in the order of head side and common rail side.
   Sleeve nut:
   37.3 ± 4 Nm {3.8 ± 0.4 kgm}



★ After installing the rocker arm assembly, adjust the valve clearance. For details, see “Adjusting valve clearance”.
   Rocker arm assembly mounting bolt:
   64.7 ± 4.9 Nm {6.6 ± 0.5 kgm}

★ Tighten the injector terminal nut with the following torque.
   Terminal nut:
   1.25 ± 0.25 Nm {0.13 ± 0.03 kgm}

★ Tighten the head cover with the following torque.
   Head cover mounting nut:
   11.8 ± 1.96 Nm {1.2 ± 0.2 kgm}

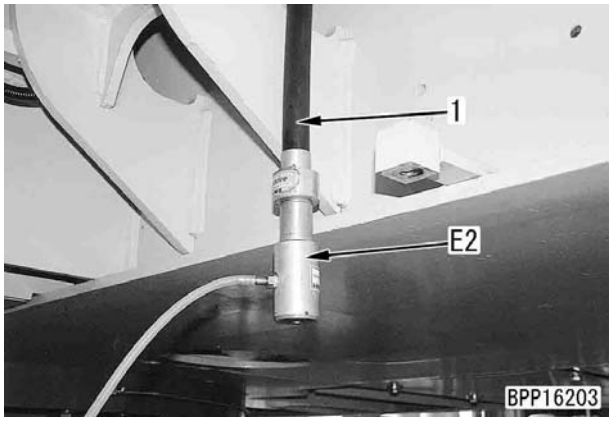
Measuring blow-by pressure

★ Blow-by pressure measurement tools

Symbol		Part No.	Part name
E	1	799-201-1504	Blow-by checker
	2	795-790-3300	Tool (Nozzle)

1. Remove the under cover of the engine block.

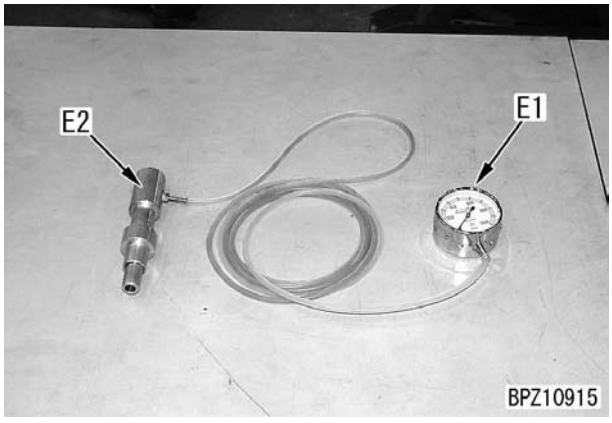
2. Install tool **E2** to blow-by hose (1) and connect gauge [1] of blow-by checker **E1**.



3. Start the engine and keep it running until temperature of the engine coolant and hydraulic oil rise to the operating range.

4. Measure the blow-by pressure at high idle and under the following conditions.
   - Working mode: P-mode
   - Swing lock switch: ON (high pressure relief)
   - Work equipment: Arm IN relief position

   ★ Read off the blow-by pressure value, when the needle of the gauge steadies itself.



5. Remove the measurement tools after the measurement, and make sure that the machine is back to normal condition.

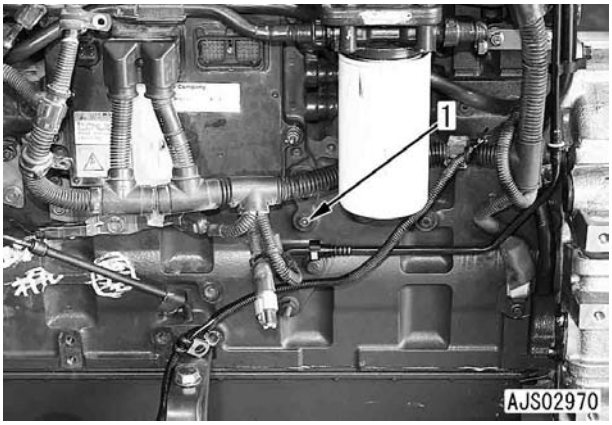
Measuring engine oil pressure

★ Measuring tools for engine oil pressure

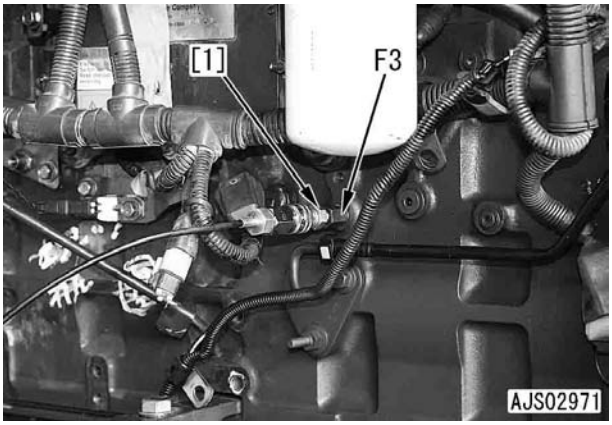
Symbol		Part No.	Part name
F	1	799-101-5002	Hydraulic tester
		790-261-1204	Digital hydraulic tester
	2	799-401-2320	Gauge
	3	6732-81-3170	Adapter
		6215-81-9710	O-ring

★ The test point is subject to machine models.

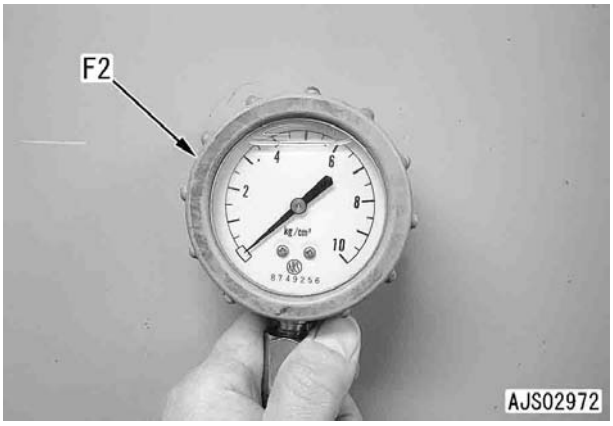
1. Open the engine hood.
2. Remove oil pressure pickup plug (1).



3. Install adapter **F3** and nipple (R1/8) [1] of hydraulic tester **F1** to the plug installation position.
4. Connect hose of hydraulic tester **F1** to nipple [1] and gauge **F2**.



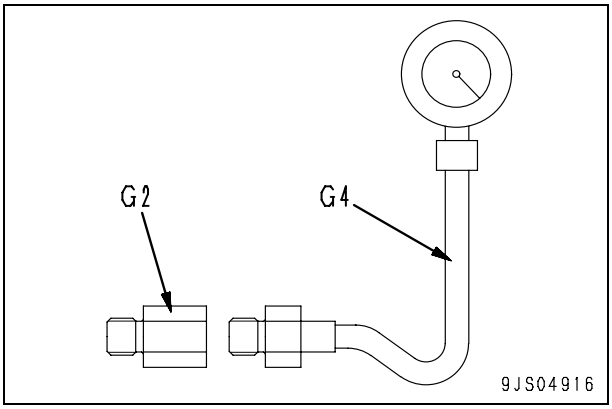
5. Run the engine at the rated output and low idle and test the oil pressure.



6. After finishing testing, remove the measuring tools and return the removed parts.

Measuring fuel pressure

Symbol		Part No.	Part name
G	1	799-101-5002	Hydraulic tester
		790-261-1204	Digital hydraulic tester
	2	6732-81-3170	Adapter (10 x 1.0 mm → R1/8)
		6215-81-9710	O-ring
	3	799-401-2320	Gauge: 1.0 MPa {10 kg/cm^2}
	4	795-790-1500	Fuel vacuum gauge
		799-201-1201	

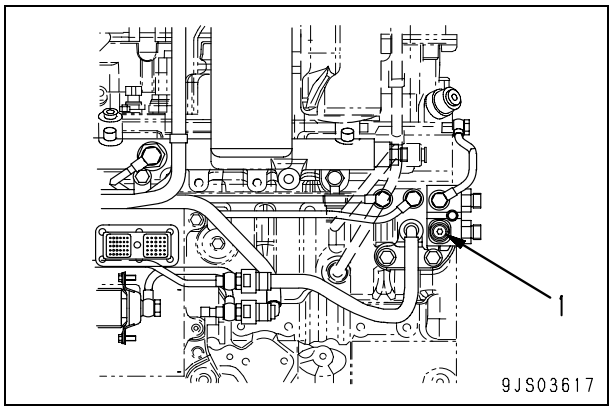


★ Fuel pressure shall be checked only in the following 2 circuits. Negative pressure circuit between the fuel supply connector and feed pump inlet and the low pressure circuit from the feed pump through the fuel main filter and up to the supply pump.

⚠ **Measurement in the high-pressure circuit is not available because of very high pressure generated in this circuit covering the supply pump through the common rail to the fuel injector.**

1. Measuring pressure in the fuel negative pressure circuit (fuel supply connector)

1) Remove fuel pressure pickup plug (1) of the fuel supply connector.



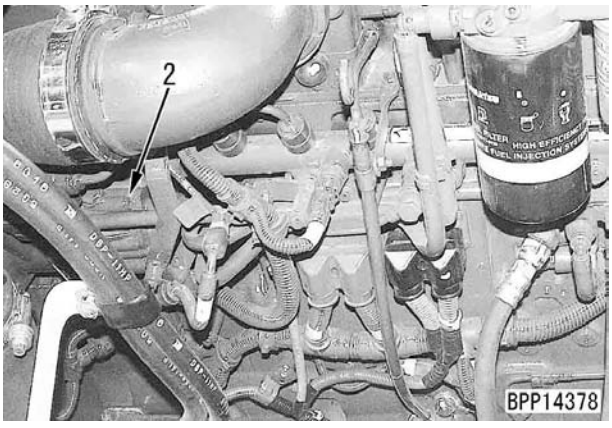
2) Connect adapter **G2** and fuel vacuum gauge **G4**.

3) Run the engine at high idle and measure the pressure in the fuel negative pressure circuit.
   - ★ If the pressure in the fuel negative pressure circuit is in the following range, it is normal.
   - ● Standard pressure value in the fuel negative pressure circuit (fuel supply connector) **Max. 27.1 kPa {Max. 203 mmHg}**

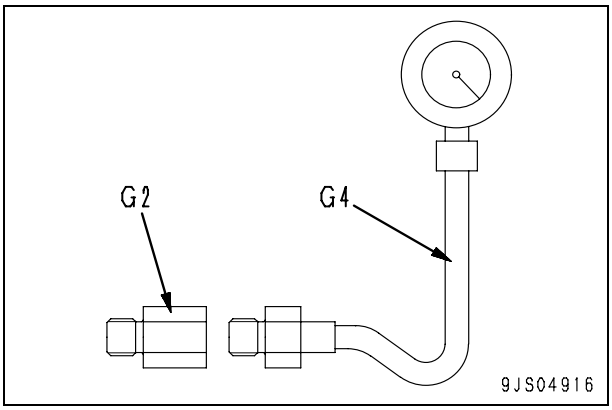
4) After finishing measurement, remove the measuring tools and return the removed parts.
   - ● Fuel pressure pickup plug: **20 – 22 Nm {2.0 – 2.2 kgm}**

2. Measuring pressure in the fuel negative pressure circuit (supply pump)

1) Remove fuel pressure pickup plug (2) of the supply pump.



2) Connect adapter **G2** and fuel vacuum gauge **G4**.

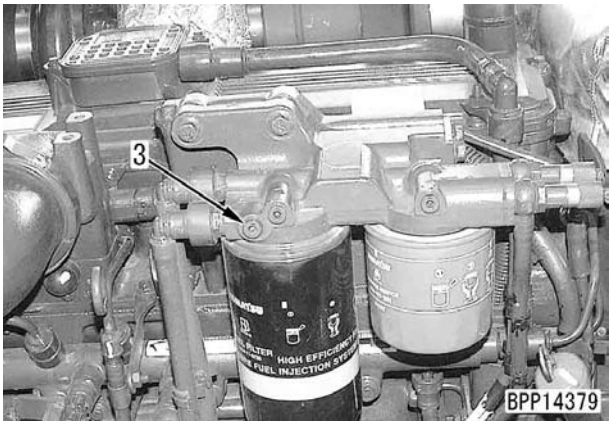


3) Run the engine at high idle and measure the pressure in the fuel negative pressure circuit.
   ★ If the pressure in the fuel negative pressure circuit is in the following range, it is normal.
   ● Standard pressure value in the fuel negative pressure circuit (supply pump) **Max. 33.9 kPa {Max. 254 mmHg}**
4) After finishing measurement, remove the measuring tools and return the removed parts.
   ● Fuel pressure pickup plug:

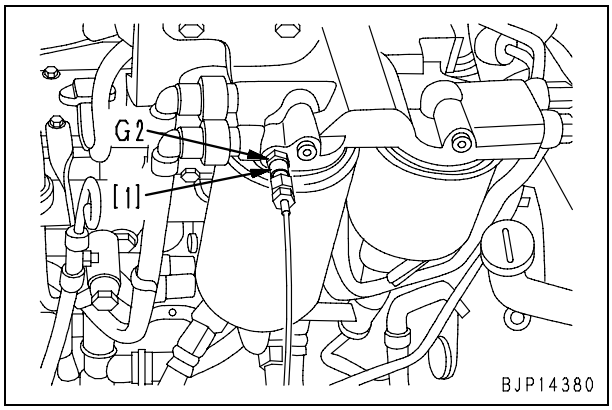
   20 – 22 Nm {2.0 – 2.2 kgm}

3. Measuring pressure in the fuel low-pressure circuit (fuel filter inlet side)

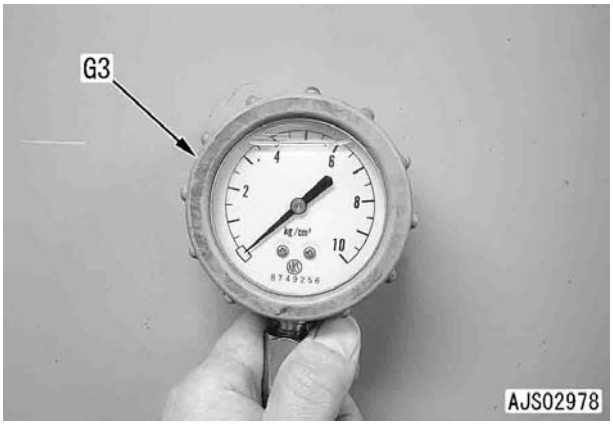
1) Remove fuel pressure pickup plug (3) situated at the fuel main filter inlet side.



2) Install adapter **G2** and nipple [1] of hydraulic tester **G1**and connect them to gauge **G3**.



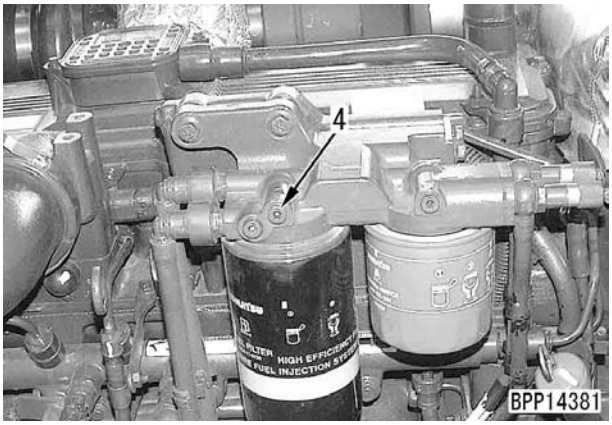
3) Measure pressure in the fuel low-pressure circuit when the engine is cranked.
   ★ If the pressure in the fuel low-pressure circuit (at the fuel filter inlet side) is in the following range, it is normal.
   ● Standard pressure values of the fuel low-pressure circuit (fuel filter inlet side) **Min. 0.14 MPa {Min. 1.4 kg/cm^2}**
   ⚠ **In order to protect the starting motor, it is prohibited to continue cranking for more than 20 seconds.**



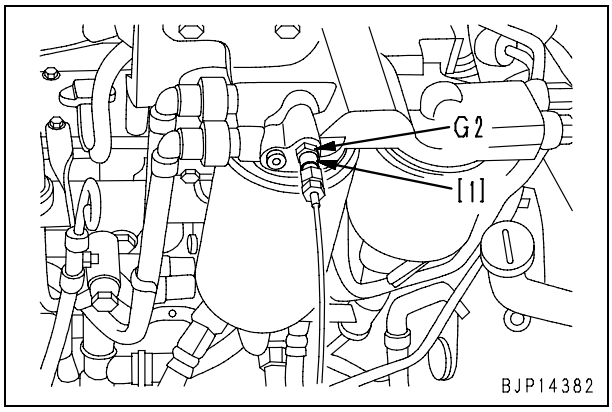
4) After finishing measurement, remove the measuring tools and return the removed parts.
   ● Fuel pressure pickup plug:
   20 – 22 Nm {2.0 – 2.2 kgm}

4. Measuring pressure in the fuel low-pressure circuit (fuel filter outlet side)

1) Remove fuel pressure pickup plug (4) situated at the fuel main filter outlet side.



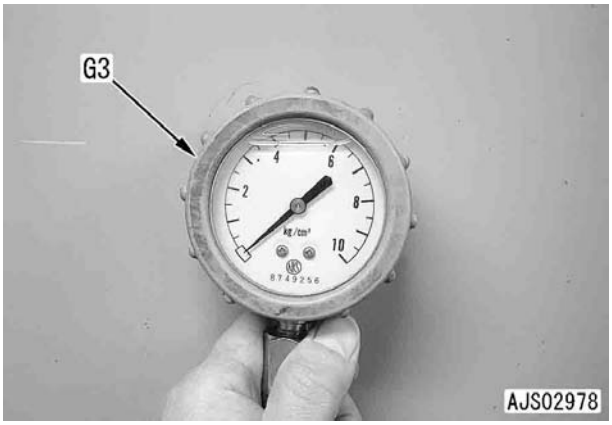
2) Install adapter **G2** and nipple [1] of hydraulic tester **G1** and connect them to gauge **G3**.



3) Run the engine at high idle and measure the pressure of the fuel low-pressure circuit.

★ If the pressure in the fuel low-pressure circuit (at the fuel filter outlet side) is in the following range, it is normal.

- Standard pressure values of the fuel low-pressure circuit (fuel filter outlet side) **Min. 0.48 MPa {Min. 4.9 kg/cm^2}**

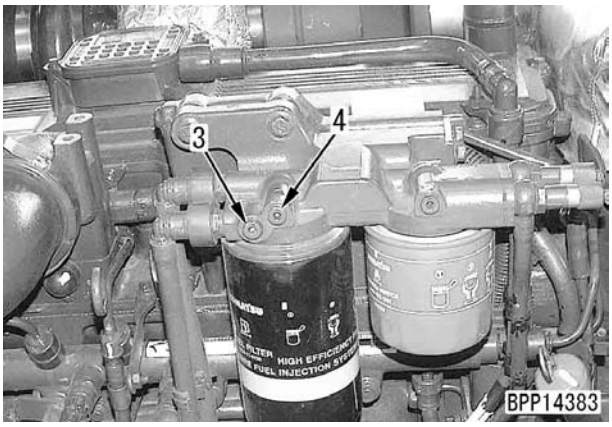


4) After finishing measurement, remove the measuring tools and return the removed parts.

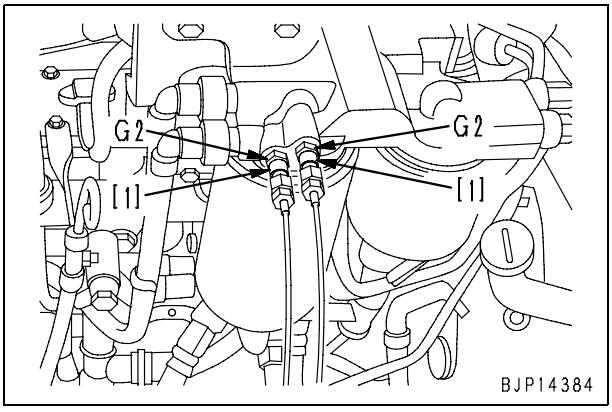
- Fuel pressure pickup plug:
  20 – 22 Nm {2.0 – 2.2 kgm}

5. Measuring drop of pressure in fuel low-pressure circuit

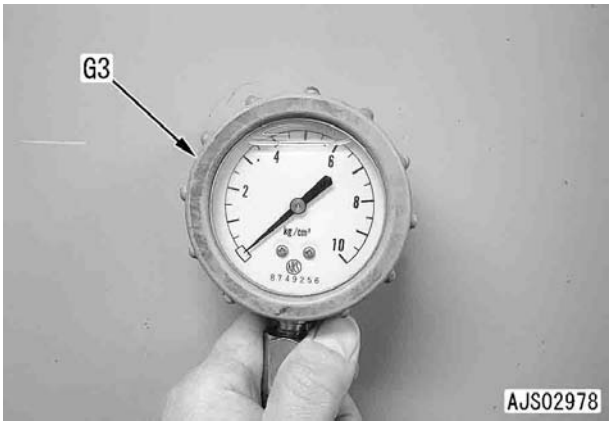
1) Remove fuel pressure pickup plug (3) at the fuel main filter inlet side and fuel pressure pickup plug (4) at the outlet side.



2) Install adapter **G2** and nipple [1] of hydraulic tester **G1** and connect them to gauge **G3**.



3) Run the engine at high idle and measure drop of the pressure of the fuel low-pressure circuit.
   - Pressure drop in the fuel low-pressure circuit =
     Fuel filter inlet pressure – Fuel pressure outlet pressure
   - ★ If the pressure drop in the fuel low-pressure circuit is in the following range, it is normal.
   - Standard pressure drop values for the fuel low-pressure circuit:
     Max. 0.14 MPa {Max. 1.4 kg/cm^2}
   - ★ When the measured pressure drop exceeded the standard value, clogging of the fuel filter should be suspected.



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

Handling during cylinder cut-out operation

★ Reduced cylinder mode operation means to run the engine with the fuel injectors of 1 or more cylinders disabled electrically to reduce the number of effective cylinders. The purposes and effects of this operation are as follows.

1. This operation is used to find out a cylinder which does not output power normally (or, combustion in it is abnormal).
2. If the engine speed and output remain the same as the normal operation (full-cylinder mode operation) when a cylinder is set to no-injection in the cylinder cut-out operation, existence of a failure on the subject cylinder should be suspected.
   Followings are the potential causes.
   Leakage from the cylinder head gasket
   Defective injection from the injector
   Failure on the piston, piston ring or cylinder liner
   Failure on the valve mechanism (valve operating system)
   Failure in the electrical system
3. Since the common rail fuel injection system controls the injector of each cylinder electronically, the operator can perform the reduced cylinder mode operation easily with switches to find out a defective cylinder.
   ★ See the section of “Special functions of machine monitor” when turning on the cylinder cut-out operation.

Handling during no injection cranking operation

★ The no injection cranking operation denotes to crank the engine from the starting motor after setting all cylinders to no injection mode. Following describes the objective and effects of this operation.

When a machine or engine has been stored for a long period of time, implementing the no injection cranking operation before restarting the engine lubricates the engine respective parts and thus helps preventing seizure of the engine.

★ See the section of “Special functions of machine monitor” when turning on the no injection cranking operation.

Measuring fuel return rate and leakage

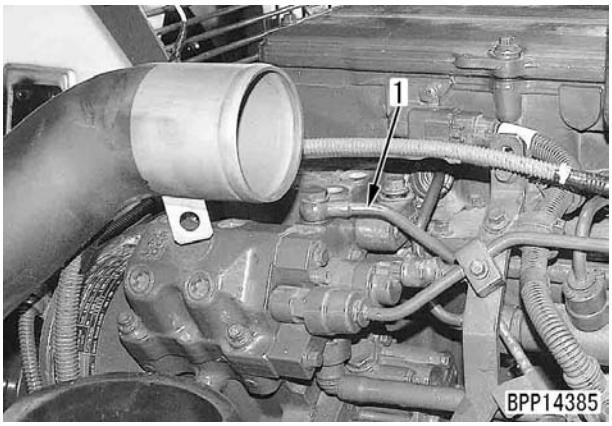
★ Testing tools for leakage from pressure limiter and return rate from injector

Symbol		Part No.	Part name
H	1	795-790-4800	Hose KIT
	2	795-790-6700	Adapter
	3	Commercially available	Measuring cylinder

⚠ **Park the machine in a level ground and lower the work equipment to the ground.**

1. Testing supply pump return rate

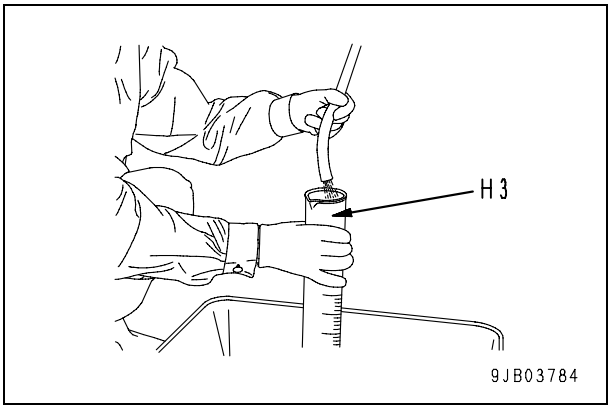
1) Disconnect return tube (1) of the supply pump.
   ★ Before starting the work, remove the return hose from the aftercooler so that it may not interfere with the inspection.



2) Connect testing tool **H1** to the supply pump side, and insert its tip into measuring cylinder **H3**.
3) Connect blocking tool **H2** to the fuel return connector side to prevent leakage of the fuel.
4) Install the aftercooler hose, run the engine at low idle and then measure the return rate from the supply pump.
   ★ If the return rate from the supply pump is in the following range, it is normal.

At low idle	300 cc/30 sec.
At cranking	200 cc/30 sec.

⚠ **If the engine cannot be started, you may measure the fuel return rate while rotating the engine with the starting motor. Do not rotate for more than 30 seconds continuously, however, for protection of the starting motor.**



5) After finishing testing, remove the testing tools and return the removed parts.
   Joint bolt (M14):
   36 ± 5 Nm {3.67 ± 0.51 kgm}

2. Testing leakage from pressure limiter

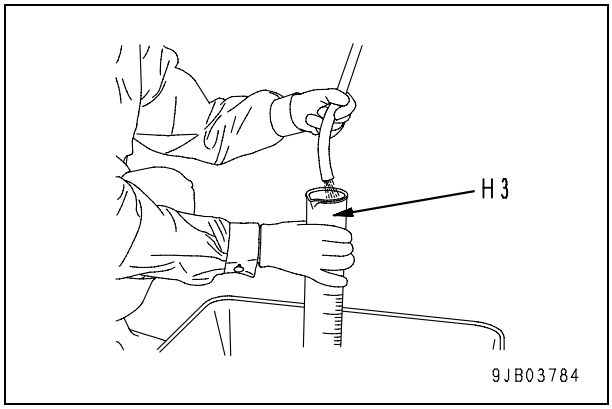
★ Before displaying failure code [CA449], its troubleshooting must be done beforehand.

1) Disconnect return tube (2) of the pressure limiter.

2) Connect testing tool **H1** to the pressure limiter side, and insert its tip into measuring cylinder **H3**.
3) Connect blocking tool **H2** to the return tube joint connection of the cylinder block side to prevent leakage of the fuel.

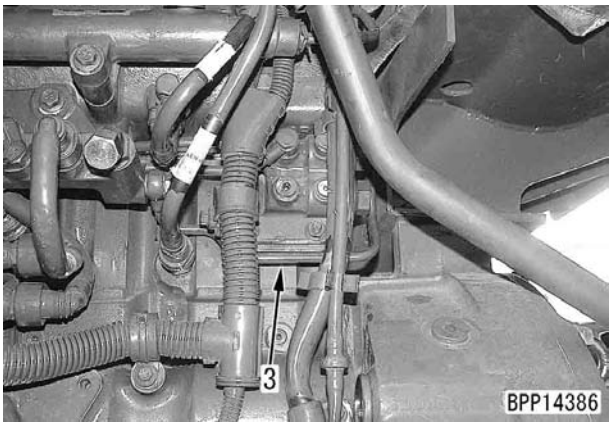
4) Run the engine at low idle and test the return rate from the pressure limiter.
★ If the leakage from the pressure limiter is in the following range, it is normal.

At low idle	Below 30 droppings/min.



5) After finishing testing, remove the testing tools and return the removed parts.
Joint bolt (M12):
24 ± 4 Nm {2.45 ± 0.41 kgm}

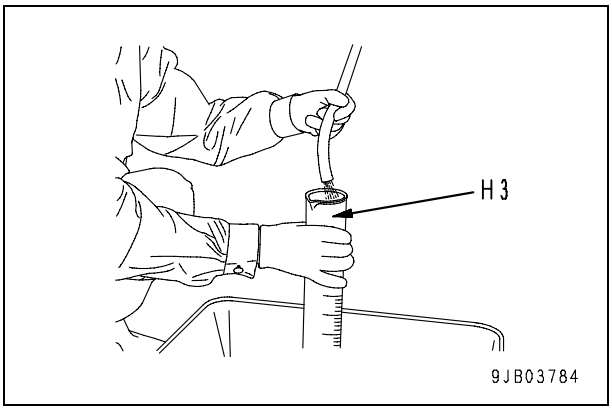
3. Testing return rate from injector
1) Disconnect return tube (3) of the injector.



2) Connect testing tool **H1** to the cylinder head side, and insert its tip into measuring cylinder **H3**.
3) Connect blocking tool **H2** to the return tube joint connection of the cylinder block side to prevent leakage of the fuel.
4) Run the engine at low idle and test the return rate from the injector.
★ If the return rate from the injector is in the following range, it is normal.

At low idle	300 cc/45 sec.
At cranking	100 cc/30 sec.

⚠ **If the engine cannot be started, you may measure the fuel return rate while rotating the engine with the starting motor. Do not rotate for more than 30 seconds continuously, however, for protection of the starting motor.**



5) After finishing testing, remove the testing tools and return the removed parts.
Joint bolt (M12):
24 ± 4 Nm {2.45 ± 0.41 kgm}

Bleeding air from fuel circuit

★ If fuel is used up or after a fuel circuit part has been removed or installed, bleed air from the fuel circuit using a power priming pump and according to the following procedure.

1. When fuel filter (1) is removed, installed or replaced, install the pump before filling fuel to the fuel filter.

2. Fill the fuel tank with fuel.

3. Set the starting switch to ON position and maintain it in that state for 30 seconds and then set the switch to OFF position and maintain it in that state for 10 seconds.

4. Repeat above procedures of step 3. four times.

5. Start the engine with cranking the starting motor.
   - ★ The air in the high-pressure circuit is bled automatically if the engine is cranked.
   - ★ If the engine does not start, there may be still air in the low-pressure circuit. In this case, repeat the above procedure from step 2.
   - ★ If the engine is started while air is remained in the fuel circuit, a fuel system error (CA449 or CA559) can result. In such case, start the engine after implementing above procedure and then maintain the engine at low idle for about 3 minutes. As air is bled from the fuel circuit, the engine speed will be stabilized, erasing the error indication.

Checking fuel circuit for leakage

⚠ **Very high pressure is generated in the high-pressure circuit of the fuel system. If fuel leaks while the engine is running, it is dangerous since it can catch fire.**
After testing the fuel system or removing its parts, test it for fuel leakage according to the following procedure.

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

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

2. Run the engine at speed below 1,000 rpm and stop it after its speed is stabilized.

3. Inspect the fuel piping and devices for fuel leakage.
   ★ Check mainly around the high-pressure circuit parts coated with the color checker for fuel leakage.
   ★ If any fuel leakage is detected, repair it and check again from step 1.

4. Run the engine at low idle.

5. Inspect the fuel piping and devices for fuel leakage.
   ★ Check mainly around the high-pressure circuit parts coated with the color checker for fuel leakage.
   ★ If any fuel leakage is detected, repair it and check again from step 1.

6. Run the engine at high idle.

7. Inspect the fuel piping and devices for fuel leakage.
   ★ Check mainly around the high-pressure circuit parts coated with the color checker for fuel leakage.
   ★ If any fuel leakage is detected, repair it and check again from step 1.

8. Run the engine at high idle and load it.
   ★ When checking while the components to be checked are mounted on the machine, stall the torque converter or relieve the hydraulic pump.

9. Inspect the fuel piping and devices for fuel leakage.
   ★ Check mainly around the high-pressure circuit parts coated with the color checker for fuel leakage.
   ★ If any fuel leakage is detected, repair it and check again from step 1.
   ★ If no fuel leakage is detected, check is completed.

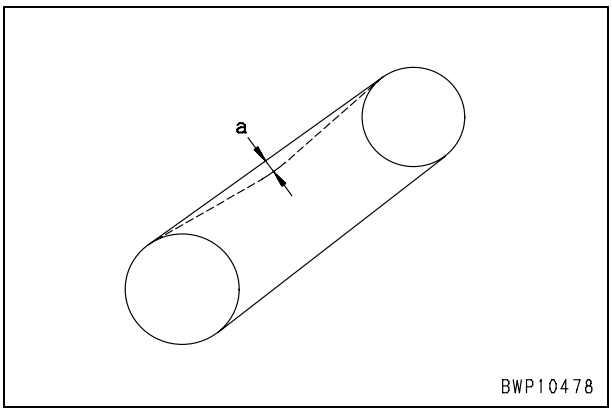
Testing and adjusting air compressor belt tension

Inspection

Test belt deflection amount **(a)** when depressing the mid point between the fan pulley and the compressor pulley with your finger.

- Belt depressing force:

  98 N {10 kg} or equivalent



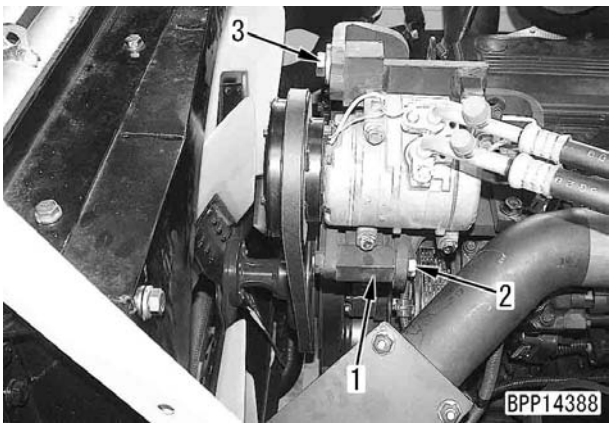
Adjustment

★ If the belt deflection amount is not proper, adjust it in the following manner.

1. Loosen mounting bolt (2) and fixing bolt (3) of compressor bracket (1).

2. Slide compressor bracket (1) using the bar, adjust the belt tension and then tighten fixing bolt (3).

3. Tighten mounting bolt (2) of compressor bracket (1).
   ★ Check the belt tension again after the adjustment.



Measuring clearance in swing circle bearings

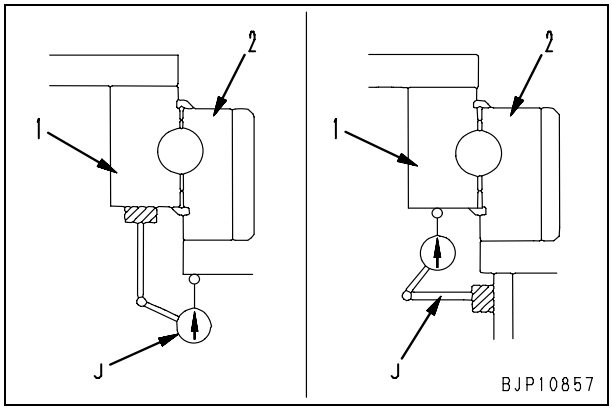
★ Swing circle bearing clearance measurement tool

Mark	Part No.	Part Name
J	Commercially available	Dial gauge

★ Follow the steps explained below when measuring clearance in the swing circle bearing on the actual machine.

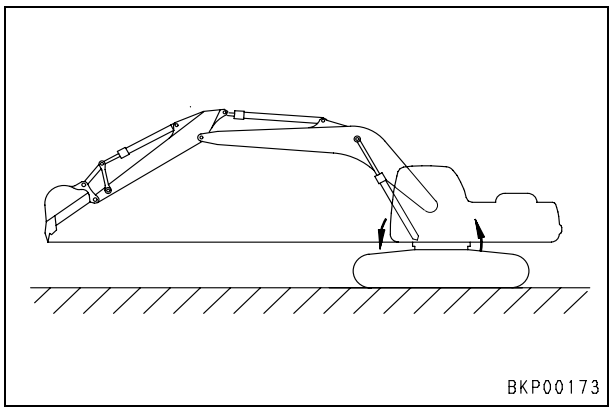
⚠ **Be careful not to put a hand or foot under the undercarriage, while taking measurement.**

1. Fasten dial gauge **J** to swing circle outer race (1) or inner race (2), and contact the probe against the end surface of inner race (2) or outer race (1) on the opposite side.
   ★ Set dial gauge **J** at the machine front or rear side.



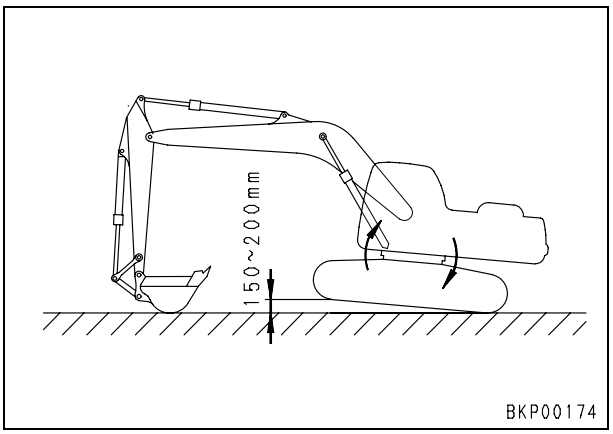
2. Keep the work equipment in the max. reach posture and keep the height of the bucket teeth tip level with the lower height of the revolving frame.
   ★ The upper structure is lowered at the front and raised at the rear at that time.

3. Set dial gauge to the zero point.



4. Hold the arm nearly perpendicular to the ground, and lower the boom until the track shoes will be lifted at the machine front.
   ★ The upper structure is raised at the front and lowered at the rear at that time.

5. Read the value indicated by dial gauge **J** in this condition.
   ★ The value indicated by dial gauge **J** represents the clearance in the bearings.



6. Return the machine to the posture in Item 2 above, and confirm dial gauge **J** reading returns to zero.
   ★ If zero value is not indicated, repeat the steps in Items 3 through 5.

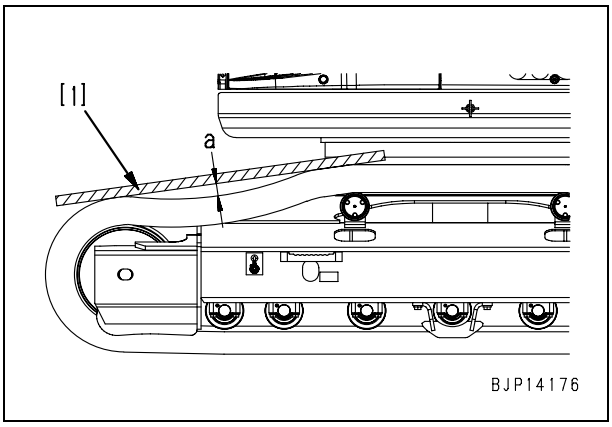
Testing and adjusting track shoe tension

Inspection

1. Travel the machine forward by the length of track on ground with the engine at low idle and then stop the machine slowly.

2. Place straight bar [1] on the track shoe between the idler and the 1st carrier roller.
   ★ L beam is recommended for bar [1] because of its deflection-free nature.

3. Measure maximum clearance **(a)** between bar [1] and the track shoe.
   ● Standard clearance **(a)**: 10 – 30 mm



Adjustment

★ If the track shoe tension is not proper, adjust it in the following manner.

1. When the tension is too strong

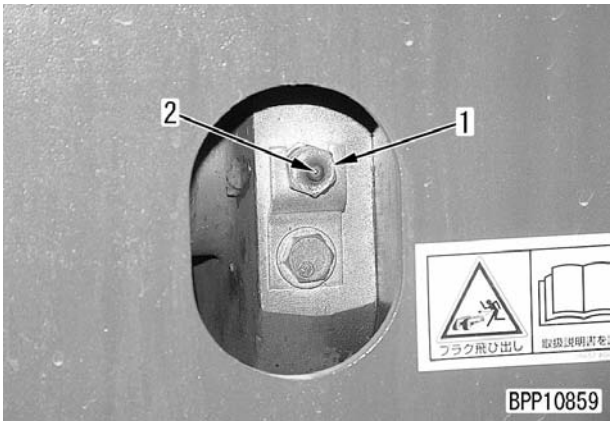
Loosen valve (1) to discharge the grease.

⚠ **Do not loosen the valve more than 1 turn. Otherwise, the valve may jump out because of the high-pressure grease inside.**

2. When the tension is too weak

Push in grease through grease fitting (2).

★ If the normal track shoe tension is not restored even after greasing, move the machine slowly back and forth.



Testing and adjusting oil pressure in work equipment, swing and travel circuit

★ Testing and adjusting tools for hydraulic oil pressure in hydraulic circuit for work equipment, swing and travel

Symbol		Part No.	Part name
L	1	799-101-5002	Hydraulic tester
		790-261-1204	Digital hydraulic tester
	2	799-101-5220	Nipple (10 x 1.25 mm)
		07002-11023	O-ring

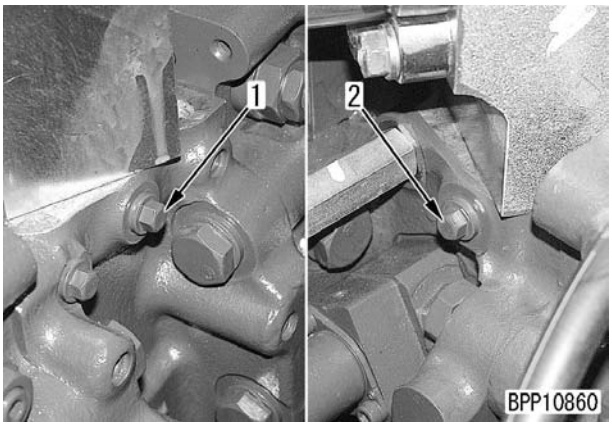
★ Checkup of the oil pressure in the work equipment, swing, and travel circuits (pump discharge pressure) is also available from the monitoring function of the machine monitor (Special functions of machine monitor).

Measurement

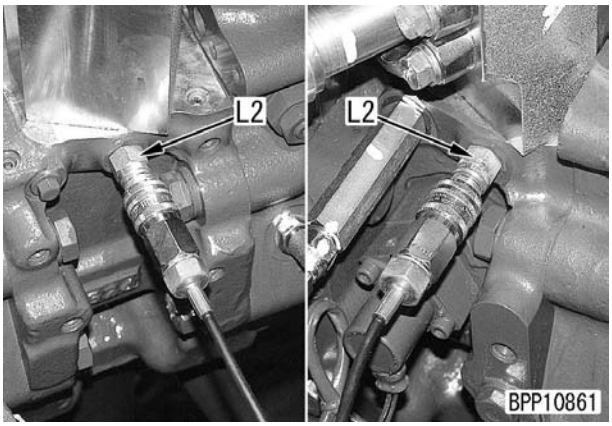
1. Preparation work

⚠ **Lower the work equipment to the ground and, after stopping the engine, release residual pressure in the piping by operating the control lever several times. Then loosen the oil filler cap gradually to release pressure inside the tank.**

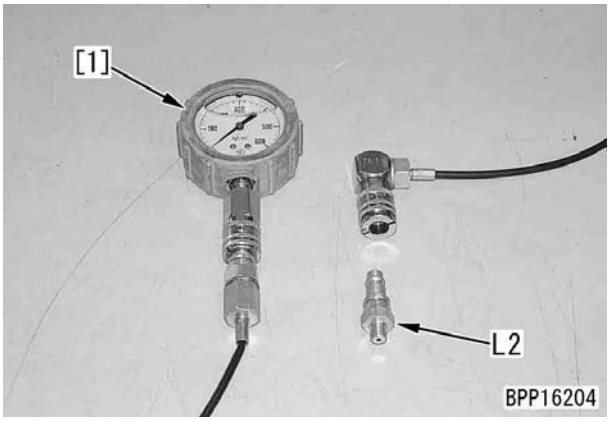
1) Remove hydraulic oil pressure measuring plugs (1) and (2).
   - Plug (1): For the front pump circuit (situated in the rear side of the machine)
   - Plug (2): For the rear pump circuit (situated in the front side of the machine)



2) Fit nipple **L2** and connect it to oil pressure gauge [1] of hydraulic tester **L1**.
   ★ Use the oil pressure gauge with capacity 60 MPa {600 kg/cm^2}.



3) Start the engine and keep it running until the hydraulic oil temperature rises to the operating range.



2. Combination of pump, actuator, and valve

★ Care must be exercised when the oil from the pump is diverted since, at this time, the actuators of the front pump and rear pump work independently, relieving different valves.

★ When the work equipment circuit or swing circuit is relieved singly, the oil of the pumps is diverted.

★ The actuators in the table are arranged in the order when the control valve is seen from the front of the machine.

Pump	Actuator		Valve to be relieved
Front pump	(Unload)		R unload valve
	Service		Safety valve
	Boom Hi	Arm Hi	R main relief valve
	Bucket		R main relief valve
	L.H travel		R main relief valve
	Boom Lo		RAISE: R main relief valve LOWER: Safety valve
Rear pump	Swing		Swing motor safety valve
	R.H travel		F main relief valve
	Arm Lo		F main relief valve
	(Unload)		F unload valve

3. Measurement of unload pressure

1) Start the engine.
2) Measure hydraulic oil pressure, when the engine is running at high idle and all the control levers are moved to the NEUTRAL position.
   ★ Hydraulic oil pressure when the unload valve unloads is displayed.

4. Measurement of work equipment relief pressure

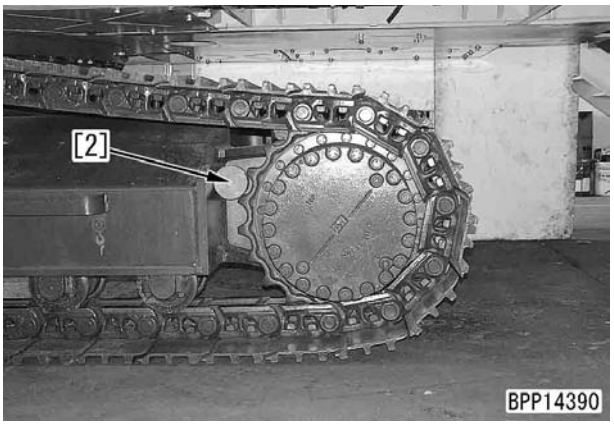
1) Start the engine and move the cylinder to be measured to its stroke end.
2) Measure hydraulic oil pressure when the cylinder is relieved while the engine is running at high idle.
   ★ Except when the boom LOWER is selected, the pressure at which the main relief valve was relieved is displayed.
   ★ Except when the boom LOWER is selected, releasing the power max. switch introduces the low-pressure relief pressure and pushing this switch introduces the high-pressure relief pressure.
   ★ Except when the boom LOWER is selected, keep the swing lock switch in the OFF position during the inspection. If it is moved to the ON position, hydraulic oil pressure is turned to high relief pressure, as the constant 2-stage relief valve is moved to the ON position.
   ★ When the boom LOWER is selected, the pressure at which the safety valve was relieved is displayed.
   ★ When the boom LOWER is selected, the relief pressure is lower than the main relief pressure.
   ★ When the boom LOWER is selected, turning off the machine push-up switch introduces the low-pressure relief pressure and turning it on introduces the high-pressure relief pressure.

5. Measurement of swing relief pressure

1) Start the engine and move the swing lock switch to the ON position.
2) Measure hydraulic oil pressure when the engine is running at high idle and the swing circuit is relieved.
   ★ Hydraulic oil pressure when the swing motor safety valve is relieved is displayed.
   ★ The relief pressure of the swing motor is lower than the main relief pressure.

6. Measurement of travel circuit relief pressure

1) Start the engine, and lock the travel.
   ⚠ **Insert pin [2] between the sprocket and the track frame to positively lock the travel circuit.**



2) Measure the pressure when the engine is set to high idle and the travel circuit is relieved.
   ★ Hydraulic oil pressure with the main relief valve in relief condition is displayed. In the travel circuit relief, the pressure is high pressure relief all the time.

Adjustment

★ Adjustment of the unload valve is not available.

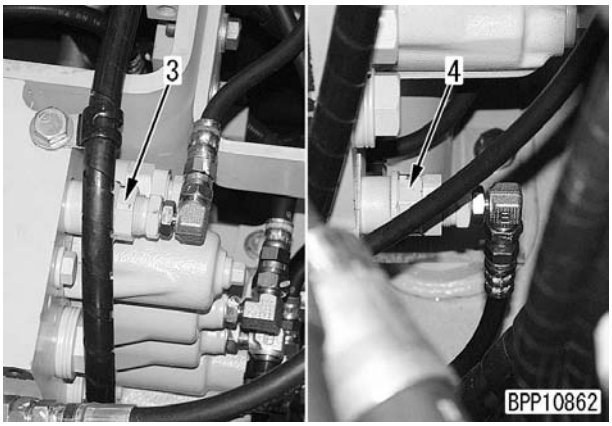
1. Adjustment of main relief pressure

★ When the relief pressure of the work equipment circuit or travel circuit is abnormal, adjust main relief valves (3) and (4) according to the following procedure.

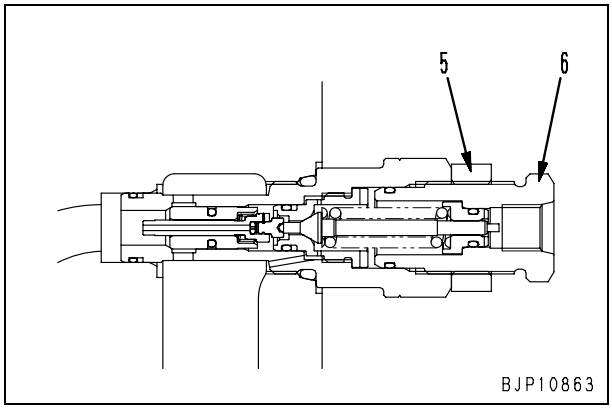
- (3): For the front pump circuit
- (4): For the rear pump circuit

★ As for the main relief valve, be sure to adjust its low-pressure relief pressure alone (adjusting the low-pressure relief pressure automatically sets the high-pressure relief pressure, too.).

★ When the low-pressure relief pressure is turned on, the 2-stage relief valve is OFF and thus the pilot pressure is not applicable to the switching port.



1) Disconnect the pilot hose.
2) Loosen locknut (5) and turn holder (6) to adjust the relief pressure.
   ★ Turning the holder clockwise increases the pressure. Turning it counterclockwise decreases the pressure.
   ★ Quantity of adjustment per turn of holder:
   Approx. 20.5 MPa {Approx. 209 kg/cm^2}
   Locknut:
   49.0 – 58.8 Nm {5 – 6 kgm}

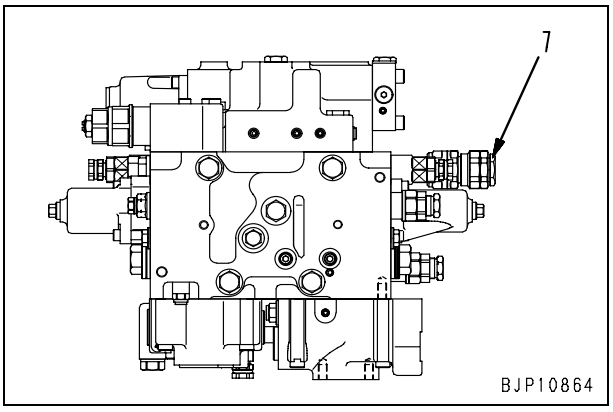


3) Check the pressure again after the adjustment, following the aforementioned steps for measurement.
   ★ Connect the pilot hose when measuring the oil pressure.

2. Adjustment of boom LOWER relief pressure (on the side where high pressure is set)

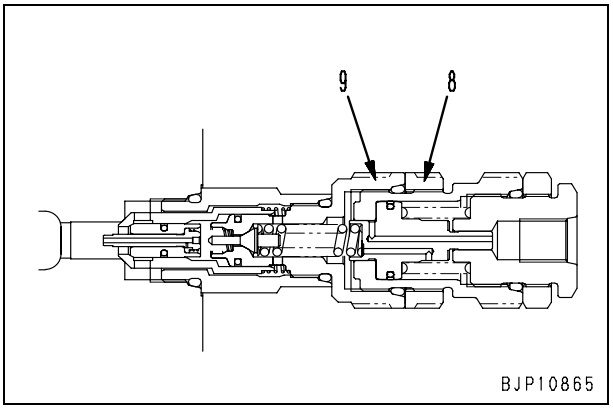
★ When the high-pressure relief pressure for the boom LOWER is not normal, adjust the high pressure side of the safety and suction valve (7) for the boom LOWER in the following procedure.

★ The the high-pressure relief pressure mode denotes the state in which the machine push-up switch is turned on, disabling to apply the pilot pressure to the switching port.



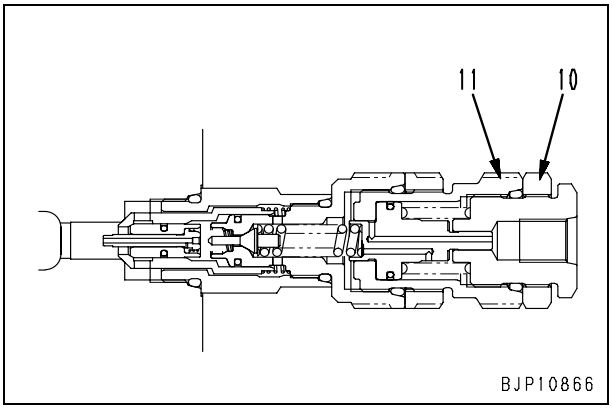
1) Disconnect the pilot hose.
2) Loosen locknut (8) and turn holder (9) to adjust the relief pressure.
   ★ Turning the holder clockwise increases the pressure. Turning it counterclockwise decreases the pressure.

★ Pressure adjustable from a single turn of the holder:
Approx. 21.8 MPa {Approx. 222 kg/cm^2}
Locknut: **93 – 123 Nm {9.5 – 12.5 kgm}**



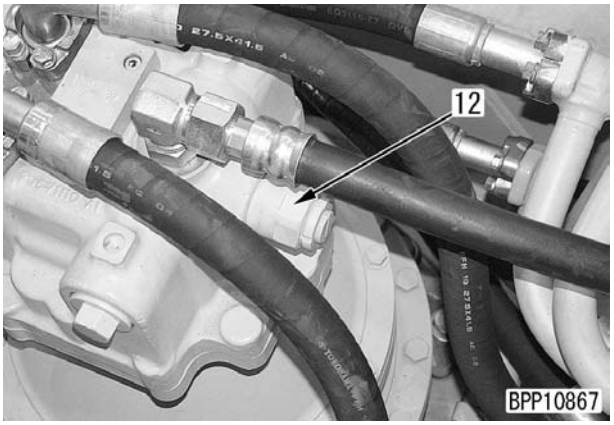
3) Check the pressure again after the adjustment, following the aforementioned steps for measurement.
★ Connect the pilot hose when measuring the oil pressure.

3. Adjustment of boom LOWER relief pressure (on the side where low pressure is set)
★ When low-pressure relief pressure of the boom LOWER is not normal or when adjustment is made of the high pressure setting side, adjust the low pressure side of the safety and suction valve for the boom LOWER in the following procedure.
★ The low-pressure relief pressure mode denotes the state in which the machine push-up switch is turned off, disabling to apply the pilot pressure to the switching port.
1) Disconnect the pilot hose.
2) Loosen locknut (10) and turn holder (11) to adjust the relief pressure.
★ Turning the holder clockwise increases the pressure. Turning it counterclockwise decreases the pressure.
★ Pressure adjustable from a single turn of the holder:
Approx. 21.8 MPa {Approx. 222 kg/cm^2}
Locknut:
78 – 93 Nm {8.0 – 9.5 kgm}

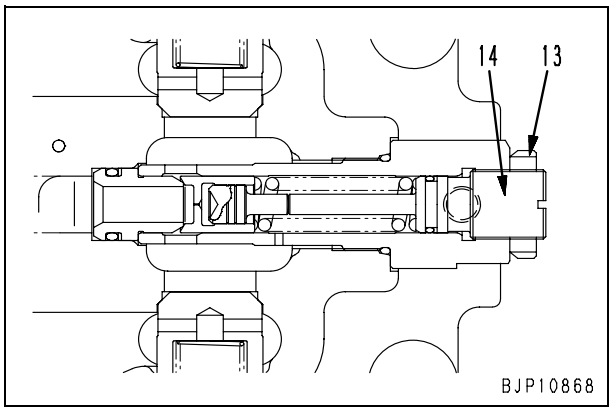


3) Check the pressure again after the adjustment, following the aforementioned steps for measurement.
★ Connect the pilot hose when measuring the oil pressure.

4. Adjustment of swing relief pressure
★ If the swing relief pressure is not normal, adjust the swing motor safety valve (12) in the following manner.



1) Loosen locknut (13) and turn adjustment screw (14) to adjust the relief pressure.
★ Turning the holder clockwise increases the pressure. Turning it counterclockwise decreases the pressure.
★ Quantity of adjustment per turn of adjusting screw:
Approx. 4.70 MPa {Approx. 47.9 kg/cm^2}
Locknut:
147 – 196 Nm {15 – 20 kgm}



2) Check the pressure again after the adjustment, following the aforementioned steps for measurement.

Testing and adjusting control circuit oil pressure

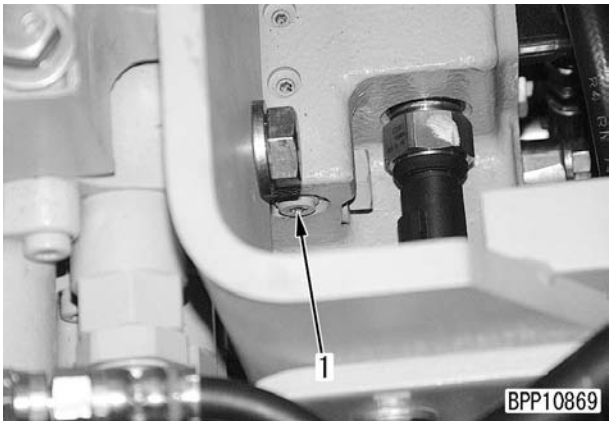
★ Control circuit oil pressure testing and adjusting tools

Symbol		Part No.	Part name
L	1	799-101-5002	Hydraulic tester
		790-261-1204	Digital hydraulic tester
	2	799-101-5220	Nipple (10 x 1.25 mm)
		07002-11023	O-ring

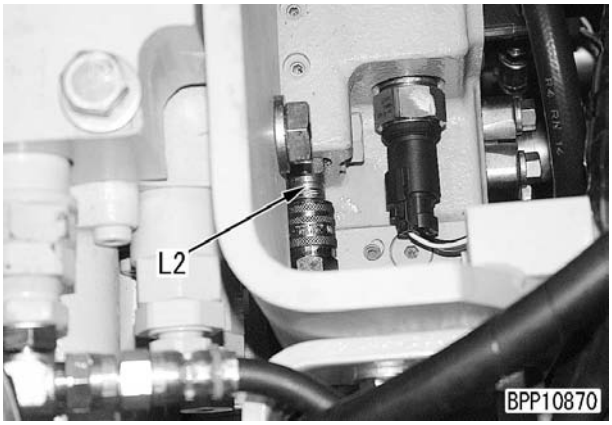
Measurement

⚠ **Lower the work equipment to the ground and, after stopping the engine, release residual pressure in the piping by operating the control lever several times. Then loosen the oil filler cap gradually to release pressure inside the tank.**

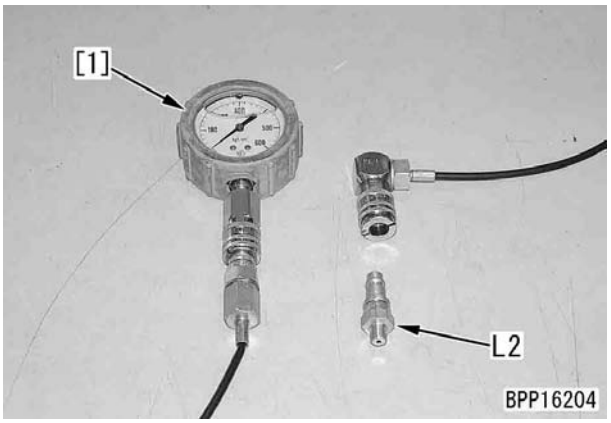
1. Remove oil pressure measurement plug (1).



2. Fit nipple **L2** and connect it to oil pressure gauge [1] of hydraulic tester **L1**.
   ★ Use the oil pressure gauge with capacity 6.0 MPa {60 kg/cm^2}.



3. Start the engine and keep it running until the hydraulic oil temperature rises to the operating range.
4. Measure hydraulic oil pressure, when the engine is running at high idle and all the control levers are moved to the NEUTRAL position.



5. Remove the measurement tool after the measurement, and make sure that the machine is back to normal condition.
   ★ It is not allowed to adjust the relief valve of the control circuit source pressure.

Testing and adjusting pump PC control circuit oil pressure

★ Pump PC control circuit oil pressure testing and adjusting tools

Symbol		Part No.	Part name
L	1	799-101-5002	Hydraulic tester
		790-261-1204	Digital hydraulic tester
	2	799-101-5220	Nipple (10 x 1.25 mm)
		07002-11023	O-ring

Measurement

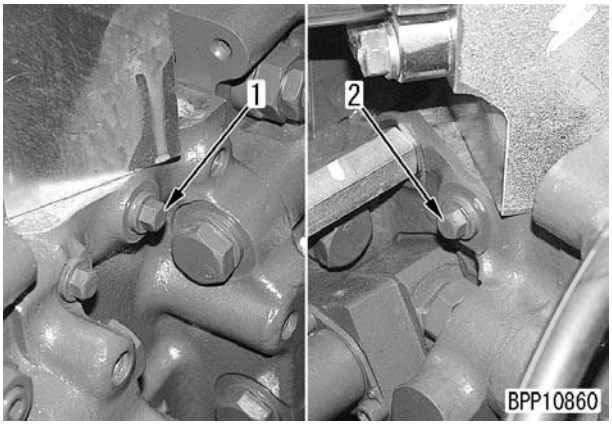
★ Measurement of the oil pressure in the pump PC control circuit shall be conducted after making sure that oil pressure of the work equipment, swing, and travel circuits as well as basic pressure of the control circuit is normal.

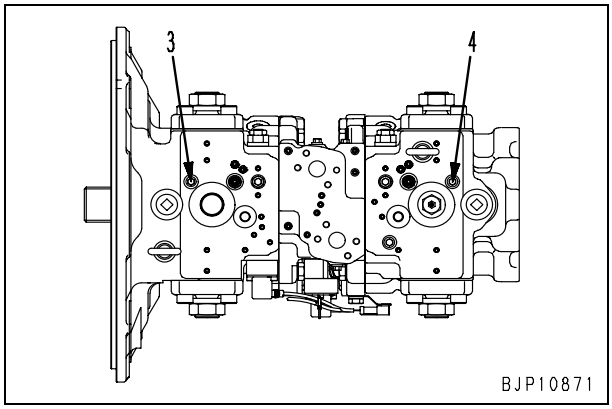
⚠ **Lower the work equipment to the ground and, after stopping the engine, release residual pressure in the piping by operating the control lever several times. Then loosen the oil filler cap gradually to release pressure inside the tank.**

1. Measurement of PC valve output pressure (servo piston inlet pressure)

★ PC valve output pressure (servo piston inlet pressure) is measured along with that of the pump discharge pressure and the result of the two is compared to each other.

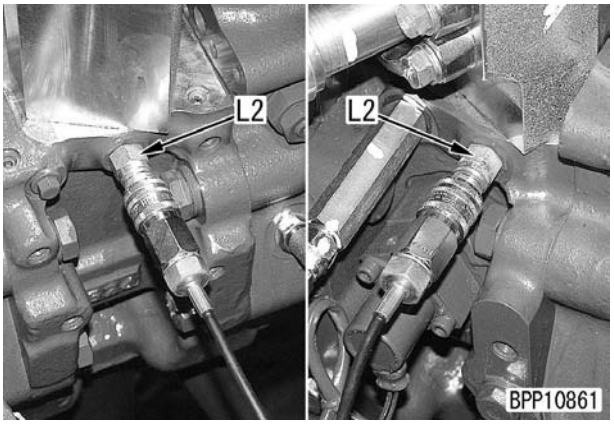
1) Remove oil pressure measurement plugs (1), (2), (3) and (4).
   - (1): For the front pump discharge pressure (situated in the rear side of the machine)
   - (2): For the rear pump discharge pressure (situated in the front side of the machine)
   - (3): For the front pump PC valve output pressure
   - (4): For the rear pump PC valve output pressure

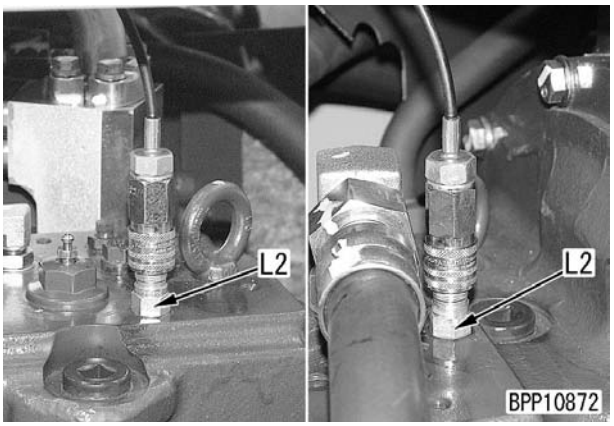




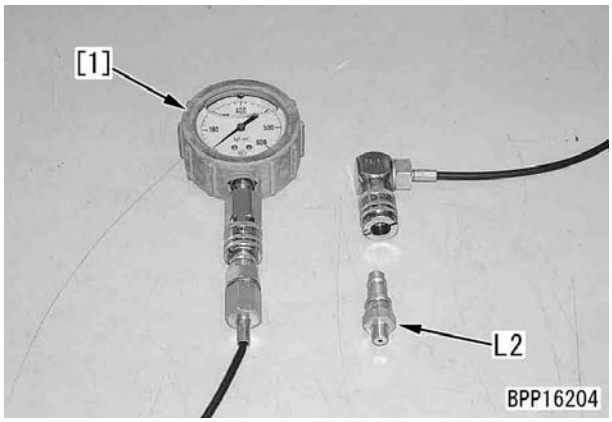
2) Fit nipple **L2** and connect it to oil pressure gauge [1] of hydraulic tester **L1**.

★ Use the oil pressure gauge with capacity 60 MPa {600 kg/cm^2}.





3) Start the engine and keep it running until the hydraulic oil temperature rises to the operating range.



4) Measure the pump discharge pressure and PC valve output pressure (pressure at servo piston inlet) at the same time after setting following conditions with the engine running at high idle.
   - Working mode: P-mode
   - Swing lock switch: ON
     (Turning 2-stage relief ON induces high-pressure relief)
   - Work equipment, swing and travel: Arm IN relief

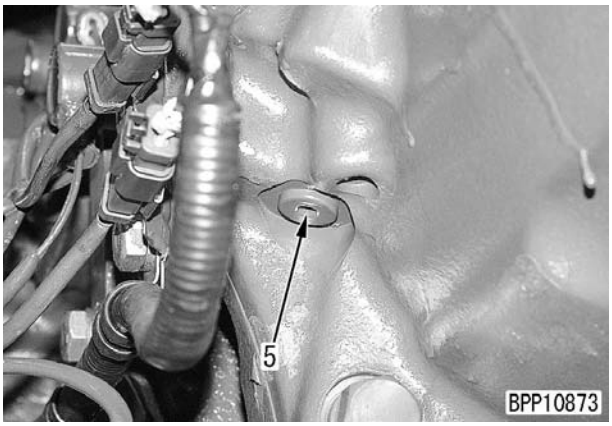
   ★ Judgement method: When the ratio between the pump discharge pressure and PC valve output pressure (servo piston input pressure) reaches the following values, both pressures are judged normal.

Measured oil pressure	Ratio between oil pressures
Pump discharge pressure	1
PC Valve output pressure	Approx. 3/5

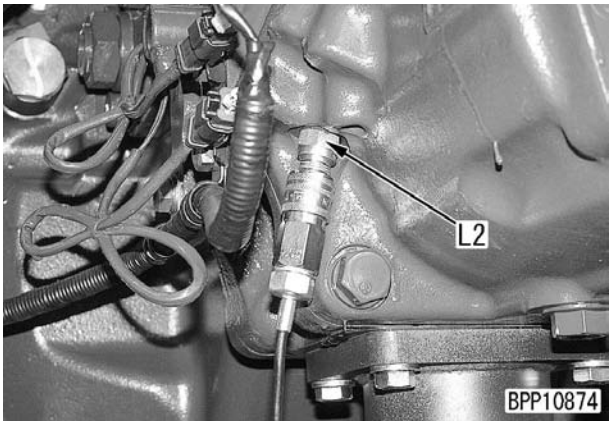
   ★ If there is any abnormality with PC valve or servo piston, the PC valve output pressure (servo piston input pressure) becomes identical with the pump discharge pressure or comes to neighborhood of 0 pressure.

2. Measurement of PC-EPC valve output pressure

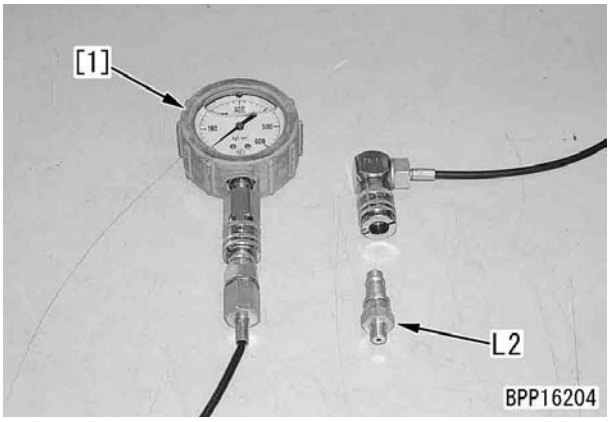
1) Remove oil pressure measurement plug (5).
   ★ The plug is installed in the front side of the machine.



2) Fit nipple **L2** and connect it to oil pressure gauge [1] of hydraulic tester **L1**.
   ★ Use the oil pressure gauge with capacity 6.0 MPa {60 kg/cm^2}.



3) Start the engine and keep it running until the hydraulic oil temperature rises to the operating range.

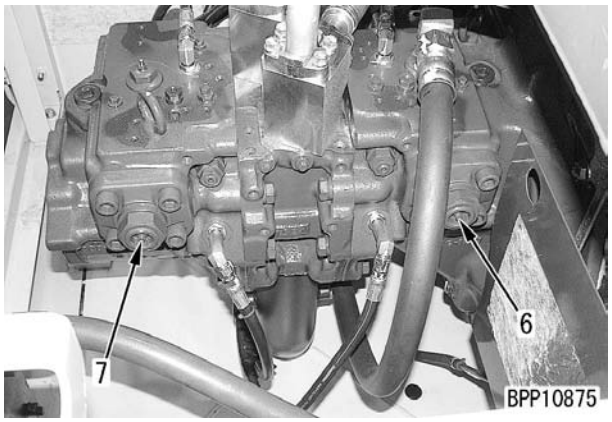


4) Measure the hydraulic oil pressure with all the control levers kept in the NEUTRAL position and the engine running at high idle and at low idle.
   ★ You can assume that the PC-EPC valve output pressure is normal when the following changes are observed.

Engine speed	Control lever	Hydraulic oil pressure
Low idle	Neutral	2.9 MPa {30 kg/cm^2}
High idle		0 MPa {0 kg/cm^2}

Adjustment

★ When a trouble on the PC valve is suspected because of the following phenomena, adjust PC valves (6) and (7) in the following manner.
- As workload increases, the engine rpm sharply drops.
- The engine rpm is normal but the work equipment speed is low.

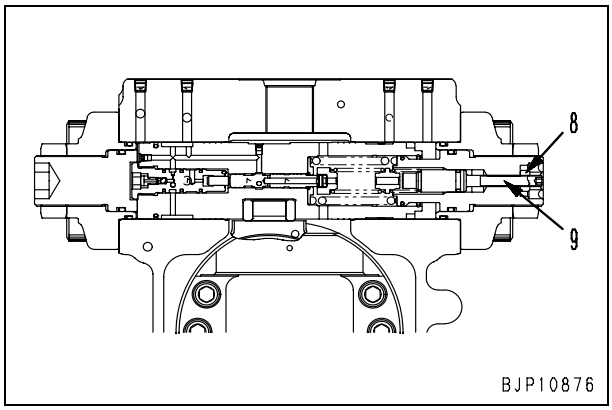


3. Loosen locknut (8) and turn holder (9) to adjust the pump absorption torque.
   ★ Turning the holder clockwise increases the pump absorption torque. Turning the holder counterclockwise decreases the pump absorption torque.
   ★ Following indicates the range of adjustment available from the adjusting screw.

   Counterclockwise: Within 1 turn

   Clockwise: Within 1/2 turn (Within 180°)

   Locknut: **27 – 34 Nm {2.8 – 3.5 kgm}**



4. After the adjustment, make sure that the PC valve output pressure (servo piston inlet pressure) is normal using the measurement steps explained earlier.

Testing and adjusting pump LS control circuit oil pressure

★ Pump LS control circuit oil pressure testing and adjusting tools

Symbol		Part No.	Part name
M	1	799-101-5002	Hydraulic tester
		790-261-1204	Digital hydraulic tester
	2	799-101-5220	Nipple (10 x 1.25 mm)
		07002-11023	O-ring
	3	799-401-1340	Differential pressure gauge

Measurement

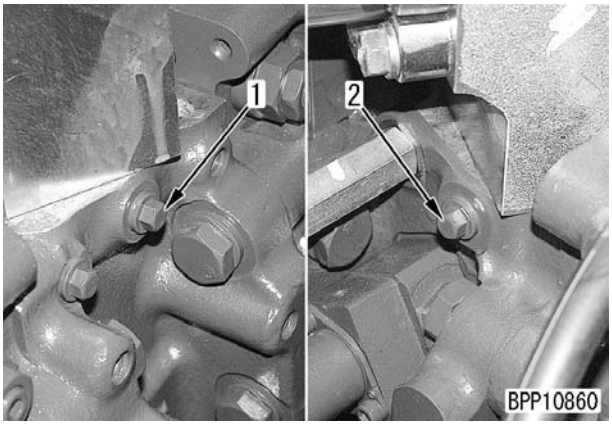
★ Measurement of the oil pressure in the pump LS control circuit shall be conducted after making sure that oil pressure of the work equipment, swing, and travel circuits as well as basic pressure of the control circuit is normal.

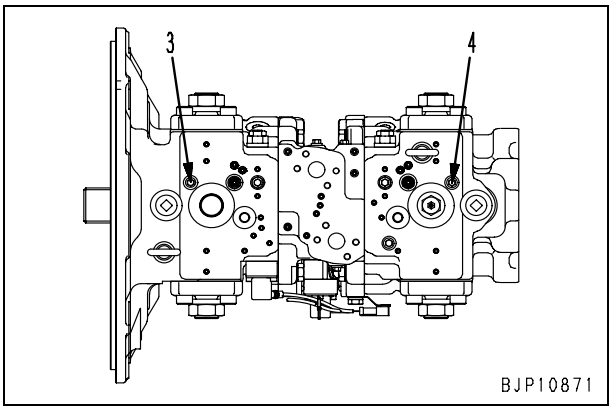
⚠ **Lower the work equipment to the ground and, after stopping the engine, release residual pressure in the piping by operating the control lever several times. Then loosen the oil filler cap gradually to release pressure inside the tank.**

1. Measurement of LS valve output pressure (servo piston inlet pressure)

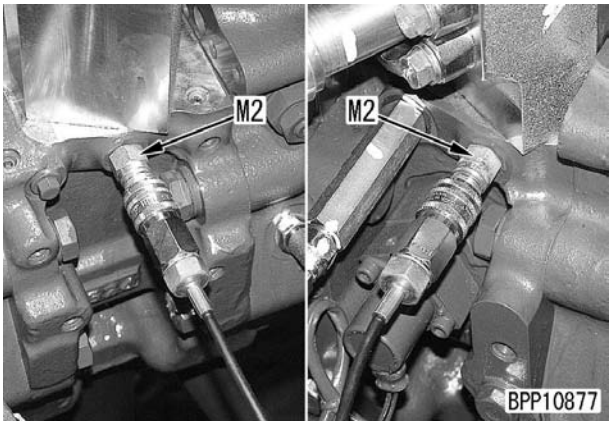
★ LS valve output pressure (servo piston inlet pressure) is measured along with that of the pump discharge pressure and the result of the two is compared to each other.

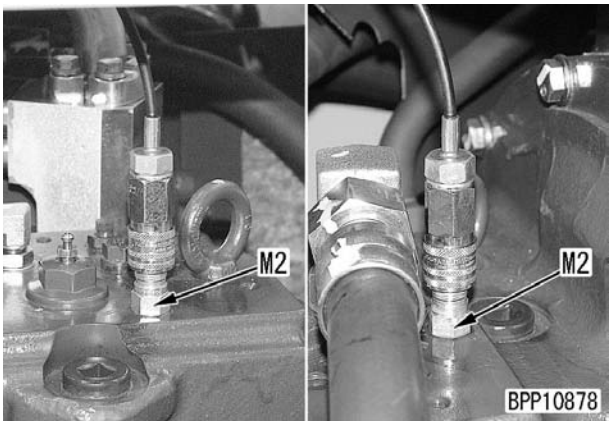
1) Remove oil pressure measurement plugs (1), (2), (3) and (4).
   - (1): For the front pump discharge pressure (situated in the rear side of the machine)
   - (2): For the rear pump discharge pressure (situated in the front side of the machine)
   - (3): For the front pump LS valve output pressure
   - (4): For the rear pump LS valve output pressure





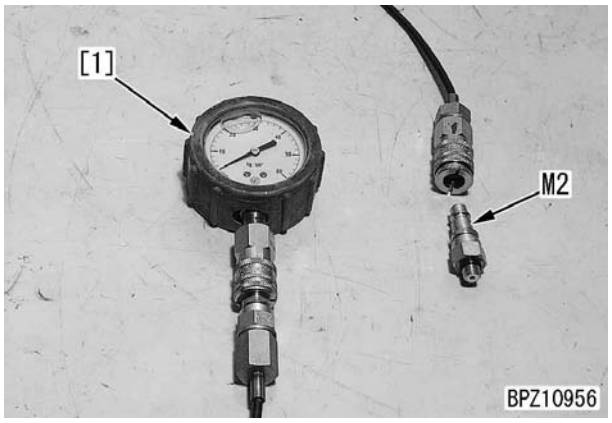
2) Fit nipple **M2** and connect it to oil pressure gauge [1] of hydraulic tester **L1**.
   ★ Use the oil pressure gauge with capacity 60 MPa {600 kg/cm^2}.





3) Start the engine and push up the track shoe on the measurement side using work equipment.
   - When measuring the front circuit: Left track shoe
   - When measuring the rear circuit: Right track shoe

   ⚠ **Provide a working area of sufficient space, as the raised track shoe will be idly rotated.**
4) Increase the hydraulic oil temperature to the operating range.



5) Measure the pump discharge pressure and LS valve output pressure (pressure at servo piston inlet) at the same time after setting following conditions with the engine running at high idle.

   - Working mode: P-mode
   - Work equipment, swing and travel: When all levers are at neutral and when travel lever is at half stroke (one side of travel is at idle)

   ★ Let the raised track shoe idly rotate, paying enough attention to the surroundings for safety.

   ★ Judgement method:
   When the ratio between the pump discharge pressure and LS valve output pressure (servo piston input pressure) reaches the following values, both pressures are judged normal.

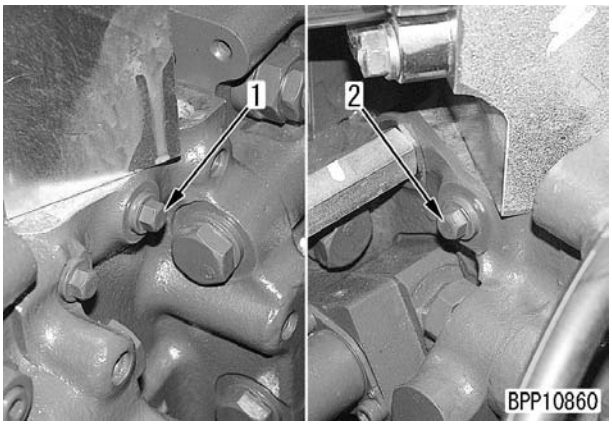
Measured oil pressure	Ratio between oil pressures	
	All at neutral	Travel lever at half stroke
Pump discharge pressure	Almost the same pressure	1
LS valve output pressure		Approx. 3/5

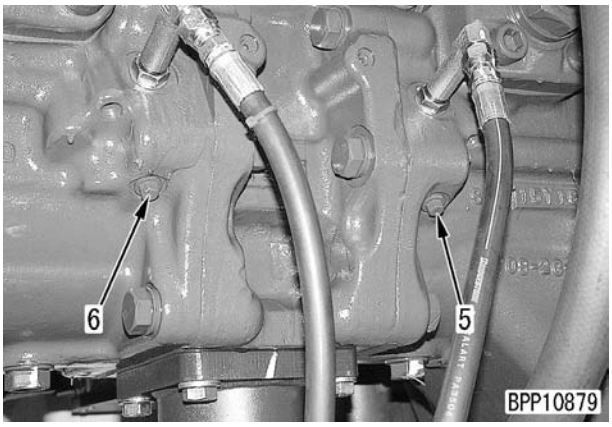
6) Remove the measurement tools after the measurement, and make sure that the machine is back to normal condition.

2. Measurement of LS differential pressure

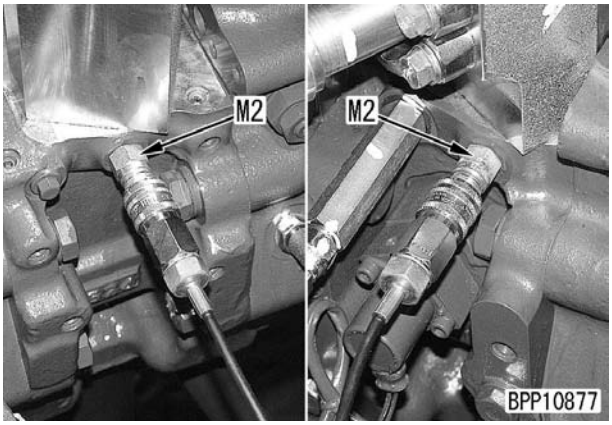
★ LS differential pressure can be obtained by measuring the pump discharge pressure and LS pressure (actuator load pressure) at the same time and computing the difference between the 2 pressures.

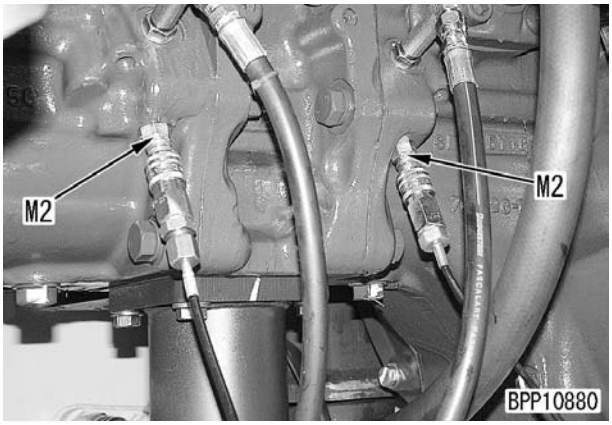
1) Remove oil pressure measurement plugs (1), (2), (5) and (6).
   - (1): For the front pump discharge pressure (situated in the rear side of the machine)
   - (2): For the rear pump discharge pressure (situated in the front side of the machine)
   - (5): For the front pump LS pressure (situated in the rear side of the machine)
   - (6): For the rear pump LS pressure (situated in the rear side of the machine)





2) Fit nipple **M2** and connect it to oil pressure gauge [1] or differential pressure gauge **M3** of hydraulic tester **M1**.
   ★ When using a differential pressure gauge:
   Connect pump discharge pressure to the high pressure side and LS pressure to the low pressure side. A differential pressure gauge requires DC 12V power. Connect it with 1 battery.
   ★ When using an oil pressure gauge:
   Use the oil pressure gauge with capacity 60 MPa {600 kg/cm^2}. The max. differential pressure is no more than approx. 3.9 MPa {40 kg/cm^2}. So the same gauge may be used throughout the measurement.

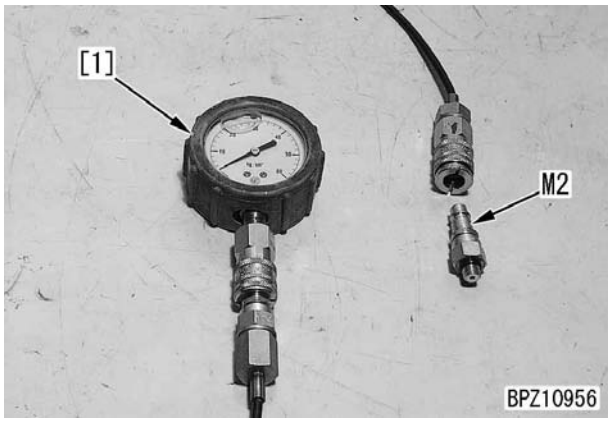




3) Start the engine and push up the track shoe on the measurement side using work equipment.
   - When measuring the front circuit: Left track shoe
   - When measuring the rear circuit: Right track shoe

   ⚠ **Provide a working area of sufficient space, as the raised track shoe will be idly rotated.**

4) Increase the hydraulic oil temperature to the operating range.



5) Measure the pump discharge pressure and LS pressure (actuator load pressure) at the same time after setting the following conditions with the engine running at high idle.
   - Working mode: P-mode
   - Travel speed: Hi
   - Work equipment, swing and travel: When all levers are at neutral and when travel lever is at half stroke (one side of travel is at idle)

   ★ Let the raised track shoe idly rotate, paying enough attention to the surroundings for safety.

   ★ Calculation of LS differential pressure: LS differential pressure = Pump discharge pressure – LS pressure

   ★ If LS differential pressure is in the following conditions, it is judged normal.

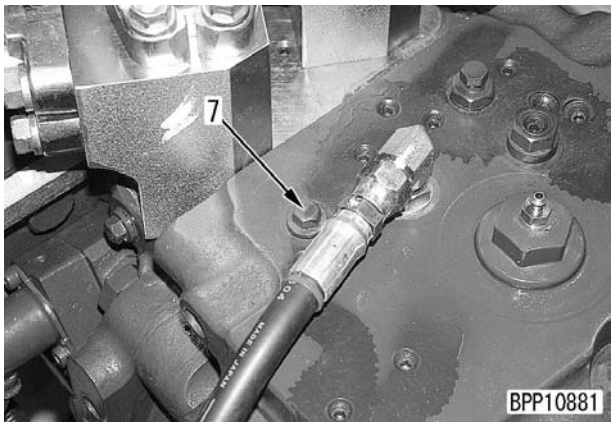
Lever operation	LS differential pressure
When all levers are set to neutral	Unload pressure (Refer to the standard value table)
Travel lever set at half stroke	Maximum LS differential pressure (Refer to the standard value table)

6) Remove the measurement tools after the measurement, and make sure that the machine is back to normal condition.

3. Measurement of LS-EPC valve output pressure

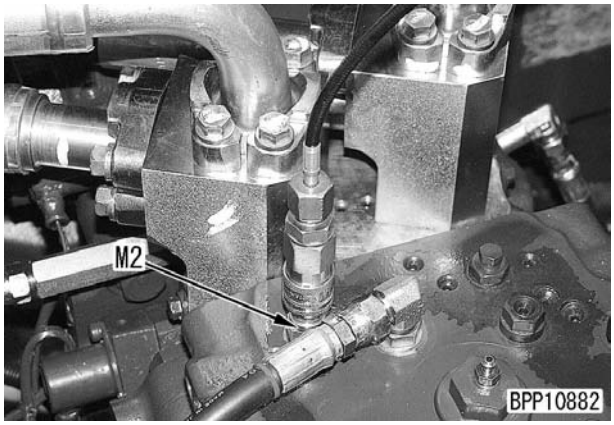
1) Remove oil pressure measurement plug (7).

   ★ The plug is installed on the rear pump.



2) Fit nipple **M2** and connect it to oil pressure gauge [1] of hydraulic tester **M1**.

   ★ Use the oil pressure gauge with capacity 6.0 MPa {60 kg/cm^2}.



3) Start the engine and keep it running until the hydraulic oil temperature rises to the operating range.

4) Measure the oil pressure when the engine is running at high idle and the travel speed switch and travel control lever are operated.
   ★ If LS-EPC valve output pressure changes to the following values, the pressure is normal.

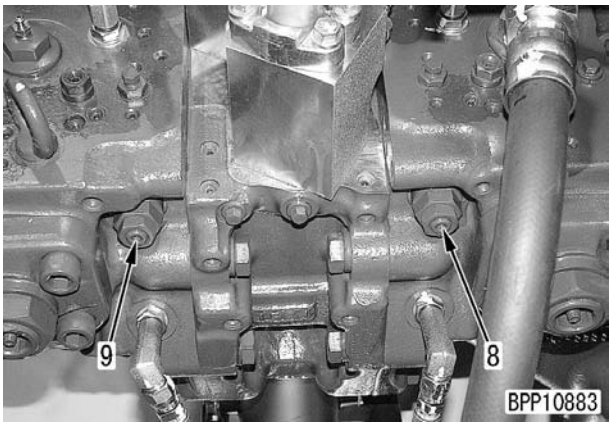
Travel speed	Travel control lever	Oil pressure
Lo	Neutral	Approx. 1.4 MPa {approx. 14 kg/cm^2}
Hi	Fine operation (Note)	0 MPa {0 kg/cm^2}

   Note: Operate the travel control lever slightly to the extent that the PPC oil pressure switch is turned ON (Stop the operation short of starting the machine).

5) Remove the measurement tool after the measurement, and make sure that the machine is back to normal condition.

Adjustment

★ When the LS differential pressure is not normal, adjust LS valves (8) and (9) in the following procedure.

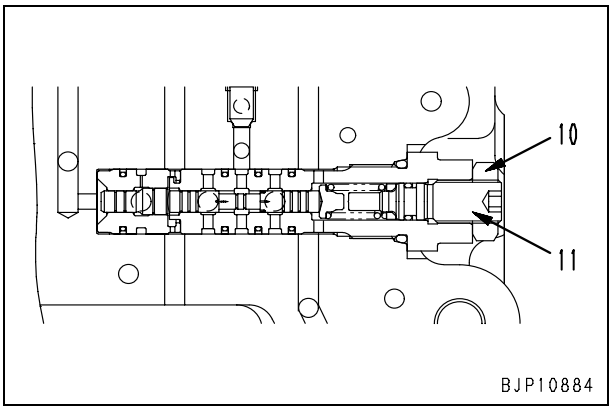


1. Loosen locknut (10) and turn adjustment screw (11) to adjust the differential pressure.
   ★ Adjustment screw
   - Turned to the right, the differential pressure is increased.
   - Turned to the left, the differential pressure is decreased.

   ★ Quantity of adjustment per turn of adjusting screw:

   Quantity of pressure adjustment (LS differential pressure) 1.3 MPa {13.3 kg/cm^2}

   Lock nut: **49 – 64 Nm {5 – 7 kgm}**



2. After the adjustment, confirm that LS differential pressure is normal, following the steps for measurement explained earlier.

Measuring solenoid valve output pressure

★ Solenoid valve output pressure measurement tools

Symbol		Part No.	Part name
N	1	799-101-5002	Hydraulic tester
		790-261-1204	Digital hydraulic tester
	2	799-401-3100	Nipple (02 size)
		02896-11008	O-ring
	3	799-401-3200	Nipple (03 size)
		02896-11009	O-ring

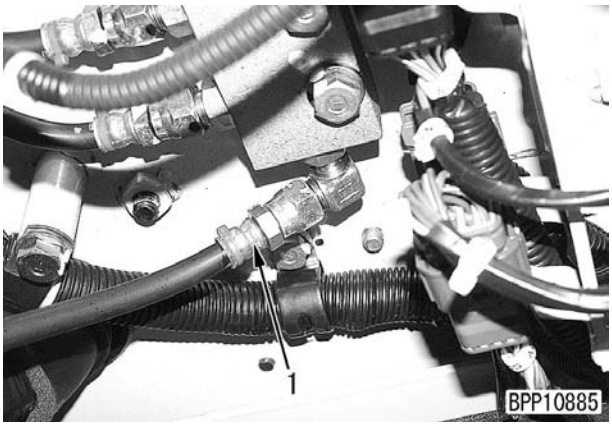
★ Measure the solenoid valve output pressure after confirming that the control circuit source pressure is normal.

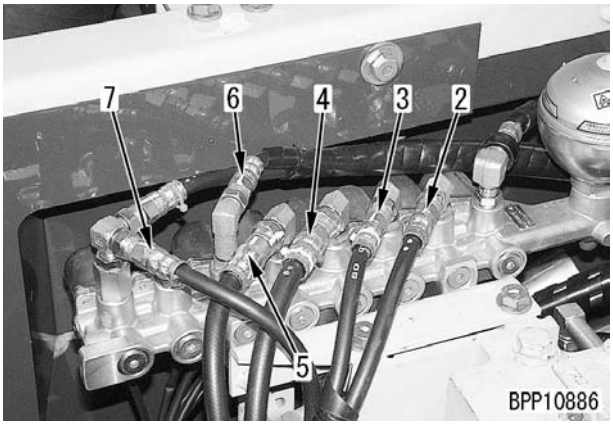
⚠ **Lower the work equipment to the ground and, after stopping the engine, release residual pressure in the piping by operating the control lever several times. Then loosen the oil filler cap gradually to release pressure inside the tank.**

1. Disconnect the hoses of solenoid valve to be measured at the outlet side.

No.	Target solenoid valves of measurement
1	PPC lock solenoid valve
2	Travel junction solenoid valve
3	Merge-divider solenoid valve
4	Travel speed switching solenoid valve
5	Swing holding brake solenoid valve
6	Machine push up solenoid valve
7	2-stage relief solenoid valve

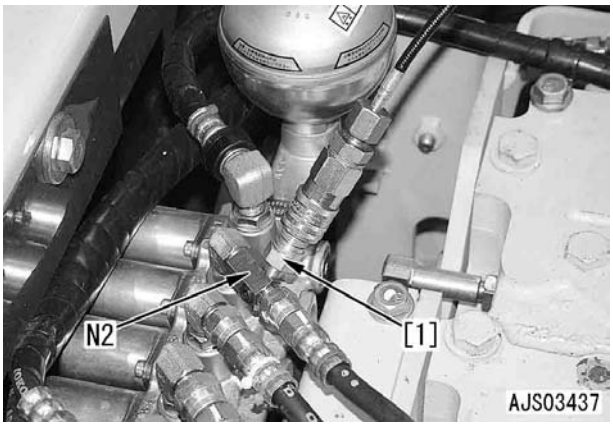
★ Hose (1) is installed in the back side of operator's cab, and hoses (2) through (7) are installed at the center of revolving frame.



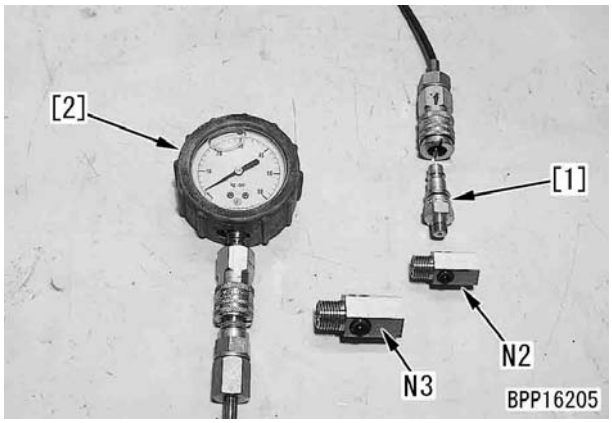


2. Fit adapter **N2** or **N3** and then connect hose currently disconnected.

3. Fit nipple [1] of hydraulic tester **N1** and then connect it to oil pressure gauge [2].
★ Use the oil pressure gauge with capacity 6.0 MPa {60 kg/cm^2}.



4. Start the engine and keep it running until the hydraulic oil temperature rises to the operating range.



5. Run the engine at full throttle, then turn each solenoid valve ON or OFF by operating the control levers and switches, and measure the pressure.
   - ★ For conditions for turning each solenoid valve ON or OFF, refer to the ensuing “Table for functioning conditions” for each solenoid valve.
   - ★ You can check operation of the solenoid valves from the monitoring function of the monitor panel (Special Function of Machine Monitor).
   - ★ When each output pressure shows the following values, it is judged normal.

Solenoid valve	Output pressure
OFF (De-energized)	0 MPa {0 kg/cm^2}
ON (Energized)	3 MPa {30 kg/cm^2}

6. Remove the measurement tools after the measurement, and make sure that the machine is back to normal condition.

Table for functioning conditions – PPC lock solenoid valve

Functioning conditions		Function
Lock lever	Lock	OFF
	Released	ON

Table for functioning conditions – Machine push up solenoid valve

Operating condition		Operation
Machine push-up switch	ON	ON
	OFF	OFF

Table for functioning conditions – Swing holding brake solenoid valve

Functioning conditions		Function
Signal of work equipment, swing and travel	When all signals are turned OFF	OFF
	When one of the signals is turned ON	ON

Table for functioning conditions – Travel junction solenoid valve

Functioning conditions			Function
When the travel steering signal is ON			ON
When the travel steering signal is OFF	When travel steering independently operated	When F or R pump pressure is 34.3 MPa {350 kg/cm^2}	
	Any other condition than above		OFF

Table for functioning conditions – Travel speed shifting solenoid valve

Functioning conditions			Function
When the overheat 2nd setting is ON			OFF
When the fuel dial is at 1,200 rpm or lower			
When the travel speed switch is at Lo			
When the travel speed switch is at Mi or Hi	When signal of the travel is OFF		
	When signal of the travel is ON	When F or R pump pressure is 32.3 MPa {330 kg/cm^2}	
		When F or R pump pressure is 18.6 MPa {190 kg/cm^2}	ON
Any other condition than above			

Table for functioning conditions – 2-stage relief solenoid valve

Operating condition			Operation
Overheat 1st setting is ON			OFF
All of work equipment, swing, and travel signals are OFF			
Swing lock switch is ON			ON
Travel signal is ON			
L mode is selected			
Boom LOWER signal is ON			
P or E mode is selected	Left knob switch is ON	Signals other than swing independent signal are ON	
		Swing independent signal is ON	OFF
Other than above conditions			

Table for functioning conditions – Merge-divider solenoid valve

<table>
<tr><th colspan="4">Functioning conditions</th><th>Function</th></tr>
<tr><td>When B mode is turned on</td><td colspan="3">When the service signal is ON</td><td rowspan="3">ON</td></tr>
<tr><td colspan="4">When independent signal of the travel is ON</td></tr>
<tr><td rowspan="4">When signal of the travel is OFF</td><td rowspan="4">When signals of the work equipment and swing are ON</td><td rowspan="2">When any mode other than L mode is turned on</td><td>When F or R pump pressure is 19.6 MPa {200 kg/cm^2} or above</td></tr>
<tr><td>When F or R pump pressure is 14.7 MPa {150 kg/cm^2} or lower</td><td>OFF</td></tr>
<tr><td rowspan="2">L mode</td><td>When F or R pump pressure is 16.7 MPa {170 kg/cm^2} or above</td><td>ON</td></tr>
<tr><td>When F or R pump pressure is 11.8 MPa {120 kg/cm^2} or lower</td><td rowspan="2">OFF</td></tr>
<tr><td colspan="4">Any other condition than above</td></tr>
</table>

Measuring PPC valve output pressure

★ PPC valve output pressure measurement tools

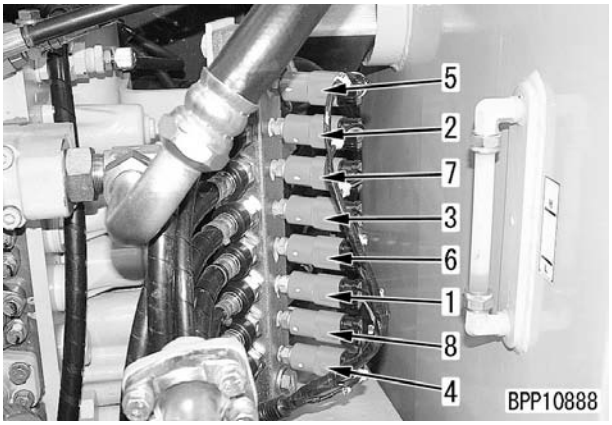
Symbol		Part No.	Part name
P	1	799-101-5002	Hydraulic tester
		790-261-1204	Digital hydraulic tester

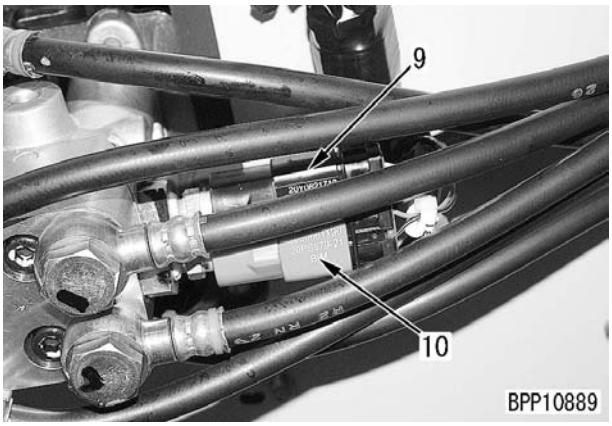
★ Measure PPC valve output pressure after confirming that control circuit original pressure is normal.

1. Remove PPC hydraulic switches (1) to (10) of the target circuit of measurement.

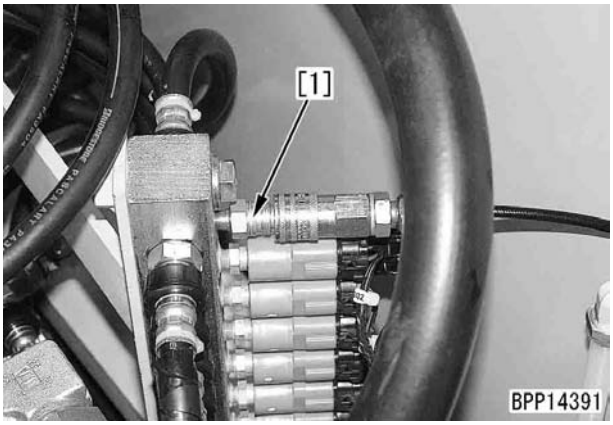
No.	Circuit to be measured	No.	Circuit to be measured
1	Boom RAISE	6	Bucket DUMP
2	Boom LOWER	7	Swing left
3	Arm IN	8	Swing right
4	Arm OUT	9	Travel (black)
5	Bucket CURL	10	Steering (red)

★ (1) through (8) are installed in the PPC relay block, and (9) and (10) are installed in the back side of operator cab.

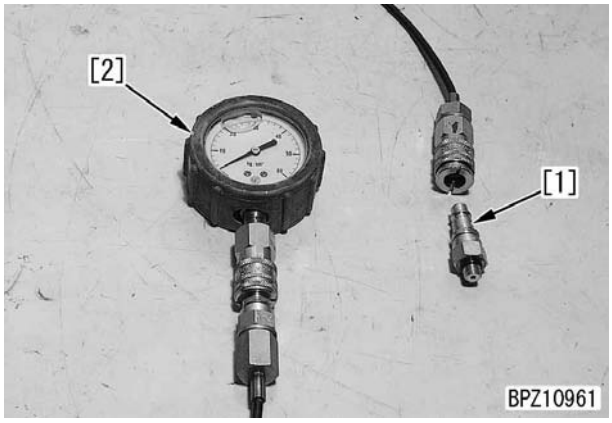




2. Fit nipple [1] of the hydraulic tester **P** and then connect it to oil pressure gauge [2].
★ Use the oil pressure gauge with capacity 6.0 MPa {60 kg/cm^2}.



3. Start the engine and keep it running until the hydraulic oil temperature rises to the operating range.



4. Measure the pressure when the engine is running at high idle and the control lever of the circuit to be measured is kept in the NEUTRAL position and at the full stroke.
★ If PPC valve output pressure is at the level shown below, it is judged normal.

Lever operation	Hydraulic oil pressure
When set to NEUTRAL	0 MPa {0 kg/cm^2}
At full stroke	Almost the same with the control circuit source pressure (refer to the standard value table)

5. Remove the measurement tools after the measurement, and make sure that the machine is back to normal condition.

Adjusting play of work equipment and swing PPC valves

★ If there is excessive play in the work equipment or swing lever, adjust it in the following manner.

1. Remove work the equipment and swing PPC valve assembly.

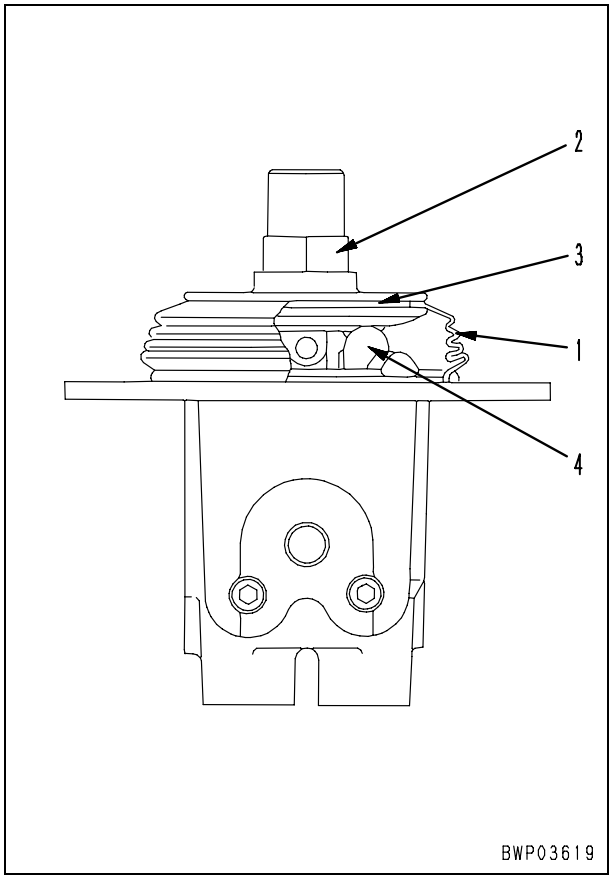
2. Remove boot (1).

3. Loosen locknut (2) and screw in disc (3) until it contacts the heads of 4 pistons (4).
   ★ Do not move the piston while doing this work.

4. Keep disc (3) in place and tighten locknut (2) to the specified tightening torque.
   Locknut: **98 – 127 Nm {10 – 13 kgm}**

5. Install boot (1).

6. Install the work equipment and swing PPC valve assembly.

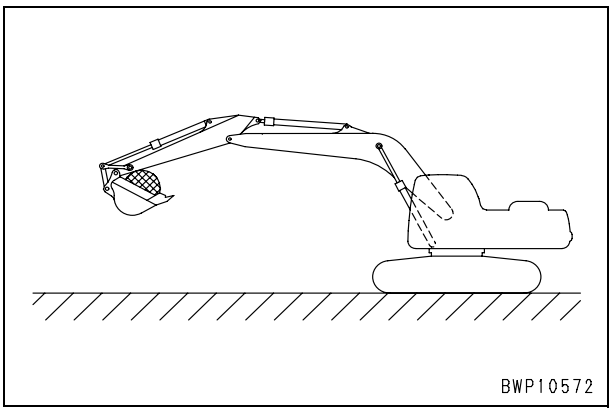


Inspecting locations of hydraulic drift of work equipment

★ If hydraulic drift occurred on the work equipment (cylinder), check to see if the cause is on the cylinder packing side or control valve side according to the following procedure.

1. Inspection of boom and bucket cylinders

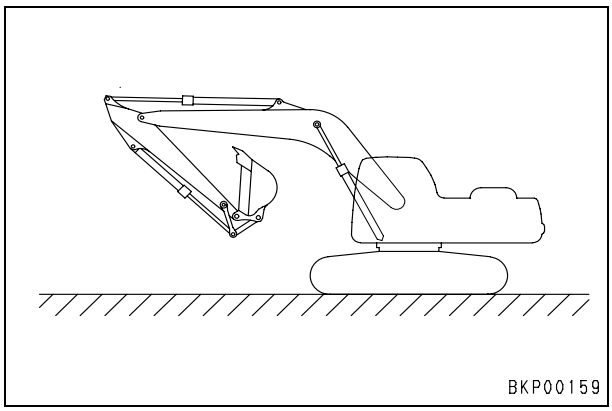
1) Set the work equipment in the same posture as when measuring hydraulic drift, and stop the engine.
   ★ Fill the bucket with earth or apply the rated load to the bucket.



2) When inspecting the boom cylinder, shift the boom control lever to RAISE side and when inspecting the bucket cylinder, shift the bucket control lever to CURL side.
   If, as the result, drifting speed increases, failure on the cylinder packing should be suspected.
   If the speed remains unchanged, failure on the control valve should be suspected.
   ★ Operate the control lever with the engine starting switch in the ON position.
   ★ If pressure in the accumulator has dropped, run the engine for approx. 10 seconds to charge the accumulator again.

2. Inspection of arm cylinder

1) Operate the arm cylinder to move the arm to the position 100 mm before the digging stroke end, and stop the engine.



2) Shift the arm control lever to IN side.
   If, as the result, drifting speed increases, failure on the cylinder packing should be suspected.
   If the speed remains unchanged, failure on the control valve should be suspected.
   ★ Operate the control lever with the engine starting switch in the ON position.
   ★ If pressure in the accumulator has dropped, run the engine for approx. 10 seconds to charge the accumulator again.

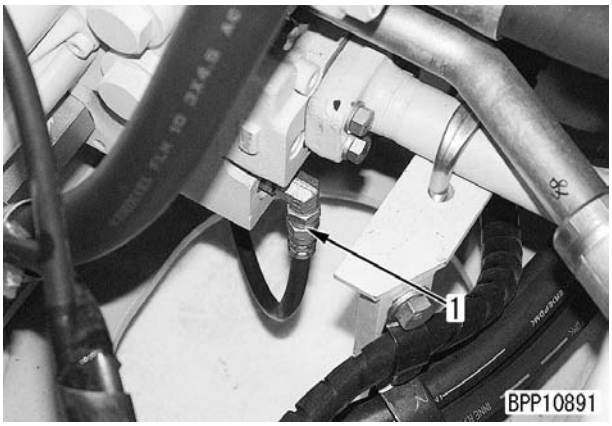
[Reference] When the cause of the hydraulic drift is in the defective packing, following explains why such occurred.

1) If the work equipment is set to the above posture (holding pressure applied to the bottom end), the oil at the bottom end leaks to the head end. However, the volume at the head end is small than the volume at the bottom end by the volume of the rod end, so the internal pressure at the head end increases because of the oil flowing in from the bottom end.

2) If the internal pressure of the head end increases, the pressure at the bottom end also rises in proportion to this and balanced at certain level (this level depends on the volume of leakage). As the pressure is balanced, the drifting speed is decreased.
3) If the lever is then operated according to the procedure given above, the circuit at the head end is opened to the drain circuit (the bottom end is closed by the check valve), so the oil at the head end flows to the drain circuit and the downward movement becomes faster.

3. Inspection of boom lock valve

1) Set the work equipment at the maximum reach and the boom top horizontal. Then stop the engine.
   ⚠ **Lock the work equipment control levers and release the pressure inside the hydraulic tank.**
   ⚠ **Do not allow anyone to come under the work equipment during the work.**
2) Disconnect drain hose (1) of the control valve, and install an oil stopper plug in the hose.
   - Oil stopper plug: 07376-70210
   ★ Leave the control valve end open.
   ★ If oil leaks out the opened port accompanying hydraulic drift of the work equipment, failure on the boom lock valve should be suspected (loose contact).



4. Inspection of PPC valve

Measure the amount of hydraulic drift of the work equipment when the accumulator is charged with pressure and the lock lever is put to the LOCK and FREE positions.
★ Operate the control lever with the engine starting switch in the ON position.
★ If pressure in the accumulator has dropped, run the engine for approx. 10 seconds to charge the accumulator again.
★ If the lock and free position cause any difference in the hydraulic drift volume, the PPC valve is defective (internal failure).

Releasing remaining pressure in hydraulic circuit

⚠ **When disconnecting the piping routed from the hydraulic cylinder and the hydraulic motor to the control valve, release the residual pressure in the circuit according to the following procedure.**

★ The swing motor circuit and travel motor circuit are free from residual pressure. However, since these circuits are affected by the pressure inside the hydraulic tank, the operation up to opening of the hydraulic tank cap must be implemented.

1. Stop the engine and then gradually loosen the oil filler cap of the hydraulic tank to release the pressure in the tank.

2. Turn the engine starting switch to the ON position and operate the control levers several times.
   - ★ Power must be conducted to PPC lock valve, thus the starting switch must be set to ON position prior to the lever operation.
   - ★ When the levers are operated 2 – 3 times, the pressure stored in the accumulator is removed.

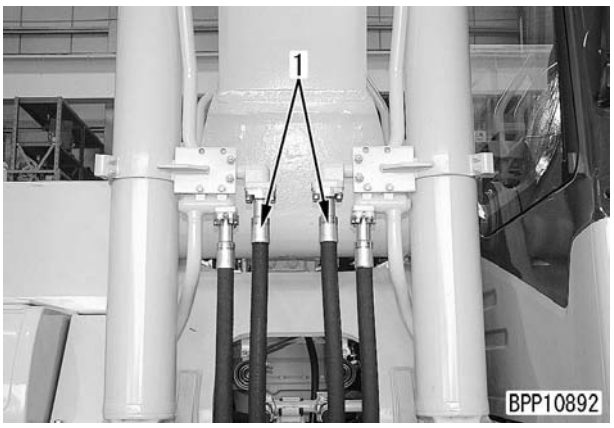
3. Start the engine, run at low idle for approx. 10 seconds to accumulate pressure in the accumulator, then stop the engine.

4. Repeat the steps in Item 2 to 3 above several times.

Measuring oil leakage amount

1. Measurement of oil leakage amount from boom cylinder

1) Start the engine and keep it running until the hydraulic oil temperature rises to the operating range. Then extend the boom cylinder to the stroke end.
   ⚠ **Release the pressure remaining in the piping referring to "Releasing remaining pressure in hydraulic circuit".**
2) Disconnect hose (1) on the cylinder head end and block the hose end with a plate.
   ⚠ **Be careful not to disconnect the hose at the cylinder bottom end.**
3) Run the engine at high idle and relieve the boom circuit by raising the boom.
4) Continue this condition for 30 seconds, then measure the oil leakage amount for 1 minute.

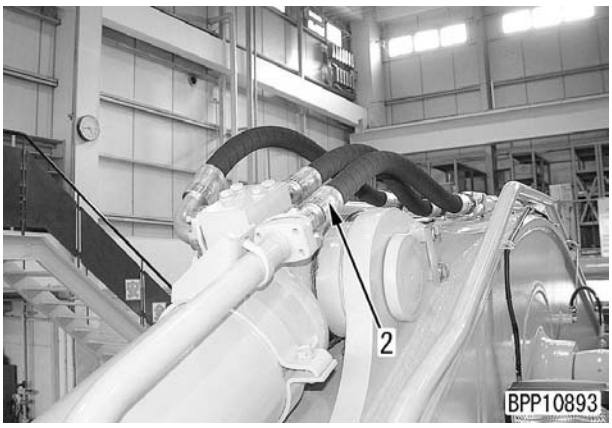


5) Remove the measurement tools after the measurement, and make sure that the machine is back to normal condition.

2. Measurement of oil leakage amount from arm cylinder

1) Start the engine and keep it running until the hydraulic oil temperature rises to the operating range. Then extend the arm cylinder to the IN stroke end.
   ⚠ **Release the pressure remaining in the piping referring to "Releasing remaining pressure in hydraulic circuit".**
2) Disconnect hose (2) on the cylinder head end and block the hose end with a plate.
   ⚠ **Be careful not to disconnect the hose at the cylinder bottom end.**
3) Run the engine at high idle and relieve the arm circuit by moving the arm IN.

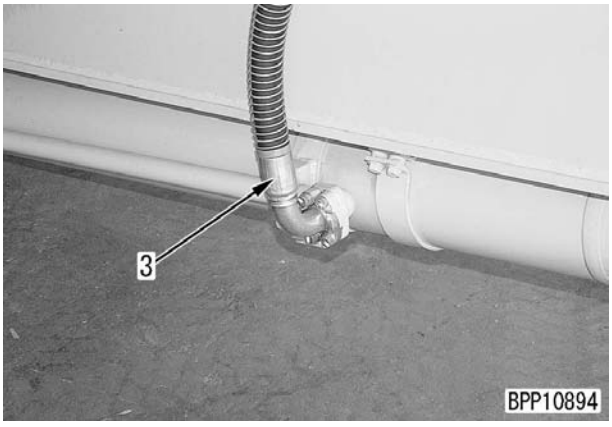
4) Continue this condition for 30 seconds, then measure the oil leakage amount for 1 minute.



5) Remove the measurement tools after the measurement, and make sure that the machine is back to normal condition.

3. Measurement of oil leakage amount from bucket cylinder

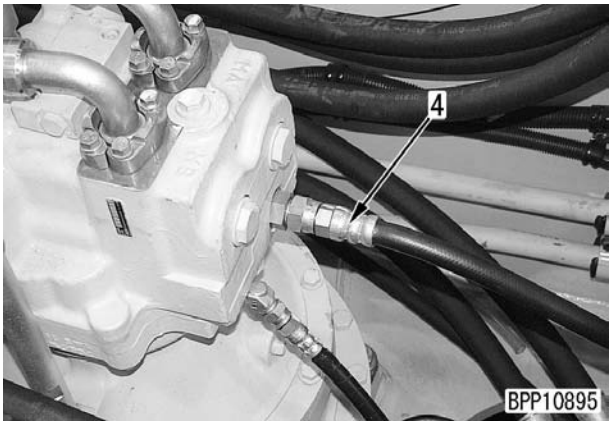
1) Start the engine and keep it running until the hydraulic oil temperature rises to the operating range. Then extend the bucket cylinder to the CURL stroke end.
   ⚠ **Release the pressure remaining in the piping referring to "Releasing remaining pressure in hydraulic circuit".**
2) Disconnect hose (3) on the cylinder head end and block the hose end with a plate.
   ⚠ **Be careful not to disconnect the hose at the cylinder bottom end.**
3) Run the engine at high idle and relieve the bucket circuit by moving the bucket CURL.
4) Continue this condition for 30 seconds, then measure the oil leakage amount for 1 minute.



5) After the measurement, make sure that the machine is back to normal condition.

4. Measurement of oil leakage amount from swing motor

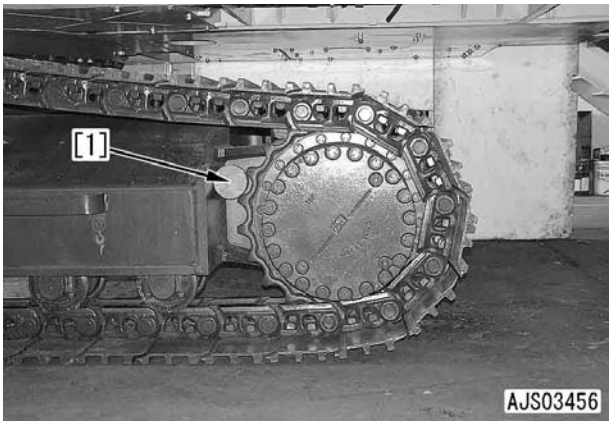
1) Disconnect drain hoses (4) and install the oil stopper plug in the hoses.
2) Turn the swing lock switch to the ON position.
3) Run the engine at high idle, relieve the swing circuit, and measure the oil leakage.
   ★ Start measuring the oil leakage 30 seconds after relieving is started and measure for 1 minute.
   ★ After measurement 1 time, swinging 180°, and then measure again.



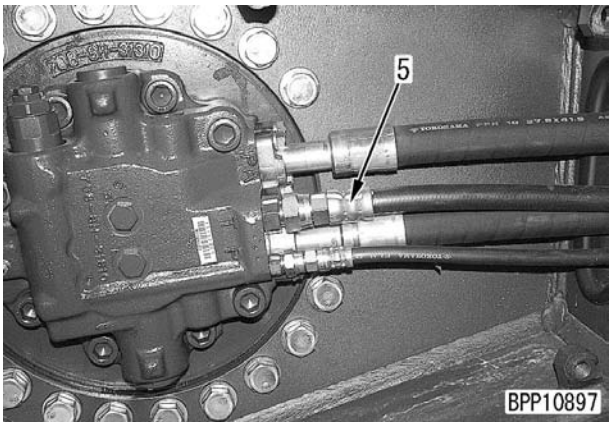
4) After the measurement, make sure that the machine is back to normal condition.

5. Measurement of oil leakage amount from travel motor

1) Take off the travel motor cover.
2) Start the engine, and lock the travel.
   ⚠ **Insert pin [1] between the sprocket and the track frame to positively lock the travel circuit.**



3) Disconnect drain hose (5) of the travel motor and fit an oil stopper plug in the hose end.
4) Run the engine at high idle, relieve the travel circuit, and measure the oil leakage.
   ⚠ **Wrong operation of the lever can cause an accident. Accordingly, make signs and checks securely.**
   ★ Start measuring the oil leakage 30 seconds after relieving is started and measure for 1 minute.
   ★ Measure several times, moving the motor a little (changing the position of the valve plate and cylinder and that of the cylinder and piston) each time.



5) After the measurement, make sure that the machine is back to normal condition.

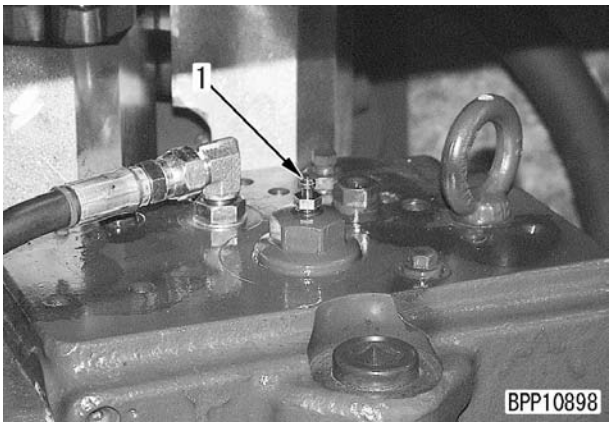
Bleeding air from various parts

Air bleeding items / Contents of work	Air bleeding procedure					
	1	2	3	4	5	6
	Bleeding air from hydraulic pump	Starting engine	Bleeding air from cylinder	Bleeding air from swing motor	Bleeding air from travel motor	Operation
• Replacement of hydraulic oil • Cleaning of strainer	●	●	●	● (See note)	● (See note)	●
• Replacement of return filter element		●	→	→	→	●
• Replacement and repair of hydraulic pump • Removal of suction piping	●	●	●	→	→	●
• Replacement and repair of control valve		●	●	→	→	●
• Replacement of cylinder • Removal of cylinder piping		●	●	→	→	●
• Replacement of swing motor • Removal of swing motor pipe		●	→	●	→	●
• Replacement of travel motor and swivel • Removal of travel motor and swivel piping		●	→	→	●	●

Note: Bleed air from the swing motor and travel motor only when oil in the casing is drained.

1. Bleeding air from hydraulic pump

1) Loosen air bleeder (1) and check that oil oozes out through the air bleeder.
2) If the oil seepage is confirmed, tighten air bleeder (1).
   Air bleeder:
   7.8 – 9.8 Nm {0.8 – 1.0 kgm}
   ★ Precautions on starting engine:
   When starting the engine after above operations, be sure to run the engine at low idle for 10 minutes. If the engine coolant temperature is low and an automatic engine warming-up function is relied on, use the fuel dial, when it becomes necessary to cancel it.



2. Bleeding air from hydraulic cylinder

1) Start the engine and keep running at low idle for 5 minutes.
2) Raise and lower the boom 4 to 5 times with the engine running at low idle.
   ★ Stop the piston approximately 100 mm in front of the stroke end so that it may not be relieved.
3) While running the engine at high idle, perform step 2).
4) Set the piston rod to the stroke end at low idle and allow it to relieve.
5) For bleeding air from the arm cylinder and bucket cylinder, follow the same steps explained in Item 2) through 4) above.
   ★ In case a cylinder is replaced with new one, it is advised to bleed air from the new one before mounting the work equipment. It is especially so with the boom cylinder, because its rod does not extend to the stroke end of LOWER side, after the work equipment is mounted.

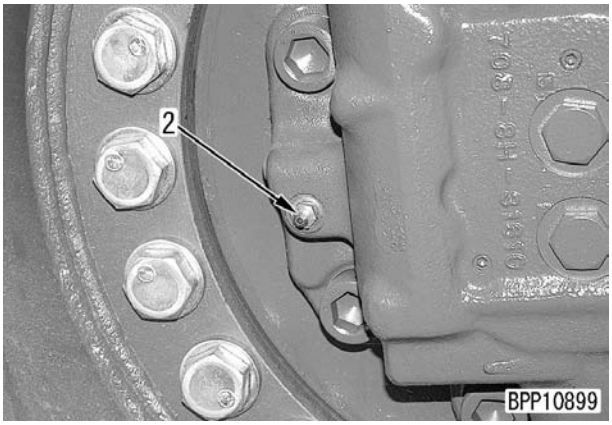
3. Bleeding air from swing motor

1) Start the engine and run it at low idle.
2) Swing slowly to bleed air.

4. Bleeding air from travel motor

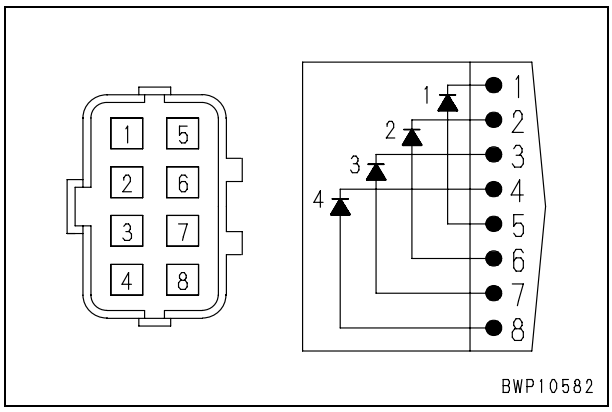
1) Start the engine and run it at low idle.
2) Loosen air bleeder (2) and confirm that oil seeps out from the plug.
3) If the oil seepage is confirmed, tighten air bleeder (2).

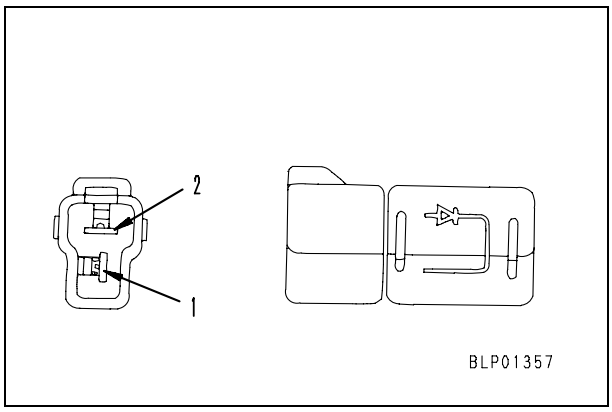
Air bleeder:
27.5 – 35.3 Nm {2.8 – 3.6 kgm}



Diode inspection procedures

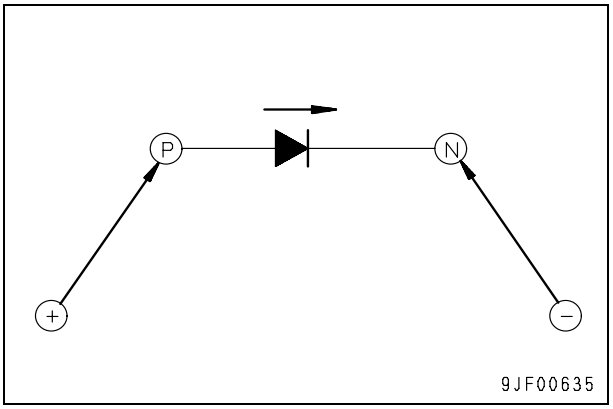
★ Check an assembled-type diode (8 pins) and independent diode (2 pins) in the following manner.
★ The conduction direction of an assembled-type diode is as shown in the diagram below.
★ The conduction direction of an independent diode is shown on the diode surface.





1. When using digital type circuit tester

1) Switch the testing mode to diode range and confirm the indicated value.
   ★ Voltage of the battery inside is displayed with conventional circuit testers.
2) Put the red probe (+) of the test lead to the anode (P) of and the black probe (–) to the cathode (N) of diode, and confirm the indicated value.
3) Determine acceptability of the diode from the indicated value.
   - Indicated value remains unchanged: Conduction is absent (Failure)
   - Indicated value changes: Conduction is present (Normal) (See Note)
     Note: A value between 0.46 V to 0.60 V is indicated for silicon diodes.
   ★ A value between 460 to 600 is indicated for silicon diodes.



2. When using analog type circuit tester

★ When the diode range is set, the testing method is the same as that done by use of the digital type circuit tester.
1) Switch the testing mode to resistance range.
2) Apply the leads of the tester as explained below and check the movement of the pointer.
   1] Put the red probe (+) of the test lead to the anode (P) and the black probe (–) to the cathode (N) of diode.
   2] Put the red probe (+) of the test lead to the cathode (N) and the black probe (–) to the anode (P) of diode.
3) Determine if a specific diode is good or no good by the way the pointer swings.
   - With the connection 1] above, the pointer is not moved. It swings, however, when the connection 2] is employed. Normal (However, magnitude of the pointer's move (indicating the resistance value) varies depending on the given tester model and the measurement range selected).
   - The pointer swings with both the connections of 1] and 2]: Defective (Internal short circuit)
   - The pointer does not swing with both the connections of 1] and 2]: Defective (Internal breaking of wire)

PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN02625-00

HYDRAULIC EXCAVATOR

PC300-8
PC300LC-8
PC350-8
PC350LC-8

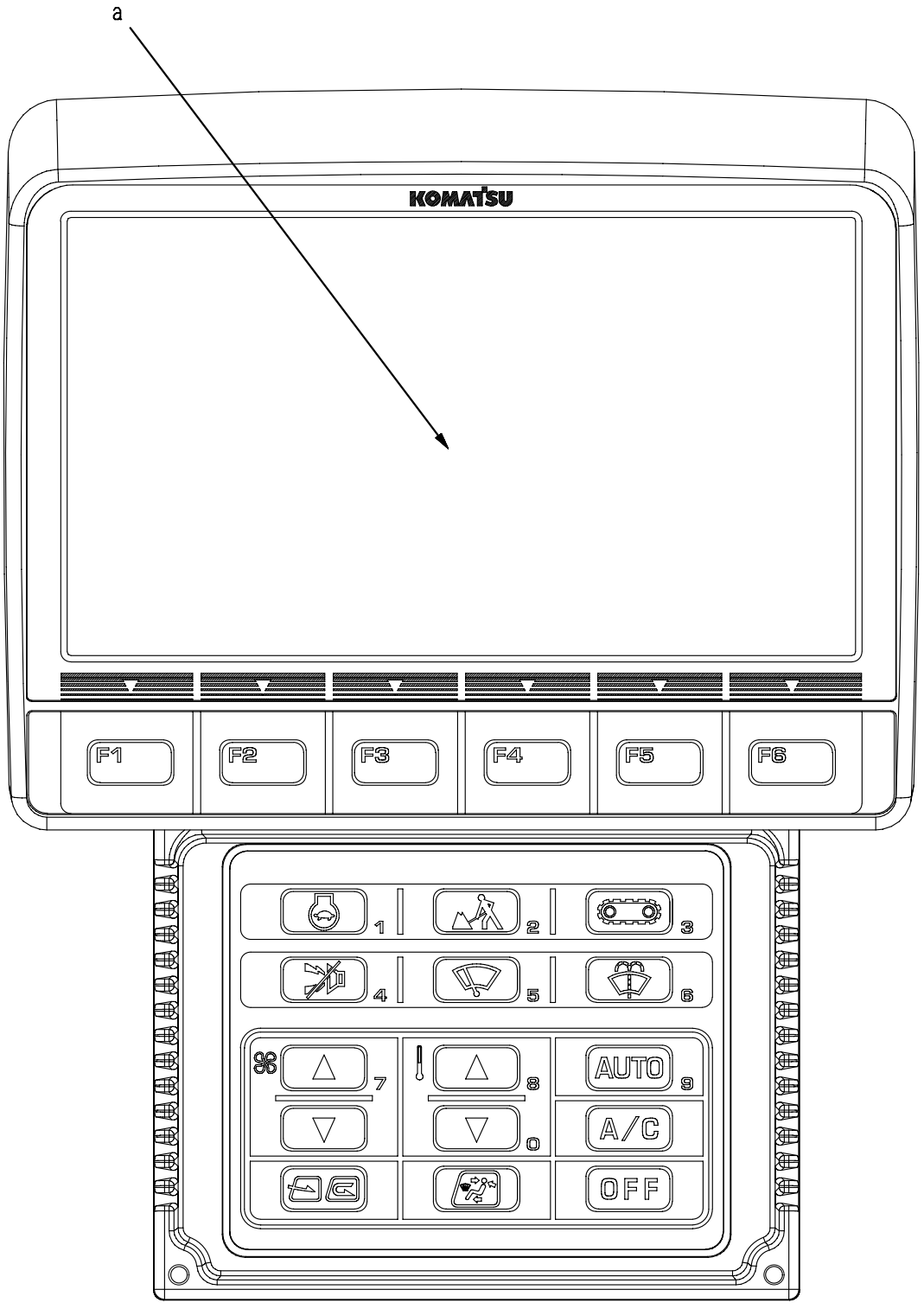
Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

30 Testing and adjusting

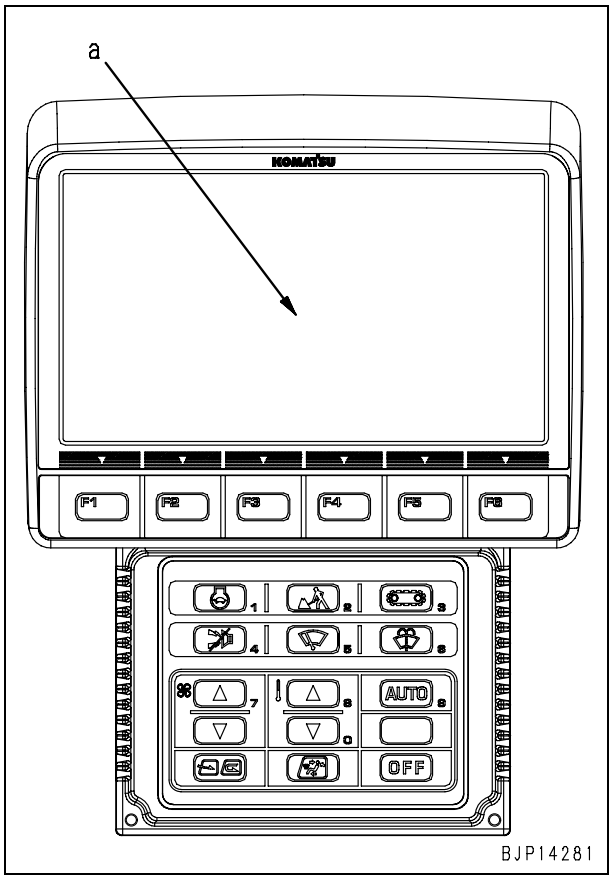
Testing and adjusting, Part 2

Special functions of machine monitor

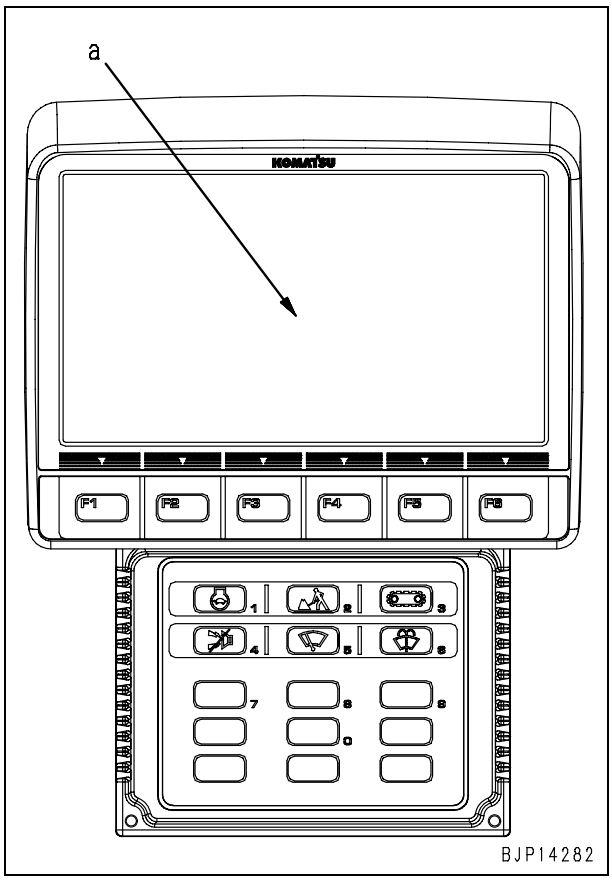
Air conditioner specification



Heater specification



Heaterless specification



Upper section of machine monitor (Display section)

(a): Multi-display

★ When the engine is started, the battery voltage may lower suddenly, depending on the ambient temperature and the condition of the battery. In this case, the machine monitor goes off for a moment. This phenomenon is not a failure, however.

Upper section of machine monitor (Switch section)

[F1]: F1 function switch
[F2]: F2 function switch
[F3]: F3 function switch
[F4]: F4 function switch
[F5]: F5 function switch
[F6]: F6 function switch

★ The function of each function switch is indicated by graphic mark in the multi-display (a) above that function switch.
★ If the graphic mark of a function switch is not displayed, that function switch is not working.

Lower section of machine monitor (Switch section)

[1]: Numeral 1 input switch/Auto-decelerator switch
[2]: Numeral 2 input switch/Working mode selector switch
[3]: Numeral 3 input switch/Travel speed shifting switch
[4]: Numeral 4 input switch/Alarm buzzer cancel switch
[5]: Numeral 5 input switch/Wiper switch
[6]: Numeral 6 input switch/Windshield washer switch
[7]: Numeral 7 input switch/Air conditioner or heater switch
[8]: Numeral 8 input switch/Air conditioner or heater switch
[9]: Numeral 9 input switch/Air conditioner or heater switch
[0]: Numeral 0 input switch/Air conditioner or heater switch

Switch having no numerals: Air conditioner or heater switch

★ Each switch has the function indicated by graphic mark and the function of inputting a numeral.
★ The machine monitor automatically judges which function of each switch is currently effective, according to the display condition of multi-display.
★ The difference between the air conditioner specification, heater specification, and heaterless specification is only the functions of the switches in this section.

■ Ordinary functions and special functions of machine monitor

The machine monitor has the ordinary function and special functions and displays information of various types on the multi-display.
Some items are displayed automatically according to the internal setting of the machine monitor and the others are displayed according to the operation of the switches.

1. Ordinary functions: Operator mode
   The items in this mode are displayed ordinarily. The operator can display and set them by operating the switches (Display and setting of some items need special operations of the switches).
2. Special functions: Service mode
   The items in this mode are not displayed ordinarily. Each serviceman can display them by operating the switches specially. This mode is used for special setting, testing, adjusting, or troubleshooting.

■ Operator mode (Outline)		Page
		6p
A	Display of KOMATSU logo	6p
A	Display of inputting password	7p
A	Display of check of breaker mode	7p
A	Display of check before starting	7p
A	Display of warning after check before starting	8p
A	Display of ending of maintenance interval	8p
A	Display of check of working mode and travel speed	8p
A	Display of ordinary screen	8p
A	Display of end screen	9p
B	Selection of auto-deceleration	9p
B	Selection of working mode	9p
B	Selection of travel speed	10p
B	Operation to stop alarm buzzer	10p
B	Operation of windshield wiper	11p
B	Operation of window washer	11p
B	Operation of air conditioner/heater	11p
B	Operation to display camera mode (if camera is installed)	12p
B	Operation to display clock and service meter	12p
B	Check of maintenance information	13p
B	Setting and display of user mode (Including KOMTRAX messages for user)	13p
C	Display of energy-saving guidance	14p
C	Display of caution monitor	14p
C	Display of automatic judgment of breaker	15p
C	Display of user code and failure code	15p
↓ (Special operation)		
D	Function of checking display of LCD (Liquid Crystal Display)	17p
D	Function of checking service meter	17p
D	Function of changing attachment/maintenance password	18p

→ (Special operation)

Service mode		Page
		20p
Monitoring		21p
Abnormality Record	Mechanical Systems	26p
	Electrical Systems	27p
	Air-conditioning System/Heater System	33p
Maintenance Record		34p
Maintenance Mode Change		35p
Phone Number Entry		37p
Default	Key-on Mode	38p
	Unit	39p
	With/Without Attachment	40p
	Attachment/Maintenance Password	41p
	Camera	42p
	ECO Display	43p
	Breaker Detect	44p
Adjustment	Pump Absorption Torque	45p
	Low Speed	46p
	Attachment Flow Adjustment	47p
Cylinder Cut-Out		48p
No Injection		49p
Fuel Consumption		51p
KOMTRAX Settings	Terminal Status	52p
	GPS & Communication Status	53p
	MODEM S/N (TH300)	54p
	MODEM IP Address (TH200)	55p
Display of KOMTRAX message		56p

★ Classification of operator mode
A: Display/Function from time when starting switch is turned ON to time when screen changes to ordinary screen and display after starting switch is turned OFF
B: Display/Function when switch of machine monitor is operated
C: Display/Function when certain condition is satisfied
D: Display/Function which needs special operation of switch

■ **Operator mode (Outline)**

★ Only outline of the operator mode is described in this section. For details of contents/operation of each function/display, see the Structure, function and maintenance standard, or Operation and Maintenance Manual.

★ The following are the displays or functions of the operator mode explained in this section (including some items which need special operations).

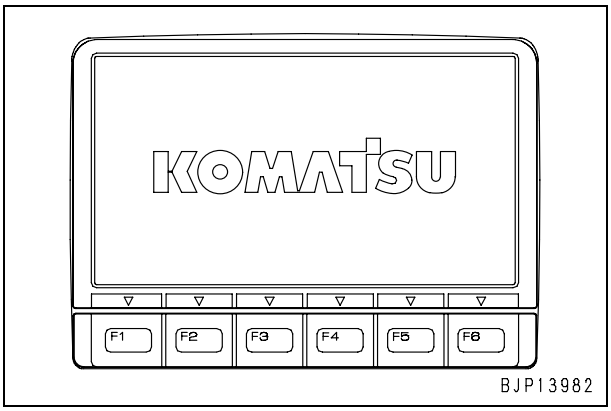
	Display pattern				
	A	B	C	D	E
Display of KOMATSU logo	1	1	1	1	1
Display of inputting password	2	—	—	—	—
Display of check of breaker mode	—	—	2	—	—
Display of check before starting	3	2	3	2	2
Display of warning after check before starting	—	—	—	3	—
Display of ending of maintenance interval	—	—	—	—	3
Display of check of working mode and travel speed	4	3	4	4	4
Display of ordinary screen	5	4	5	5	5
Display of end screen					
Selection of auto-deceleration					
Selection of working mode					
Selection of travel speed					
Operation to stop alarm buzzer					
Operation of windshield wiper					
Operation of windshield washer					
Operation of air conditioner/heater					
Operation to display camera mode (if camera is installed)					
Operation to display clock and service meter					
Check of maintenance information					
Setting and display of user mode (including KOMTRAX messages for user)					
Display of energy-saving guidance					
Display of caution monitor					
Display of automatic judgment of breaker					
Display of user code and failure code					
↓ (Special operation)					
Function of checking display of LCD (Liquid Crystal Display)					
Function of checking service meter					
Function of changing attachment/maintenance password					

★ Display pattern of operator mode
The contents of display from the time when starting switch is turned ON to time when screen changes to ordinary screen depends on the setting and condition of the machine.
A : When engine start lock is set effective
B : When engine start lock is set ineffective
C : When working mode at start is set to breaker mode (B)
D : When there is abnormal item in check-before-starting items
E : When there is maintenance item which is not maintained after specified interval

Display of KOMATSU logo

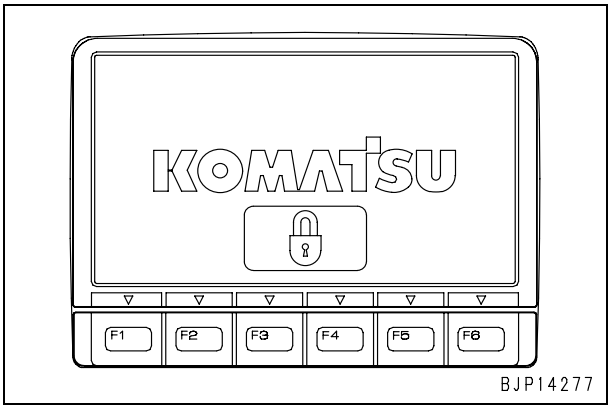
When the starting switch is turned ON, the KOMATSU logo is displayed for 2 seconds.

★ After the KOMATSU logo is displayed for 2 seconds, the screen changes to “Display of inputting password”, “Display of check of breaker mode (if B mode is set)”, or “Display of check before starting”.



★ The following screen may be displayed instead of the above Display of inputting password screen.

★ If this screen is displayed, call the person responsible to operation of KOMTRAX in your Komatsu distributor and ask for remedy.



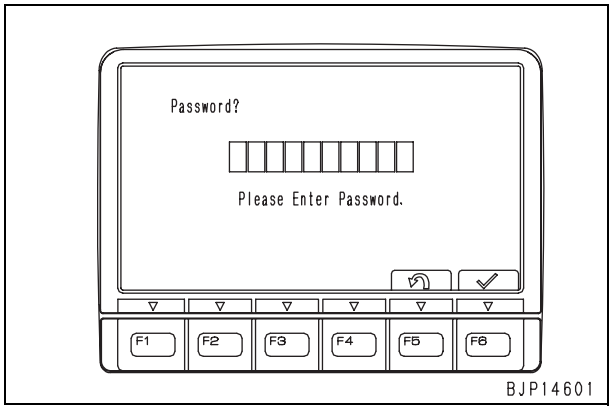
Display of inputting password

After the KOMATSU logo is displayed, the screen to input the engine start lock password is displayed.

★ This screen is displayed only when the engine start lock function is set effective.

★ If the password is input normally, the screen changes to “Display of check of breaker mode (if B mode is set)” or “Display of check before starting”.

★ The machine monitor has some password functions other than the engine start lock. Those functions are independent from one another.

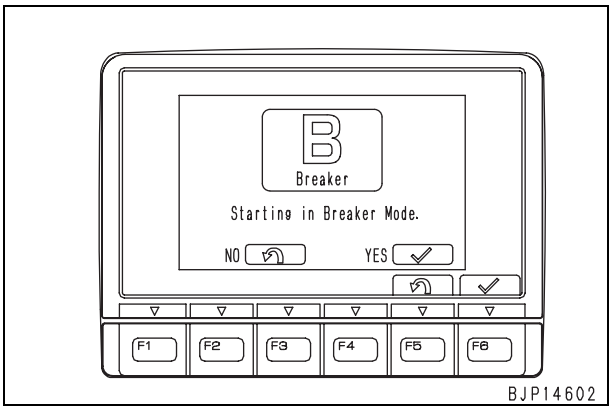


Display of check of breaker mode

When the starting switch is turned ON, if the working mode is set to the breaker mode [B], a message to inform the operator of starting in the breaker mode is displayed on the screen.

⚠ **If an attachment other than the breaker is used while the working mode is set to the breaker mode [B], the machine may move unexpectedly or may not operate normally or the hydraulic components may be damaged.**

★ After operation to check of the breaker mode is finished, the screen changes to “Display of check before starting”.
If No is selected: Working mode is set to economy mode [E]
If Yes is selected: Working mode is set to breaker mode [B]



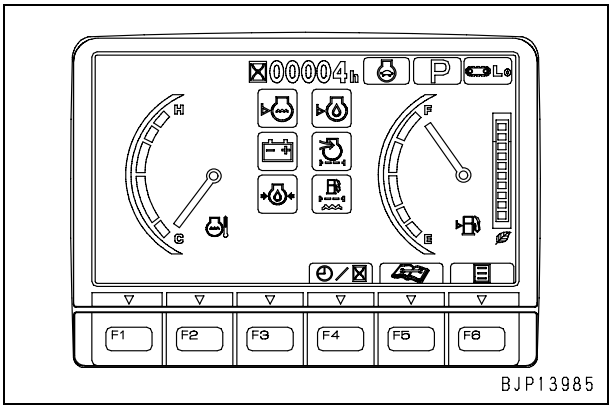
Display of check before starting

When the screen changes to the check-before-starting screen, the check before starting is carried out for 2 seconds.

★ If any abnormality is detected by the check before starting, the screen changes to “Display of warning after check before starting” or “Display of ending of maintenance interval”.

★ If no abnormality is detected by the check before starting, the screen changes to “Display of check of working mode and travel speed”.

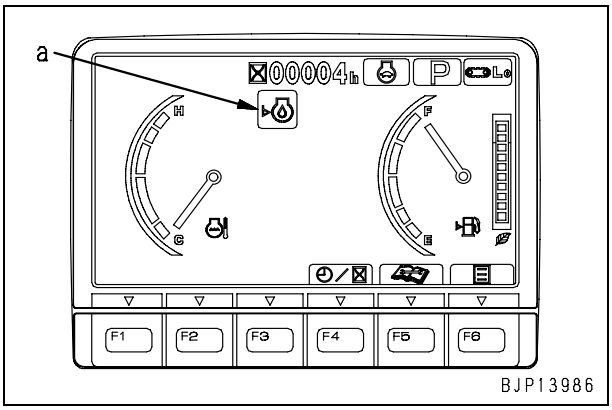
★ The monitors (6 pieces) displayed on the screen are the items under the check before starting.



Display of warning after check before starting

If any abnormality is detected by the check before starting, the warning monitor is displayed on the screen.

★ The following figure shows that the engine oil level monitor (a) is warning of low of engine oil level.



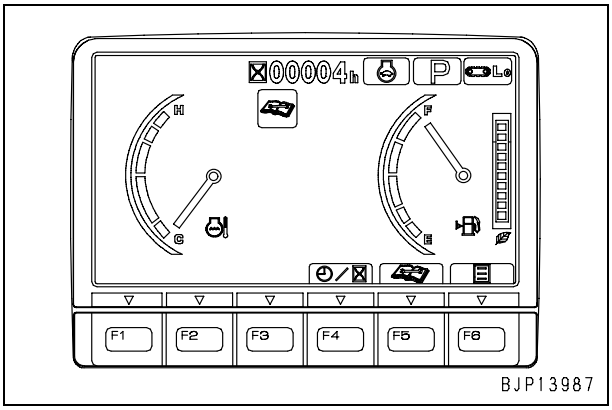
Display of ending of maintenance interval

When the check before starting is carried out, if a maintenance item is near or after the end of the set interval, the maintenance monitor is displayed for 30 seconds to urge the operator to maintenance.

★ This screen is displayed only when the maintenance function is effective. The color of the maintenance monitor (yellow or red) indicates the length of the time after the maintenance interval.

★ Set or change the maintenance function in the service mode.

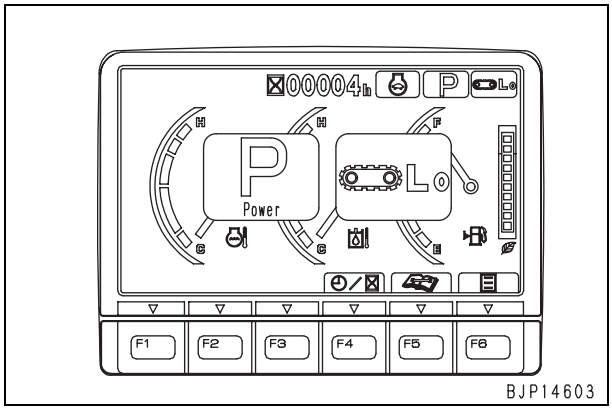
★ After display of this screen is finished, the screen changes to “Display of check of working mode and travel speed”.



Display of check of working mode and travel speed

If the check before starting is finished normally, the screen to check the working mode and travel speed is displayed for 2 seconds.

★ After display of check of the working mode and travel speed is finished, the screen changes to “Display of ordinary screen”.

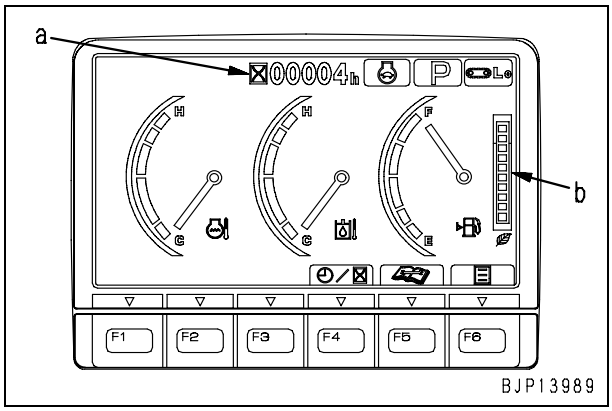


Display of ordinary screen

If the machine monitor starts normally, the ordinary screen is displayed.

★ Service meter (a) or a clock is displayed at the center upper section of the screen (The service meter or clock is selected with [F4]).

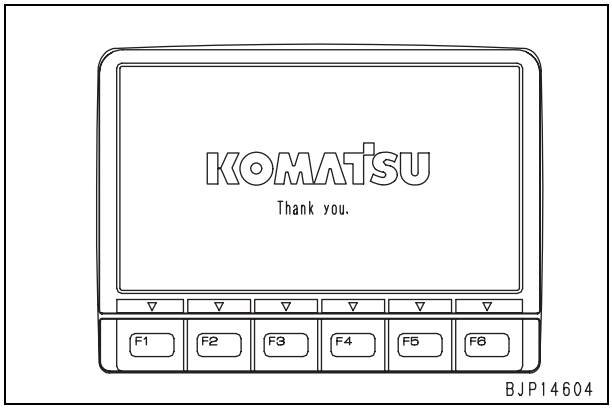
★ ECO gauge (b) is displayed at the right end of the screen (It is turned ON and OFF in the service mode).



Display of end screen

When the starting switch is turned OFF, the end screen is displayed for 5 seconds.

★ Another message may be displayed on the end screen, depending on the message display function of KOMTRAX.



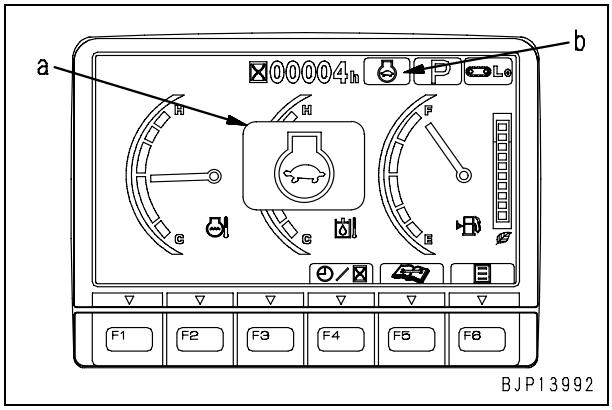
Selection of auto-deceleration

While the ordinary screen is displayed, if the auto-deceleration switch is pressed, large auto-deceleration monitor (a) is displayed for 2 seconds and the setting of the auto-deceleration is changed.

★ Each time the auto-deceleration switch is pressed, the auto-deceleration is turned ON and OFF alternately.

★ If the auto-deceleration is turned ON, large monitor (a) and auto-deceleration monitor (b) are displayed simultaneously.

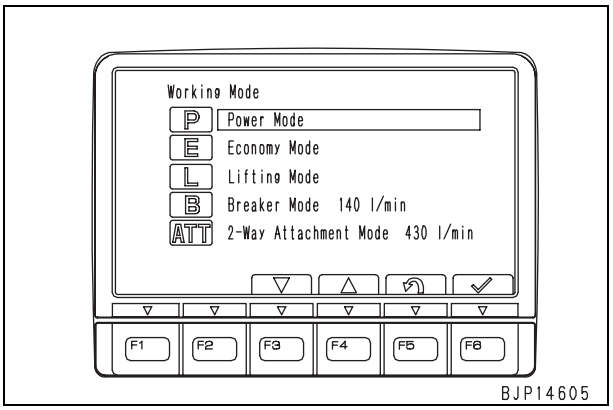
★ If the auto-deceleration is turned OFF, auto-deceleration monitor (b) goes off.



Selection of working mode

Select a working mode according to the following procedure.

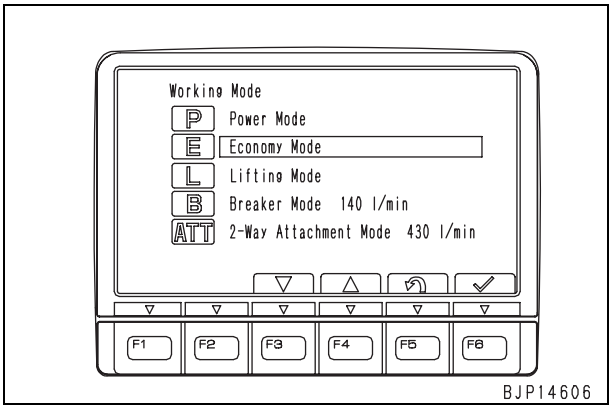
1. While the ordinary screen is displayed, press the working mode selector switch, and the working mode selection screen is displayed.
   ★ The following figure is the working mode selection screen displayed when "With attachment" is set (If "With attachment" is not set in the service mode, the attachment mode [ATT] is not displayed).



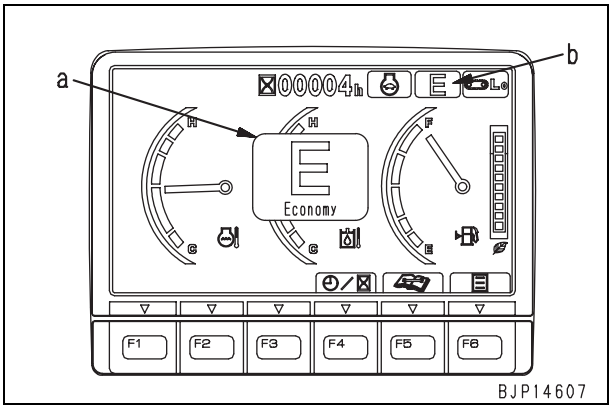
2. Operate the function switches or working mode selector switch to select and confirm the working mode which you will use.
   Function switches
   - [F3]: Move to lower working mode
   - [F4]: Move to upper working mode
   - [F5]: Cancel selection and return to ordinary screen
   - [F6]: Confirm selection and return to ordinary screen

   Working mode selector switch
   - Press: Move to lower working mode
   - Hold down: Confirm selection and return to ordinary screen

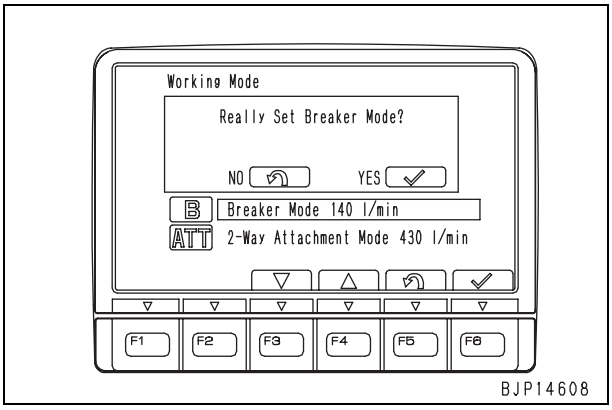
   ★ If you do not touch any of the function switches and working mode selector switch for 5 seconds, the selection is confirmed and the screen changes to the ordinary screen.



3. When the ordinary screen is displayed again, large working mode monitor (a) is displayed for 2 seconds, and then the setting of the working mode is changed.
   ★ When large monitor (a) is displayed, the display of working mode monitor (b) is changed, too.

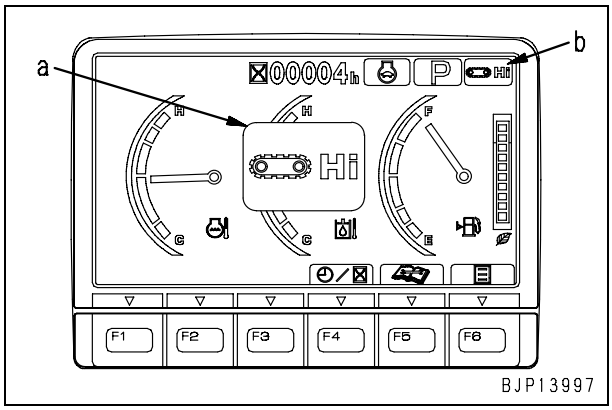


<Precautions for selecting breaker mode [B]>
- If breaker mode [B] is selected, both of the control of the hydraulic pump and the setting of the hydraulic circuit are changed.
- If an attachment other than the breaker is used, the machine may move unexpectedly or may not operate normally or the hydraulic components may be damaged.
- After the breaker mode is selected, the screen to confirm the selection of the breaker mode is displayed (The buzzer sounds intermittently while this screen is displayed).
- If the setting is confirmed on this screen, the screen changes to the ordinary screen.
  If No is selected:
  Screen returns to screen to select working mode.
  If Yes is selected:
  Working mode is set to breaker mode [B]



Selection of travel speed

While the ordinary screen is displayed, if the travel speed shifting switch is pressed, large travel speed monitor (a) is displayed for 2 seconds and the setting of the travel speed is changed.
★ Each time the travel speed shifting switch is pressed, the travel speed is changed to Lo, Mi, Hi, and Lo again in order.
★ When large monitor (a) is displayed, the display of travel speed monitor (b) is changed, too.



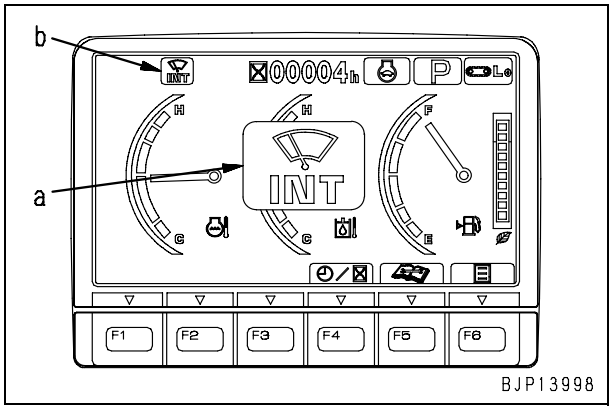
Operation to stop alarm buzzer

While the alarm buzzer is sounding, if the alarm buzzer cancel switch is pressed, the alarm buzzer stops.
★ Even if the alarm buzzer cancel switch is pressed, the screen does not change.

Operation of windshield wiper

While the ordinary screen is displayed, if the wiper switch is pressed, large wiper monitor (a) is displayed for 2 seconds and the windshield wiper starts or stops.

★ Each time the wiper switch is pressed, the windshield wiper setting is changed to INT, ON, OFF, and INT again in order.
★ When large monitor (a) is displayed, the display of wiper monitor (b) is changed or turned OFF, too.
★ If the windshield wiper is turned OFF, large monitor (a) is not displayed.



Operation of window washer

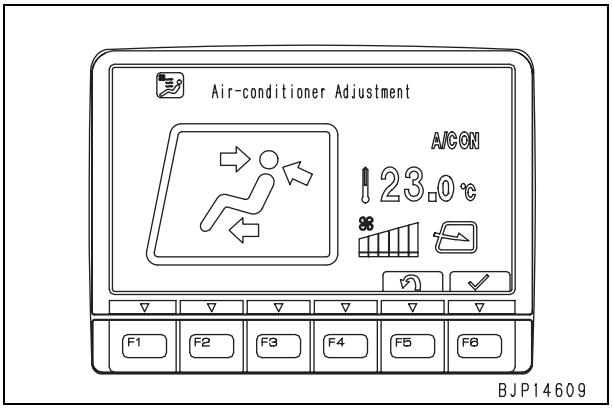
While the ordinary screen is displayed, if the window washer switch is pressed, the washing liquid is splashed only while the switch is held down.

★ Even if the window washer switch is pressed, the screen does not change.

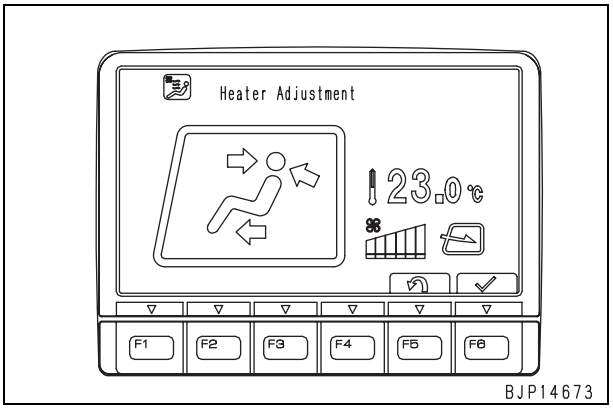
Operation of air conditioner/heater

While the ordinary screen is displayed, press the air conditioner switch or heater switch, and the air conditioner adjustment screen or heater adjustment screen is displayed.

★ While the air conditioner adjustment screen or heater adjustment screen is displayed, if you do not touch any switch for 5 seconds, the screen changes to the ordinary screen.
★ Air conditioner specification

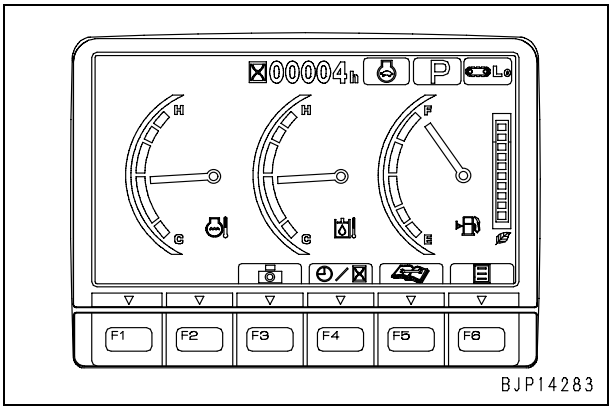


★ Heater specification

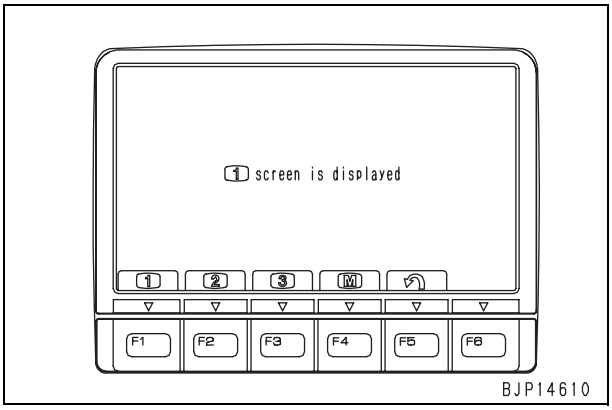


Operation to display camera mode (if camera is installed)

When a camera is installed, if [F3] is pressed, the multi-display changes to the camera image (Set the connection of the camera in the service mode).



★ Up to 3 cameras can be connected. If the camera mode is selected, however, only the image of camera 1 is always displayed.

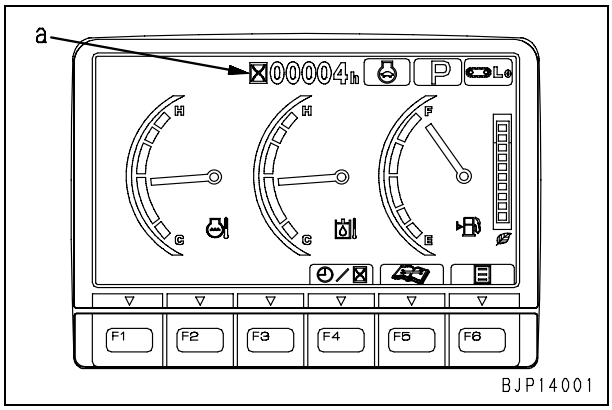


★ If a caution is generated in the camera mode, the caution monitor is displayed at the left upper of the screen (The low hydraulic oil temperature caution is not displayed there, however).
★ When an error that there is a user code occurs in the camera mode, if you do not touch any control lever for 10 seconds, the screen changes to the ordinary screen and displays the error information.
★ When two or more cameras are connected, the image of one of them or the images of two of them can be displayed.
  If 2-camera image display [F4] is selected, the image of camera 1 is displayed on the left side of the screen and the image of camera 2 is displayed on the right side. The image of camera 3 is displayed only singly.
★ If the images of 2 cameras are displayed simultaneously, images are displayed at intervals of 1 second on the right and left screen.

Operation to display clock and service meter

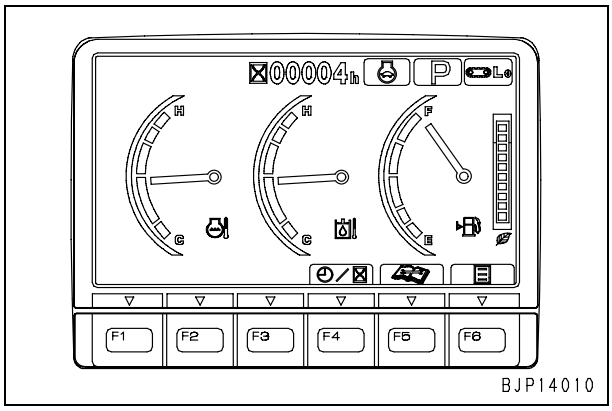
While the ordinary screen is displayed, press [F4], and section (a) changes to the service meter and clock alternately.

★ When the clock is selected, adjust the time, set 12-hour or 24-hour display, and set the summer time with the user mode function.

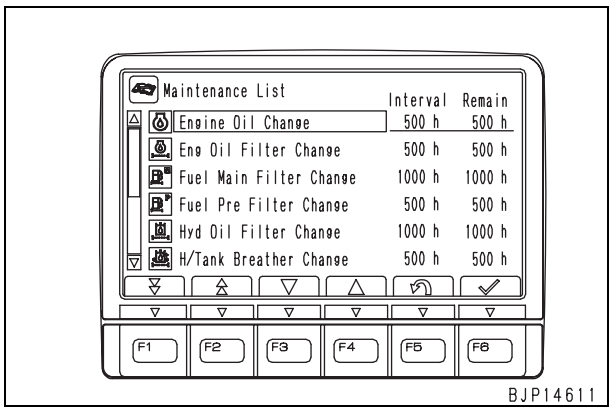


Check of maintenance information

While the maintenance monitor or ordinary screen is displayed, press [F5], and the maintenance table screen is displayed.

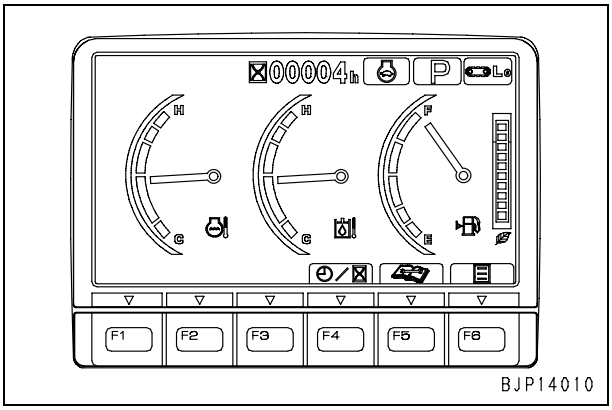


★ To reset the time left after finishing maintenance, more operations are necessary.



Setting and display of user mode (Including KOMTRAX messages for user)

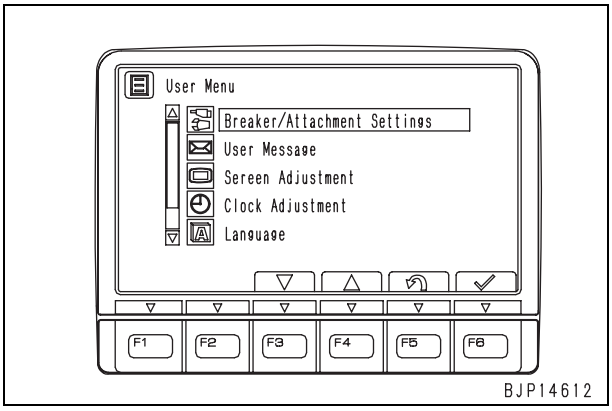
While the ordinary screen is displayed, press [F6], and the user menu screen is displayed.



★ There are following items in the user menu.

Breaker/Attachment Settings
User Message
Screen Adjustment
Clock Adjustment
Language
Economy Mode Adjustment

★ The breaker/attachment setting menu is displayed only when "With attachment" is set in the service mode.



[KOMTRAX message]

- There are 2 types of KOMTRAX message; 1 is for the user and the other is for the service.
- For user:
  A message transmitted from the KOMTRAX base station for the user. If it is received, the message monitor is displayed on the ordinary screen. To see the contents of the message, operate "User Message" in the above user menu.
- For service:
  A message transmitted from the KOMTRAX base station for the service. Even if it is received, nothing is displayed on the ordinary screen. To see the contents of the message, operate "KOMTRAX message" display in the service menu.

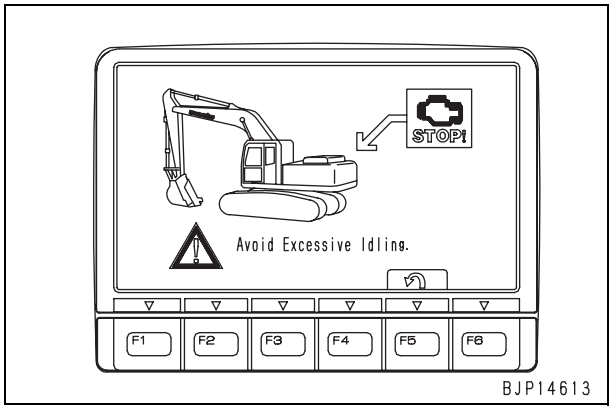
Display of energy-saving guidance

When the machine is set in a certain operating condition, the energy-saving guidance screen is displayed automatically to urge the operator to the energy-saving operation.

★ The energy-saving guidance is displayed when the following condition is satisfied while the display setting is set effective in the service mode.

★ Condition for display:
  Engine is running + All levers have been in neutral for 5 minutes + Caution (Note) or user code is not generated (Note)
  Note: Excluding hydraulic oil low temperature caution

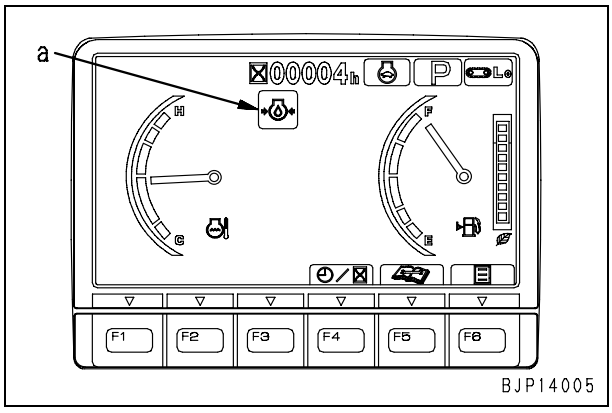
★ If any lever or pedal is operated, or [F5] is pressed, the screen returns to the ordinary screen.



Display of caution monitor

If an abnormality which displays a caution monitor occurs on the ordinary screen or camera mode screen, the caution monitor is displayed large for a moment and then displayed at (a) in the screen.

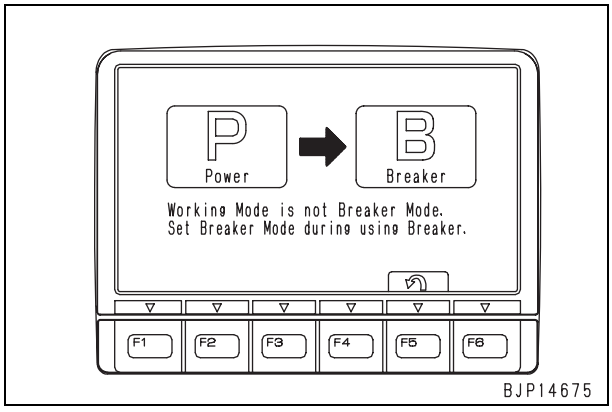
★ On the camera mode screen, the caution monitor flashes at the left upper of the screen when the caution is generated.



Display of automatic judgment of breaker

If the operator performs breaker work in an improper working mode, the breaker automatic judgment screen is displayed to urge the operator to select a proper working mode.

★ The breaker automatic judgment is displayed when the following condition is satisfied while the display setting is set effective in the service mode.
★ Condition for display:
When the pump controller measures the rear pump pressure for a certain time, the obtained value is similar to the pulsation wave form of breaker operation which is held in the controller in advance.
★ The breaker automatic judgment function is set to Not used (Not displayed) when delivered.
★ If this screen is displayed, check the setting of the working mode. If the breaker is being used, select the breaker mode [B].
★ To return to the ordinary screen, press [F5].

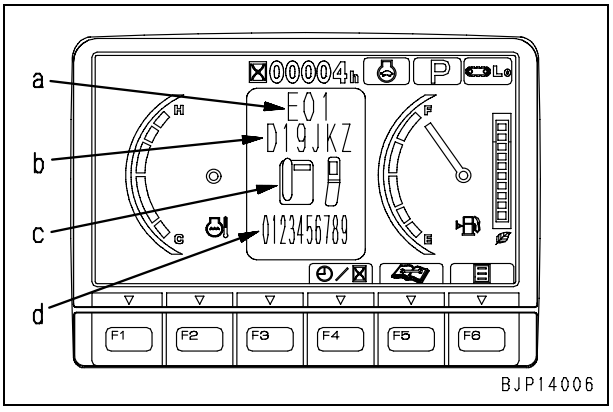


Display of user code and failure code

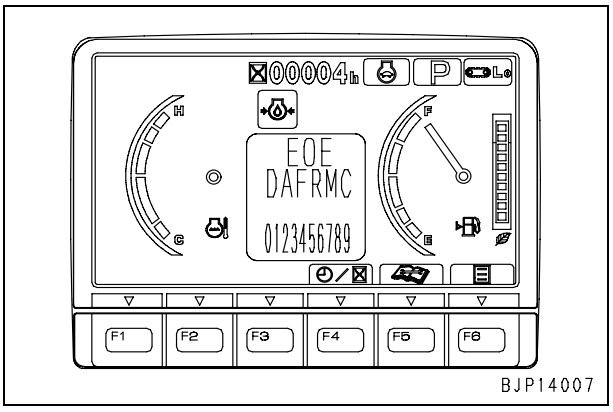
If an abnormality which displays a user code and a failure code occurs on the ordinary screen or camera mode screen, all the information of the abnormality is displayed.

(a): User code (3 digits)
(b): Failure code (5 or 6 digits)
(c): Telephone mark
(d): Telephone No.

★ This screen is displayed only when an abnormality (failure code) for which a user code is set occurs.
★ The telephone mark and telephone No. are displayed only when the telephone No. is registered in the service mode.
★ If multiple abnormalities occur simultaneously, all the codes are displayed repeatedly in order.
★ Since the information of the displayed failure code is recorded in the abnormality record in the service mode, check the details in the service mode.



★ When the caution monitor is also displayed, the telephone mark is not displayed.



★ Remedies given by displayed user codes to operator to take (The following table is an excerpt from the Operation and Maintenance Manual)

User code	Failure mode	Action
E02	Pump control system error	When emergency pump drive switch is at the up (emergency) position, normal operations become possible, but have inspection carried out immediately.
E03	Swing brake system error	Move the swing brake cancel switch up to release the brake. When applying the swing brake, operate the swing lock switch manually. Depending on the cause of the problem, it may not be possible to release it. In any case, have inspection carried out immediately.
E10	Engine controller power source error Engine controller drive system circuit error (engine stopped)	Have inspection carried out immediately.
E11	Engine controller system error Output reduced to protect engine	Operate machine to a safe posture and have inspection carried out immediately.
E14	Abnormality in throttle system	Operate machine to a safe posture and have inspection carried out immediately.
E15	Engine sensor (coolant temperature, fuel pressure, oil pressure) system error	Operations are possible, but have inspection carried out immediately.
E0E	Network error	Operate machine to a safe posture and have inspection carried out immediately.

Function of checking display of LCD (Liquid Crystal Display)

While the ordinary screen is displayed, if the following numeral input switch and function switch are operated as follows, all the LCD (Liquid Crystal Display) lights up in white.

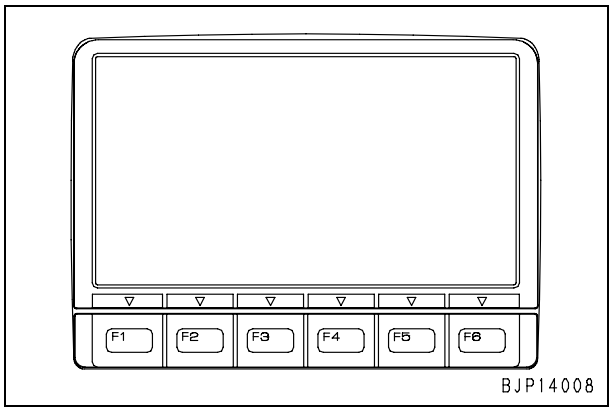
- Operation of switches (simultaneous): [4] + [F2]

★ When finishing the operation of the switches, release [F2] first.

★ If there is a display error in the LCD, only that part is indicated in black.

★ The LCD panel sometimes has black points (points which are not lighted) and bright points (points which do not go off) for the reason of its characteristics. If the number of the bright points and black points does not exceed 10, those points are not a failure or a defect.

★ To return to the former screen, press the function switch.



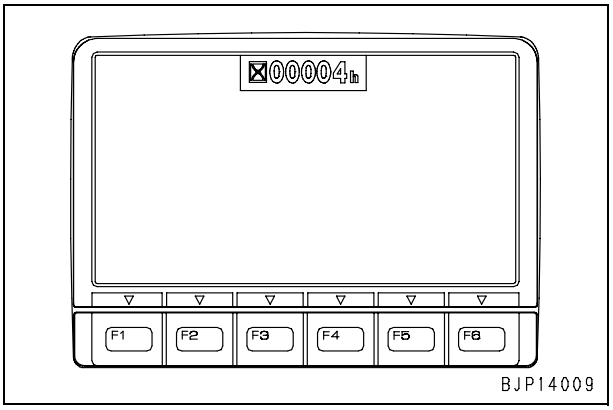
Function of checking service meter

To check the service meter while the starting switch is turned OFF, operate the numeral input switches as follows. At this time, only the service meter section displays.

- Operation of switches (simultaneous): [4] + [1]

★ Since there is some time lag in start of the LCD, hold down the switches until the LCD displays normally.

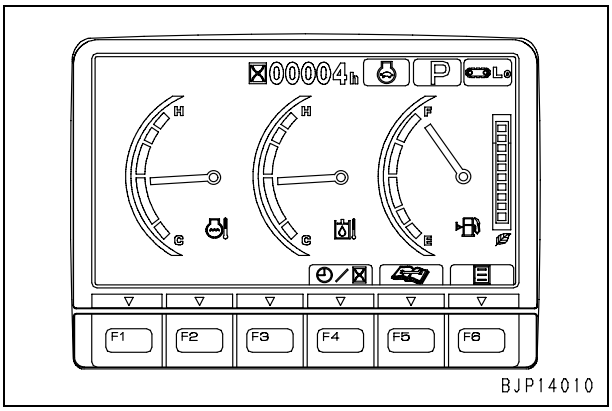
★ After the machine monitor is used continuously, blue points (points which do not go off) may be seen on this screen. This phenomenon does not indicate a failure or a defect.



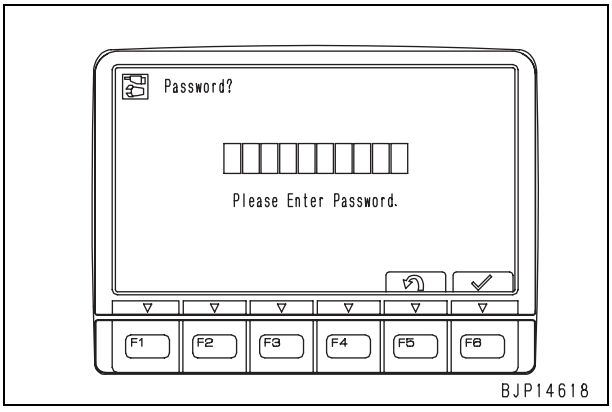
Function of changing attachment/maintenance password

When changing the attachment/maintenance password used for the attachment setting function and maintenance setting function, follow these procedures.

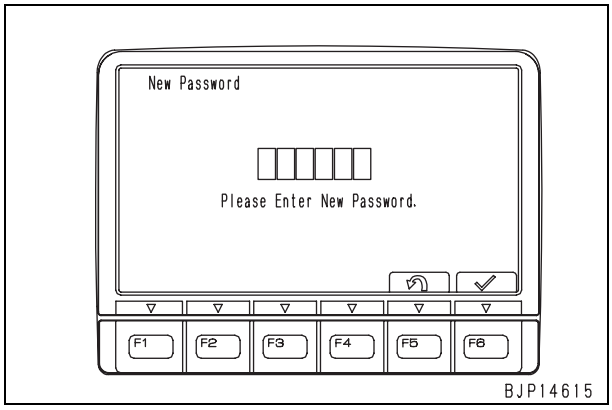
1. While the ordinary screen is displayed, perform the following operation with the numeral input switches.
   - Operation of switches (While pressing [4], perform the operation in order):
     [4] + [5] → [5] → [5]
   - ★ This operation of the switches is not accepted until 10 minutes pass after the starting switch is turned on.



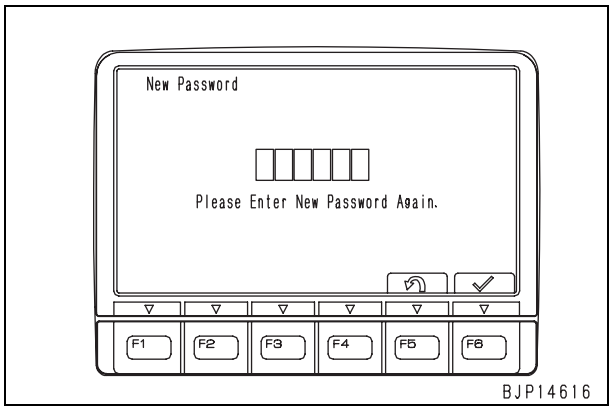
2. After the Attachment/Maintenance PASSWORD screen is displayed, input the current password with the numeral input switches and confirm it with the function switch.
   - [F5]: Reset input numeral/Return to ordinary screen
   - [F6]: Confirm input numeral
   - ★ Default password: [000000]
   - ★ If the input password is correct, the screen changes to the next screen.
   - ★ If the input password is incorrect, the message to input the password again is displayed.



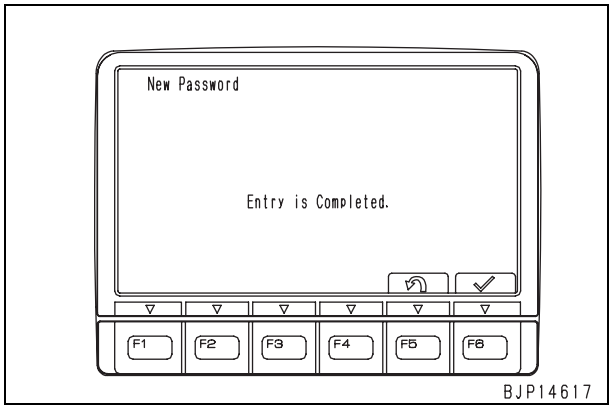
3. After the New password input screen is displayed, input a new password with the numeral input switches and confirm it with the function switch.
   - ★ Set a new password of 4 – 6 digits (If it has only 3 or less digits or has 7 or more digits, it is not accepted).
   - [F5]: Reset input numeral/Return to ordinary screen
   - [F6]: Confirm input numeral



4. After the New password input screen is displayed again, input a new password again with the numeral input switches and confirm it with the function switch.
   - [F5]: Reset input numeral/Return to ordinary screen
   - [F6]: Confirm input numeral
   - ★ If a password different from the password input before is input, the message to input again is displayed.



5. If the screen to notify completion of setting is displayed and then the ordinary screen is displayed, the password is changed successfully.

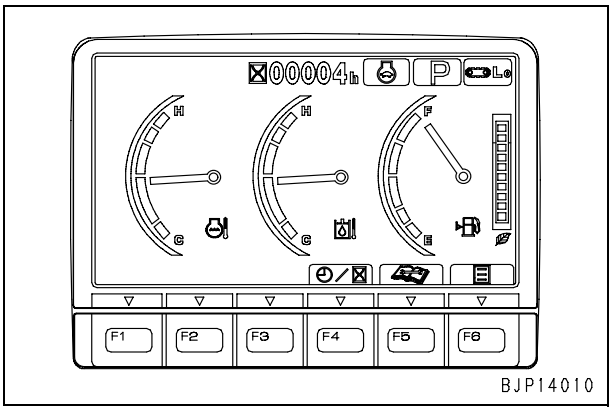


■ **Service mode**

To change the operator mode to the service mode, perform the following operation.
This operation is always required when you use the service mode.

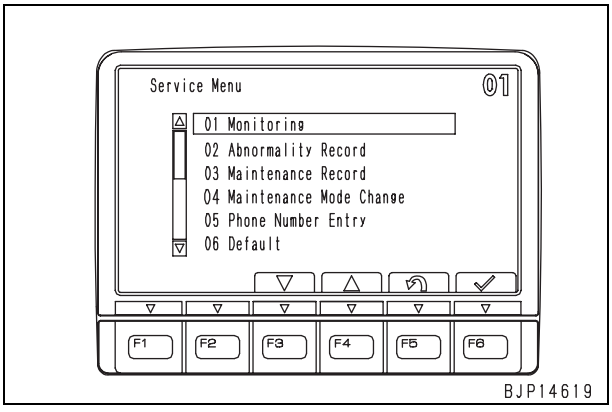
1. Check of display of screen and operation of switches
   While the ordinary screen is displayed, perform the following operation with the numeral input switches.
   - Operation of switches (While pressing [4], perform the operation in order):
     [4] + [1] → [2] → [3]

   ★ This operation of the switches is accepted only while the ordinary screen is displayed.



2. Selection of service menu
   When the Service menu screen is displayed, the service mode is selected. Select a service menu you use with the function switches or numeral input switches.
   - [F3]: Move to lower menu
   - [F4]: Move to upper menu
   - [F5]: Return to ordinary screen (operator mode)
   - [F6]: Confirm selection

   ★ You may enter a 2-digit code with the numeral input switches to select the menu of that code and confirm it with [F6].



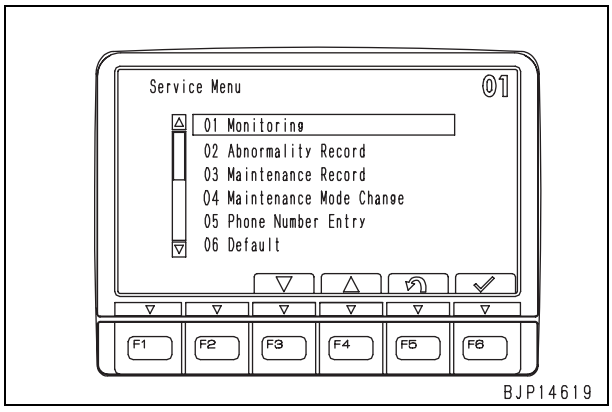
★ The items which can be selected in the service menu are as follows (including some items which need special operations).

01 Monitoring	
02 Abnormality Record	Mechanical Systems
	Electrical Systems
	Air-conditioning System/Heater System
03 Maintenance Record	
04 Maintenance Mode Change	
05 Phone Number Entry	
06 Default	Key-on Mode
	Unit
	With/Without Attachment
	Attachment/Maintenance Password
	Camera
	ECO Display
	Breaker Detect
07 Adjustment	Pump Absorption Torque
	Low Speed
	Attachment Flow Adjustment
08 Cylinder Cut-Out	
09 No Injection	
10 Fuel Consumption	
11 KOMTRAX Settings	Terminal Status
	GPS & Communication Status
	MODEM S/N (TH300)
	MODEM IP Address (TH200)

Monitoring

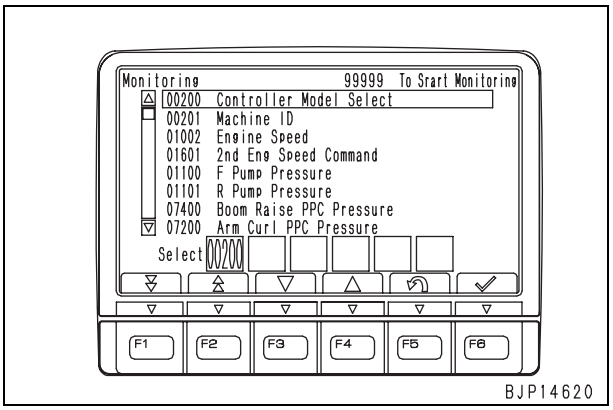
The machine monitor can monitor the condition of the machine in real time by receiving signals from various switches, sensors, and actuators installed to many parts of the machine and the information from the controllers which are controlling switches, etc.

1. Selecting menu
   Select “Monitoring” on the service menu screen.

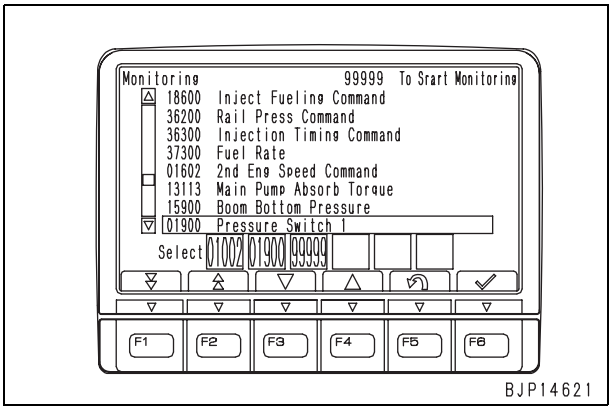


2. Selecting monitoring items
   After the “Monitoring selection menu screen” is displayed, select items to be monitored with the function switches or numeral input switches.
   - [F1]: Move to next page (screen)
   - [F2]: Move to previous page (screen)
   - [F3]: Move to lower item
   - [F4]: Move to upper item
   - [F5]: Reset input numeral/Return to service menu screen
   - [F6]: Confirm selection

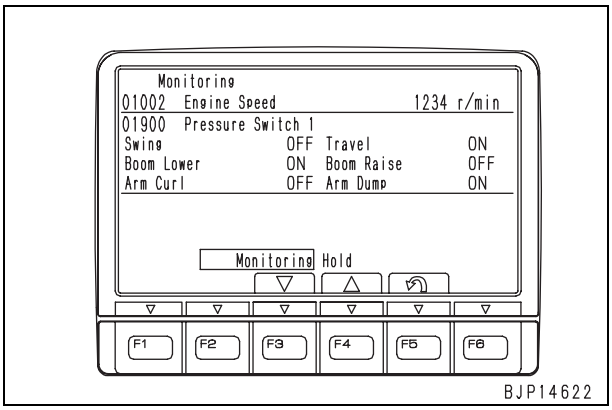
   ★ Selection with function switches: Select an item with [F3] or [F4] and confirm it with [F6].
   ★ Selection with numeral input switches: Enter a 5-digit code, and the item of that code is selected directly. Confirm that item with [F6].
   ★ If the color of the selected box changes from yellow to red, selection of the item of that box is confirmed.
   ★ Up to 6 monitoring items can be selected at a time. You may not able to set up to 6 items, however, depending on the display form of those items.



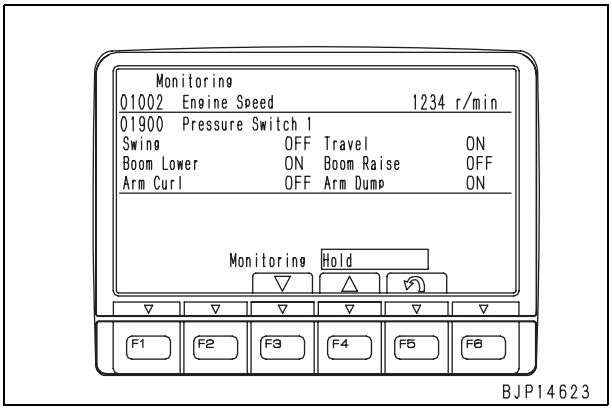
3. Deciding monitoring items
   After selecting monitoring items, execute monitoring with the function switch or numeral input switch.
   ★ Execution with function switch: Double-click or hold down [F6] (about 2 seconds).
   ★ Execution with numeral input switch: Input [99999] and press [F6].
   ★ When monitoring only 2 items, for example, select them and confirm with [F6]. If [F6] is pressed once more at this time, monitoring is executed.
   ★ If monitoring items are selected up to the limit number, monitoring is executed automatically.



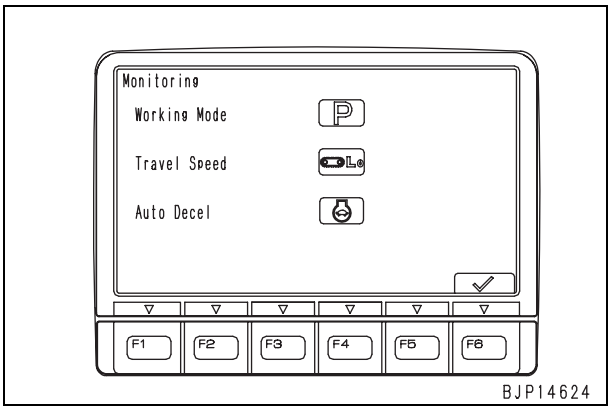
4. Executing monitoring
   After the “Executing monitoring screen” is displayed, perform the necessary operation of the machine and check the monitoring information.
   ★ Monitoring information is indicated by value, ON/OFF, or special display.
   ★ The unit of display can be set to SI unit, metric unit, or inch unit with the Initialization function in the service mode.



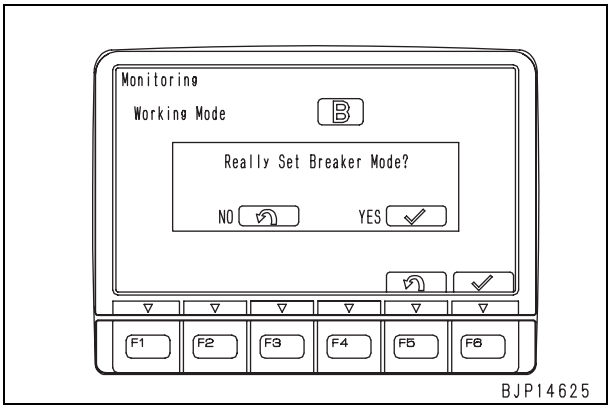
5. Holding monitoring information
   The monitoring information can be held and reset with the function switches.
   - [F3]: Reset holding
   - [F4]: Hold information (displayed data)
   - [F5]: Return to monitoring selection menu screen



6. Changing machine setting mode
   To change the setting of the working mode, travel speed, or auto-deceleration during monitoring, operate the corresponding switch under the current condition, and the mode setting screen is displayed.
   While this screen is displayed, if the corresponding switch is operated further, the corresponding mode is changed.
   ★ After finishing changing the setting, press [F6] to return to the monitoring information screen.
   ★ If the setting is changed during monitoring, the new setting is held even after the screen returns to the ordinary screen after monitoring is finished.



   ★ If the working mode is changed to breaker mode [B], the screen to confirm the change of the setting is displayed as in changing the working mode on the ordinary screen.



Monitoring items table

Code No.	Monitoring item (Display on screen)	Unit (Initial setting: ISO)			Component in charge	Remarks
		ISO	meter	inch		
00200	Controller Model Select	—			PUMP	
00201	Machine ID	—			ENG	
01002	Engine speed	r/min	rpm	rpm	ENG	
01601	2nd Eng. Speed Command	r/min	rpm	rpm	PUMP	
01100	F Pump Pressure	MPa	kg/cm^2	psi	PUMP	
01101	R Pump Pressure	MPa	kg/cm^2	psi	PUMP	
07400	Boom Raise PPC Pressure	MPa	kg/cm^2	psi	PUMP	
07200	Arm Curl PPC Pressure	MPa	kg/cm^2	psi	PUMP	
07300	Bucket Curl PPC Pressure	MPa	kg/cm^2	psi	PUMP	
07301	Bucket Dump PPC Pressure	MPa	kg/cm^2	psi	PUMP	
09001	Swing left PPC Pressure	MPa	kg/cm^2	psi	PUMP	
09002	Swing right PPC Pressure	MPa	kg/cm^2	psi	PUMP	
04107	Coolant Temperature	°C	°C	°F	ENG	
04401	Hydr. Oil Temperature	°C	°C	°F	PUMP	
01300	PC-EPC Sol. Curr.(F)	mA	mA	mA	PUMP	
01302	PC-EPC Sol. Curr.(R)	mA	mA	mA	PUMP	
01500	LS-EPC Sol. Curr.	mA	mA	mA	PUMP	
08000	Merge-divider Sol. Curr.(Main)	mA	mA	mA	PUMP	
08001	Merge-divider Sol. Curr.(LS)	mA	mA	mA	PUMP	
01700	Service Sol. Curr.	mA	mA	mA	PUMP	
03200	Battery Voltage	V	V	V	PUMP	
03203	Battery Power Supply	V	V	V	ENG	
04300	Battery Charge Vol.	V	V	V	MON	
36400	Rail Pressure	MPa	kg/cm^2	psi	ENG	
37400	Ambient Pressure	kPa	kg/cm^2	psi	ENG	
18500	Charge Temperature	°C	°C	°F	ENG	
36500	Boost Pressure	kPa	kg/cm^2	psi	ENG	Absolute value indication (including atmospheric pressure)
36700	Engine Torque Ratio	%	%	%	ENG	
18700	Engine Output Torque	Nm	kgm	lbft	ENG	
03000	Fuel Dial Pos Sens Volt	V	V	V	ENG	
04200	Fuel Level Sensor Vol.	V	V	V	MON	
04105	Eng. Water Temp. Vol. Lo	V	V	V	ENG	
04402	Hydr. Temp. Sensor Vol.	V	V	V	PUMP	
37401	Ambient Press Sens Volt	V	V	V	ENG	
18501	Charge Temp Sens Volt	V	V	V	ENG	
36501	Charge Press Sens Volt	V	V	V	ENG	
36401	Rail Pressure Sens Volt	V	V	V	ENG	
17500	Engine Power Mode	—			ENG	
31701	Throttle Position	%	%	%	ENG	
31706	Final Throttle Position	%	%	%	ENG	
18600	Inject Fueling Command	mg/st	mg/st	mg/st	ENG	
36200	Rail Press Command	MPa	kg/cm^2	psi	ENG	
36300	Injection Timing Command	CA	CA	CA	ENG	
37300	Fuel Rate	ℓ/h	ℓ/h	gal/h	ENG	
01602	2nd Eng. Speed Command	%	%	%	PUMP	
13113	Main Pump Absorb Torque	Nm	kgm	lbft	PUMP	
15900	Boom Bottom Pressure	MPa	kg/cm^2	psi	PUMP	

Code No.	Monitoring item (Display on screen)		Unit (Initial setting: ISO)			Component in charge	Remarks
			ISO	meter	inch		
01900	Pressure Switch 1	Swing	ON•OFF			PUMP	
		Travel	ON•OFF			PUMP	
		Boom Lower	ON•OFF			PUMP	
		Boom Raise	ON•OFF			PUMP	
		Arm Curl	ON•OFF			PUMP	
		Arm Dump	ON•OFF			PUMP	
01901	Pressure Switch 2	Bucket Curl	ON•OFF			PUMP	
		Bucket Dump	ON•OFF			PUMP	
		Service	ON•OFF			PUMP	
		Travel Steering	ON•OFF			PUMP	
02300	Solenoid Valve 1	Travel Junction	ON•OFF			PUMP	
		Swing Brake	ON•OFF			PUMP	
		Merge-divider	ON•OFF			PUMP	
		2-Stage Relief	ON•OFF			PUMP	
		Travel Speed	ON•OFF			PUMP	
02301	Solenoid Valve 2	Service Return	ON•OFF			PUMP	
02200	Switch Input 1	Lever Sw.	ON•OFF			PUMP	
		Swing Release Sw.	ON•OFF			PUMP	
		Swing Brake Sw.	ON•OFF			PUMP	
02201	Switch Input 2	Model Select 1	ON•OFF			PUMP	
		Model Select 2	ON•OFF			PUMP	
		Model Select 3	ON•OFF			PUMP	
		Model Select 4	ON•OFF			PUMP	
		Model Select 5	ON•OFF			PUMP	
		Overload Alarm	ON•OFF			PUMP	
02202	Switch Input 3	Key Switch (ACC)	ON•OFF			PUMP	
02204	Switch Input 5	Window Limit SW.	ON•OFF			PUMP	
		P Limit SW.	ON•OFF			PUMP	
		W Limit SW.	ON•OFF			PUMP	
04500	Monitor input 1	Key Switch	ON•OFF			MON	
		Start	ON•OFF			MON	
		Preheat	ON•OFF			MON	
		Light	ON•OFF			MON	
		Rad. Level	ON•OFF			MON	
04501	Monitor Input 2	Air cleaner	ON•OFF			MON	
		Eng. Oil Level	ON•OFF			MON	
		Battery Charge	ON•OFF			MON	
04502	Monitor Input 3	Swing Brake Sw.	ON•OFF			MON	
04503	Monitor Function Switches	F1	ON•OFF			MON	
		F2	ON•OFF			MON	
		F3	ON•OFF			MON	
		F4	ON•OFF			MON	
		F5	ON•OFF			MON	
		F6	ON•OFF			MON	
04504	Monitor 1st & 2nd Row Switches	SW1	ON•OFF			MON	
		SW2	ON•OFF			MON	
		SW3	ON•OFF			MON	
		SW4	ON•OFF			MON	
		SW5	ON•OFF			MON	
		SW6	ON•OFF			MON	

Code No.	Monitoring item (Display on screen)		Unit (Initial setting: ISO)			Component in charge	Remarks
			ISO	meter	inch		
04505	Monitor 3rd & 4th Row Switches	SW7	ON•OFF			MON	
		SW8	ON•OFF			MON	
		SW9	ON•OFF			MON	
		SW10	ON•OFF			MON	
		SW11	ON•OFF			MON	
		SW12	ON•OFF			MON	
04506	Monitor 5th Row Switches	SW13	ON•OFF			MON	
		SW14	ON•OFF			MON	
		SW15	ON•OFF			MON	
18800	Water In Fuel		ON•OFF			ENG	WIF: Water In Fuel
20216	ECM Build Version		—			ENG	
20217	ECM CAL Data Ver		—			ENG	
18900	ECM Internal Temp		°C	°C	°F	ENG	
20400	ECM Serial No		—			ENG	
20227	Monitor Ass'y P/N		—			MON	
20402	Monitor Serial No		—			MON	
20228	Monitor Prog. P/N		—			MON	
20229	Pump Con. Ass'y P/N		—			PUMP	
20403	Pump Con. Serial No		—			PUMP	
20230	Pump Con. Prog. P/N		—			PUMP	

★ Entry order of items in table
The items are entered in the order of display on the monitoring selection menu screen.

★ Unit
The display unit can be set to ISO, meter, or inch freely (Set it with Unit selecting in Initialization of the service menu).
"CA" in the display unit is an abbreviation for crankshaft angle.
"mg/st" in the display unit is an abbreviation for milligram/stroke.

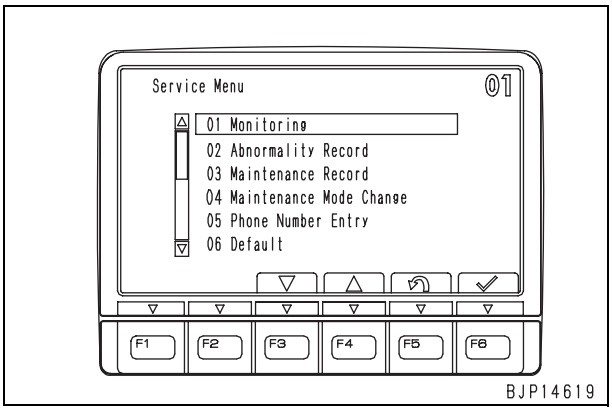
★ Component in charge
MON: The machine monitor is in charge of detection of monitoring information.
ENG: The engine controller is in charge of detection of monitoring information.
PUMP: The pump controller is in charge of detection of monitoring information.

Abnormality Record (Mechanical Systems)

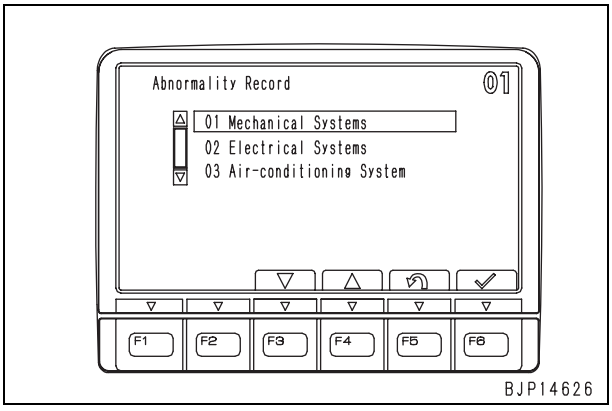
The machine monitor classifies and records the abnormalities which occurred in the past or which are occurring at present into the mechanical systems, electrical systems, and air-conditioning system or heater system.

To check the mechanical system abnormality record, perform the following procedures.

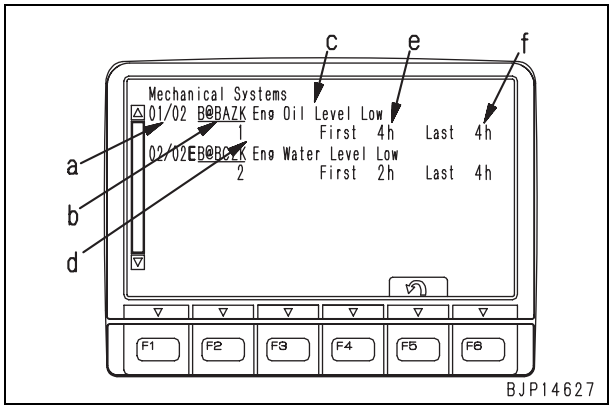
1. Selecting menu
   Select “Abnormality Record” on the “Service Menu” screen.



2. Selecting sub menu
   After the “Abnormality Record” screen is displayed, select “Mechanical Systems” with the function switches or numeral input switches.
   - [F3]: Move to lower item
   - [F4]: Move to upper item
   - [F5]: Return to service menu screen
   - [F6]: Confirm selection
   - ★ You may enter a 2-digit code with the numeral input switches to select the record of that code and confirm it with [F6].
   - ★ The following figure shows the display of the air conditioner specification. The heater specification and heaterless specification are different from each other in the display of "03 Air-conditioning System", which may not be displayed in the heaterless specification.



3. Information displayed on “abnormality record” screen
   On the “Mechanical Systems” screen, the following information is displayed.
   (a) : Occurrence order of abnormalities from latest one/Total number of records
   (b) : Failure code
   (c) : Contents of trouble
   (d) : Number of occurrence time (Displayable range: 0 – 65,535 times)
   (e) : Service meter reading at first occurrence
   (f) : Service meter reach at last occurrence
   - [F1]: Move to next page (screen) (if displayed)
   - [F2]: Move to previous page (screen) (if displayed)
   - [F5]: Return to abnormality record screen
   - ★ If no abnormality record is recorded, "No abnormality record" is displayed.
   - ★ If the number of occurrence time is 1 (first occurrence), the service meter reading at the first occurrence and that at the last occurrence are the same.
   - ★ If [**E**] is displayed on the left of a failure code, the abnormality is still occurring or resetting of it has not been confirmed.
   - ★ For all the failure codes that the machine monitor can record, see the failure codes table in “Abnormality Record (Electrical Systems)”.

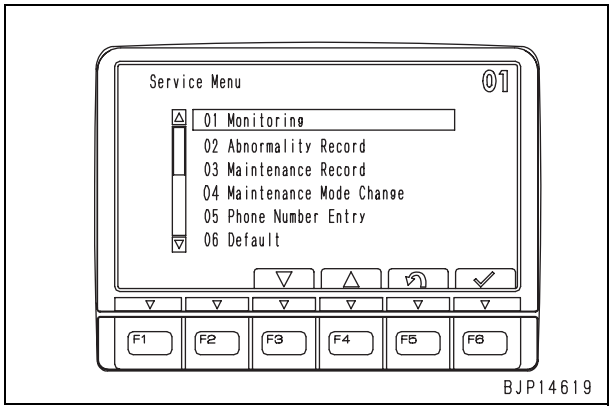


4. Resetting abnormality record
   The contents of the mechanical system abnormality record cannot be reset.

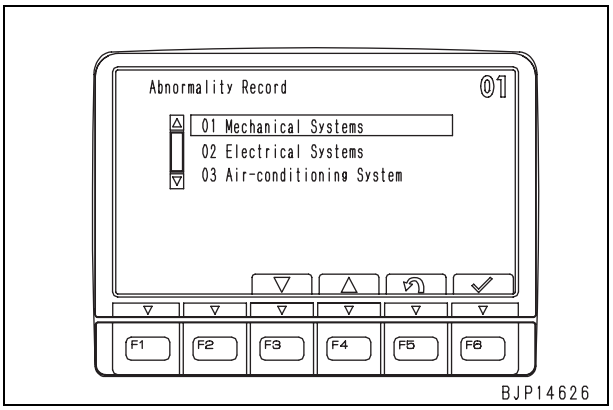
Abnormality Record (Electrical Systems)

The machine monitor classifies and records the abnormalities which occurred in the past or which are occurring at present into the mechanical systems, electrical systems, and air-conditioning system.
To check the electrical system abnormality record, perform the following procedures.

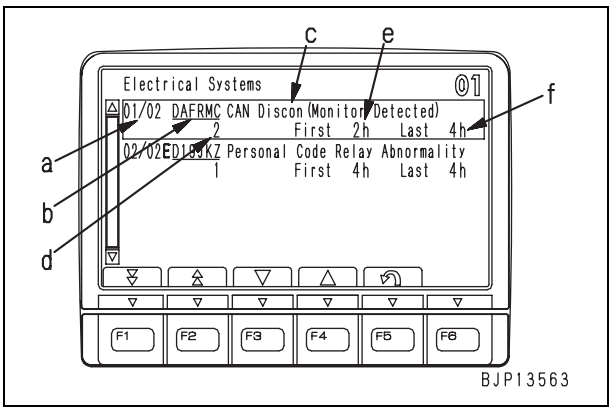
1. Selecting menu
   Select “Abnormality Record” on the “Service Menu” Screen.



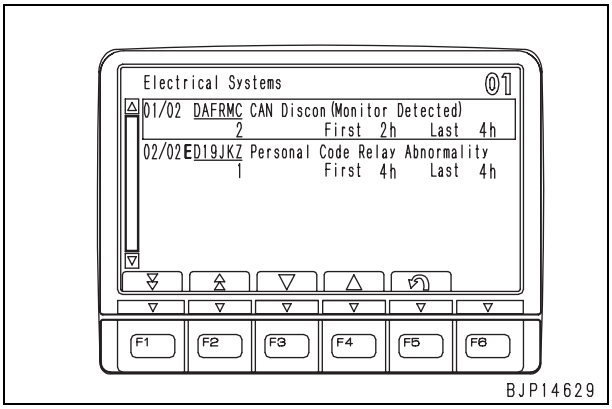
2. Selecting sub menu
   After the “Abnormality Record” screen is displayed, select “Electrical Systems” with the function switches or numeral input switches.
   - [F3]: Move to lower item
   - [F4]: Move to upper item
   - [F5]: Return to service menu screen
   - [F6]: Confirm selection
   - ★ You may enter a 2-digit code with the numeral input switches to select the record of that code and confirm it with [F6].
   - ★ The following figure shows the display of the air conditioner specification. The heater specification and heaterless specification are different from each other in the display of "03 Air-conditioning System", which may not be displayed in the heaterless specification.



3. Information displayed on “abnormality record” screen
   On the “Electrical Systems” screen, the following information is displayed.
   (a) : Occurrence order of abnormalities from latest one/Total number of records
   (b) : Failure code
   (c) : Contents of trouble
   (d) : Number of occurrence time (Displayable range: 0 – 65,535 times)
   (e) : Service meter reading at first occurrence
   (f) : Service meter reach at last occurrence
   - [F1]: Move to next page (screen) (if displayed)
   - [F2]: Move to previous page (screen) (if displayed)
   - [F3]: Move to lower item
   - [F4]: Move to upper item
   - [F5]: Return to “abnormality record” screen
   - ★ If no abnormality record is recorded, "No abnormality record" is displayed.
   - ★ If the number of occurrence time is 1 (first occurrence), the service meter reading at the first occurrence and that at the last occurrence are the same.
   - ★ If [**E**] is displayed on the left of a failure code, the abnormality is still occurring or resetting of it has not been confirmed.
   - ★ For all the failure codes that the machine monitor can record, see the failure codes table.

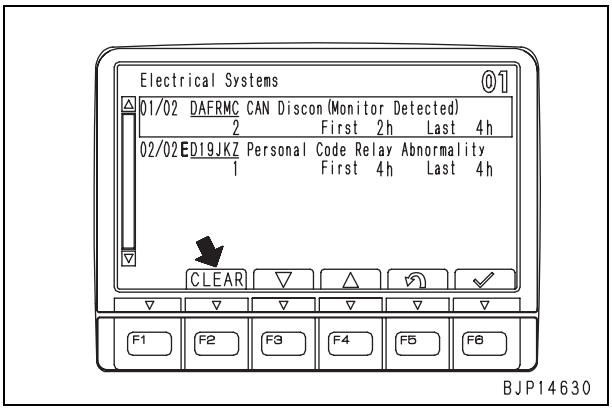


4. Resetting abnormality record
   1) While the “Electrical Systems” screen is displayed, perform the following operation with the numeral input switches.
      - Operation of switches (While pressing [4], perform the operation in order):
        [4] + [1] → [2] → [3]



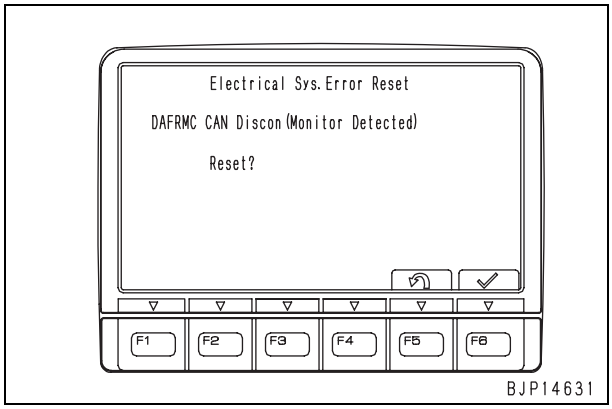
   2) Check that the screen is set in the reset mode, and then reset the items one by one or together with the function switches.
      ★ If the screen is set in the reset mode, [CLEAR] graphic mark is indicated at [F2].
      - [F2]: Reset all items
      - [F3]: Move to lower item
      - [F4]: Move to upper item
      - [F5]: Return to abnormality record screen
      - [F6]: Reset selected item

      ★ To reset items one by one: Select the item to be reset with [F3] or [F4] and press [F6].
      ★ To reset all items together: Press [F2], and all the items are reset, regardless of selection of the items.
      ★ If [**E**] is displayed on the left of a failure code, the resetting operation is accepted but the information is not reset.

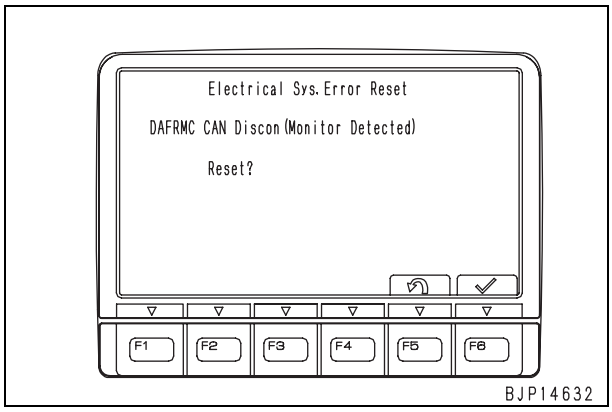


   3) After the “Electrical Sys. Error Reset” screen is displayed, operate the function switches.
      - [F5]: Return to “Electrical systems” screen (Reset mode)
      - [F6]: Execute reset

      ★ The following figure shows the screen displayed when the items are reset one by one (which is a little different from the screen displayed when all the items are reset together).



   4) If the screen to notify completion of reset is displayed and then the “Electrical Systems” (reset mode) screen is displayed, the reset of the abnormality record is completed.
      ★ After a while, the screen returns to the “Electrical Systems” screen.



Failure codes table

Action code	Failure code	Trouble (Displayed on screen)	Device in charge	Category of record
—	**A000N1**	Eng. Hi Out of Std	MON	Mechanical system
—	**AA10NX**	Air cleaner Clogging	MON	Mechanical system
—	**AB00KE**	Charge Voltage Low	MON	Mechanical system
—	**B@BAZG**	Eng. Oil Press. Low Speed Derate	MON	Mechanical system
—	**B@BAZG**	Eng. Oil Press. Low Torque Derate	MON	Mechanical system
—	**B@BAZK**	Eng Oil Level Low	MON	Mechanical system
—	**B@BCNS**	Eng. Overheat	MON	Mechanical system
—	**B@BCZK**	Eng. Water Lvl Low	MON	Mechanical system
E02	**B@HANS**	Hydr. Oil Overheat	MON	Mechanical system
E10	**CA111**	EMC Critical Internal Failure	ENG	Electrical system
E11	**CA115**	Eng Ne and Bkup Speed Sens Error	ENG	Electrical system
E11	**CA122**	Chg Air Press Sensor High Error	ENG	Electrical system
E11	**CA123**	Chg Air Press Sensor Low Error	ENG	Electrical system
E14	**CA131**	Throttle Sensor High Error	ENG	Electrical system
E14	**CA132**	Throttle Sensor Low Error	ENG	Electrical system
E15	**CA144**	Coolant Temp Sens High Error	ENG	Electrical system
E15	**CA145**	Coolant Temp Sens Low Error	ENG	Electrical system
E15	**CA153**	Chg Air Temp Sensor High Error	ENG	Electrical system
E15	**CA154**	Chg Air Temp Sensor Low Error	ENG	Electrical system
E15	**CA187**	Sens Supply 2 Volt Low Error	ENG	Electrical system
E15	**CA221**	Ambient Press Sens High Error	ENG	Electrical system
E15	**CA222**	Ambient Press Sens Low Error	ENG	Electrical system
E15	**CA227**	Sens Supply 2 Volt High Error	ENG	Electrical system
—	**CA234**	Eng Overspeed	ENG	Mechanical system
E15	**CA238**	Ne Speed Sens Supply Volt Error	ENG	Electrical system

Action code	Failure code	Trouble (Displayed on screen)	Device in charge	Category of record
E11	**CA271**	IMV/PCV1 Short Error	ENG	Electrical system
E11	**CA272**	IMV/PCV1 Open Error	ENG	Electrical system
E11	**CA322**	Inj #1 (L#1) Open/Short Error	ENG	Electrical system
E11	**CA323**	Inj #5 (L#5) Open/Short Error	ENG	Electrical system
E11	**CA324**	Inj #3 (L#3) Open/Short Error	ENG	Electrical system
E11	**CA325**	Inj #6 (L#6) Open/Short Error	ENG	Electrical system
E11	**CA331**	Inj #2 (L#2) Open/Short Error	ENG	Electrical system
E11	**CA332**	Inj #4 (L#4) Open/Short Error	ENG	Electrical system
E10	**CA342**	Calibration Code Incompatibility	ENG	Electrical system
E10	**CA351**	Injectors Drive Circuit Error	ENG	Electrical system
E15	**CA352**	Sens Supply 1 Volt Low Error	ENG	Electrical system
E15	**CA386**	Sens Supply 1 Volt High Error	ENG	Electrical system
E15	**CA428**	Water in Fuel Sensor High Error	ENG	Electrical system
E15	**CA429**	Water in Fuel Sensor Low Error	ENG	Electrical system
E10	**CA441**	Engine Controller Battery Voltage Low Error	ENG	Electrical system
E10	**CA442**	Engine Controller Battery Voltage High Error	ENG	Electrical system
E11	**CA449**	Rail Press Very High Error	ENG	Electrical system
E11	**CA451**	Rail Press Sensor High Error	ENG	Electrical system
E11	**CA452**	Rail Press Sensor Low Error	ENG	Electrical system
E15	**CA553**	Rail Press High Error	ENG	Electrical system
E15	**CA559**	Rail Press Low Error	ENG	Electrical system
E11	**CA689**	Ne Speed Sensor Error	ENG	Electrical system
E11	**CA731**	Bkup Speed Sens Phase Error	ENG	Electrical system
E10	**CA757**	All Persistent Data Lost Error	ENG	Electrical system
E11	**CA778**	Bkup Speed Sensor Error	ENG	Electrical system

Action code	Failure code	Trouble (Displayed on screen)	Device in charge	Category of record
E0E	**CA1633**	KOMNET Datalink Timeout Error	ENG	Electrical system
E14	**CA2185**	Throt Sens Sup Volt High Error	ENG	Electrical system
E14	**CA2186**	Throt Sens Sup Volt Low Error	ENG	Electrical system
E11	**CA2249**	Rail Press Very Low Error	ENG	Electrical system
E15	**CA2265**	Electric Lift Pump High Error	ENG	Electrical system
E15	**CA2266**	Electric Lift Pump Low Error	ENG	Electrical system
E15	**CA2555**	Grid Htr Relay Volt Low Error	ENG	Electrical system
E15	**CA2556**	Grid Htr Relay Volt High Error	ENG	Electrical system
—	**D110KB**	Battery Relay Output	PUMP	Electrical system
—	**D196KA**	Service Return Relay Disc.	PUMP	Electrical system
—	**D196KB**	Service Return Relay S/C	PUMP	Electrical system
E02	**DA25KP**	Press. Sensor Power Volt Low	PUMP	Electrical system
E0E	**DA2RMC**	Comm. Error (Pump Controller)	PUMP	Electrical system
—	**DA2SKQ**	Model Selection Signal For Model Code Input Mismatch	PUMP	Electrical system
E0E	**DAFRMC**	Comm. Error (Machine Monitor)	PUMP	Electrical system
—	**DHPAMA**	F Pump P.Sensor Error	PUMP	Electrical system
—	**DHPBMA**	R Pump P.Sensor Error	PUMP	Electrical system
—	**DHS3MA**	Arm Curl PPC Sen. Error	PUMP	Electrical system
—	**DHS4MA**	Bucket Curl PPC Sen. Error	PUMP	Electrical system
—	**DW43KA**	Travel Speed Sol. Disc.	PUMP	Electrical system
—	**DW43KB**	Travel Speed Sol. S/C	PUMP	Electrical system
E03	**DW45KA**	Swing Brake Sol. Disc.	PUMP	Electrical system
E03	**DW45KB**	Swing Brake Sol. S/C	PUMP	Electrical system
—	**DW91KA**	Travel Junction Sol. Disc.	PUMP	Electrical system
—	**DW91KB**	Travel Junction Sol. S/C	PUMP	Electrical system

Action code	Failure code	Trouble (Displayed on screen)	Device in charge	Category of record
—	**DWJ0KA**	Merge-divider Sol. Disc.	PUMP	Electrical system
—	**DWJ0KB**	Merge-divider Sol. S/C	PUMP	Electrical system
—	**DWK0KA**	2-stage Relief Sol. Disc.	PUMP	Electrical system
—	**DWK0KB**	2-stage Relief Sol. S/C	PUMP	Electrical system
E02	**DXA0KA**	PC-EPC Sol. Disc.	PUMP	Electrical system
E02	**DXA0KB**	PC-EPC Sol. S/C	PUMP	Electrical system
—	**DXE0KA**	LS-EPC Sol. Disc.	PUMP	Electrical system
—	**DXE0KB**	LS-EPC Sol. S/C	PUMP	Electrical system
—	**DXE4KA**	Service Current EPC Solenoid Disc.	PUMP	Electrical system
—	**DXE4KB**	Service Current EPC Solenoid S/C	PUMP	Electrical system
—	**DY20KA**	Wiper Working Disc.	MON	Electrical system
—	**DY20MA**	Wiper Parking Error	MON	Electrical system
—	**DY2CKB**	Washer Drive S/C	MON	Electrical system
—	**DY2DKB**	Wiper Drive (For) S/C	MON	Electrical system
—	**DY2EKB**	Wiper Drive (Rev) S/C	MON	Electrical system

★ This table lists the failed sections in the order of the failure code.
★ Those failure codes to which the corresponding number is not indicated in the action code space are not displayed on the ordinary screen if a failure is found. They are just recorded in the abnormality record (electrical system and mechanical system) of the service menu.
★ The category of record is used for indicating to which of the electrical and mechanical system of the service menu's abnormality record a given failure is classified.
★ **E** of at beginning the action code indicates the following state.
- With **E**: The failure still remains without being resolved.
- Without **E**: The failure is already resolved.

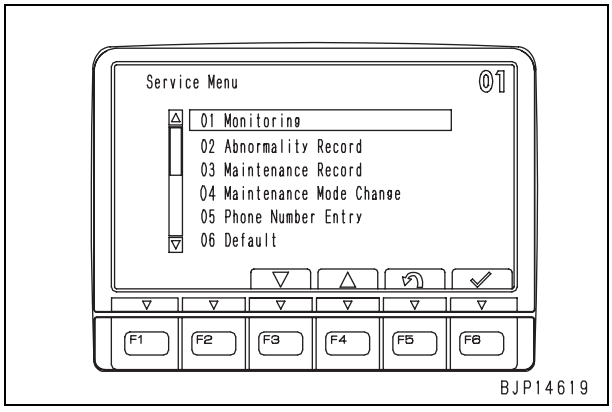
Abnormality Record (Air-conditioning System/ Heater System)

The machine monitor classifies and records the abnormalities which occurred in the past or which are occurring at present into the mechanical systems, electrical systems, and air-conditioning abnormalities or heater abnormalities.

To check the air-conditioning abnormality record or heater abnormality record, perform the following procedures.

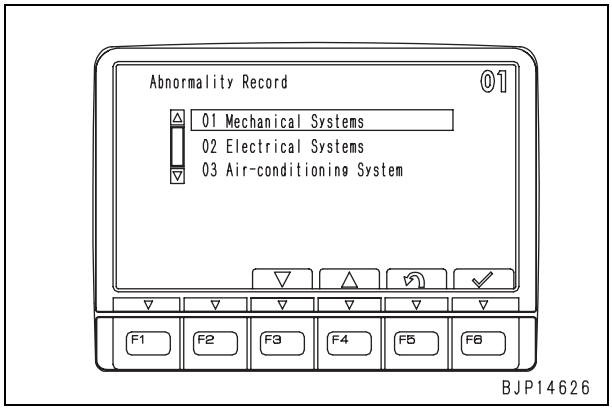
★ All the following figures show the air conditioner specification.

1. Selecting menu
   Select “Abnormality Record” on the “Service Menu” screen.



2. Selecting sub menu
   After the “Abnormality Record” screen is displayed, select “Air-conditioning System” or “Heater System” with the function switches or numeral input switches.
   - [F3]: Move to lower item
   - [F4]: Move to upper item
   - [F5]: Return to service menu screen
   - [F6]: Confirm selection

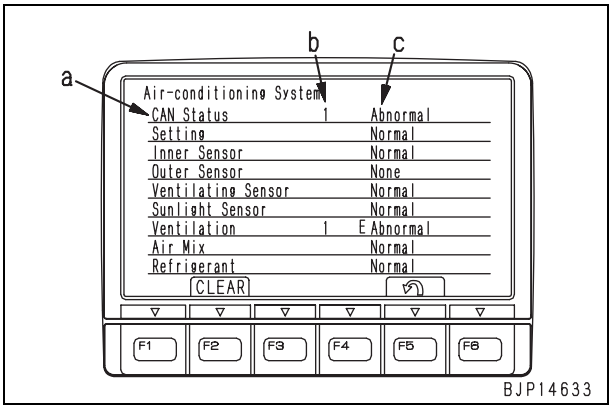
   ★ You may enter a 2-digit code with the numeral input switches to select the record of that code and confirm it with [F6].



3. Information displayed on “abnormality record” screen
   On the “Air-conditioning System” or “Heater System” screen, the following information is displayed.
   (a): System/Component name
   (b): Number of occurrence time
   (c): Condition (Normal or abnormal)
   - [F2]: Reset abnormality record
   - [F5]: Return to abnormality record screen

   ★ If [**E**] is displayed on the left of a condition, the abnormality is still occurring or resetting of it has not been confirmed.

   ★ If CAN disconnection is displayed in Communication condition, communication cannot be carried out normally. Accordingly, the conditions of other items are turned OFF.



4. Resetting abnormality record
   While the “abnormality record” screen is displayed, press [F2], and the number of occurrence time of abnormality is reset. If it is confirmed at this time that the abnormality has been reset, the display changes to Normal.

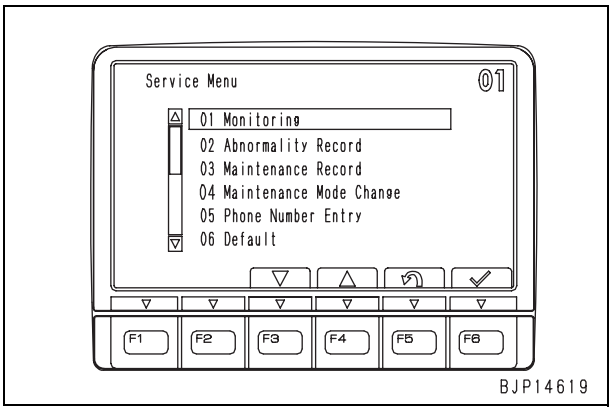
★ Heater specification
In the heater specification, the display of “Air-conditioning” is replaced with “Heater” and the items which are not related to the heater are not displayed.

★ Heaterless specification
In the heaterless specification, the abnormality record menu and screen are not displayed.

Maintenance Record

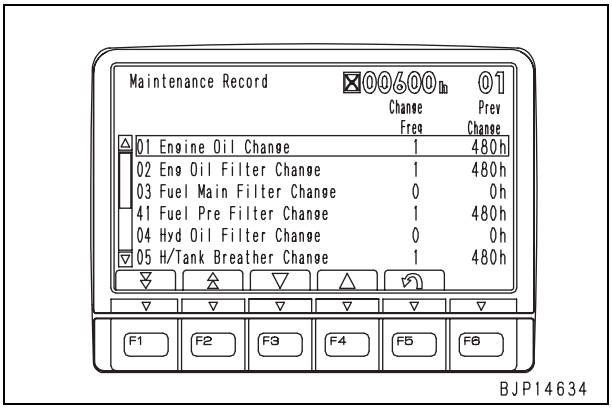
The machine monitor records the maintenance information of the filters, oils, etc., which the operator can display and check by the following operations. When maintenance is carried out, if the data are reset in the operator mode, the number of the times of maintenance is recorded in this section.

1. Selecting menu
   Select “Maintenance Record” on the “Service Menu” screen.



2. Selecting maintenance record item
   After the “Maintenance Record” screen is displayed, select an item to be checked with the function switches or numeral input switches.
   - [F1]: Move to next page (screen)
   - [F2]: Move to previous page (screen)
   - [F3]: Move to lower item
   - [F4]: Move to upper item
   - [F5]: Return to service menu screen

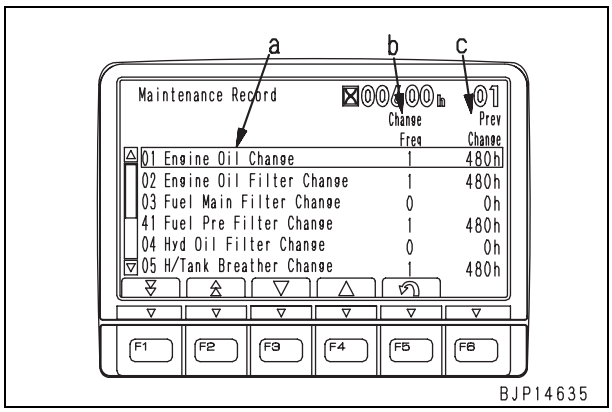
   ★ You may enter a 2-digit code with the numeral input switches to select the item of that code.



   ★ The following items can be selected in the maintenance record.

01 Engine oil change
02 Engine oil filter change
03 Fuel main filter change
41 Fuel pre-filter change
04 Hydraulic oil filter change
05 Hydraulic tank breather change
06 Corrosion resistor change
07 Damper case service
08 Final drive case oil change
09 Machinery case oil change
10 Hydraulic oil change

3. Items displayed on maintenance record screen
   The following items are displayed.
   (a) : Maintenance items
   (b) : Number of times of replacement up to now
   (c) : Service meter reading (SMR) at previous replacement

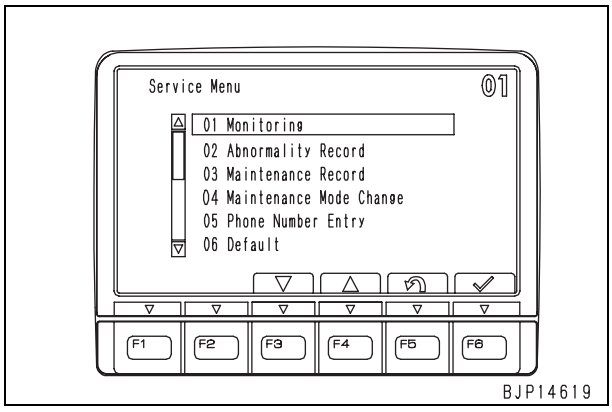


Maintenance Mode Change

The operating condition for maintenance function in the operation mode can be set and changed with this menu.

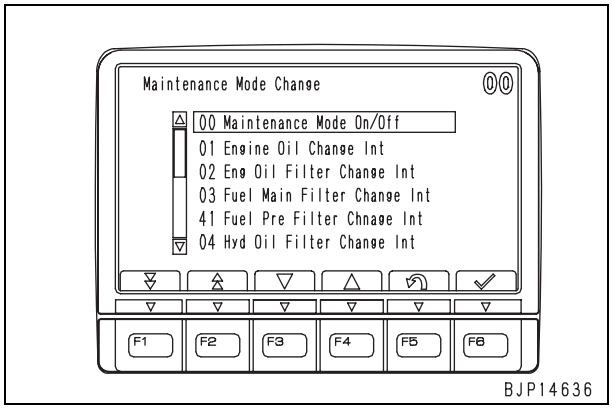
- Set function effective or ineffective
- Change set replacement interval (by items)
- Initialize all set replacement intervals

1. Selecting menu
   Select of “Maintenance Mode Change” on the “Service Menu” screen.



2. Selecting sub menu
   After the “Maintenance Mode Change” screen is displayed, select an item to change the setting with the function switches or numeral input switches.
   - [F1]: Move to next page (screen)
   - [F2]: Move to previous page (screen)
   - [F3]: Move to lower item
   - [F4]: Move to upper item
   - [F5]: Return to service menu screen

   ★ You may enter a 2-digit code with the numeral input switches to select the item of that code and confirm it with [F6].

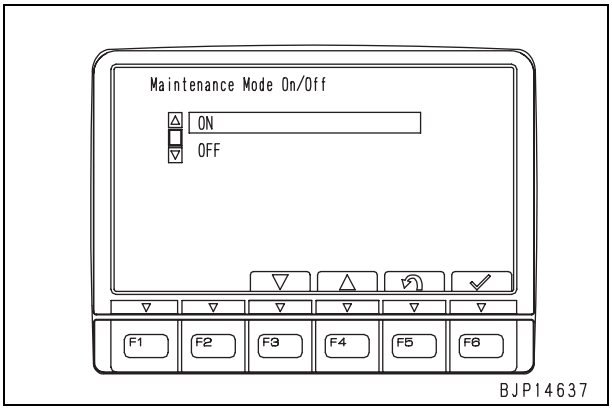


★ The following items can be selected on the Change of maintenance mode screen.

00 Maintenance mode on/off
01 Engine oil change int.
02 Engine oil filter change int.
03 Fuel main filter change int.
41 Fuel pre filter change int.
04 Hyd oil filter change int.
05 Hyd tank breather change int.
06 Corrosion resistor change int.
07 Damper case service int.
08 Final drive case oil change int.
09 Machinery case change int.
10 Hydraulic oil change int.
99 Initialize all items

3. Contents of setting of Maintenance mode on/off
   After selecting “Maintenance Mode On/Off”, if the screen is displayed, set ON or OFF with the function switches.
   - ON: Functions of all maintenance items are set effective in operator mode
   - OFF: Functions of all maintenance items are set ineffective in operator mode
   - [F3]: Move to lower item
   - [F4]: Move to upper item
   - [F5]: Cancel selection and return to Maintenance mode change screen
   - [F6]: Confirm selection and return to Maintenance mode change screen

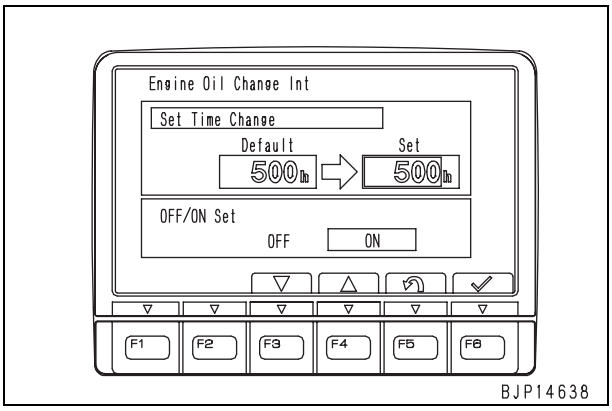
   ★ Even if ON/OFF of each item has been set, if the above setting is changed, it is applied.



4. Contents of setting of each maintenance item
   After selecting each maintenance item, if the screen is displayed, set the item with the function switches.
   - Initial value: Maintenance interval set in machine monitor (Recommended by manufacturer and not changeable).
   - Set value: Maintenance interval which can be set freely. Maintenance functions in operator mode operate on basis of this set time (which is increased or decreased by 50 hours).
   - ON: Maintenance function of this item is set effective in operator mode.
   - OFF: Maintenance function of this item is set ineffective in operator mode.
   - [F3]: Select Reduce set value (Upper) or OFF (Lower).
   - [F4]: Select Increase set value (Upper) or ON (Lower).
   - [F5]: Cancel setting before confirmation and return to Maintenance mode change screen.
   - [F6]: Confirm setting of upper or lower line.

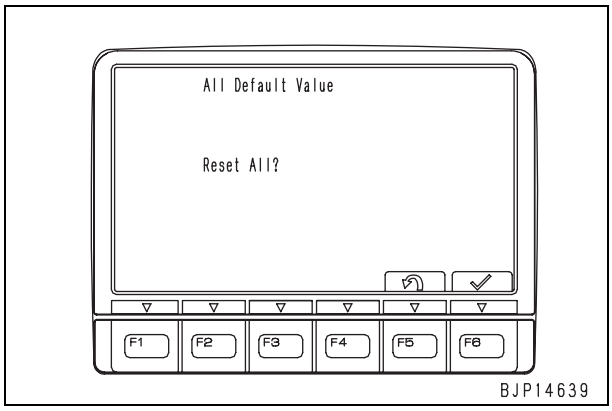
   ★ After the setting of the upper and lower lines is confirmed with [F6] and the screen changes to the Maintenance mode change screen with [F5], the setting is effective.

   ★ If the set value of an item set to “ON” is changed after 1 or more operating hours since the start of setting, the change is recognized as a resetting operation.



5. Function of initializing all items
   After selecting “All Default Value”, if the screen is displayed, set with the function switches.
   - If this operation is executed, the set values of all the maintenance items are initialized.
   - [F5]: Return to Maintenance mode change screen
   - [F6]: Execute initialization

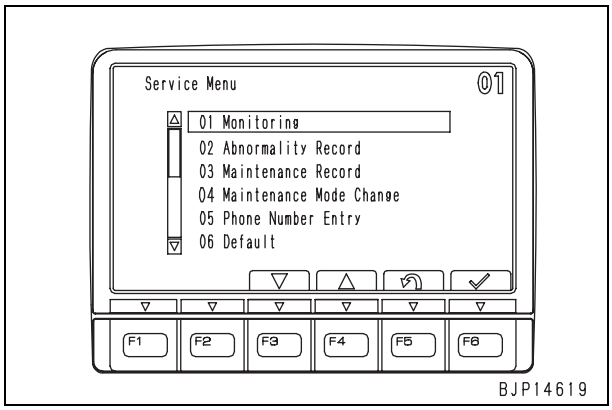
   ★ A while after [F6] is pressed, the initialization completion screen is displayed. Then, if the “Maintenance Mode Change” screen is displayed, initialization is completed.



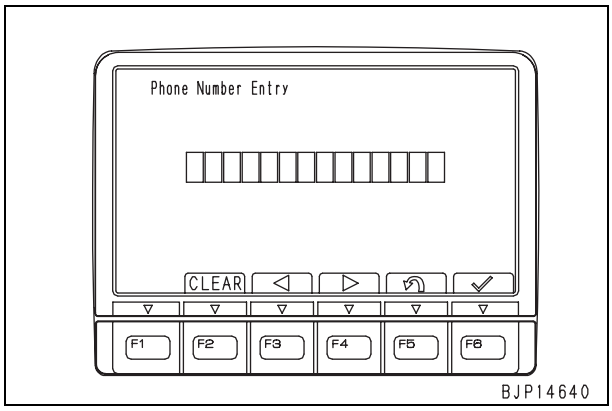
Phone Number Entry

The telephone No. displayed when the user code/ failure code is displayed in the operator mode can be input and changed according to the following procedure.
If a telephone No. is not input with this function, no telephone No. is displayed in the operator mode.

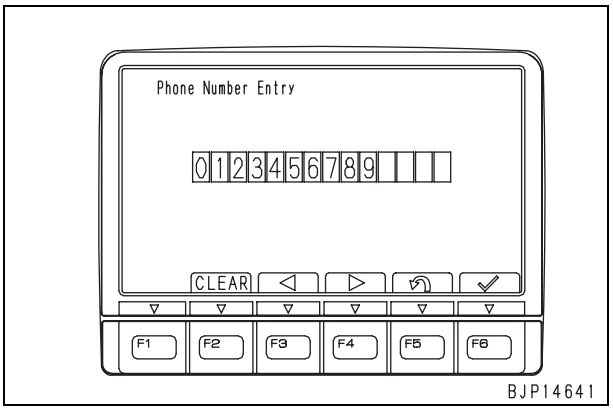
1. Selecting menu
   Select “Phone Number Entry” on the “Service Menu” screen.



2. Registering and changing telephone No.
   After the “Phone Number Entry” screen is displayed, register or change the telephone No.
   - [F2]: Reset all input No.
   - [F3]: Move to left position (if not blank)
   - [F4]: Move to right position (if not blank)
   - [F5]: Reset input digit/Return to service menu
   - [F6]: Confirm input



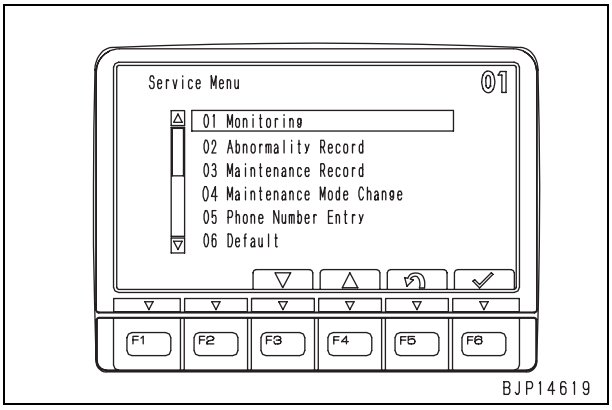
   ★ Up to 14 digits can be input from the left. Input nothing in the surplus positions.
   ★ If one of the input digits is wrong, move to that digit (orange background) and overwrite it with the correct digit.
   ★ If [F6] is pressed without inputting a digit, there is not information of telephone No. Accordingly, no telephone No. is displayed in the operator mode.



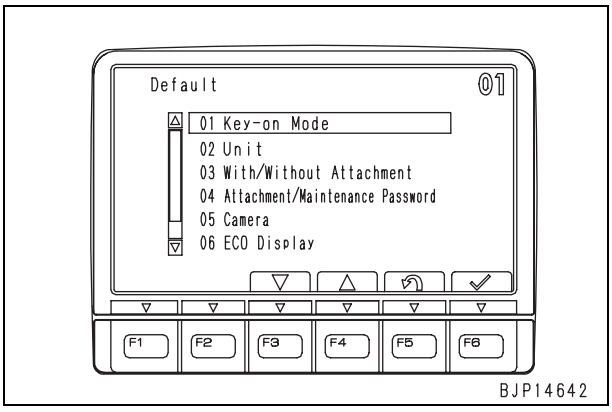
Default (Key-on Mode)

Check or change various settings related to the machine monitor and machine by "Default".
The function of working mode with key ON is used to set the working mode displayed on the machine monitor when the starting switch is turned ON.

1. Selecting menu
   Select “Default” on the “Service Menu” screen.

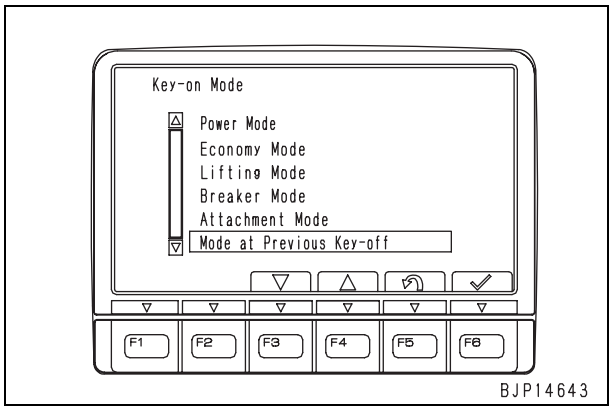


2. Selecting sub menu
   After the “Default” screen is displayed, select “Key-on Mode” with the function switches or numeral input switches.
   ★ Select this item similarly to an item on the “Service Menu” screen.



3. Selecting mode
   After the “Key-on Mode” screen is displayed, select the mode to be set with the function switches.
   - Power Mode: [P] is displayed when key is ON
   - Economy Mode: [E] is displayed when key is ON
   - Lifting Mode: [L] is displayed when key is ON
   - Breaker Mode: [B] is displayed when key is ON
   - Attachment Mode: [ATT] is displayed when key is ON
   - Mode at Previous Key-off: Final mode in previous operation is displayed when key is ON
   - [F3]: Move to lower item
   - [F4]: Move to upper item
   - [F5]: Cancel selection and return to “Default” screen
   - [F6]: Confirm selection and return to “Default” screen

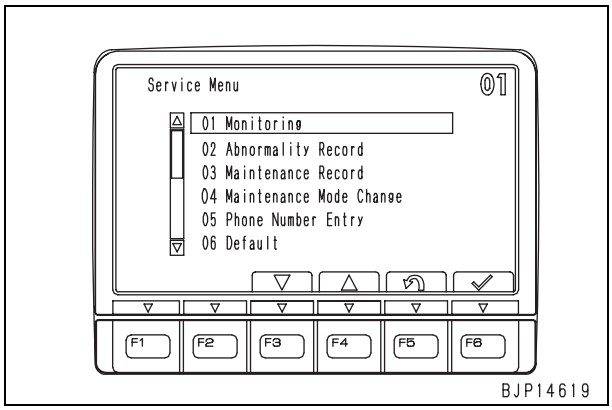
   ★ When the machine is delivered, Mode at previous key-OFF is set.
   ★ If "With attachment" is not set, the attachment mode cannot be selected.
   ★ While Attachment mode [ATT] is selected, if "Without attachment" is set, Power mode [P] is displayed when the key is turned ON.
   ★ If the engine is stopped while breaker mode [B] is selected in the operator mode, Breaker mode [B] is always displayed, regardless of the above setting.



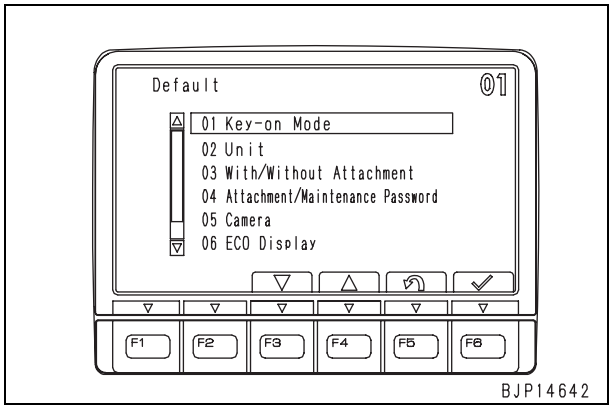
Default (Unit)

Check or change various settings related to the machine monitor and machine by "Default".
The unit selecting function is used to select the unit of the data displayed for monitoring, etc.

1. Selecting menu
   Select “Default” on the “Service Menu” screen.

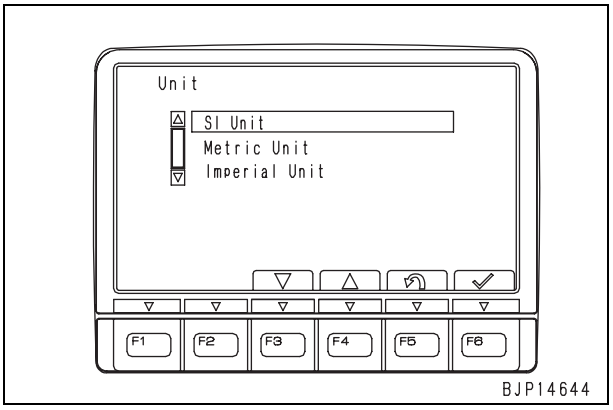


2. Selecting sub menu
   After the “Default” screen is displayed, select “Unit” with the function switches or numeral input switches.
   ★ Select this item similarly to an item on the “Service Menu” screen.



3. Selecting unit
   After the “Unit” screen is displayed, select the unit to be set with the function switches.
   - [F3]: Move to lower unit
   - [F4]: Move to upper unit
   - [F5]: Cancel selection and return to “Default” screen
   - [F6]: Confirm selection and return to “Default” screen

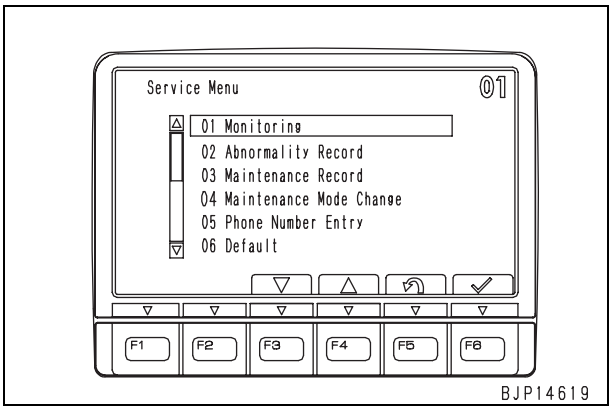
★ When the machine is delivered, the SI unit system is set.



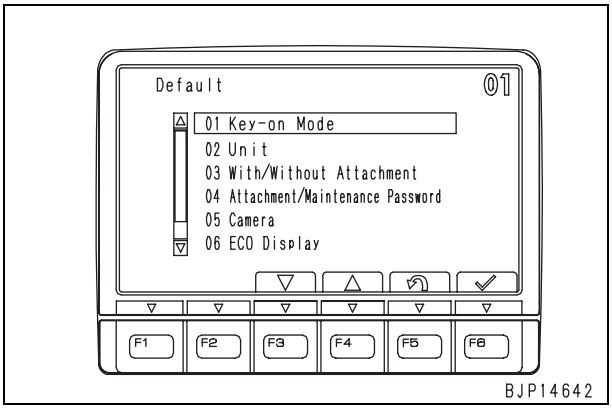
Default (With/Without Attachment)

Check or change various settings related to the machine monitor and machine by "Default".
The "With/Without attachment" function is used to set an installed or a remove attachment.

1. Selecting menu
   Select "Default" on the “Service Menu” screen.

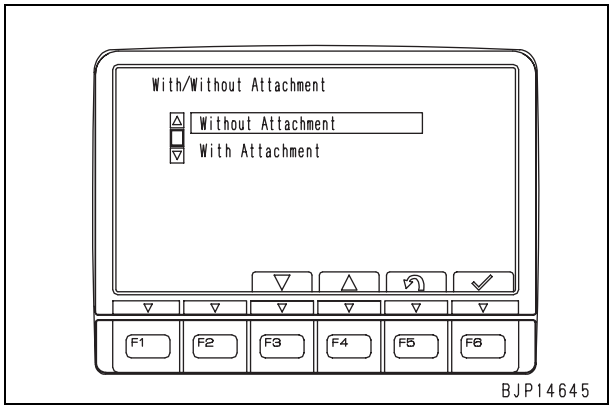


2. Selecting sub menu
   After the "Default" screen is displayed, select “With/Without Attachment” with the function switches or numeral input switches.
   ★ Select this item similarly to an item on the “Service Menu” screen.



3. Selecting With/Without
   After the “With/Without Attachment” screen is displayed, select the setting with the function switches.
   - Without Attachment:
     When attachment is not installed
   - With Attachment:
     When attachment is installed
   - [F3] : Move to lower item
   - [F4] : Move to upper item
   - [F5] : Cancel selection and return to Default screen
   - [F6] : Confirm selection and return to Default screen

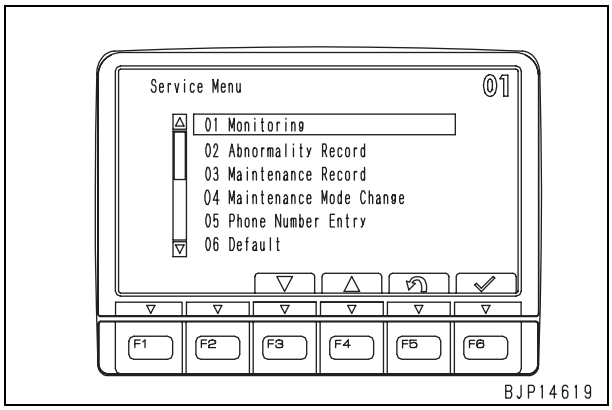
   ★ When an attachment is installed, if this setting is not carried out normally, the attachment cannot be set in the operator mode. As a result, the attachment may not work normally or the hydraulic components may have trouble.



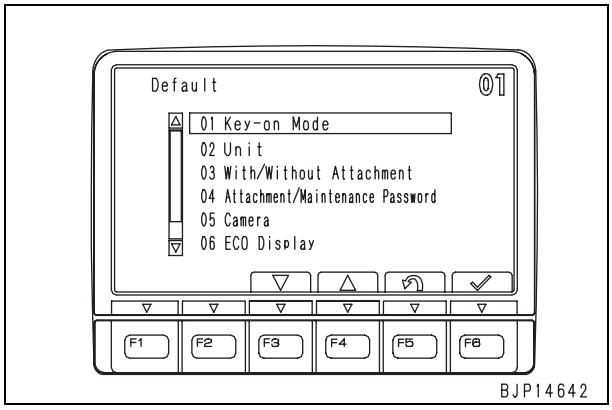
Default (Attachment/Maintenance Password)

Check or change various settings related to the machine monitor and machine by "Default".
The function of setting attachment/maintenance password is used to set the display of the password screen when the functions related to the attachment and maintenance are used in the operator mode.

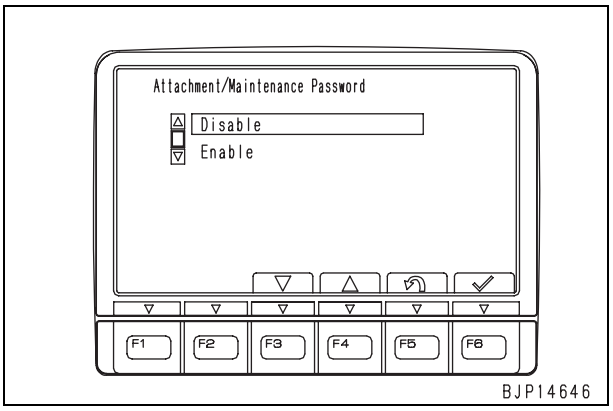
1. Selecting menu
   Select “Default” on the “Service Menu” screen.



2. Selecting sub menu
   After the “Default” screen is displayed, select “Attachment/Maintenance Password” with the function switches or numeral input switches.
   ★ Select this item similarly to an item on the “Service Menu” screen.



3. Selecting Disable/Enable
   After the Attachment/Maintenance Password screen is displayed, select the setting with the function switches.
   - Disable : Password screen is not displayed
   - Enable : Password screen is displayed
   - [F3] : Move to lower item
   - [F4] : Move to upper item
   - [F5] : Cancel selection and return to "Default" screen
   - [F6] : Confirm selection and return to "Default" screen



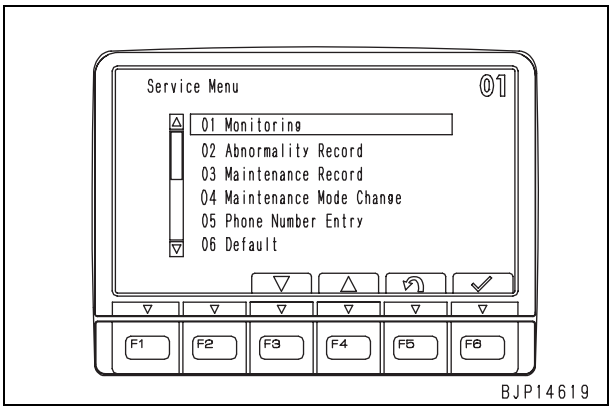
4. Displaying attachment/maintenance password screen
   When the following operation is performed, the password screen is displayed in the operator mode.
   - Maintenance mode: The Maintenance table screen is changed to the Maintenance interval reset screen.
   - User mode: On the User menu screen, the Breaker/Attachment setting menu is selected and the screen is changed to the Attachment setting menu screen.

5. Changing attachment/maintenance password
   The password can be changed by operating the switches specially in the operator mode.
   ★ See Attachment/Maintenance password changing function in the operator mode.
   ★ Default password: [000000]
   ★ If the password setting is changed from Enable to Disable, the password is reset to the default. When Enable is set again, be sure to set a new password.
   ★ The attachment/maintenance password is different from the engine start lock password.

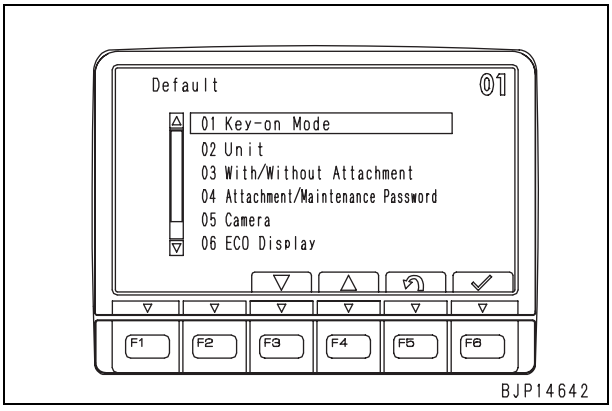
Default (Camera)

Check or change various settings related to the machine monitor and machine by "Default".
The camera setting function is used to set installation and removal of a camera.

1. Selecting menu
   Select “Default” on the “Service Menu” screen.

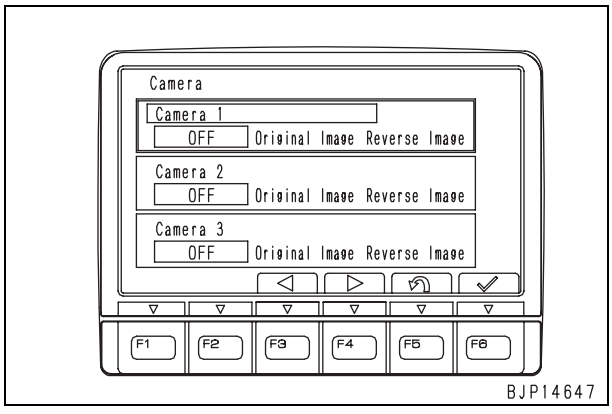


2. Selecting sub menu
   After the “Default” screen is displayed, select “Camera” with the function switches or numeral input switches.
   ★ Select this item similarly to an item on the “Service Menu” Screen.



3. Selecting camera setting
   After the “Camera” setting screen is displayed, select the setting with the function switches.
   - OFF: Camera is not used
   - Original Image: Image of connected camera is displayed in original position (as in mirror, used as back monitor)
   - Reverse Image: Image of connected camera is displayed in reverse position (as seen directly, used as front or side monitor)
   - [F3]: Move to left item
   - [F4]: Move to right item
   - [F5]: Cancel setting before confirmation and return to “Default” screen
   - [F6]: Confirm selection in each line

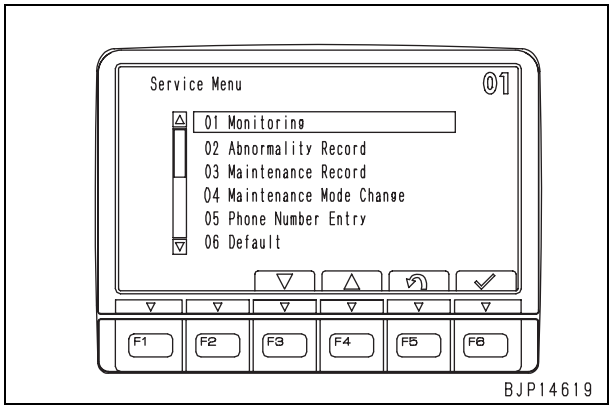
   ★ After “Camera” screen is displayed, camera 1 can be always set. When 2 or more cameras are connected, if camera 1 is set, the screen changes to setting of camera 2 automatically.
   ★ After confirming the setting of each line with [F6], return to the "Default" screen with [F5], and the setting is effective.
   ★ If a camera is connected but not set normally with this function, the graphic mark of camera is not displayed at [F3] in the operator mode. Accordingly, the image of the camera cannot be used.
   ★ If 2 or more cameras are connected, be sure to set the use of them from camera 1 in order.
   ★ The function of displaying 2 images simultaneously is effective when use of camera 1 and camera 2 is set.
   ★ When a camera is installed, check that the displayed image is not inverted horizontally.



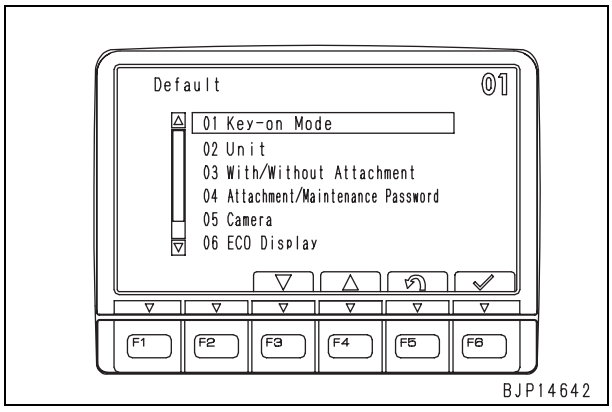
Default (ECO Display)

Check or change various settings related to the machine monitor and machine by "Default".
The ECO display setting function is used to set the display of the ECO gauge and energy saving guidance.

1. Selecting menu
   Select “Default” on the “Service Menu” screen.



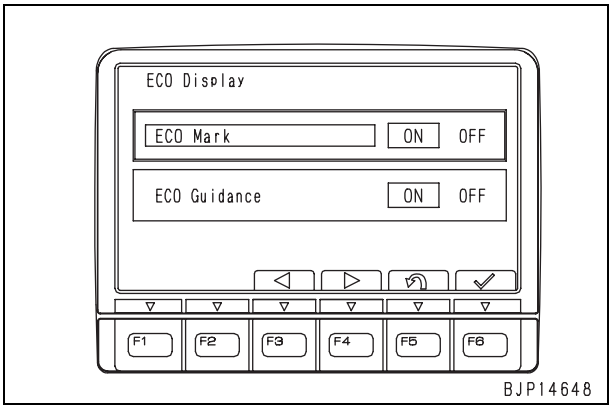
2. Selecting sub menu
   After the “Default” screen is displayed, select “ECO Display” with the function switches or numeral input switches.
   ★ Select this item similarly to an item on the “Service Menu” screen.



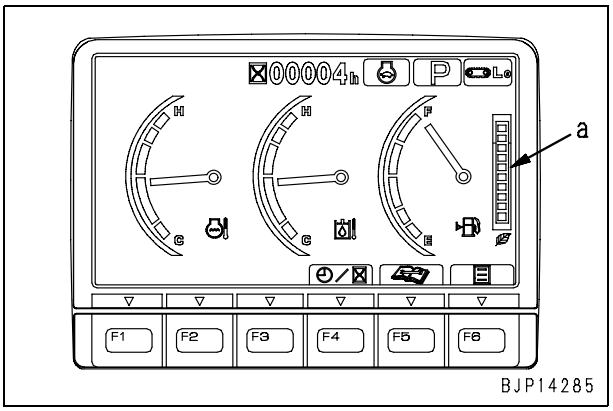
3. Selecting display setting
   After the “ECO Display” screen is displayed, select the setting with the function switches.
   - ON : Display ECO
   - OFF: Do not display ECO
   - [F3] : Move to left item
   - [F4] : Move to right item
   - [F5] : Cancel setting before confirmation and return to "Default" screen
   - [F6] : Confirm selection in each line

   ★ After confirming the setting of the upper and lower lines with [F6], return to the "Default" screen with [F5], and the setting is effective.

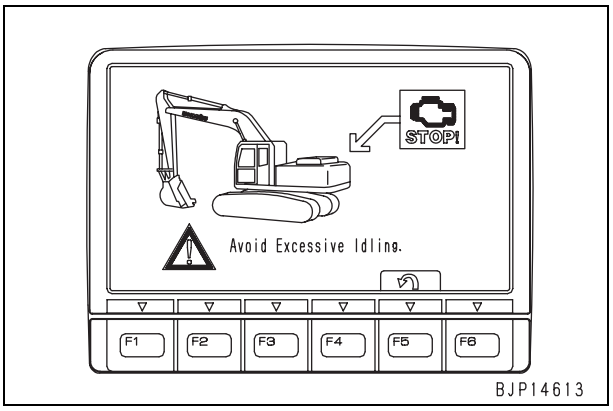
★ If ECO display is turned ON, ECO is displayed when the screen changes to the ordinary screen. Even if the energy saving guidance is turned ON, however, it is not displayed if the condition for display is not satisfied on the ordinary screen.



★ Display of ECO gauge (a)



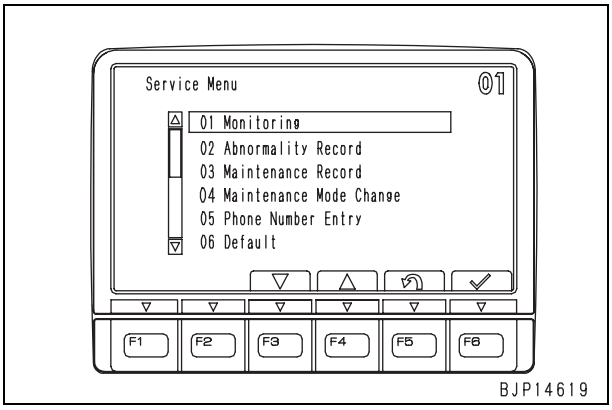
★ Display of energy saving guidance



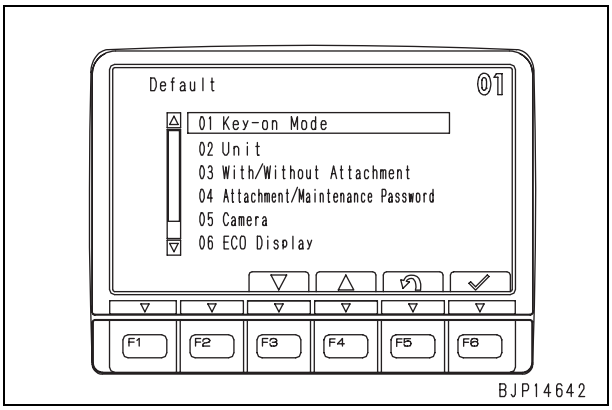
Default (Breaker Detect)

Check or change various settings related to the machine monitor and machine by "Default".
The function of setting breaker automatic judgment is used to set the display to give warning when the breaker is used in an improper working mode.

1. Selecting menu
   Select “Default” on the “Service Menu” screen.

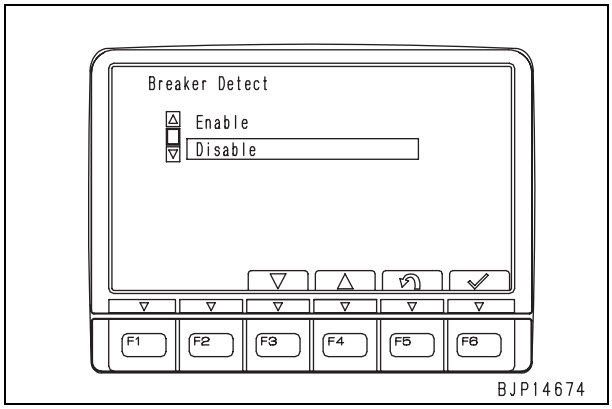


2. Selecting sub menu
   After the “Default” screen is displayed, select "Breaker Detect" with the function switches or numeral input switches.
   ★ Select this item similarly to an item on the “Service menu” screen.

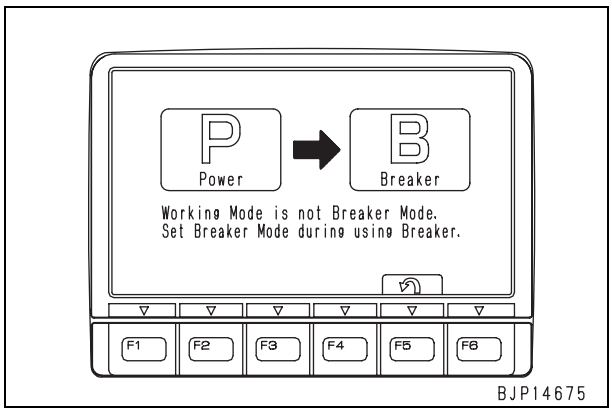


3. Selecting display setting
   After the "Breaker Detect" screen is displayed, select the setting with the function switches.
   - [F3]: Move to lower item
   - [F4]: Move to upper item
   - [F5]: Cancel selection and return to Default screen
   - [F6]: Confirm selection and return to Default screen

   ★ When the machine is delivered, Disable is set.



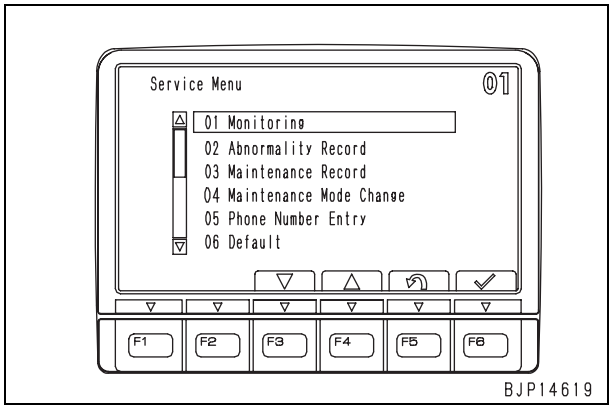
★ Display of "Breaker Detect"



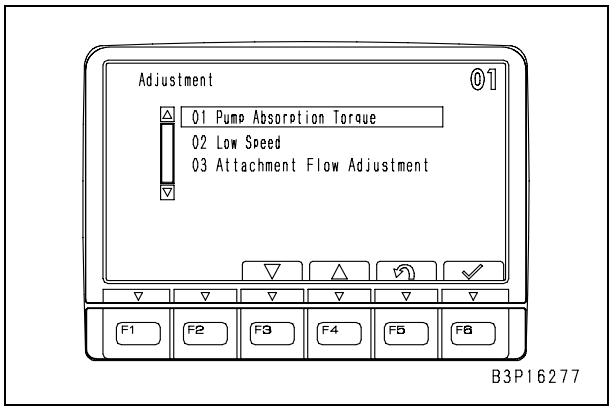
Adjustment (Pump Absorption Torque)

The operator can adjust various items related to the machine with the machine monitor.
The pump absorption torque function is used to finely adjust the absorption torque on the rear side of the hydraulic pump.

1. Selecting menu
   Select “Adjustment” on the “Service Menu” screen.

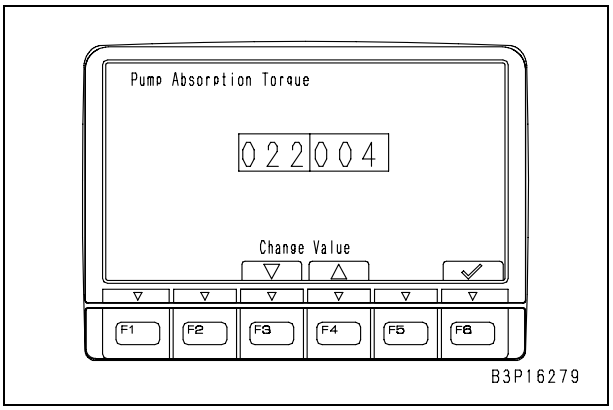


2. Selecting sub menu
   After the “Adjustment” screen is displayed, select “Pump Absorption Torque” with the function switches or numeral input switches.
   ★ Select this item similarly to an item on the “Service Menu” screen.



3. Selecting absorption torque
   After the "Pump Absorption Torque" screen is displayed, select a set value on the right side with the function switches.
   - Set value: For actual torque adjustment value, see table
   - [F3]: Increase set value
   - [F4]: Decrease set value
   - [F6]: Confirm setting and return to Adjustment menu screen

   ★ The 3 digits on the left side do not vary since they are the code of this function.



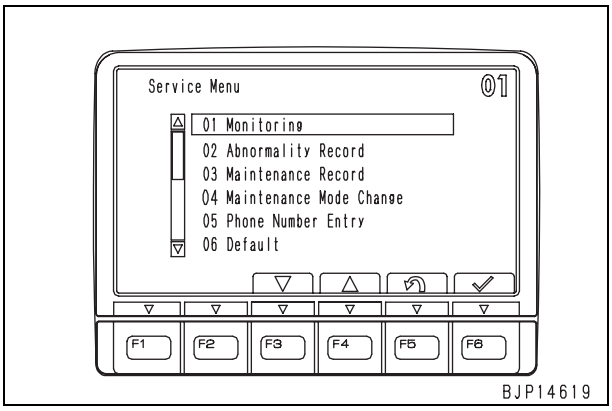
★ Relationship between set value and torque adjustment value

Code	Set value	Torque adjustment value
022	000	+78.4 Nm {+8 kgm}
	001	+58.8 Nm {+6 kgm}
	002	+39.2 Nm {+4 kgm}
	003	+19.6 Nm {+2 kgm}
	004	0 Nm {0 kgm}
	005	–19.6 Nm {–2 kgm}
	006	–39.2 Nm {–4 kgm}
	007	–58.8 Nm {–6 kgm}
	008	–78.4 Nm {–8 kgm}

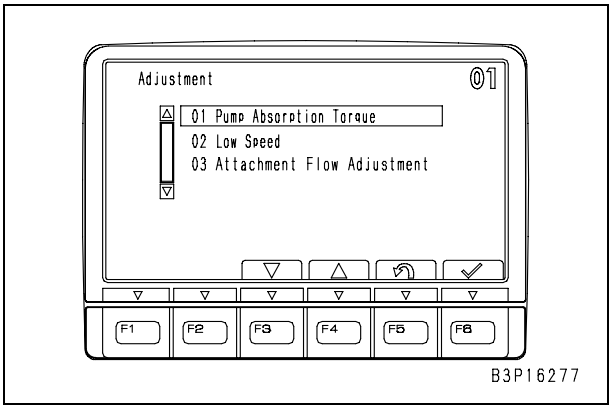
Adjustment (Low speed)

The operator can adjust various items related to the machine with the machine monitor.
The travel Low speed setting function is used to finely adjust the travel Low speed.

1. Selecting menu
   Select “Adjustment” on the “Service Menu” screen.

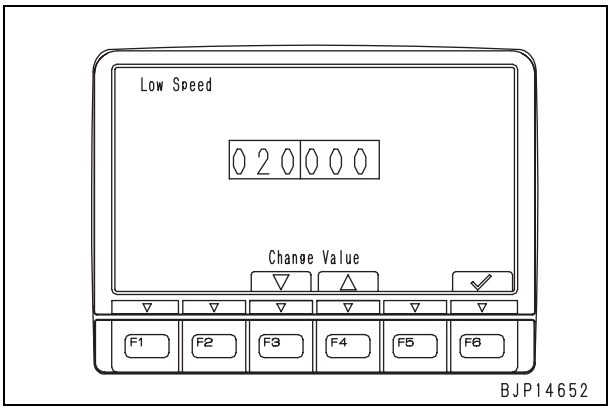


2. Selecting sub menu
   After the “Adjustment” screen is displayed, select “Low speed” with the function switches or numeral input switches.
   ★ Select this item similarly to an item on the “Service Menu” screen.



3. Selecting travel Low speed
   After the "Low Speed" setting screen is displayed, select a set value on the right side with the function switches.
   - Set value: For actual travel Low speed value, see table
   - [F3]: Increase set value
   - [F4]: Decrease set value
   - [F6]: Confirm setting and return to Adjustment menu screen

   ★ The 3 digits on the left side do not vary since they are the code of this function.



★ Relationship between set value and travel Low speed value

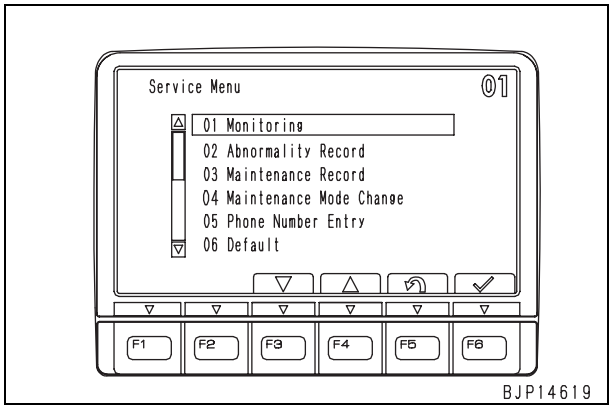
Code	Set value	Travel Low speed value
020	000	3.2 km/h
	001	2.8 km/h
	002	3.0 km/h
	003	3.4 km/h

Adjustment (Attachment Flow Adjustment)

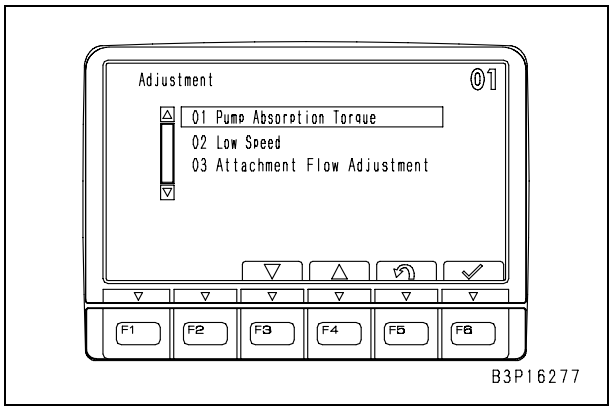
The operator can adjust various items related to the machine with the machine monitor.

The function of "Attachment Flow Adjustment" is used to finely adjust the oil flow to the attachment in compound operation.

1. Selecting menu
   Select “Adjustment” on the “Service Menu” screen.

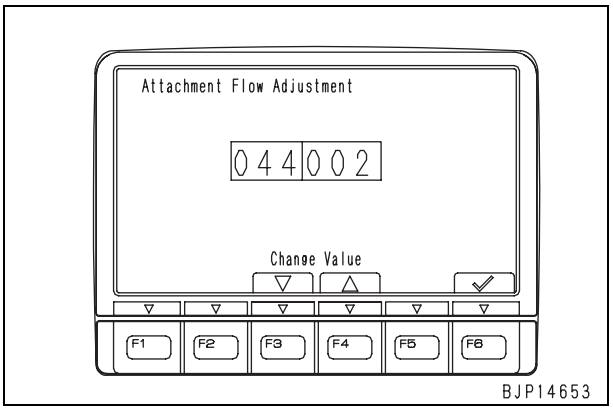


2. Selecting sub menu
   After the “Adjustment” screen is displayed, select “Attachment Flow Adjustment” with the function switches or numeral input switches.
   ★ Select this item similarly to an item on the “Service Menu” screen.



3. Selecting distribution of oil flow
   After the screen of "Attachment Flow Adjustment" is displayed, select a set value on the right side with the function switches.
   - Set value: For actual distribution of flow, see table
   - [F3]: Increase set value
   - [F4]: Decrease set value
   - [F6]: Confirm setting and return to Adjustment menu screen

   ★ The 3 digits on the left side do not vary since they are the code of this function.



★ Relationship between set value and distribution of flow to attachment

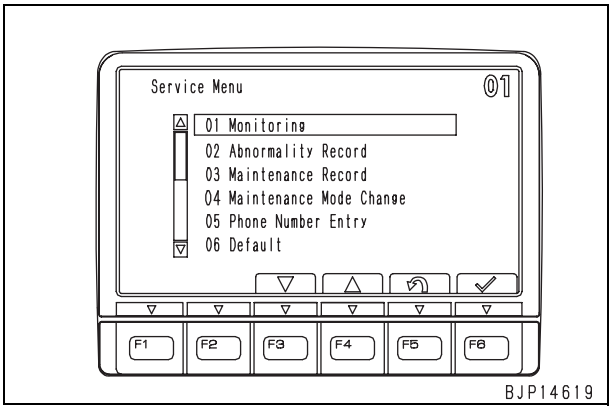
Code	Set value	Distribution of flow to attachment
044	000	50 %
	001	70 %
	002	100 %
	003	40 %

Cylinder Cut-Out

The operator can perform "Cylinder Cut-Out" operation with the machine monitor.

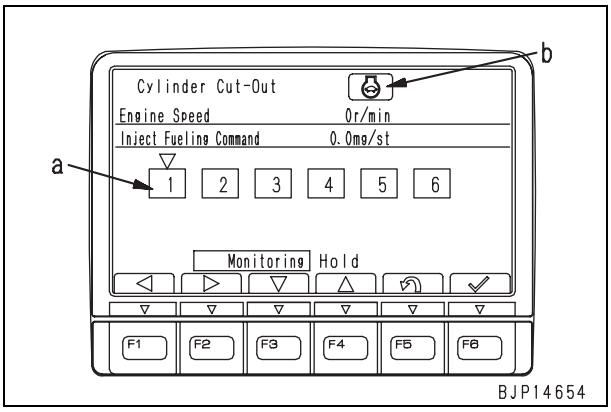
"Cylinder Cut-Out" operation means to run the engine with 1 or more fuel injectors disabled electrically to reduce the number of effective cylinders. This operation is used to find out a cylinder which does not output power normally (combustion in it is abnormal).

1. Selecting menu
   Select “Cylinder Cut-Out” on the “Service Menu” screen.



2. Selecting cylinder to be disabled
   After the "Cylinder Cut-Out" screen is displayed, select a cylinder to be Cut-Out with the function switches.
   - [F1]: Move selection mark (▽) to left
   - [F2]: Move selection mark (▽) to right
   - [F3]: Reset holding
   - [F4]: Hold
   - [F5]: Return to service menu screen
   - [F6]: Confirm selection

   ★ This operation may be performed while the engine is running.
   ★ When [F6] is pressed, if background (a) of the selected cylinder No. becomes white, the cylinder is Cut-Out.
   ★ If the machine monitor Cut-Out a cylinder but the engine controller cannot Cut-Out that cylinder, the background (a) of the cylinder No. becomes yellow.
   ★ One or more cylinders can be Cut-Out.
   ★ In the cylinder Cut-Out operation, the auto-deceleration function can be selected. If the auto-deceleration is turned ON, auto-deceleration monitor (b) is displayed.

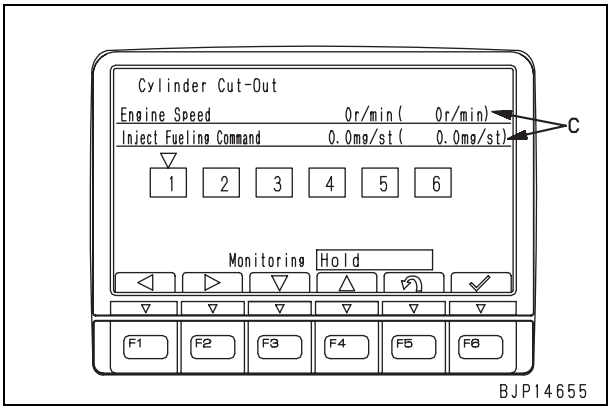


3. Resetting Cut-Out cylinder
   When changing a cylinder to be Cut-Out or when Cylinder Cut-Out operation is finished, select a Cut-Out cylinder to be reset with the function switches.

   ★ This operation may be performed while the engine is running.
   ★ When [F6] is pressed, if background (a) of the selected cylinder No. becomes blue, the cylinder is reset.
   ★ If the machine monitor resets a Cut-Out cylinder but the engine controller cannot reset that Cut-Out cylinder, the background (a) of the cylinder No. becomes red.
   ★ The Cut-Out operation is not automatically reset after the screen returns to the operator mode. Accordingly, be sure to perform the resetting operation after the cylinder cut-out operation is finished.

4. Function of holding displayed information
   If [F4] is pressed during the cylinder Cut-Out operation, the displayed information is newly held (c) (The real-time information is kept displayed on the left side).
   While the information is held, if [F3] is pressed, the holding function is reset.

   ★ The holding function is effective, regardless of setting of the reduced cylinder mode operation.



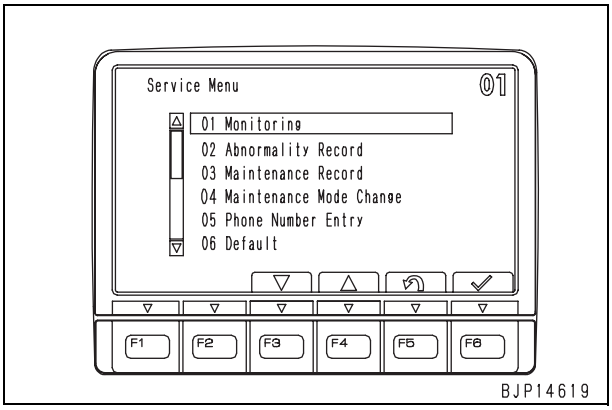
[Reference]

- If a normally operating cylinder is Cut-Out, the following phenomena occur.
  1) Lowering of engine speed
  2) Increase of final injection rate command (quantity)
- If the engine is running near the high idle, however, the engine speed may not lower for the reason of engine control.
- In this case, lower the engine speed with the fuel control dial and judge by increase of the injection rate command.

No Injection

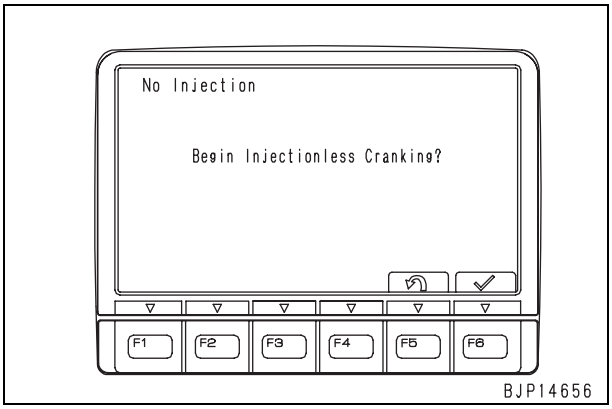
If the engine is operated after long storage of the machine, it may be worn or damaged because of insufficient lubrication with oil. To prevent this, the function to lubricate the engine before starting it by cranking it without injecting fuel is installed.
Set the no-injection cranking while the engine is stopped.

1. Selecting menu
   Select “No Injection” on the “Service Menu” screen.

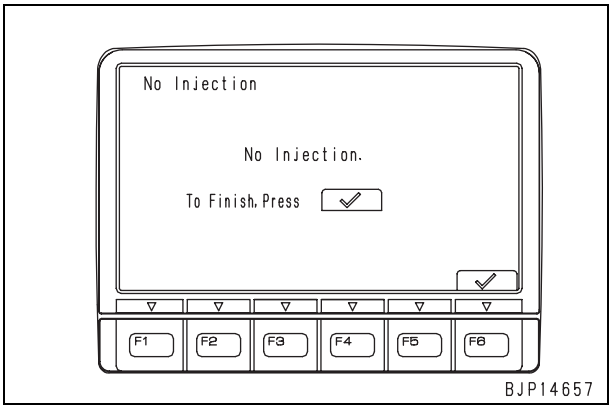


2. Displaying check screen
   If the "No injection" screen is displayed, the machine monitor asks the operator if no injection cranking should be performed. Answer with the function switch.
   - [F5]: Do not perform (Return to Service menu screen)
   - [F6]: Perform

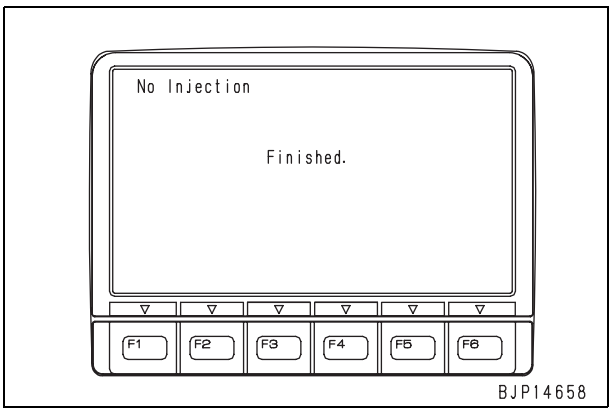
   ★ While the screen is changing to the following screen, the screen of "Communication between controllers is being checked" is displayed.



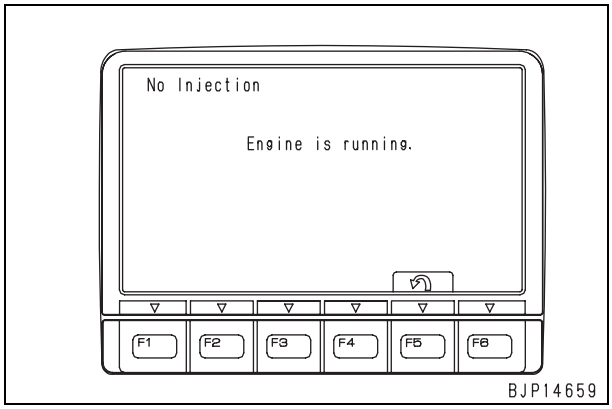
3. Starting no injection cranking
   If no injection cranking (Fuel injection in no cylinders) becomes effective, that is displayed on the screen. Under this condition, crank the engine with the starting motor.
   ★ While the screen is changing to the following screen, the screen of "Setting is being prepared" is displayed.
   ★ Limit the cranking time to 20 seconds to protect the starting motor.



4. Finishing no injection cranking
   After completing the no injection cranking operation, press [F6], and finish of no injection cranking is displayed and the screen returns to the “Service Menu” screen automatically.



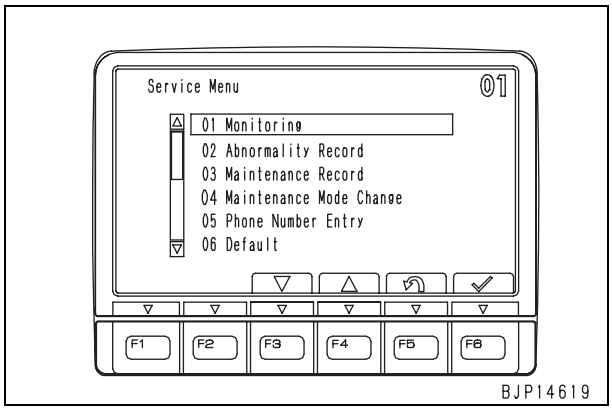
5. Prohibiting no injection cranking
   If the operator tries to perform the no injection cranking while the engine is running, the message that the engine is running is displayed and the no injection cranking is not set effective.
   ★ This function can be selected even while the engine is running. If the no injection cranking is performed, however, the message of "Engine is running" is displayed on the screen.



Fuel Consumption

This function calculates the hourly fuel consumption from the actual fuel consumption in a measuring period and indicates it.

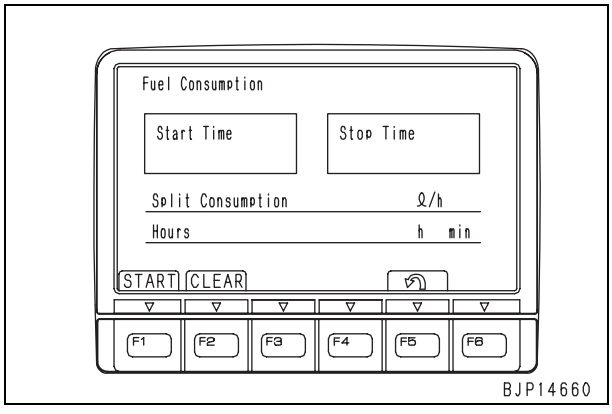
1. Selecting menu
   Select “Fuel Consumption” on the “Service Menu” screen.



2. Starting measurement
   After the screen of “Fuel Consumption” is displayed, start measurement with the function switches.
   - [F1]: Start
   - [F2]: Clear
   - [F5]: Return to Service menu screen

   ★ When the screen of Fuel consumption is displayed, if a data is indicated, it is the data of the previous measurement. This data is not an obstacle to new measurement and can be reset by pressing [F2].

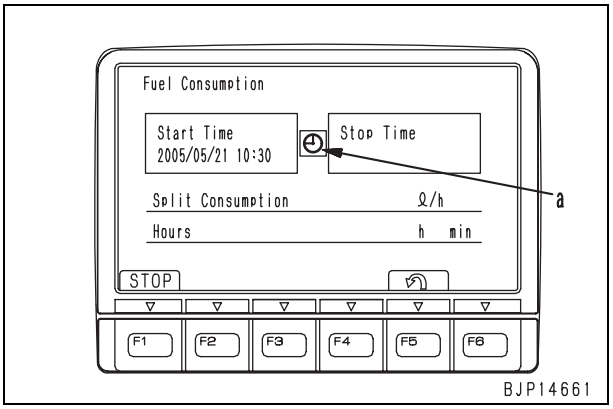
   ★ If [F1] is pressed, the data is displayed on the starting date and time side and measurement starts.



   ★ The display unit of the fuel changes according to the unit set with the default (unit setting) function.
   SI and meter: ℓ/h
   inch: gal/h

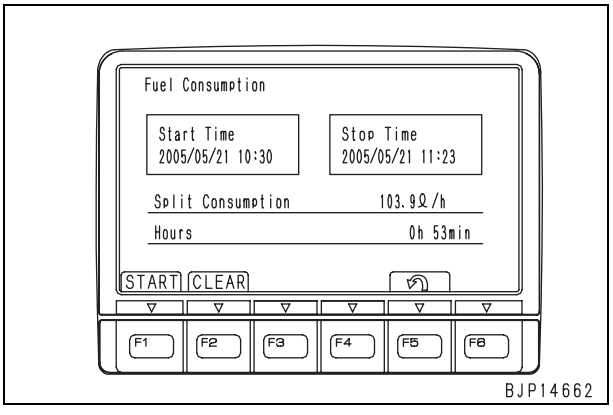
3. Display and function during measurement
   Clock mark (a) flashes during measurement.

   ★ While the fuel consumption is being measured, the operator can work with the operator mode and other functions. Measurement is not finished until this screen is displayed again and [F1] is pressed (Even if the starting switch is turned OFF, this function is kept effective, although fuel consumption is measured only while the engine is running).



4. Finishing measurement
   Press [F1], and measurement is finished and the data are displayed on the finishing date and time side.

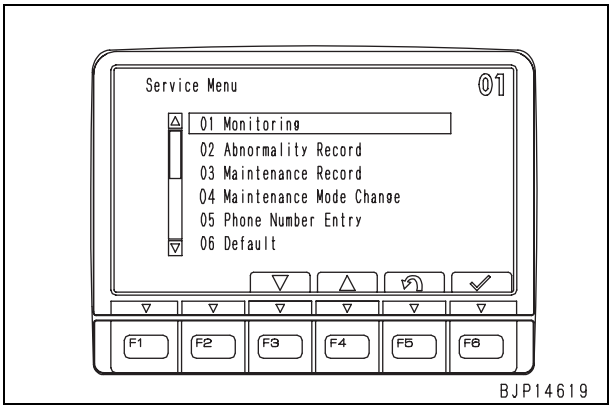
5. Displaying fuel consumption
   If the measurement is finished, the hourly fuel consumption calculated from the fuel consumption calculated by the engine controller and the elapsed time are displayed.



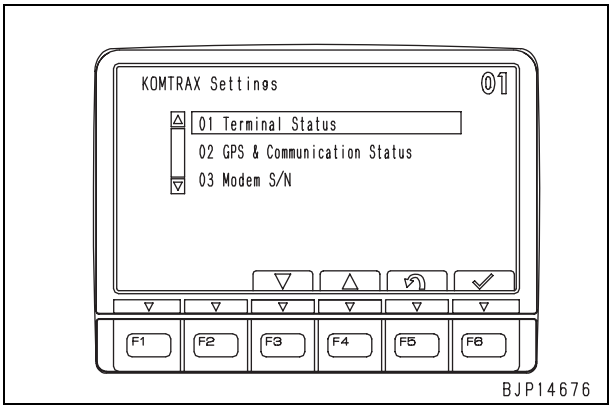
KOMTRAX Settings (Terminal Status)

The setting condition and operating condition of KOMTRAX can be checked with Display of KOMTRAX setting.
Setting condition of terminal is used to check the setting condition of the KOMTRAX terminal.

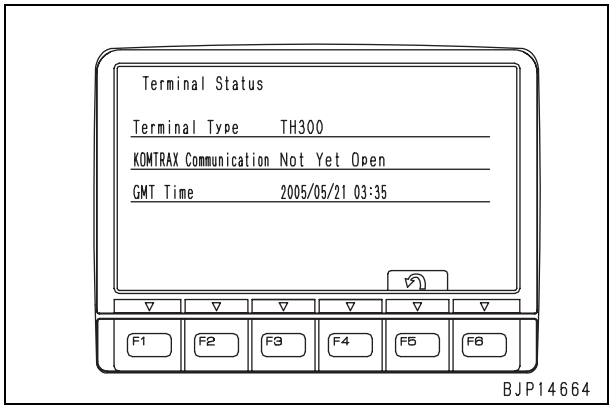
1. Selecting menu
   Select “KOMTRAX Settings” on the “Service Menu” screen.



2. Selecting sub menu
   After the “KOMTRAX Settings” screen is displayed, select “Terminal Status” with the function switches or numeral input switches.
   - ★ Select this item similarly to an item on the Service menu screen.
   - ★ The following figure shows the display when Model TH300 KOMTRAX is installed. When TH200 is installed, “03 IP Adress” is displayed.



3. Contents of display of terminal status
   On the “Terminal Status” screen, the following items are displayed.
   - Terminal type: Model name of KOMTRAX communication MODEM
   - KOMTRAX communication: Executing condition of station opening inspection
   - GMT time: Greenwich Meant Time
   - [F5]: Return to KOMTRAX settings screen

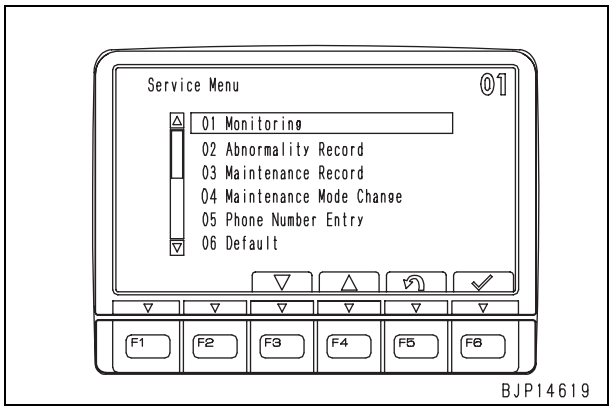


KOMTRAX Settings (GPS & Communication Status)

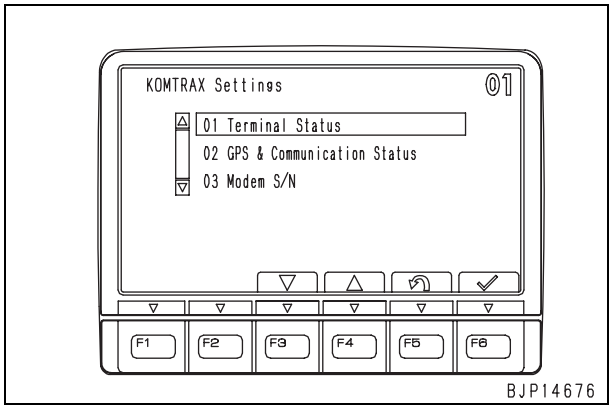
The setting condition and operating condition of KOMTRAX can be checked with “KOMTRAX Settings”.

GPS & communication status is used to check the condition of positioning and communication of the KOMTRAX terminal.

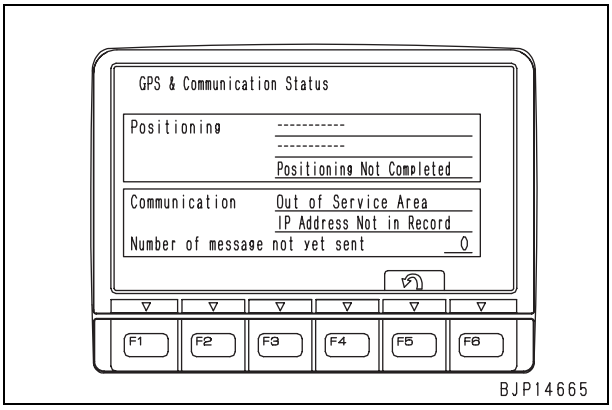
1. Selecting menu
   Select “KOMTRAX Settings” on the “Service Menu” screen.



2. Selecting sub menu
   After the “KOMTRAX Settings” screen is displayed, select GPS & communication status with the function switches or numeral input switches.
   - ★ Select this item similarly to an item on the “Service Menu” screen.
   - ★ The following figure shows the display when Model TH300 KOMTRAX is installed. When TH200 is installed, “03 IP Adress” is displayed.



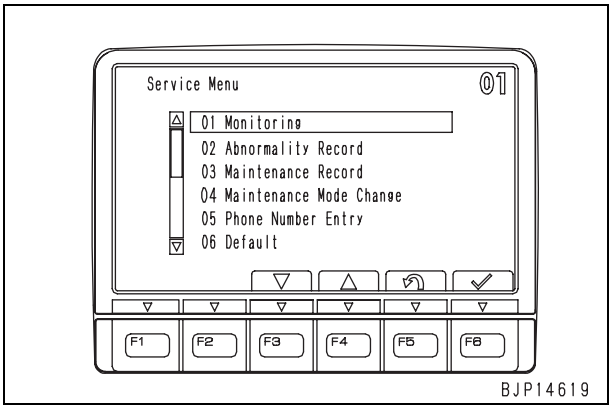
3. Contents of display of GPS & communication status
   On the screen of “GPS & Communication Status”, the following items are displayed.
   - Positioning: Positioning condition of GPS
   - Communication: Communication environment of communication MODEM and connecting condition of communication MODEM
   - Number of message not yet sent: Number of mails which are saved in machine monitor and not transmitted yet
   - [F5]: Return to KOMTRAX settings screen



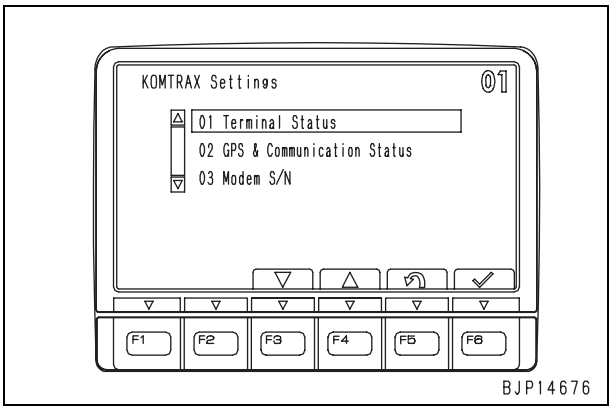
KOMTRAX Setting (MODEM S/N: TH300)

The setting condition and operating condition of KOMTRAX can be checked with Display of KOMTRAX setting.
MODEM S/N is used to check the serial No. of the KOMTRAX communication MODEM.

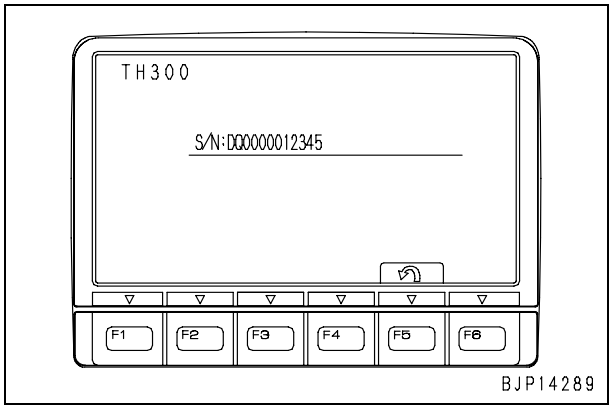
1. Selecting menu
   Select “KOMTRAX Settings” on the “Service Menu” screen.



2. Selecting sub menu
   After the “KOMTRAX Settings” screen is displayed, select “Modem S/N” with the function switches or numeral input switches.
   ★ Select this item similarly to an item on the “Service Menu” screen.



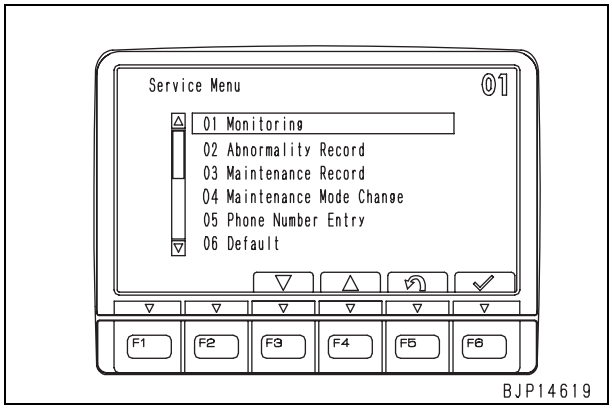
3. Contents of display of Modem S/N
   The serial No. of TH300 Modem is displayed.
   - [F5]: Return to KOMTRAX settings screen



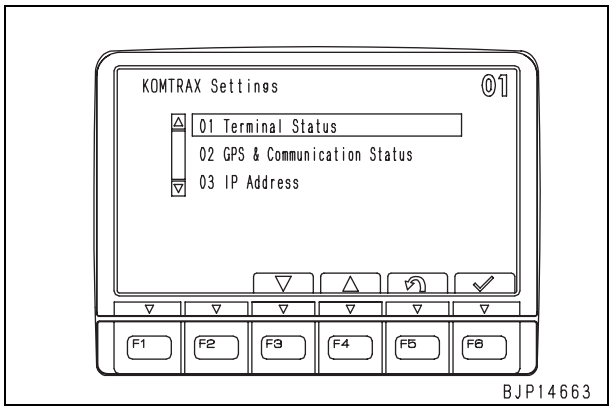
KOMTRAX Settings (IP Address: TH200)

The setting condition and operating condition of KOMTRAX can be checked with Display of KOMTRAX settings.
IP address is used to check the IP address of the KOMTRAX communication MODEM.

1. Selecting menu
   Select "KOMTRAX Settings" on the service menu screen.

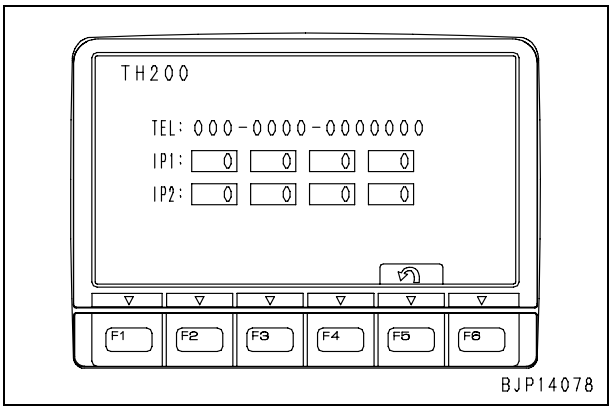


2. Selecting sub menu
   After the “KOMTRAX Settings” screen is displayed, select “IP Address” with the function switches or numeral input switches.
   ★ Select this item similarly to an item on the “Service Menu” screen.



3. Contents of display of IP address
   The telephone No. and IP address (2 systems) of TH200 MODEM are displayed.
   - [F5]: Return to KOMTRAX setting screen

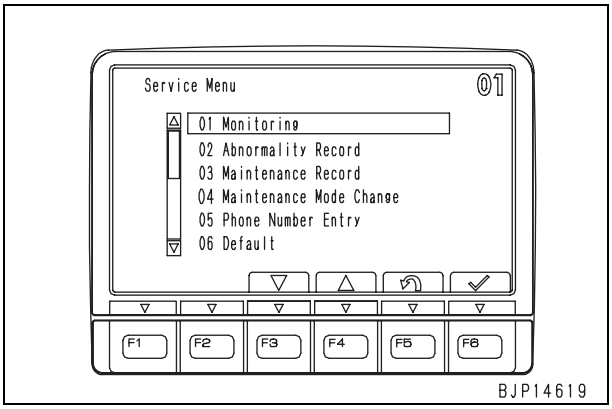
   ★ The IP address is a No. specific to each MODEM which is required when communication is made between the MODEM and the server.



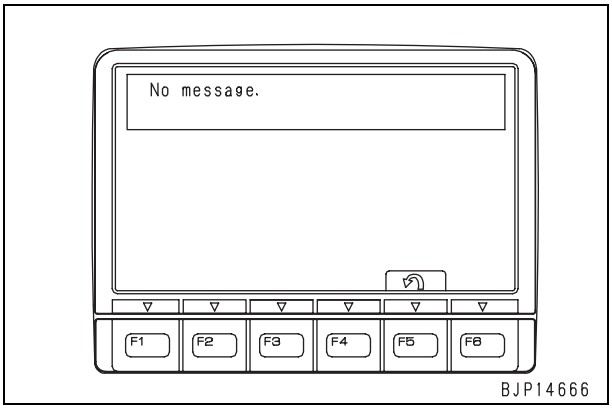
Display of KOMTRAX message

Special messages for the serviceman sent from the KOMTRAX base station (a distributor, etc.) can be checked with this function.
If there is setting in a message, a return mail can be sent by using numeral input switches.

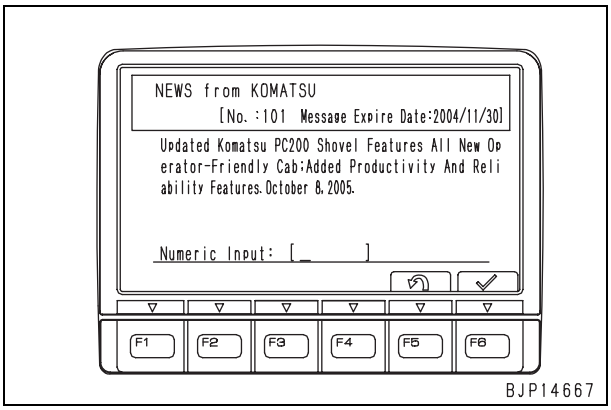
1. Operation to display menu
   Select "Service message" on the service menu screen.



2. Display of message (Read-only)
   If there is a message, its contents are displayed. If there is not a message, "No message" is displayed.
   - [F5]: Return to service menu screen
   - ★ This message is different from a message transmitted to the operator in the operator mode.
   - ★ Since this message is special for the serviceman, the message monitor is not displayed when it is received as in the operator mode.



3. Display of message (with return mail function)
   If a box to enter a value with the numeral keys is displayed under the message, enter a proper number with the numeral input switches and function switches and confirm it, and the information is returned to the KOMTRAX base station.
   - [F5]: Return to service menu screen
   - [F6]: Confirm and return input value
   - ★ This message is different from a message transmitted to the operator in the operator mode.
   - ★ Since this message is special for the serviceman, the message monitor is not displayed when it is received as in the operator mode.



PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN02626-00

HYDRAULIC EXCAVATOR

PC300-8
PC300LC-8
PC350-8
PC350LC-8

Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

30 Testing and adjusting

Testing and adjusting, Part 3

Handling voltage circuit of engine controller

1. Before disconnecting or connecting a connector between the engine controller and engine, be sure to turn the starting switch OFF.

2. If a T-adapter is inserted in or connected to a connector between the engine controller and engine for troubleshooting, do not start the engine.
   ★ You may turn the starting switch to the OFF or ON position but must not turn it to the START position.

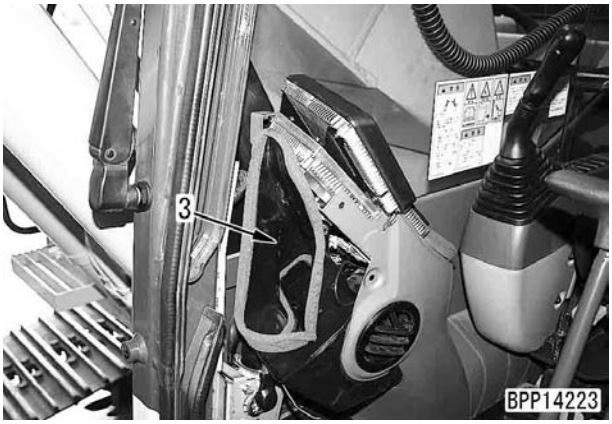
Preparation work for troubleshooting of electrical system

★ When carrying out troubleshooting of an electric circuit related to the machine monitor, engine controller, pump controller, or KOMTRAX communication MODEM, expose the related connectors according to the following procedure.
★ Disconnect and connect the connectors having special locking mechanisms according to the procedure shown below.

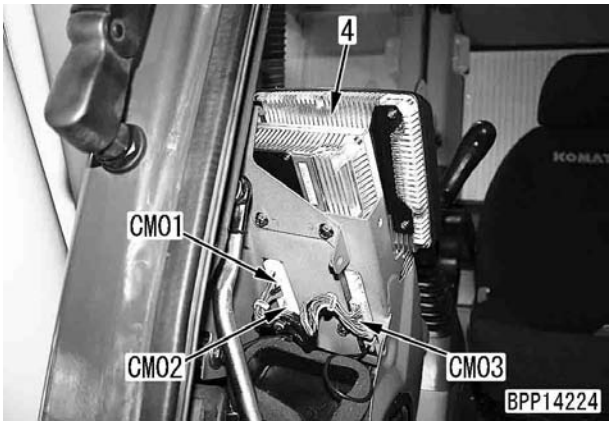
1. Machine monitor

1) Remove 2 mounting bolts and cover (1).
   ★ One of the mounting bolts is installed in the cover on the right of the daylight sensor.
   ★ While removing the mounting bolts, disconnect connector **P31** of the daylight sensor.
2) Remove cover (2).
   ★ The cover is fixed with clips. Remove it by pull it up.
   ★ While removing the cover, disconnect connector **M04** of the cigarette lighter.

3) Remove 1 mounting bolt and duct (3).

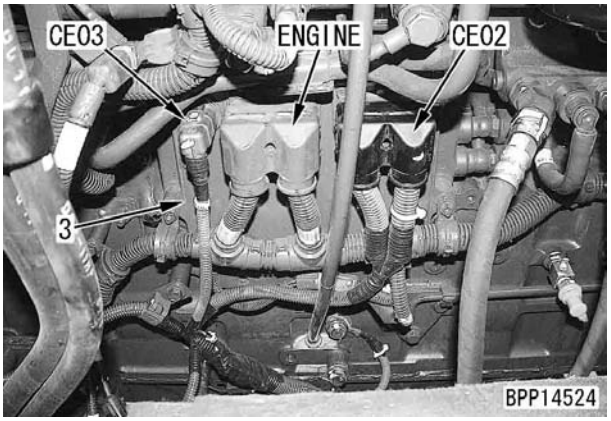


4) Insert or connect troubleshooting T-adapters in or to connectors **CM01**, **CM02**, and **CM03** of machine monitor (4).
   ★ Connectors **CM02** and **CM03** are of the same type. When returning them, check the mark plates of the mounting brackets and take care not to make a wrong connection.



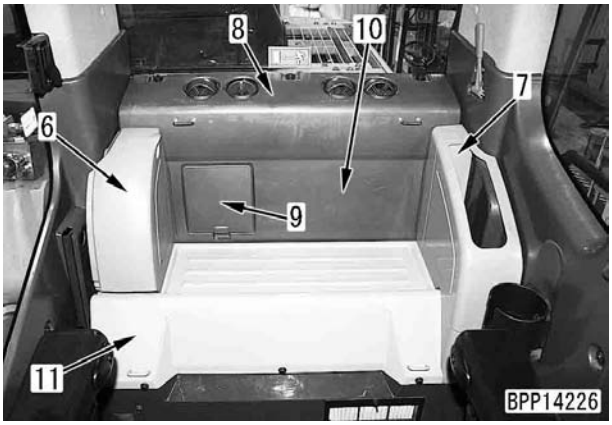
2. Engine controller

★ The engine controller is installed in the left side of the engine.
1) Open the engine hood.
2) Insert or connect troubleshooting T-adapter in or to connectors ENGINE, CE02 and CE03 of engine controller (3).
   ★ Connectors are fixed with screw. Loosen the screws before disconnecting them.
   ★ When returning the connectors back to their position, tighten them to the specified torque.
   Screw: **2.82 Nm {0.288 kgm}**

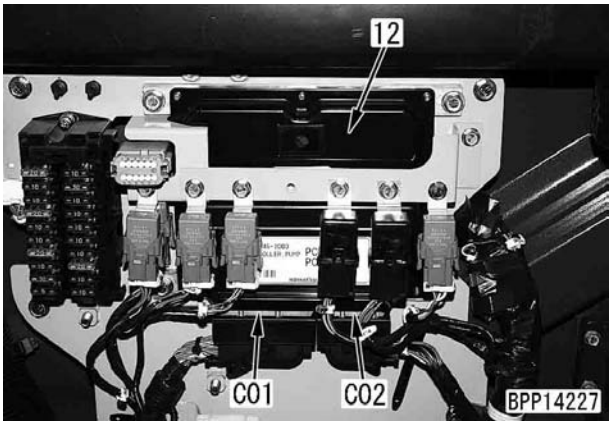


3. Pump controller

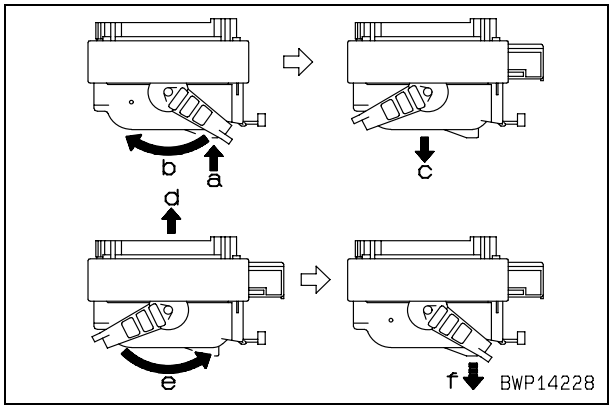
1) Slide the operator's seat and seat stand to the forward end.
2) Remove the 5 mounting bolts and cool & hot box (6).
   ★ While removing the cool & hot box, disconnect the drain hose.
3) Remove the 2 mounting bolts, 1 fastener, and magazine box (7).
4) Remove the 3 mounting bolts and cover (8).
5) Remove fuse box cover (9) and cover (10).
   ★ Since the underside of cover (10) is clamped, pull it up.
6) Remove the 7 mounting bolts and cover (11).



7) Connect the troubleshooting adapters to connectors **C01** and **C02** of pump controller (12).
   ★ Install the adapters to only the wiring harness side.

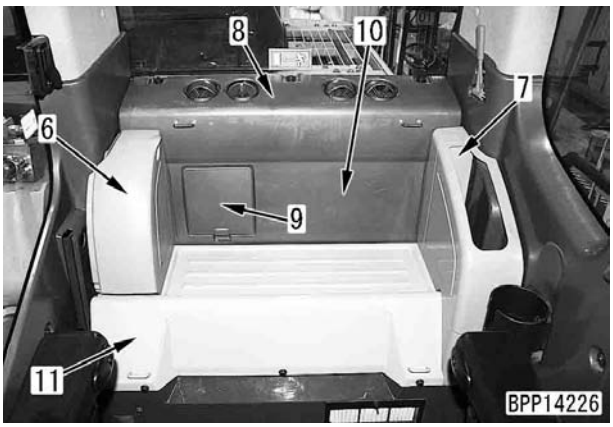


★ The connectors of the pump controller have a special locking mechanism. Disconnect them according to steps (a) – (c) and connect them according to steps (d) – (f) as shown below.
Disconnection: (a) Unlock – (b) Slide lever – (c) Disconnect connector.
Connection: (d) Position connector – (e) Slide lever – (f) Lock.

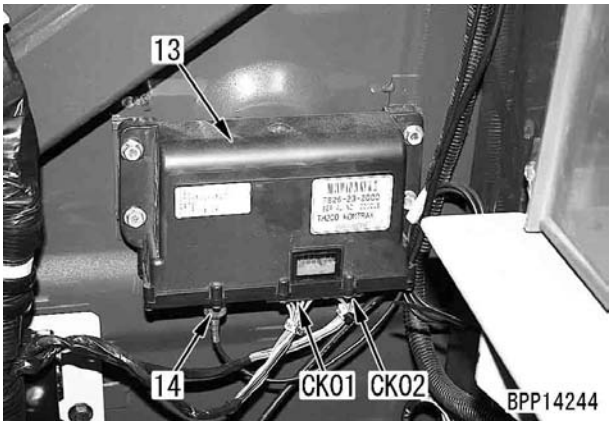


4. KOMTRAX communication module

1) Slide the operator's seat and seat stand to the forward end.
2) Remove the 5 mounting bolts and cool & hot box (6).
   ★ While removing the cool & hot box, disconnect the drain hose.
3) Remove the 2 mounting bolts, 1 fastener, and magazine box (7).
4) Remove the 3 mounting bolts and cover (8).
5) Remove fuse box cover (9) and cover (10).
   ★ Since the underside of cover (10) is clamped, pull it up.
6) Remove the 7 mounting bolts and cover (11).

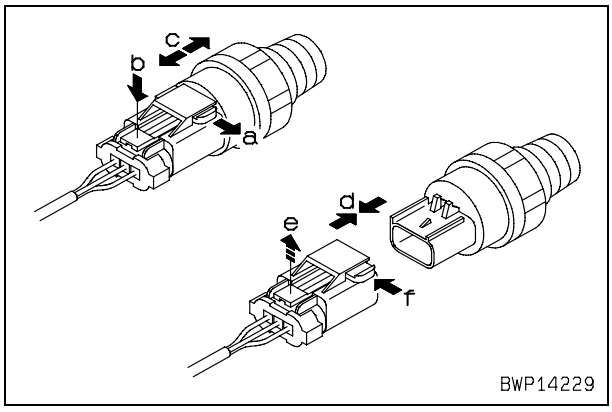


7) Connect troubleshooting T-adapters to connectors **CK01** and **CK02** of KOMTRAX communication module (13).
★ Cable (14) is for the communication antenna.



5. Atmospheric pressure sensor (AMBAIR PRESSURE)
Engine Ne speed sensor (CRANK SENSOR)
Engine Bkup speed sensor (CAM SENSOR)
Engine oil pressure switch (OIL PRESSURE SWITCH)

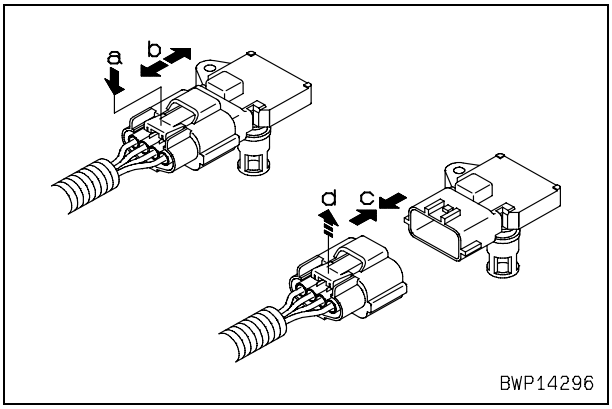
★ **Disconnection and connection of connectors**
The connectors of the atmospheric pressure sensor, engine Ne speed sensor, engine Bkup speed sensor, engine oil pressure switch have a special locking mechanism. Disconnect them according to steps (a) – (c) and connect them according to steps (d) – (f) as shown below.
Disconnection: (a) Slide lever – (b) Unlock – (c) Disconnect connector.
Connection: (d) Connect connector – (e) Lock – (f) Slide lever.



★ **Removal and installation of sensor**
A deep socket is necessary for removal and installation of the engine oil pressure switch. See "Tools for testing, adjusting, and troubleshooting".

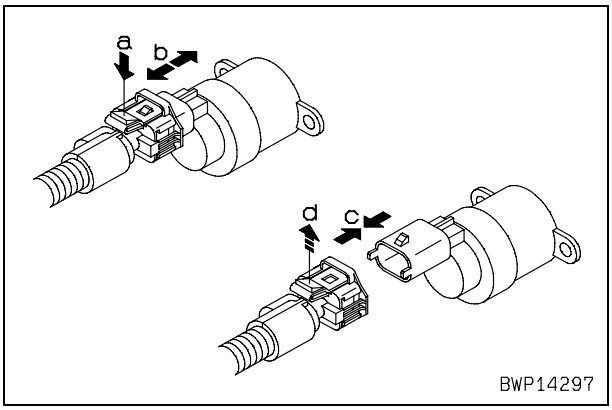
6. Boost pressure and temperature sensor (BOOST PRESS & IMT)

★ **Disconnection and connection of connector**
The connector of the boost pressure and temperature sensor has a special locking mechanism. Disconnect it according to steps (a) – (b) and connect it according to steps (c) – (d) as shown below.
Disconnection: (a) Unlock – (b) Disconnect connector.
Connection: (c) Connect connector – (d) Lock.

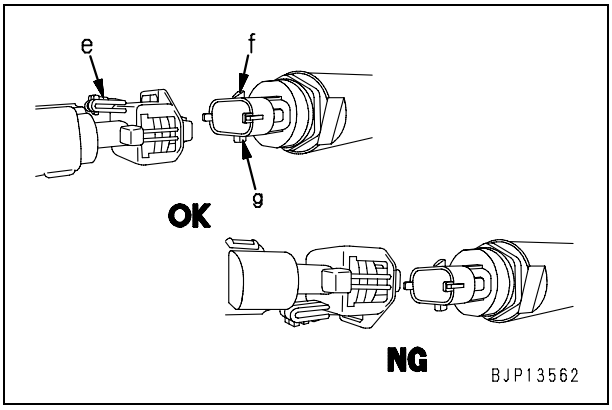


★ **Removal and installation of sensor**
A torque wrench is necessary for removal and installation of the boost pressure and temperature sensor. See "Tools for testing, adjusting, and troubleshooting".

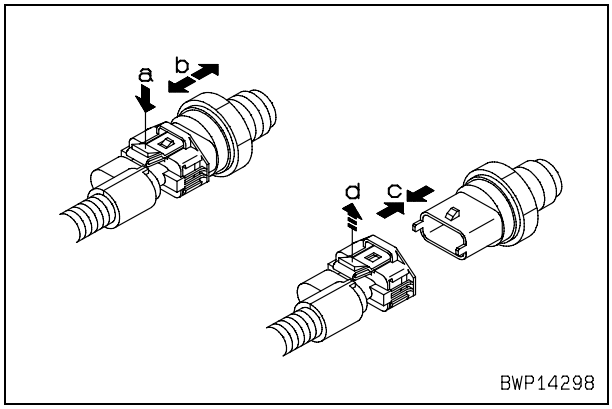
7. **Supply pump IMV solenoid (FUEL REGULATOR)**
   Electric priming pump (FUEL LIFT PUMP)
   Water-in-fuel sensor intermediate connector (WIF)
   ★ **Disconnection and connection of connector**
   The connector of the supply pump IMV solenoid has a special locking mechanism. Disconnect it according to steps (a) – (b) and connect it according to steps (c) – (d) as shown below.
   Disconnection: (a) Unlock – (b) Disconnect connector.
   Connection: (c) Connect connector – (d) Lock.



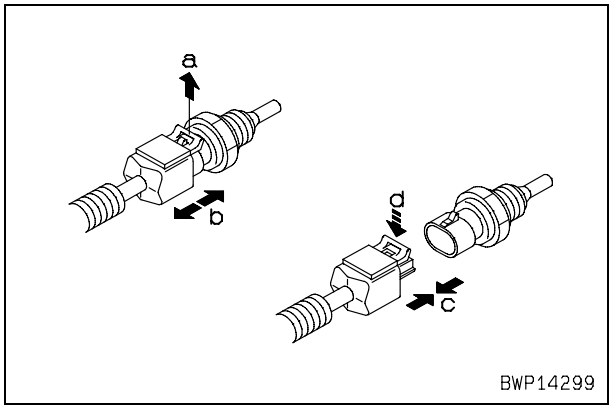
   ★ **Precautions for connecting connector**
   Take care not to connect the connector reversely.
   Engage lock (e) on the wiring harness side with triangular notch (f) on the sensor side (Do not engage lock (e) with square guide (g) on the opposite side of triangular notch (f)).



8. **Common rail pressure sensor (FUEL RAIL PRESS)**
   ★ **Disconnection and connection of connector**
   The connector of the common rail pressure sensor has a special locking mechanism. Disconnect it according to steps (a) – (b) and connect it according to steps (c) – (d) as shown below.
   Disconnection: (a) Unlock – (b) Disconnect connector.
   Connection: (c) Connect connector – (d) Lock.



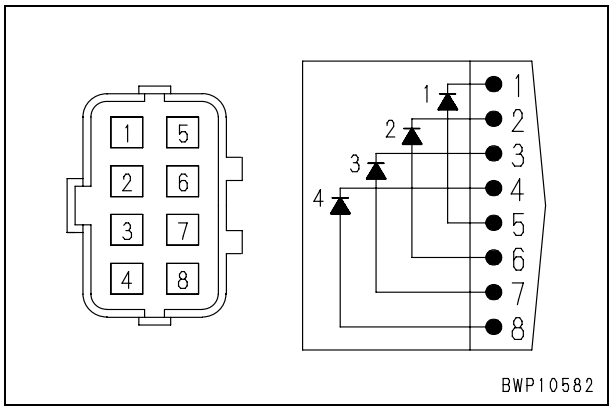
9. **Engine coolant temperature sensor (COOLANT TEMP)**
   ★ **Disconnection and connection of connector**
   The connector of the engine coolant temperature sensor has a special locking mechanism. Disconnect it according to steps (a) – (b) and connect it according to steps (c) – (d) as shown below.
   Disconnection: (a) Unlock – (b) Disconnect connector.
   Connection: (c) Connect connector – (d) Lock.



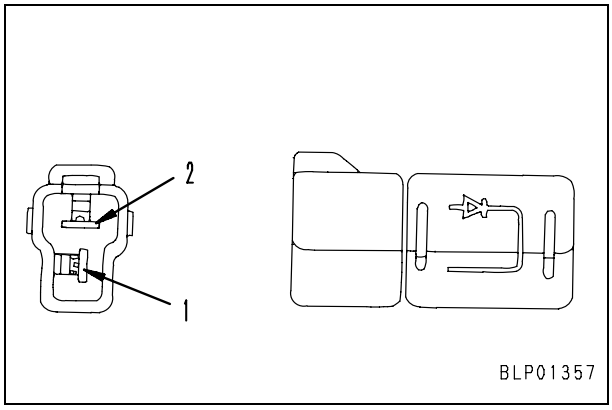
   ★ **Removal and installation of sensor**
   A deep socket is necessary for removal and installation of the engine coolant temperature sensor. See "Tools for testing, adjusting, and troubleshooting".

Procedure for testing diodes

★ Test the assembled-type diode (8-pin) and the single diode (2-pin) according to the following procedure.
★ The conductive directions of the assembled-type diode are as follows.



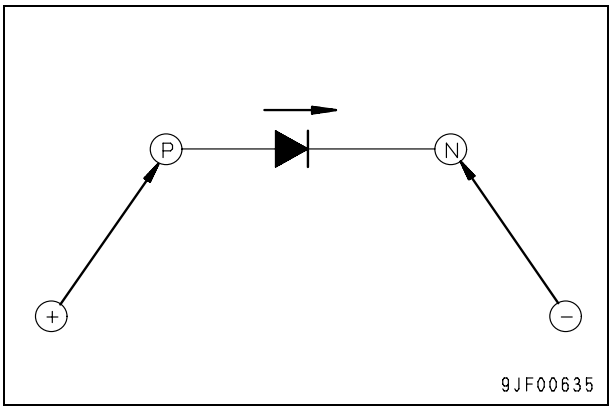
★ The conductive direction of the single diode is indicated on the surface of the diode.



1. When using digital circuit tester

1) Set the tester in the diode range and check the indicated value.
   ★ When an ordinary circuit tester is used, the voltage of the internal battery is indicated.
2) Apply the red (+) lead of the tester to the anode (P) side of the diode and apply the black (–) lead to the cathode (N) side and check the indicated value.
3) Judge the condition of the diode by the indicated value.
   - The indicated value does not change: The diode does not have conductivity (Defective).
   - The indicated value changes: The diode has conductivity (Normal).

   Note: In the case of a silicon diode, a value in the range from 460 to 600 is indicated.



2. When using analog circuit tester

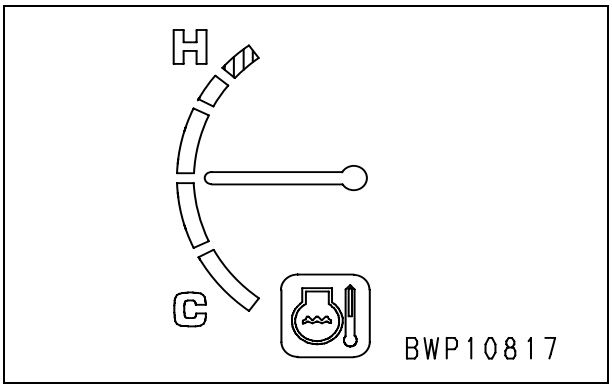
1) Set the tester in the resistance range.
2) Apply the leads of the tester as explained below and check the movement of the pointer.
   i) Apply the red (+) lead of the tester to the anode (P) side of the diode and apply the black (–) lead to the cathode (N) side.
   ii) Apply the red (+) lead of the tester to the cathode (N) side of the diode and apply the black (–) lead to the anode (P) side.
3) Judge the condition of the diode by the movement of the pointer.
   - The pointer does not move in i) but moves in ii): The diode is normal (The moving range (resistance) depends on the type and selected range of the tester, however).
   - The pointer moves in both i) and ii): The diode is defective (Internal short circuit).
   - The pointer moves in neither of i) and ii): The diode is defective (Internal disconnection).

Pm clinic service

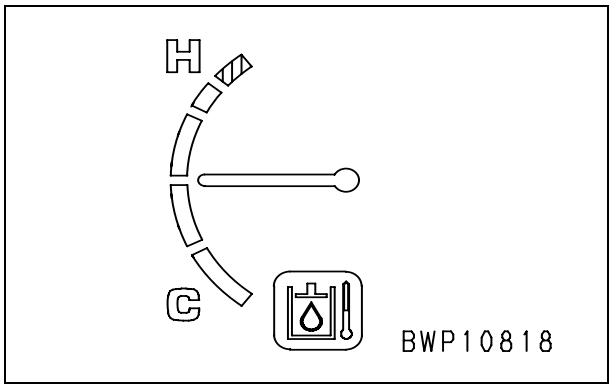
Machine model	Model number	Service meter
☐ PC300-8 ☐ PC350-8 ☐ LC		h
User name	**Date of execution**	**Inspector**
	/ /	
Specifications		
Main components	**Attachments**	**Shoe width**
Boom ☐ Standard ☐ ( ) Arm ☐ Standard ☐ ( ) Bucket ☐ Standard ☐ ( )	☐ Breaker ☐ ( ) ☐ ( )	☐ 600 mm ☐ 700 mm ☐ ( )
Check of oil/coolant level		
☐ Radiator coolant ☐ Engine oil ☐ Hydraulic oil	When necessary ☐ Damper case oil ☐ Final drive case oil	☐ Machinery case oil ☐ ( )
Ambient temperature	**Altitude**	
°C	m	
Operator's opinion		
Result of visual inspection		

Mechanical systems abnormality record				Electrical systems abnormality record			
A000N1	Times/1st time	h/Latest	h		Times/1st time	h/Latest	h
AA10NX	Times/1st time	h/Latest	h		Times/1st time	h/Latest	h
AB00KE	Times/1st time	h/Latest	h		Times/1st time	h/Latest	h
B@BAZG	Times/1st time	h/Latest	h		Times/1st time	h/Latest	h
B@BAZK	Times/1st time	h/Latest	h		Times/1st time	h/Latest	h
B@BCNS	Times/1st time	h/Latest	h		Times/1st time	h/Latest	h
B@BCZK	Times/1st time	h/Latest	h		Times/1st time	h/Latest	h
B@HANS	Times/1st time	h/Latest	h		Times/1st time	h/Latest	h

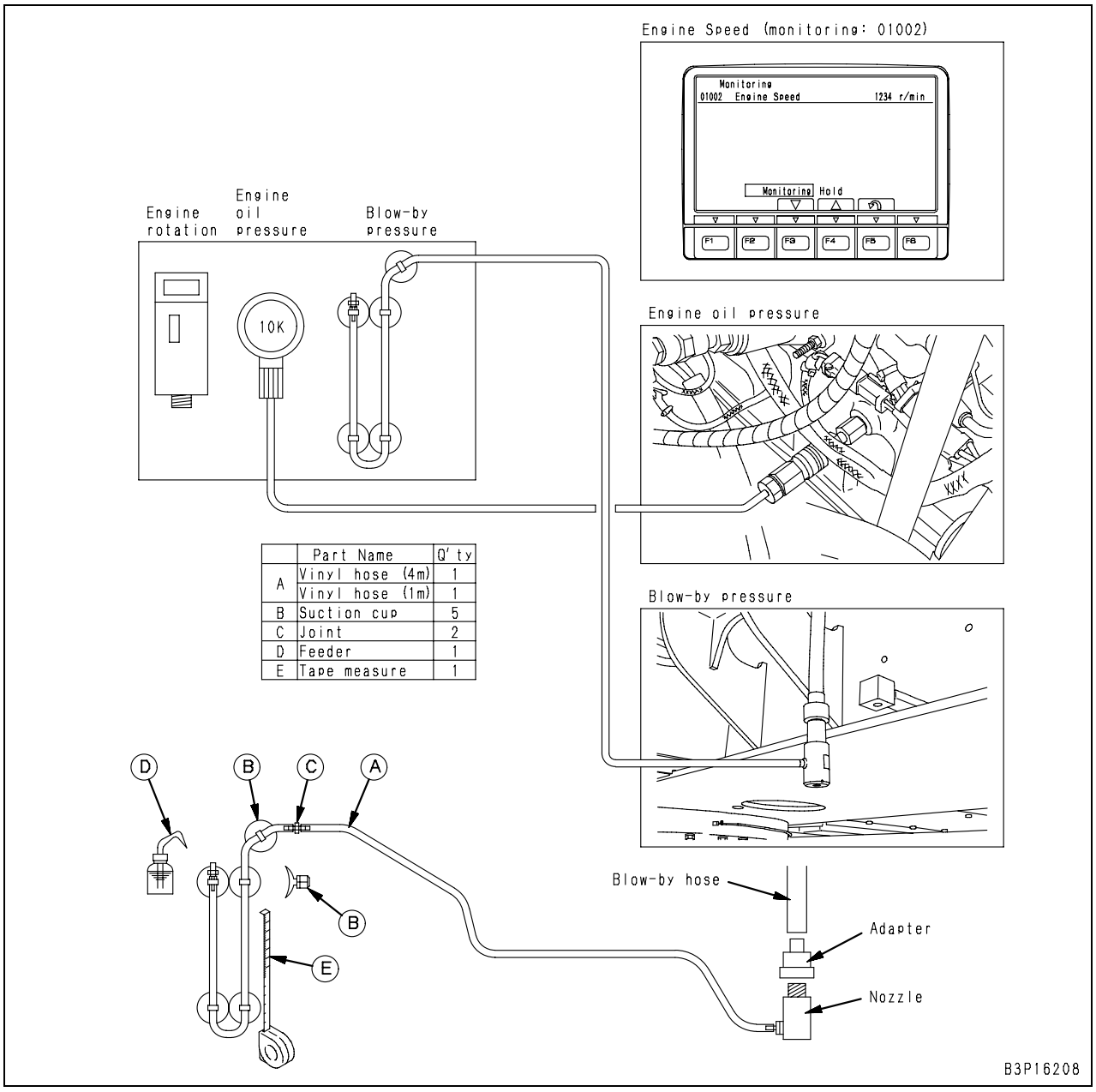
Max. range of engine coolant temperature gauge



Max. range of hydraulic oil temperature gauge

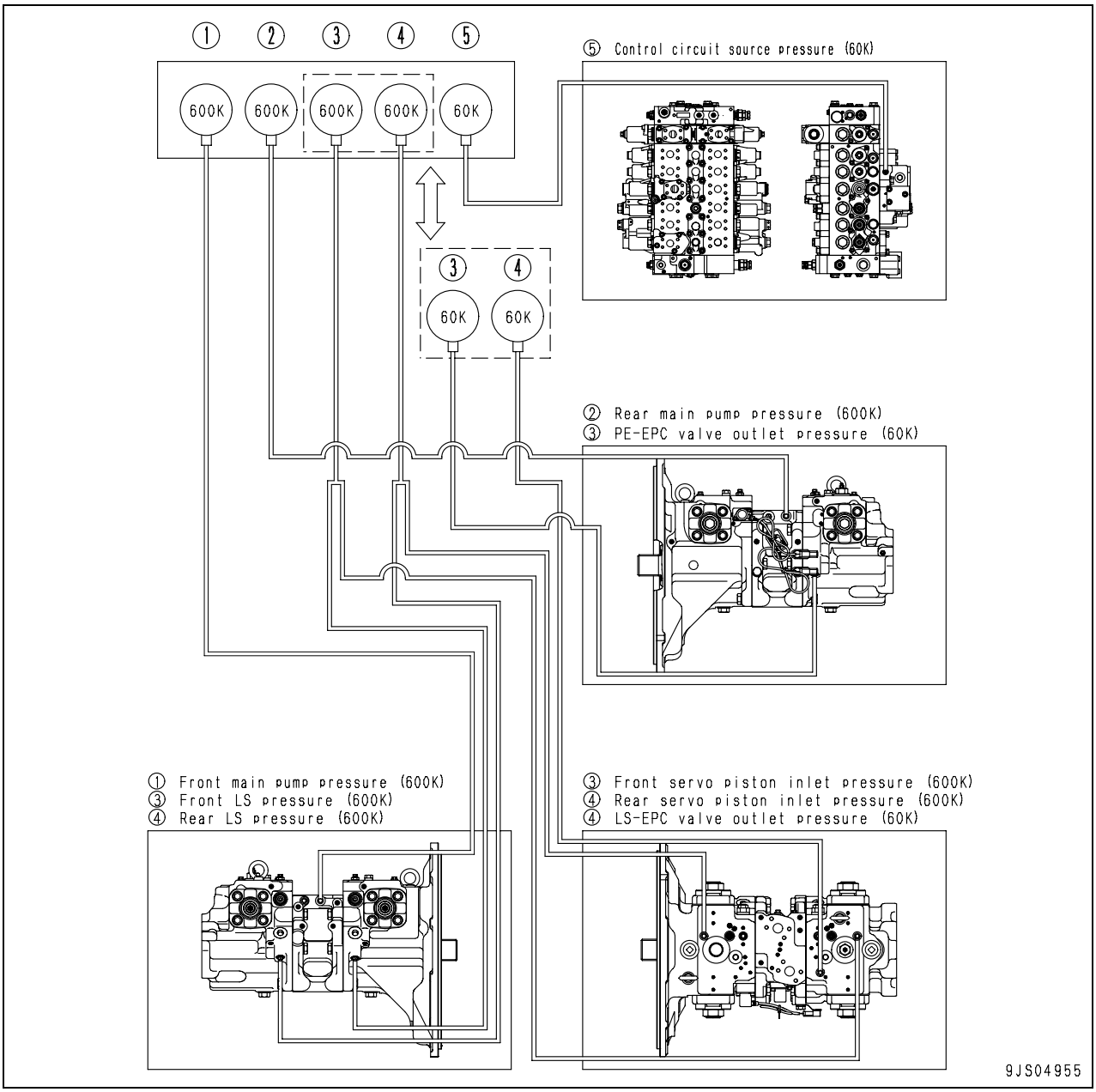


Items related to engine



	Part Name	Q'ty
A	Vinyl hose (4m)	1
	Vinyl hose (1m)	1
B	Suction cup	5
C	Joint	2
D	Feeder	1
E	Tape measure	1

Items related to oil pressure



Model	Serial No.	Service meter reading	Client user's name	Implemented on:	Inspected by:

1. Engine

No.	Condition setting					Measurement item	Unit	Standard value		Measured value	Judgement
	Fuel dial	Working mode	Auto decelerator	One-touch power max. switch	Work equipment operation			New machine	Failure judgement		
1	Full	P	OFF	OFF	Operating travel control lever (Do not travel machine)	Engine rotation	rpm	1,930 – 2,130	—		Good / No good
2						Engine oil pressure	MPa{kg/cm²}	0.36 – 0.61{3.5– 6.0}	0.18{1.8}		Good / No good
3	Low				All control levers in NEUTRAL	Engine rotation	rpm	950 – 1,050	—		Good / No good
4						Engine oil pressure	MPa{kg/cm²}	Min. 0.10{Min. 1.0}	0.07{0.7}		Good / No good
5	Full			ON	Arm (extended) relief	Engine rotation	rpm	1,770 – 1,970	—		Good / No good
6						Blow-by pressure	kPa{mmH$_2$O}	Max. 1.0{Max. 100}	2.0{200}		Good / No good
7			ON	OFF	All control levers in NEUTRAL	Engine rotation	rpm	1,300 – 1,500	—		Good / No good

2. Work equipment speed

Hydraulic oil temperature (45 – 55°C)

No.	Condition setting			Measurement item			Unit	Standard value				Measured value	Judgement
								PC300, 300LC-8		PC350, 350LC-8			
	Fuel dial	Working mode	Work equipment posture					New model	Failure judgement	New model	Failure judgement		
1	Full	P	No load, fully extended	Boom RAISE			Sec.	3.3 – 4.1	Max. 4.5	3.4 – 4.2	Max. 4.6		Good / No good
2			Boom held level	Arm DUMPING				2.6 – 3.2	Max. 3.5	2.9 – 3.5	Max. 3.7		Good / No good
3				Arm DIGGING				3.4 – 4.2	Max. 4.5	3.4 – 4.2	Max. 4.5		Good / No good
4		E						3.6 – 4.6	Max. 4.9	3.5 – 4.5	Max. 4.8		Good / No good
5		(※L)						4.4 – 5.4	Max. 5.7	4.4 – 5.4	Max. 5.7		Good / No good
6		P	Boom and arm held level	Bucket DIGGING				2.9 – 3.5	Max. 3.8	2.9 – 3.5	Max. 3.8		Good / No good
7			Fully extended	Swing (5 turns)		Right		28.7 – 34.5	Max. 38	28.7 – 34.5	Max. 38		Good / No good
						Left							Good / No good
8			Track shoe raised at one side	Travel (5 turns)	Lo	Right		44.0 – 66.0 LC: 46.5 – 69.5	42.0 – 70.0 LC: 45.0 – 74.5	44.0 – 66.0 LC: 46.5 – 69.5	42.0 – 70.0 LC: 45.0 – 74.5		Good / No good
						Left							Good / No good
					(※Mi)	Right		33.5 – 44.5 LC: 35.5 – 47.5	31.5 – 48.5 LC: 34.0 – 51.5	33.5 – 44.5 LC: 35.5 – 47.5	31.5 – 48.5 LC: 34.0 – 51.5		Good / No good
						Left							Good / No good
					Hi	Right		30.0 – 34.0 LC: 32.0 – 36.0	28.0 – 39.0 LC: 32.0 – 41.5	30.0 – 34.0 LC: 32.0 – 36.0	28.0 – 39.0 LC: 32.0 – 41.5		Good / No good
						Left							Good / No good

※ : The "Mi" and "L" modes are on the multi-monitor specification machine only.

3. Work equipment hydraulic drift amount

Hydraulic oil temperature (45 – 55°C)

No.	Condition setting			Measurement item	Unit	Standard value				Measured value	Judgement
						PC300, 300LC-8		PC350, 350LC-8			
	Fuel dial	Working mode	Work equipment posture			New model	Failure judgement	New model	Failure judgement		
1	Engine stop		Boom and arm held level, Bucket loaded	Hydraulic drift amount at bucket tooth tip (15 min.)	mm	450	Max. 675	550	Max. 825		Good / No good

4. Inspection of hydraulic circuit

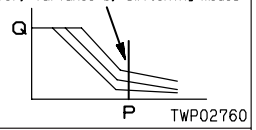
No.	Part to be checked	Condition setting						① 600 kg/cm²	② 600 kg/cm²	③ 600 kg/cm²	④ 600 kg/cm²	⑤ 60 kg/cm²	Remarks
		Fuel dial	Working mode	Auto-decelerator	One-touch power max. switch	Work equipment operation		F main pump	R main pump	F pump LS	R pump LS	Control circuit pressure	
1	Self-decompression valve	Full	P	OFF	OFF	Arm OUT relief		■		■	■	→	Circuit pressure 3.2 MPa {33 kg/cm²}
2	Main relief valve								↓	↓	↓	↓	■	34.8 → 37.3 MPa
3	(When power increased)				ON								■	{355 → 380 kg/cm²}
4	LS valve (LS differential pressure valve)				OFF	Neutral							■	Main–LS=2.9 MPa{30 kg/cm²} (LS differential pressure ≒ Unload pressure)
						Travel without load, engine at Hi idling and control lever at half stroke	Right		■		■	■	Main–LS=2.5 MPa{25.0 kg/cm²} (LS pressure)
							Left	■		■		■	
5	Swing safety valve					Swing lock switch ON	Right relief			■	■	■	30.9 MPa {315 kg/cm²}
							Left relief			■	■	■	
6	Main relief valve, Travel safety valve, Travel interlocking valve					Track shoe locked	Right forward		■	■	■	■	38.2 MPa {390 kg/cm²}
							Right reverse		■	■	■	■	
							Left forward	■		■	■	■	
							Left reverse	■		■	■	■	

■ Connection to be changed to hoses ③ and ④

No.	Part to be checked	Condition setting					① 600 kg/cm²	② 600 kg/cm²	③ 600 kg/cm²	④ 600 kg/cm²	⑤ 60 kg/cm²	Remarks
		Fuel dial	Working mode	Auto-decelerator	One-touch power max. switch	Work equipment operation	F main pump	R main pump	F pump servo	R pump servo	Control circuit pressure	
7	Servo	Full	P	OFF	OFF	Arm OUT relief					■	Main servo pressure balance ③ / ① ≒ ④ / ② ≒ 3/5

■ Connection to be changed to hoses ③ and ④, and gauge to be replaced with one with 60 K capacity.

No.	Part to be checked	Condition setting						① 600 kg/cm²	② 600 kg/cm²	③" 60 kg/cm²	④" 60 kg/cm²	⑤ 60 kg/cm²	Remarks <Reference value: kg/cm²>
		Fuel dial	Working mode	Auto-decelerator	One-touch power max. switch	Work equipment operation	Travel lever	F main pump	R main pump	PC EPC	LS EPC	Control circuit pressure	
8	PC-EPC valve	Low	P	OFF	OFF	Neutral	Neutral	■	■		■	■	<32> Delivery variance by switching modes
		Full						■	■		■	■	< 0>
			E					■	■		■	■	<10>
			(※ L)					■	■		■	■	<11>
			B					■	■		■	■	<10>
9	LS-EPC valve	Full	P	OFF	OFF	Neutral	Neutral			■	←	■	At neutral: 2.9 MPa {30 kg/cm²}
			(※ L)			Arm OUT relief	Neutral			■	←	■	When 2 pumps relieved: 0 MPa {0 kg/cm²}
							Right lever at halfway position			■		■	When one pump relieved: 1.5 MPa {15 kg/cm²}
							Left lever at halfway position			■		■	
						Arm IN relief	Right lever at halfway position			■		■	
							Left lever at halfway position			■		■	



※ : The "L" mode is on the multi-monitor specification machine only

Do not travel the machine.

PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN02663-00

HYDRAULIC EXCAVATOR

PC300-8
PC300LC-8
PC350-8
PC350LC-8

Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

40 Troubleshooting

Failure code table and fuse locations

Failure codes table

Action code	Failure code	Trouble (Displayed on screen)	Device in charge	Category of record	Reference document No.
—	**A000N1**	Eng. Hi Out of Std	MON	Mechanical system	Troubleshooting of failure code, Part 1 SEN02629-00
—	**AA10NX**	Air cleaner Clogging	MON	Mechanical system	
—	**AB00KE**	Charge Voltage Low	MON	Mechanical system	
—	**B@BAZG**	Eng. Oil Press. Low	MON	Mechanical system	
—	**B@BAZK**	Eng Oil Level Low	MON	Mechanical system	
—	**B@BCNS**	Eng. Water Overheat	MON	Mechanical system	
—	**B@BCZK**	Eng. Water Lvl Low	MON	Mechanical system	
E02	**B@HANS**	Hydr. Oil Overheat	MON	Mechanical system	
E10	**CA111**	EMC Critical Internal Failure	ENG	Electrical system	
E11	**CA115**	Eng Ne and Bkup Speed Sens Error	ENG	Electrical system	
E11	**CA122**	Chg Air Press Sensor High Error	ENG	Electrical system	
E11	**CA123**	Chg Air Press Sensor Low Error	ENG	Electrical system	
E14	**CA131**	Throttle Sensor High Error	ENG	Electrical system	
E14	**CA132**	Throttle Sensor Low Error	ENG	Electrical system	
E15	**CA144**	Coolant Temp Sens High Error	ENG	Electrical system	
E15	**CA145**	Coolant Temp Sens Low Error	ENG	Electrical system	
E15	**CA153**	Chg Air Temp Sensor High Error	ENG	Electrical system	
E15	**CA154**	Chg Air Temp Sensor Low Error	ENG	Electrical system	
E15	**CA187**	Sens Supply 2 Volt Low Error	ENG	Electrical system	
E15	**CA221**	Ambient Press Sens High Error	ENG	Electrical system	
E15	**CA222**	Ambient Press Sens Low Error	ENG	Electrical system	
E15	**CA227**	Sens Supply 2 Volt High Error	ENG	Electrical system	
—	**CA234**	Eng Overspeed	ENG	Mechanical system	
E15	**CA238**	Ne Speed Sens Supply Volt Error	ENG	Electrical system	
E11	**CA271**	IMV/PCV1 Short Error	ENG	Electrical system	
E11	**CA272**	IMV/PCV1 Open Error	ENG	Electrical system	
E11	**CA322**	Inj #1 (L#1) Open/Short Error	ENG	Electrical system	
E11	**CA323**	Inj #5 (L#5) Open/Short Error	ENG	Electrical system	
E11	**CA324**	Inj #3 (L#3) Open/Short Error	ENG	Electrical system	
E11	**CA325**	Inj #6 (L#6) Open/Short Error	ENG	Electrical system	
E11	**CA331**	Inj #2 (L#2) Open/Short Error	ENG	Electrical system	
E11	**CA332**	Inj #4 (L#4) Open/Short Error	ENG	Electrical system	
E10	**CA342**	Calibration Code Incompatibility	ENG	Electrical system	Troubleshooting of failure code, Part 2 SEN02630-00
E10	**CA351**	Injectors Drive Circuit Error	ENG	Electrical system	
E15	**CA352**	Sens Supply 1 Volt Low Error	ENG	Electrical system	
E15	**CA386**	Sens Supply 1 Volt High Error	ENG	Electrical system	
E15	**CA428**	Water in Fuel Sensor High Error	ENG	Electrical system	
E15	**CA429**	Water in Fuel Sensor Low Error	ENG	Electrical system	
E10	**CA441**	Battery Voltage Low Error	ENG	Electrical system	
E10	**CA442**	Battery Voltage High Error	ENG	Electrical system	
E11	**CA449**	Rail Press Very High Error	ENG	Electrical system	
E11	**CA451**	Rail Press Sensor High Error	ENG	Electrical system	

Action code	Failure code	Trouble (Displayed on screen)	Device in charge	Category of record	Reference document No.
E11	**CA452**	Rail Press Sensor Low Error	ENG	Electrical system	Troubleshooting of failure code, Part 2 SEN02630-00
E15	**CA553**	Rail Press High Error	ENG	Electrical system	
E15	**CA559**	Rail Press Low Error	ENG	Electrical system	
E11	**CA689**	Ne Speed Sensor Error	ENG	Electrical system	
E11	**CA731**	Bkup Speed Sens Phase Error	ENG	Electrical system	
E10	**CA757**	All Persistent Data Lost Error	ENG	Electrical system	
E11	**CA778**	Bkup Speed Sensor Error	ENG	Electrical system	
E0E	**CA1633**	KOMNET Datalink Timeout Error	ENG	Electrical system	
E14	**CA2185**	Throt Sens Sup Volt High Error	ENG	Electrical system	
E14	**CA2186**	Throt Sens Sup Volt Low Error	ENG	Electrical system	
E11	**CA2249**	Rail Press Very Low Error	ENG	Electrical system	
E15	**CA2265**	Electric Lift Pump High Error	ENG	Electrical system	
E15	**CA2266**	Electric Lift Pump Low Error	ENG	Electrical system	
E15	**CA2555**	Grid Htr Relay Volt Low Error	ENG	Electrical system	
E15	**CA2556**	Grid Htr Relay Volt High Error	ENG	Electrical system	
—	**D110KB**	Battery Relay Drive S/C	PUMP	Electrical system	
E02	**DA25KP**	Press. Sensor Power Abnormality	PUMP	Electrical system	
E0E	**DA2RMC**	Pump Comm. Abnormality	PUMP	Electrical system	
—	**DA2SKQ**	Model Selection Abnormality	PUMP	Electrical system	
E0E	**DAFRMC**	Monitor Comm. Abnormality	PUMP	Electrical system	Troubleshooting of failure code, Part 3 SEN02631-00
—	**DHPAMA**	F Pump Press Sensor Abnormality	PUMP	Electrical system	
—	**DHPBMA**	R Pump Press Sensor Abnormality	PUMP	Electrical system	
—	**DHS3MA**	Arm Curl PPC Sen. Abnormality	PUMP	Electrical system	
—	**DHS4MA**	Bucket Curl PPC Press Sensor Abnormality	PUMP	Electrical system	
—	**DW43KA**	Travel Speed Sol. Disc.	PUMP	Electrical system	
—	**DW43KB**	Travel Speed Sol. S/C	PUMP	Electrical system	
E03	**DW45KA**	Swing Brake Sol. Disc.	PUMP	Electrical system	
E03	**DW45KB**	Swing Brake Sol. S/C	PUMP	Electrical system	
—	**DW91KA**	Travel Junction Sol. Disc.	PUMP	Electrical system	
—	**DW91KB**	Travel Junction Sol. S/C	PUMP	Electrical system	
—	**DWJ0KA**	Merge-divider Sol. Disc	PUMP	Electrical system	
—	**DWJ0KB**	Merge-divider Sol. S/C	PUMP	Electrical system	
—	**DWK0KA**	2-stage Relief Sol. Disc.	PUMP	Electrical system	
—	**DWK0KB**	2-stage Relief Sol. S/C	PUMP	Electrical system	
E02	**DXA0KA**	PC-EPC Sol. Disc.	PUMP	Electrical system	
E02	**DXA0KB**	PC-EPC Sol. S/C	PUMP	Electrical system	
—	**DXE0KA**	LS-EPC Sol. Disc.	PUMP	Electrical system	
—	**DXE0KB**	LS-EPC Sol. S/C	PUMP	Electrical system	
—	**DXE4KA**	Service Current EPC Disc.	PUMP	Electrical system	
—	**DXE4KB**	Service Current EPC S/C	PUMP	Electrical system	
—	**DY20KA**	Wiper Working Abnormality	MON	Electrical system	
—	**DY20MA**	Wiper Parking Abnormality	MON	Electrical system	

Action code	Failure code	Trouble (Displayed on screen)	Device in charge	Category of record	Reference document No.
—	**DY2CKB**	Washer Drive S/C	MON	Electrical system	Troubleshooting of failure code, Part 3 SEN02631-00
—	**DY2DKB**	Wiper Drive (For) S/C	MON	Electrical system	
—	**DY2EKB**	Wiper Drive (Rev) S/C	MON	Electrical system	

★ This failure codes table is the same as that in Testing and adjusting, Special functions of machine monitor.

Fuse locations

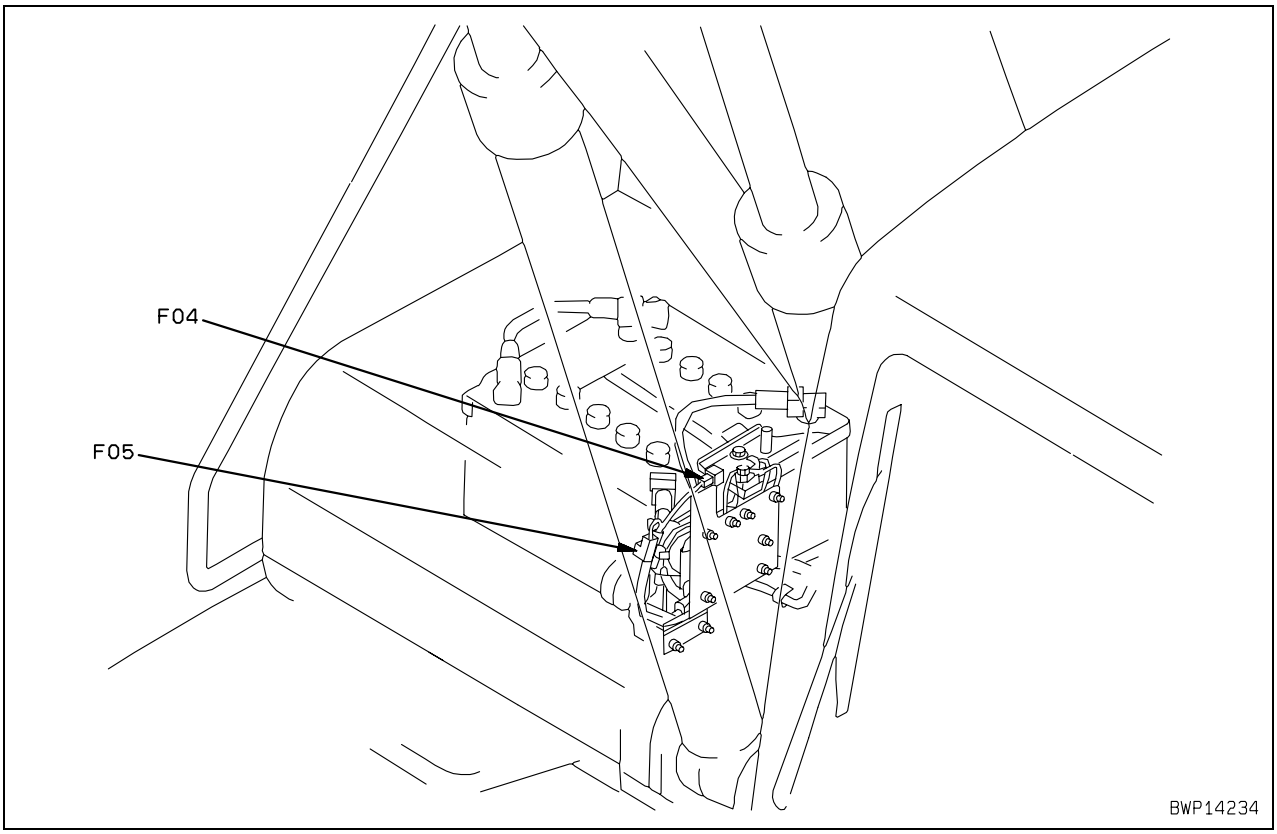
Connection table of fuse box

★ This connection table shows the devices to which each power supply of the fuse box supplies power (A switch power supply is a device which supplies power while the starting switch is in the ON position and a constant power supply is a device which supplies power while the starting switch is in the OFF and ON positions).

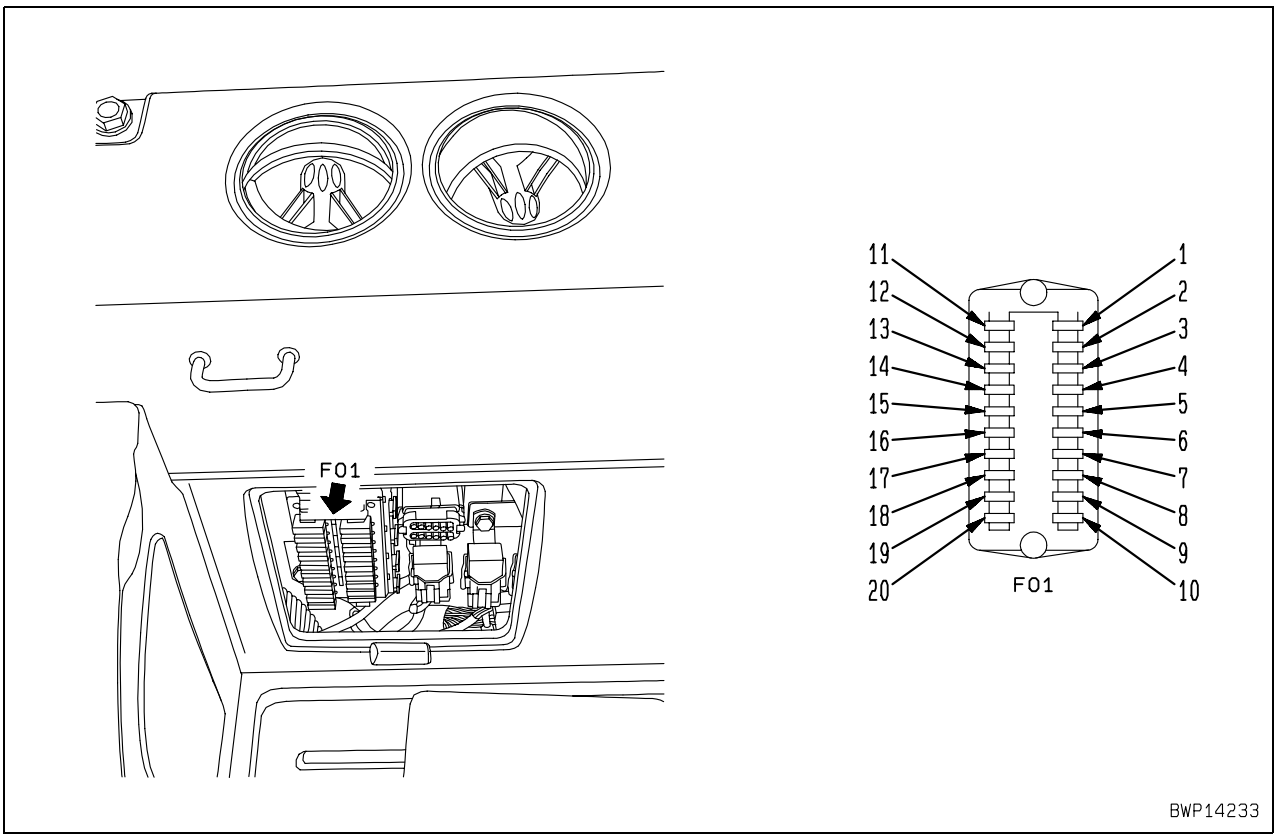
★ When carrying out troubleshooting related to the electrical system, you should check the fuses and fusible links to see if the power is supplied normally.

Type of power supply	Fusible link	Fuse No.	Fuse capacity	Destination of power
Switch power supply	F04 (65A)	1	10A	Work lamp, relay, emergency switch
		2	30A	Pump controller (Solenoid power supply)
		3	10A	PPC oil pressure lock solenoid valve
		4	10A	Cigarette lighter
				Windshield washer motor
		5	10A	Horn relay, horn
Switch power supply	F04 (65A)	6	10A	Auto preheater
		7	10A	Rotary lamp
		8	20A	Working lamp (boom), working lamp (rear)
		9	10A	Radio, speaker
				Left knob switch (pump controller input)
		10	20A	(Spare)
Switch power supply	F04 (65A)	11	20A	Air conditioner unit
		12	10A	(Spare)
		13	10A	Headlamp
		14	10A	Optional power supply (1)
		15	20A	Travel alarm, 12 V power supply
				Optional power supply (2), heated seat, air suspension seat
Constant power supply	F05 (30A)	16	10A	Radio (backup power supply)
				Room lamp
		17	20A	Pump controller
				Machine monitor
		18	10A	(Spare)
		19	30A	Engine controller
Switch power supply	Starting switch ACC	20	5A	Engine controller (ACC signal)

Locations of fusible links



Location of fuse box and fuse Nos.



Troubles that occur when controller power supply of pump controller is defective

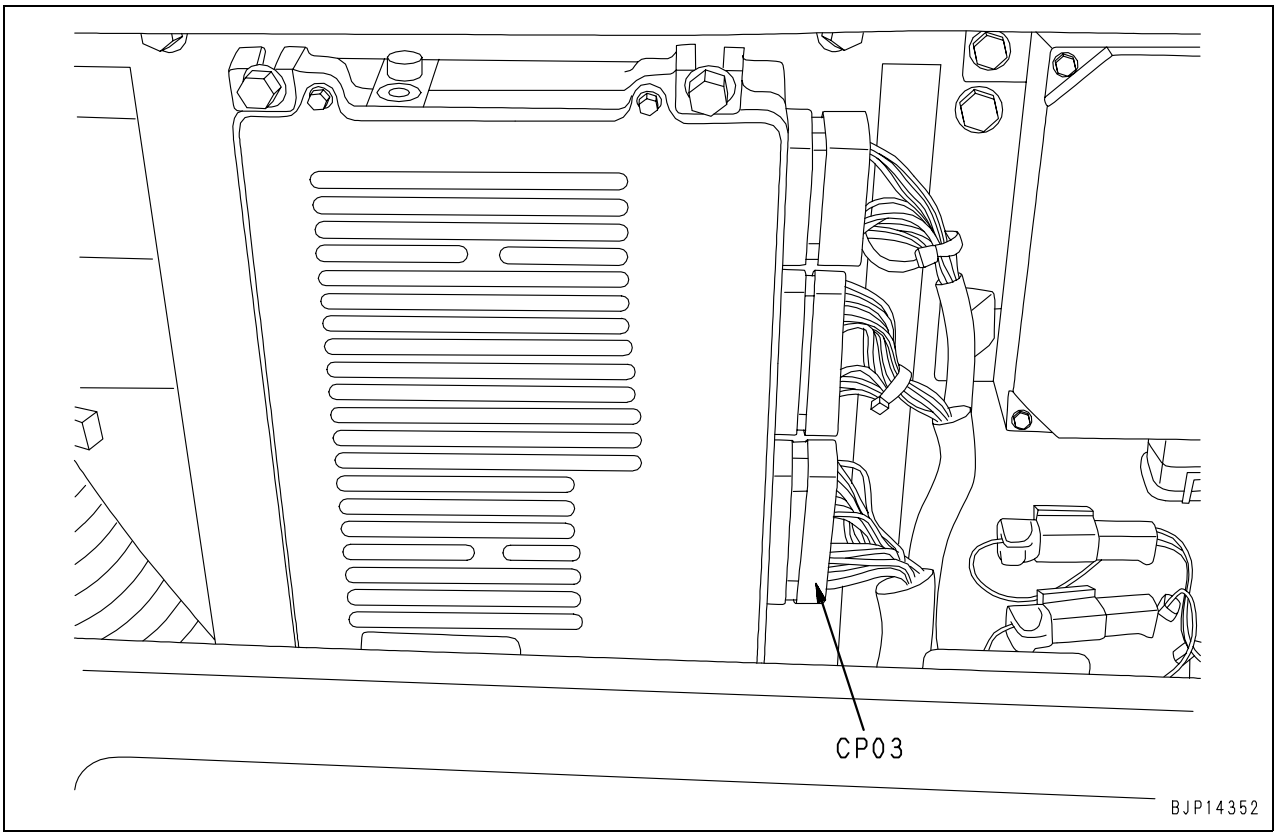
★ The controller power supply (F01-1) of the pump controller drives the controller system. Accordingly, if it is turned off, the controller cannot control the system and the troubles shown below occur simultaneously (The following is an example of the troubles).
- The working mode cannot be changed.
- The auto-decelerator does not work or is not reset.
- The travel speed does not change.
- The power maximizing function does not work.
- The swing holding brake cannot be reset automatically.
- The machine deviates during travel.

Troubles that occur when solenoid power supply of pump controller is defective

★ The solenoid power supply (F01-2) of the pump controller is used by the controller to drive the solenoids and relays. Accordingly, if the solenoid power supply is turned off, when the controller outputs the power to the solenoids or relays, the power is not supplied to any of the solenoids and relays and all or some of the following failure codes are displayed simultaneously.
- [DW43KA], [DW43KB]: Travel speed solenoid system
- [DW45KA], [DW45KB]: Swing holding brake solenoid system
- [DW91KA], [DW91KB]: Travel junction solenoid system
- [DWA2KA], [DWA2KB]: Service solenoid system
- [DWK0KA], [DWK0KB]: 2-stage relief solenoid system
- [DXA0KA], [DXA0KB]: PC-EPC (F) solenoid system
- [DXE0KA], [DXE0KB]: LS-EPC solenoid system
- [DXE4KA], [DXE4KB]: Service current EPC system (if attachment is installed)
- [DWJ0KA], [DWJ0KB]: Merge-divider main solenoid system

★ If the above problems occur, check the related fuse (F01-2) and inlet voltage of the pump controller.
1) Disconnect connector CP03 of the controller and connect a T-adapter to the wiring harness side.
2) Turn the starting switch ON.
3) Measure the voltage between each of pins (2), and (12) and each of pins (27), (32), and (33).
* Pins (2) and (12) are the power supply and pins (27), (32), and (33) are the chassis ground.
* If the voltage is 20 – 30 V, it is normal.

★ Power supply connector (CP03) of pump controller



PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN02627-00

HYDRAULIC EXCAVATOR

PC300-8
PC300LC-8
PC350-8
PC350LC-8

Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

40 Troubleshooting

General information on troubleshooting

Points to remember when troubleshooting

- ⚠ **Stop the machine in a level place, and check that the safety pin, blocks, and parking brake are securely fitted.**
- ⚠ **When carrying out the operation with 2 or more workers, keep strictly to the agreed signals, and do not allow any unauthorized person to come near.**
- ⚠ **If the radiator cap is removed when the engine is hot, hot water may spurt out and cause burns, so wait for the engine to cool down before starting troubleshooting.**
- ⚠ **Be extremely careful not to touch any hot parts or to get caught in any rotating parts.**
- ⚠ **When disconnecting wiring, always disconnect the negative (–) terminal of the battery first.**
- ⚠ **When removing the plug or cap from a location which is under pressure from oil, water, or air, always release the internal pressure first. When installing measuring equipment, be sure to connect it properly.**

The aim of troubleshooting is to pinpoint the basic cause of the failure, to carry out repairs swiftly, and to prevent reoccurrence of the failure. When carrying out troubleshooting, and important point is of course to understand the structure and function. However, a short cut to effective troubleshooting is to ask the operator various questions to form some idea of possible causes of the failure that would produce the reported symptoms.

1. When carrying out troubleshooting, do not hurry to disassemble the components.
   If components are disassembled immediately any failure occurs:
   - Parts that have no connection with the failure or other unnecessary parts will be disassembled.
   - It will become impossible to find the cause of the failure.

   It will also cause a waste of manhours, parts, or oil or grease, and at the same time, will also lose the confidence of the user or operator. For this reason, when carrying out troubleshooting, it is necessary to carry out thorough prior investigation and to carry out troubleshooting in accordance with the fixed procedure.

2. Points to ask user or operator
   1) Have any other problems occurred apart from the problem that has been reported?
   2) Was there anything strange about the machine before the failure occurred?
   3) Did the failure occur suddenly, or were there problems with the machine condition before this?
   4) Under what conditions did the failure occur?
   5) Had any repairs been carried out before the failure? When were these repairs carried out?
   6) Has the same kind of failure occurred before?

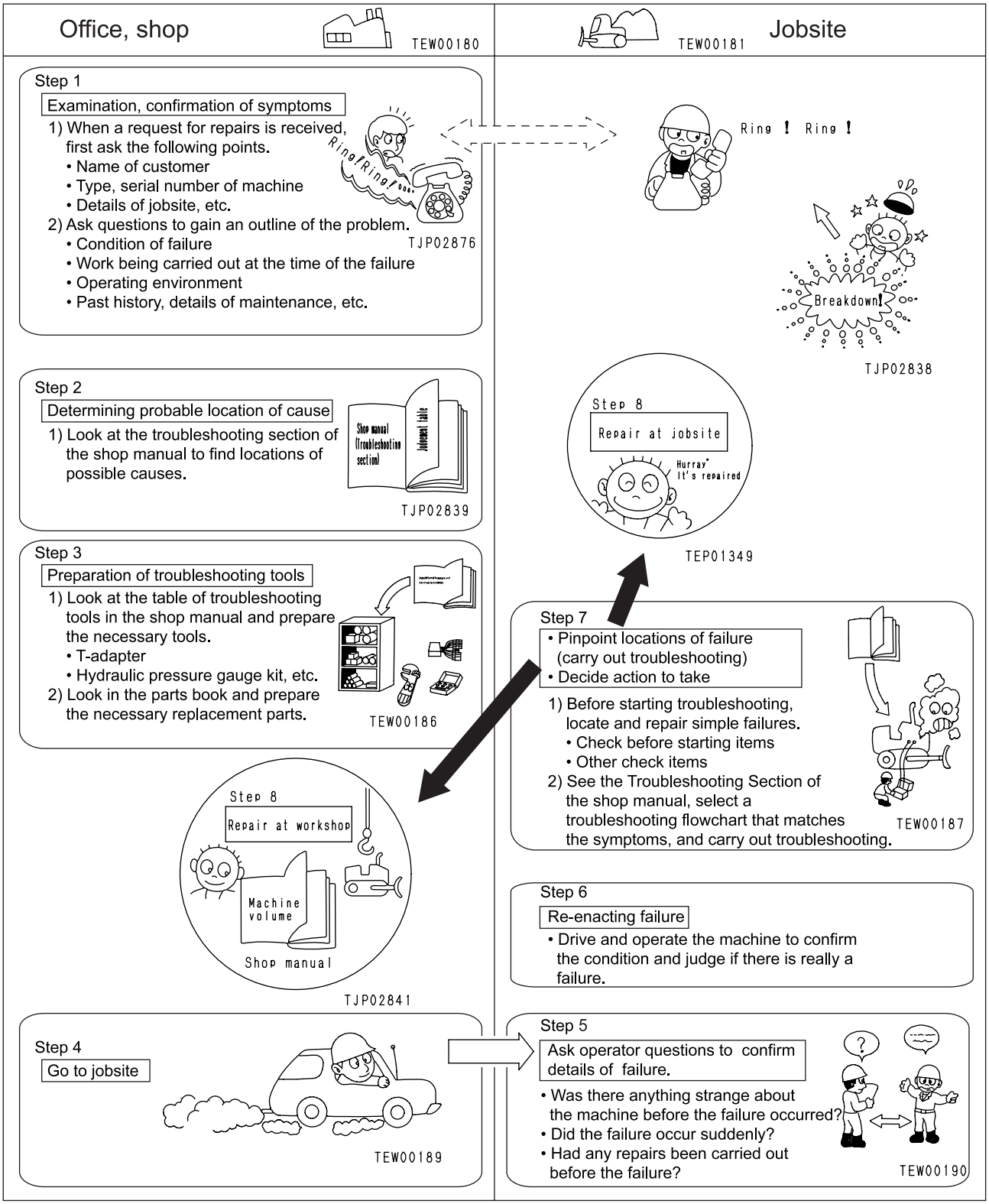
3. Check before troubleshooting
   1) Is there any sign of irregularities of the machine?
   2) Make checks before starting day's work.
   3) Make checks of other items.
   4) Other maintenance items can be checked externally, so check any item that is considered to be necessary.

4. Confirming failure
   Confirm the extent of the failure yourself, and judge whether to handle it as a real failure or as a problem with the method of operation, etc.
   ★ When operating the machine to reenact the troubleshooting symptoms, do not carry out any investigation or measurement that may make the problem worse.

5. Troubleshooting
   Use the results of the investigation and inspection in Items 2 – 4 to narrow down the causes of failure, then use the troubleshooting table or troubleshooting flowchart to locate the position of the failure exactly.
   ★ The basic procedure for troubleshooting is as follows.
      1] Start from the simple points.
      2] Start from the most likely points.
      3] Investigate other related parts or information.

6. Measures to remove root cause of failure
   Even if the failure is repaired, if the root cause of the failure is not repaired, the same failure will occur again.To prevent this, always investigate why the problem occurred. Then, remove the root cause.

Sequence of events in troubleshooting



Checks before troubleshooting

	Item	Criterion	Remedy
Lubricating oil/Coolant	1. Check of level and type of fuel	—	Add fuel
	2. Check of fuel for foreign matter	—	Clean and drain
	3. Check of hydraulic oil level	—	Add oil
	4. Check of hydraulic oil strainer	—	Clean and drain
	5. Check of swing machinery oil level	—	Add oil
	6. Check of level and type of engine oil (in oil pan)	—	Add oil
	7. Check of coolant level	—	Add coolant
	8. Check of dust indicator for clogging	—	Clean or replace
	9. Check of hydraulic oil filter	—	Replace
Electrical equipment	1. Check of battery terminals and wiring for looseness and corrosion	—	Retighten or replace
	2. Check of alternator terminals and wiring for looseness and corrosion	—	Retighten or replace
	3. Check of starting motor terminals and wiring for looseness and corrosion	—	Retighten or replace
Hydraulic/ Mechanical equipment	1. Check for abnormal noise and smell	—	Repair
	2. Check for oil leakage	—	Repair
	3. Bleeding air	—	Bleed air
Electric, electrical equipment	1. Check of battery voltage (with engine stopped)	20 – 30 V	Replace
	2. Check of electrolyte level	—	Add or replace
	3. Check of wires for discoloration, burn, and removal of cover	—	Replace
	4. Check for released wire clamp and drooping wire	—	Repair
	5. Check of wires for wetness (Check connectors and terminals for wetness, in particular)	—	Disconnect the connectors and dry
	6. Check of fuse for disconnection and corrosion	—	Replace
	7. Check of alternator voltage (while engine speed is at middle or higher)	After operating for several minutes: 27.5 – 29.5 V	Replace
	8. Check of battery relay for operating sound (when starting switch is turned ON or OFF)	—	Replace

Classification and troubleshooting steps

Classification of troubleshooting

Mode	Contents
Display of code	Troubleshooting by failure code
E-mode	Troubleshooting of electrical system
H-mode	Troubleshooting of hydraulic and mechanical system
S-mode	Troubleshooting of engine

Troubleshooting steps

If a problem that appears to be a failure occurs on the machine, identify the relevant troubleshooting No. by performing the following steps and proceed to the main body of troubleshooting.

1. **Procedure for troubleshooting to be taken when action code is displayed on machine monitor:**
   When action code is displayed on machine monitor, press [✓] switch at panel switch section to display failure code.
   Carry out the troubleshooting for the corresponding [**Display of code**] according to the displayed failure code.

2. **Procedure for troubleshooting to be taken when failure code is recorded in abnormality record:**
   If an action code is not displayed on the machine monitor, check a failure code with the abnormality record function of the machine monitor.
   If a code is recorded, carry out troubleshooting for the corresponding [**Display of code**] according to the recorded code.
   - ★ If an electrical system failure code is recorded, delete all the codes and reproduce them, and then see if the trouble is still detected.
   - ★ An error code of the mechanical system cannot be deleted.

3. **Procedure for troubleshooting to be taken when action code is not displayed and no failure code is recorded in abnormality record:**
   If an action code is not displayed on the machine monitor and no failure code is recorded in the abnormality record, a trouble that the machine cannot find out by itself may have occurred in the electrical system or hydraulic and mechanical system.
   In this case, check the phenomenon looking like a trouble again and select the same phenomenon from the table of “Phenomena looking like troubles and troubleshooting Nos.”, and then carry out troubleshooting corresponding to that phenomenon in the “**E-mode**”, “**H-mode**”, or “**S-mode**”.

Information in troubleshooting table

★ The following information is summarized in the troubleshooting table and the related electrical circuit diagram. Before carrying out troubleshooting, understand that information fully.

Action code	Failure code	Trouble	
Display on machine monitor	**Display on machine monitor**	Trouble	**Trouble name displayed in abnormality record machine monitor**
Contents of trouble	**Contents of trouble detected by machine monitor or controller**		
Action of machine monitor or controller	**Action taken by machine monitor or controller to protect system or devices when engine controller detects trouble**		
Problem that appears on machine	**Problem that appears on machine as result of action taken by machine monitor or controller (shown above)**		
Related information	**Information related to detected trouble or troubleshooting**		

	Cause		Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1 2 3 4	Possible causes of trouble (Given numbers are reference numbers, which do not indicate priority)	**<Contents of description>** **• Standard value in normal state to judge possible causes** **• Remarks on judgment** **<Troubles in wiring harness>** **• Disconnection** **Connector is connected imperfectly or wiring harness is broken.** **• Ground fault** **Wiring harness which is not connected to chassis ground circuit is in contact with chassis ground circuit.** **• Hot short** **Wiring harness which is not connected to power source (24 V) circuit is in contact with power source (24 V) circuit.** **• Short circuit** **Independent wiring harnesses are in contact with each other abnormally.** **<Precautions for troubleshooting>** **(1) Method of indicating connector No. and handling of T-adapter** **Insert or connect T-adapter as explained below for troubleshooting, unless otherwise specified.** **• If connector No. has no marks of “male” and “female”, disconnect connector and insert T-adapters in both male side and female side.** **• If connector No. has marks of “male” and “female”, disconnect connector and connect T-adapter to only male side or female side.** **(2) Entry order of pin Nos. and handling of tester leads** **Connect positive (+) lead and negative (–) lead of tester as explained below for troubleshooting, unless otherwise specified.** **• Connect positive (+) lead to pin No. or wiring harness entered on front side.** **• Connect negative (–) lead to pin No. or harness entered on rear side.**

Related circuit diagram

This drawing is a part of the electric circuit diagram related to trouble-shooting.

- Connector No.: Indicates (Model – Number of pins) and (Color).
- “Connector No. and pin No.” from each branching/merging point: Shows the ends of branch or source of merging within the parts of the same wiring harness.
- Arrow (⇔): Roughly shows the location on the machine.

Possible problems and troubleshooting No.

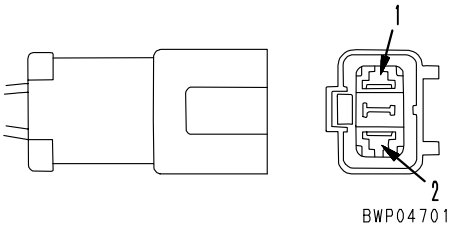
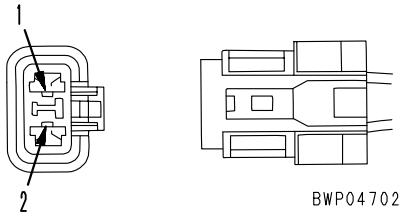
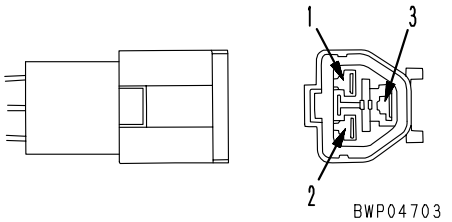
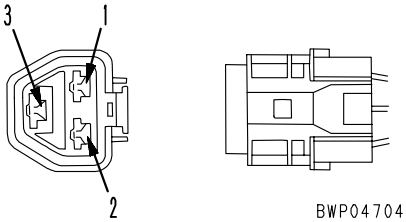
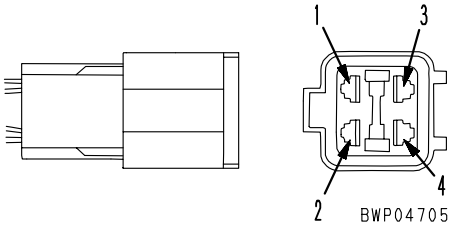
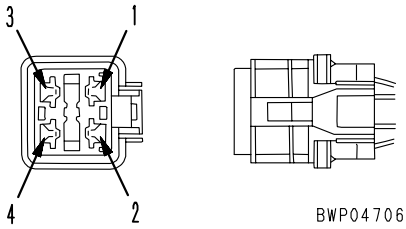
No.	Phenomena looking like troubles		Troubleshooting			
			Display of code	E-mode	H-mode	S-mode
Phenomena related to action code/failure code						
1	An action code is displayed on machine monitor.		**According to displayed code**			
2	When abnormality record is checked, failure code is displayed in electrical system abnormality record					
3	When abnormality record is checked, failure code is displayed in mechanical system abnormality record					
Phenomena related to engine						
4	Starting performance is poor (it always starts up slowly)					**S-1**
5	Engine does not start	Engine does not rotate		**E-1**		**S-2 a)**
6		Engine rotates, but exhaust gas does not come out				**S-2 b)**
7		Engine emits exhaust gas, but it does not start				**S-2 c)**
8	Engine does not pick up smoothly (follow-up performance is poor)					**S-3**
9	Engine stops during operations				**H-2**	**S-4**
10	Engine rotation is unstable (it hunts).					**S-5**
11	Engine lacks output or power				**H-1**	**S-6**
12	Exhaust smoke is black (incomplete combustion)					**S-7**
13	Oil consumption is excessive or exhaust smoke is blue					**S-8**
14	Oil becomes contaminated quickly					**S-9**
15	Fuel consumption is excessive					**S-10**
16	Oil is in coolant, coolant spurts back or coolant level goes down					**S-11**
17	Oil pressure drops					**S-12**
18	Oil level rises (Entry of coolant or fuel)					**S-13**
19	Coolant temperature becomes too high (overheating)					**S-14**
20	Abnormal noise is made					**S-15**
21	Vibration is excessive					**S-16**
22	Auto-decelerator does not operate			**E-2**	**H-5**	
23	Automatic warm-up system does not operate			**E-3**		
24	Preheater does not operate			**E-4**		
Phenomena related to work equipment, swing, and travel						
25	Speed or power of whole work equipment, travel, and swing is low				**H-1**	**S-6**
26	Engine speed lowers extremely or engine stalls				**H-2**	**S-4**
27	Work equipment, swing, and travel mechanism do not move			**E-5**	**H-3**	
28	Abnormal sound comes out from around hydraulic pump				**H-4**	
29	Fine control performance or response is low				**H-6**	
Phenomena related to work equipment						
30	Speed or power of boom is low			**E-18,19**	**H-7**	
31	Speed or power of arm is low			**E-20,21**	**H-8**	
32	Speed or power of bucket is low			**E-22,23**	**H-9**	
33	Work equipment does not move singly				**H-10**	
34	Hydraulic drift of work equipment is large				**H-11**	
35	Time lag of work equipment is large				**H-12**	
36	When part of work equipment is relieved singly, other parts of work equipment move				**H-13**	

No.	Phenomena looking like troubles	Troubleshooting			
		Display of code	E-mode	H-mode	S-mode
37	Power maximizing function does not work.	**E-6, 18 - 23**		**H-14**	
Phenomena related to compound operation					
38	In compound operation of work equipment, speed of part loaded more is low			**H-15**	
39	When machine swings and raises boom simultaneously, boom rising speed is low			**H-16**	
40	When machine swings and travels simultaneously, travel speed lowers largely			**H-17**	
Phenomena related to travel					
41	Machine deviates during travel			**H-18**	
42	Travel speed is low		**E-25**	**H-19**	
43	Machine is not steered well or steering power is low		**E-25,26**	**H-20**	
44	Travel speed does not change or travel speed is low or high		**E-25**	**H-21**	
45	Travel system does not move (only one side)			**H-22**	
Phenomena related to swing					
46	Upper structure does not swing		**E-24**	**H-23**	
47	Swing acceleration or swing speed is low			**H-24**	
48	Upper structure overruns remarkably when it stops swinging			**H-25**	
49	Large shock is made when upper structure stops swinging			**H-26**	
50	Large sound is made when upper structure stops swinging			**H-27**	
51	Hydraulic drift of swing is large			**H-28**	
Phenomena related to machine monitor (Operator menu: ordinary screen)					
52	Machine monitor does not display any items		**E-7**		
53	Machine monitor does not display some items		**E-8**		
54	Contents of display by machine monitor are different from applicable machine		**E-9**		
55	Radiator coolant level monitor lights up in red during check before starting	**B@BCZK**			
56	Engine oil level monitor lights up in red during check before starting	**B@BAZK**			
57	Maintenance interval monitor lights up in red during check before starting	**See the Operation and Maintenance Manual.**			
58	Charge level monitor lights up in red while engine is running	**AB00KE**			
59	Fuel level monitor lights up in red while engine is running		**E-10**		
60	Air cleaner clogging monitor lights up in red while engine is running	**AA10NX**			
61	Engine coolant temperature monitor lights up in red while engine is running	**B@BCNS**			
62	Hydraulic oil temperature monitor lights up in red while engine is running	**B@HANS**			
63	Engine coolant temperature gauge does not indicate normally		**E-11**		
64	Hydraulic oil temperature gauge does not indicate normally		**E-12**		
65	Fuel level gauge does not indicate normally		**E-13**		
66	Swing lock monitor does not indicate normally		**E-14**		
67	Machine monitor display anything even when operated on monitor switch section		**E-15**		
68	Windshield wiper and window washer do not operate		**E-16**		
69	Machine push-up function does not work normally		**E-17**		

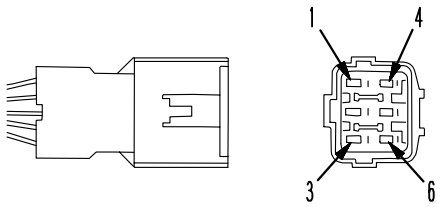
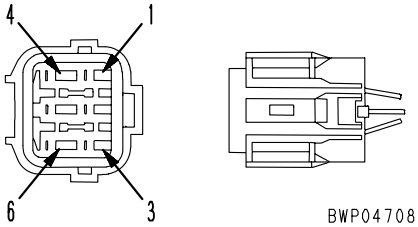
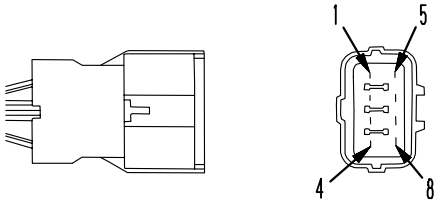
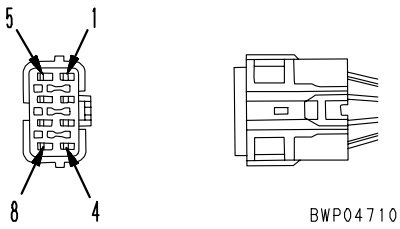
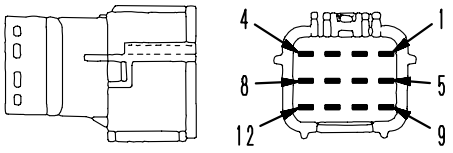
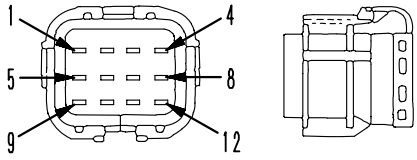
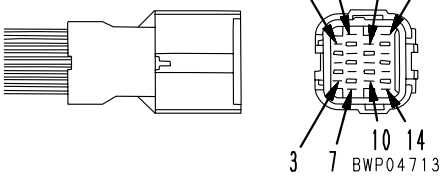
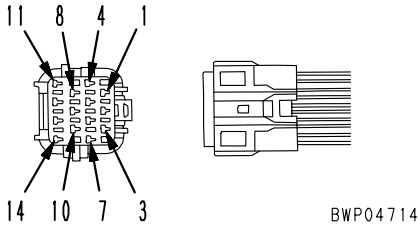
No.	Phenomena looking like troubles	Troubleshooting			
		Display of code	E-mode	H-mode	S-mode
Phenomena related to machine monitor (Service menu: special functions screen)					
70	Monitoring function does not display “Boom RAISE” normally		**E-18**		
71	Monitoring function does not display “Boom LOWER” normally		**E-19**		
72	Monitoring function does not display “Arm IN” normally		**E-20**		
73	Monitoring function does not display “Arm OUT” normally		**E-21**		
74	Monitoring function does not display “Bucket CURL” normally		**E-22**		
75	Monitoring function does not display “Bucket DUMP” normally		**E-23**		
76	Monitoring function does not display “Swing” normally		**E-24**		
77	Monitoring function does not display “Travel” normally		**E-25**		
78	Monitoring function does not display “Travel Steering” normally		**E-26**		
79	Monitoring function does not display “Service” normally		**E-27**		
Phenomena related to KOMTRAX					
80	KOMTRAX system does not operate normally		**E-28**		
Other phenomena					
81	Air conditioner does not operate		**E-29**		
82	Travel alarm does not sound or does not stop sounding		**E-30**		
83	Horn does not sound		**E-31**		

Connection table for connector pin numbers (Rev. 2007.4)

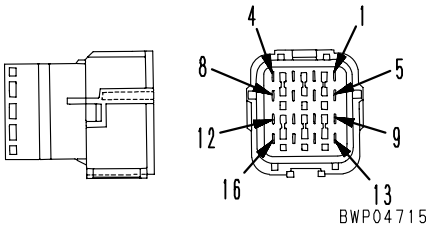
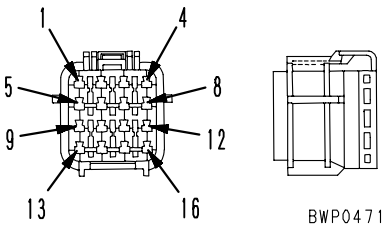
★ The terms of male and female refer to the pins, while the terms of male housing and female housing refer to the mating portion of the housing.

No. of pins	X type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
1	Part No. : 08055-00181	Part No. : 08055-00191	799-601-7010
2	 BWP04701	 BWP04702	799-601-7020
	Part No. : 08055-00282	Part No. : 08055-00292	
3	 BWP04703	 BWP04704	799-601-7030
	Part No. : 08055-00381	Part No. : 08055-00391	
4	 BWP04705	 BWP04706	799-601-7040
	Part No. : 08055-00481	Part No. : 08055-00491	
—	Terminal part No. : 79A-222-3370 ·Electric wire size: 0.85 ·Grommet: Black ·Q'ty: 20	Terminal part No. : 79A-222-3390 ·Electric wire size: 0.85 ·Grommet: Black ·Q'ty: 20	—
—	Terminal part No. : 79A-222-3380 ·Electric wire size: 2.0 ·Grommet: Red ·Q'ty: 20	Terminal part No. : 79A-222-3410 ·Electric wire size: 2.0 ·Grommet: Red ·Q'ty: 20	—

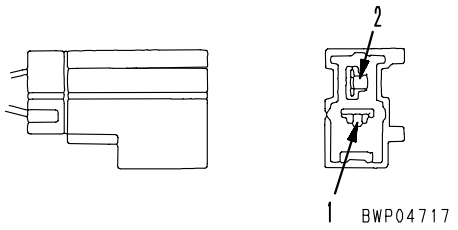
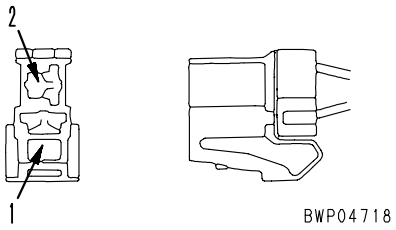
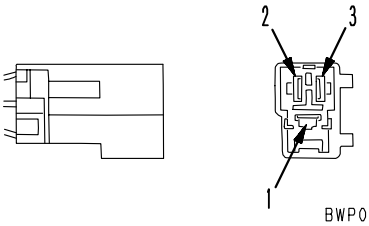
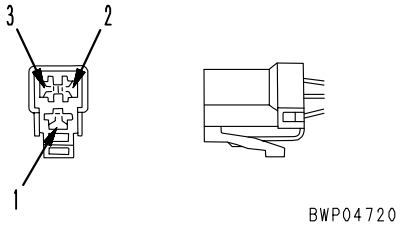
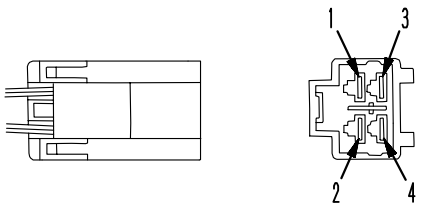
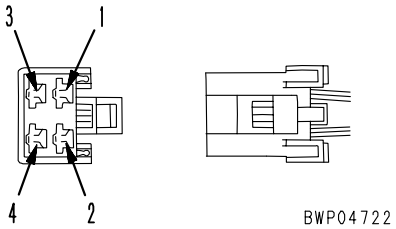
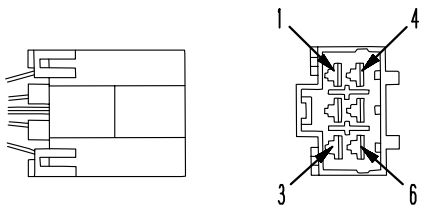
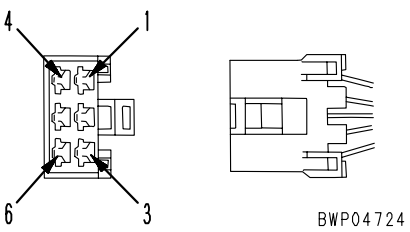
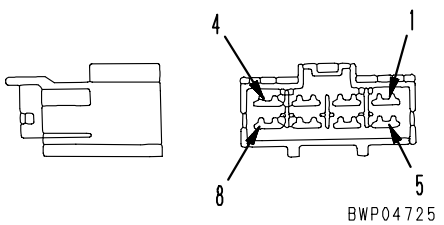
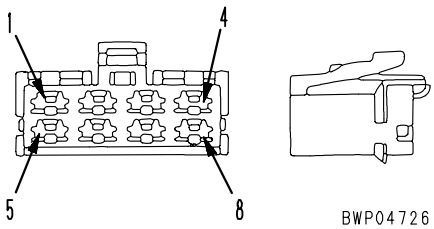
9JS04890

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

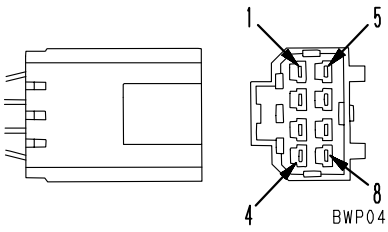
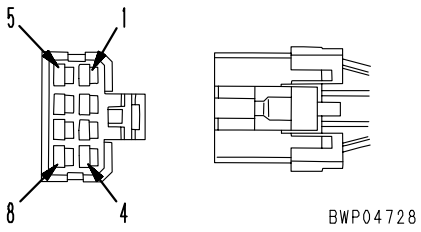
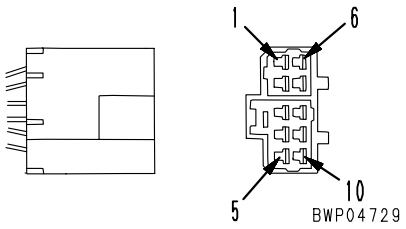
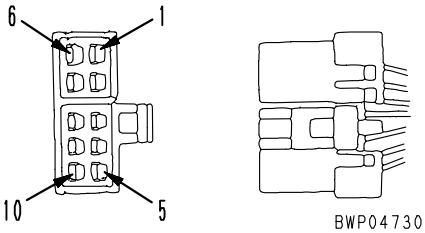
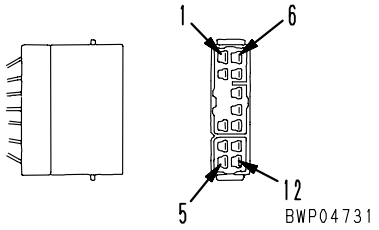
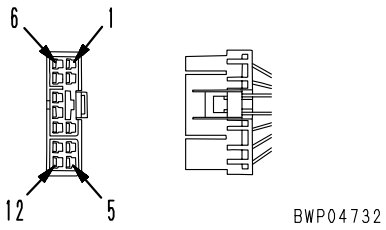
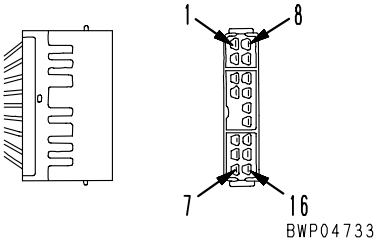
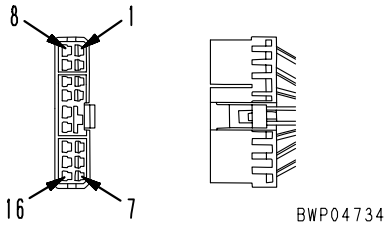
9JS04891

No. of pins	SWP type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
16	 BWP04715	 BWP04716	799-601-7320
	Part No. : 08055-11681	Part No. : 08055-11691	
—	Terminal part No. : ·Electric wire size: 0.85 ·Grommet: Black ·Q'ty: 20	Terminal part No. : ·Electric wire size: 0.85 ·Grommet: Black ·Q'ty: 20	—
—	Terminal part No. : ·Electric wire size: 1.25 ·Grommet: Red ·Q'ty: 20	Terminal part No. : ·Electric wire size: 1.25 ·Grommet: Red ·Q'ty: 20	—

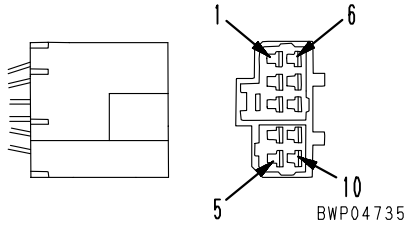
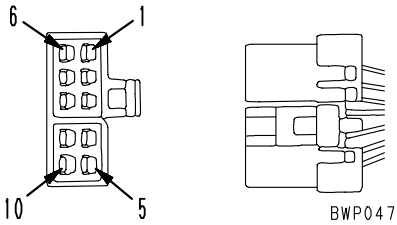
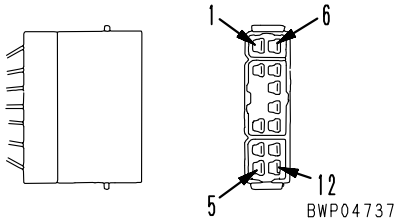
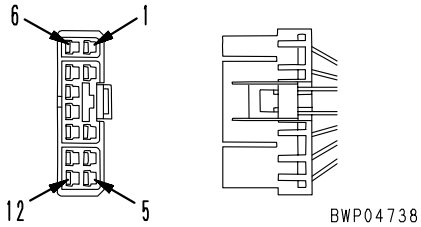
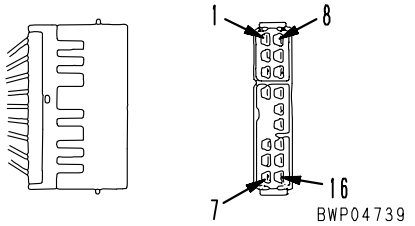
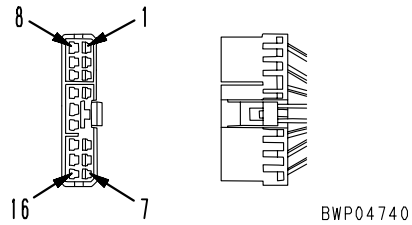
9JS04892

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

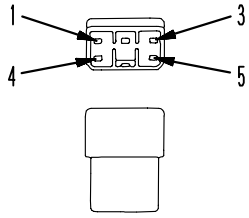
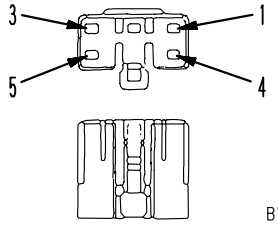
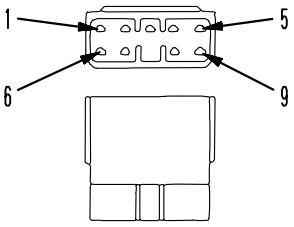
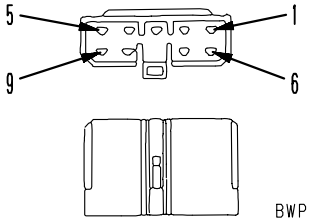
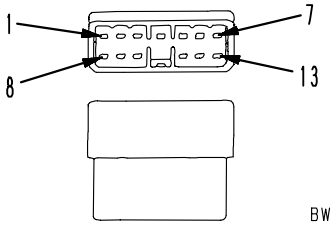
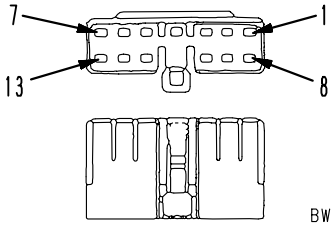
9JS04893

No. of pins	S type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
8	 BWP04727	 BWP04728	799-601-7140
	Part No. : 08056-10871	Part No. : 08056-10881	
10 (White)	 BWP04729	 BWP04730	799-601-7150
	Part No. : 08056-11071	Part No. : 08056-11081	
12 (White)	 BWP04731	 BWP04732	799-601-7350
	Part No. : 08056-11271	Part No. : 08056-11281	
16 (White)	 BWP04733	 BWP04734	799-601-7330
	Part No. : 08056-11671	Part No. : 08056-11681	

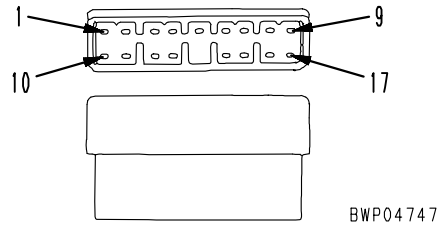
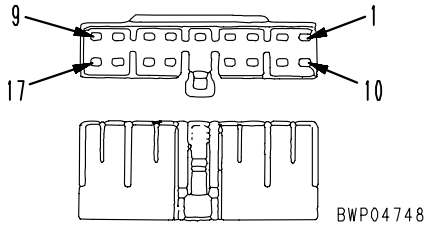
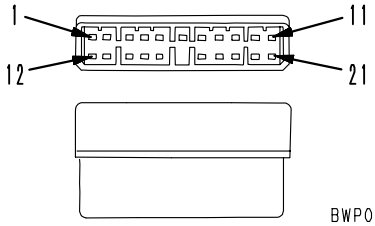
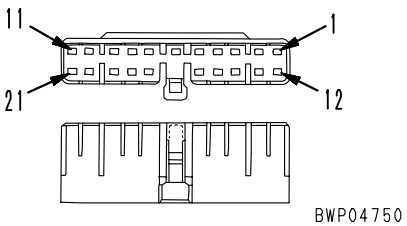
9JS04894

No. of pins	S type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
10 (Blue)	 BWP04735	 BWP04736	—
	—	—	
12 (Blue)	 BWP04737	 BWP04738	799-601-7160
	Part No. : 08056-11272	Part No. : 08056-11282	
16 (Blue)	 BWP04739	 BWP04740	799-601-7170
	Part No. : 08056-11672	Part No. : 08056-11682	

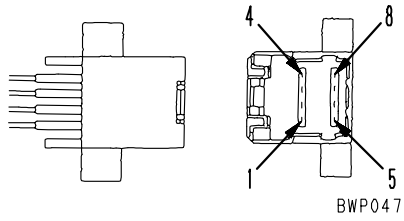
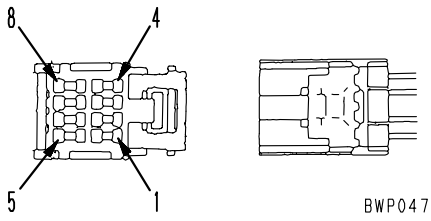
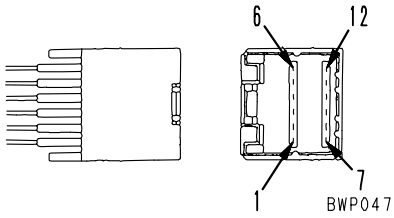
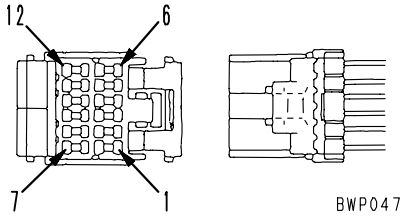
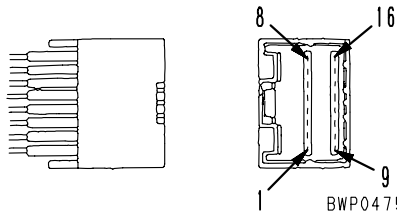
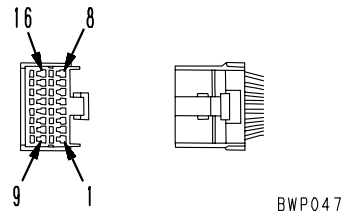
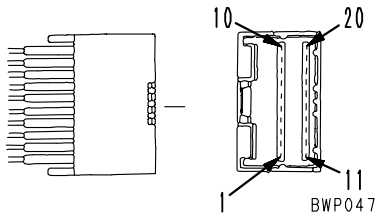
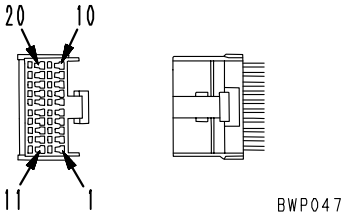
9JS04895

No. of pins	MIC type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
7	Body part No. : 79A-222-2640 (Q'ty:5)	Body part No. : 79A-222-2630 (Q'ty:5)	—
11	Body part No. : 79A-222-2680 (Q'ty:5)	Body part No. : 79A-222-2670 (Q'ty:5)	—
5	 BWP04741	 BWP04742	799-601-2710
	Body part No. : 79A-222-2620 (Q'ty:5)	Body part No. : 79A-222-2610 (Q'ty:5)	
9	 BWP04743	 BWP04744	799-601-2950
	Body part No. : 79A-222-2660 (Q'ty:5)	Body part No. : 79A-222-2650 (Q'ty:5)	
13	 BWP04745	 BWP04746	799-601-2720
	Body part No. : 79A-222-2710 (Q'ty:2)	Body part No. : 79A-222-2690 (Q'ty:2)	

9JS04896

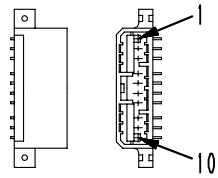
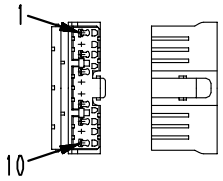
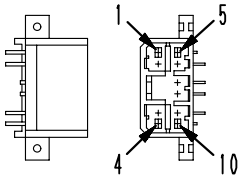
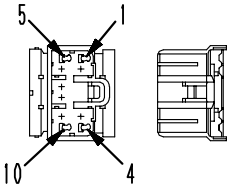
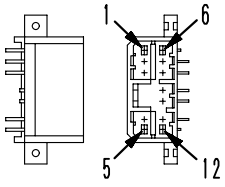
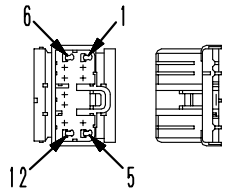
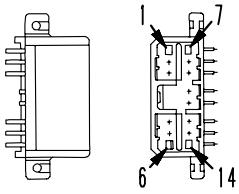
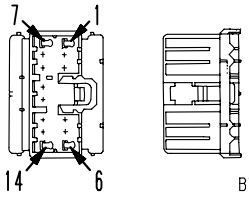
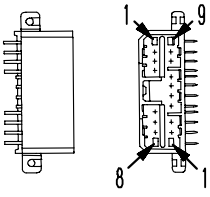
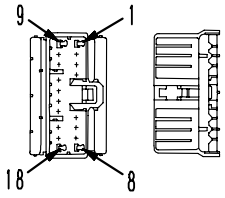
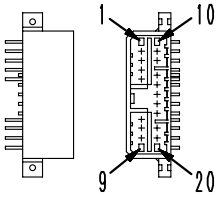
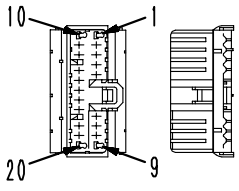
No. of pins	MIC type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
17	 BWP04747	 BWP04748	799-601-2730
	Body part No. : 79A-222-2730 (Q'ty:2)	Body part No. : 79A-222-2720 (Q'ty:2)	
21	 BWP04749	 BWP04750	799-601-2740
	Body part No. : 79A-222-2750 (Q'ty:2)	Body part No. : 79A-222-2740 (Q'ty:2)	
	Terminal part No. : 79A-222-2770 (Q'ty:50)	Terminal part No. : 79A-222-2760 (Q'ty:50)	

9JS04897

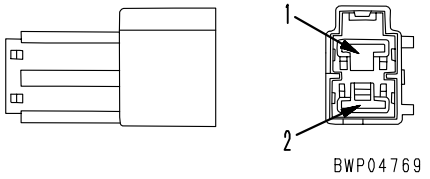
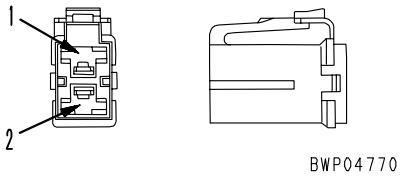
No. of pins	AMP040 type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
8	 BWP04751	 BWP04752	799-601-7180
	—	Housing part No. : 79A-222-3430 (Q'ty:5)	
12	 BWP04753	 BWP04754	799-601-7190
	—	Housing part No. : 79A-222-3440 (Q'ty:5)	
16	 BWP04755	 BWP04756	799-601-7210
	—	Housing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

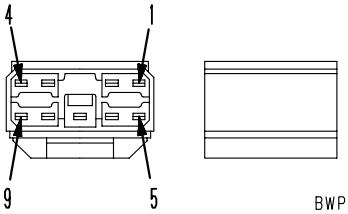
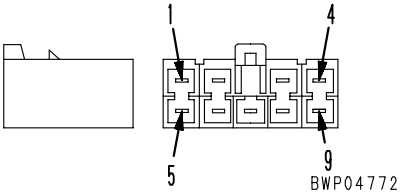
★ Terminal part No. :79A-222-3470 (No relation with number of pins)

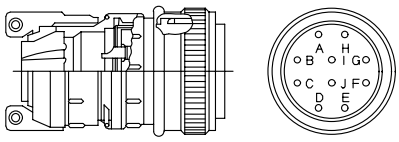
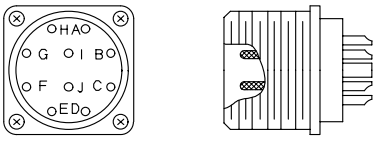
9JS04898

No. of pins	AMP070 type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
10	 BWP04759	 BWP04760	—
	—	Part No. : 08195-10210	
10	 9JS02245	 9JS02246	799-601-7510
	—	Part No. : 7821-92-7330	
12	 BWP04761	 BWP04762	799-601-7520
	—	Part No. : 7821-92-7340	
14	 BWP04763	 BWP04764	799-601-7530
	—	Part No. : 7821-92-7350	
18	 BWP04765	 BWP04766	799-601-7540
	—	Part No. : 7821-92-7360	
20	 BWP04767	 BWP04768	799-601-7550
	—	Part No. : 7821-92-7370	

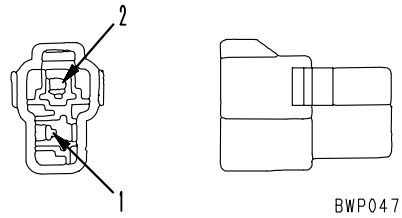
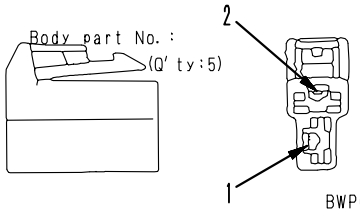
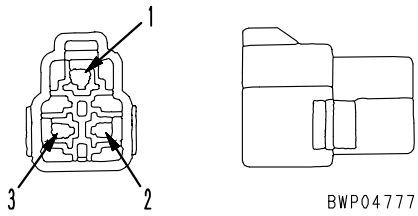
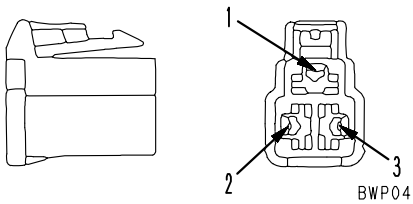
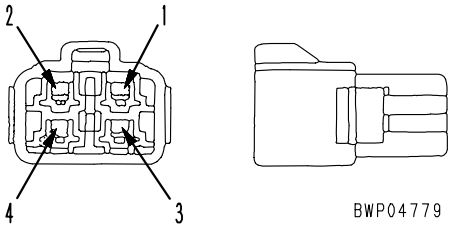
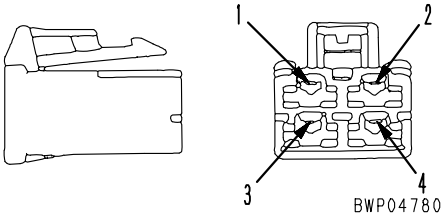
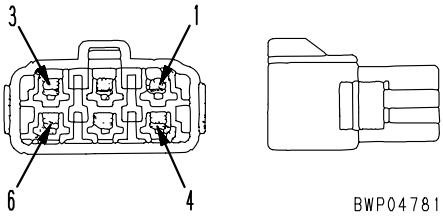
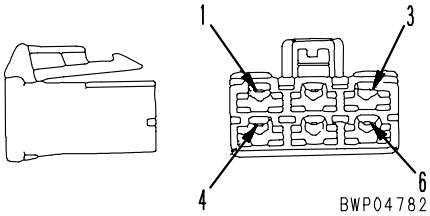
BJP15789

No. of pins	L type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
2	 BWP04769	 BWP04770	—
	—	—	

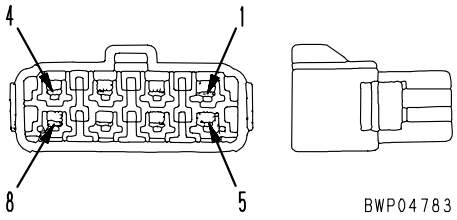
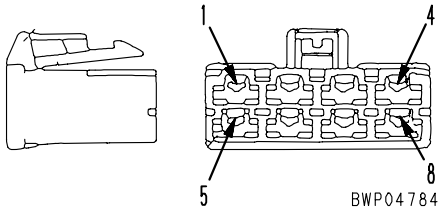
No. of pins	Connector for PA		
	Male (female housing)	Female (male housing)	T-adapter Part No.
9	 BWP04771	 BWP04772	—
	—	—	

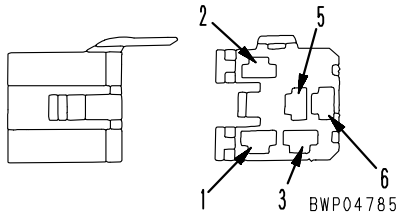
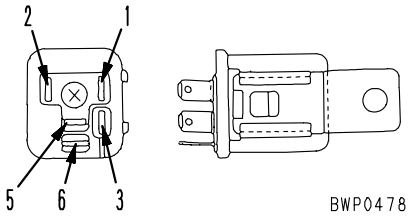
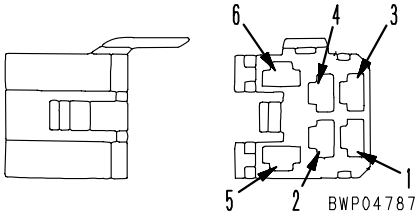
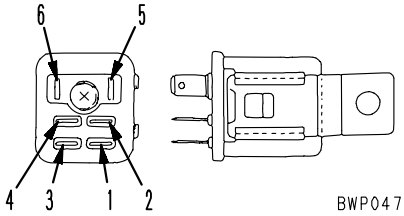
No. of pins	Bendix MS connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
10	 BWP04773	 BWP04774	799-601-3460
	—	—	

9JS04900

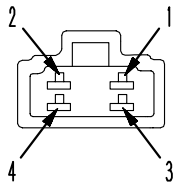
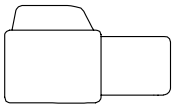
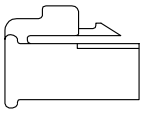
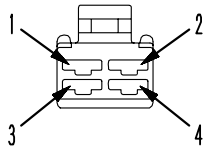
No. of pins	KES 1 (Automobile) connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
2			—
	Part No. : 08027-10210 (Natural color) 08027-10220 (Black)	Part No. : 08027-10260 (Natural color) 08027-10270 (Black)	
3			—
	Part No. : 08027-10310	Part No. : 08027-10360	
4			—
	Part No. : 08027-10410 (Natural color) 08027-10420 (Black)	Part No. : 08027-10460 (Natural color) 08027-10470 (Black)	
6			—
	Part No. : 08027-10610 (Natural color) 08027-10620 (Black)	Part No. : 08027-10660 (Natural color) 08027-10670 (Black)	

9JS04901

No. of pins	KES1 (Automobile) connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
8			—
	Part No. :08027-10810 (Natural color) 08027-10820 (Black)	Part No. :08027-10860 (Natural color) 08027-10870 (Black)	

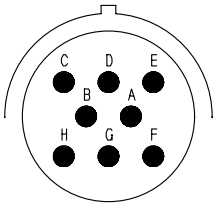
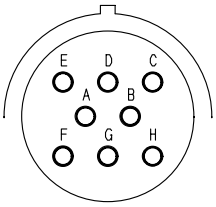
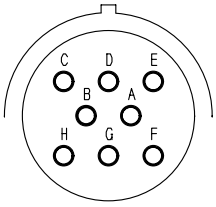
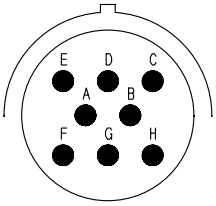
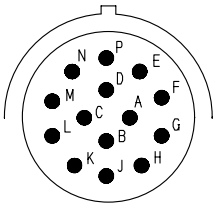
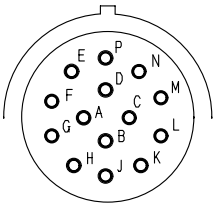
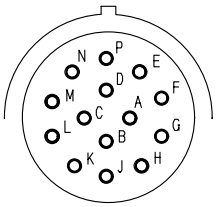
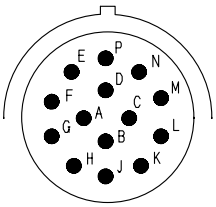
No. of pins	Connector for relay (Socket type)		
	Male (female housing)	Female (male housing)	T-adapter Part No.
5			799-601-7360
	—	—	
6			799-601-7370
	—	—	

9JS04902

No. of pins	F type connector				T-adapter Part No.
	Male (female housing)		Female (male housing)		
4		 BWP03905		 BWP03906	—
	—		—		

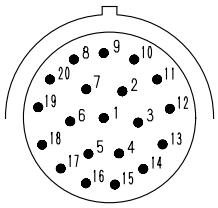
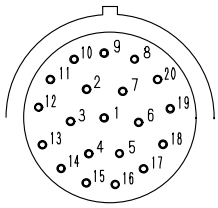
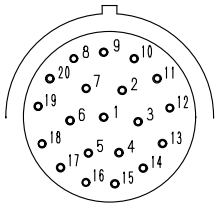
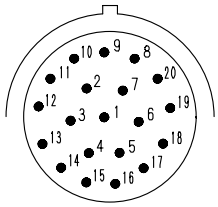
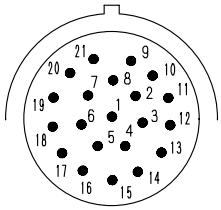
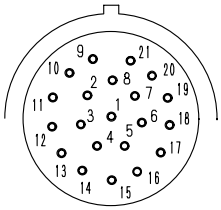
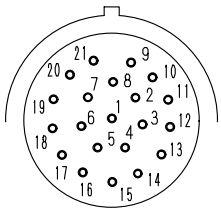
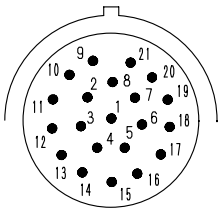
9JS04903

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

Type (shell size code)	HD30 Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
18-8 (1)	Pin (male terminal)	Socket (female terminal)	799-601-9210
	 BWP05001	 BWP05002	
	Part No. :08191-11201, 08191-11202, 08191-11205, 08191-11206	Part No. :08191-14101, 08191-14102, 08191-14105, 08191-14106	
	Socket (female terminal)	Pin (male termial)	799-601-9210
	 BWP05003	 BWP05004	
	Part No. :08191-12201, 08191-12202, 08191-12205, 08191-12206	Part No. :08191-13101, 08191-13102, 08191-13105, 08191-13106	
18-14 (2)	Pin (male terminal)	Socket (female terminal)	799-601-9220
	 BWP05005	 BWP05006	
	Part No. :08191-21201, 08191-12202, 08191-21205, 08191-12206	Part No. :08191-24101, 08191-24102, 08191-24105, 08191-24106	
	Socket (female terminal)	Pin (male termial)	799-601-9220
	 BWP05007	 BWP05008	
	Part No. :08191-22201, 08191-22202, 08191-22205, 08191-22206	Part No. :08191-23101, 08191-23102, 08191-23105, 08191-23106	

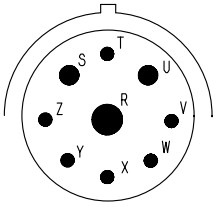
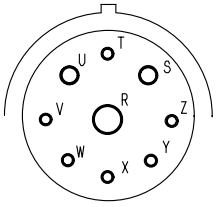
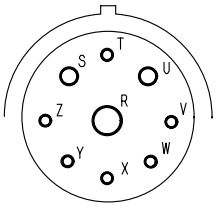
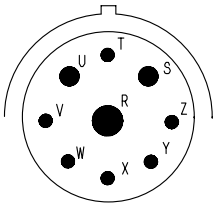
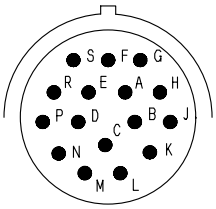
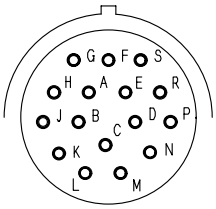
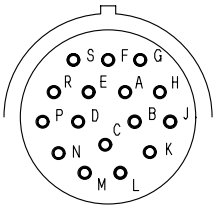
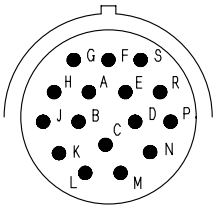
9JS04904

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

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

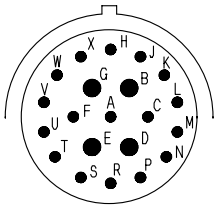
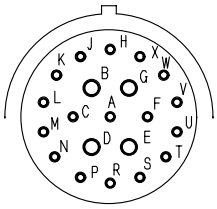
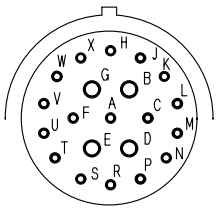
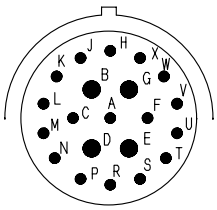
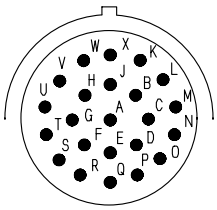
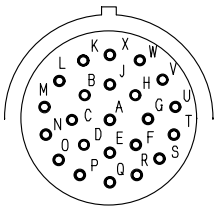
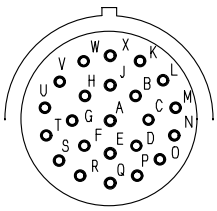
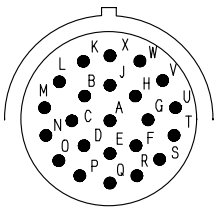
9JS04905

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

Type (shell size code)	HD30 Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
24-9 (5)	Pin (male terminal)	Socket (female terminal)	799-601-9250
	 BWP05017	 BWP05018	
	Part No. :08191-51201, 08191-51202	Part No. :08191-54101, 08191-54102	
	Socket (female terminal)	Pin (male termial)	799-601-9250
	 BWP05019	 BWP05020	
	Part No. :08191-52201, 08191-52202	Part No. :08191-53101, 08191-53102	
24-16 (6)	Pin (male terminal)	Socket (female terminal)	799-601-9260
	 BWP05021	 BWP05022	
	Part No. :08191-61201, 08191-62202, 08191-61205, 08191-62206	Part No. :08191-64101, 08191-64102, 08191-64105, 08191-64106	
	Socket (female terminal)	Pin (male termial)	799-601-9260
	 BWP05023	 BWP05024	
	Part No. :08191-62201, 08191-62202, 08191-62205, 08191-62206	Part No. :08191-63101, 08191-63102, 08191-63105, 08191-63106	

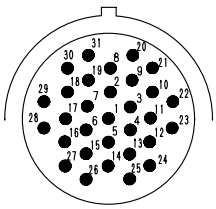
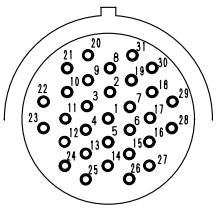
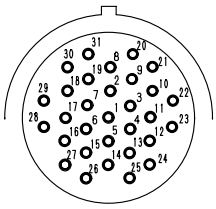
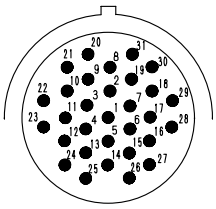
9JS04906

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

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

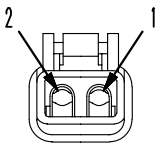
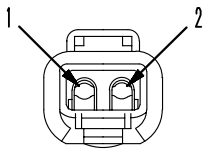
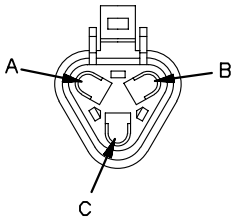
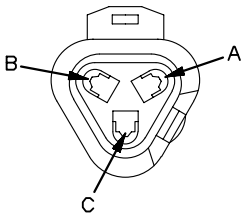
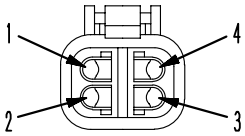
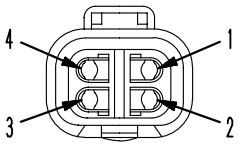
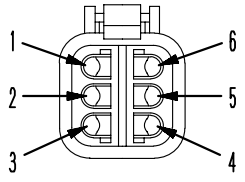
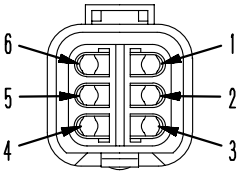
9JS04907

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

Type (shell size code)	HD30 Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
24-31 (9)	Pin (male terminal)	Socket (female terminal)	799-601-9290
	 BWP05033	 BWP05034	
	Part No. :08191-91203, 08191-91204, 08191-91205, 08191-91206	Part No. :08191-94103, 08191-94104, 08191-94105, 08191-94106	
	Socket (female terminal)	Pin (male termial)	799-601-9290
	 BWP05035	 BWP05036	
	Part No. :08191-92203, 08191-92204, 08191-92205, 08191-92206	Part No. :08191-93103, 08191-93104, 08191-93105, 08191-93106	

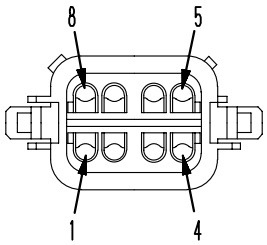
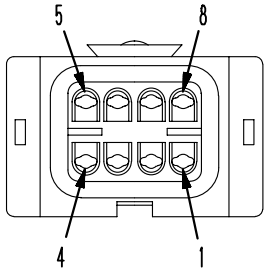
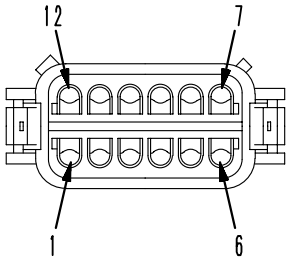
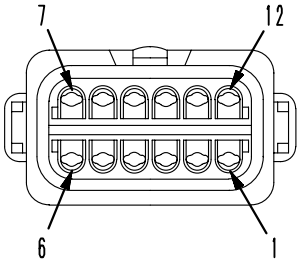
9JS04908

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

No. of pins	DT Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
2	 BWP05037	 BWP05038	799-601-9020 799-601-9890
	Part No. :08192-12200 (normal type) 08192-22200 (fine wire type)	Part No. :08192-12100 (normal type) 08192-22100 (fine wire type)	
3	 BWP05039	 BWP05040	799-601-9030 799-601-9890
	Part No. :08192-1A200 (normal type) 08192-2A200 (fine wire type)	Part No. :08192-13100 (normal type) 08192-23100 (fine wire type)	
4	 BWP05041	 BWP05042	799-601-9040 799-601-9890
	Part No. :08192-14200 (normal type) 08192-24200 (fine wire type)	Part No. :08192-14100 (normal type) 08192-24100 (fine wire type)	
6	 BWP05043	 BWP05044	799-601-9050
	Part No. :08192-16200 (normal type) 08192-26200 (fine wire type)	Part No. :08192-16100 (normal type) 08192-26100 (fine wire type)	

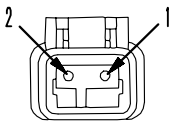
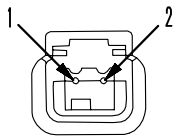
B3D15085

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

No. of pins	DT Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
8	 BWP05045	 BWP05046	8GR:799-601-9060 8B: 799-601-9070 8G: 799-601-9080 8BR:799-601-9090
	Part No. :08192-1820□ (normal type) 08192-2820□ (fine wire type)	Part No. :08192-1810□ (normal type) 08192-2810□ (fine wire type)	
12	 BWP05047	 BWP05048	12GR:799-601-9110 12B: 799-601-9120 12G: 799-601-9130 12BR:799-601-9140
	Part No. :08192-1920□ (normal type) 08192-2920□ (fine wire type)	Part No. :08192-1910□ (normal type) 08192-2910□ (fine wire type)	

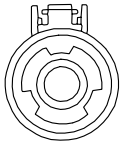
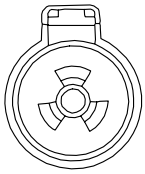
9JS04910

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

No. of pins	DTM Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
2	 BWP05049	 BWP05050	799-601-9010 799-601-9890
	Part No. :08192-02200	Part No. :08192-02100	

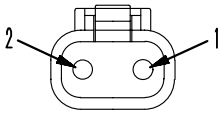
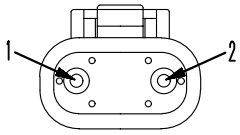
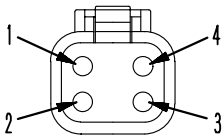
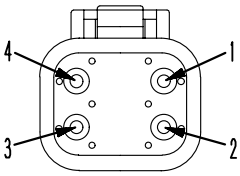
B3D15086

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

No. of pins	DTHD Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
2	 BWP05051	 BWP05052	—
	Part No. :08192-31200 (Contact size #12) 08192-41200 (Contact size #8) 08192-51200 (Contact size #4)	Part No. :08192-31100 (Contact size #12) 08192-41100 (Contact size #8) 08192-51100 (Contact size #4)	

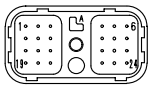
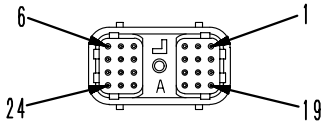
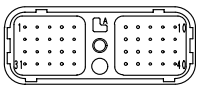
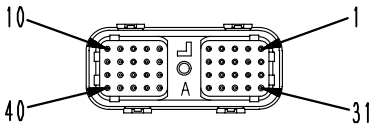
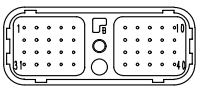
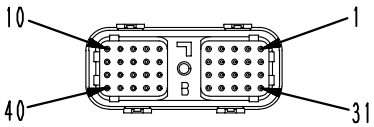
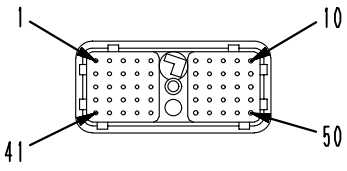
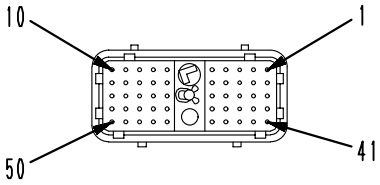
9JS04912

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

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

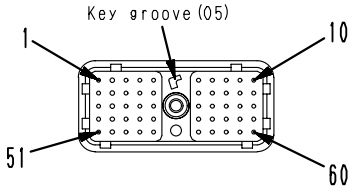
B3D15084

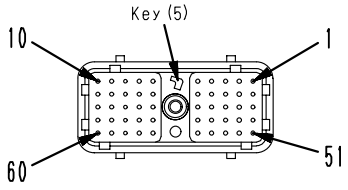
[The pin No. is also marked on the connector (electric wire insertion end)]

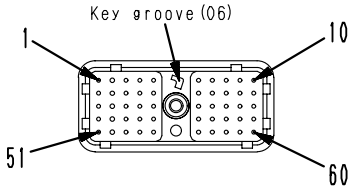
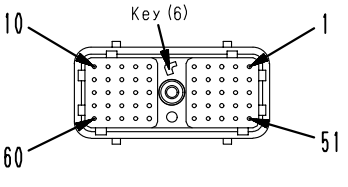
No. of pins	DRC26 Series connector		
	Male pin (female housing)	Female pin (male housing)	T-adapter Part No.
24	 BJD12722	 BJD12723	799-601-9360 (Kit:799-601-9300)
	–	Part No. :08194-01101	
40 (A)	 BJD12724	 BJD12725	799-601-9350 (Kit:799-601-9300)
	–	Part No. :08194-02101	
40 (B)	 BJD12726	 BJD12727	799-601-9350 (Kit:799-601-9300)
	–	Part No. :08194-02102	
50	 9JS02951	 9JS02952	799-601-4210 (Kit:799-601-4100)
	–	Part No. :08194-03103	

BJW12751

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

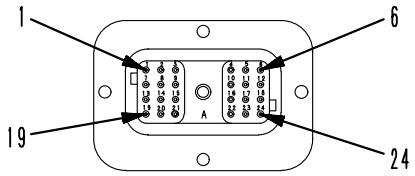
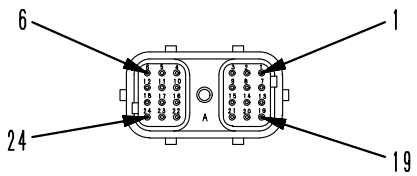
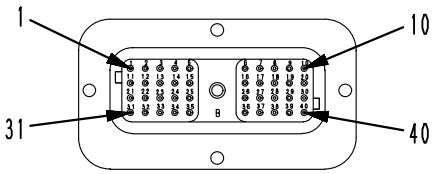
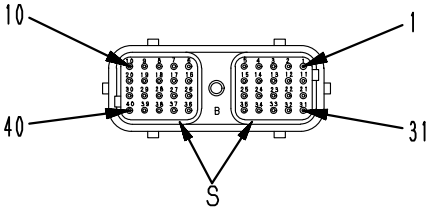
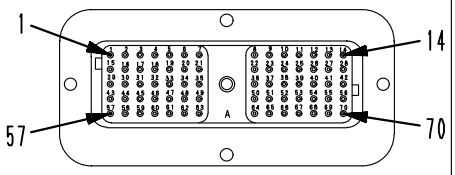
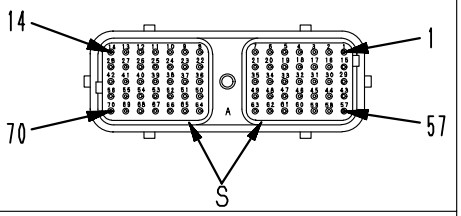
<table>
<tr><td rowspan="2">No. of pins</td><td colspan="2">DRC26 Series connector</td><td rowspan="2">T-adapter Part No.</td></tr>
<tr><td>Male pin (female housing)</td><td>Female pin (male housing)</td></tr>
<tr><td rowspan="3">60
-05※</td><td> 

BJD14063</td><td> 

BJD14064</td><td rowspan="3">799-601-4220
(Kit:799-601-4100)</td></tr>
<tr><td>–</td><td>Part No. 08194-04104</td></tr>
<tr><td colspan="2">※-05:Key position</td></tr>
<tr><td rowspan="3">60
-06※</td><td rowspan="2"> 
</td><td rowspan="2"> 
</td><td>Socket Part No.</td></tr>
<tr><td rowspan="2">799-601-4390</td></tr>
<tr><td>–</td><td>–</td></tr>
<tr><td colspan="2">※-06:Key position</td></tr>
</table>

BJW12752

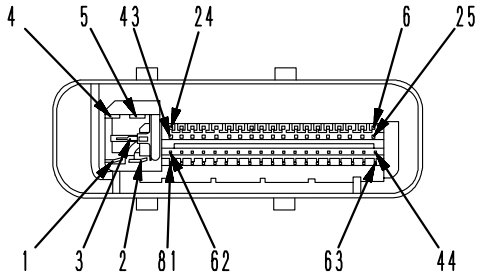
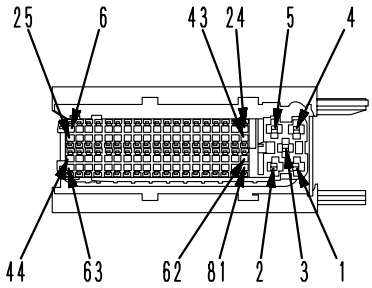
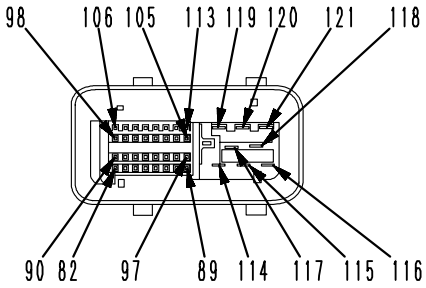
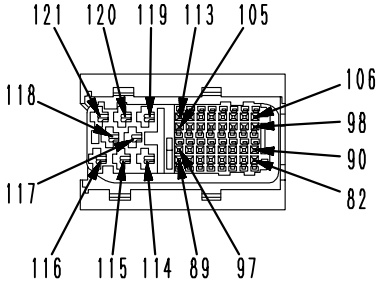
[The pin No. is also marked on the connector (electric wire insertion end)]

No. of pins	DRC12, 16 Series connector		
	DRC12:Male pin (female housing)	DRC16:Female pin (male housing)	T-adapter Part No.
24 (A)※ (B) (C)			–
	–	–	
40 (A)※ (B) (C)			–
	–	Seal(S) Part No. : 17A-06-41830	
70 (A)※ (B) (C)			–
	–	Seal(S) Part No. : 17A-06-41840	

※ (A)、(B)、(C):Key position

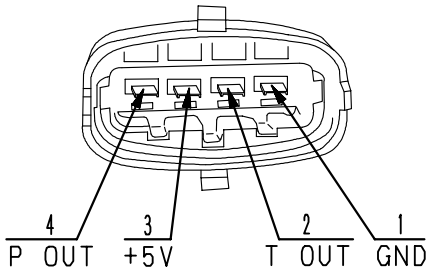
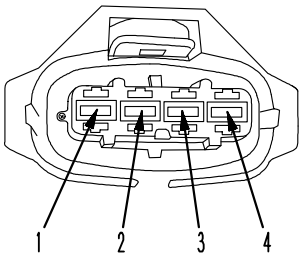
BJW12753

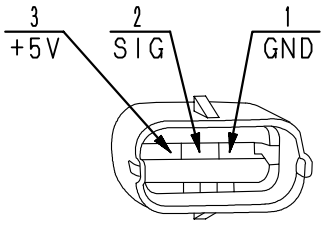
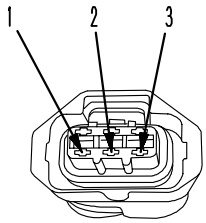
AMP connector for pump controller (CH700)

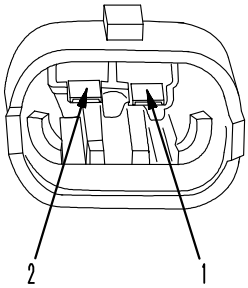
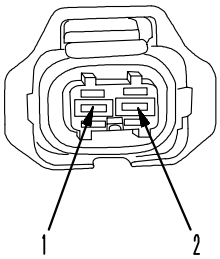
No. of pins	PC200/220-8, 160-7E0, 128/138US-8, 228US-3E0 and so on	T-adapter Part No.
	Controller side (plug)	
		
	—	
81	Harness side (receptacle)	
		
	Part No. : 7880-70-9040	799-601-4280
	Controller side (plug)	
		
	—	
40	Harness side (receptacle)	
		
	Part No. : 7880-70-9010	

BJW12754

BOSCH connector for engine

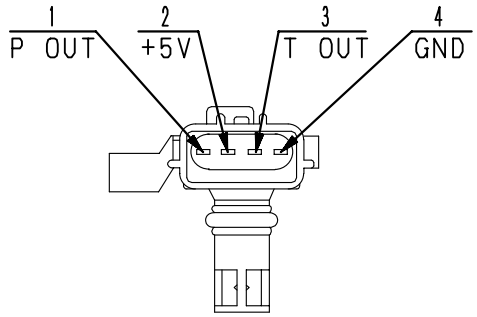
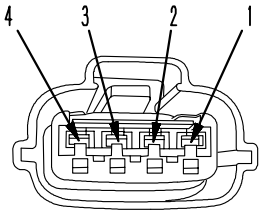
No. of pins	Boost (air intake) pressure and temperature sensor (95 engine)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
4			799-601-4380
	—	—	

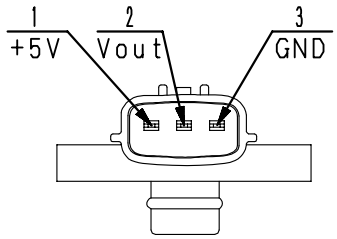
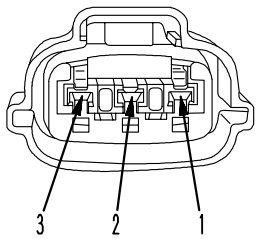
No. of pins	Common rail (fuel) pressure sensor (95, 107, 114 engine)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
3			799-601-4190 (Kit:799-601-4100)
	—	—	

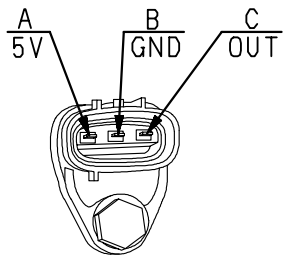
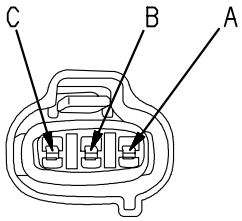
No. of pins	Fuel supply pump (95, 107 engine) and fuel injector (95 engine)		
	Valve side (plug)	Harness side (receptacle)	T-adapter Part No.
2			799-601-4340 (Kit:799-601-4100)
	—	—	

BJW12755

SUMITOMO connector for engine

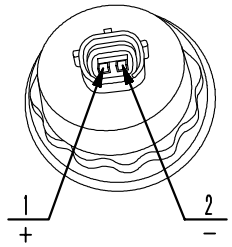
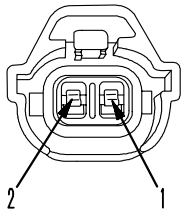
No. of pins	Boost (air intake) pressure and temeperature sensor (107, 114 engine)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
4			799-601-4230 (Kit:799-601-4100)
	-	-	

No. of pins	Boost (air intake) pressure sensor (125, 170, 12V140, 140 without EGR engine)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
3			799-601-4250 (Kit:799-601-4100)
	-	-	

No. of pins	G sensor (fuel supply pump speed sensor) (125, 140, 170, 12V140 engine)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
3			799-601-4330 (Kit:799-601-4100)
	-	-	

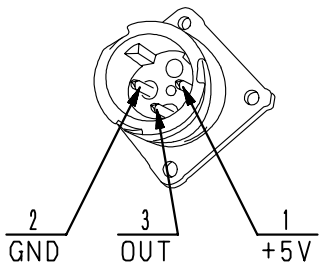
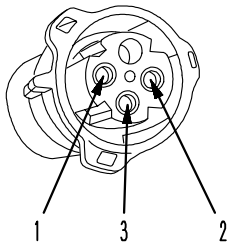
BJW12756

SUMITOMO connector for engine

No. of pins	PCV (125, 140, 170, 12V140 engine)		
	Valve side (plug)	Harness side (receptacle)	T-adapter Part No.
2			799-601-9430 (Kit : 799-601-4100)
	—	—	

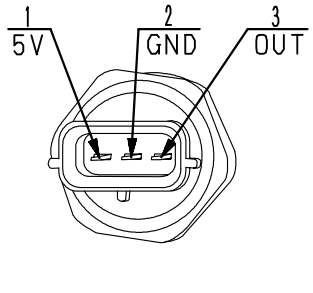
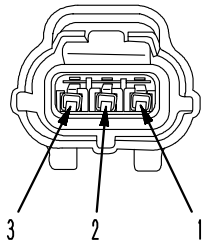
BJW12757

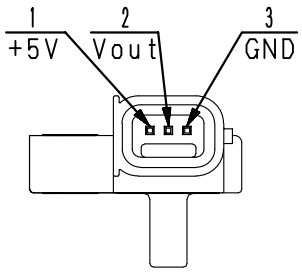
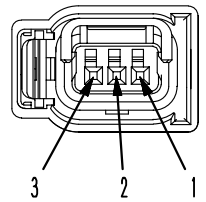
CANNON connector for engine

No. of pins	Boost (air intake) pressure sensor (140 with EGR engine)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
4			799-601-4110
	☆ Without pin (4)	☆ Without pin (4)	

BJW12758

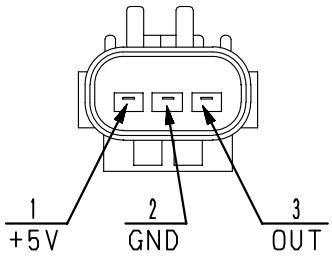
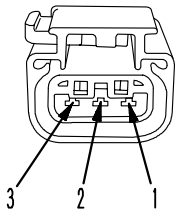
AMP connetor for engine

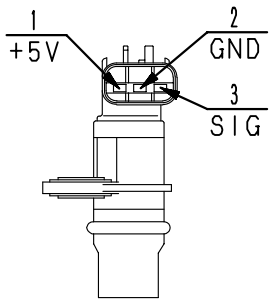
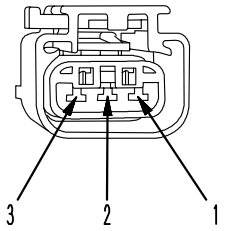
No. of pins	Common rail (fuel) pressure sensor (125, 140, 170, 12V140 engine)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
3			799-601-9420 (Kit:799-601-4100)
	—	—	

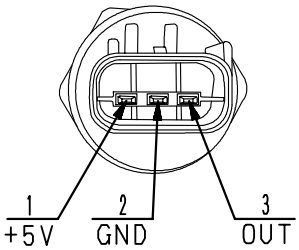
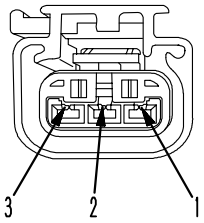
No. of pins	Ambient pressure sensor (95, 125, 140, 170, 12V140 engine)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
3			799-601-4240 (Kit:799-601-4100)
	—	—	

BJW12759

FRAMATOME connector for engine

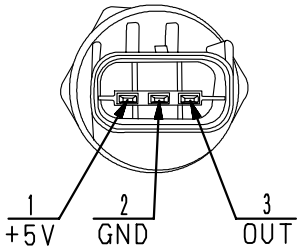
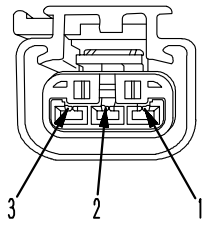
No. of pins	Ambient pressure sensor (107, 114 engine)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
3			799-601-4140 Kit:799-601-4100)
	—	—	

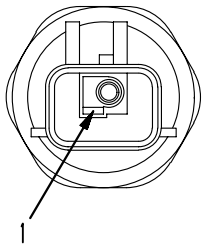
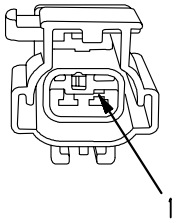
No. of pins	NE speed sensor (95, 107, 114, 125, 140, 170, 12V140 engine) and CAM sensor (95, 107, 114 engine)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
3			799-601-4130 Kit:799-601-4100)
	—	—	

No. of pins	EGR gas pressure sensor (125, 140 engine)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
3			799-601-4180 Kit:799-601-4100)
	—	—	

BJW12760

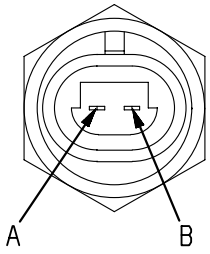
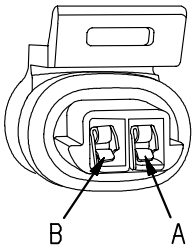
FRAMATOME connector for engine

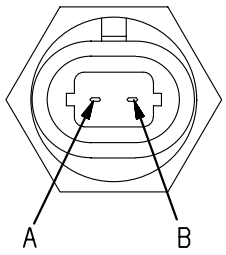
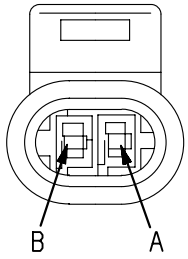
No. of pins	Lubricating oil pressure sensor (125, 140, 170, 12V140 engine)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
3			799-601-4150 Kit:799-601-4100)
	-	-	

No. of pins	Hydraulic switch (95, 107, 114 engine)		
	Switch side (plug)	Harness side (receptacle)	T-adapter Part No.
2			799-601-4160 Kit:799-601-4100)
	☆ Without pin (2)	☆ Without pin (2)	

BJW12761

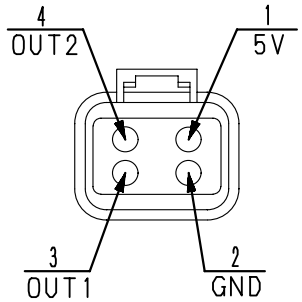
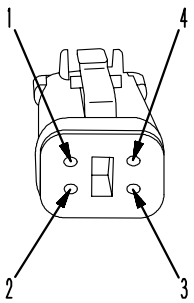
PACKARD conncetor for engine

No. of pins	Temperature sensor of coolant, fuel and lubricating oil (95, 107, 114, 125, 140, 170, 12V140 engine)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
2			795-799-5530 (Kit:799-601-4100)
	☆ Non-polarity	—	

No. of pins	Boost (air intake) temperature sensor (125, 140, 170, 12V140 engine)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
2			795-799-5540 (Kit:799-601-4100)
	☆ Non-polarity	—	

BJW12762

DT series connector for engine

No. of pins	EGR (by pass) valve stroke sensor (125, 140, 170, 12V140 engine)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
4			799-601-9040 (Kit:799-601-4100)
	—	—	

BJW12763

T-adapter box and T-adapter table (Rev. 2007.4)

★ The vertical column indicates a part number of T-branch box or T-branch adapter while the horizontal column indicates a part number of harness checker assembly.

Part No.	Part name	Number of pins	Identification symbol	T-adapter kit														Out of kit
				799-601-2500	799-601-2700	799-601-2800	799-601-7000	799-601-7100	799-601-7400	799-601-7500	799-601-8000	799-601-9000	799-601-9100	799-601-9200	799-601-9300	799-601-4100	799-601-4200	
799-601-2600	T-box (for ECONO)	21		●		●		●	●		●							
799-601-3100	T-box (for MS)	37																
799-601-3200	T-box (for MS)	37																
799-601-3380	• Plate for MS (14-pin)																	●
799-601-3410	Adapter for BENDIX (MS)	24	MS-24P															●
799-601-3420	Adapter for BENDIX (MS)	24	MS-24P															●
799-601-3430	Adapter for BENDIX (MS)	17	MS-17P															●
799-601-3440	Adapter for BENDIX (MS)	17	MS-17P															●
799-601-3450	Adapter for BENDIX (MS)	5	MS-5P															●
799-601-3460	Adapter for BENDIX (MS)	10	MS-10P															●
799-601-3510	Adapter for BENDIX (MS)	5	MS-5S															●
799-601-3520	Adapter for BENDIX (MS)	17	MS-17P															●
799-601-3530	Adapter for BENDIX (MS)	19	MS-19P															●
799-601-2910	Adapter for BENDIX (MS)	14	MS-14P															●
799-601-3470	Case																	●
799-601-2710	Adapter for MIC	5	MIC-5P	●	●				●									
799-601-2720	Adapter for MIC	13	MIC-13P	●	●				●									
799-601-2730	Adapter for MIC	17	MIC-17P	●	●	●		●	●		●							
799-601-2740	Adapter for MIC	21	MIC-21P	●	●	●		●	●		●							
799-601-2950	Adapter for MIC	9	MIC-9P				●	●	●		●							
799-601-2750	Adapter for ECONO	2	ECONO2P	●	●													
799-601-2760	Adapter for ECONO	3	ECONO3P	●	●													
799-601-2770	Adapter for ECONO	4	ECONO4P	●	●													
799-601-2780	Adapter for ECONO	8	ECONO8P	●	●													
799-601-2790	Adapter for ECONO	12	ECONO12P	●	●													
799-601-2810	Adapter for DLI	8	DLI-8P	●	●													
799-601-2820	Adapter for DLI	12	DLI-12P	●	●													
799-601-2830	Adapter for DLI	16	DLI-16P	●	●													
799-601-2840	Extension cable (ECONO type)	12	ECONO12P	●	●				●									
799-601-2850	Case			●														
799-601-4210	Adapter for DRC	50	DRC50															●
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				●	●	●		●							

Part No.	Part name	Number of pins	Identification symbol	T-adapter kit														Out of kit
				799-601-2500	799-601-2700	799-601-2800	799-601-7000	799-601-7100	799-601-7400	799-601-7500	799-601-8000	799-601-9000	799-601-9100	799-601-9200	799-601-9300	799-601-4100	799-601-4200	
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 connector 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							●								
799-601-7530	Adapter for 070	14	07-14							●								
799-601-7540	Adapter for 070	18	07-18							●								
799-601-7550	Adapter for 070	20	07-20							●								
799-601-7360	Adapter for relay	5	REL-5P															●
799-601-7370	Adapter for relay	6	REL-6P															●
799-601-7380	Adapter for JFC	2																●
799-601-9010	Adapter for DTM	2	DTM2									●		●				
799-601-9020	Adapter for DT	2	DT2									●		●		●	●	
799-601-9030	Adapter for DT	3	DT3									●		●				
799-601-9040	Adapter for DT	4	DT4									●		●		●	●	
799-601-9050	Adapter for DT	6	DT6									●		●				
799-601-9060	Adapter for DT (Gray)	8	DT8GR									●		●				
799-601-9070	Adapter for DT (Black)	8	DT8B									●		●				
799-601-9080	Adapter for DT (Green)	8	DT8G									●		●				
799-601-9090	Adapter for DT (Brown)	8	DT8BR									●		●				
799-601-9110	Adapter for DT (Gray)	12	DT12GR									●		●				
799-601-9120	Adapter for DT (Black)	12	DT12B									●		●				
799-601-9130	Adapter for DT (Green)	12	DT12G									●		●				
799-601-9140	Adapter for DT	12	DT12BR									●		●				
799-601-9210	Adapter for HD30-18	8	D18-8									●	●					
799-601-9220	Adapter for HD30-18	14	D18-14									●	●					
799-601-9230	Adapter for HD30-18	20	D18-20									●	●					
799-601-9240	Adapter for HD30-18	21	D18-21									●	●					
799-601-9250	Adapter for HD30-24	9	D24-9									●	●					
799-601-9260	Adapter for HD30-24	16	D24-16									●	●					
799-601-9270	Adapter for HD30-24	21	D24-21									●	●					
799-601-9280	Adapter for HD30-24	23	D24-23									●	●					
799-601-9290	Adapter for HD30-24	31	D24-31									●	●					
799-601-9310	Plate for HD30 (24-pin)											●	●		●			
799-601-9320	T-box (for DT/HD)	12										●	●		●			

Part No.	Part name	Number of pins	Identification symbol	T-adapter kit														Out of kit
				799-601-2500	799-601-2700	799-601-2800	799-601-7000	799-601-7100	799-601-7400	799-601-7500	799-601-8000	799-601-9000	799-601-9100	799-601-9200	799-601-9300	799-601-4100	799-601-4200	
799-601-9330	Case											●						
799-601-9340	Case												●					
799-601-9350	Adapter for DRC	40	DRC-40												●			
799-601-9360	Adapter for DRC	24	DRC-24												●			
799-601-9410*	Socket for engine (CRI-T2)	2	G															●
799-601-9420	Adapter for engine (CRI-T2) Adapter for engine (CRI-T3) PFUEL	3	A3													●	●	
799-601-9430*	Socket for engine (CRI-T2) Socket for engine (CRI-T3) PCV	2	P													●	●	
799-601-9440*	Socket for engine (CRI-T2)	3	1,2,3															●
795-799-5520*	Socket for engine (HPI-T2)	2	S															●
795-799-5530*	Socket for engine (HPI-T2) Socket for engine (CRI-T3) Temperature sensor	2	C													●	●	
795-799-5540*	Socket for engine (HPI-T2) Socket for engine (CRI-T3) TIM	2	A													●	●	
795-799-5460	Cable for engine (HPI-T2)	3																●
795-799-5470	Cable for engine (HPI-T2)	3																●
795-799-5480	Cable for engine (HPI-T2)	3																●
799-601-4110	Adapter for engine (140-T3) PIM	4	ITT3N															●
799-601-4130	Adapter for engine (CRI-T3) NE, CAM	3	FCIN													●	●	
799-601-4140	Adapter for engine (CRI-T3) Atomosphere pressure	3	FCIG													●	●	
799-601-4150	Adapter for engine (CRI-T3) POIL	3	FCIB													●	●	
799-601-4160	Adapter for engine (CRI-T3) Oil pressure switch	2	4160													●	●	
799-601-4180	Adapter for engine (CRI-T3) PEVA	3	4180													●	●	
799-601-4190*	Socket for engine (CRI-T3) Commonrail pressure	3	1,2,3L													●	●	
799-601-4230*	Socket for engine (CRI-T3) Air intake pressure/temperature	4	1,2,3,4C													●	●	
799-601-4240*	Socket for engine (CRI-T3) PAMB	3	1,2,3A													●	●	
799-601-4250*	Socket for engine (CRI-T3) PIM	3	1,2,3B													●	●	
799-601-4330*	Socket for engine (CRI-T3) G	3	1,2,3,G													●	●	
799-601-4340*	Socket for engine (CRI-T3) Pump actuator	2	2,PA													●	●	
799-601-4380*	Socket for engine (CRI-T3)(95) Air intake pressure/temperature	4	1,2,3,4T															●
799-601-4260	Adapter for controller (ENG)	4	DTP4													●	●	
799-601-4211	Adapter for controller (ENG)	50	DRC50													●		
799-601-4220	Adapter for controller (ENG)	60	DRC60													●		
799-601-4390*	Socket for controller (95 ENG)	60																●
799-601-4280	Box for controller (PUMP)	121																●
799-601-9720	Adapter for controller (HST)	16	HST16A															●
799-601-9710	Adapter for controller (HST)	16	HST16B															●
799-601-9370	Adapter for controller (HST)	26	HST26A															●
799-601-9890	Multi-adapter for DT2 – 4 and DTM2	2, 3, 4	—															●

"*" Shows not T-adapter but socket.

PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN02628-00

HYDRAULIC EXCAVATOR

PC300-8
PC300LC-8
PC350-8
PC350LC-8

Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

40 Troubleshooting

Troubleshooting by failure code (Display of code), Part 1

Failure code [A000N1] Eng. Hi Out of Std

Action code	Failure code	Trouble	Engine high idle out of standard (Mechanical system)
—	**A000N1**		
Contents of trouble	• While the engine was running, engine speed exceeded 2,350 rpm for more than 10 seconds.		
Action of controller	• None in particular. • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• If machine is operated as it is, engine may be damaged.		
Related information	• Input from the engine speed sensor (engine speed) can be checked with monitoring function. (Code 010: Engine speed)		

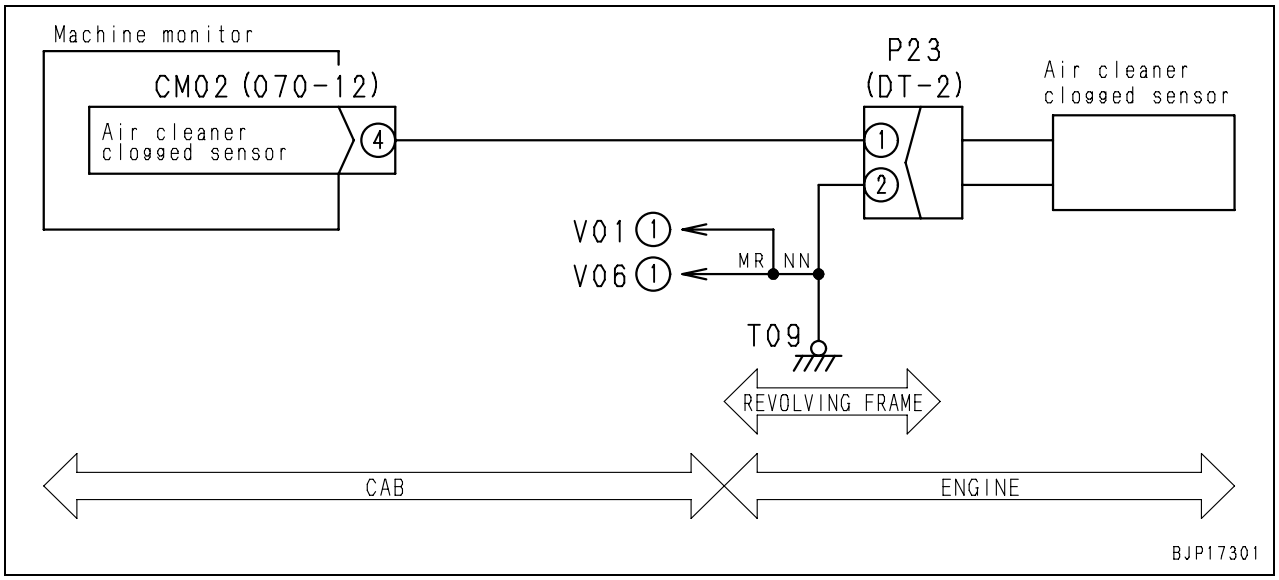
	Cause		Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Defective engine mechanical system	Check for any internal or external factor that might cause the excessive engine high idle speed for troubleshooting of engine mechanical system.
	2	Defective engine controller	Since trouble is in system, troubleshooting cannot be carried out. (If no visible error appears on the machine, the controller can be continuously used as it is.)

Failure code [AA10NX] Air cleaner Clogging

User code	Failure code	Trouble	Air cleaner clogging (Machine monitor system)
—	**AA10NX**		
Contents of trouble	• While engine was running, signal circuit of air cleaner clogging switch detected clogging of air cleaner (sensor contact opened).		
Action of machine monitor	• Displays air cleaner clogging monitor on machine monitor. • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• If machine is operated as it is, engine may be damaged.		
Related information	• Condition of air cleaner clogging switch signal can be checked with monitoring function. (Code: 04501 Monitor input 2) • Method of reproducing failure code: Start engine.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Clogging of air cleaner (when system is normal)	★ Check the air cleaner for clogging and then clean or replace it if clogged.			
	2	Defective air cleaner clogging switch (internal disconnection)	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			P23 (male)	Air cleaner	Resistance	
			Between (1) – (2)	Value in normal state	Max. 1 Ω	
				Value when clogged	Min. 1MΩ	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			Wiring harness between CM02 (female) (4) – P23 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between P23 (female) (2) – chassis ground		Resistance	Max. 1 Ω
	4	Defective machine monitor	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			CM02	Air cleaner	Voltage	
			Between (4) – chassis ground	Value in normal state	Max. 1 V	
				Value when clogged	20 – 30 V	

Circuit diagram related to air cleaner clogging switch of machine monitor

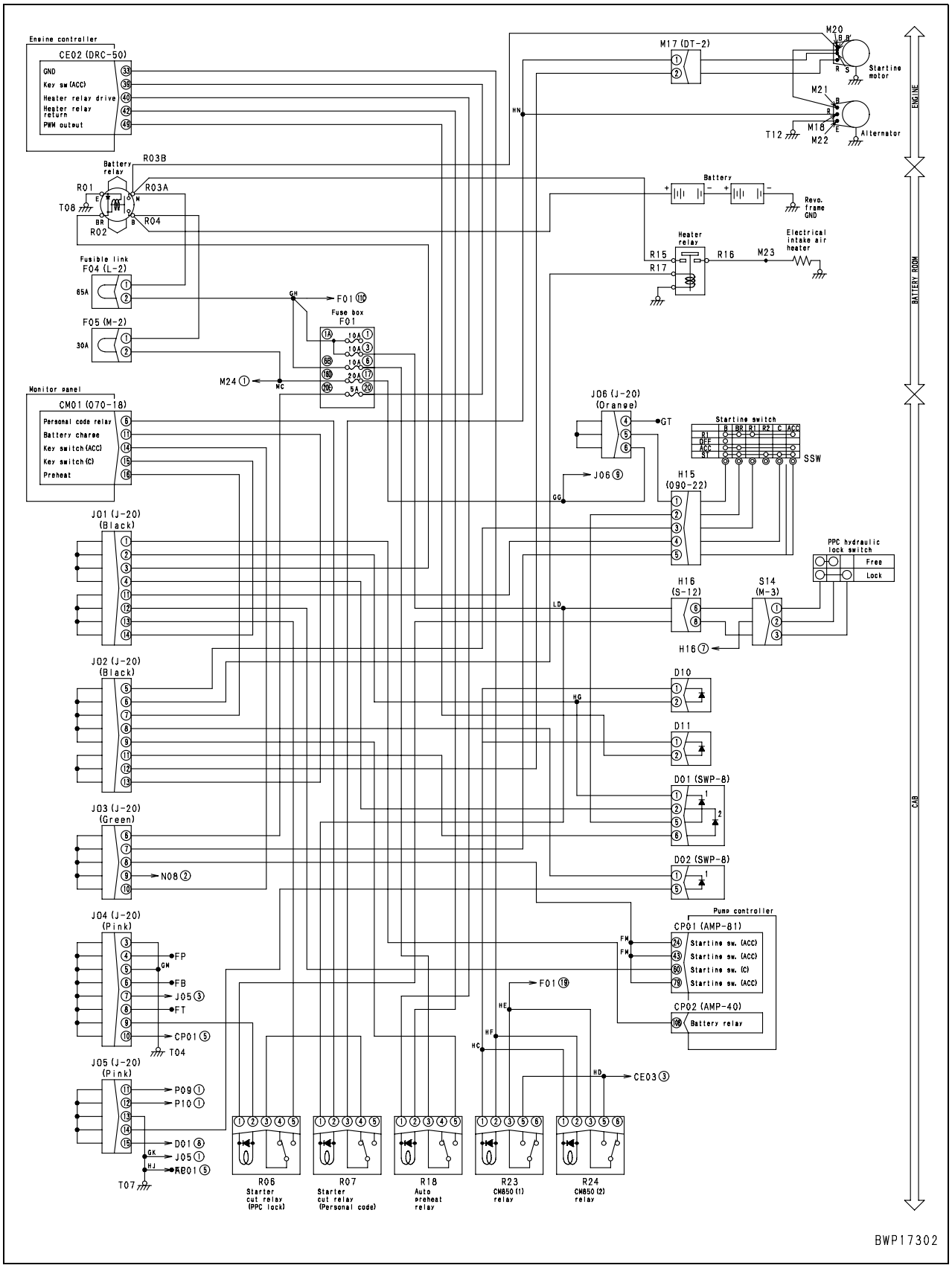


Failure code [AB00KE] Charge Voltage Low

User code	Failure code	Trouble	Charge voltage low (Machine monitor system)
—	**AB00KE**		
Contents of trouble	• While engine is running, signal circuit of alternator detected low charge voltage (below 7.8 V).		
Action of machine monitor	• Displays charge level monitor on machine monitor. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• If machine is operated as it is, battery may not be charged.		
Related information	• Signal voltage of alternator can be checked with monitoring function. (Code: 04300 Charge voltage) • Method of reproducing failure code: Start engine.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective alternator (Low power generation)	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			Alternator	Engine speed	Voltage	
			R terminal – chassis ground	Min. medium speed	27.5 – 29.5 V	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CM01 (female) (11) – J02 – Alternator R terminal		Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CM01 (female) (11) – J02 – Alternator R terminal, between CM01 (female) (11) – J02 – D01 (female) (6) and between CM01 (female) (11) – J02 – M17 (female) (2) and chassis ground		Resistance	Min. 1MΩ
	4	Defective machine monitor	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			CM01	Engine speed	Voltage	
			Between (11) – chassis ground	Min. medium speed	27.5 – 29.5 V	

Circuit diagram related to starting and charge of machine monitor

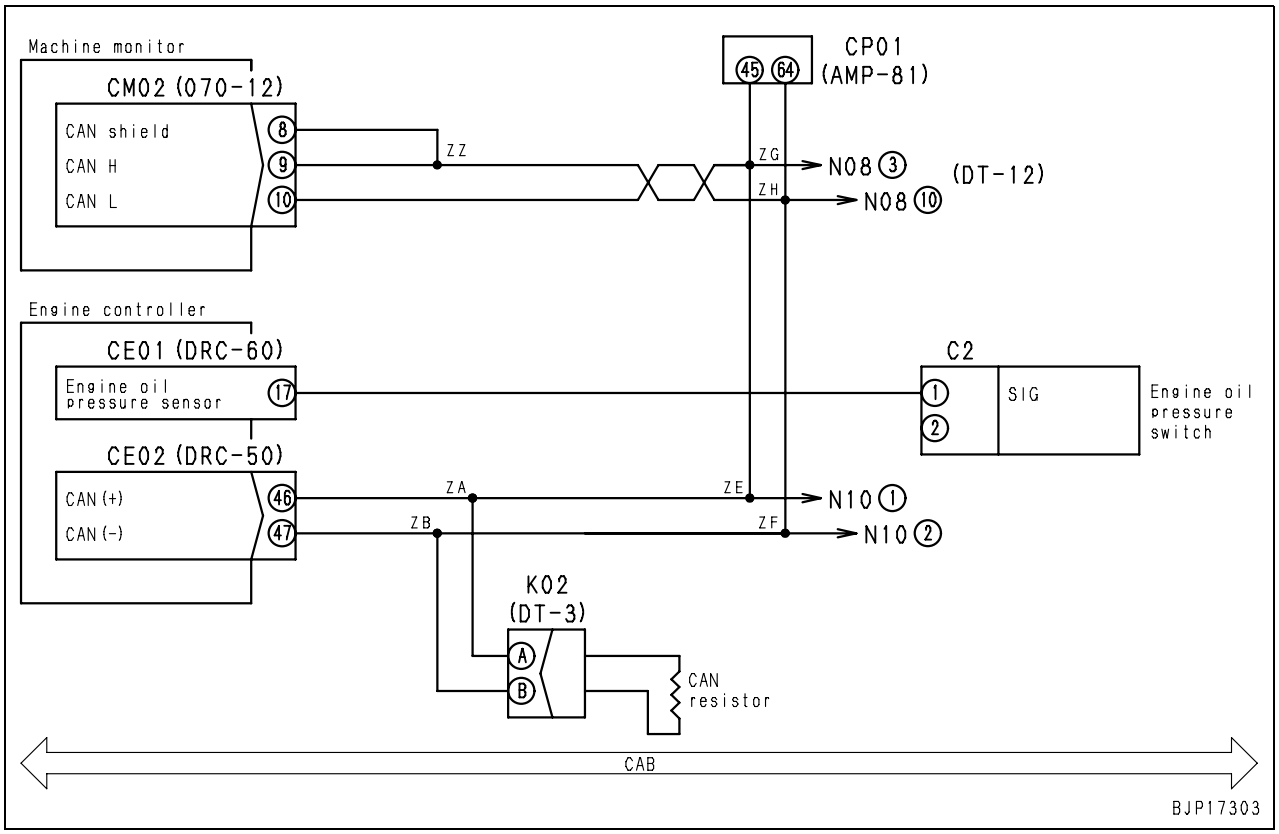


Failure code [B@BAZG] Eng Oil Press. Low

Action code	Failure code	Trouble	Engine oil pressure low (Engine controller system)
—	**B@BAZG**		
Contents of trouble	• While engine was running, signal circuit of engine oil pressure switch detected low engine oil pressure (sensor contact opened).		
Action of controller	• Displays engine oil pressure monitor on machine monitor. • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• If machine is operated as it is, engine may be damaged.		
Related information	• Engine oil pressure switch signal is input to engine controller and then transmitted to machine monitor. • Method of reproducing failure code: Start engine		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Lowering of engine oil pressure (when system is normal)	★ Determine the cause and check the damage to the engine and then modify it.			
	2	Defective engine oil pressure sensor (Internal defect)	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			C2 (male)	Engine	Resistance	
			Between (1) – chassis ground	When started	Min. 1MΩ	
				When stopped	Max. 1 Ω	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CE01 (female) (17) – C2 (female) (1)		Resistance	Max. 1 Ω
	4	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CE01 (female) (17) – C2 (female) (1) and chassis ground (when engine is started)		Resistance	Min. 1MΩ
	5	Defective engine controller	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			CE01	Engine	Resistance	
			Between (17) – chassis ground	When started	Min. 1MΩ	
				When stopped	Max. 1 Ω	

Circuit diagram related to engine oil pressure of machine monitor

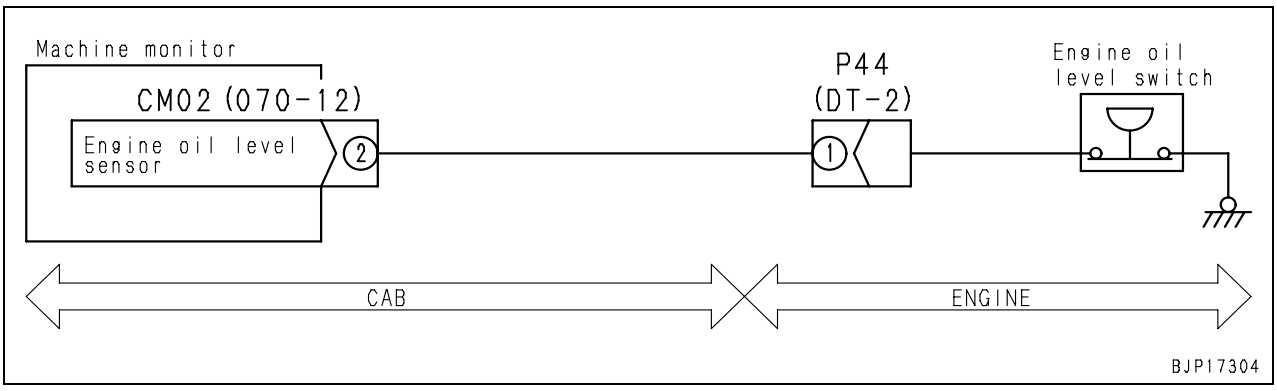


Failure code [B@BAZK] Eng Oil Level Low

Action code	Failure code	Trouble	Engine oil level low (Machine monitor system)
—	**B@BAZK**		
Contents of trouble	• When starting switch is turned ON (but engine is not started), signal circuit of engine oil level switch detected low engine oil level (sensor contact opened).		
Action of machine monitor	• Displays engine oil level monitor on machine monitor. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• If machine is operated as it is, engine may be damaged.		
Related information	• Engine oil level switch signal can be checked with monitoring function. (Code 04501: Monitor Input 2) • Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Lowering of engine oil level (when system is normal)	★ Check the engine oil level and add new oil. (If this phenomenon frequently occurs, investigate the cause.)		
	2	Defective engine oil level switch (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			P44 (male)	Engine oil level	Resistance
			Between (1) – chassis ground	Value in normal state	Max. 1 Ω
				Value when oil level is low	Min. 1MΩ
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CM02 (female) (2) – P44 (female) (1)	Resistance	Max. 1 Ω
	4	Defective machine monitor	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			CM02	Engine oil level	Voltage
			Between (2) – chassis ground	Value in normal state	Max. 1 V
				Value when oil level is low	20 – 30 V

Circuit diagram related to engine oil level switch of machine monitor

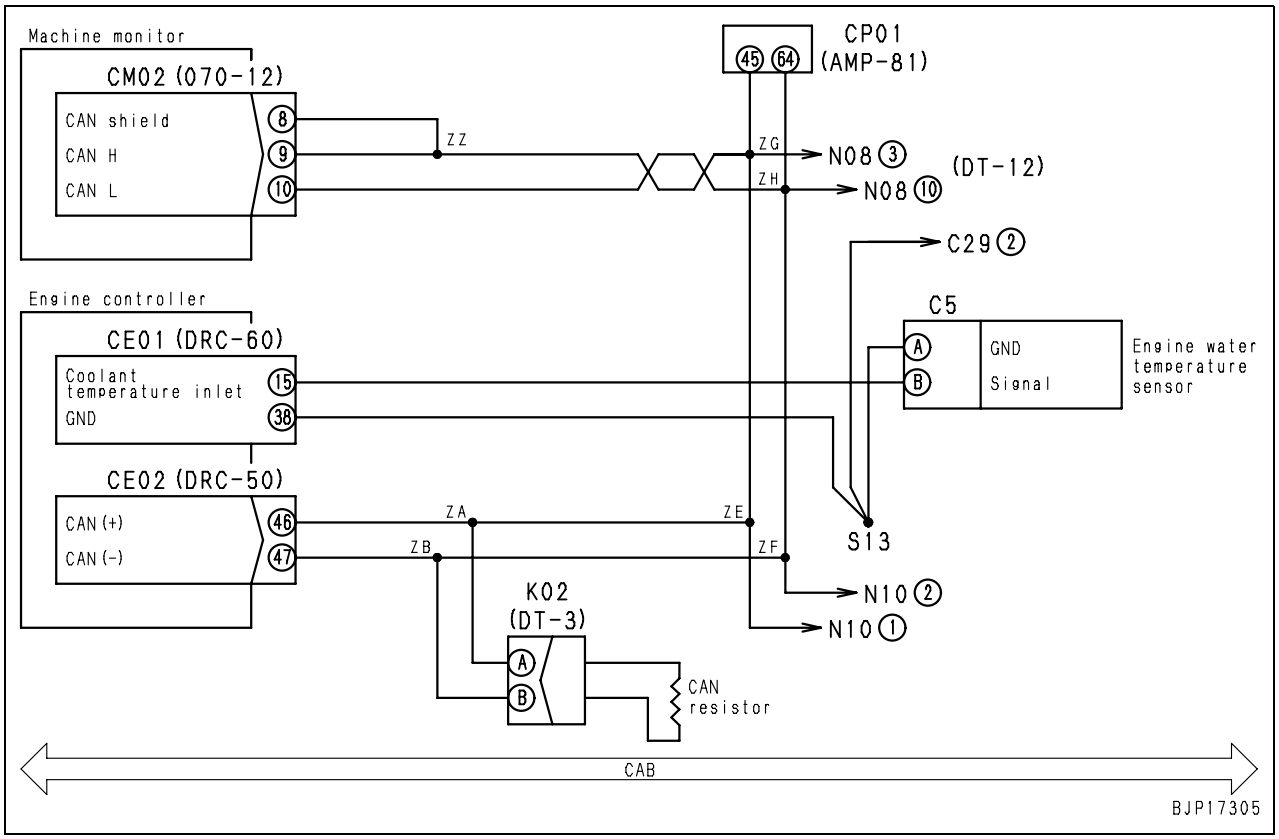


Failure code [B@BCNS] Eng. Water Overheat

User code	Failure code	Trouble	Engine coolant overheat (Engine controller system)
—	**B@BCNS**		
Contents of trouble	• While engine was running, signal circuit of engine coolant temperature sensor detected overheating of engine coolant (above about 102°C).		
Action of controller	• Displays engine coolant temperature monitor with red on machine monitor. • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• If machine is operated as it is, engine may be seized.		
Related information	• Engine coolant temperature sensor signal is input to engine controller and then transmitted to machine monitor. • Engine coolant temperature can be checked with monitoring function (Code: 04107 Engine coolant temperature) • Method of reproducing failure code: Start engine.		

	Cause		Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Overheating of engine coolant (when system is normal)	Engine coolant may be overheating. Check it and remove cause if it is overheating.
	2	Defective engine coolant temperature gauge system	If cause 1 is not detected, engine coolant temperature gauge system may be defective. Carry out troubleshooting for "[CA144] [CA145]" in troubleshooting.

Circuit diagram related to engine coolant temperature sensor of machine monitor

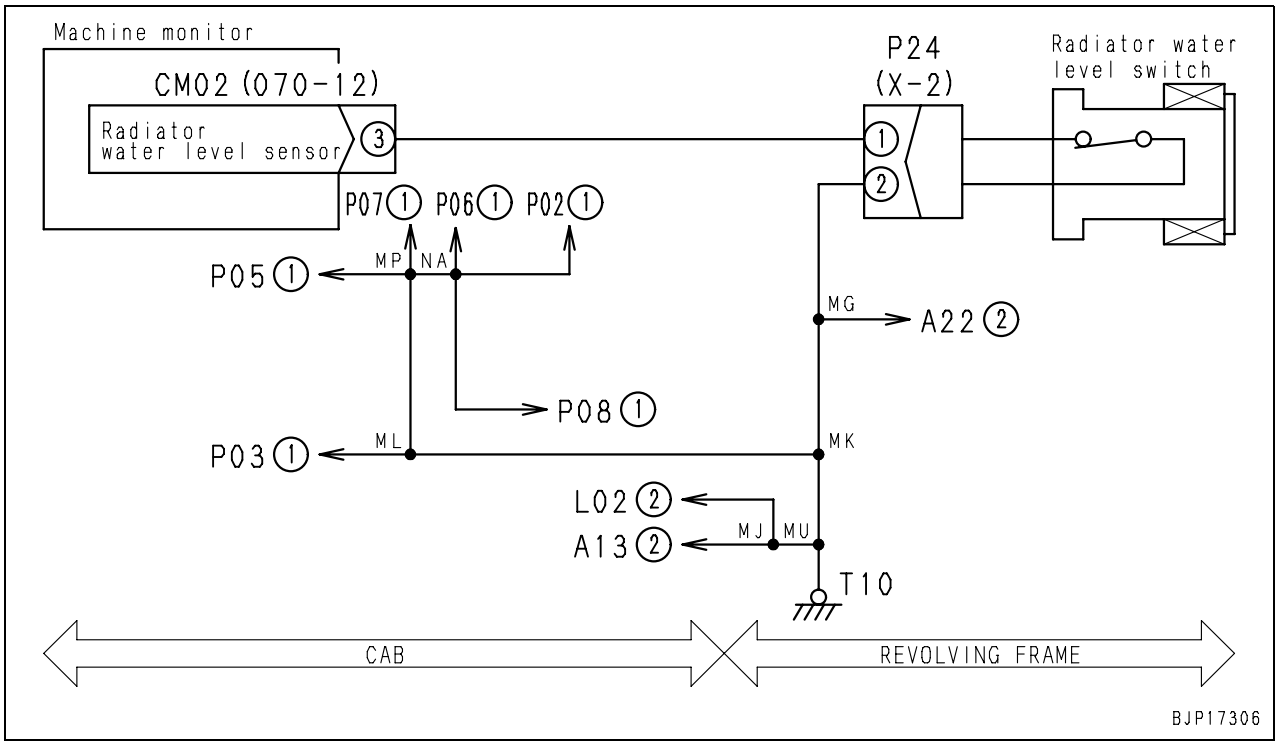


Failure code [B@BCZK] Eng Water Level Low

User code	Failure code	Trouble	Engine coolant level low (Machine monitor system)
—	**B@BCZK**		
Contents of trouble	• When starting switch is turned ON, signal circuit of radiator coolant level sensor detected low radiator coolant level (sensor contact opened).		
Action of machine monitor	• Displays radiator coolant level monitor on machine monitor. • Even if cause of failure disappers, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• If machine is operated as it is, engine may overheats.		
Related information	• Condition of radiator coolant level switch can be checked with monitoring function (Code: 04500 Monitor input 1) • Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Lowering of radiator coolant level (when system is normal)	★ Check the coolant level and add coolant. (If this phenomenon frequently occurs, investigate the cause.)			
	2	Defective radiator coolant level switch (internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			P24 (male)	Radiator coolant level	Resistance	
			Between (1) – (2)	Value in normal state	Max. 1 Ω	
				Value when coolant level is low	Min. 1MΩ	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CM02 (female) (3) – P24 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between P24 (female) (2) – chassis ground		Resistance	Max. 1 Ω
	4	Defective machine monitor	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			CM02	Engine coolant temperature	Voltage	
			Between (3) – chassis ground	Value in normal state	Max. 1 V	
				Value when coolant level is low	20 – 30 V	

Circuit diagram related to radiator coolant level switch of machine monitor

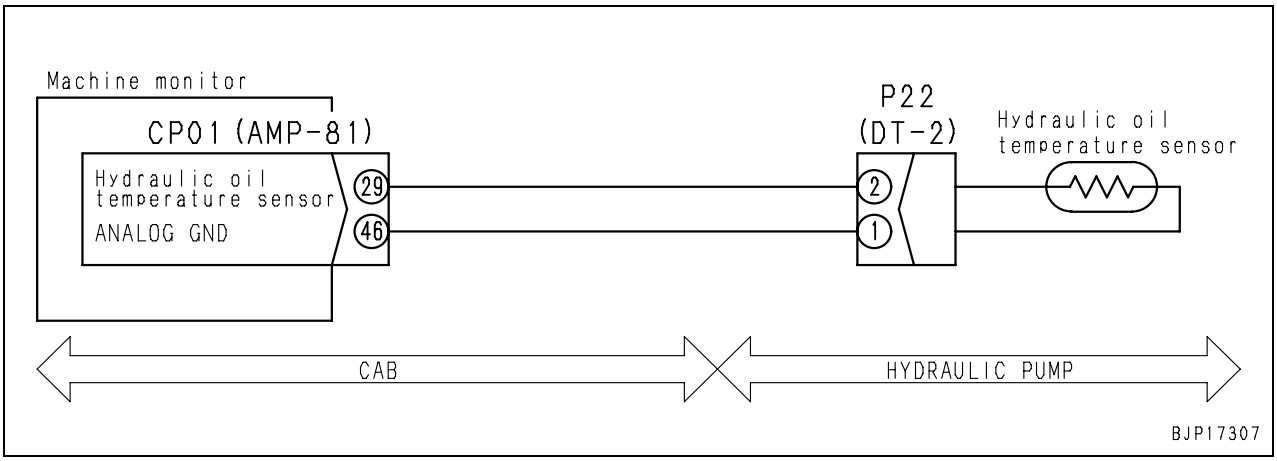


Failure code [B@HANS] Hydr Oil Overheat

User code	Failure code	Trouble	Hydraulic oil overheat (Pump controller system)
—	**B@HANS**		
Contents of trouble	• While engine was running, signal circuit of hydraulic oil temperature sensor detected overheating of hydraulic oil (above about 102°C).		
Action of controller	• Displays hydraulic oil temperature monitor with red on machine monitor. • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• If machine is operated as it is, engine may be seized.		
Related information	• Hydraulic oil temperature sensor signal is input to engine controller and then transmitted to machine monitor. • Hydraulic oil temperature can be checked with monitoring function (Code: 04401 Hydraulic oil temperature) • Method of reproducing failure code: Start engine.		

Possible causes and standard value in normal state		Cause	Standard value in normal state/Remarks on troubleshooting
	1	Overheating of hydraulic oil (when system is normal)	Hydraulic oil may be overheating. Check it and remove cause if it is overheating.
	2	Defective hydraulic oil temperature gauge system	If cause 1 is not detected, hydraulic oil temperature gauge system may be defective. Carry out troubleshooting for "E-12 Hydraulic oil temperature gauge does not work normally" in E-mode.

Circuit diagram related to hydraulic oil temperature sensor of machine monitor



Failure code [CA111] EMC Critical Internal Failure

Action code	Failure code	Trouble	EMC critical internal failure (Engine controller system)
E10	**CA111**		
Contents of trouble	• Memory or power supply circuit in engine controller is defective.		
Action of controller	• None in particular.		
Problem that appears on machine	• Engine does not start.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective engine controller	Engine controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)

Failure code [CA115] Eng Ne and Bkup Speed Sens Error

Action code	Failure code	Trouble	Engine Ne and Bkup speed sensor error (Engine controller system)
E11	**CA115**		
Contents of trouble	• Both signals of engine Ne speed sensor and engine Bkup speed sensor are abnormal.		
Action of controller			
Problem that appears on machine	• Engine stops. • Engine does not start.		
Related information	• Method of reproducing failure code: Start engine		

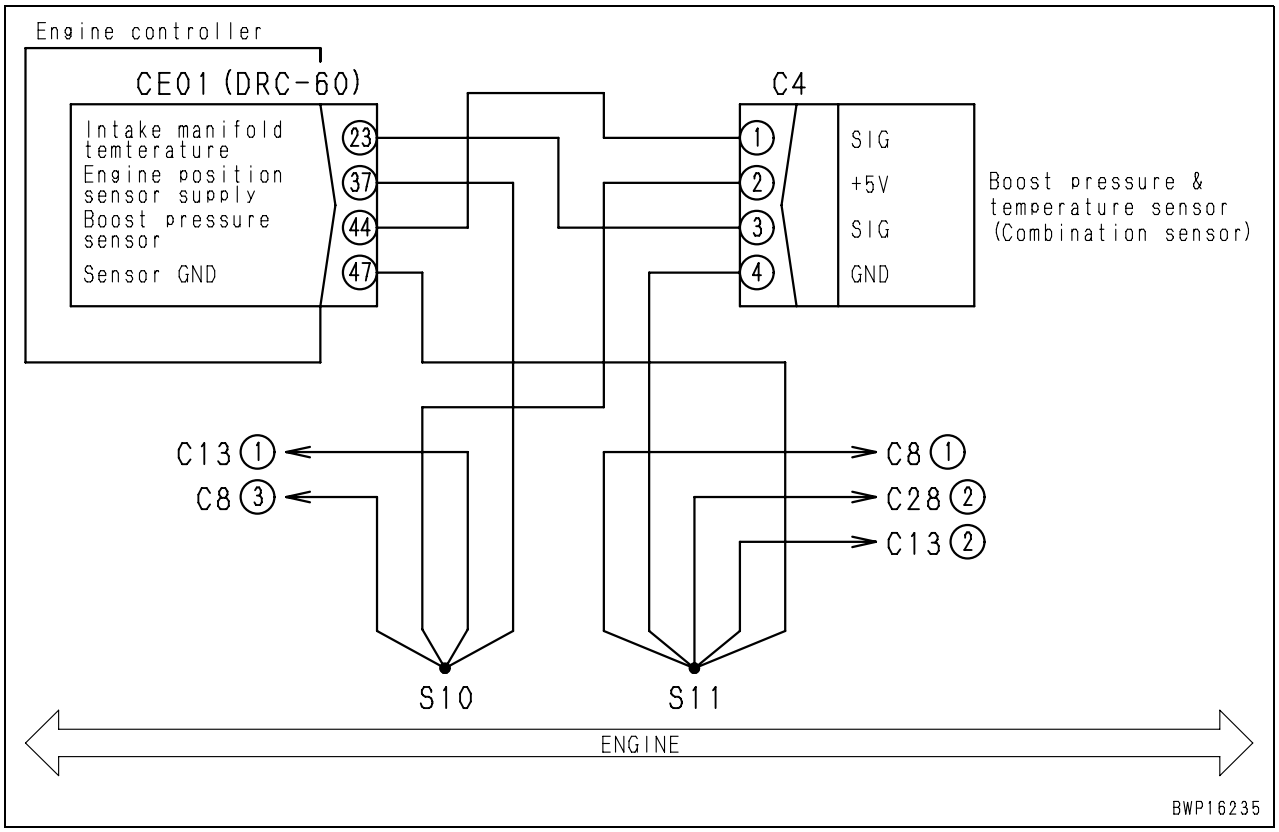
Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective connection of sensor connector	Connectors of Ne speed sensor and Bkup speed sensor may be connected defectively (or connected to wrong parts). Check them directly.

Failure code [CA122] Chg Air Press Sensor High Error

Action code	Failure code	Trouble	Charge air pressure sensor high error (Engine controller system)
E11	**CA122**		
Contents of trouble	• Pressure signal circuit of boost pressure, temperature sensor detected high voltage.		
Action of controller	• Fixes charge pressure value and continues operation.		
Problem that appears on machine	• Engine output lowers.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective sensor power supply 2 system	If failure code [**CA227**] is also indicated, carry out troubleshooting for it first.			
	2	Defective boost pressure, temperature sensor [pressure signal system]	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			C4 (male)		Voltage	
			Between (1) – (4)	Power supply	4.75 – 5.25 V	
			Voltage is measured with wiring harness connected. Accordingly, if voltage is abnormal, check wiring harness and controller, too, for another cause of trouble, and then judge.			
	3	Hot short in wiring harness (Short circuit with 5V/24V circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CE01 (female) (44) – C4 (female) (1) and chassis ground		Voltage	Max. 1 V
	4	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CE01 (female) (44) – C4 (female) (1) and between CE01 (female) (37) – C4 (female) (2)		Resistance	Min. 100 kΩ
	5	Defective wiring harness connector	Connecting parts between boost pressure, temperature sensor – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation			
	6	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			CE01		Voltage	
			Between (37) – (47)	Power supply	4.75 – 5.25 V	

Circuit diagram related to boost pressure, temperature sensor (combination sensor)

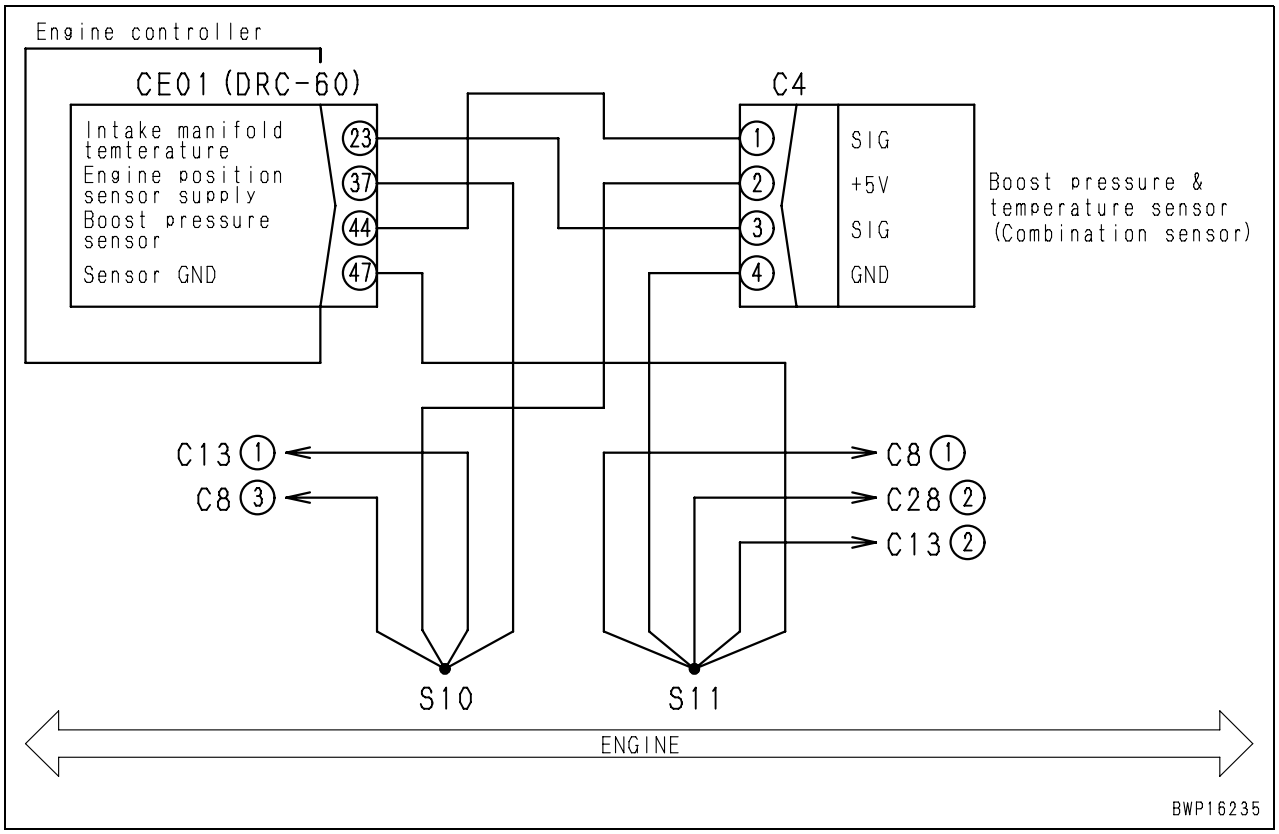


Failure code [CA123] Chg Air Press Sensor Low Error

Action code	Failure code	Trouble	Charge air pressure sensor low error (Engine controller system)
E11	**CA123**		
Contents of trouble	• Pressure signal circuit of boost pressure, temperature sensor detected low voltage.		
Action of controller	• Fixes charge pressure value and continues operation.		
Problem that appears on machine	• Engine output lowers.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective sensor power supply 2 system	If failure code [**CA187**] is also indicated, carry out troubleshooting for it first.			
	2	Defective boost pressure, temperature sensor [pressure signal system]	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			C4 (male)		Voltage	
			Between (1) – (4)	Power supply	4.75 – 5.25 V	
			Voltage is measured with wiring harness connected. Accordingly, if voltage is abnormal, check wiring harness and controller, too, for another cause of trouble, and then judge.			
	3	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CE01 (female) (44) – C4 (female) (1) and chassis ground		Resistance	Min. 100 kΩ
	4	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CE01 (female) (44) – C4 (female) (1) and between CE01 (female) (47) – C4 (female) (2)		Resistance	Min. 100 kΩ
	5	Defective wiring harness connector	Connecting parts between boost pressure, temperature sensor – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation			
	6	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			CE01		Voltage	
			Between (37) – (47)	Power supply	4.75 – 5.25 V	

Circuit diagram related to boost pressure, temperature sensor (combination sensor)

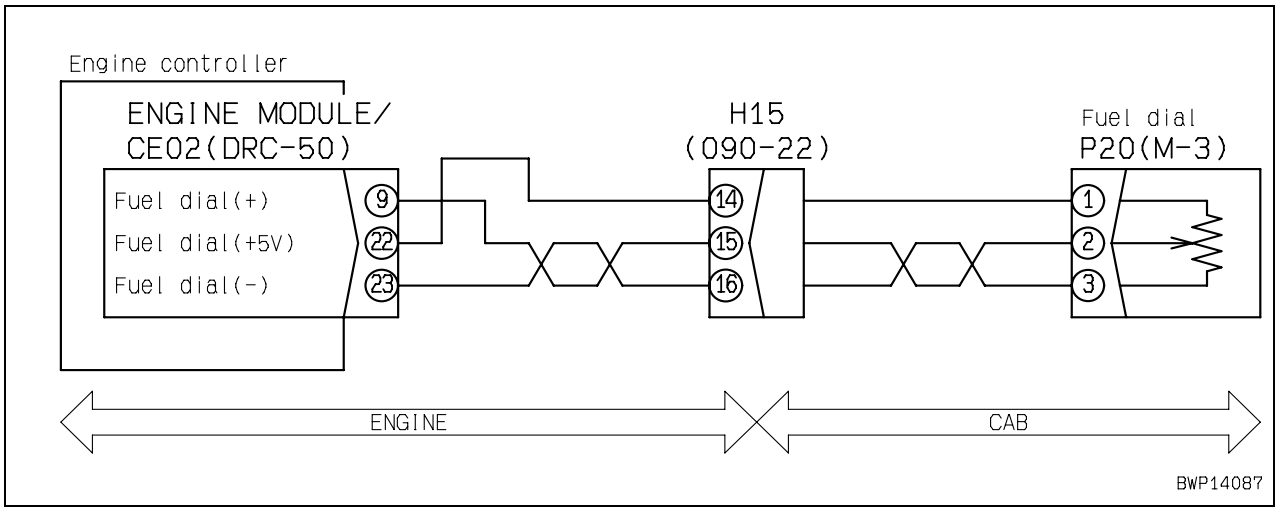


Failure code [CA131] Throttle Sensor High Error

User code	Failure code	Trouble	Throttle sensor high error (Engine controller system)
E14	**CA131**		
Contents of trouble	• Signal circuit of fuel control dial detected high voltage.		
Action of controller	• If trouble occurs while starting switch is in ON position, controller fixes voltage value to level just before detection of trouble and continues operation. • If starting switch is turned ON while voltage is abnormally high, controller continues operation with voltage at 100% value.		
Problem that appears on machine	• Engine speed cannot be controlled with fuel control dial.		
Related information	• Signal voltage of fuel control dial can be checked with monitoring function. (Code: 03000 Fuel control dial voltage) • Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective throttle sensor power supply system	If failure code [**CA2185**] is also indicated, carry out troubleshooting for it first.		
	2	Defective fuel control dial	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			P20		Voltage
			Between (1) – (3)	Power supply	4.75 – 5.25 V
			Voltage is measured with wiring harness connected. Accordingly, if voltage is abnormal, check wiring harness and controller, too, for another cause of trouble, and then judge.		
	3	Hot short (Short circuit with 5 V/24 V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Wiring harness between CE02 (female) (9) – P20 (female) (2)	Voltage	Max. 1 V
	4	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE02 (female) (9) – P20 (female) (2) and between CE02 (female) (22) – P20 (female) (1)	Resistance	Min. 100 kΩ
	5	Defective wiring harness connector	Connecting parts between fuel control dial – machine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	6	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			CE02		Voltage
			Between (22) – (23)	Power supply	4.75 – 5.25 V

Circuit diagram related to fuel control dial

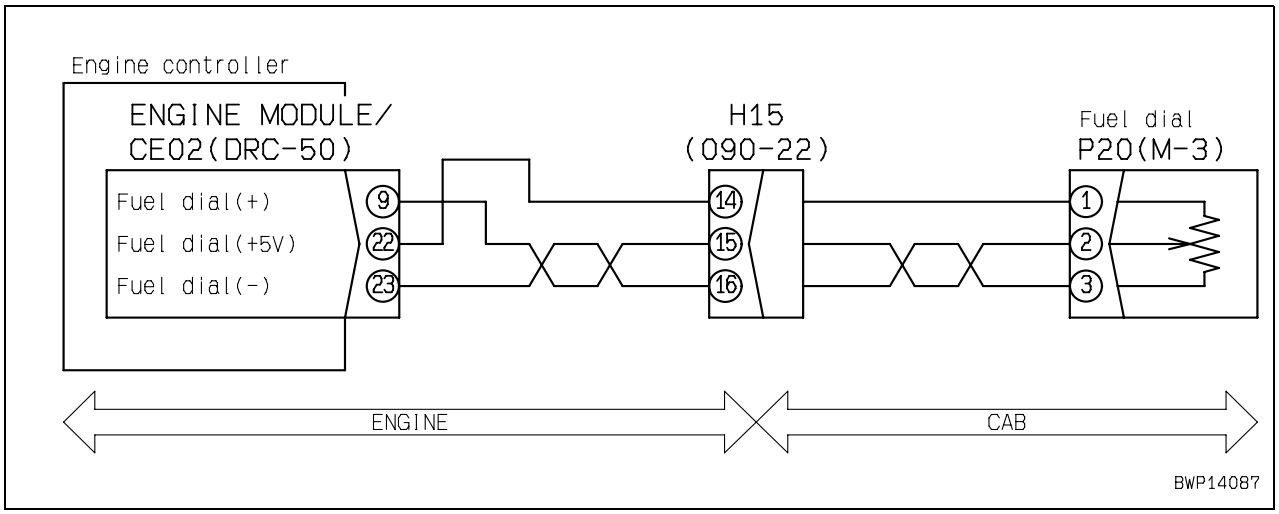


Failure code [CA132] Throttle Sensor Low Error

User code	Failure code	Trouble	Throttle sensor low error (Engine controller system)
E14	**CA132**		
Contents of trouble	• Signal circuit of fuel control dial detected low voltage.		
Action of controller	• If trouble occurs while starting switch is in ON position, controller fixes voltage value to level just before detection of trouble and continues operation. • If starting switch is turned ON while voltage is abnormally high, controller continues operation with voltage at 100% value.		
Problem that appears on machine	• Engine speed cannot be controlled with fuel control dial.		
Related information	• Signal voltage of fuel control dial can be checked with monitoring function. (Code: 03000 Fuel control dial voltage) • Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective throttle sensor power supply system	If failure code [**CA2186**] is also indicated, carry out troubleshooting for it first.		
	2	Defective fuel control dial	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			P20		Voltage
			Between (1) – (3)	Power supply	4.75 – 5.25 V
			Voltage is measured with wiring harness connected. Accordingly, if voltage is abnormal, check wiring harness and controller, too, for another cause of trouble, and then judge.		
	3	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE02 (female) (9) – P20 (female) (2)	Resistance	Min. 100 kΩ
	4	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE02 (female) (9) – P20 (female) (2) and between CE02 (female) (23) – P20 (female) (3)	Resistance	Min. 100 kΩ
	5	Defective wiring harness connector	Connecting parts between fuel control dial – machine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	6	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			CE02		Voltage
			Between (22) – (23)	Power supply	4.75 – 5.25 V

Circuit diagram related to fuel control dial

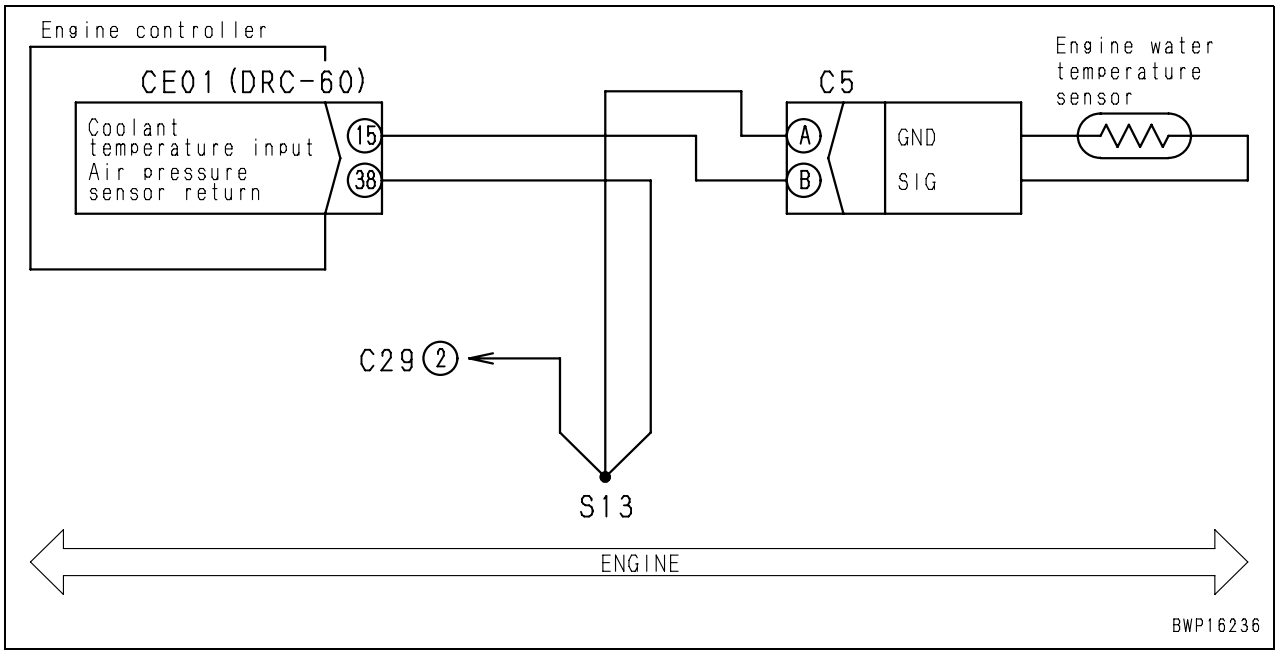


Failure code [CA144] Coolant Temp Sens High Error

Action code	Failure code	Trouble	Coolant temperature sensor high error (Engine controller system)
E15	**CA144**		
Contents of trouble	• Signal circuit of coolant temperature sensor detected high voltage.		
Action of controller	• Fixes coolant temperature value and continues operation.		
Problem that appears on machine	• Exhaust gas becomes white. Overheat prevention function does not work.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective coolant temperature sensor	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			C5 (male)	Resistance		
			Between (A) – (B)	0.18 – 160 kΩ		
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CE01 (female) (15) – C5 (female) (B)	Resistance	Max. 10 Ω	
			Wiring harness between CE01 (female) (38) – C5 (female) (A)	Resistance	Max. 10 Ω	
	3	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between CE01 (female) (15) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 100 kΩ	
	4	Defective wiring harness connector	Connecting parts between coolant temperature sensor – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation			
	5	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			CE01 (female)	Resistance		
			Between (15) – (38)	0.18 – 160 kΩ		

Circuit diagram related to engine coolant temperature sensor

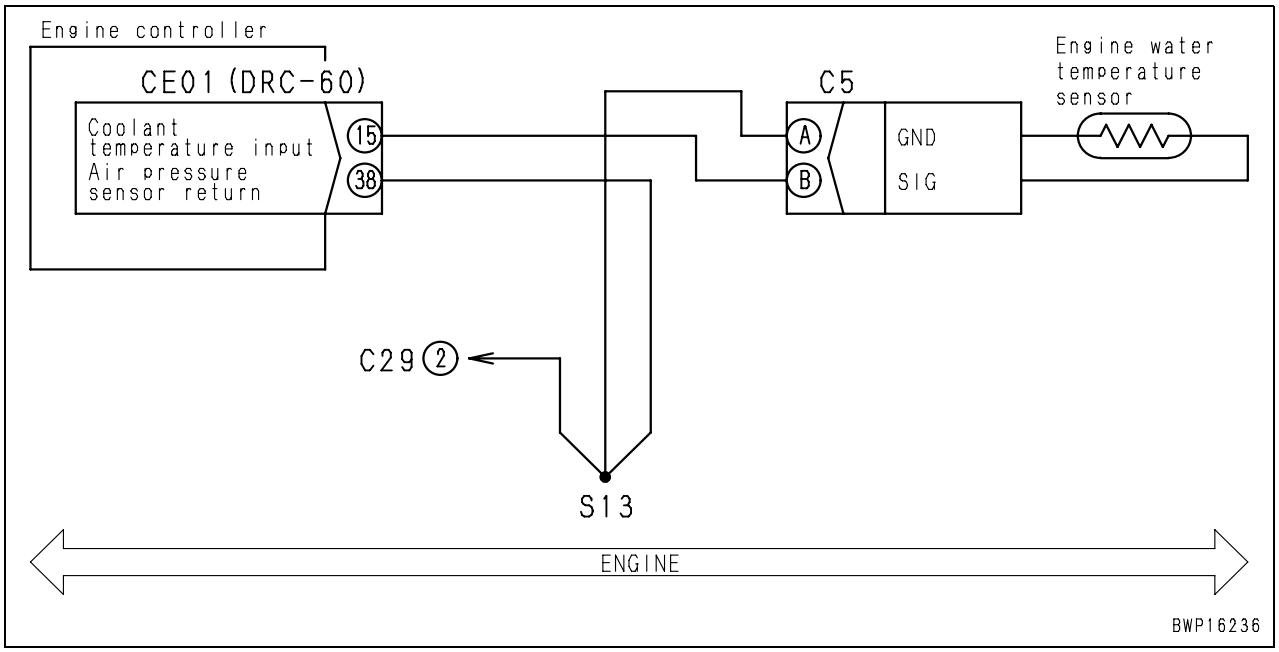


Failure code [CA145] Coolant Temp Sens Low Error

Action code	Failure code	Trouble	Coolant temperature sensor low error (Engine controller system)
E15	**CA145**		
Contents of trouble	• Signal circuit of coolant temperature sensor detected low voltage.		
Action of controller	• Fixes coolant temperature value and continues operation.		
Problem that appears on machine	• Exhaust gas becomes white. • Overheat prevention function does not work.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective coolant temperature sensor	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			C5 (male)	Resistance		
			Between (A) – (B)	0.18 – 160 kΩ		
			Between (B) – chassis ground	Min. 100 kΩ		
	2	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CE01 (female) (15) – C5 (female) (B) and chassis ground	Resistance	Min. 100 kΩ	
	3	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between CE01 (female) (15) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 100 kΩ	
	4	Defective wiring harness connector	Connecting parts between coolant temperature sensor – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation			
	5	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			CE01 (female)	Resistance		
			Between (15) – (38)	0.18 – 160 kΩ		
			Between (15) – chassis ground	Min. 100 kΩ		

Circuit diagram related to engine coolant temperature sensor

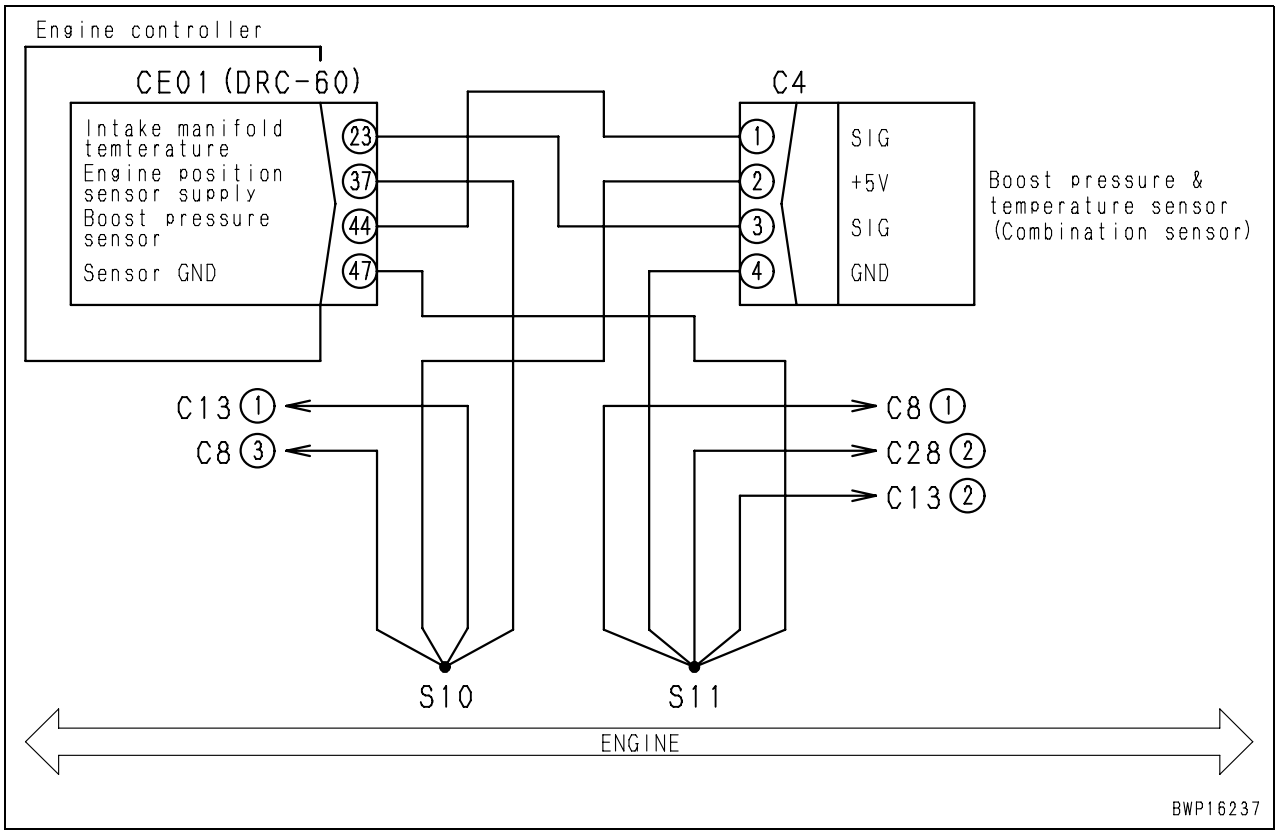


Failure code [CA153] Chg Air Temp Sensor High Error

Action code	Failure code	Trouble	Charge air temperature sensor high error (Engine controller system)
E15	**CA153**		
Contents of trouble	• Temperature signal circuit of boost pressure, temperature sensor detected high voltage.		
Action of controller	• Fixes charge temperature value and continues operation.		
Problem that appears on machine	• Exhaust gas becomes white. • Engine protection function based on boost temperature does not work		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective boost pressure, temperature sensor [temperature signal system]	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			C4 (male)	Resistance	
			Between (3) – (4)	0.18 – 160 kΩ	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE01 (female) (23) – C4 (female) (3)	Resistance	Max. 10 Ω
			Wiring harness between CE01 (female) (47) – C4 (female) (4)	Resistance	Max. 10 Ω
	3	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between CE01 (female) (23) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 100 kΩ
	4	Defective wiring harness connector	Connecting parts between boost pressure, temperature sensor – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	5	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CE01 (female)	Resistance	
			Between (23) – (47)	0.18 – 160 kΩ	

Circuit diagram related to boost pressure, temperature sensor (combination sensor)

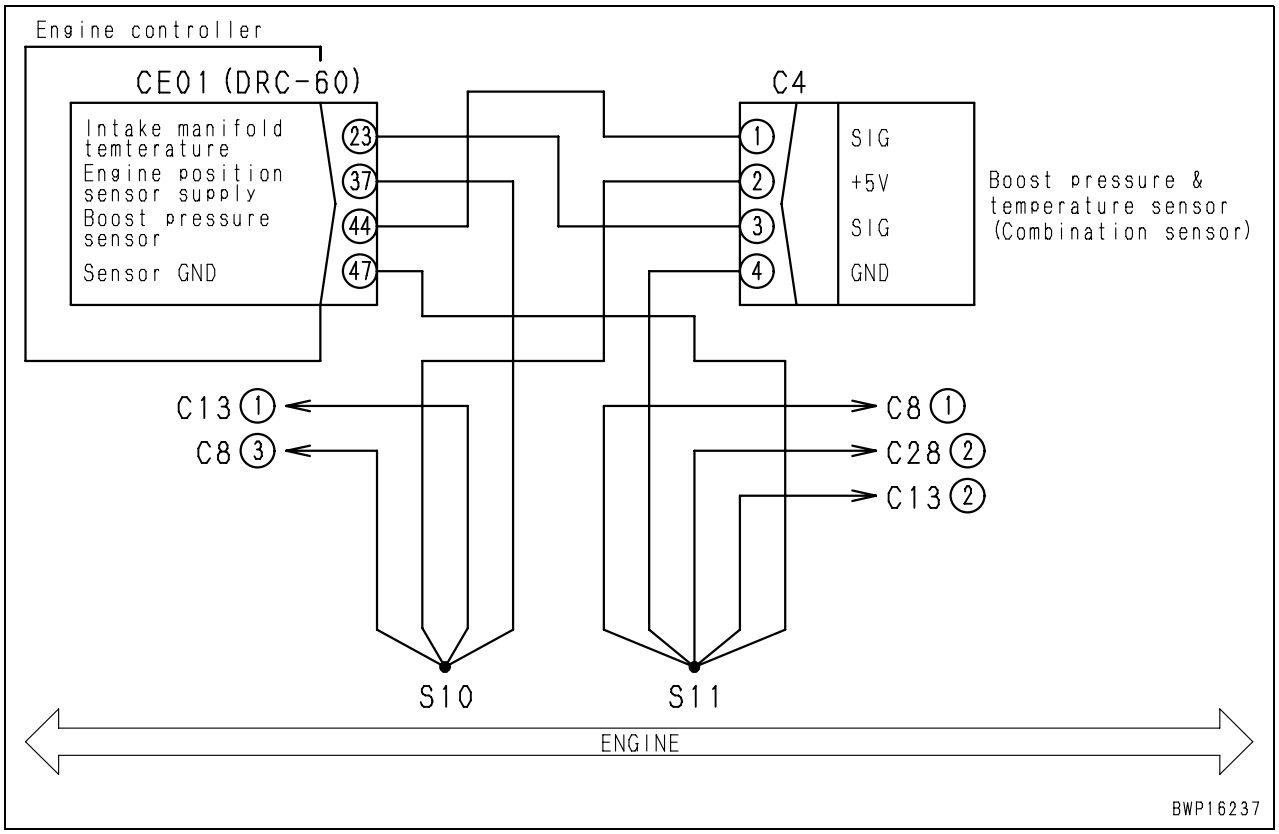


Failure code [CA154] Chg Air Temp Sensor Low Error

Action code	Failure code	Trouble	Charge air temperature sensor low error (Engine controller system)
E15	**CA154**		
Contents of trouble	• Temperature signal circuit of boost pressure, temperature sensor detected low voltage.		
Action of controller	• Fixes charge temperature value and continues operation.		
Problem that appears on machine	• Exhaust gas becomes white. • Engine protection function based on boost temperature does not work		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective boost pressure, temperature sensor [temperature signal system]	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			C4 (male)	Resistance	
			Between (3) – (4)	0.18 – 160 kΩ	
			Between (3) – chassis ground	Min. 100 kΩ	
	2	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE01 (female) (23) – C4 (female) (3) and chassis ground	Resistance	Min. 100 Ω
	3	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between CE01 (female) (23) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 100 kΩ
	4	Defective wiring harness connector	Connecting parts between boost pressure, temperature sensor – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	5	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CE01 (female)	Resistance	
			Between (23) – (47)	0.18 – 160 kΩ	
			Between (23) – chassis ground	Min.100 Ω	

Circuit diagram related to boost pressure, temperature sensor (combination sensor)

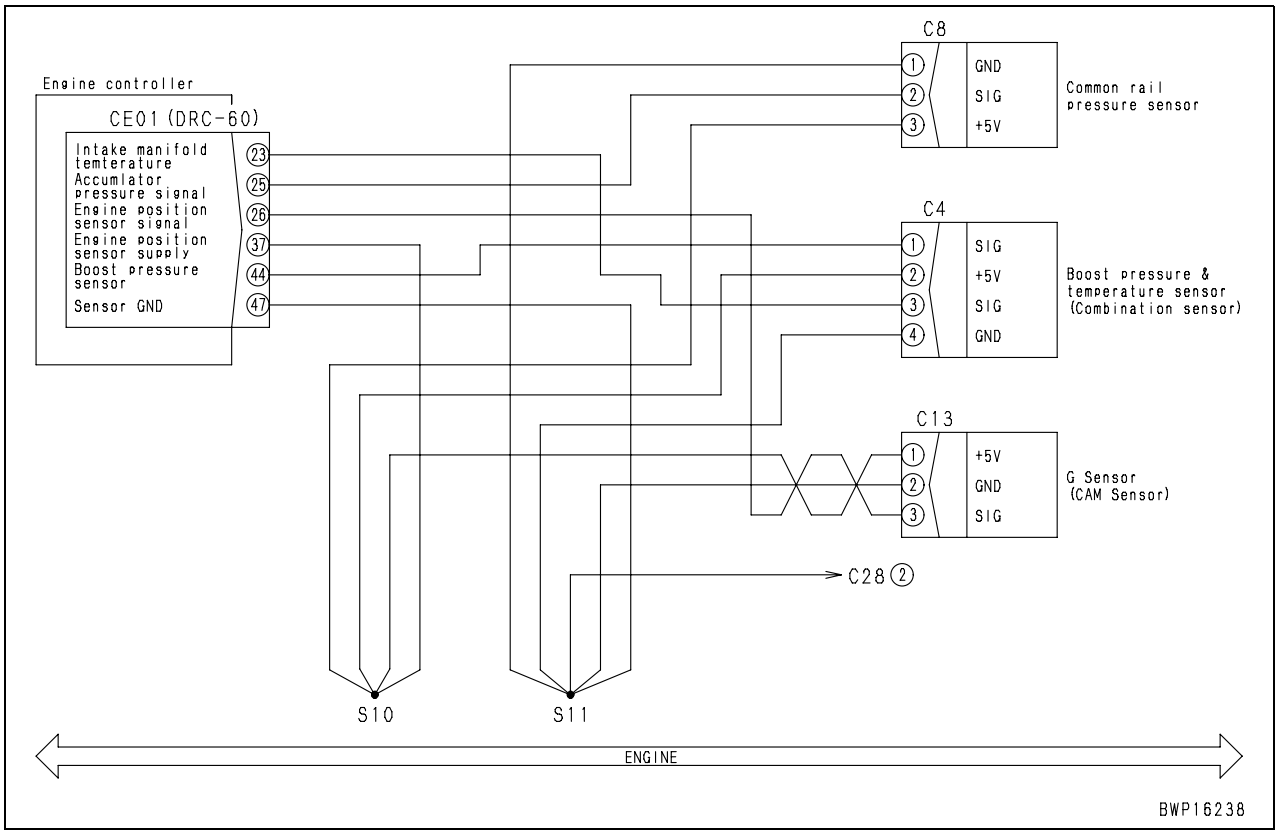


Failure code [CA187] Sens Supply 2 Volt Low Error

Action code	Failure code	Trouble	Sensor power supply 2 voltage low error (Engine controller system)
E15	**CA187**		
Contents of trouble	• Low voltage was detected in sensor power supply 2 circuit.		
Action of controller	• Fixes charge pressure and charge temperature values and continues operation. • Limits output and continues operation.		
Problem that appears on machine	• Engine output lowers.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective sensor or wiring harness	★ Disconnect connector with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Disconnect sensor and wiring harness at right in order and carry out operation to reproduce trouble. If “E” of failure code goes off when sensor or wiring harness is disconnected, that sensor or wiring harness is defective.	Boost pressure, temperature sensor	C4
				Common rail pressure sensor	C8
				Bkup sensor	C13
				Engine wiring harness	CE01
	2	Defective wiring harness connector	Connecting parts between each sensor – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	3	Defective engine controller	If causes 1 and 2 are not detected, engine controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related to sensor power supply 2

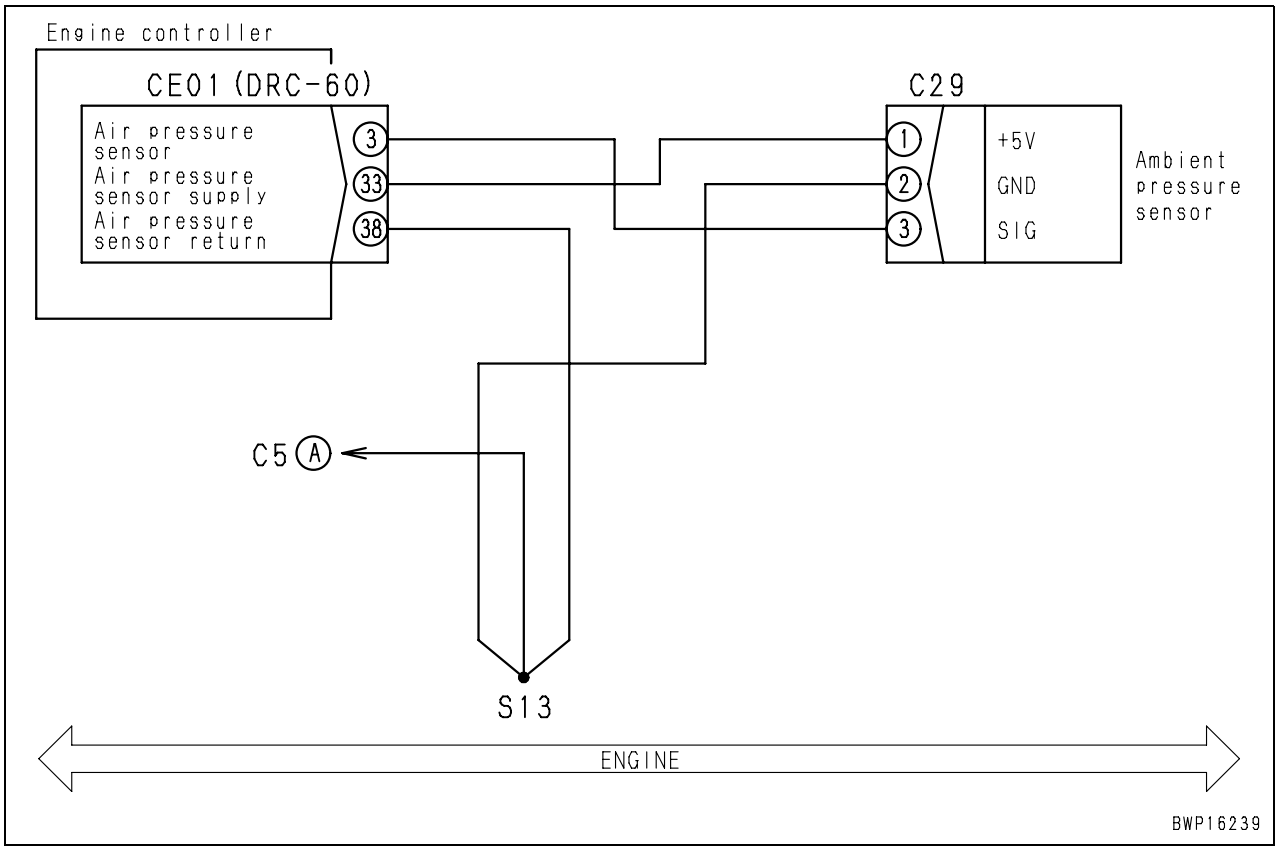


Failure code [CA221] Ambient Press Sens High Error

Action code	Failure code	Trouble	Ambient pressure sensor high error (Engine controller system)
E15	**CA221**		
Contents of trouble	• High voltage was detected in signal circuit of ambient pressure sensor.		
Action of controller	• Fixes ambient pressure value and continues operation.		
Problem that appears on machine	• Engine output lowers. • Engine starting performance becomes deteriorated.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective sensor power supply 1 system	If failure code [**CA386**] is also indicated, carry out troubleshooting for it first.			
	2	Defective ambient pressure sensor	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			C29 (male)		Voltage	
			Between (1) – (2)	Power supply	4.75 – 5.25 V	
			Voltage is measured with wiring harness connected. Accordingly, if voltage is abnormal, check wiring harness and controller, too, for another cause of trouble, and then judge.			
	3	Hot short (Short circuit with 5V/24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CE01 (female) (3) – C29 (female) (3) and chassis ground		Voltage	Max. 1 V
	4	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CE01 (female) (3) – C29 (female) (3) and between CE01 (female) (33) – C29 (female) (1)		Resistance	Min. 100 kΩ
	5	Defective wiring harness connector	Connecting parts between ambient pressure sensor – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation			
	6	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			CE01		Voltage	
			Between (33) – (38)	Power supply	4.75 – 5.25 V	

Circuit diagram related to atmospheric pressure sensor

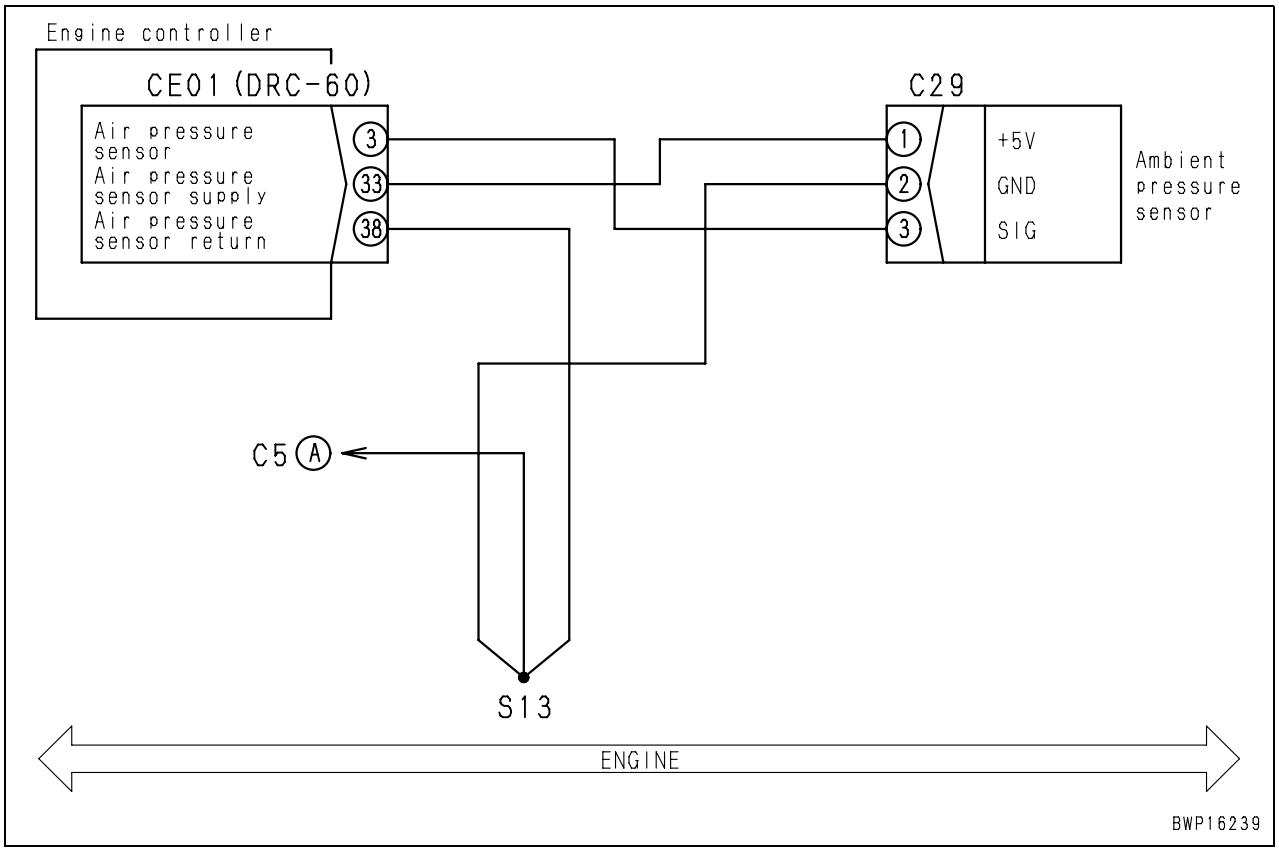


Failure code [CA222] Ambient Press Sens Low Error

Action code	Failure code	Trouble	Ambient pressure sensor low error (Engine controller system)
E15	**CA222**		
Contents of trouble	• Low voltage was detected in signal circuit of ambient pressure sensor.		
Action of controller	• Fixes ambient pressure value and continues operation.		
Problem that appears on machine	• Engine output lowers. • Engine starting performance becomes deteriorated.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective sensor power supply 1 system	If failure code [**CA352**] is also indicated, carry out troubleshooting for it first.		
	2	Defective ambient pressure sensor	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			C29 (male)		Voltage
			Between (1) – (2)	Power supply	4.75 – 5.25 V
			Voltage is measured with wiring harness connected. Accordingly, if voltage is abnormal, check wiring harness and controller, too, for another cause of trouble, and then judge.		
	3	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE01 (female) (3) – C29 (female) (3) and chassis ground	Resistance	Min. 100 kΩ
	4	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE01 (female) (3) – C29 (female) (3) and between CE01 (female) (38) – JC03 – C29 (female) (2)	Resistance	Min. 100 kΩ
	5	Defective wiring harness connector	Connecting parts between ambient pressure sensor – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	6	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			CE01		Voltage
			Between (33) – (38)	Power supply	4.75 – 5.25 V

Circuit diagram related to atmospheric pressure sensor

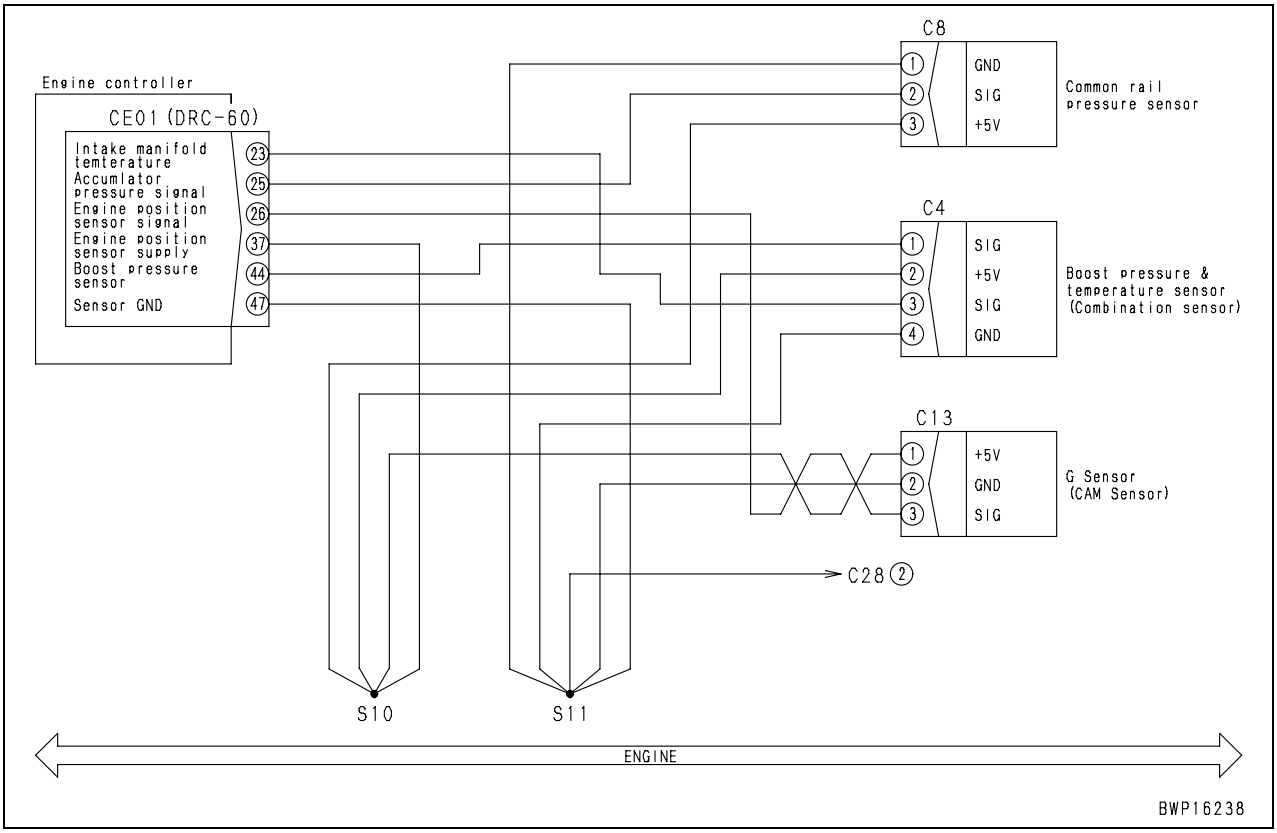


Failure code [CA227] Sens Supply 2 Volt High Error

Action code	Failure code	Trouble	Sensor power supply 2 voltage high error (Engine controller system)
E15	**CA227**		
Contents of trouble	• High voltage was detected in sensor power supply 2 circuit.		
Action of controller	• Fixes charge pressure and charge temperature values and continues operation. • Limits output and continues operation.		
Problem that appears on machine	• Engine output lowers.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

		Cause	Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Defective wiring harness connector	Connecting parts between each sensor – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation
	2	Defective engine controller	If cause 1 is not detected, engine controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)

Circuit diagram related to sensor power supply 2



Failure code [CA234] Eng Overspeed

Action code	Failure code	Trouble	Engine overspeed (Engine controller system)
—	**CA234**		
Contents of trouble	• Engine speed exceeded control upper speed limit.		
Action of controller	• Stops injection until engine speed lowers to normal level.		
Problem that appears on machine	• Engine speed fluctuates.		
Related information	• Method of reproducing failure code: Run engine at high idle.		

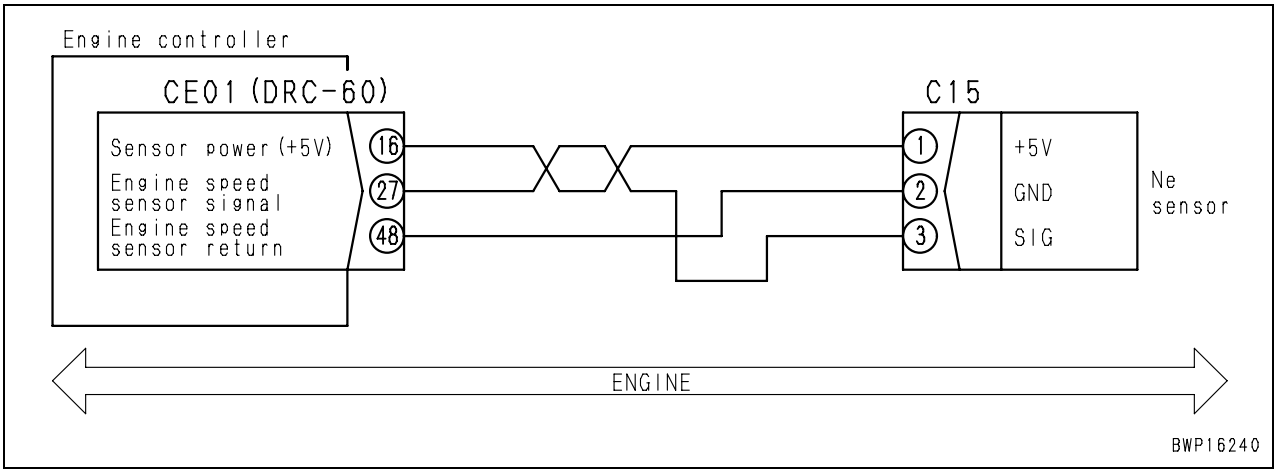
		Cause	Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Use of improper fuel	Fuel used may be improper. Check it directly.
	2	Improper use	Machine may be used improperly. Teach operator proper using method.
	3	Defective engine controller	If cause 1 is not detected, engine controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)

Failure code [CA238] Ne Speed Sens Supply Volt Error

Action code	Failure code	Trouble	Ne speed sensor supply power voltage error (Engine controller system)
E15	**CA238**		
Contents of trouble	• Low voltage was detected in power supply circuit of engine Ne speed sensor.		
Action of controller	• Controls the engine with signal from engine Bkup speed sensor.		
Problem that appears on machine	• Engine does not start easily. • Engine hunts.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective sensor or wiring harness	★ Disconnect connector with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Disconnect sensor and wiring harness at right in order and carry out operation to reproduce trouble. If "E" of failure code goes off when sensor or wiring harness is disconnected, that sensor or wiring harness is defective.	Ne speed sensor	C15
				Engine wiring harness	CE01
	2	Defective wiring harness connector	Connecting parts between each sensor – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		

Circuit diagram related to engine Ne speed sensor

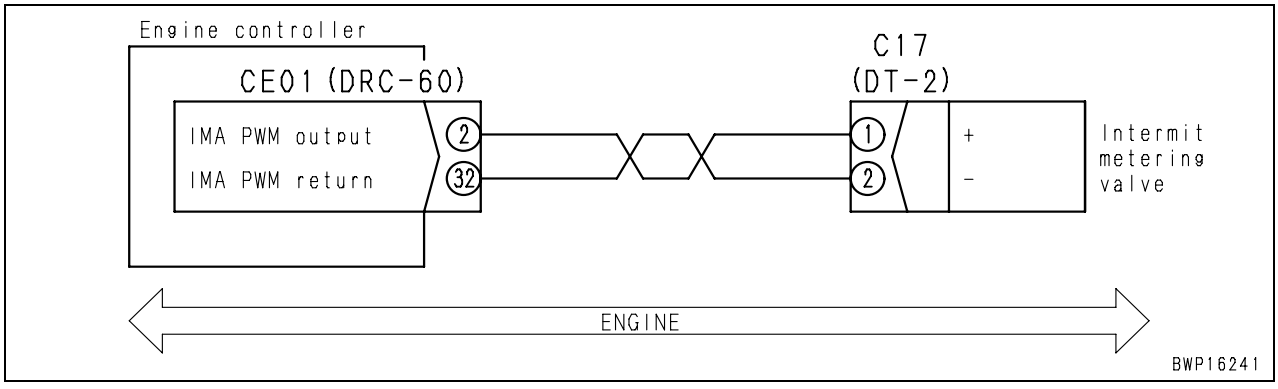


Failure code [CA271] IMV/PCV1 Short Error

Action code	Failure code	Trouble	IMV/PCV1 short error (Engine controller system)
E11	**CA271**		
Contents of trouble	• Short circuit was detected in drive circuit of supply pump actuator.		
Action of controller	• None in particular.		
Problem that appears on machine	• Engine speed does not rise from low idle. • Engine output lowers. • Common rail fuel pressure rises above command value.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective supply pump actuator	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			C17 (male)	Resistance	
			Between (1) – chassis ground	Min. 100 kΩ	
	2	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE01 (female) (2) – C17 (female) (1) and chassis ground	Resistance	Min. 100 kΩ
	3	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between CE01 (female) (2) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 100 kΩ
	4	Defective wiring harness connector	Connecting parts between supply pump actuator – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	5	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CE01 (female)	Resistance	
			Between (2) – chassis ground	Min. 100 kΩ	

Circuit diagram related to supply pump actuator (metering unit)

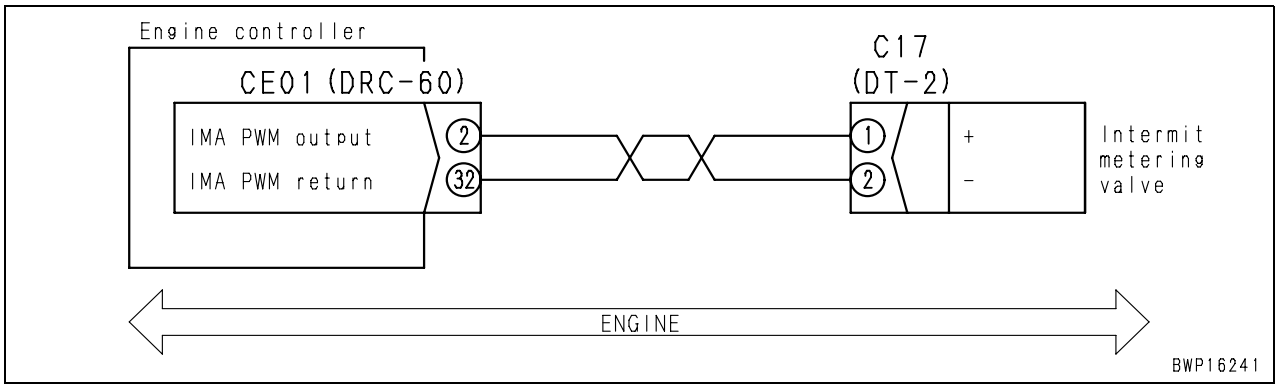


Failure code [CA272] IMV/PCV1 Open Error

Action code	Failure code	Trouble	IMV/PCV1 open error (Engine controller system)
E11	**CA272**		
Contents of trouble	• Opening was detected in drive circuit of supply pump actuator.		
Action of controller	• None in particular.		
Problem that appears on machine	• Engine runs but its operation is unstable. • Common rail fuel pressure rises above command value.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective supply pump actuator	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			C17 (male)	Resistance	
			Between (1) – (2)	Max. 5 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE01 (female) (2) – C17 (female) (1)	Resistance	Max. 10 Ω
			Wiring harness between CE01 (female) (32) – C17 (female) (2)	Resistance	Max. 10 Ω
	3	Hot short in wiring harness (Short circuit with 24V circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Wiring harness between CE01 (female) (2) – C17 (female) (1) and chassis ground	Voltage	Max. 3 V
	4	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between CE01 (female) (2) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 100 kΩ
	5	Defective wiring harness connector	Connecting parts between supply pump actuator – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	6	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CE01 (female)	Resistance	
			Between (2) – (32)	Max. 5 Ω	

Circuit diagram related to supply pump actuator (metering unit)

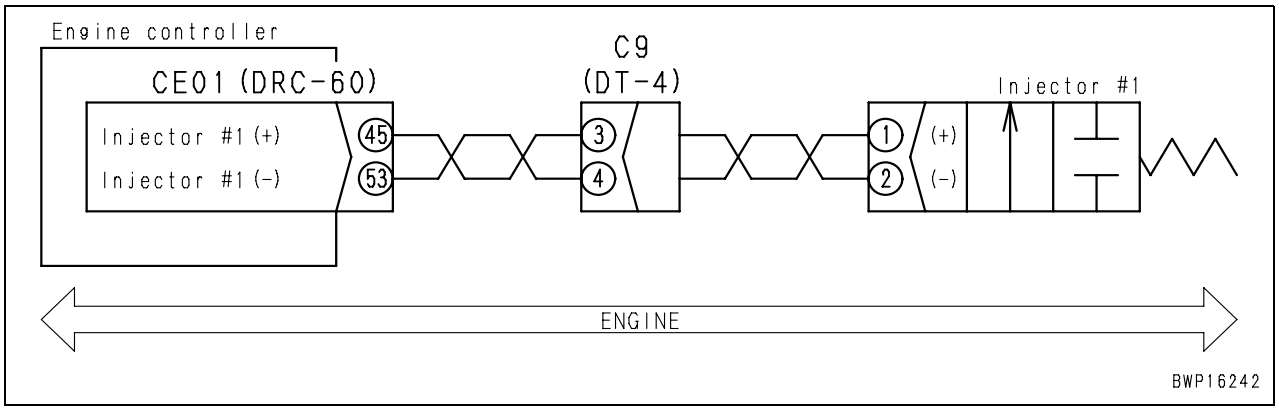


Failure code [CA322] Inj #1 Open/Short Error

Action code	Failure code	Trouble	Injector #1 open/short circuit error (Engine controller system)
E11	**CA322**		
Contents of trouble	• Opening or short circuit was detected in drive circuit of No. 1 injector.		
Action of controller	• None in particular.		
Problem that appears on machine	• Combustion becomes irregular or engine hunts. • Engine output lowers.		
Related information	• Method of reproducing failure code: Start engine		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective engine controller	If following failure codes are also displayed, trouble is in engine controller: [**CA322**], [**CA324**], [**CA331**]		
	2	Defective No. 1 injector	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			C9 (male)	Resistance	
			Between (3) – (4)	Max. 2 Ω	
			Between (3) – chassis ground	Min. 100 kΩ	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE01 (female) (45) – C9 (female) (3)	Resistance	Max. 2 Ω
			Wiring harness between CE01 (female) (53) – C9 (female) (4)	Resistance	Max. 2 Ω
	4	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE01 (female) (45) – C9 (female) (3) and chassis ground	Resistance	Max. 2 Ω
	5	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between CE01 (female) (45) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 100 kΩ
			Between CE01 (female) (53) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 100 kΩ
	6	Defective wiring harness connector	Connecting parts between No. 1 injector – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	7	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CE01 (female)	Resistance	
			Between (45) – (53)	Max. 2 Ω	
			Between (45) – chassis ground	Min. 100 kΩ	

Circuit diagram related to injector No. 1

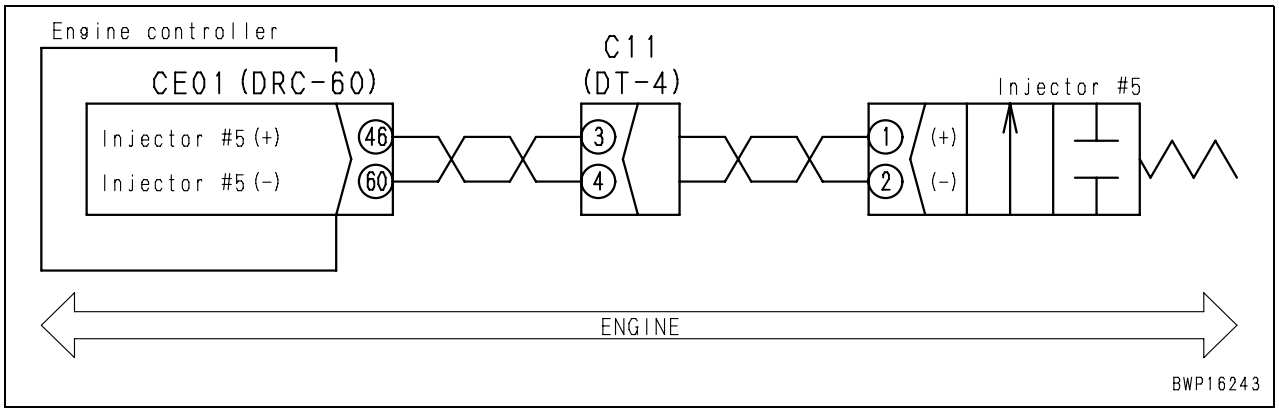


Failure code [CA323] Inj #5 Open/Short Error

Action code	Failure code	Trouble	Injector #5 open/short circuit error (Engine controller system)
E11	**CA323**		
Contents of trouble	• Opening or short circuit was detected in drive circuit of No. 5 injector.		
Action of controller	• None in particular.		
Problem that appears on machine	• Combustion becomes irregular or engine hunts. • Engine output lowers.		
Related information	• Method of reproducing failure code: Start engine		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective engine controller	If following failure codes are also displayed, trouble is in engine controller: [**CA323**], [**CA325**], [**CA332**]		
	2	Defective No. 5 injector	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			C11 (male)	Resistance	
			Between (3) – (4)	Max. 2 Ω	
			Between (3) – chassis ground	Min. 100 kΩ	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE01 (female) (46) – C11 (female) (3)	Resistance	Max. 2 Ω
			Wiring harness between CE01 (female) (60) – C11 (female) (4)	Resistance	Max. 2 Ω
	4	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE01 (female) (46) – C11 (female) (3) and chassis ground	Resistance	Max. 2 Ω
	5	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between CE01 (female) (46) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 100 kΩ
			Between CE01 (female) (60) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 100 kΩ
	6	Defective wiring harness connector	Connecting parts between No. 5 injector – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	7	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CE01 (female)	Resistance	
			Between (46) – (60)	Max. 2 Ω	
			Between (46) – chassis ground	Min. 100 kΩ	

Circuit diagram related to injector No. 5

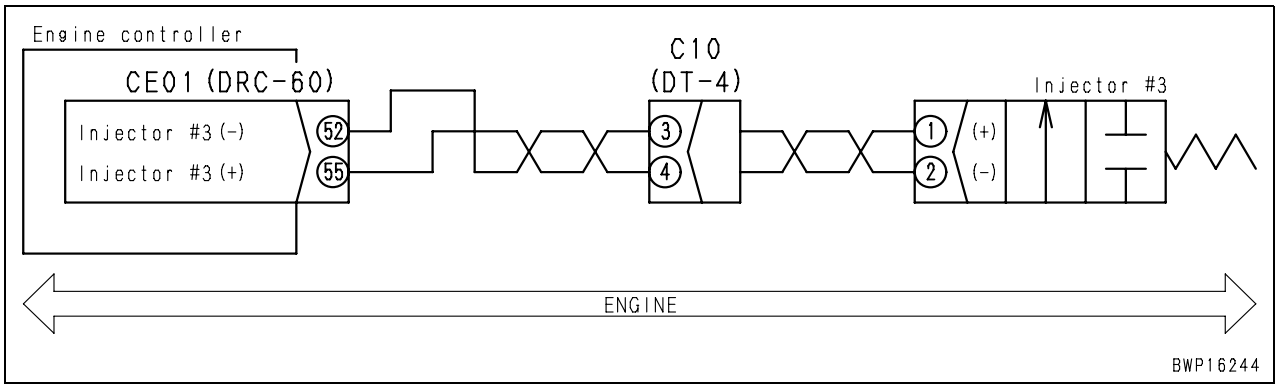


Failure code [CA324] Inj #3 Open/Short Error

Action code	Failure code	Trouble	Injector #3 open/short circuit error (Engine controller system)
E11	**CA324**		
Contents of trouble	• Opening or short circuit was detected in drive circuit of No. 3 injector.		
Action of controller	• None in particular.		
Problem that appears on machine	• Combustion becomes irregular or engine hunts. • Engine output lowers.		
Related information	• Method of reproducing failure code: Start engine		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective engine controller	If following failure codes are also displayed, trouble is in engine controller: [**CA322**], [**CA324**], [**CA331**]		
	2	Defective No. 3 injector	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			C10 (male)	Resistance	
			Between (3) – (4)	Max. 2 Ω	
			Between (3) – chassis ground	Min. 100 kΩ	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE01 (female) (55) – C10 (female) (3)	Resistance	Max. 2 Ω
			Wiring harness between CE01 (female) (52) – C10 (female) (4)	Resistance	Max. 2 Ω
	4	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE01 (female) (55) – C10 (female) (3) and chassis ground	Resistance	Max. 2 Ω
	5	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between CE01 (female) (55) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 100 kΩ
			Between CE01 (female) (52) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 100 kΩ
	6	Defective wiring harness connector	Connecting parts between No. 3 injector – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	7	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CE01 (female)	Resistance	
			Between (55) – (52)	Max. 2 Ω	
			Between (55) – chassis ground	Min. 100 kΩ	

Circuit diagram related to injector No. 3

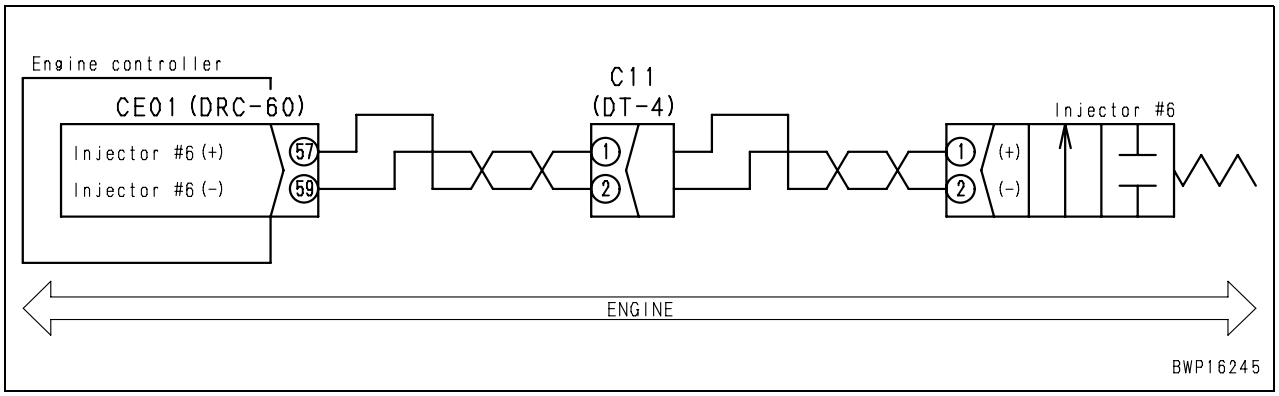


Failure code [CA325] Inj #6 Open/Short Error

Action code	Failure code	Trouble	Injector #6 open/short circuit error (Engine controller system)
E11	**CA325**		
Contents of trouble	• Opening or short circuit was detected in drive circuit of No. 6 injector.		
Action of controller	• None in particular.		
Problem that appears on machine	• Combustion becomes irregular or engine hunts.		
Related information	• Method of reproducing failure code: Start engine		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective engine controller	If following failure codes are also displayed, trouble is in engine controller: [**CA323**], [**CA325**], [**CA332**]			
	2	Defective No. 6 injector	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			C11 (male)	Resistance		
			Between (1) – (2)	Max. 2 Ω		
			Between (2) – chassis ground	Min. 100 kΩ		
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CE01 (female) (57) – C11 (female) (2)	Resistance	Max. 2 Ω	
			Wiring harness between CE01 (female) (59) – C11 (female) (1)	Resistance	Max. 2 Ω	
	4	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CE01 (female) (57) – C11 (female) (2) and chassis ground	Resistance	Max. 2 Ω	
	5	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between CE01 (female) (57) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 100 kΩ	
			Between CE01 (female) (59) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 100 kΩ	
	6	Defective wiring harness connector	Connecting parts between No. 6 injector – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation			
	7	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CE01 (female)	Resistance		
			Between (57) – (59)	Max. 2 Ω		
			Between (57) – chassis ground	Min. 100 kΩ		

Circuit diagram related to injector No. 6

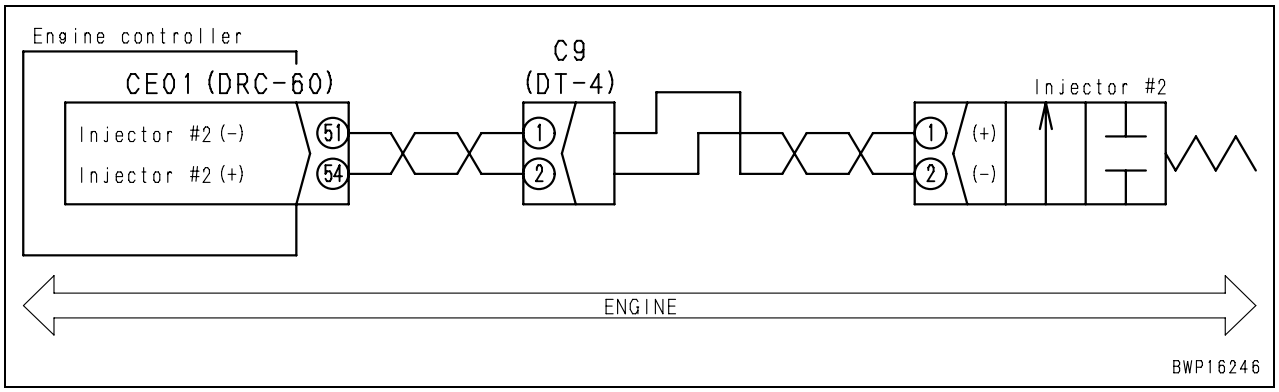


Failure code [CA331] Inj #2 Open/Short Error

Action code	Failure code	Trouble	Injector #2 open/short circuit error (Engine controller system)
E11	**CA331**		
Contents of trouble	• Opening or short circuit was detected in drive circuit of No. 2 injector.		
Action of controller	• None in particular.		
Problem that appears on machine	• Combustion becomes irregular or engine hunts. • Engine output lowers.		
Related information	• Method of reproducing failure code: Start engine		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective engine controller	If following failure codes are also displayed, trouble is in engine controller: [**CA322**], [**CA324**], [**CA331**]		
	2	Defective No. 2 injector	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			C9 (male)	Resistance	
			Between (1) – (2)	Max. 2 Ω	
			Between (2) – chassis ground	Min. 100 kΩ	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE01 (female) (54) – C9 (female) (2)	Resistance	Max. 2 Ω
			Wiring harness between CE01 (female) (51) – C9 (female) (1)	Resistance	Max. 2 Ω
	4	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE01 (female) (54) – C9 (female) (2) and chassis ground	Resistance	Max. 2 Ω
	5	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between CE01 (female) (54) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 100 kΩ
			Between CE01 (female) (51) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 100 kΩ
	6	Defective wiring harness connector	Connecting parts between No. 2 injector – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	7	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CE01 (female)	Resistance	
			Between (54) – (51)	Max. 2 Ω	
			Between (54) – chassis ground	Min. 100 kΩ	

Circuit diagram related to injector No. 2

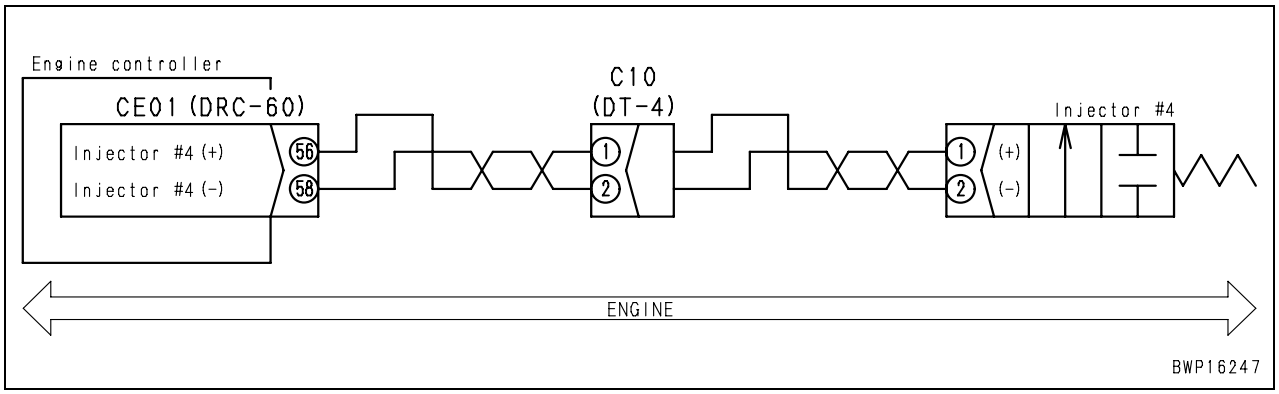


Failure code [CA332] Inj #4 Open/Short Error

Action code	Failure code	Trouble	Injector #4 open/short circuit error (Engine controller system)
E11	**CA332**		
Contents of trouble	• Opening or short circuit was detected in drive circuit of No. 4 injector.		
Action of controller	• None in particular.		
Problem that appears on machine	• Combustion becomes irregular or engine hunts. • Engine output lowers.		
Related information	• Method of reproducing failure code: Start engine		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective engine controller	If following failure codes are also displayed, trouble is in engine controller: [**CA323**], [**CA325**], [**CA332**]		
	2	Defective No. 4 injector	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			C10 (male)	Resistance	
			Between (1) – (2)	Max. 2 Ω	
			Between (2) – chassis ground	Min. 100 kΩ	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE01 (female) (56) – C10 (female) (2)	Resistance	Max. 2 Ω
			Wiring harness between CE01 (female) (58) – C10 (female) (1)	Resistance	Max. 2 Ω
	4	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE01 (female) (56) – C10 (female) (2) and chassis ground	Resistance	Max. 2 Ω
	5	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between CE01 (female) (56) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 100 kΩ
			Between CE01 (female) (58) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 100 kΩ
	6	Defective wiring harness connector	Connecting parts between No. 4 injector – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	7	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CE01 (female)	Resistance	
			Between (56) – (58)	Max. 2 Ω	
			Between (56) – chassis ground	Min. 100 kΩ	

Circuit diagram related to injector No. 4



PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN02629-00

HYDRAULIC EXCAVATOR

PC300-8
PC300LC-8
PC350-8
PC350LC-8

Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

40 Troubleshooting

Troubleshooting by failure code (Display of code), Part 2

Failure code [CA342] Calibration Code Incompatibility

Action code	Failure code	Trouble	Calibration code incompatibility (Engine controller system)
E10	**CA342**		
Contents of trouble	• Incompatibility of data occurred in engine controller.		
Action of controller	• None in particular.		
Problem that appears on machine	• Normal operation, engine stopped, or start disabled		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

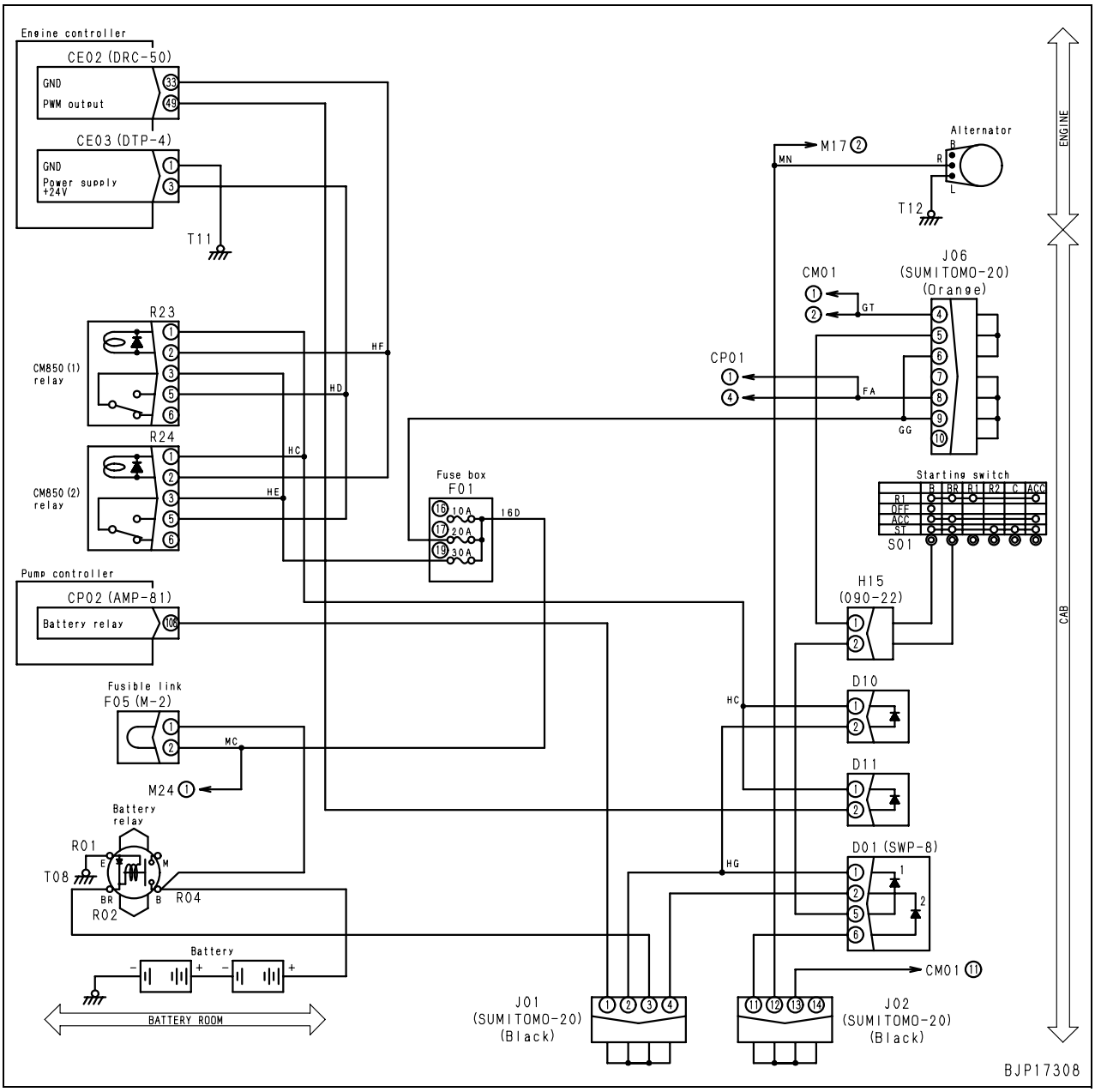
Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defect in related system	If another failure code is displayed, carry out troubleshooting for it.
	2	Defective engine controller	Engine controller may be defective. (Troubleshooting cannot be carried out.)

Failure code [CA351] Injectors Drive Circuit Error

Action code	Failure code	Trouble	Injectors drive circuit error (Engine controller system)
E10	**CA351**		
Contents of trouble	• There is error in drive power circuit of injector.		
Action of controller	• Limits output and continues operation.		
Problem that appears on machine	• Exhaust gas becomes black. • Combustion becomes irregular. • Engine output lowers. • Engine cannot be started.		
Related information	• Method of reproducing failure code: Start engine.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defect in related system	If another failure code is displayed, carry out troubleshooting for it.		
	2	Defective fuse No. 19	If fuse is broken, circuit probably has ground fault.		
	3	Defective relay for engine controller power supply	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Replace relay (R23, R24) for engine controller with another relay and perform reproducing operation. If “E” of failure code goes off at this time, replaced relay is defective.		
	4	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between F01-19 – R23, R24 (female) (3)	Resistance	Max. 0.5 Ω
			Wiring harness between R23, R24 (female) (5) – CE03 (female) (3)	Resistance	Max. 0.5 Ω
			Wiring harness between CE03 (female) (1) – chassis ground (T11)	Resistance	Max. 10 Ω
	5	Defective engine controller	If causes 1 – 4 are not detected, engine controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related to engine controller power supply

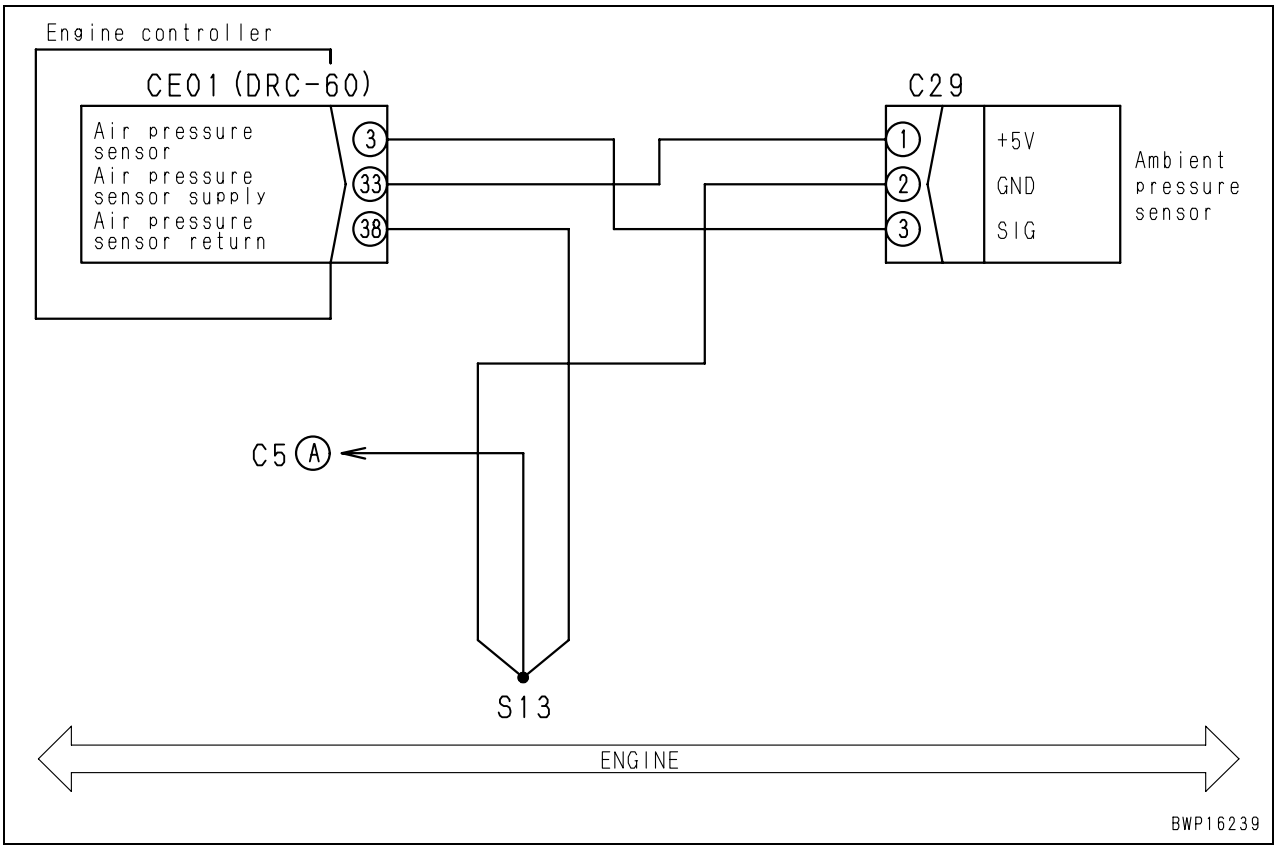


Failure code [CA352] Sens Supply 1 Volt Low Error

Action code	Failure code	Trouble	Sensor power supply 1 voltage low error (Engine controller system)
E15	**CA352**		
Contents of trouble	• Low voltage was detected in sensor power supply 1 circuit.		
Action of controller	• Fixes ambient pressure value and continues operation.		
Problem that appears on machine	• Engine output lowers. • Engine does not start easily.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective sensor or wiring harness	★ Disconnect connector with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Disconnect sensor and wiring harness at right in order and carry out operation to reproduce trouble. If “E” of failure code goes off when sensor or wiring harness is disconnected, that sensor or wiring harness is defective.	Ambient pressure sensor	C29
				Engine wiring harness	CE01
	2	Defective wiring harness connector	Connecting parts between ambient pressure sensor – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	3	Defective engine controller	If causes 1 and 2 are not detected, engine controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related to sensor power supply 1

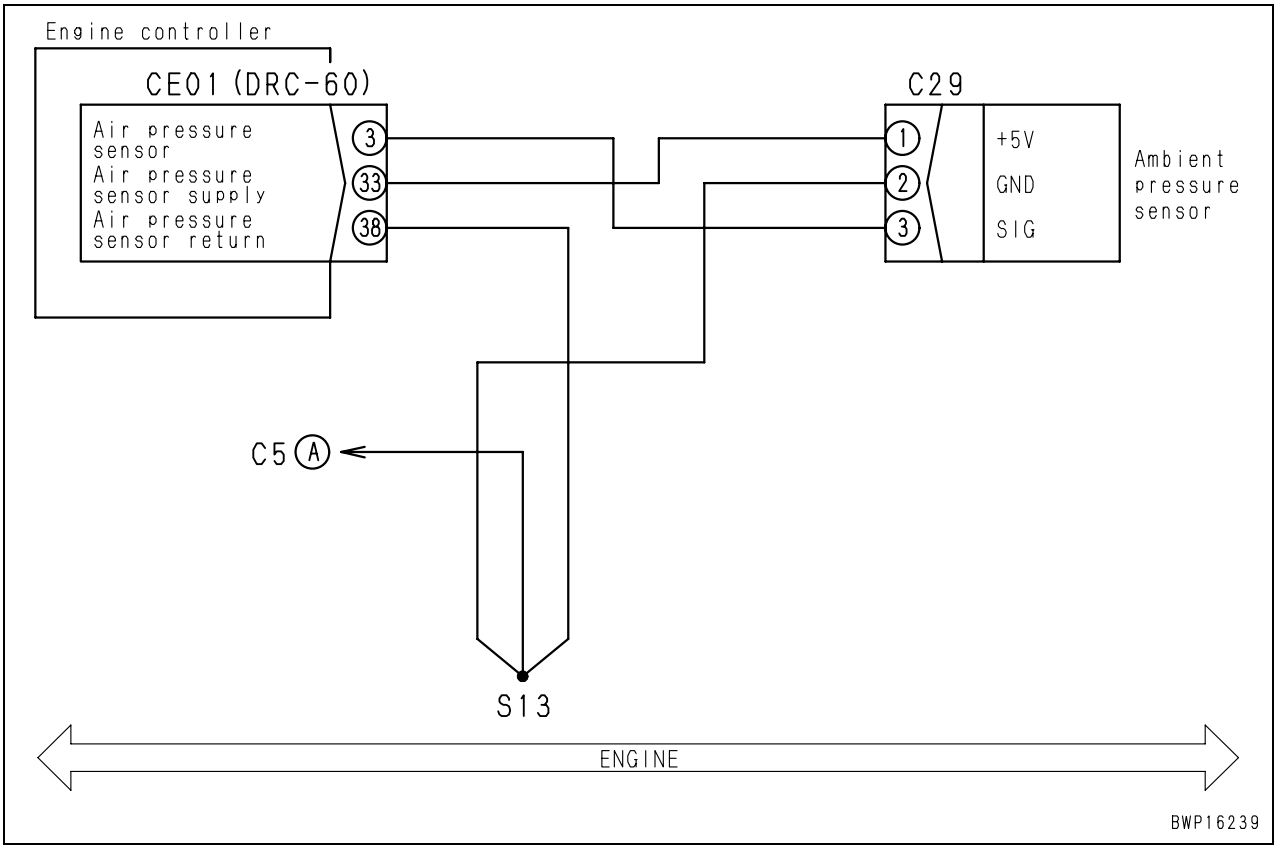


Failure code [CA386] Sens Supply 1 Volt High Error

Action code	Failure code	Trouble	Sensor power supply 1 voltage high error (Engine controller system)
E15	**CA386**		
Contents of trouble	• High voltage was detected in sensor power supply 1 circuit.		
Action of controller	• Fixes ambient pressure value and continues operation.		
Problem that appears on machine	• Engine output lowers. • Engine does not start easily.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Defective wiring harness connector	Connecting parts between ambient pressure sensor – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation
	2	Defective engine controller	If cause 1 is not detected, engine controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)

Circuit diagram related to sensor power supply 1

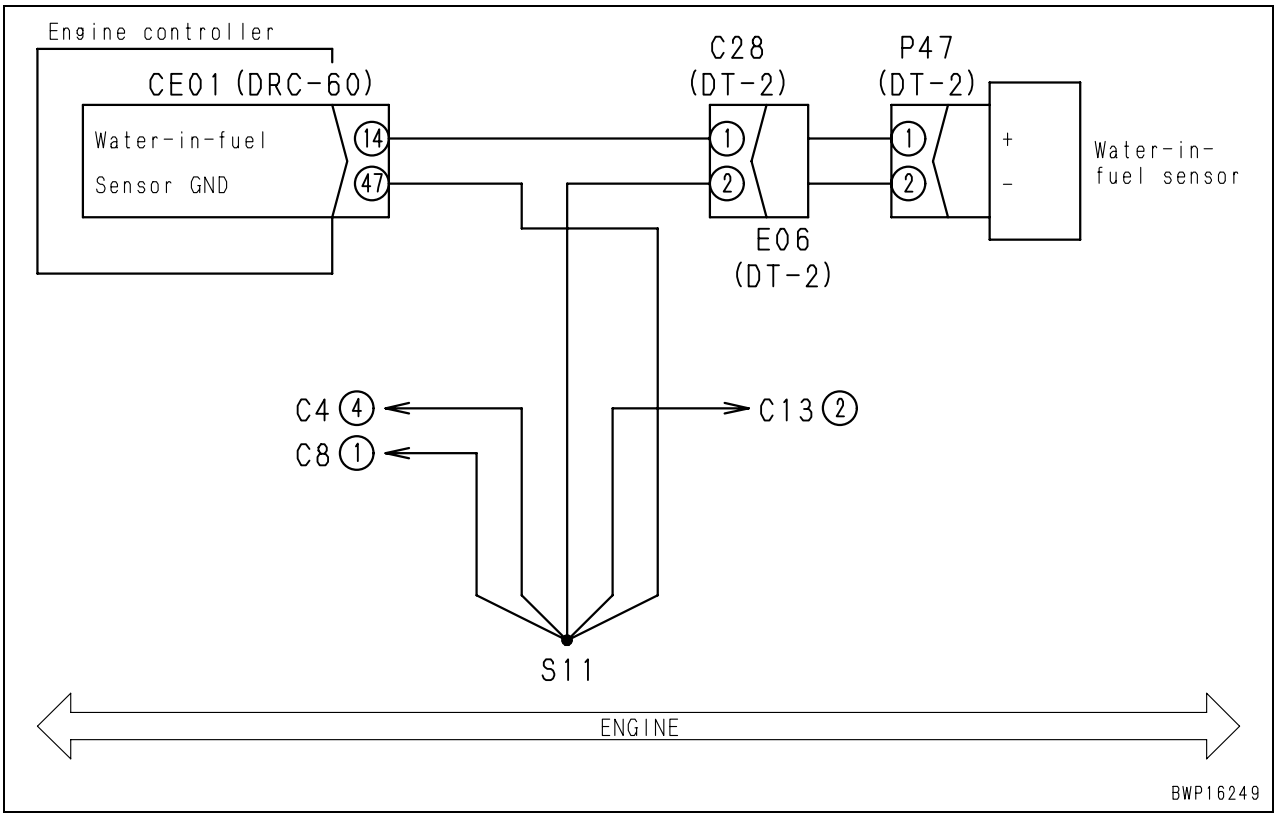


Failure code [CA428] Water in Fuel Sensor High Error

Action code	Failure code	Trouble	Water-in-fuel sensor high error (Engine controller system)
E15	**CA428**		
Contents of trouble	• High voltage was detected in signal circuit of water-in-fuel sensor.		
Action of controller	• None in particular.		
Problem that appears on machine	• Water separator monitor does not display normally.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective water-in-fuel sensor	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			P47 (male)	Resistance	
			Between (1) – (2)	Max. 10 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE01 (female) (14) – P47 (female) (1)	Resistance	Max. 10 Ω
			Wiring harness between CE01 (female) (47) – P47 (female) (2)	Resistance	Max. 10 Ω
	3	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between CE01 (female) (14) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 100 kΩ
	4	Defective wiring harness connector	Connecting parts between water-in-fuel sensor – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	5	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CE01 (female)	Resistance	
			Between (14) – (47)	Max. 10 Ω	

Circuit diagram related to water-in-fuel sensor

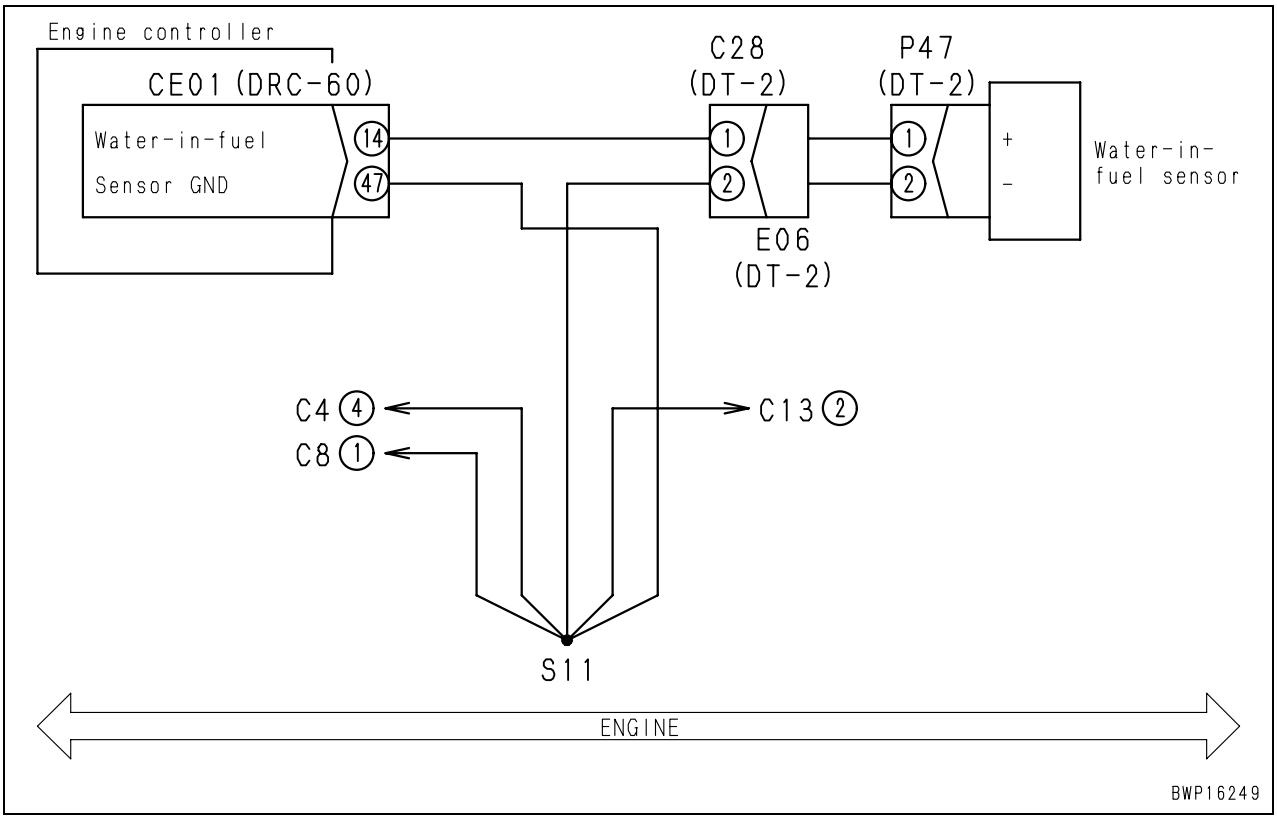


Failure code [CA429] Water in Fuel Sensor Low Error

Action code	Failure code	Trouble	Water-in-fuel sensor low error (Engine controller system)
E15	**CA429**		
Contents of trouble	• Low voltage was detected in signal circuit of water-in-fuel sensor.		
Action of controller	• None in particular.		
Problem that appears on machine	• Water separator monitor does not display normally.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective water-in-fuel sensor	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			P47 (male)	Resistance	
			Between (1) – (2)	Max. 10 Ω	
			Between (1) – chassis ground	Min. 100 kΩ	
	2	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE01 (female) (14) – P47 (female) (1) and chassis ground	Resistance	Min. 100 kΩ
	3	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between CE01 (female) (14) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 100 kΩ
	4	Defective wiring harness connector	Connecting parts between water-in-fuel sensor – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	5	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CE01 (female)	Resistance	
			Between (14) – (47)	Max. 10 Ω	
			Between (14) – chassis ground	Min. 100 kΩ	

Circuit diagram related to water-in-fuel sensor



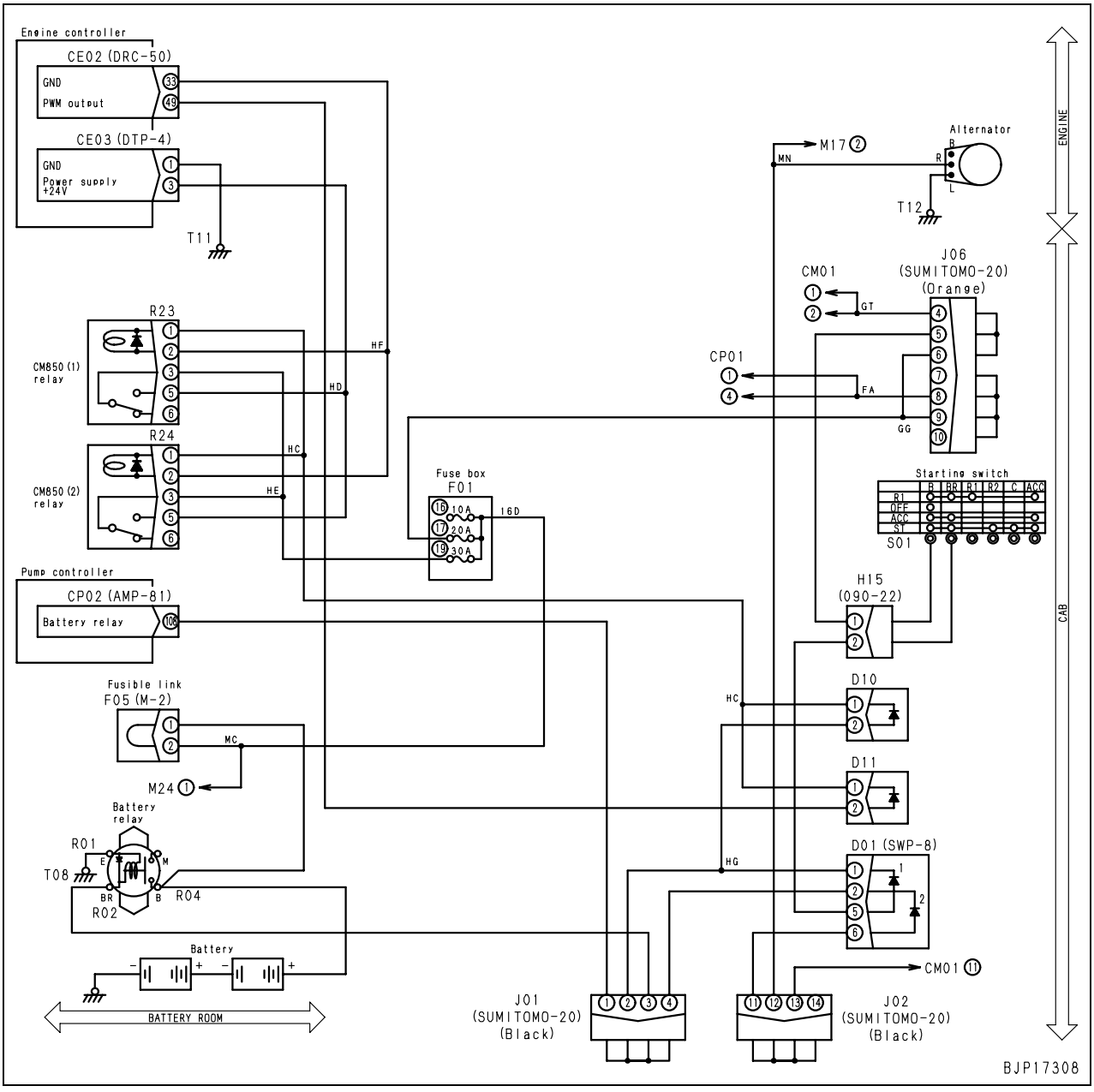
Failure code [CA441] Battery Voltage Low Error

Action code	Failure code	Trouble	Battery voltage low error (Engine controller system)
E10	**CA441**		
Contents of trouble	• There is low voltage in controller power supply circuit.		
Action of controller	• None in particular.		
Problem that appears on machine	• Engine stops. • Engine does not start easily.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Looseness or corrosion of battery terminal	Battery terminal may be loosened or corroded. Check it directly.		
	2	Defective battery voltage	★ Prepare with starting switch OFF, then keep starting switch OFF and turn it to START and carry out troubleshooting in each case.		
			Battery (1 piece)	Starting switch	Voltage
			Between (+) – (–) terminals	OFF	Min. 12 V
				START	Min. 6.2 V
	3	Defective fuse No. 19	If fuse is broken, circuit probably has ground fault. (See Cause 6)		
	4	Defective relay for engine controller power supply	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Replace relay (R23, R24) for engine controller with another relay and perform reproducing operation. If “E” of failure code goes off at this time, replaced relay is defective.		
	5	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between F01-19 – R23, R24 (female) (3)	Resistance	Max. 10 Ω
			Wiring harness between R23, R24 (female) (5) – CE03 (female) (3)	Resistance	Max. 10 Ω
			Wiring harness between CE03 (female) (1) – chassis ground (T11)	Resistance	Max. 10 Ω
	6	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between F01-19 – R23, R24 (female) (3) and chassis ground	Resistance	Min. 100 kΩ
			Wiring harness between R23, R24 (female) (5) – CE03 (female) (3) and chassis ground	Resistance	Max. 10 Ω
	7	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between CE03 (female) (3) – CE03 (female) (1) pins (With battery terminal disconnected)	Resistance	Min. 100 kΩ
			Between CE03 (female) (3) – each of CE02 (female) pins (With battery terminal disconnected)	Resistance	Min. 100 kΩ
			Between CE03 (female) (1) – each of CE02 (female) pins (With battery terminal disconnected)	Resistance	Min. 100 kΩ

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	8	Defective wiring harness connector	Connecting parts between fuse No. 19 – machine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	9	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and start engine and carry out troubleshooting in each case.		
			CE03 (female)	Starting switch	Voltage
			Between (3) – (1)	ON	Min. 24 V
				START	Min. 12 V

Circuit diagram related to engine controller power supply

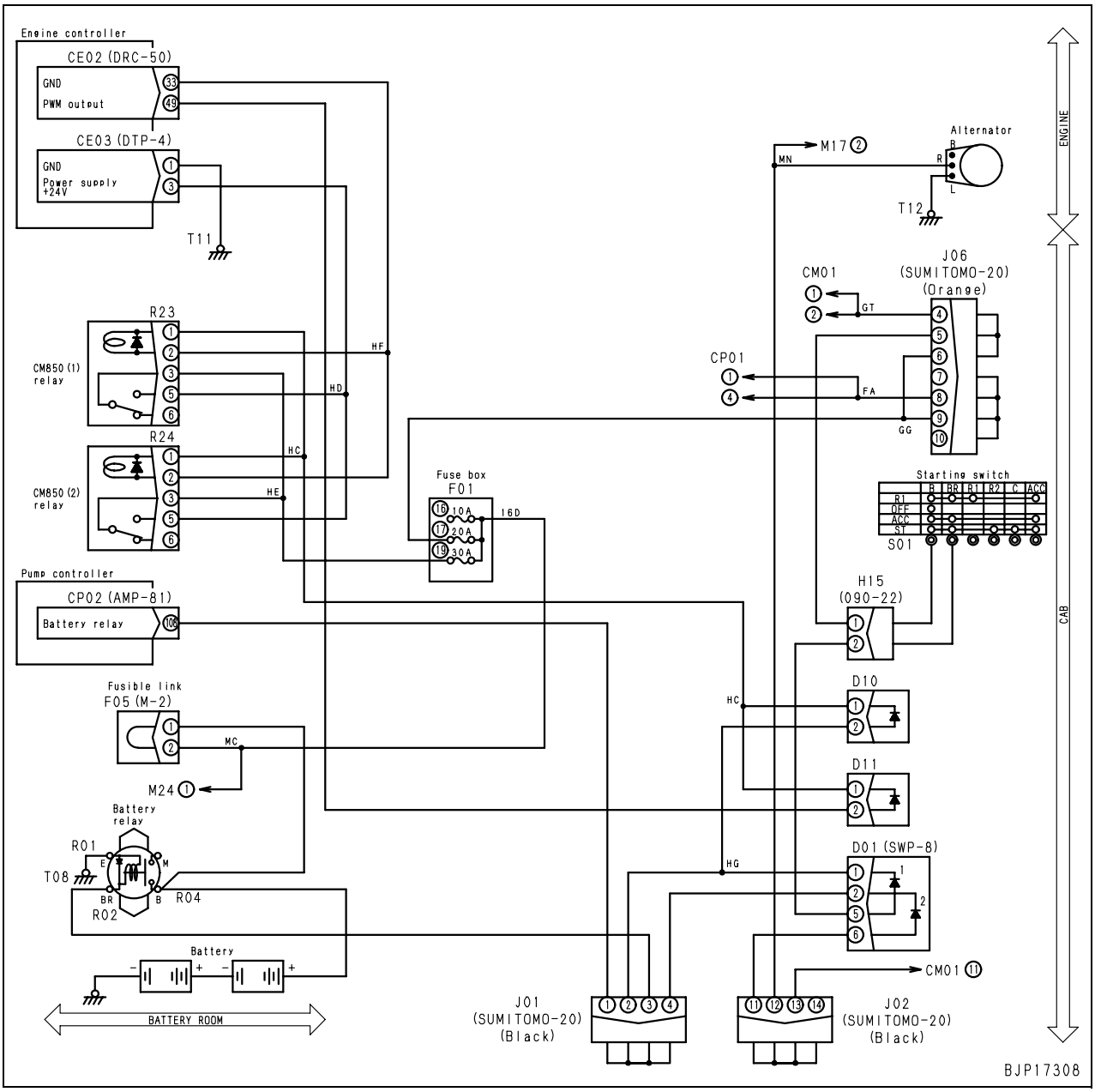


Failure code [CA442] Battery Voltage High Error

Action code	Failure code	Trouble	Battery voltage high error (Engine controller system)
E10	**CA442**		
Contents of trouble	• There is high voltage (36 V or higher) in controller power supply circuit.		
Action of controller	• None in particular.		
Problem that appears on machine	• Engine may stop.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective battery voltage	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Battery	Voltage	
			Between (+) – (–) terminals	Max. 32 V	
	2	Defective alternator	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.		
			Alternator	Engine speed	Voltage
			R terminal – chassis ground	Medium or higher	27.5 – 29.5 V
	3	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			CE03 (female)	Voltage	
			Between (3) – (1)	Max. 32 V	

Circuit diagram related to engine controller power supply



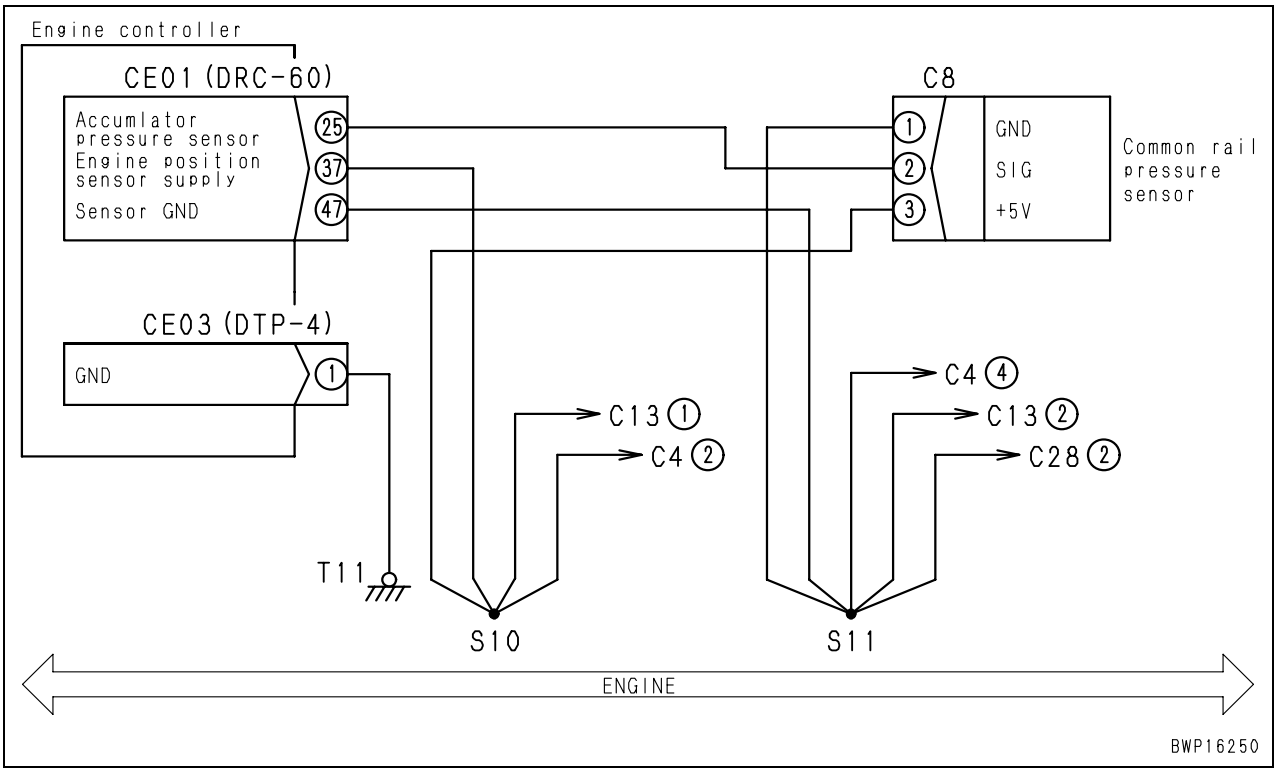
Failure code [CA449] Rail Press Very High Error

Action code	Failure code	Trouble	Common rail pressure very high error (Engine controller system)
E11	**CA449**		
Contents of trouble	• There is high pressure error (2) in common rail circuit.		
Action of controller	• Limits output and continues operation.		
Problem that appears on machine	• Engine output lowers.		
Related information	• Method of reproducing failure code: Start engine.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defect in related system	If another failure code is displayed, carry out troubleshooting for it.		
	2	Air in low pressure circuit	There may be air in low pressure circuit. Check it directly according to the following procedure. 1) Remove pressure pickup plug (outlet side) of fuel main filter. 2) Operate feed pump of fuel pre-filter. 3) Check pressure pickup plug for leakage of fuel and air. • If this error occurs during air bleeding after the fuel filter was replaced, air may remain in the fuel circuit. Keep running the engine at low idle for about three minutes. As air is bled from the fuel circuit, the engine speed will be stabilized, erasing the error indication.		
	3	Defect in fuel low pressure circuit parts	★ For check of pressure in fuel low pressure circuit, see Testing and adjusting, Checking fuel pressure. • Measured in fuel filter outlet side.		
			Pressure in fuel low-pressure circuit	During high idle (if engine can be started)	Max. 0.48 MPa {Max. 4.9 kg/cm^2}
			★ For check of pressure in fuel low pressure circuit, see Testing and adjusting, Checking fuel pressure. • Measured in fuel filter inlet and outlet sides. • Pressure drop in fuel low-pressure circuit = Fuel filter inlet pressure — Fuel filter outlet pressure		
			Pressure drop in fuel low-pressure circuit	During high idle	Max. 0.14 MPa {Max. 1.4 kg/cm^2}
			★ For check of fuel suction pressure, see Testing and adjusting, Checking fuel pressure. • Measured in gear pump fuel inlet side of supply pump.		
			Fuel suction circuit pressure (gear pump side)	During high idle	Max. 33.9 kPa {Max. 254 mmHg}
			★ For check of fuel return circuit pressure, see Testing and adjusting, Checking fuel pressure.		
			Fuel suction circuit pressure (fuel connector side)	During high idle	Max. 27.1 kPa {Max. 203 mmHg}
	4	Defective fuel cooler	★ Directly check for fuel leakage from fuel tube of fuel cooler, O-ring, seal washer damage, and check valve clogging or damage.		

<table>
<tr><td rowspan="15">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="3">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">5</td><td rowspan="3">Defective common rail pressure sensor</td><td colspan="3">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td>Monitoring by machine monitor</td><td colspan="2">Monitoring code: 36400</td></tr>
<tr><td>Common rail pressure</td><td>While engine is stopped</td><td>0 ± 0.39 MPa
{0 ± 4 kg/cm^2}</td></tr>
<tr><td>6</td><td>Defective O-ring of supply pump actuator</td><td colspan="3">★ Directly check that O-ring of supply pump actuator is not damaged.</td></tr>
<tr><td rowspan="6">7</td><td rowspan="6">Defective supply pump actuator</td><td colspan="3">★ Prepare with starting switch OFF (INSITE connection), then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td>Monitoring by machine monitor</td><td colspan="2">Monitoring code: 36400</td></tr>
<tr><td>Common rail pressure</td><td>While engine is stopped</td><td>0 ± 0.39 MPa
{0 ± 4 kg/cm^2}</td></tr>
<tr><td colspan="3">★ Prepare with starting switch OFF (INSITE connection), then start engine and carry out troubleshooting.
• Measured after one minute or more lapsed at idle.</td></tr>
<tr><td>Monitoring by machine monitor</td><td colspan="2">Monitoring code: 36400</td></tr>
<tr><td>Common rail pressure</td><td>During low idle</td><td>1.96 MPa
{20 kg/cm^2}</td></tr>
<tr><td>8</td><td>Defective wiring harness connector</td><td colspan="3">The common rail fuel pressure sensor connector and supply pump actuator may be defective. Check them directly.
• Looseness of connector, breakage of lock, or breakage of seal
• Corrosion, bend, breakage, push-in, or expansion of pin
• Moisture or dirt in connector or defective insulation</td></tr>
<tr><td rowspan="3">9</td><td rowspan="3">Defective engine controller ground wiring harness</td><td colspan="3">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="2">CE03 (female)</td><td>Resistance</td></tr>
<tr><td colspan="2">Between (1) – chassis ground</td><td>Max. 10 Ω</td></tr>
<tr><td>10</td><td>Defective supply pump</td><td colspan="3">If causes 1 – 9 are not detected, supply pump may be defective.</td></tr>
</table>

Circuit diagram related to common rail pressure sensor and engine controller ground line

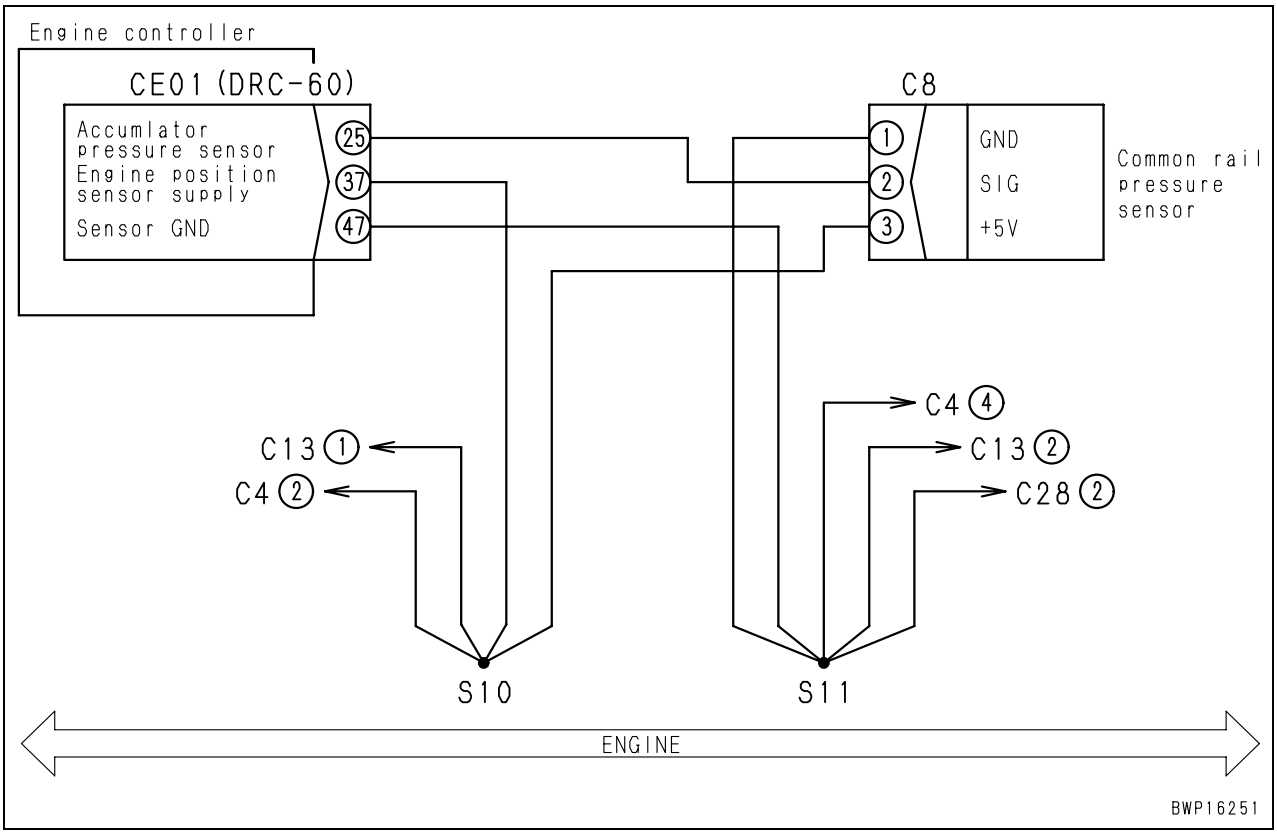


Failure code [CA451] Rail Press Sensor High Error

Action code	Failure code	Trouble	Common rail pressure sensor high error (Engine controller system)
E11	**CA451**		
Contents of trouble	• There is high voltage in signal circuit of common rail pressure sensor.		
Action of controller	• Limits output and continues operation.		
Problem that appears on machine	• Engine speed or output lowers. • Engine does not start.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective sensor power supply 2 system	If failure code [**CA227**] is also indicated, carry out troubleshooting for it first.			
	2	Defective common rail pressure sensor	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			C8 (male)		Voltage	
			Between (3) – (1)	Power supply	4.75 – 5.25 V	
			Voltage is measured with wiring harness connected. Accordingly, if voltage is abnormal, check wiring harness and controller, too, for another cause of trouble, and then judge.			
	3	Hot short (Short circuit with 5V/24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CE01 (female) (25) – C8 (female) (2) and chassis ground		Voltage	Max. 1 V
	4	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harnesses between CE01 (female) (25) – C8 (female) (2) and between CE01 (female) (37) – C8 (female) (3)		Resistance	Min. 100 kΩ
	5	Defective wiring harness connector	Connecting parts between common rail pressure sensor – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation			
	6	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			CE01		Voltage	
			Between (37) – (47)	Power supply	4.75 – 5.25 V	

Circuit diagram related to common rail pressure sensor

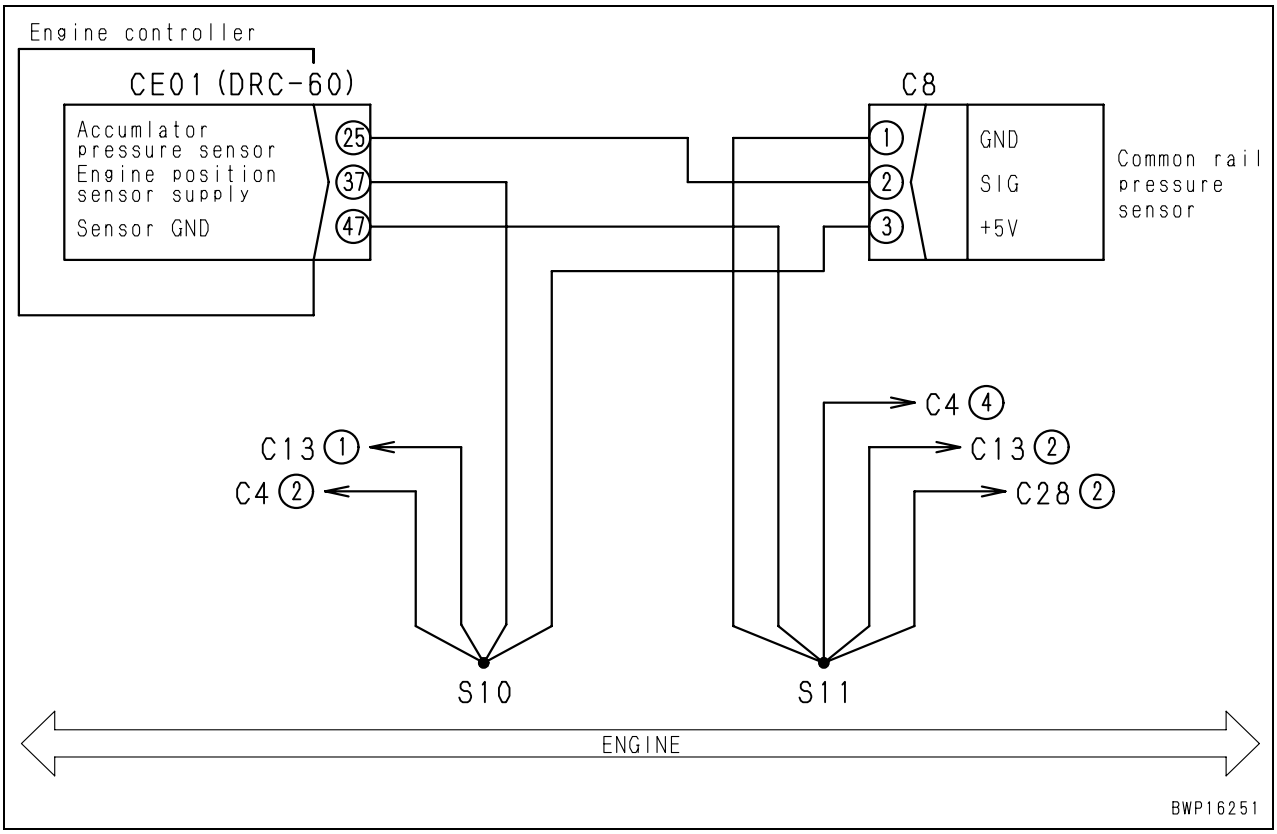


Failure code [CA452] Rail Press Sensor Low Error

Action code	Failure code	Trouble	Common rail pressure sensor low error (Engine controller system)
E11	**CA452**		
Contents of trouble	• There is low voltage in signal circuit of common rail pressure sensor.		
Action of controller	• Limits output and continues operation.		
Problem that appears on machine	• Engine speed or output lowers. • Engine does not start.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective sensor power supply 2 system	If failure code [**CA187**] is also indicated, carry out troubleshooting for it first.		
	2	Defective common rail pressure sensor	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			C8 (male)		Voltage
			Between (3) – (1)	Power supply	4.75 – 5.25 V
			Voltage is measured with wiring harness connected. Accordingly, if voltage is abnormal, check wiring harness and controller, too, for another cause of trouble, and then judge.		
	3	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Wiring harness between CE01 (female) (25) – C8 (female) (2) and chassis ground	Resistance	Min. 100 kΩ
	4	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE01 (female) (25) – C8 (female) (2) and between CE01 (female) (47) – C8 (female) (1)	Resistance	Min. 100 kΩ
	5	Defective wiring harness connector	Connecting parts between common rail pressure sensor – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	6	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			CE01		Voltage
			Between (37) – (47)	Power supply	4.75 – 5.25 V

Circuit diagram related to common rail pressure sensor



Failure code [CA553] Rail Press High Error

Action code	Failure code	Trouble	Common rail pressure high error (Engine controller system)
E15	**CA553**		
Contents of trouble	• There is high pressure error (1) in common rail circuit.		
Action of controller	• None in particular.		
Problem that appears on machine	• Engine sound becomes large when no or light load is applied. • Engine output lowers.		
Related information	• Method of reproducing failure code: Start engine.		

		Cause	Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Defect in related system	If another failure code is displayed, carry out troubleshooting for it.
	2	Defective connection of ground terminal	Ground terminal may be connected defectively. Check following terminals directly. • Ground terminal of machine ((–) terminal of battery) • Ground terminal of engine • Ground terminal of engine controller • Ground terminal of starting motor
	3	Defective O-ring of supply pump actuator	O-ring of supply pump actuator may be broken. Check it directly.

Failure code [CA559] Rail Press Low Error

Action code	Failure code	Trouble	Common rail pressure low error (Engine controller system)
E15	**CA559**		
Contents of trouble	• There is low pressure error (1) in common rail circuit.		
Action of controller	• None in particular.		
Problem that appears on machine	• Engine does not start at all or does not start easily. • Exhaust gas becomes black. • Engine output lowers.		
Related information	• Method of reproducing failure code: Start engine.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Fuel leakage to outside	Fuel may be leaking to outside. Check it directly (Check visually while running engine at low idle).		
	2	Defect in low pressure circuit parts	★ For check of pressure in fuel low pressure circuit, see Testing and adjusting, Checking fuel pressure. • Measured in fuel filter inlet side. • Cranking speed: Min. 150 rpm		
			Pressure in fuel low-pressure circuit	During cranking	Min. 0.14 MPa {Min. 1.4 kg/cm^2}
			★ For check of pressure in fuel low pressure circuit, see Testing and adjusting, Checking fuel pressure. • Measured in fuel filter outlet side.		
			Pressure in fuel low-pressure circuit	During high idle	Min. 0.48 MPa {Min. 4.9 kg/cm^2}
			★ For check of pressure in fuel low pressure circuit, see Testing and adjusting, Checking fuel pressure. • Measured in fuel filter inlet and outlet sides. • Pressure drop in fuel low-pressure circuit = Fuel filter inlet pressure — Fuel filter outlet pressure		
			Pressure drop in fuel low-pressure circuit	During high idle	Max. 0.14 MPa {Max. 1.4 kg/cm^2}
			★ For check of fuel suction pressure, see Testing and adjusting, Checking fuel pressure. • Measured in gear pump fuel inlet side of supply pump.		
			Fuel suction circuit pressure (gear pump side)	During high idle	Max. 33.9 kPa {Max. 254 mmHg}
			★ For check of fuel suction pressure, see Testing and adjusting, Checking fuel pressure. • Measured in fuel connector side.		
			Fuel suction circuit pressure (fuel connector side)	During high idle	Max. 27.1 kPa {Max. 203 mmHg}

<table>
<tr><td rowspan="9">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="3">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Defective injector (including high pressure piping in head)</td><td colspan="3">★ For check of return rate from injector, see Testing and adjusting, Checking fuel return rate and leakage.</td></tr>
<tr><td rowspan="2">Return rate from injector</td><td>During cranking (if engine cannot be started)</td><td>Max. 100 cc/30 sec.</td></tr>
<tr><td>During low idle (if engine can be started)</td><td>Max. 300 cc/45 sec.</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Defective supply pump</td><td colspan="3">★ For check of return rate from supply pump, see Testing and adjusting, Checking fuel return rate and leakage.</td></tr>
<tr><td rowspan="2">Return rate from supply pump</td><td>During cranking (if engine cannot be started)</td><td>Max. 100 cc/30 sec.</td></tr>
<tr><td>During low idle (if engine can be started)</td><td>Max. 300 cc/45 sec.</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Defective pressure limiter</td><td colspan="3">★ For check of leakage through pressure limiter, see Testing and adjusting, Checking fuel return rate and leakage.</td></tr>
<tr><td>Leakage through pressure limiter</td><td>During cranking</td><td>Max. 30 cc/min</td></tr>
<tr><td>6</td><td>Defective supply pump plunger</td><td colspan="3">★ Remove the supply pump head, and directly check that the plunger is not damaged.</td></tr>
<tr><td>7</td><td>Air in low pressure circuit</td><td colspan="3">There may be air in low pressure circuit. Check it directly according to the following procedure.
1) Remove pressure pickup plug (outlet side) of fuel main filter.
2) Operate feed pump of fuel pre-filter.
3) Check pressure pickup plug for leakage of fuel and air.
• If this error occurs during air bleeding after the fuel filter was replaced, air may remain in the fuel circuit. Keep running the engine at low idle for about three minutes. As air is bled from the fuel circuit, the engine speed will be stabilized, erasing the error indication.</td></tr>
</table>

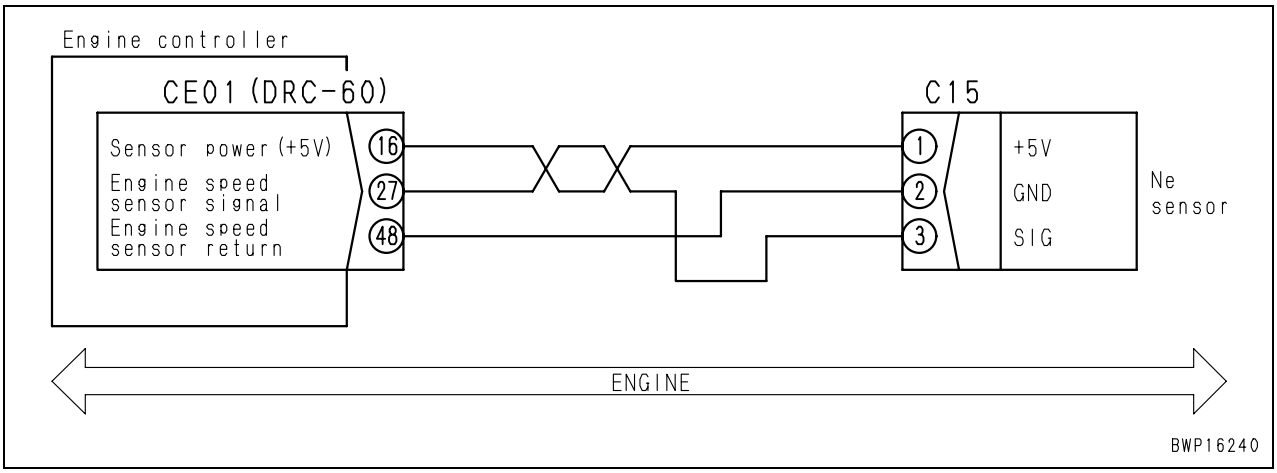
Failure code [CA689] Eng Ne Speed Sensor Error

Action code	Failure code	Trouble	Engine Ne speed sensor error (Engine controller system)
E11	**CA689**		
Contents of trouble	• There is error in signal from engine Ne speed sensor.		
Action of controller	• Continues control with signal from engine Bkup speed sensor.		
Problem that appears on machine	• Engine hunts. • Engine does not start easily. • Engine output lowers.		
Related information	• Method of reproducing failure code: Start engine.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective Ne speed sensor power supply system	If failure code [**CA238**] is also indicated, carry out troubleshooting for it first.			
	2	Defective engine Ne speed sensor	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			C15 (male)		Voltage	
			Between (1) – (2)	Power supply	4.75 – 5.25 V	
			Voltage is measured with wiring harness connected. Accordingly, if voltage is abnormal, check wiring harness and controller, too, for another cause of trouble, and then judge.			
	3	Breakage or improper clearance of engine Ne speed sensor	Engine Ne speed sensor may be broken or may have improper clearance. Check it directly.			
	4	Breakage of rotation sensor wheel	Rotation sensor wheel may be broken. Check it directly.			
	5	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CE01 (female) (27) – C15 (female) (3)		Resistance	Max. 10 Ω
	6	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CE01 (female) (27) – C15 (female) (3) and chassis ground		Resistance	Min. 100 kΩ
	7	Hot short (Short circuit with 5V/24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CE01 (female) (27) – C15 (female) (3) and chassis ground		Voltage	Max. 1 V

<table>
<tr><td rowspan="6">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="4">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">8</td><td rowspan="3">Short circuit in wiring harness
(with another wiring harness)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="2">Wiring harness between CE01 (female) (27) – C15 (female) (3) and between CE01 (female) (16) – C15 (female) (1)</td><td>Resistance</td><td>Min. 100 kΩ</td></tr>
<tr><td colspan="2">Wiring harness between CE01 (female) (27) – C15 (female) (3) and between CE01 (female) (48) – C15 (female) (2)</td><td>Resistance</td><td>Min. 100 kΩ</td></tr>
<tr><td>9</td><td>Defective wiring harness connector</td><td colspan="4">Connecting parts between engine Ne speed sensor – engine wiring harness – engine controller may be defective. Check them directly.
• Looseness of connector, breakage of lock, or breakage of seal
• Corrosion, bend, breakage, push-in, or expansion of pin
• Moisture or dirt in connector or defective insulation</td></tr>
<tr><td rowspan="3">10</td><td rowspan="3">Defective engine controller</td><td colspan="4">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td colspan="3">CE01</td><td>Voltage</td></tr>
<tr><td>Between (16) – (48)</td><td>Power supply</td><td>4.75 – 5.25 V</td></tr>
</table>

Circuit diagram related to engine Ne speed sensor



Failure code [CA731] Eng Bkup Speed Sens Phase Error

Action code	Failure code	Trouble	Engine Bkup speed sensor phase error (Engine controller system)
E11	**CA731**		
Contents of trouble	• Phase error was detected in signals from engine Ne speed sensor and engine Bkup speed sensor		
Action of controller	• Controls the engine with signal from engine Ne speed sensor.		
Problem that appears on machine	• Engine does not start at all or does not start easily. • Idle speed is unstable. • Exhaust gas becomes black.		
Related information	• Method of reproducing failure code: Start engine.		

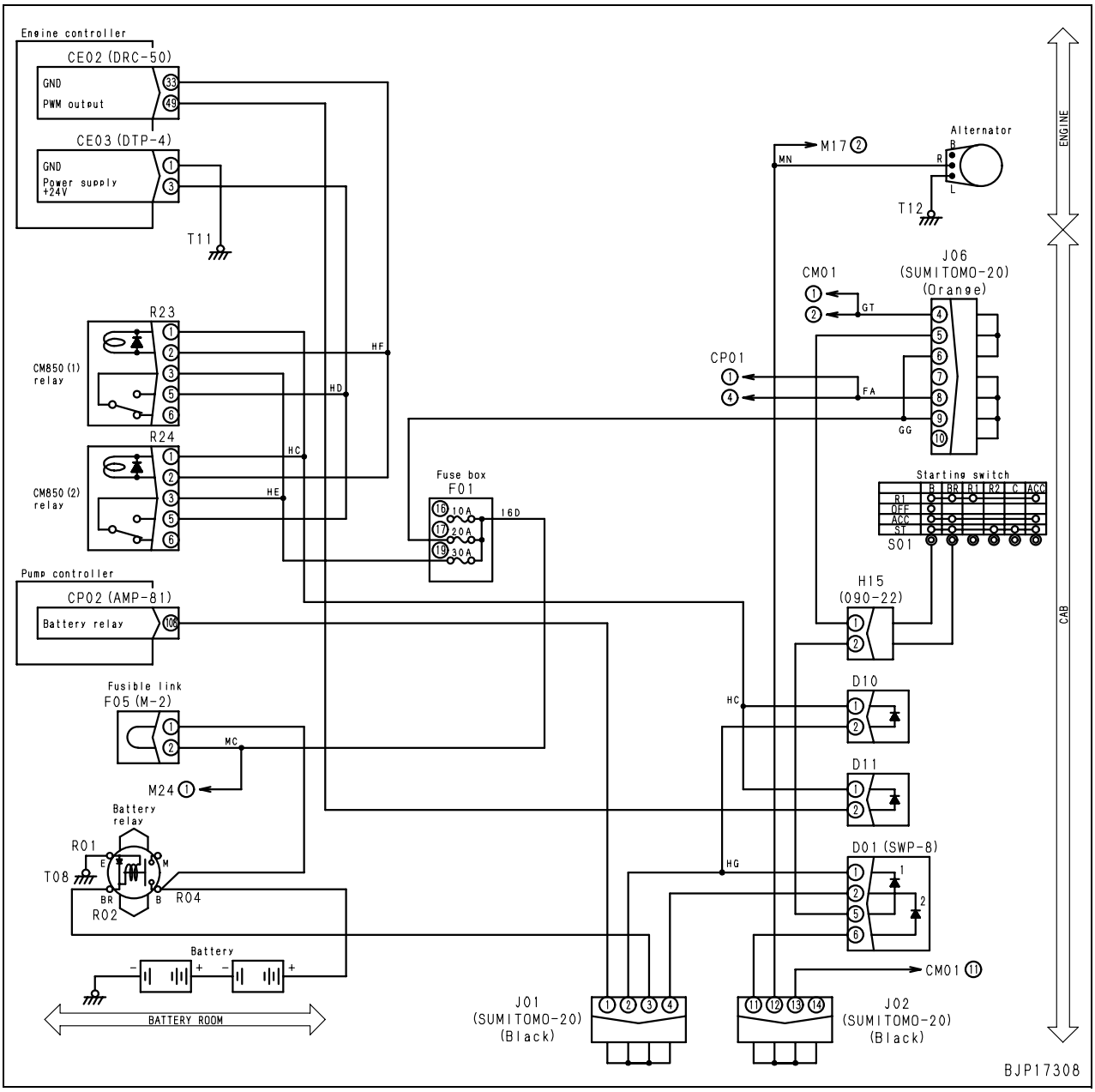
	Cause		Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Breakage of engine Ne speed sensor	Engine Ne speed sensor may be broken. Check it directly.
	2	Breakage of engine Bkup speed sensor	Engine Bkup speed sensor may be broken. Check it directly.
	3	Defective installation or breakage of rotation sensor wheel on crankshaft side	Rotation sensor wheel on crankshaft side may be installed defectively or broken. Check it according to the following procedure. 1) Set No. 1 cylinder at compression top dead center (Match stamped mark). 2) If center of oblong hole of rotation sensor wheel is at tip of Ne speed sensor, rotation sensor wheel is installed normally.
	4	Defective installation or breakage of rotation sensor ring on camshaft side	Rotation sensor ring on camshaft side may be installed defectively or broken. Check it according to the following procedure. 1) Set No. 1 cylinder at compression top dead center (Match stamped mark). 2) Remove Bkup speed sensor. 3) If 2 grooves (1 crest) of rotation sensor ring are seen through sensor mounting hole, rotation sensor ring is installed normally.
	5	Defective timing of crankshaft and camshaft	Timing of crankshaft and camshaft may be defective. Check it directly.
	6	Defective connection of ground terminal	Ground terminal may be connected defectively. Check following terminals directly. • Ground terminal of machine ((–) terminal of battery) • Ground terminal of engine • Ground terminal of engine controller • Ground terminal of starting motor

Failure code [CA757] All Persistent Data Lost Error

Action code	Failure code	Trouble	All persistent data lost error (Engine controller system)
E10	**CA757**		
Contents of trouble	• All data in engine controller are lost.		
Action of controller	• None in particular.		
Problem that appears on machine	• Engine may stop and may not be started again. • Monitoring function of machine monitor (engine controller system) may not work normally.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

		Cause	Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defect in related system	If another failure code is displayed, carry out troubleshooting for it.			
	2	Looseness or corrosion of battery terminal	Battery terminal may be loosened or corroded. Check it directly.			
	3	Defective battery voltage	★ Prepare with starting switch OFF, then keep starting switch OFF and turn it to START and carry out troubleshooting in each case.			
			Battery (1 piece)	Starting switch	Voltage	
			Between (+) – (–) terminals	OFF	Min. 12 V	
				START	Min. 6.2 V	
	4	Defective fuse No. 19	If fuse is broken, circuit probably has ground fault.			
	5	Defective relay for engine controller power supply	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Replace relay (R23, R24) for engine controller with another relay and perform reproducing operation. If “E” of failure code goes off at this time, replaced relay is defective.			
	6	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between F01-19 – R23, R24 (female) (3)		Resistance	Max. 10 Ω
			Wiring harness between R23, R24 (female) (5) – CE03 (female) (3)		Resistance	Max. 10 Ω
			Wiring harness between CE03 (female) (1) – chassis ground (T11)		Resistance	Max. 10 Ω
	7	Defective wiring harness connector	Connecting parts between fuse No. 19 – machine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation			
	8	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and start engine and carry out troubleshooting in each case.			
			CE03 (female)	Starting switch	Voltage	
			Between (3) – (1)	ON	Min. 24 V	
				START	Min. 12 V	

Circuit diagram related to engine controller power supply



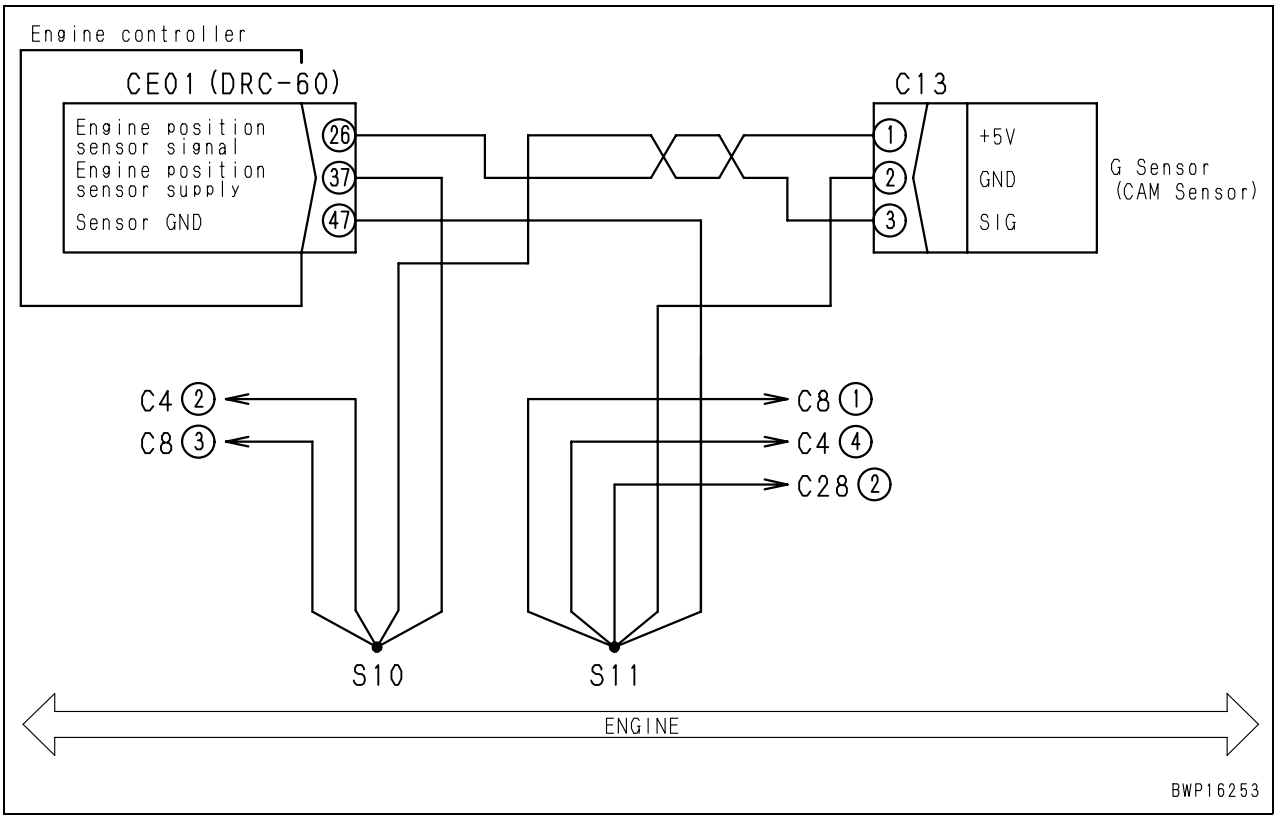
Failure code [CA778] Eng Bkup Speed Sensor Error

Action code	Failure code	Trouble	Engine Bkup speed sensor error (Engine controller system)
E11	**CA778**		
Contents of trouble	• There is error in signal from engine Bkup speed sensor.		
Action of controller	• Continues control with signal from engine Ne speed sensor.		
Problem that appears on machine	• Engine does not start easily. • Engine output lowers.		
Related information	• Method of reproducing failure code: Start engine.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective sensor power supply 2 system	If failure code [**CA187**] is also indicated, carry out troubleshooting for it first.			
	2	Defective engine Bkup speed sensor	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			C13 (male)		Voltage	
			Between (1) – (2)	Power supply	4.75 – 5.25 V	
			Voltage is measured with wiring harness connected. Accordingly, if voltage is abnormal, check wiring harness and controller, too, for another cause of trouble, and then judge.			
	3	Breakage or improper clearance of engine Bkup speed sensor	Engine Bkup speed sensor may be broken or may have improper clearance. Check it directly.			
	4	Breakage of rotation sensor ring	Rotation sensor ring may be broken. Check it directly.			
	5	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CE01 (female) (26) – C13 (female) (3)		Resistance	Max. 10 Ω
	6	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CE01 (female) (26) – C13 (female) (3) and chassis ground		Resistance	Min. 100 kΩ
	7	Hot short (Short circuit with 5V/24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CE01 (female) (26) – C13 (female) (3) and chassis ground		Voltage	Max. 1 V
	8	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CE01 (female) (26) – C13 (female) (3) and between CE01 (female) (37) – C13 (female) (1)		Resistance	Min. 100 kΩ
			Wiring harness between CE01 (female) (26) – C13 (female) (3) and between CE01 (female) (47) – C13 (female) (2)		Resistance	Min. 100 kΩ

<table>
<tr><td rowspan="4">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="3">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td>9</td><td>Defective wiring harness connector</td><td colspan="3">Connecting parts between engine Bkup speed sensor – engine wiring harness – engine controller may be defective. Check them directly.
• Looseness of connector, breakage of lock, or breakage of seal
• Corrosion, bend, breakage, push-in, or expansion of pin
• Moisture or dirt in connector or defective insulation</td></tr>
<tr><td rowspan="3">10</td><td rowspan="3">Defective engine controller</td><td colspan="3">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td colspan="2">CE01</td><td>Voltage</td></tr>
<tr><td>Between (37) – (47)</td><td>Power supply</td><td>4.75 – 5.25 V</td></tr>
</table>

Circuit diagram related to engine Bkup speed sensor

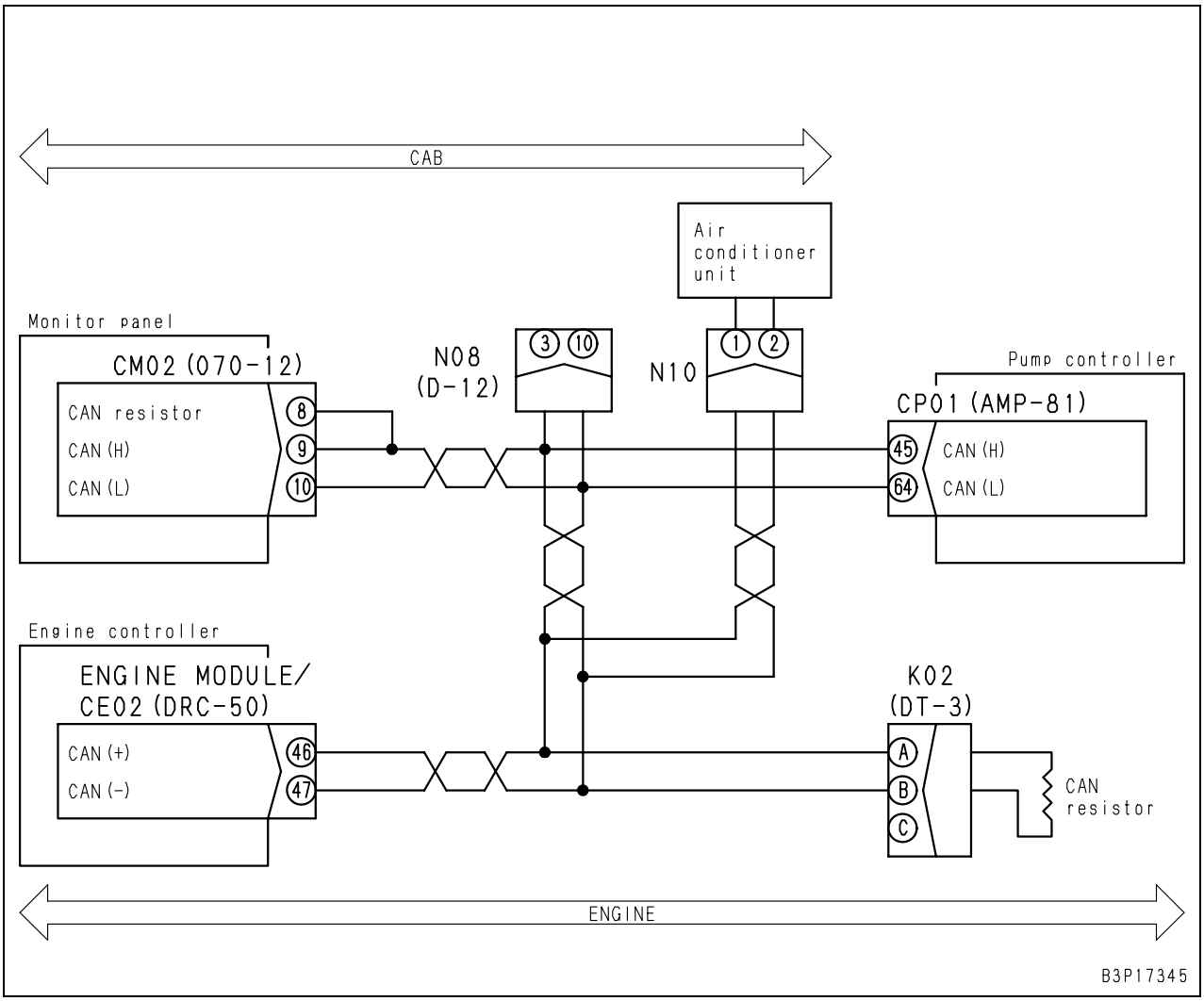


Failure code [CA1633] KOMNET Datalink Timeout Error

User code	Failure code	Trouble	KOMNET Datalink timeout error (Engine controller system)
E0E	**CA1633**		
Contents of trouble	• Engine controller detected communication error in KOMNET communication circuit between pump controller and machine monitor.		
Action of controller	• Continues operation in default mode. • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• Information may not transmitted normally by KOMNET communication and machine may not operate normally. (Trouble phenomenon depends on failed section.)		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CM02 (female) (8), (9) – CP01 (female) (45), – CE02 (female) (46), – K02 (female) (A)	Resistance	Max. 1 Ω
			Wiring harness between CM02 (female) (10) – CP01 (female) (64), – CE02 (female) (47), – K02 (female) (B)	Resistance	Max. 1 Ω
	2	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CM02 (female) (8), (9) – CP01 (female) (45), – CE02 (female) (46), – K02 (female) (A), – N08 (male) (3)	Resistance	Min. 1 MΩ
			Wiring harness between CM02 (female) (10) – CP01 (female) (64), – CE02 (female) (47), – K02 (female) (B), – N08 (male) (10)	Resistance	Min. 1 MΩ
	3	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Wiring harness between CM02 (female) (8), (9) – CP01 (female) (45), – CE02 (female) (46), – K02 (female) (A), – N08 (male) (3)	Voltage	Max. 5.5 V
			Wiring harness between CM02 (female) (10) – CP01 (female) (64), – CE02 (female) (47), – K02 (female) (B), – N08 (male) (10)	Voltage	Max. 5.5 V
	4	Defective CAN terminal resistance (Internal short circuit or disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			K02 (male)	Resistance	
			Between (A) – (B)	120 ± 12 Ω	
	5	Defective pump controller	If causes 1 – 4 are not detected, engine controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related to KOMNET communication

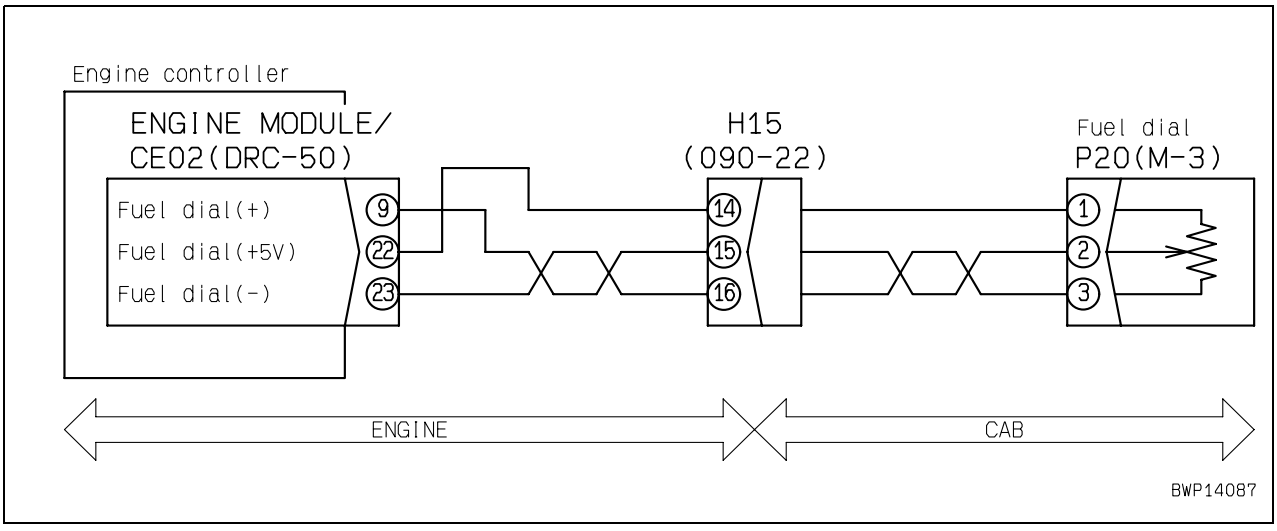


Failure code [CA2185] Throt Sens Sup Volt High Error

Action code	Failure code	Trouble	Throttle sensor supply voltage high error (Engine controller system)
E14	**CA2185**		
Contents of trouble	• High voltage (5.25 V or higher) was detected in throttle sensor power supply circuit.		
Action of controller	• If trouble occurs while starting switch is in ON position, controller fixes voltage value to level just before detection of trouble and continues operation. • If starting switch is turned ON while voltage is abnormally high, controller continues operation with voltage at 100% value.		
Problem that appears on machine	• Engine speed cannot be controlled with fuel control dial.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between CE02 (female) (22) – each of CE02 (female) pins (With P20 disconnected)	Resistance	Min. 100 kΩ
			Between CE02 (female) (22) – CE03 (female) (3) (With P20 disconnected)	Resistance	Min. 100 kΩ
	2	Defective wiring harness connector	Connecting parts between fuel control dial – machine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	3	Defective engine controller	If causes 1 and 2 are not detected, engine controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related to fuel control dial

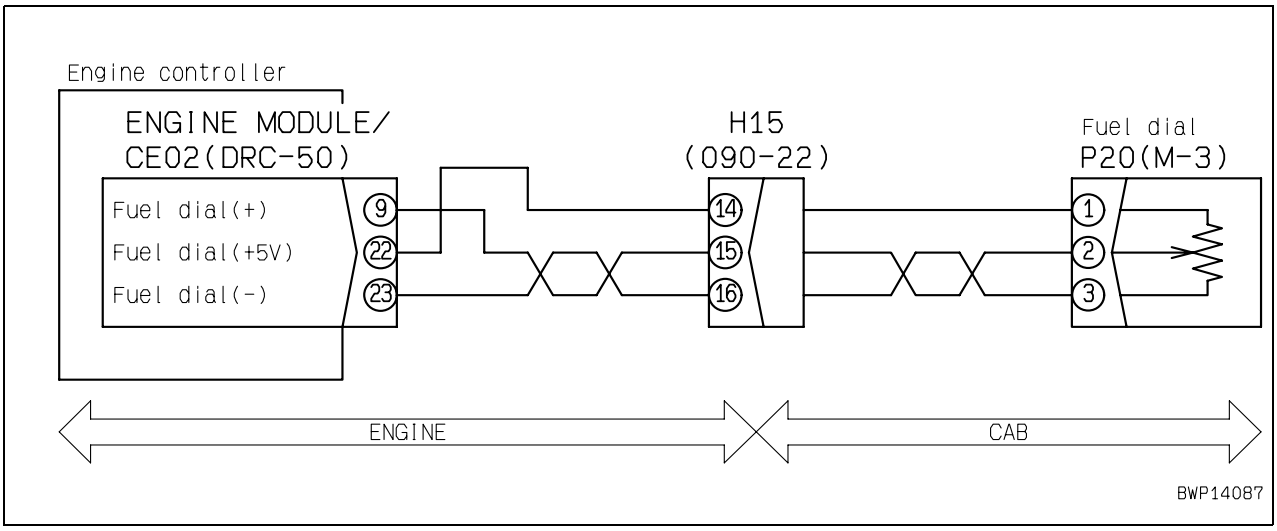


Failure code [CA2186] Throt Sens Sup Volt Low Error

Action code	Failure code	Trouble	Throttle sensor supply voltage low error (Engine controller system)
E14	**CA2186**		
Contents of trouble	• Low voltage was detected in throttle sensor power supply circuit.		
Action of controller	• If trouble occurs while starting switch is in ON position, controller fixes voltage value to level just before detection of trouble and continues operation. • If starting switch is turned ON while voltage is abnormally high, controller continues operation with voltage at 100% value.		
Problem that appears on machine	• Engine speed cannot be controlled with fuel control dial.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE02 (female) (22) – P20 (female) (1) and chassis ground	Resistance	Min. 100 kΩ
	2	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between CE02 (female) (9) – each of CE02 (female) pins (With P20 disconnected)	Resistance	Min. 100 kΩ
	3	Defective wiring harness connector	Connecting parts between fuel control dial – machine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	4	Defective engine controller	If causes 1 and 3 are not detected, engine controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related to fuel control dial



Failure code [CA2249] Rail Press Very Low Error

Action code	Failure code	Trouble	Common rail pressure very low error (Engine controller system)
E11	**CA2249**		
Contents of trouble	• There is low pressure error (2) in common rail circuit.		
Action of controller	• Limits output and continues operation.		
Problem that appears on machine	• Engine does not start easily. • Exhaust gas becomes black. • Engine output lowers.		
Related information	• Method of reproducing failure code: Start engine.		

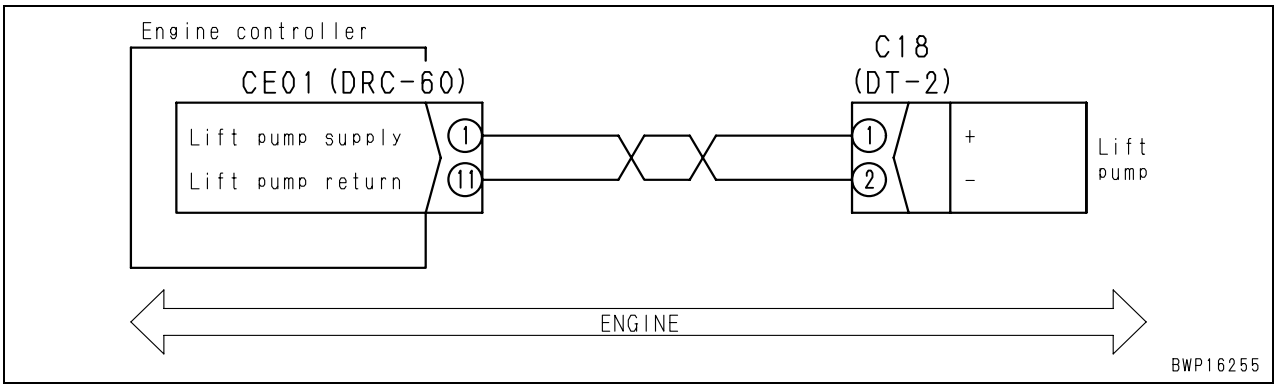
Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Carry out troubleshooting for failure code [**CA559**].	

Failure code [CA2265] Electric Lift Pump High Error

Action code	Failure code	Trouble	Electric lift pump high error (Engine controller system)
E15	**CA2265**		
Contents of trouble	• Opening was detected in drive circuit of electric lift pump actuator.		
Action of controller	• None in particular.		
Problem that appears on machine	• Engine does not start easily.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective electric lift pump (Internal disconnection or short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			C18 (male)	Resistance	
			Between (1) – (2)	Max. 20 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE01 (female) (1) – C18 (female) (1)	Resistance	Max. 10 Ω
			Wiring harness between CE01 (female) (11) – C18 (female) (2)	Resistance	Max. 10 Ω
	3	Hot short (Short circuit with 12V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Wiring harness between CE01 (female) (1) – C18 (female) (1) and chassis ground	Voltage	Max. 6 V
	4	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between CE01 (female) (1) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 1 MΩ
	5	Defective wiring harness connector	Connecting parts between common rail pressure sensor – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	6	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CE01 (female)	Resistance	
			Between (1) – (11)	Max. 20 Ω	

Circuit diagram related to electric lift pump actuator

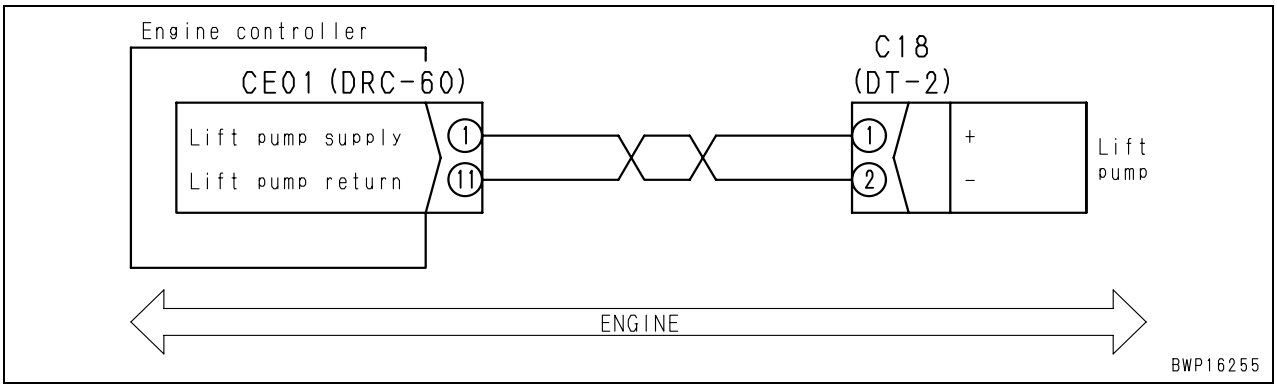


Failure code [CA2266] Electric Lift Pump Low Error

Action code	Failure code	Trouble	Electric lift pump low error (Engine controller system)
E15	**CA2266**		
Contents of trouble	• Opening was detected in electric lift pump actuator.		
Action of controller	• None in particular.		
Problem that appears on machine	• Engine does not start easily.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective electric lift pump (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			C18 (male)	Resistance	
			Between (1) – (2)	Max. 20 Ω	
			Between (1) – chassis ground	Min. 100 kΩ	
	2	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE01 (female) (1) – C18 (female) (1) and chassis ground	Resistance	Max. 100 kΩ
	3	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Wiring harness between CE01 (female) (1) – C18 (female) (1) and chassis ground	Voltage	Max. 6 V
	4	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between CE01 (female) (1) – each of CE01 (female) pins (With all wiring harness connectors disconnected)	Resistance	Min. 100 kΩ
	5	Defective wiring harness connector	Connecting parts between common rail pressure sensor – engine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	6	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CE01 (female)	Resistance	
			Between (1) – (11)	Max. 20 Ω	
			Between (1) – chassis ground	Min. 100 kΩ	

Circuit diagram related to electric lift pump actuator

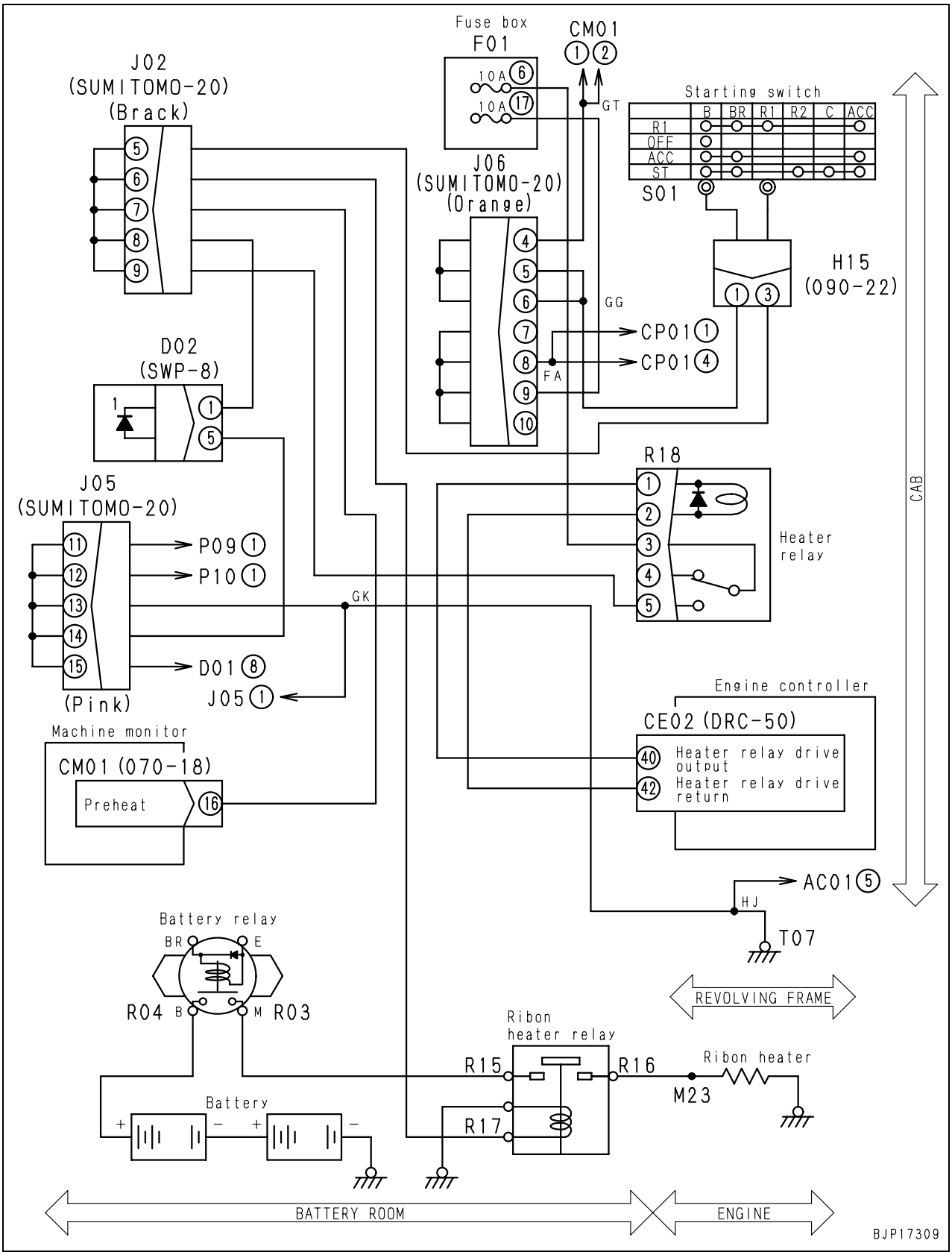


Failure code [CA2555] Grid Htr Relay Volt High Error

Action code	Failure code	Trouble	Grid heater relay volt high error (Engine controller system)
E15	**CA2555**		
Contents of trouble	• Disconnection was detected in drive circuit of intake air heater relay.		
Action of controller	• None in particular.		
Problem that appears on machine	• Intake air heater does not work (Engine does not start easily and exhaust gas becomes white at low temperature).		
Related information	• Method of reproducing failure code: Turn starting switch ON when engine coolant temperature is below –4°C.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective automatic preheater relay (Internal disconnection).	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON. (Troubleshooting for relay unit)		
			R18 (male)	Resistance	
			Between (1) – (2)	300 – 600 Ω	
			★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting. (Troubleshooting by replacement)		
			Replace automatic preheater relay (R18) with another relay and perform reproducing operation. If “E” of failure code goes off at this time, replaced relay is defective.		
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE02 (female) (40) – R18 (female) (1)	Resistance	Max. 10 Ω
			Wiring harness between CE02 (female) (42) – R18 (female) (2)	Resistance	Max. 10 Ω
	3	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between CE02 (female) (40) – each of CE02 (female) pins (With R18 disconnected)	Resistance	Min. 100 kΩ
	4	Defective wiring harness connector	Connecting parts between automatic preheater relay – machine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation		
	5	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CE02 (female)	Resistance	
			Between (40) – (42)	300 – 600 Ω	

Circuit diagram related to preheating, starting and charging engine

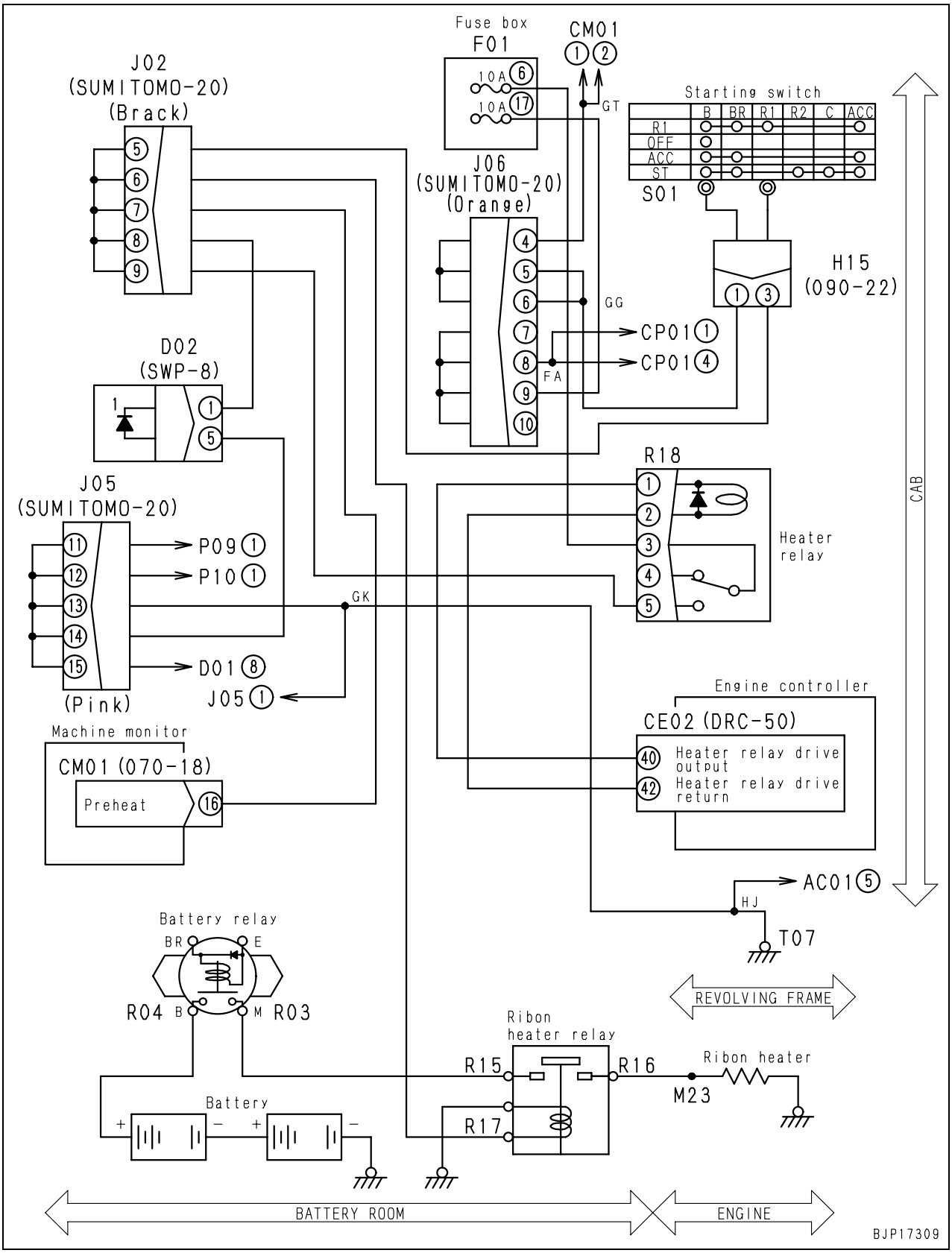


Failure code [CA2556] Grid Htr Relay Volt Low Error

Action code	Failure code	Trouble	Grid heater relay volt low error (Engine controller system)
E15	**CA2556**		
Contents of trouble	• Short circuit was detected in drive circuit of intake air heater relay.		
Action of controller	• None in particular.		
Problem that appears on machine	• Intake air heater does not work (Engine does not start easily and exhaust gas becomes white at low temperature).		
Related information	• Method of reproducing failure code: Turn starting switch ON when engine coolant temperature is below –4°C.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective automatic preheater relay (Internal disconnection).	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON. (Troubleshooting for relay unit)			
			R18 (male)	Resistance		
			Between (1) – (2)	300 – 600 Ω		
			★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting. (Troubleshooting by replacement)			
			Replace automatic preheater relay (R18) with another relay and perform reproducing operation. If “E” of failure code goes off at this time, replaced relay is defective.			
	2	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CE02 (female) (40) – R18 (female) (1) and chassis ground	Resistance	Min. 100 kΩ	
	3	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between CE02 (female) (40) – each of CE02 (female) pins (With R18 disconnected)	Resistance	Min. 100 kΩ	
	4	Defective wiring harness connector	Connecting parts between automatic preheater relay – machine wiring harness – engine controller may be defective. Check them directly. • Looseness of connector, breakage of lock, or breakage of seal • Corrosion, bend, breakage, push-in, or expansion of pin • Moisture or dirt in connector or defective insulation			
	5	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CE02 (female)	Resistance		
			Between (40) – (42)	300 – 600 Ω		

Circuit diagram related to preheating, starting and charging engine

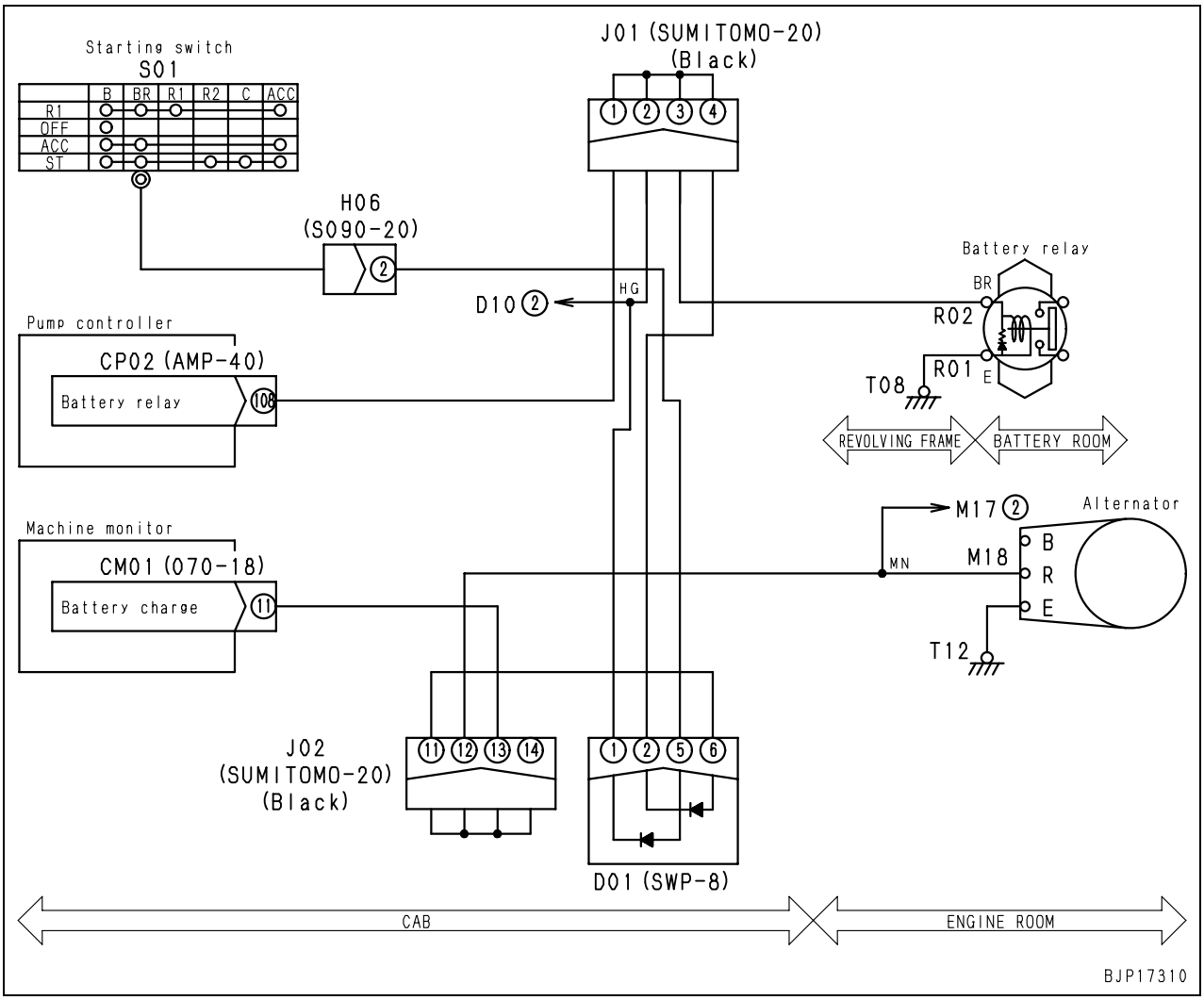


Failure code [D110KB] Battery Relay Drive S/C

Action code	Failure code	Trouble	Battery relay drive short (Pump controller system)
—	**D110KB**		
Contents of trouble	• Abnormal current flowed at output to battery relay drive circuit.		
Action of controller	• Turns output to battery relay drive circuit OFF. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• Engine does not stop.		
Related information	• Operating condition of battery relay (ON/OFF) can be checked with monitoring function. Code 03700: Controller Output)		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective battery relay (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Battery relay	Resistance	
			Between R02 (terminal BR) – R01 (terminal E)	There is continuity	
			Between R02 (terminal BR) – chassis ground	Min. 1 MΩ	
	2	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CP02 (female) (108) – J01 – R02 (terminal BR) and chassis ground	Resistance	Min. 1 MΩ
	3	Defective pump controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			CP02 (female)	Turn starting switch OFF.	Voltage
			Between (108) – chassis ground	ON → OFF	20 – 30 V (4 – 7 sec.)

Circuit diagram related to battery relay drive



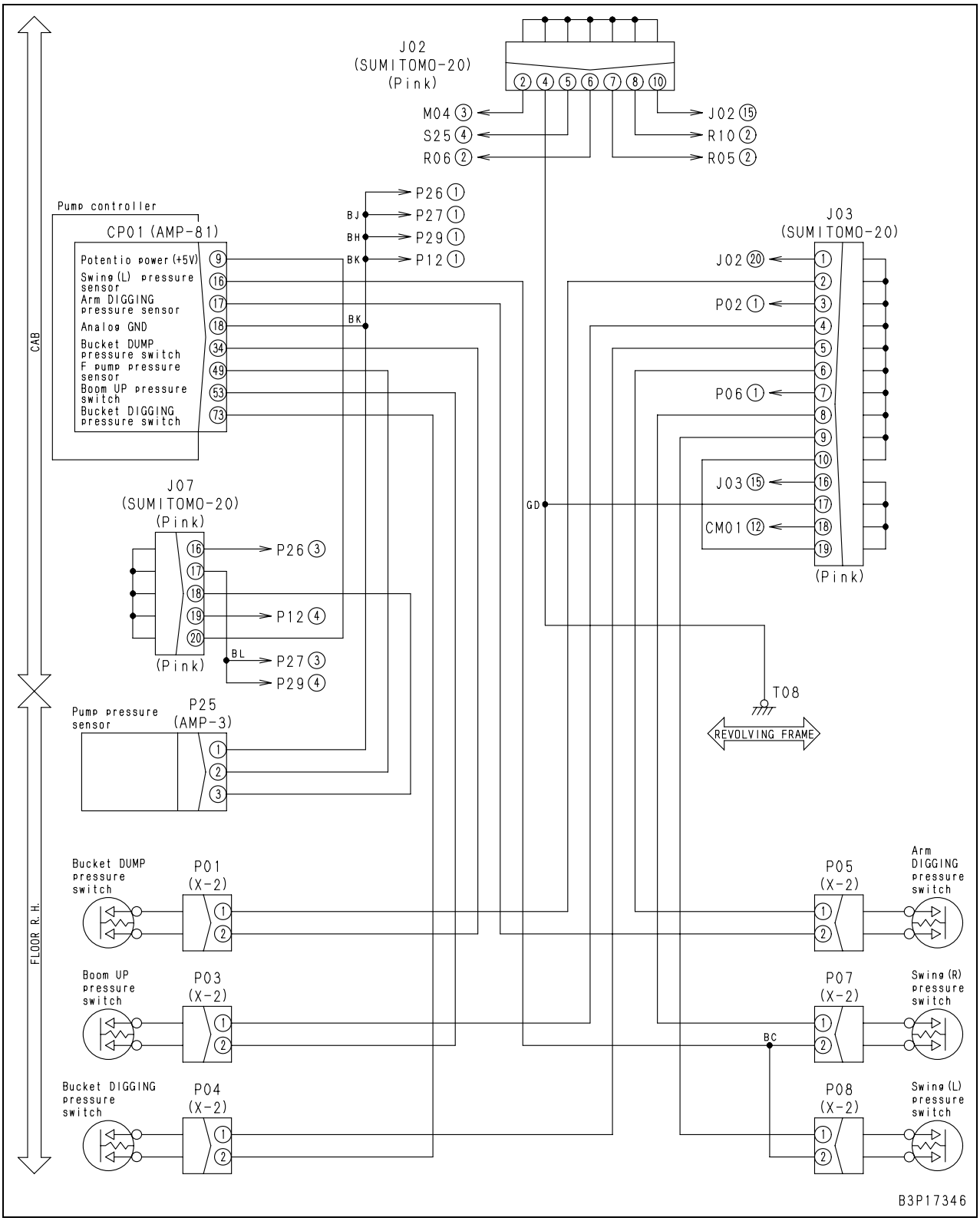
Failure code [DA25KP] 5V sensor 1 power abnormality

User code	Failure code	Trouble	5V sensor power supply output 1 abnormality (Pump controller system)
—	**DA25KP**		
Contents of trouble	• Voltage of 5V sensor power supply output 1 circuit is below 2.5 V or above 6.0 V.		
Action of controller	• Turns output of 5V sensor power supply output 1 OFF. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• Automatic gear shifting function does not work (pump pressure sensor system). • Auto-decelerator keeps working and is not reset or fine control performance of work equipment is lowered (PPC pressure sensor system).		
Related information	• Method of reproducing failure code; Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective pressure sensor (Internal short circuit)	★ Disconnect connector with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Disconnect sensors at right in order and carry out operation to reproduce trouble. If "E" of failure code goes off when a sensor is disconnected, that sensor is defective.	Bucket DUMP PPC pressure switch	P01
				Boom RAISE PPC pressure switch	P03
				Bucket CURL PPC pressure switch	P04
				Arm IN PPC pressure switch	P05
				Swing RIGHT PPC pressure switch	P07
				Swing LEFT PPC pressure switch	P08
				Pump pressure sensor	P25
	2	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CP01 (female) (34) – P01 (female) (2), P01 (female) (1) – J03 – ground (T08) [Bucket DUMP PPC pressure switch system]	Resistance	Min. 1 MΩ
			Wiring harness between CP01 (female) (53) – P03 (female) (2), P03 (female) (1) – J03 – ground (T08) [Boom RAISE PPC pressure switch system]	Resistance	Min. 1 MΩ
			Wiring harness between CP01 (female) (73) – P04 (female) (2), P04 (female) (1) – J03 – ground (T08) [Bucket CURL PPC pressure switch system]	Resistance	Min. 1 MΩ
			Wiring harness between CP01 (female) (17) – P05 (female) (2), P05 (female) (1) – J03 – ground (T08) [Arm IN PPC pressure switch system]	Resistance	Min. 1 MΩ
			Wiring harness between CP01 (female) (16) – P07 (female) (2), P07 (female) (1) – J03 – ground (T08) [Swig RIGHT PPC pressure switch system]	Resistance	Min. 1 MΩ

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	2	Ground fault in wiring harness (Short circuit with GND circuit)	Wiring harness between CP01 (female) (16) – P08 (female) (2), P08 (female) (1) – J03 – ground (T08) [Swing LEFT PPC pressure switch system]	Resistance	Min. 1 MΩ
			Wiring harness between CP01 (female) (9) – J07 – P25 female (3) [Pump pressure sensor system]	Resistance	Min. 1 MΩ
	3	Hot short (Short circuit with 24 V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Wiring harness between CP01 (female) (34) – P01 (female) (2), P01 (female) (1) – J03 – ground (T08) [Bucket CURL PPC pressure sensor system]	Voltage	Max. 1 V
			Wiring harness between CP01 (female) (53) – P03 (female) (2), P03 (female) (1) – J03 – ground (T08) [Swing LEFT PPC pressure sensor system]	Voltage	Max. 1 V
			Wiring harness between CP01 (female) (73) – P04 (female) (2), P04 (female) (1) – J03 – ground (T08) [Arm IN PPC pressure sensor system]	Voltage	Max. 1 V
			Wiring harness between CP01 (female) (17) – P05 (female) (2), P05 (female) (1) – J03 – ground (T08) [Bucket DUMP PPC pressure sensor system]	Voltage	Max. 1 V
			Wiring harness between CP01 (female) (16) – P07 (female) (2), P07 (female) (1) – J03 – ground (T08) [Boom RAISE PPC pressure sensor system]	Voltage	Max. 1 V
			Wiring harness between CP01 (female) (16) – P08 (female) (2), P08 (female) (1) – J03 – ground (T08) [Swing RIGHT PPC pressure sensor system]	Voltage	Max. 1 V
			Wiring harness between CP01 (female) (9) – J07 – P25 (female) (3) [Pump pressure sensor system]	Voltage	Max. 1 V
	4	Defective pump controller	If causes 1 – 3 are not detected, pump controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related to pressure sensor power supply of pump controller

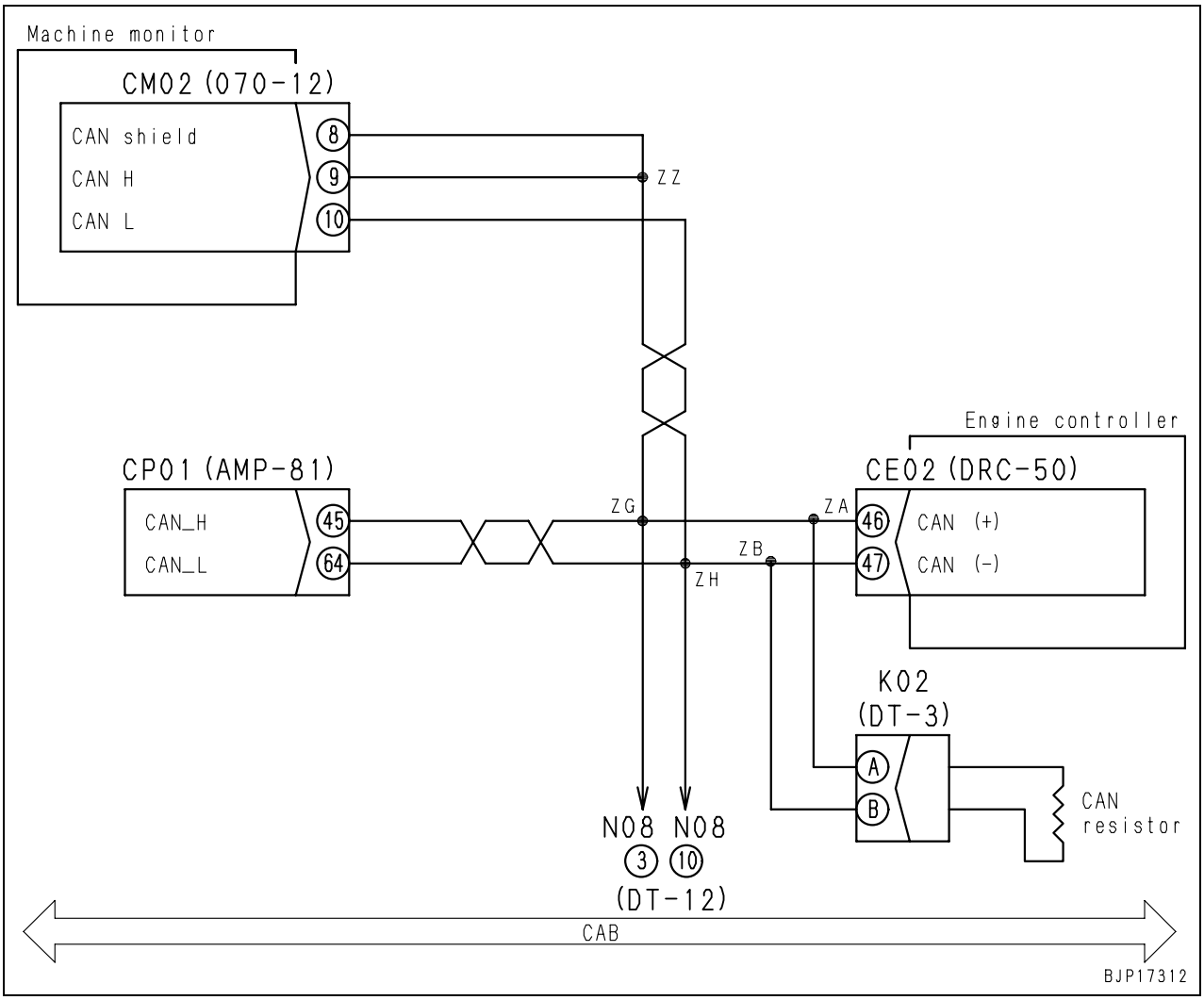


Failure code [DA2RMC] Pump Comm. Abnormality

Action code	Failure code	Trouble	Pump communication abnormality (Pump controller system)
E0E	**DA2RMC**		
Contents of trouble	• Pump controller detected communication error in CAN communication circuit between machine monitor and engine controller.		
Action of controller	• Fix engine output to E-mode, and limit pump absorption torque to about 80%. • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• Output lowers. (Pump absorption torque decreases.) • As the working load increases, engine may stall.		
Related information			

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CM02 (female) (10) – CE02 (female) (47), – CP01 (female) (64)	Resistance	Max. 1 Ω
			Wiring harness between CM02 (female) (9) – CE02 (female) (46), – CP01 (female) (45)	Resistance	Max. 1 Ω
	2	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CM02 (female) (10) – CE02 (female) (47), – CP01 (female) (64), – other related circuit and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between CM02 (female) (9) – CE02 (female) (46), – CP01 (female) (45), – other related circuit and chassis ground	Resistance	Min. 1 MΩ
	3	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Wiring harness between CM02 (female) (10) – CE02 (female) (47), – CP01 (female) (64), – other related circuit and chassis ground	Voltage	Max. 1 V
			Wiring harness between CM02 (female) (9) – CE02 (female) (46), – CP01 (female) (45), – other related circuit and chassis ground	Voltage	Max. 1 V
	4	Defective CAN terminal resistance	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			K02 (male)	Resistance	
			Between (A) – (B)	40 – 80 Ω	
	5	Defective machine monitor, engine controller, or pump controller	If causes 1 – 4 are not detected, machine monitor, engine controller, or pump controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related to CAN communication of pump controller

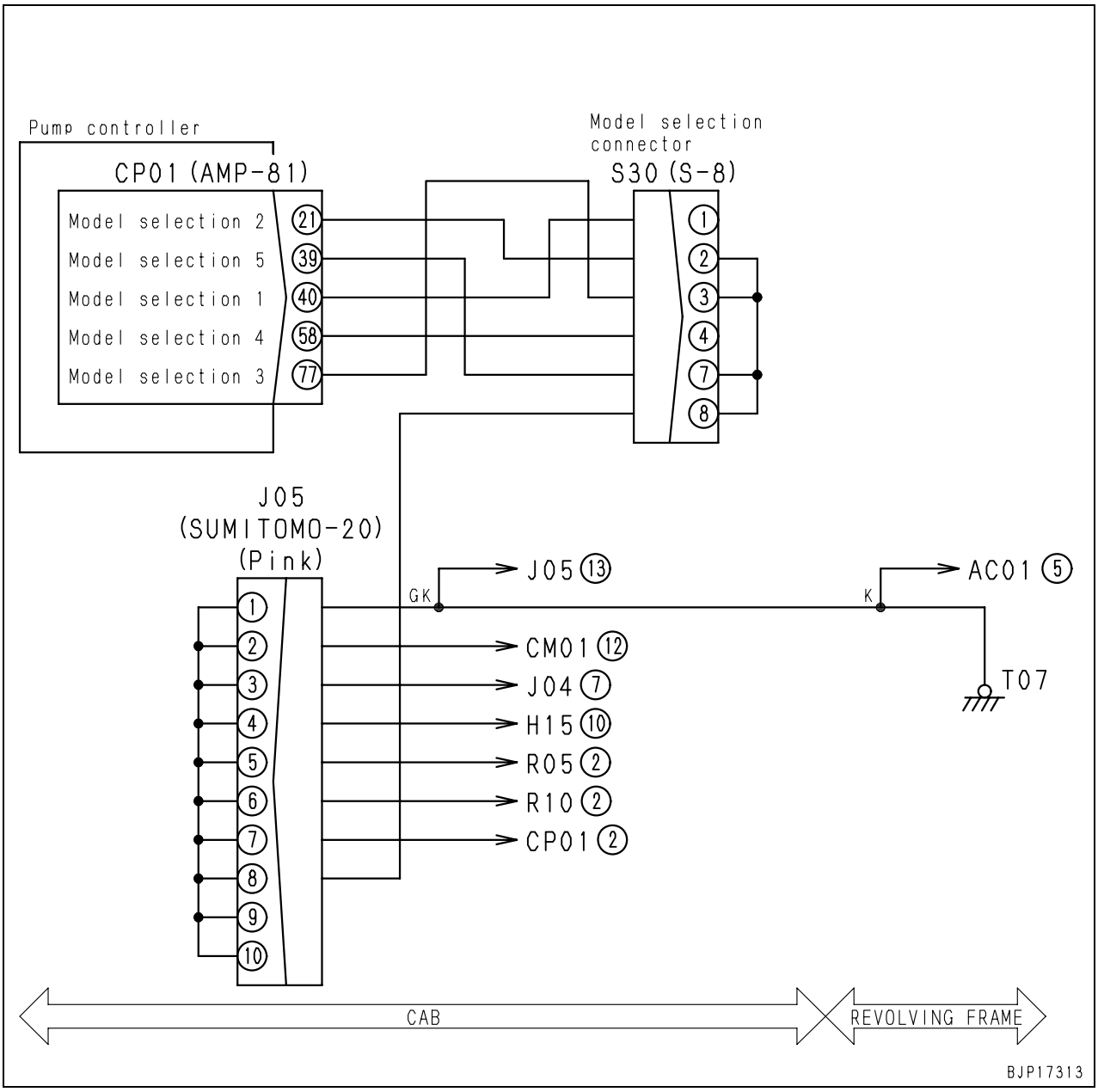


Failure code [DA2SKQ] Model Selection Abnormality

Action code	Failure code	Trouble	Model selection abnormality (Pump controller system)
—	**DA2SKQ**		
Contents of trouble	• Model code signal for model which is not registered in controller is input.		
Action of controller	• Changes input model code to code of default model (PC300) and continues control. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• None in particular.		
Related information	• Controller-recognized model name (digits) can be checked with monitoring function. (Code: 00200) • Input of model selection signal (ON/OFF) can be checked with monitoring function. (Code 02200: Switch Input 2)		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective model selection connector (Internal disconnection or short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			S30 (female)	Resistance	
			Between (2), (3), (7) – (8)	Max. 1 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CP01 (female) (58) – S30 (male) (4) and chassis ground	Resistance	Max. 1 Ω
			Wiring harness between CP01 (female) (77) – S30 (male) (3)	Resistance	Max. 1 Ω
			Wiring harness between CP01 (female) (21) – S30 (male) (2)	Resistance	Max. 1 Ω
			Wiring harness between CP01 (female) (39) – S30 (male) (7)	Resistance	Max. 1 Ω
			Wiring harness between S30 (male) (8) – J05 – T07 – chassis ground	Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CP01 (female) (58) – S30 (male) (4) and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between CP01 (female) (39) – S30 (male) (7) and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between CP01 (female) (77) – S30 (male) (3) and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between CP01 (female) (40) – S30 (male) (1) and chassis ground	Resistance	Min. 1 MΩ
	4	Defective pump controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			CP01	Voltage	
			Between (58), (39), (21), (40) – chassis ground	20 – 30 V	
			Between (39), (77), (21) – chassis ground	Max. 1 V	

Circuit diagram related to model selection connector of pump controller



PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN02630-00

HYDRAULIC EXCAVATOR

PC300-8
PC300LC-8
PC350-8
PC350LC-8

Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

40 Troubleshooting

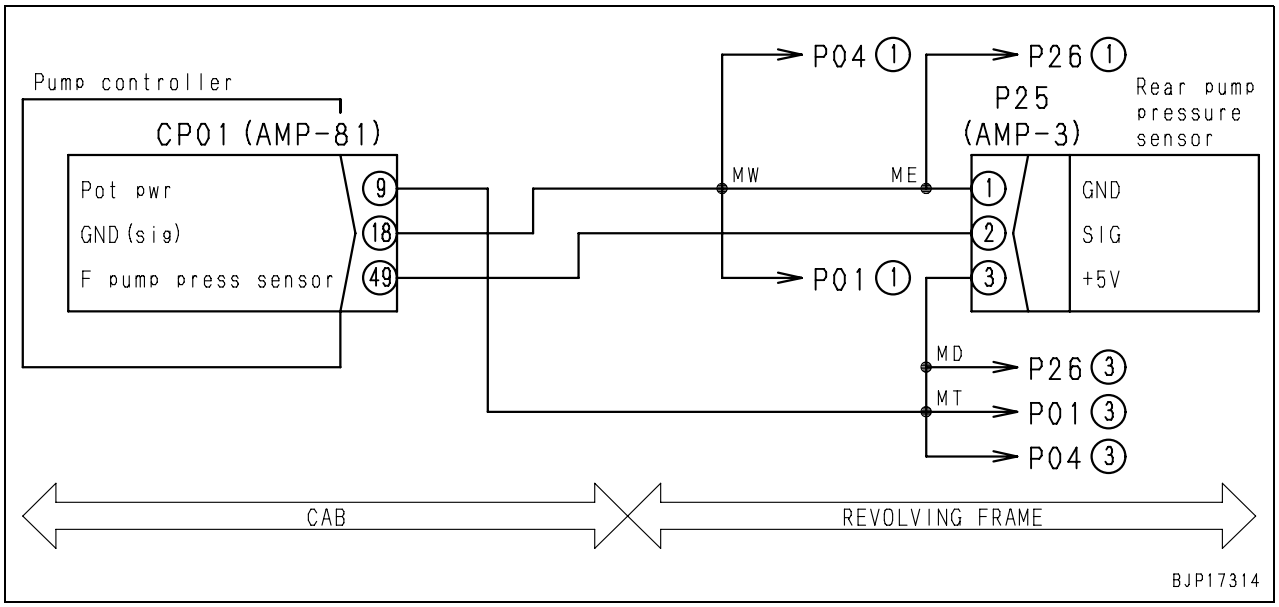
Troubleshooting by failure code (Display of code), Part 3

Failure code [DAFRMC] CAN discon (Monitor detected)

User code	Failure code	Trouble	CAN disconnection (Monitor detected) (Machine monitor system)
E0E	**DAFRMC**		
Contents of trouble	• Machine monitor detected communication error in CAN communication circuit between pump controller and engine controller.		
Action of machine monitor	• If cause of failure disappears, system resets itself.		
Problem that appears on machine	• Information may not transmitted normally by CAN communication and machine may not operate normally. (Trouble phenomenon depends on failed section.)		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CM02 (female) (8), (9) – CP01 (female) (45), – CE02 (female) (46), – K02 (female) (A)	Resistance	Max. 1 Ω
			Wiring harness between CM02 (female) (10) – CP01 (female) (64), – CE02 (female) (47), – K02 (female) (B)	Resistance	Max. 1 Ω
	2	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CM02 (female) (8), (9) – CP01 (female) (45), – CE02 (female) (46), – K02 (female) (A), – N08 (male) (3)	Resistance	Min. 1 MΩ
			Wiring harness between CM02 (female) (10) – CP01 (female) (64), – CE02 (female) (47), – K02 (female) (B), – N08 (male) (10)	Resistance	Min. 1 MΩ
	3	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Wiring harness between CM02 (female) (8), (9) – CP01 (female) (45), – CE02 (female) (46), – K02 (female) (A), – N08 (male) (3)	Voltage	Max. 5.5 V
			Wiring harness between CM02 (female) (10) – CP01 (female) (64), – CE02 (female) (47), – K02 (female) (B), – N08 (male) (10)	Voltage	Max. 5.5 V
	4	Defective CAN terminal resistance (Internal short circuit or disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			K02 (male)	Resistance	
			Between (A) – (B)	120 ± 12 Ω	
	5	Defective machine monitor	If causes 1 – 4 are not detected, machine monitor may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related to CAN communication of machine monitor

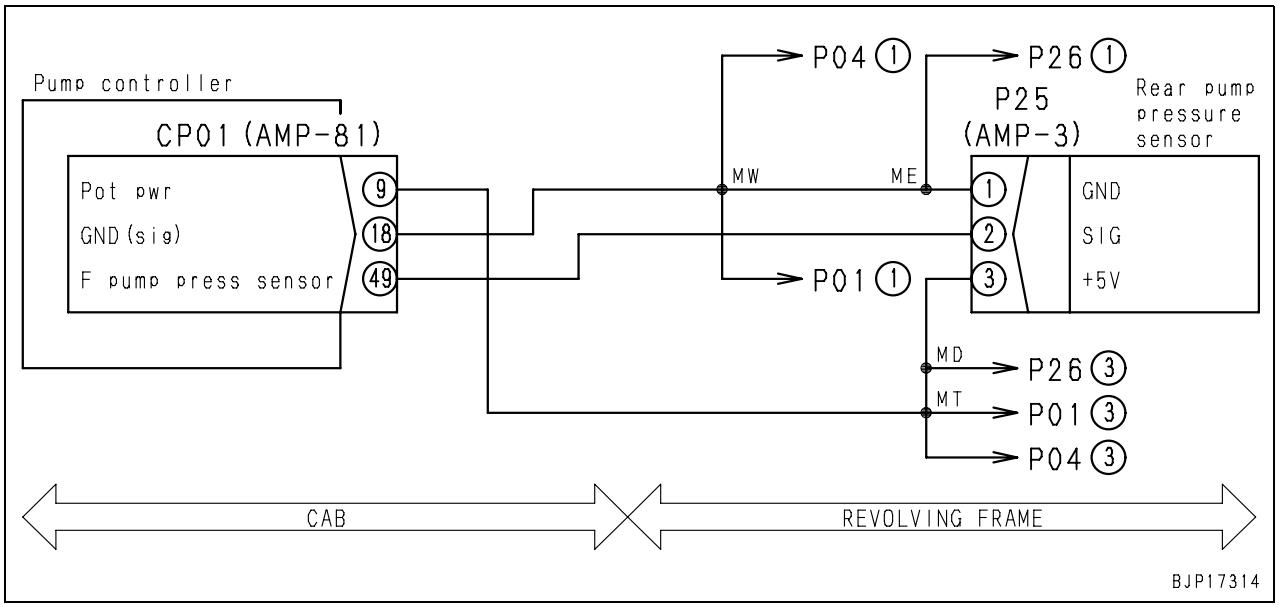


Failure code [DHPAMA] F Pump Press Sensor Abnormality

Action code	Failure code	Trouble	F pump press sensor abnormality (Pump controller system)
—	**DHPAMA**		
Contents of trouble	• Signal voltage from F pump pressure sensor is below 0.3 V or above 4.42 V.		
Action of controller	• Fixes F pump pressure at 0 MPa {0 kg/cm^2} and continues control. • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• No automatic gear shifting		
Related information	★ If 5V circuit (3) and ground circuit (1) of pressure sensor are connected inversely, pressure sensor will be broken. Accordingly, take extreme care when checking. • Input from F pump pressure sensor (pressure) can be checked with monitoring function. (Code 01112: F pump pressure		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective sensor power supply system	If failure code [**DA25KP**] is also displayed, carry out troubleshooting for it first.			
	2	Defective F pump pressure sensor (Internal defect)	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			P25	Voltage		
			Between (3) – (1)	4.5 – 5.5 V		
			Between (2) – (1)	0.5 – 4.5 V		
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP01 (female) (9) – P25 (female) (3)	Resistance	Max. 1 Ω	
			Wiring harness between CP01 (female) (18) – P25 (female) (1)	Resistance	Max. 1 Ω	
			Wiring harness between CP01 (female) (49) – P25 (female) (2)	Resistance	Max. 1 Ω	
	4	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP01 (female) (49) – P25 (female) (2) and chassis ground	Resistance	Min. 1 MΩ	
	5	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CP01 (female) (9) – P25 (female) (3) and chassis ground	Voltage	Max. 1 V	
			Wiring harness between CP01 (female) (49) – P25 (female) (2) and chassis ground	Voltage	Max. 1 V	
	6	Defective pump controller	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			CP01	Voltage		
			Between (19) – (18)	4.5 – 5.5 V		
			Between (49) – (18)	0.5 – 4.5 V		

Circuit diagram related to F pump pressure sensor of pump controller

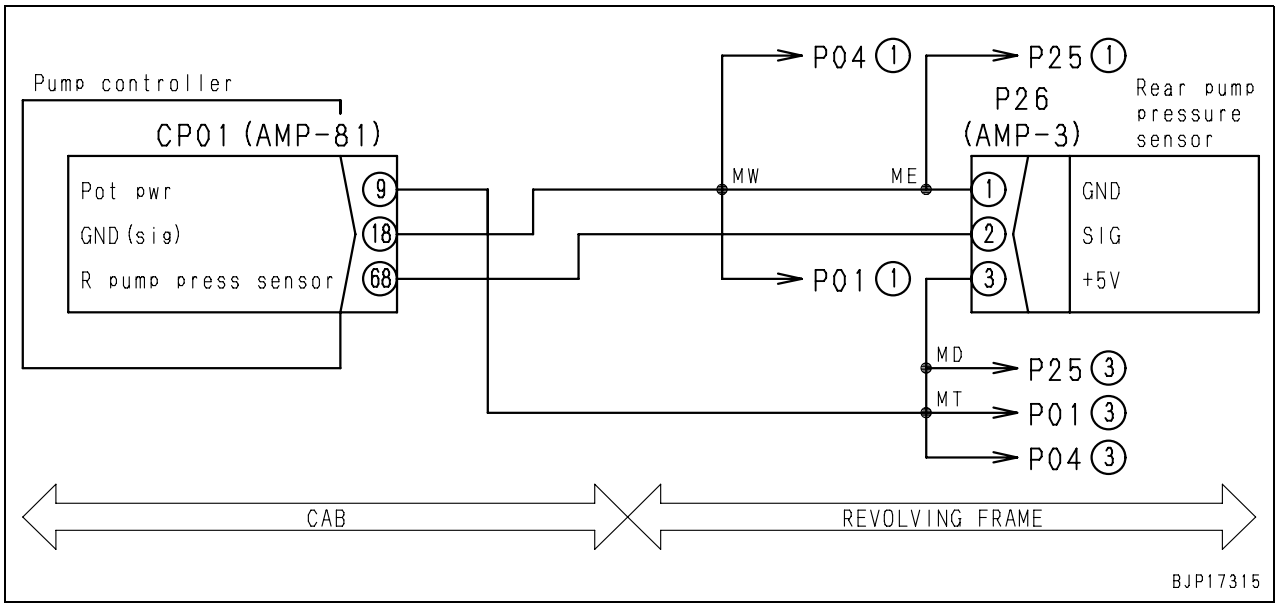


Failure code [DHPBMA] R Pump Press Sensor Abnormality

Action code	Failure code	Trouble	R pump pressure sensor abnormality (Pump controller system)
—	**DHPBMA**		
Contents of trouble	• Signal voltage from R pump pressure sensor is below 0.3 V or above 4.42 V.		
Action of controller	• Fixes R pump pressure at 0 MPa {0 kg/cm^2} and continues control. • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• No automatic gear shifting		
Related information	★ If 5V circuit (3) and ground circuit (1) of pressure sensor are connected inversely, pressure sensor will be broken. Accordingly, take extreme care when checking. • Input from R pump pressure sensor (pressure) can be checked with monitoring function. (Code 01113: R pump pressure		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective sensor power supply system	If failure code [**DA25KP**] is also displayed, carry out troubleshooting for it first.			
	2	Defective R pump pressure sensor (Internal defect)	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			P26	Voltage		
			Between (3) – (1)	4.5 – 5.5 V		
			Between (2) – (1)	0.5 – 4.5 V		
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP01 (female) (9) – P26 (female) (3)	Resistance	Max. 1 Ω	
			Wiring harness between CP01 (female) (18) – P26 (female) (1)	Resistance	Max. 1 Ω	
			Wiring harness between CP01 (female) (68) – P26 (female) (2)	Resistance	Max. 1 Ω	
	4	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP01 (female) (68) – P26 (female) (2) and chassis ground	Resistance	Min. 1 MΩ	
	5	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CP01 (female) (9) – P26 (female) (3) and chassis ground	Voltage	Max. 1 V	
			Wiring harness between CP01 (female) (68) – P26 (female) (2) and chassis ground	Voltage	Max. 1 V	
	6	Defective pump controller	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			CP01	Voltage		
			Between (9) – (18)	4.5 – 5.5 V		
			Between (68) – (18)	0.5 – 4.5 V		

Circuit diagram related to R pump pressure sensor of pump controller

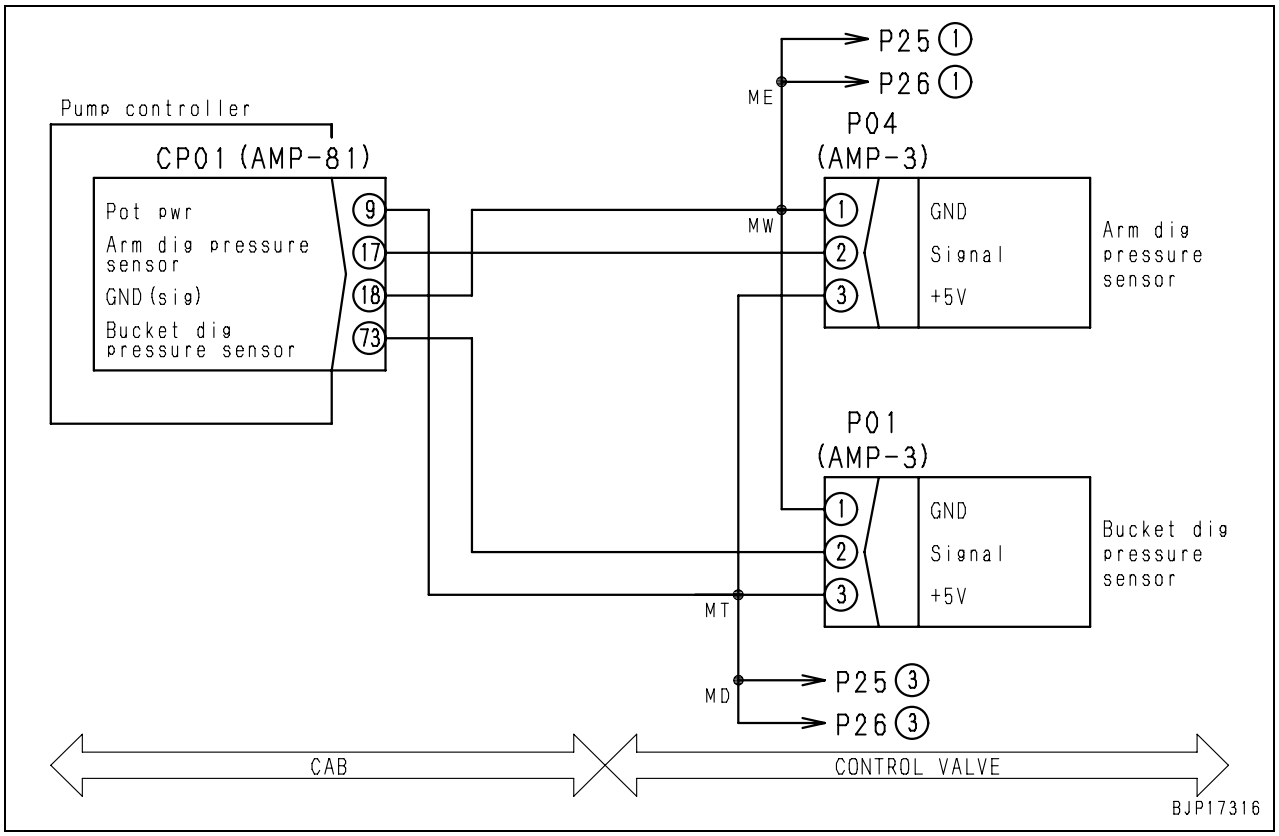


Failure code [DHS3MA] Arm Curl PPC Sen. Abnormality

Action code	Failure code	Trouble	Arm IN PPC pressure sensor abnormality (Pump controller system)
—	**DHS3MA**		
Contents of trouble	• Signal voltage from arm IN PPC pressure sensor is below 0.3 V or above 4.72 V.		
Action of controller	• Fixes arm IN PPC pressure at 0 MPa {0 kg/cm^2} and continues control. • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• No automatic gear shifting		
Related information	★ If 5V circuit (3) and ground circuit (1) of pressure sensor are connected inversely, pressure sensor will be broken. Accordingly, take extreme care when checking. • Input from arm IN PPC pressure sensor (pressure) can be checked with monitoring function. (Code 07200: Arm IN PPC pressure		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective sensor power supply system	If failure code [**DA25KP**] is also displayed, carry out troubleshooting for it first.			
	2	Defective arm IN PPC pressure sensor (Internal defect)	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			P04	Voltage		
			Between (3) – (1)	4.5 – 5.5 V		
			Between (2) – (1)	0.5 – 4.5 V		
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP01 (female) (9) – P04 (female) (3)	Resistance	Max. 1 Ω	
			Wiring harness between CP01 (female) (18) – P04 (female) (1)	Resistance	Max. 1 Ω	
			Wiring harness between CP01 (female) (17) – P04 (female) (2)	Resistance	Max. 1 Ω	
	4	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP01 (female) (17) – P04 (female) (2) and chassis ground	Resistance	Min. 1 MΩ	
	5	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CP01 (female) (9) – P04 (female) (3) and chassis ground	Voltage	Max. 1 V	
			Wiring harness between CP01 (female) (17) – P04 (female) (2) and chassis ground	Voltage	Max. 1 V	
	6	Defective pump controller	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			CP01	Voltage		
			Between (9) – (18)	4.5 – 5.5 V		
			Between (17) – (18)	0.5 – 4.5 V		

Circuit diagram related to arm IN PPC pressure sensor of pump controller

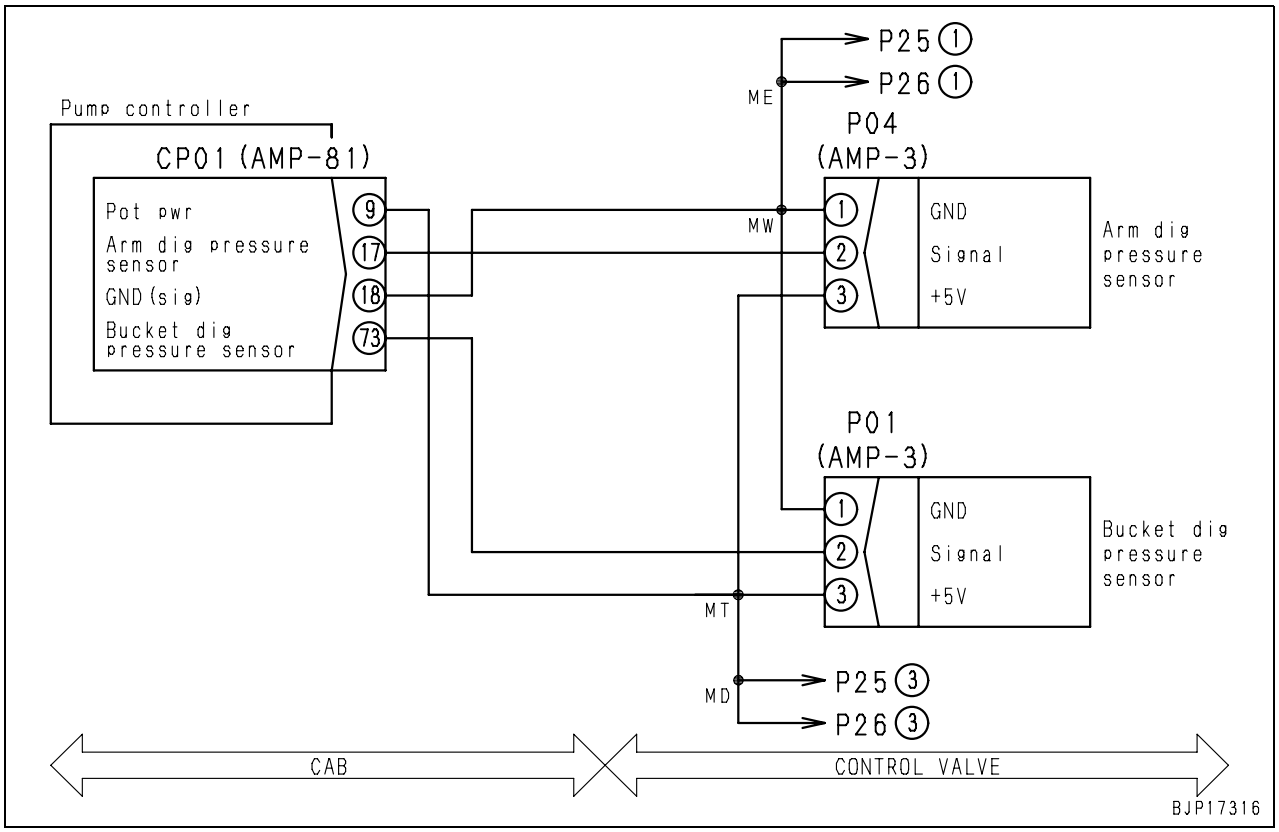


Failure code [DHS4MA] Bucket Curl PPC Press Sensor Abnormality

Action code	Failure code	Trouble	Bucket CURL PPC press sensor abnormality (Pump controller system)
—	**DHS4MA**		
Contents of trouble	• Signal voltage from bucket curl PPC pressure sensor is below 0.3 V or above 4.42 V.		
Action of controller	• Fixes bucket curl PPC pressure at 0 MPa {0 kg/cm^2} and continues control. • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• No automatic gear shifting		
Related information	★ If 5V circuit (3) and ground circuit (1) of pressure sensor are connected inversely, pressure sensor will be broken. Accordingly, take extreme care when checking. • Input from bucket curl PPC pressure sensor (pressure) can be checked with monitoring function. (Code 07300: Bucket Curl PPC pressure)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective sensor power supply system	If failure code [**DA25KP**] is also displayed, carry out troubleshooting for it first.			
	2	Defective bucket curl PPC pressure sensor (Internal defect)	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			P01	Voltage		
			Between (3) – (1)	4.5 – 5.5 V		
			Between (2) – (1)	0.5 – 4.5 V		
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP01 (female) (9) – P01 (female) (3)	Resistance	Max. 1 Ω	
			Wiring harness between CP01 (female) (18) – P01 (female) (1)	Resistance	Max. 1 Ω	
			Wiring harness between CP01 (female) (73) – P01 (female) (2)	Resistance	Max. 1 Ω	
	4	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP01 (female) (73) – P01 (female) (2) and chassis ground	Resistance	Min. 1 MΩ	
	5	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CP01 (female) (9) – P01 (female) (3) and chassis ground	Voltage	Max. 1 V	
			Wiring harness between CP01 (female) (73) – P01 (female) (2) and chassis ground	Voltage	Max. 1 V	
	6	Defective pump controller	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			CP01	Voltage		
			Between (9) – (18)	4.5 – 5.5 V		
			Between (73) – (18)	0.5 – 4.5 V		

Circuit diagram related to bucket curl PPC pressure sensor of pump controller

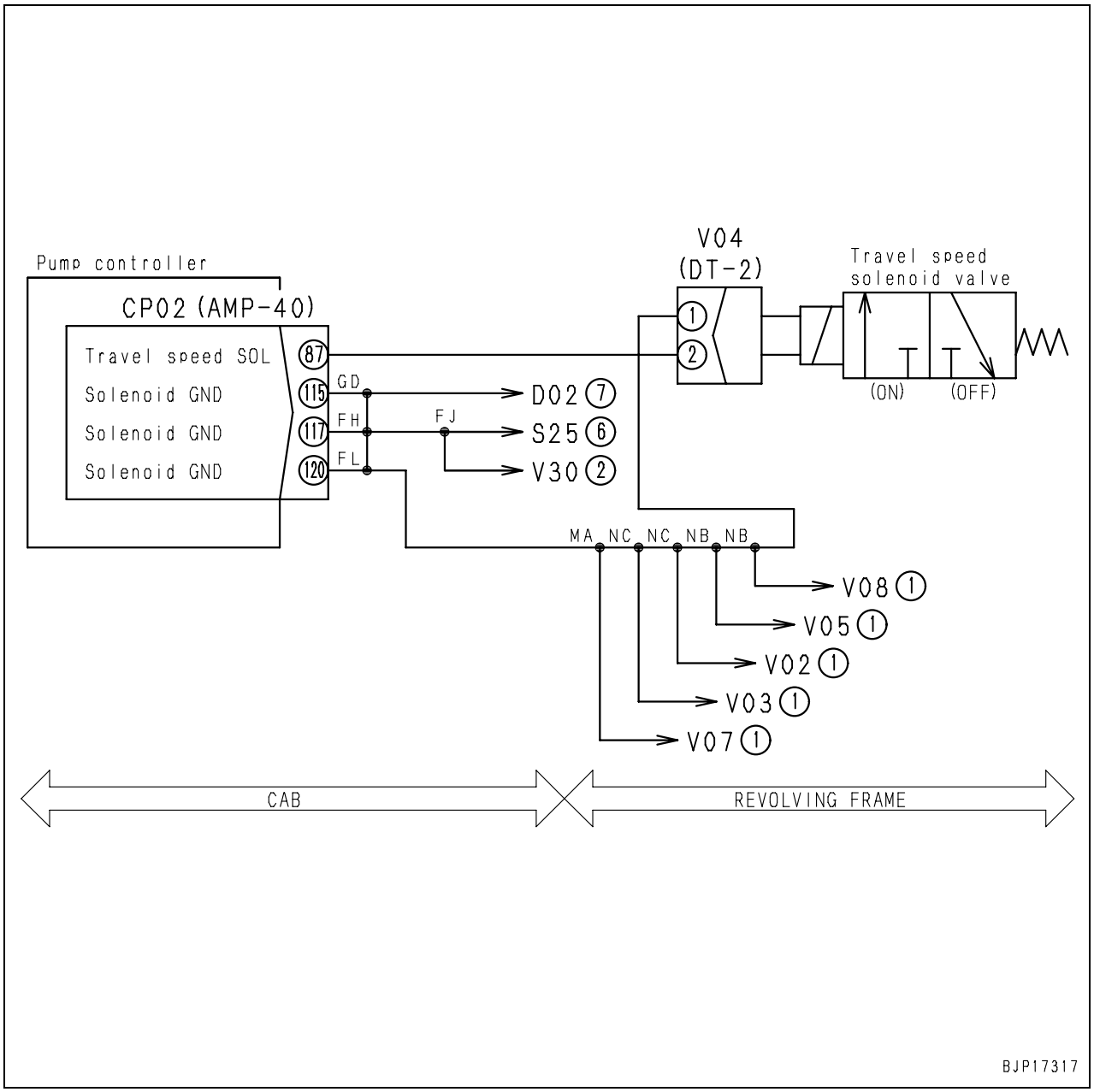


Failure code [DW43KA] Travel Speed Sol. Disc.

Action code	Failure code	Trouble	Travel speed solenoid disconnection (Pump controller system)
—	**DW43KA**		
Contents of trouble	• No current flows at output to travel speed solenoid circuit.		
Action of controller	• None in particular. (Since no current flows, solenoid does not operate.) • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• Travel speed does not change to Hi. (Machine monitor changes to the normal state.)		
Related information	• Operating condition of travel speed solenoid (ON/OFF) can be checked with monitoring function. (Code 02300: Solenoid 1) • Solenoid detects disconnection when output is turned on. To confirm the reproduction after repair, be sure to turn output on. (For more information on how to turn output on/off, see troubleshooting for failure code [**DW43KB**].)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective travel speed solenoid (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			V04 (male)	Resistance		
			Between (1) – (2)	20 – 60 Ω		
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP02 (female) (87) – V04 (female) (2)	Resistance	Max. 1 Ω	
			Wiring harness between V04 (female) (1) – chassis ground	Resistance	Max. 1 Ω	
	3	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CP02 (female) (87) – V04 (female) (2) and chassis ground	Voltage	Max. 1 V	
	4	Defective pump controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CP02 (female)	Resistance		
			Between (87) – chassis ground	20 – 60 Ω		

Circuit diagram related to travel speed solenoid of pump controller

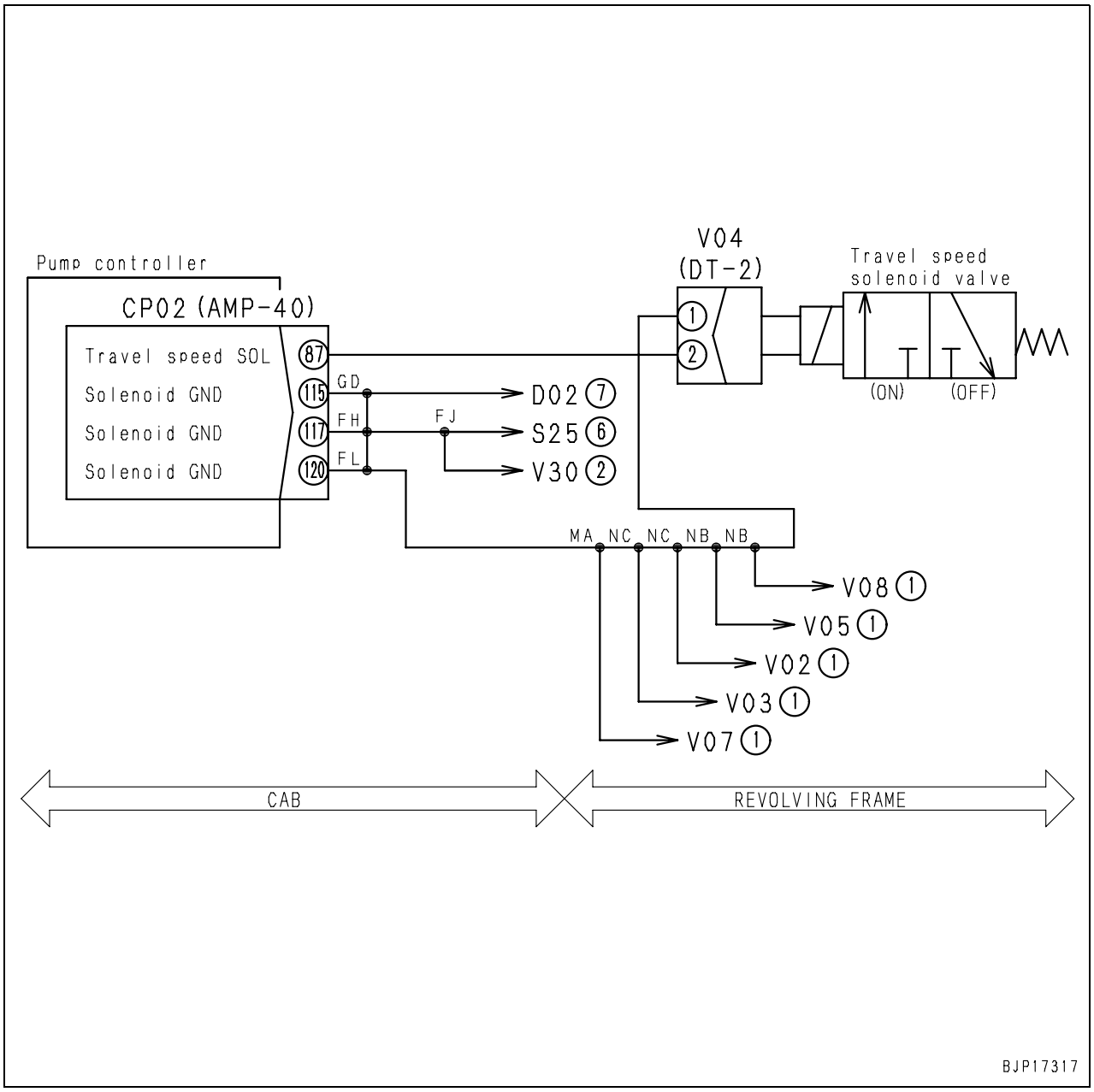


Failure code [DW43KB] Travel Speed Sol. S/C

Action code	Failure code	Trouble	Travel speed solenoid short (Pump controller system)
—	**DW43KB**		
Contents of trouble	• Abnormal current flowed at output to travel speed solenoid circuit.		
Action of controller	• Turns output to travel speed solenoid circuit OFF. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• Travel speed does not change to Hi. (Machine monitor changes to the normal state.)		
Related information	• Operating condition of travel speed solenoid (ON/OFF) can be checked with monitoring function. (Code 02300: Solenoid 1)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective travel speed solenoid (Internal short circuit or ground fault)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			V04 (male)		Resistance	
			Between (1) – (2)		20 – 60 Ω	
			Between (2) – chassis ground		Min. 1 MΩ	
	2	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP02 (female) (87) – V04 (female) (2) and chassis ground		Resistance	Min. 1 MΩ
	3	Defective pump controller	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			CP02	Travel speed	Voltage	
			Between (87) – chassis ground	Lo	Max. 1 V	
				Hi + Travel operation	20 – 30 V	

Circuit diagram related to travel speed solenoid of pump controller



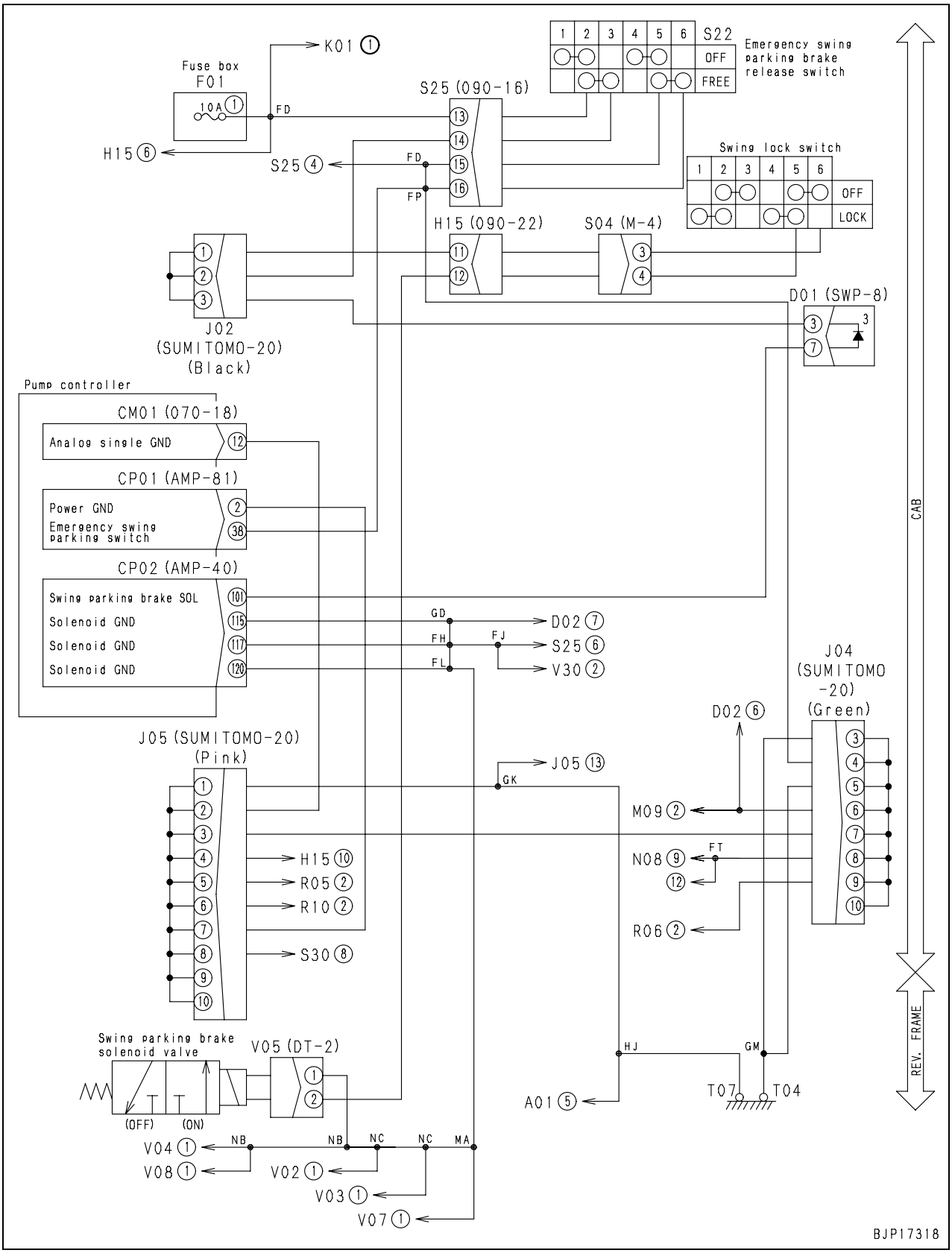
Failure code [DW45KA] Swing Brake Sol. Disc.

Action code	Failure code	Trouble	Swing holding brake solenoid disconnection (Pump controller system)
E03	**DW45KA**		
Contents of trouble	• No current flows at output to swing holding brake solenoid circuit.		
Action of controller	• None in particular. (Since no current flows, solenoid does not operate.) • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• Machine cannot swing.		
Related information	• Operating condition of swing holding brake solenoid (ON/OFF) can be checked with monitoring function. (Code 02300: Solenoid 1) • If solenoid and wiring harness are normal, operator can swing machine by setting emergency swing brake release switch in release position (Swing holding brake does not work, however, when machine stops). • Turn both of swing lock and emergency swing release switches OFF during troubleshooting. • Solenoid detects disconnection when output is turned on. To confirm the reproduction after repair, be sure to turn output on. (For more information on how to turn output on/off, see troubleshooting for failure code [**DW45KB**].)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective swing holding brake solenoid (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			V05 (male)		Resistance	
			Between (1) – (2)		20 – 60 Ω	
	2	Defective swing lock switch (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			S04 (female)	Switch	Resistance	
			Between (3) – (4)	OFF	Max. 1 Ω	
				LOCK	Min. 1 MΩ	
	3	Defective assembled-type diode D01 (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			D01 (male)	Digital circuit tester	Continuity	
			Between (7) – (3)	Diode mode	There is continuity	
	4	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP02 (female) (101) – D01 (female) (7)		Resistance	Max. 1 Ω
			Wiring harness between D01 (female) (3) – J02 – S04 (male) (3)		Resistance	Max. 1 Ω
			Wiring harness between S04 (male) (4) – V05 (female) (2)		Resistance	Max. 1 Ω
			Wiring harness between V05 (female) (1) – CP02 (female) (115), (117), (120)		Resistance	Max. 1 Ω

<table>
<tr><td rowspan="6">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="4">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">5</td><td rowspan="3">Hot short (Short circuit with 24V circuit) in wiring harness</td><td colspan="4">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td colspan="2">Wiring harness between CP02 (female) (101) – D01 – H15 – S04 (male) (3) and chassis ground</td><td>Voltage</td><td>Max. 1 V</td></tr>
<tr><td colspan="2">Wiring harness between V05 (female) (2) – H15 – S04 (male) (4) and chassis ground</td><td>Voltage</td><td>Max. 1 V</td></tr>
<tr><td rowspan="3">6</td><td rowspan="3">Defective pump controller</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td>CP02 (female)</td><td rowspan="2">Disconnect D01 and connect pins (3) and (7) on female side directly.</td><td colspan="2">Resistance</td></tr>
<tr><td>Between (101) – chassis ground</td><td colspan="2">20 – 60 Ω</td></tr>
</table>

Circuit diagram related to swing holding brake solenoid of pump controller

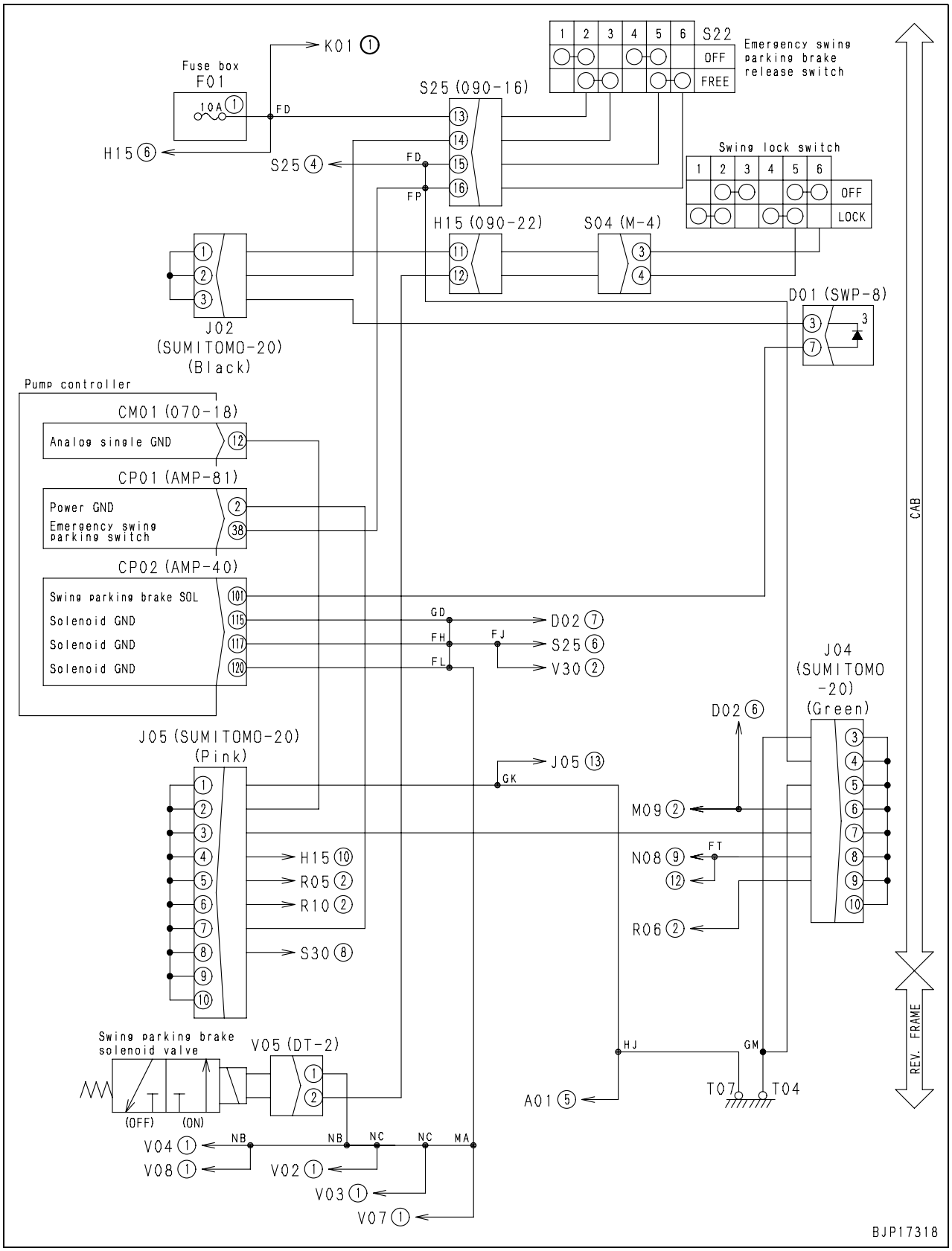


Failure code [DW45KB] Swing Brake Sol. S/C

Action code	Failure code	Trouble	Swing holding brake solenoid short (Pump controller system)
E03	**DW45KB**		
Contents of trouble	• Abnormal current flowed at output to swing holding brake solenoid circuit.		
Action of controller	• Turns output to swing holding brake solenoid circuit OFF. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• Machine cannot swing.		
Related information	• Operating condition of swing holding brake solenoid (ON/OFF) can be checked with monitoring function. (Code 02300: Solenoid 1) • If solenoid and wiring harness are normal, operator can swing machine by setting emergency swing brake release switch in release position (Swing holding brake does not work, however, when machine stops).		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective swing holding brake solenoid (Internal short circuit or ground fault)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			V05 (male)	Resistance		
			Between (1) – (2)	20 – 60 Ω		
			Between (2) – chassis ground	Min. 1 MΩ		
	2	Defective assembled-type diode D01 (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			D01 (male)	Resistance		
			Between (3) – (7)	Min. 1 MΩ		
	3	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP02 (female) (101) – D01 – J02 – H15 – S04 (male) (3) and chassis ground	Resistance	Min. 1 MΩ	
			Wiring harness between V05 (female) (2) – H15 – S04 (male) (4) and chassis ground	Resistance	Min. 1 MΩ	
	4	Defective pump controller	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			CP02	Swing lever	Voltage	
			Between (101) – chassis ground	At neutral	Max. 1 V	
				At swing	20 – 30 V	

Circuit diagram related to swing holding brake solenoid of pump controller

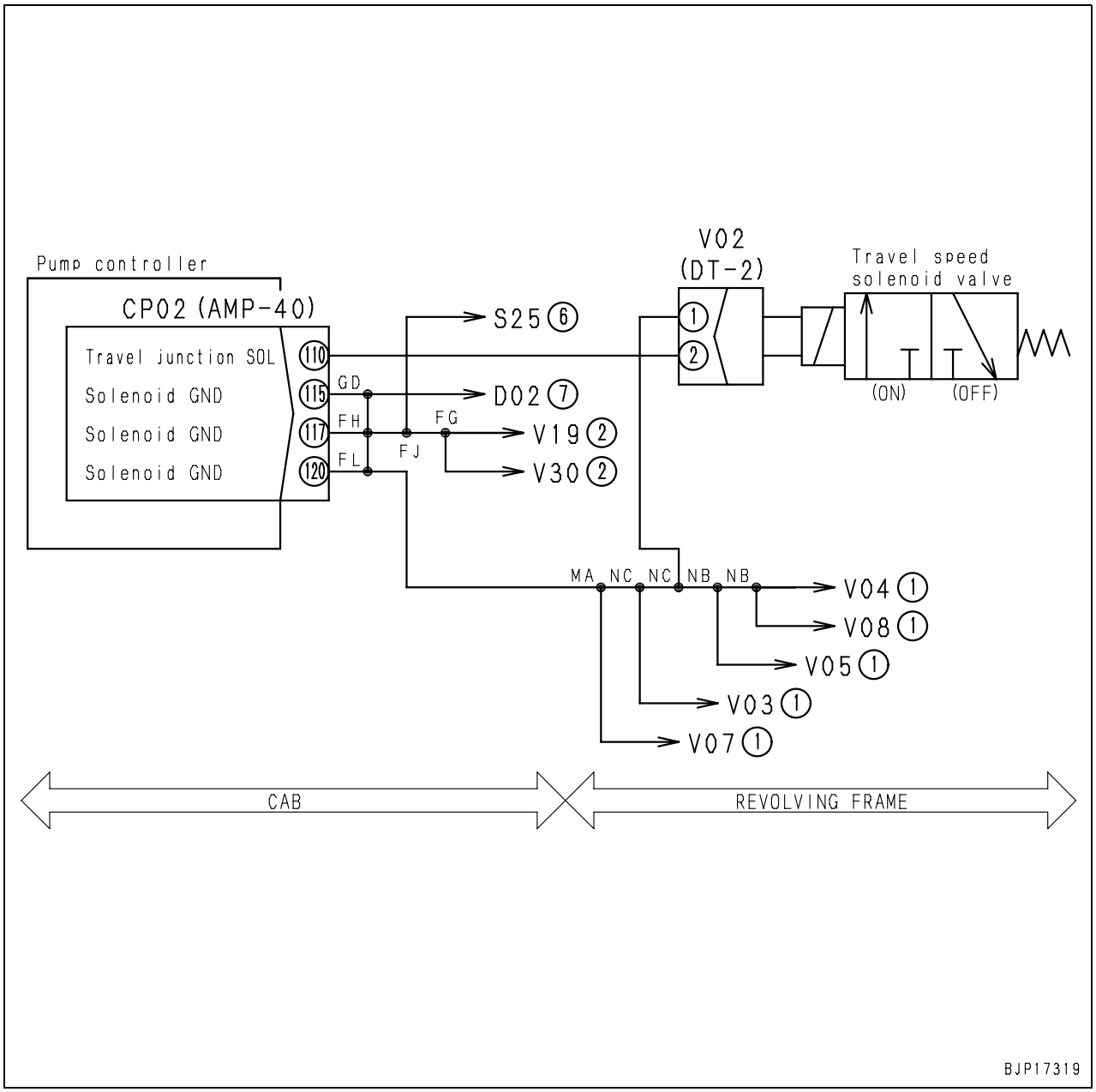


Failure code [DW91KA] Travel Junction Sol. Disc.

Action code	Failure code	Trouble	Travel junction solenoid disconnection (Pump controller system)
—	**DW91KA**		
Contents of trouble	• No current flows at output to travel junction solenoid circuit.		
Action of controller	• None in particular. (Since no current flows, solenoid does not operate.) • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• Hard to turn when operating travel steering.		
Related information	• Operating condition of travel junction solenoid (ON/OFF) can be checked with monitoring function. (Code 02300: Solenoid 1) • Solenoid detects disconnection when output is turned on. To confirm the reproduction after repair, be sure to turn output on. (For more information on how to turn output on/off, see troubleshooting for failure code [**DW91KB**].)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective travel junction solenoid (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			V02 (male)	Resistance		
			Between (1) – (2)	20 – 60 Ω		
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP02 (female) (110) – V02 (female) (2)	Resistance	Max. 1 Ω	
			Wiring harness between V02 (female) (1) – CP02 (female) (115), (117), (120) and chassis ground	Resistance	Max. 1 Ω	
	3	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CP02 (female) (110) – V02 (female) (2) and chassis ground	Voltage	Max. 1 V	
	4	Defective pump controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CP02 (female)	Resistance		
			Between (110) – (115), (117), (120)	20 – 60 Ω		

Circuit diagram related to travel junction solenoid of pump controller

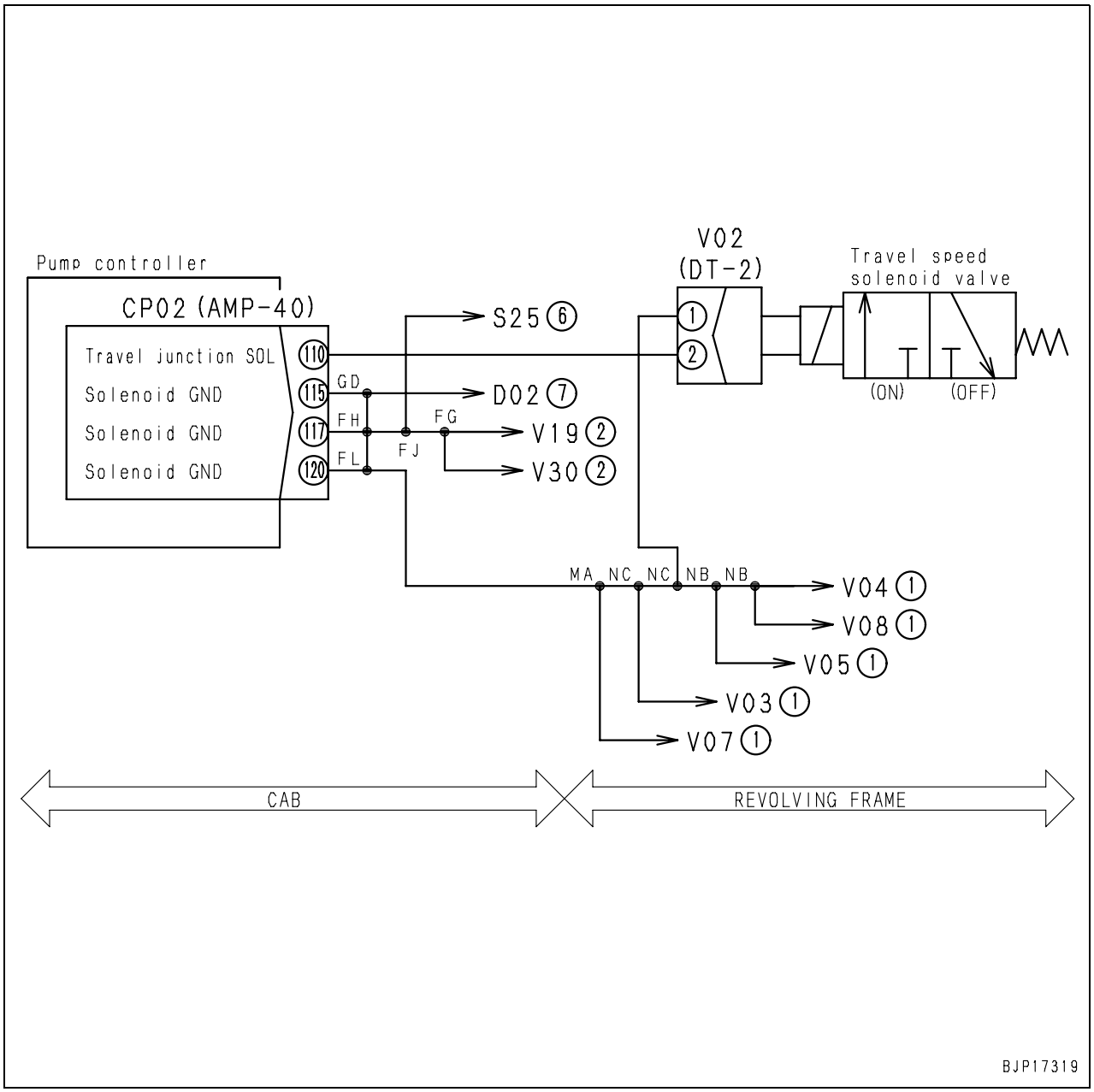


Failure code [DW91KB] Travel Junction Sol. S/C

Action code	Failure code	Trouble	Travel junction solenoid short (Pump controller system)
—	**DW91KB**		
Contents of trouble	• Abnormal current flowed at output to travel junction solenoid circuit.		
Action of controller	• Turns output to travel junction solenoid OFF. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• Hard to turn when operating travel steering.		
Related information	• Operating condition of travel junction solenoid (ON/OFF) can be checked with monitoring function. Code 02300: Solenoid 1)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective travel junction solenoid (Internal short circuit or ground fault)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			V02 (male)		Resistance	
			Between (1) – (2)		20 – 60 Ω	
			Between (2) – chassis ground		Min. 1 MΩ	
	2	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP02 (female) (110) – V02 (female) (2) and chassis ground		Resistance	Min. 1 MΩ
	3	Defective pump controller	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			CP02	Travel lever	Voltage	
			Between (110) – (115), (117), (120)	At straight-travel	Max. 1 V	
				At steering	20 – 30 V	

Circuit diagram related to travel junction solenoid of pump controller

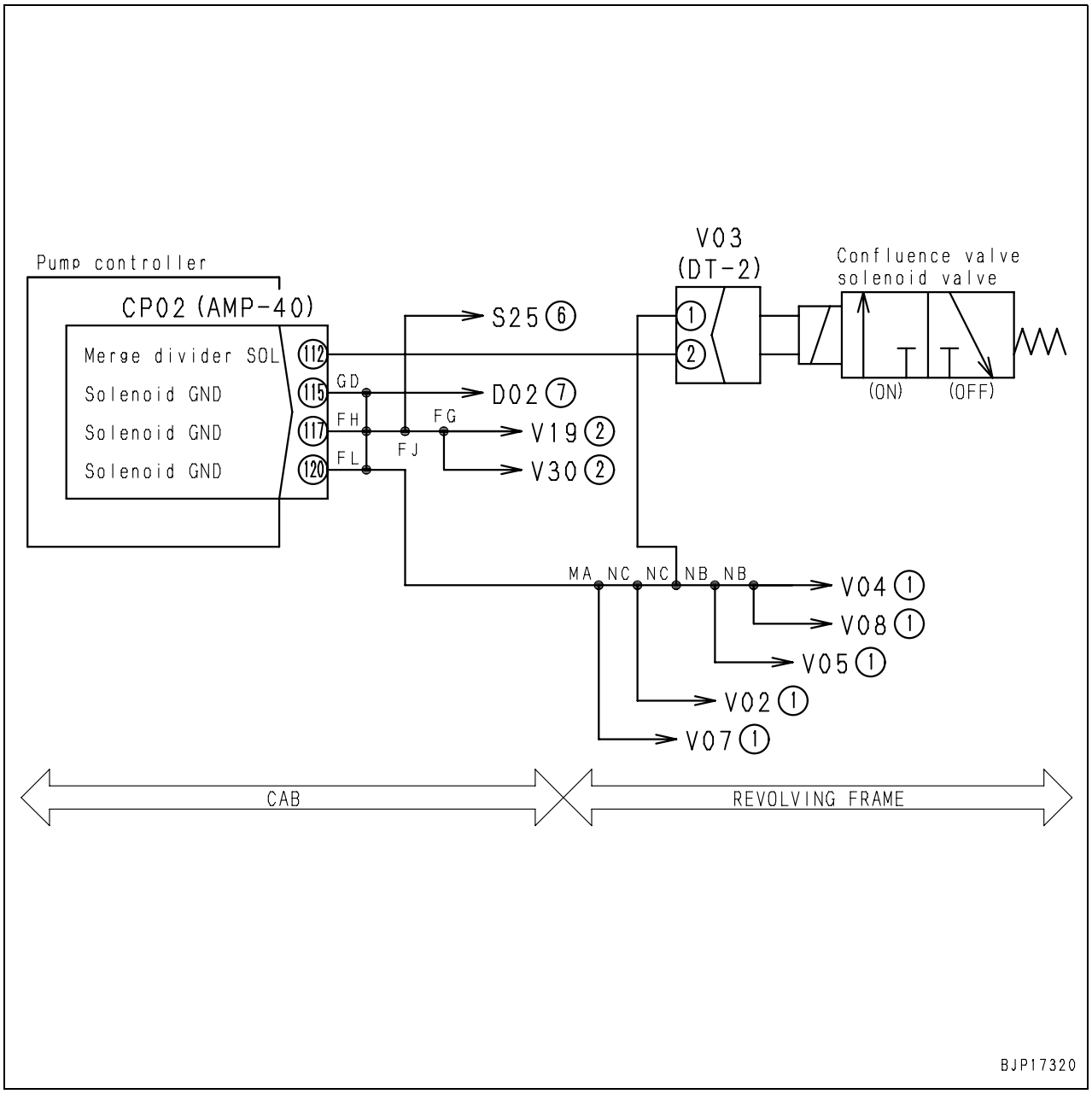


Failure code [DWJ0KA] Merge-divider Sol. Disc

Action code	Failure code	Trouble	Merge-divider solenoid disconnection (Pump controller system)
—	**DWJ0KA**		
Contents of trouble	• No current flows at output to merge-divider solenoid circuit.		
Action of controller	• None in particular. (Since no current flows, solenoid does not operate.) • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• Single operation speed of work equipment and swing is high in lifting mode (L).		
Related information	• Operating condition of merge-divider solenoid (ON/OFF) can be checked with monitoring function. (Code 02300: Solenoid 1) • Solenoid detects disconnection when output is turned on. To confirm the reproduction after repair, be sure to turn output on. (For more information on how to turn output on/off, see troubleshooting for failure code [**DWJ0KB**].)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective merge-divider solenoid (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			V03 (male)	Resistance		
			Between (1) – (2)	20 – 60 Ω		
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP02 (female) (112) – V03 (female) (2)	Resistance	Max. 1 Ω	
			Wiring harness between V03 (female) (1) – CP02 (female) (115), (117), (120) and chassis ground	Resistance	Max. 1 Ω	
	3	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CP02 (female) (112) – V03 (female) (2) and chassis ground	Voltage	Max. 1 V	
	4	Defective pump controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CP02 (female)	Resistance		
			Between (112) – (115), (117), (120)	20 – 60 Ω		

Circuit diagram related to merge-divider solenoid of pump controller

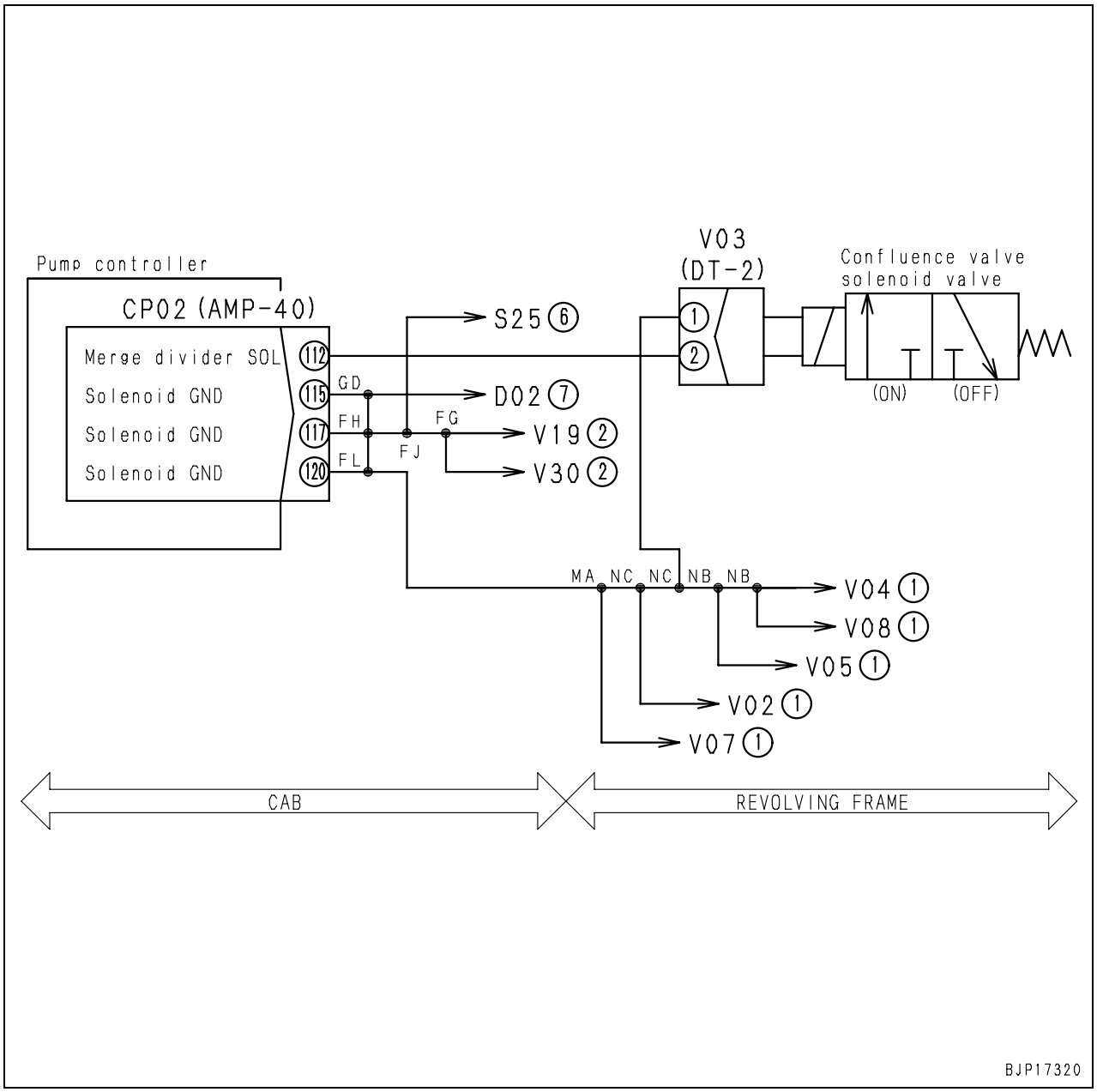


Failure code [DWJ0KB] Merge-divider Sol. S/C

Action code	Failure code	Trouble	Merge-divider solenoid short (Pump controller system)
—	**DWJ0KB**		
Contents of trouble	• Abnormal current flowed at output to merge-divider solenoid circuit.		
Action of controller	• Turns output to merge-divider solenoid circuit OFF. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• Single operation speed of work equipment and swing is high in lifting mode (L).		
Related information	• Operating condition of merge-divider solenoid (ON/OFF) can be checked with monitoring function. (Code 02300: Solenoid 1)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective merge-divider solenoid (Internal short circuit or ground fault)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			V03 (male)		Resistance	
			Between (1) – (2)		20 – 60 Ω	
			Between (2) – chassis ground		Min. 1 MΩ	
	2	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP02 (female) (112) – V03 (female) (2) and chassis ground		Resistance	Min. 1 MΩ
	3	Defective pump controller	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			CP02	Travel lever	Voltage	
			Between (112) – (115), (117), (120)	At neutral	Max. 1 V	
				When either side is operated	20 – 30 V	

Circuit diagram related to merge-divider solenoid of pump controller

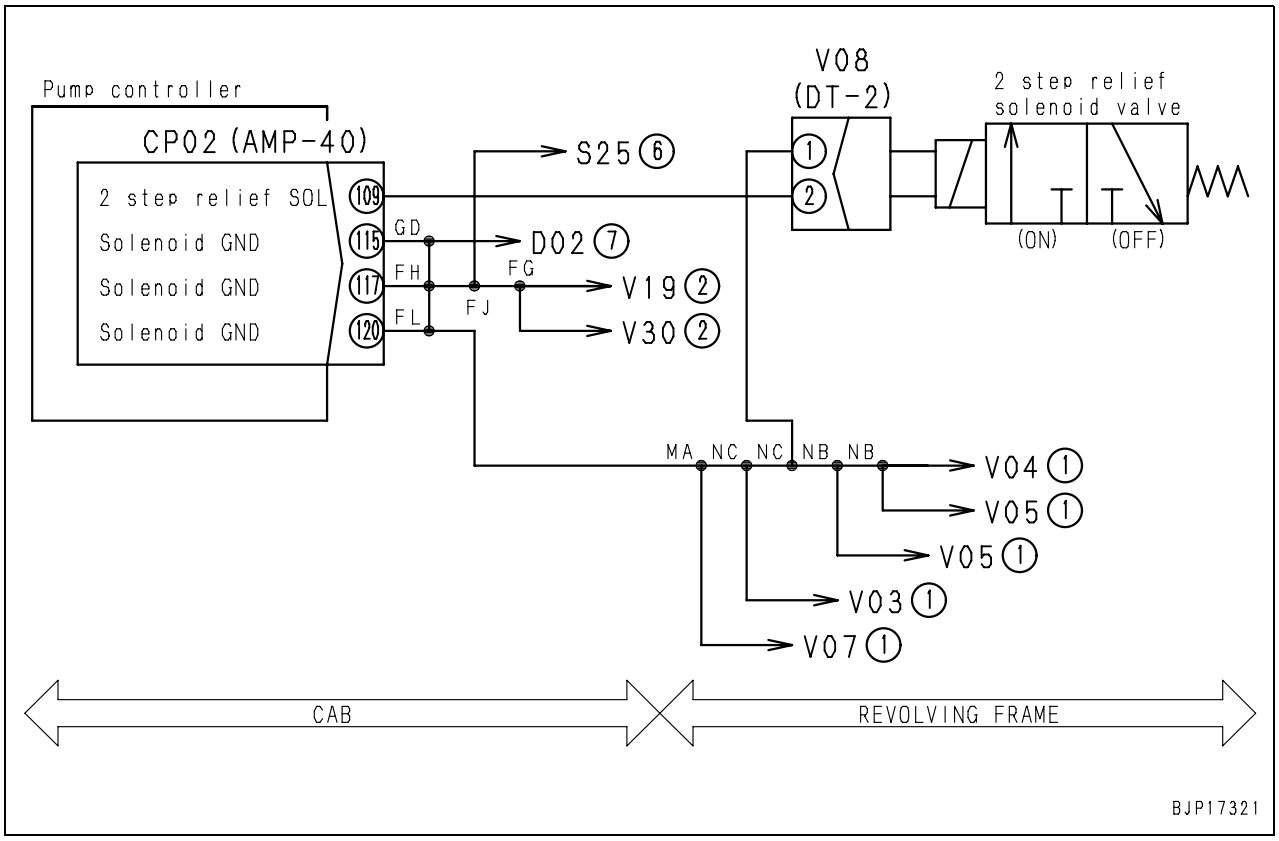


Failure code [DWK0KA] 2-stage Relief Sol. Disc.

Action code	Failure code	Trouble	2-stage relief solenoid disconnection (Pump controller system)
—	**DWK0KA**		
Contents of trouble	• No current flows at output to 2-stage relief solenoid circuit.		
Action of controller	• None in particular. (Since no current flows, solenoid does not operate.) • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• Power maximizing function does not work.		
Related information	• Operating condition of 2-stage relief solenoid (ON/OFF) can be checked with monitoring function. (Code 02300: Solenoid 1) • Solenoid detects disconnection when output is turned on. To confirm the reproduction after repair, be sure to turn output on. (For more information on how to turn output on/off, see troubleshooting for failure code [**DWK0KB**].)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective 2-stage relief solenoid (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			V08 (male)	Resistance		
			Between (1) – (2)	20 – 60 Ω		
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP02 (female) (109) – V08 (female) (2)	Resistance	Max. 1 Ω	
			Wiring harness between V08 (female) (1) – CP02 (female) (115), (117), (120)	Resistance	Max. 1 Ω	
	3	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CP02 (female) (109) – V08 (female) (2) and chassis ground	Voltage	Max. 1 V	
	4	Defective pump controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CP02 (female)	Resistance		
			Between (109) – chassis ground	20 – 60 Ω		

Circuit diagram related to 2-stage relief solenoid of pump controller

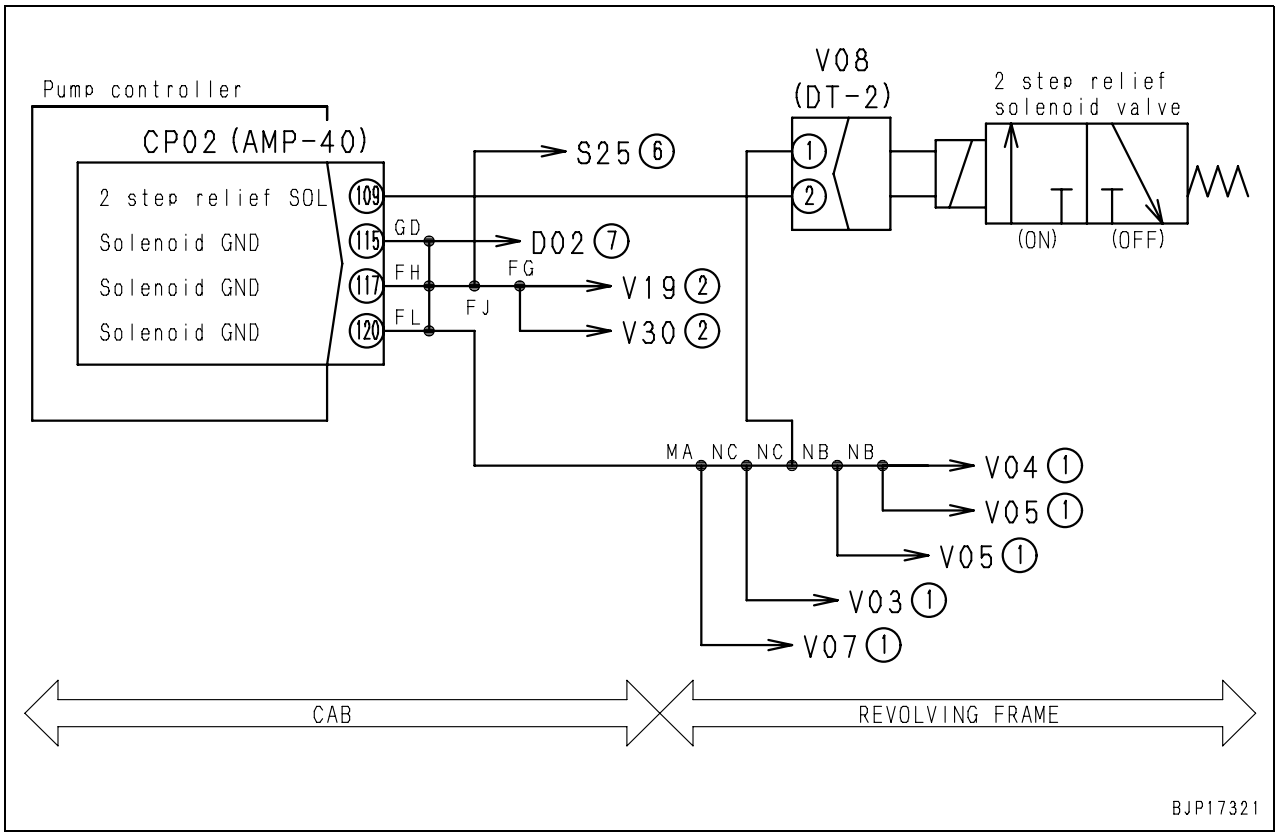


Failure code [DWK0KB] 2-stage Relief Sol. S/C

Action code	Failure code	Trouble	2-stage relief solenoid short (Pump controller system)
—	**DWK0KB**		
Contents of trouble	• Abnormal current flowed at output to 2-stage relief solenoid circuit.		
Action of controller	• Turns output to 2-stage relief solenoid circuit OFF. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• Power maximizing function does not work.		
Related information	• Operating condition of 2-stage relief solenoid (ON/OFF) can be checked with monitoring function. (Code 02300: Solenoid 1)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective 2-stage relief solenoid (Internal short circuit or ground fault)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			V08 (male)		Resistance	
			Between (1) – (2)		20 – 60 Ω	
			Between (2) – chassis ground		Min. 1 MΩ	
	2	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP02 (female) (109) – V08 (female) (2) and chassis ground		Resistance	Min. 1 MΩ
	3	Defective pump controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			CP02	Working mode	Voltage	
			Between (109) – chassis ground	When L-mode is not selected	Max. 1 V	
				When L-mode is selected	20 – 30 V	

Circuit diagram related to 2-stage relief solenoid of pump controller

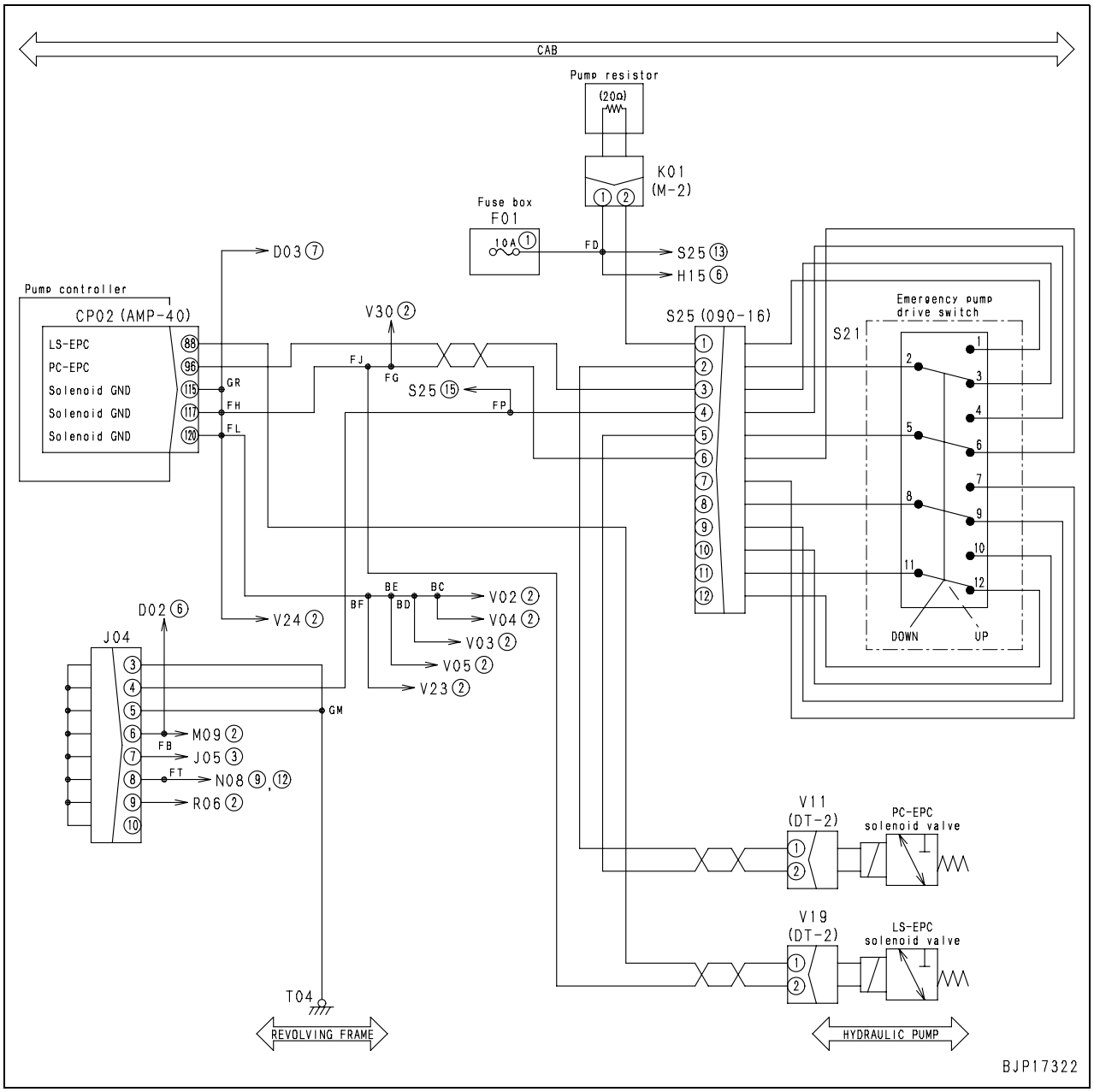


Failure code [DXA0KA] PC-EPC Sol. Disc.

Action code	Failure code	Trouble	PC-EPC solenoid disconnection (Pump controller system)
E02	**DXA0KA**		
Contents of trouble	• No current flows to PC-EPC solenoid circuit.		
Action of controller	• None in particular. (Since no current flows, solenoid does not operate.) • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• If pump load increases, engine speed lowers largely and engine may stall.		
Related information	• Output to PC-EPC solenoid (current value) can be checked with monitoring function. (Code 01300: PC-EPC solenoid current) • If solenoid and wiring harness are not defective, turn emergency drive switch on; the operator can operate the machine with output equivalent to E-mode. (Failure code [**DXA0KA**] is then displayed, but it is not defective.)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective PC-EPC solenoid (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			V11 (male)		Resistance	
			Between (1) – (2)		7 – 14 Ω	
	2	Defective emergency pump drive switch (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			S21	Switch	Resistance	
			Between (2) – (3)	OFF	Max. 1 Ω	
				ON	Min. 1 MΩ	
			Between (5) – (6)	OFF	Max. 1 Ω	
				ON	Min. 1 MΩ	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP02 (female) (96) – S21 (3)		Resistance	Max. 1 Ω
			Wiring harness between S21 (2) – V11 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between CP02 (female) (115), (117), (120) – chassis ground		Resistance	Max. 1 Ω
			Wiring harness between S21 (5) – V11 (female) (2)		Resistance	Max. 1 Ω
	4	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CP02 (female) (96) – S21 (3) and chassis ground		Voltage	Max. 1 V
			Wiring harness between S21 (2) – V11 (female) (1) and chassis ground		Voltage	Max. 1 V
	5	Defective pump controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CP02 (female)		Resistance	
			Between (96) – (115), (117), (120)		7 – 14 Ω	

Circuit diagram related to LS-EPC and PC-EPC solenoids of pump controller

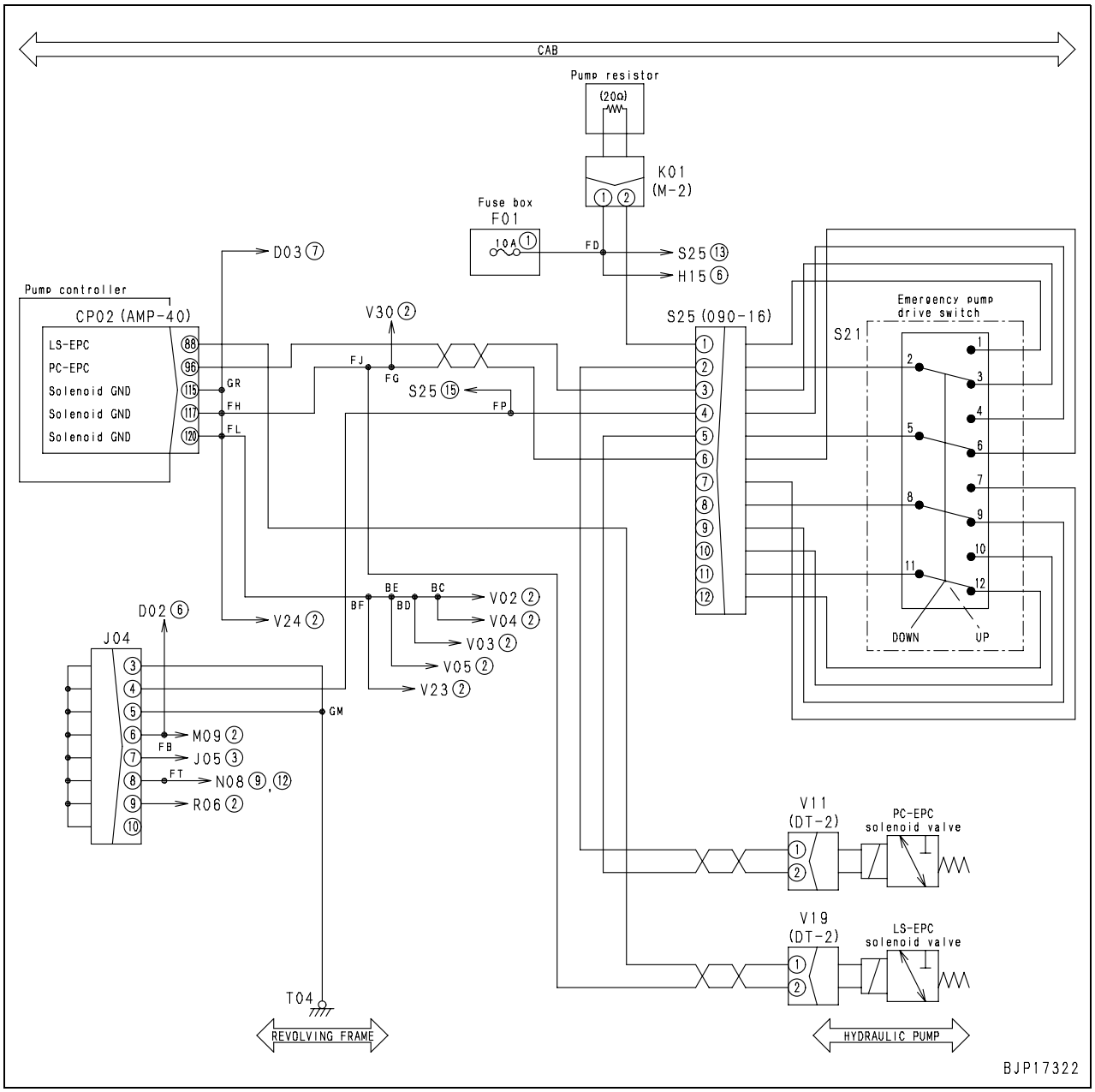


Failure code [DXA0KB] PC-EPC Sol. S/C

Action code	Failure code	Trouble	PC-EPC solenoid short (Pump controller system)
E02	**DXA0KB**		
Contents of trouble	• Abnormal current flowed to PC-EPC solenoid circuit.		
Action of controller	• Sets output to PC-EPC solenoid circuit to 0. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• If pump load increases, engine speed lowers largely and engine may stall.		
Related information	• Output to PC-EPC solenoid (current value) can be checked with monitoring function. (Code 01300: PC-EPC solenoid current) • If solenoid and wiring harness are not defective, turn emergency drive switch on; the operator can operate the machine with output equivalent to E-mode. (Failure code [**DXA0KA**] is then displayed, but it is not defective.) ★ Turn emergency pump drive switch OFF during troubleshooting.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective PC-EPC solenoid (Internal short circuit or ground fault)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			V11 (male)	Resistance		
			Between (1) – (2)	7 – 14 Ω		
			Between (1) – chassis ground	Min. 1 MΩ		
	2	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP02 (female) (96) – S21 – V11 (female) (1) and chassis ground	Resistance	Min. 1 MΩ	
	3	Defective pump controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CP02 (female)	Resistance		
			Between (96) – (115), (117), (120)	7 – 14 Ω		
			Between (96) – chassis ground	Min. 1 MΩ		

Circuit diagram related to LS-EPC and PC-EPC solenoids of pump controller

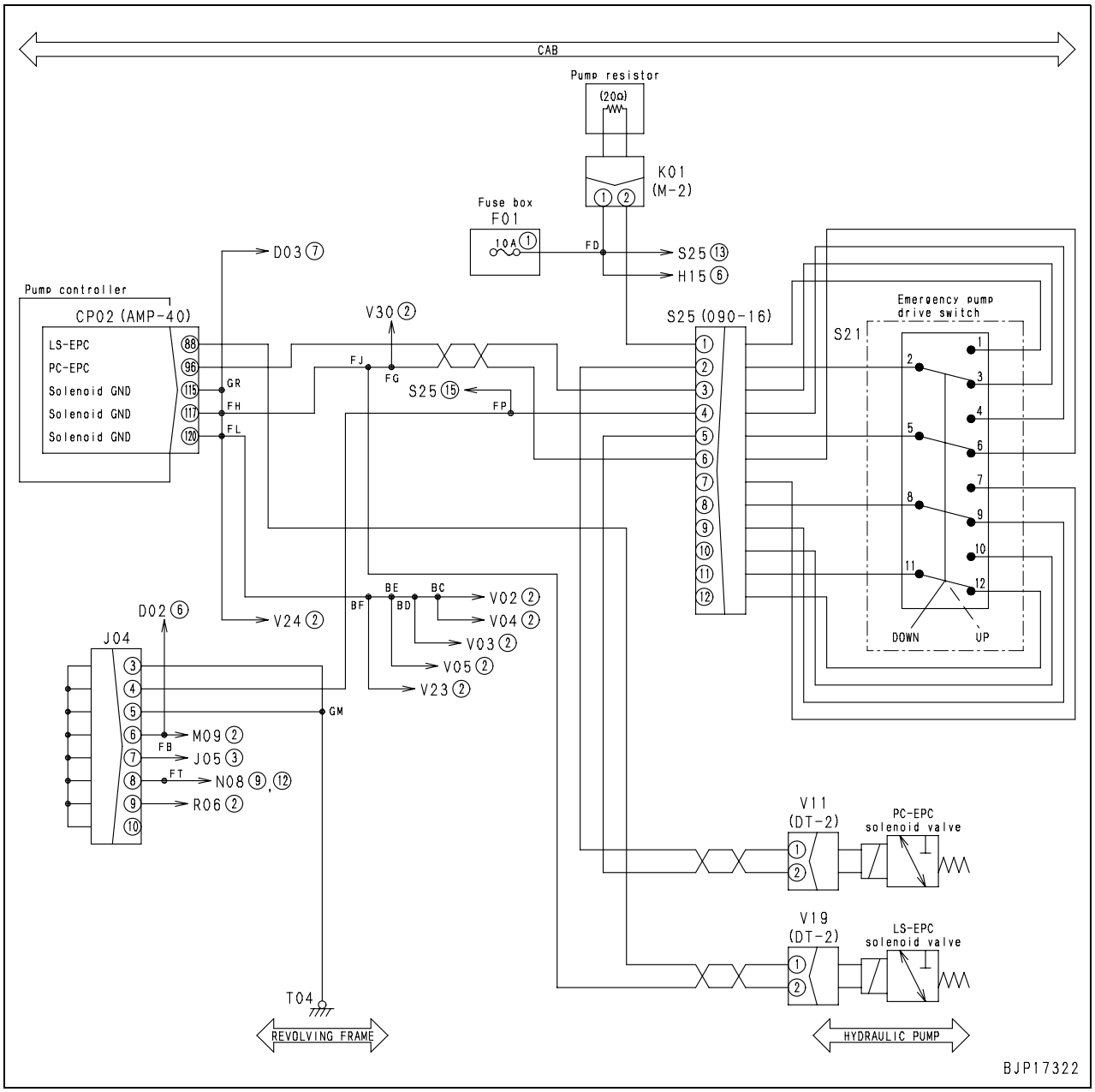


Failure code [DXE0KA] LS-EPC Sol. Disc.

Action code	Failure code	Trouble	LS-EPC solenoid disconnection (Pump controller system)
—	**DXE0KA**		
Contents of trouble	• No current flows to LS-EPC solenoid circuit.		
Action of controller	• None in particular. (Since no current flows, solenoid does not operate.) • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• Travel speed Mi or Lo is high. • Speed of work equipment and swing is high in lifting mode (L).		
Related information	• Output to LS-EPC solenoid (current value) can be checked with monitoring function. (Code 01500: LS-EPC solenoid current)		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective LS-EPC solenoid (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			V19 (male)	Resistance	
			Between (1) – (2)	7 – 14 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CP02 (female) (88) – V19 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between CP02 (female) (115), (117), (120) – J05 and chassis ground	Resistance	Max. 1 Ω
			Wiring harness between S21 (6) – V19 (female) (2)	Resistance	Max. 1 Ω
	3	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Wiring harness between CP02 (female) (88) – V19 (female) (1) and chassis ground	Voltage	Max. 1 V
	4	Defective pump controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CP02 (female)	Resistance	
			Between (88) – (115), (117), (120)	7 – 14 Ω	

Circuit diagram related to LS-EPC and PC-EPC solenoids of pump controller

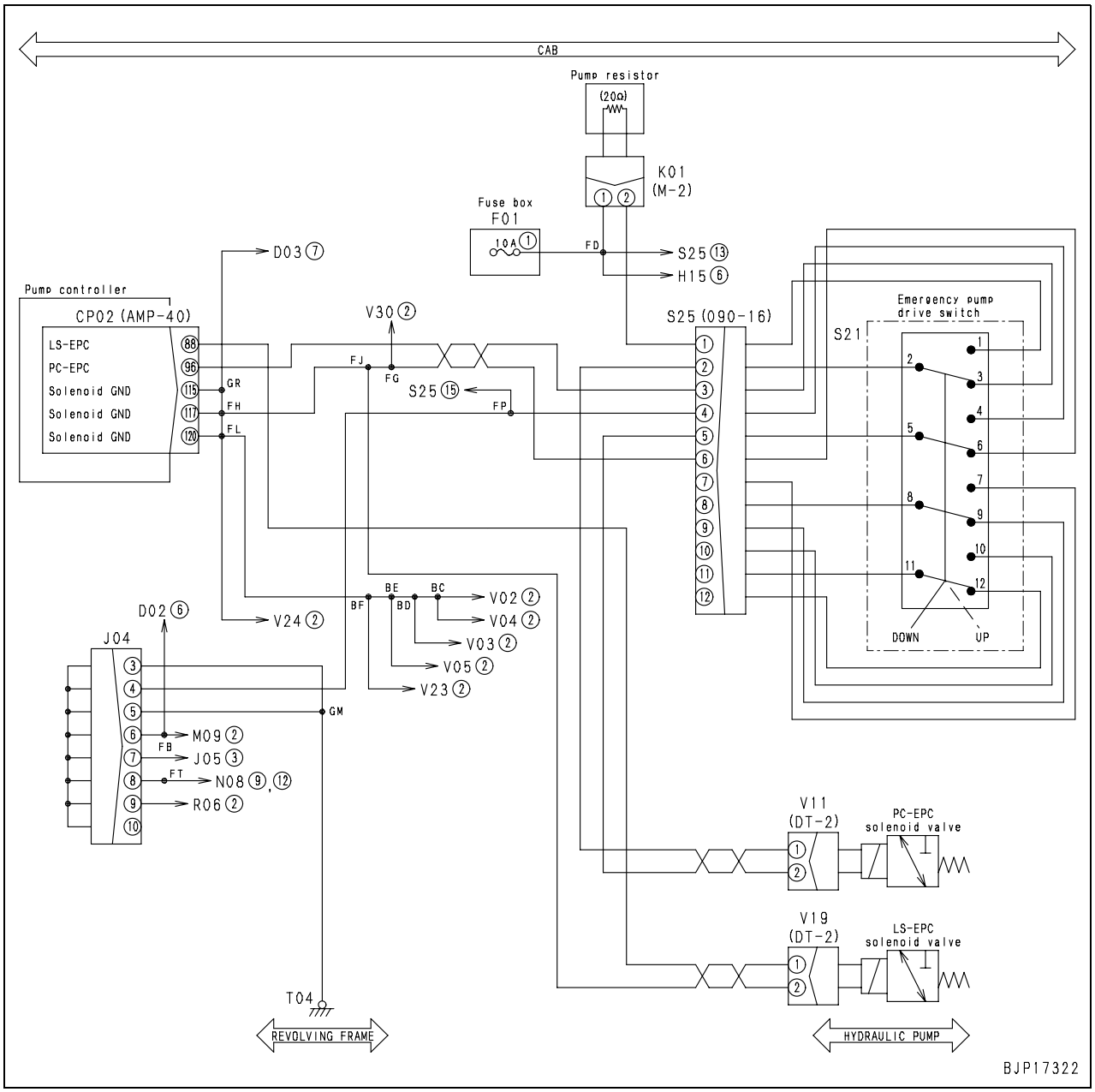


Failure code [DXE0KB] LS-EPC Sol. S/C

Action code	Failure code	Trouble	LS-EPC solenoid short (Pump controller system)
—	**DXE0KB**		
Contents of trouble	• Abnormal current flowed to LS-EPC solenoid circuit.		
Action of controller	• Sets output to LS-EPC solenoid circuit to 0. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• Travel speed Mi or Lo is high. • Work equipment speed and swing speed are high in lifting mode (L).		
Related information	• Output to LS-EPC solenoid (current value) can be checked with monitoring function. (Code 01500: LS-EPC solenoid current)		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective LS-EPC solenoid (Internal short circuit or ground fault)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			V19 (male)	Resistance	
			Between (1) – (2)	7 – 14 Ω	
			Between (1) – chassis ground	Min. 1 MΩ	
	2	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CP02 (female) (88) – V19 (female) (1) and chassis ground	Resistance	Min. 1 MΩ
	3	Defective pump controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CP02 (female)	Resistance	
			Between (88) – (115), (117), (120)	7 – 14 Ω	
			Between (88) – chassis ground	Min. 1 MΩ	

Circuit diagram related to LS-EPC and PC-EPC solenoids of pump controller

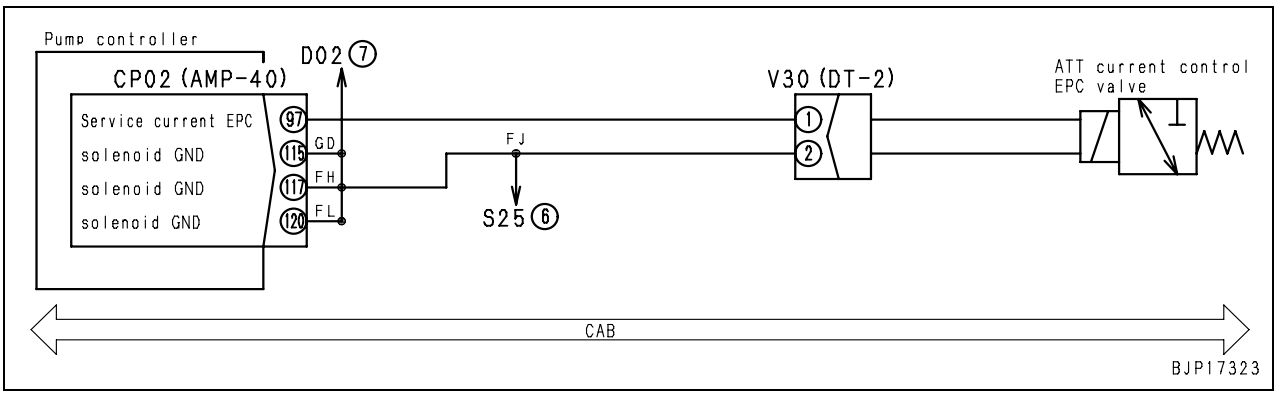


Failure code [DXE4KA] Service Current EPC Disc.

Action code	Failure code	Trouble	Service current EPC solenoid disconnection (Pump controller system)
—	**DXE4KA**		
Contents of trouble	• No current flows to service current EPC solenoid circuit.		
Action of controller	• None in particular. (Since no current flows, solenoid does not operate.) • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• Attachment does not move.		
Related information	• Carry out troubleshooting only for setting with ATT. (Confirm settings on the monitor panel.) • Output to service current EPC solenoid (current value) can be checked with monitoring function. (Code 01700: Service solenoid current)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective service current EPC solenoid (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			V30 (male)	Resistance		
			Between (1) – (2)	7 – 14 Ω		
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP02 (female) (97) – V30 (female) (1)	Resistance	Max. 1 Ω	
			Wiring harness between CP02 (female) (115), (117), (120) – V30 (female) (2)	Resistance	Max. 1 Ω	
	2	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CP02 (female) (97) – V30 (female) (1) and chassis ground	Voltage	Max. 1 V	
	3	Defective pump controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CP02 (female)	Resistance		
			Between (97) – (115), (117), (120)	7 – 14 Ω		

Circuit diagram related to service current EPC solenoid of pump controller

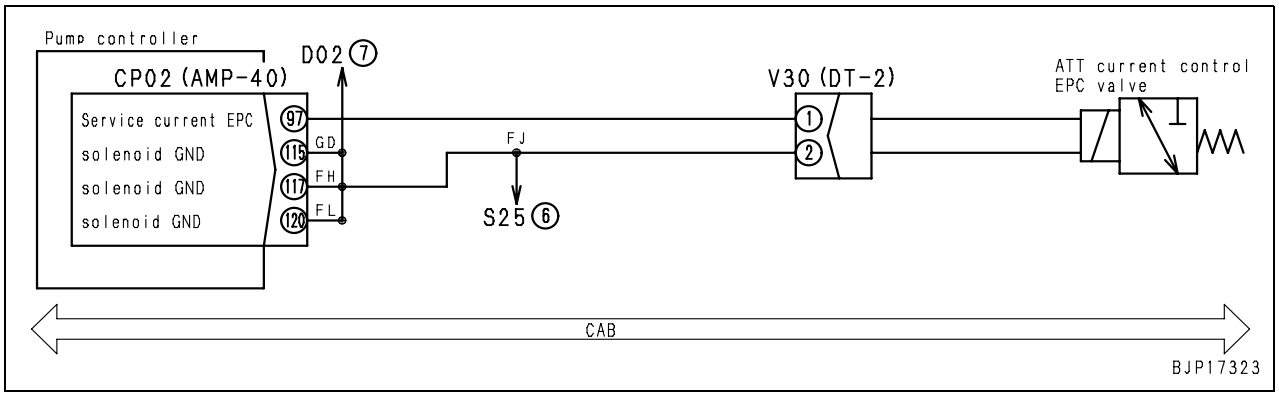


Failure code [DXE4KB] Service Current EPC S/C

Action code	Failure code	Trouble	Service current EPC solenoid short (Pump controller system)
—	**DXE4KB**		
Contents of trouble	• Abnormal current flowed to service current EPC solenoid circuit.		
Action of controller	• Sets output to service current EPC solenoid circuit to 0. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• Attachment does not move.		
Related information	• Carry out troubleshooting only for setting with ATT. (Confirm settings on the monitor panel.) • Output to service current EPC solenoid (current value) can be checked with monitoring function. (Code 01700: Service solenoid current)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective service current EPC solenoid (Internal short circuit or ground fault)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			V30 (male)	Resistance		
			Between (1) – (2)	7 – 14 Ω		
			Between (1) – chassis ground	Min. 1 MΩ		
	2	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP02 (female) (97) – V30 (female) (1) and chassis ground	Resistance	Min. 1 MΩ	
	3	Defective pump controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CP02 (female)	Resistance		
			Between (97) – (115), (117), (120)	7 – 14 Ω		
			Between (97) – chassis ground	Min. 1 MΩ		

Circuit diagram related to service current EPC solenoid of pump controller

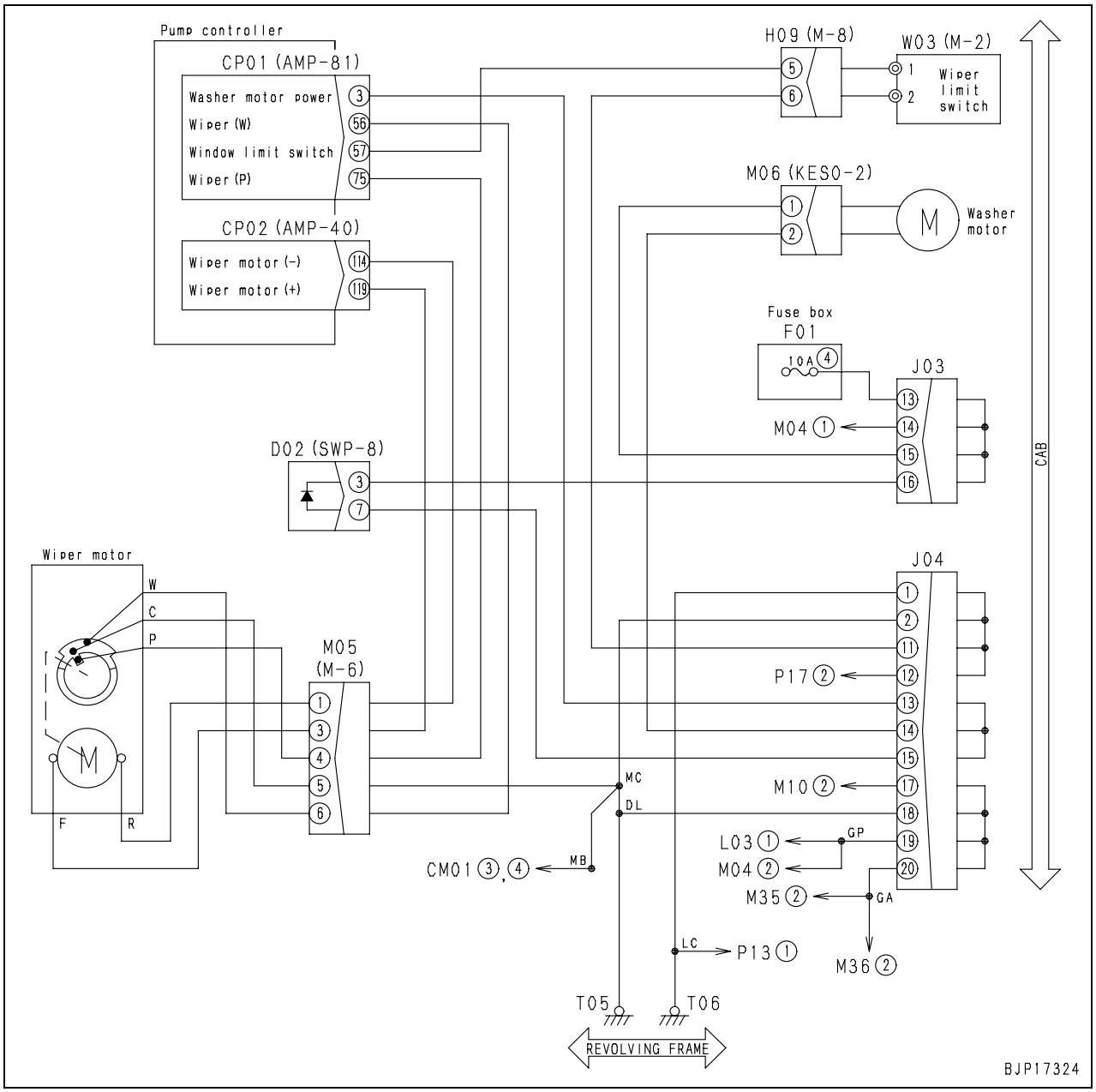


Failure code [DY20KA] Wiper Working Abnormality

User code	Failure code	Trouble	Wiper working abnormality (Pump controller system)
—	**DY20KA**		
Contents of trouble	• When windshield wiper works, W signal of working ends is not input.		
Action of controller	• Turns working output to wiper motor OFF. • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• Wiper motor does not work.		
Related information	• Condition of W contact signal of wiper working area can be checked with monitoring function. (Code: 02204 switch 5) • Method of reproducing failure code: Turn starting switch ON + Set wiper switch to INT or ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective wiper motor (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			M05 (female)	Wiper blade	Resistance	
			Between (6) – (5)	Operating range top	Max. 1 Ω	
				Other than operating range top	Min. 1 MΩ	
			Between (1) – (3)	All range	Max. 20 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP01 (female) (56) – M05 (male) (6)		Resistance	Max. 1 Ω
			Wiring harness between M05 (female) (5) – J04 – chassis ground (T05, T06)		Resistance	Max. 1 Ω
			Wiring harness between CP02 (female) (114) – M05 (male) (1)		Resistance	Max. 1 Ω
			Wiring harness between CP02 (female) (119) – M05 (male) (3)		Resistance	Max. 1 Ω
	3	Defective pump controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CP01 (female)	Wiper blade	Resistance	
			Between (56) – chassis ground	Operating range top	Max. 1 Ω	
				Other than operating range top	Min. 1 MΩ	
			Between (114) – (119)	All range	Max. 20 Ω	

Circuit diagram related to wiper motor of machine monitor

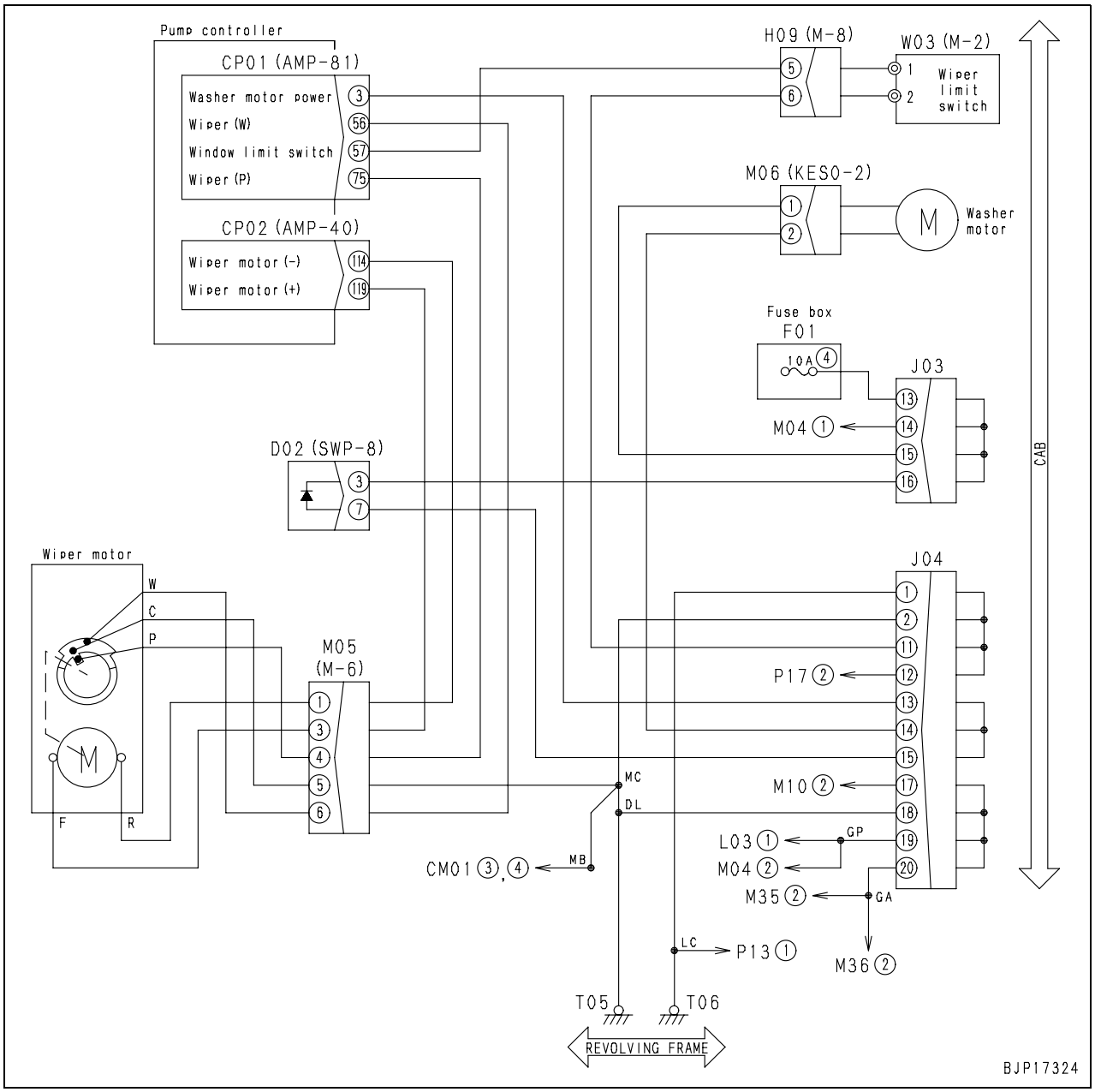


Failure code [DY20MA] Wiper Parking Abnormality

User code	Failure code	Trouble	Wiper parking abnormality (Pump controller system)
—	**DY20MA**		
Contents of trouble	• When windshield wiper parks, P signal of storage area is not input.		
Action of controller	• Turns parking output to wiper motor OFF. • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• Wiper motor does not park.		
Related information	• Condition of P contact signal of wiper parking area can be checked with monitoring function. (Code: 02204 switch 5) • Method of reproducing failure code: Turn starting switch ON + Set wiper switch to INT/ON to OFF.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective wiper motor (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			M05 (female)	Wiper blade	Resistance	
			Between (4) – (5)	Storage area	Max. 1 Ω	
				Working area	Min. 1 MΩ	
			Between (1) – (3)	All range	Max. 20 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP01 (female) (75) – M05 (male) (4)		Resistance	Max. 1 Ω
			Wiring harness between M05 (female) (5) – J04 – chassis ground (T05, T06)		Resistance	Max. 1 Ω
			Wiring harness between CP02 (female) (114) – M05 (male) (1)		Resistance	Max. 1 Ω
			Wiring harness between CP02 (female) (119) – M05 (male) (3)		Resistance	Max. 1 Ω
	3	Defective pump controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CP01 (female)	Wiper blade	Resistance	
			Between (75) – chassis ground	Storage area	Max. 1 Ω	
				Working area	Min. 1 MΩ	
			Between (114) – (119)	All range	Max. 20 Ω	

Circuit diagram related to wiper motor of machine monitor

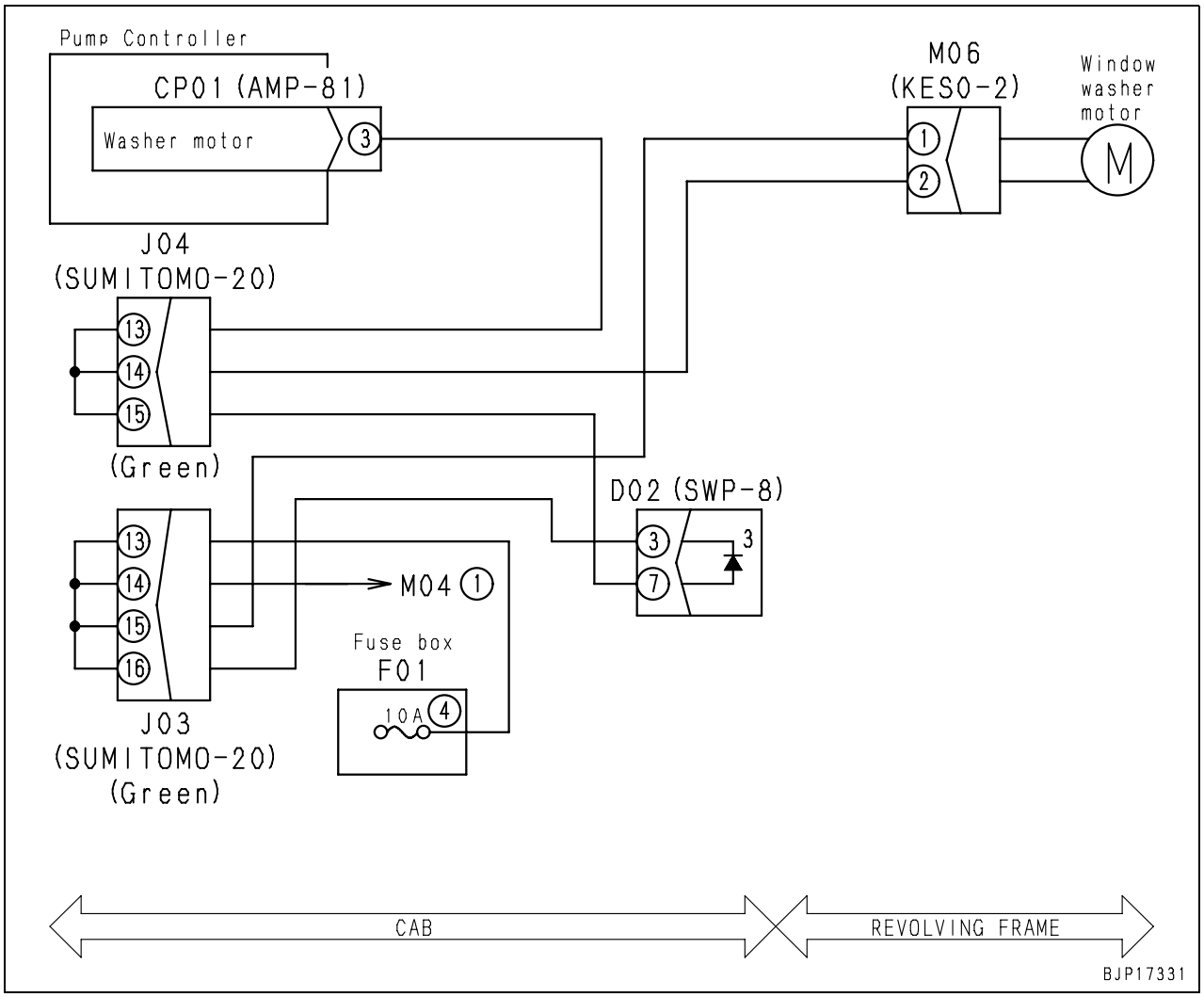


Failure code [DY2CKB] Washer Drive Short

User code	Failure code	Trouble	Window washer drive system short (Pump controller system)
—	**DY2CKB**		
Contents of trouble	• When output to window washer drive system was turned ON (ground circuit was disconnected), short circuit was detected in circuit.		
Action of controller	• Turns output to washer motor OFF. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• Window washer does not operate.		
Related information	• Method of reproducing failure code: Turn starting switch ON + Turn washer switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective washer motor (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			M06 (male)	Resistance	
			Between (1) – (2)	5 – 20 Ω	
	2	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Wiring harness between CP01 (female) (3) – J04 – M6 (female) (2), – D02 (female) (7)	Voltage	Max. 1 V
	3	Defective pump controller	If causes 1 and 2 are not detected, pump controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related to window washer motor of machine monitor

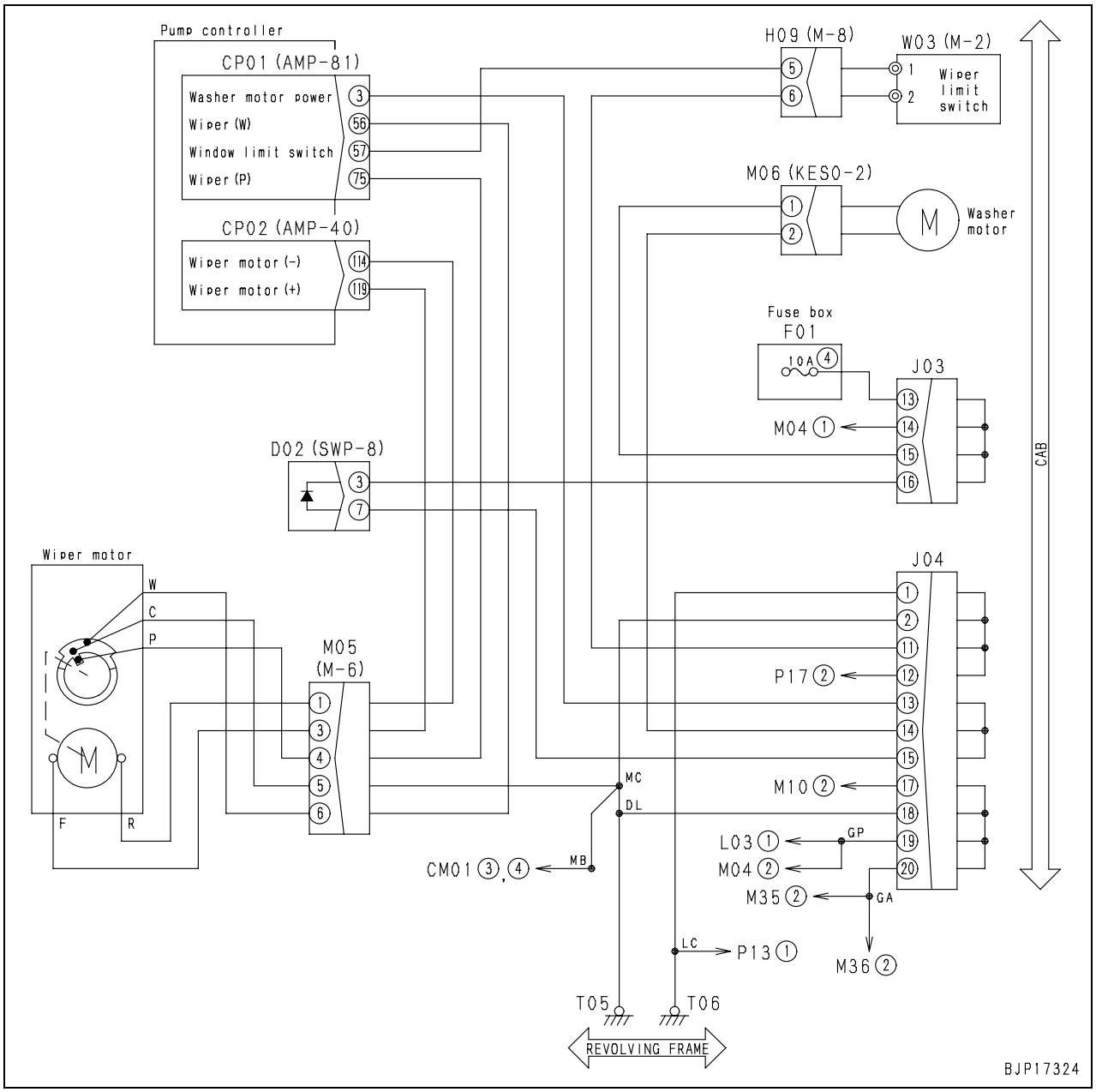


Failure code [DY2DKB] Wiper Drive (For) Short

User code	Failure code	Trouble	Wiper motor drive forward system short (Pump controller system)
—	**DY2DKB**		
Contents of trouble	• When output to wiper motor drive forward side was turned ON, short circuit was detected in circuit.		
Action of controller	• Turns output to wiper motor drive forward side OFF. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• Windshield wiper does not operate.		
Related information	• Method of reproducing failure code: Turn starting switch ON + Set wiper switch to INT or ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective wiper motor (Internal short circuit or ground fault)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			M05 (female)	Resistance		
			Between (3) – (1)	There is continuity		
			Between (3) – chassis ground	Min. 1 MΩ		
	2	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP02 (female) (119) – M05 (male) (3)	Resistance	Min. 1 MΩ	
	3	Defective pump controller	If causes 1 and 2 are not detected, pump controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)			

Circuit diagram related to wiper motor of machine monitor

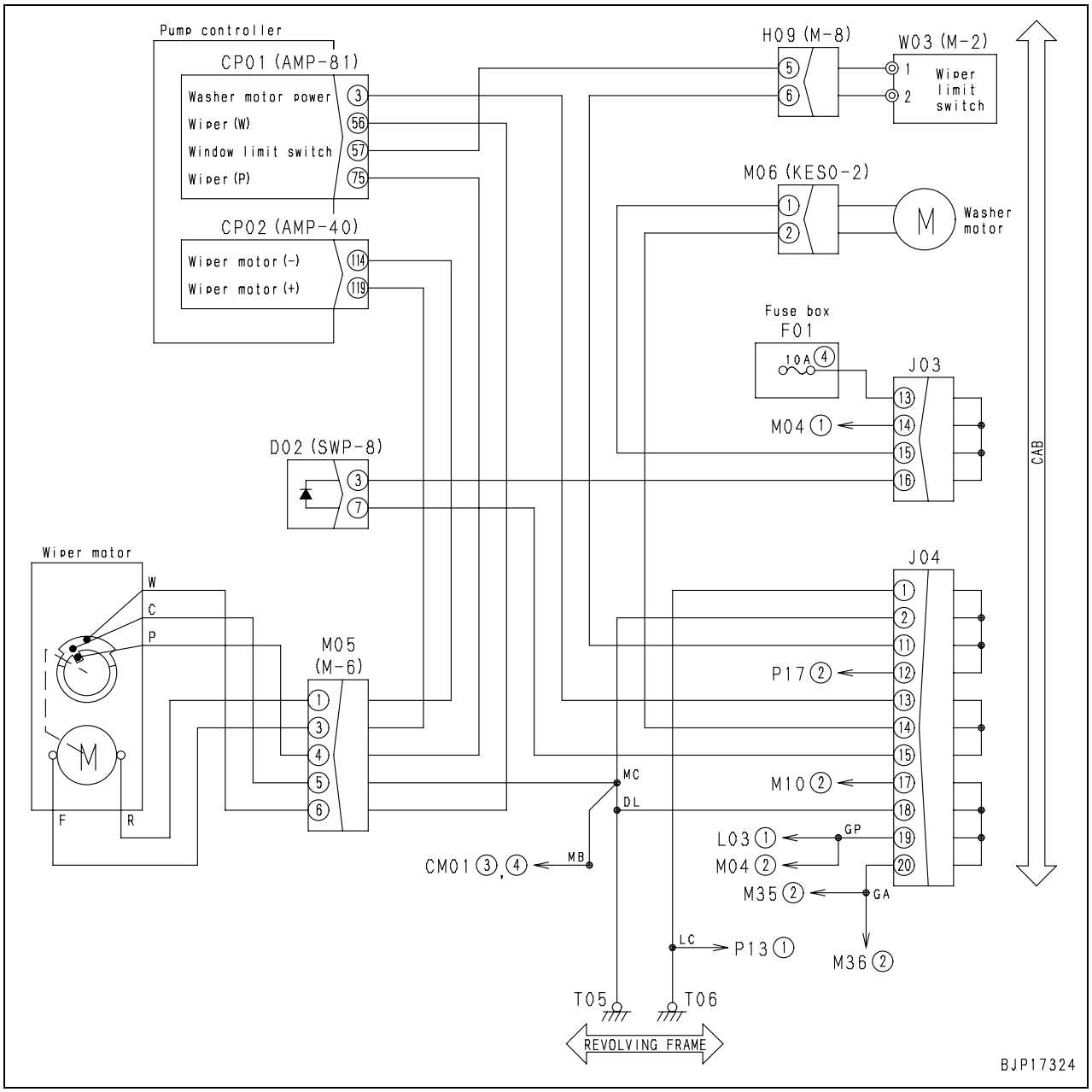


Failure code [DY2EKB] Wiper Drive (Rev) Short

User code	Failure code	Trouble	Wiper motor drive reverse system short (Pump controller system)
—	**DY2EKB**		
Contents of trouble	• When output to wiper motor drive reverse side was turned ON, short circuit was detected in circuit.		
Action of controller	• Turns output to wiper motor drive reverse side OFF. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• Windshield wiper does not operate.		
Related information	• Method of reproducing failure code: Turn starting switch ON + Set wiper switch to INT or ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective wiper motor (Internal short circuit or ground fault)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			M05 (female)	Continuity/Resistance		
			Between (1) – (3)	There is continuity		
			Between (1) – chassis ground	Min. 1 MΩ		
	2	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP02 (female) (114) – M05 (male) (1)	Resistance	Min. 1 MΩ	
	3	Defective pump controller	If causes 1 and 2 are not detected, pump controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)			

Circuit diagram related to wiper motor of machine monitor



PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN02631-00

HYDRAULIC EXCAVATOR

PC300-8
PC300LC-8
PC350-8
PC350LC-8

Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

40 Troubleshooting

Troubleshooting of electrical system (E-mode)

Before carrying out troubleshooting of electrical system

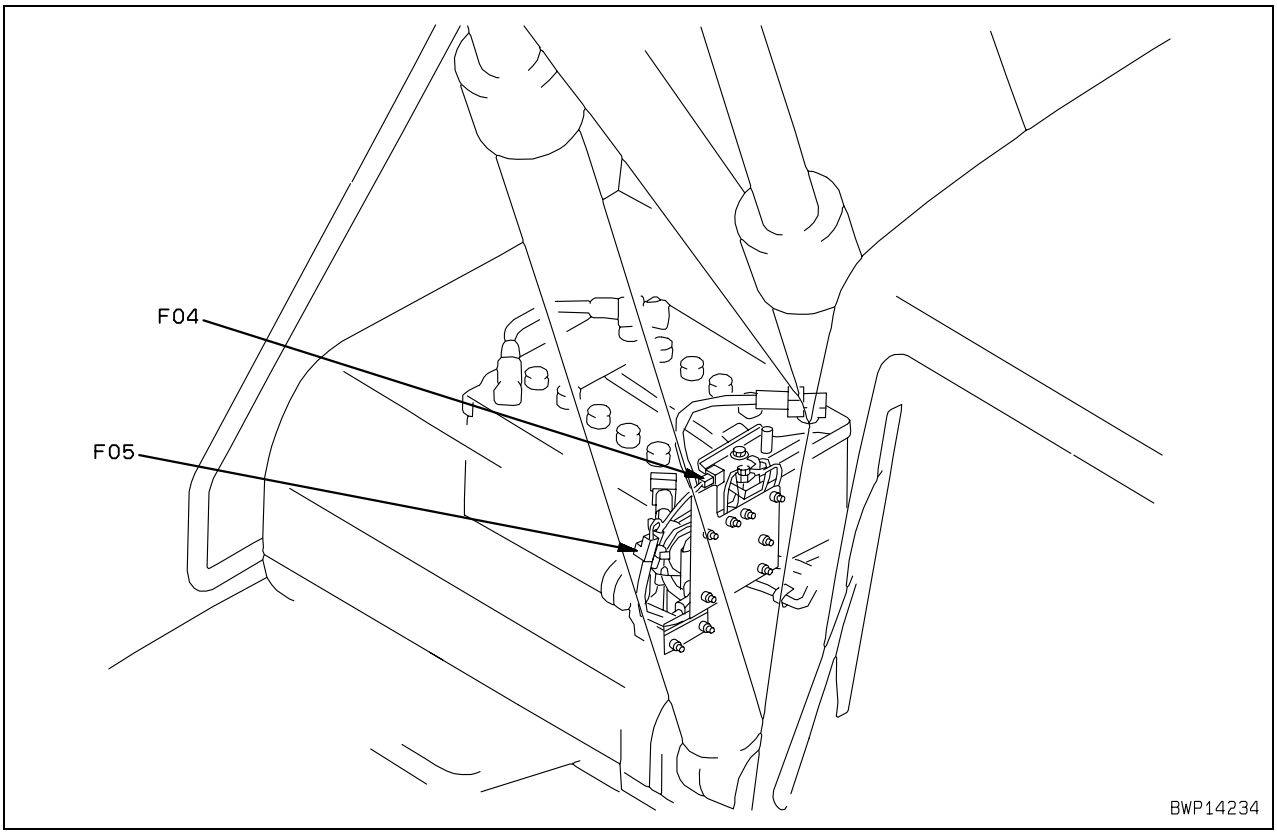
Connection table of fuse box

★ This connection table shows the devices to which each power supply of the fuse box supplies power (A switch power supply is a device which supplies power while the starting switch is in the ON position and a constant power supply is a device which supplies power while the starting switch is in the OFF and ON positions).

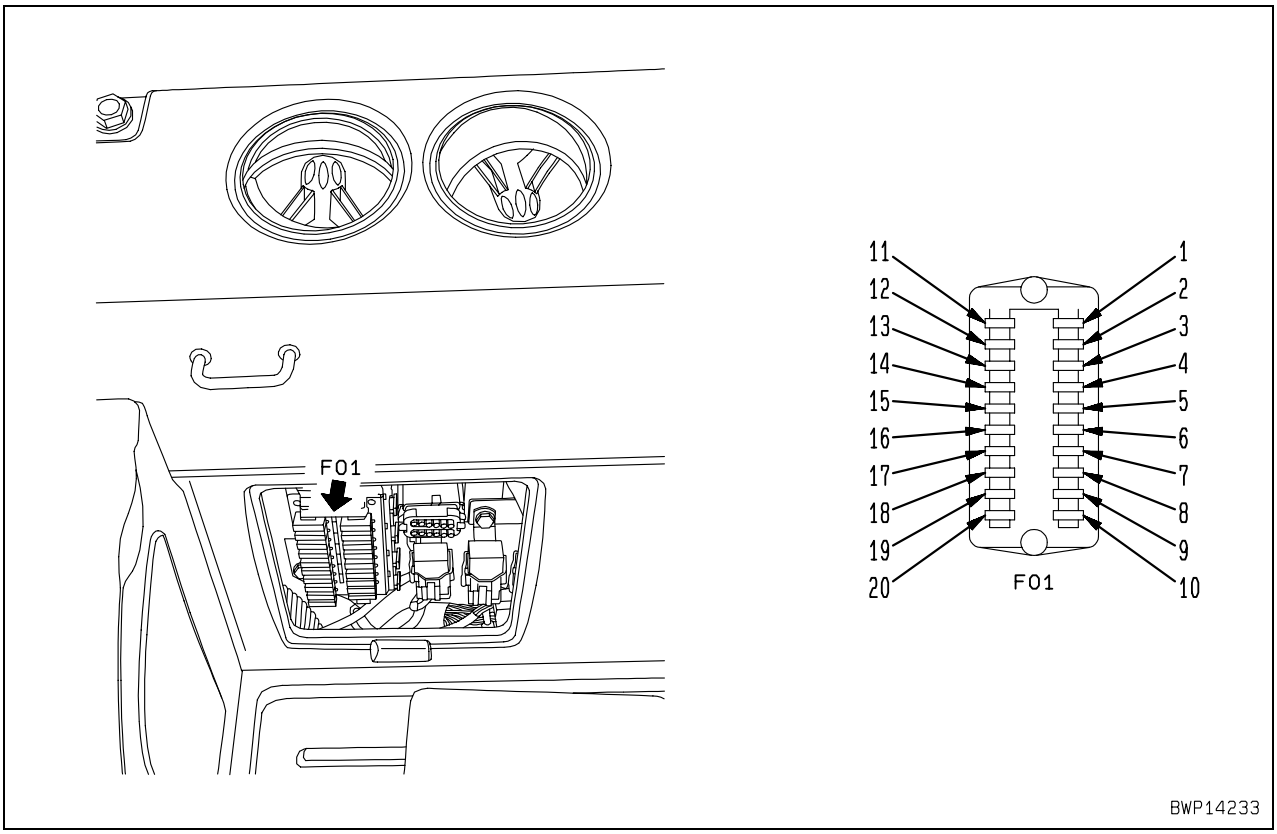
★ When carrying out troubleshooting related to the electrical system, you should check the fuses and fusible links to see if the power is supplied normally.

Type of power supply	Fusible link	Fuse No.	Fuse capacity	Destination of power
Switch power supply	F04 (65A)	1	10A	Work lamp, relay, emergency switch
		2	30A	Pump controller (Solenoid power supply)
		3	10A	PPC oil pressure lock solenoid valve
		4	10A	Cigarette lighter
				Windshield washer motor
		5	10A	Horn relay, horn
Switch power supply	F04 (65A)	6	10A	Auto preheater
		7	10A	Rotary lamp
		8	20A	Working lamp (boom), working lamp (rear)
		9	10A	Radio, speaker
				Left knob switch (pump controller input)
		10	20A	(Spare)
Switch power supply	F04 (65A)	11	20A	Air conditioner unit
		12	10A	(Spare)
		13	10A	Headlamp
		14	10A	Optional power supply (1)
		15	20A	Travel alarm, 12 V power supply
				Optional power supply (2), heated seat, air suspension seat
Constant power supply	F05 (30A)	16	10A	Radio (backup power supply)
				Room lamp
		17	20A	Pump controller
				Machine monitor
		18	10A	(Spare)
		19	30A	Engine controller
Switch power supply	Starting switch ACC	20	5A	Engine controller (ACC signal)

Locations of fusible links



Location of fuse box and fuse Nos.



Information contained in troubleshooting table

★ Troubleshooting Table and Related Circuit Diagram collectively carry the following information. Carry out troubleshooting work after fully grasping their contents.

Failure phenomenon	**Phenomenon occurring on machine**
Relative information	**Information on the failure occurred as well as the troubleshooting**

	Cause		Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Possible causes of trouble (Given numbers are reference numbers, which do not indicate priority)	**<Contents of description>** **• Standard value in normal state to judge possible causes Remarks on judgment** **<Troubles in wiring harness>** **• Disconnection** **Connector is connected imperfectly or wiring harness is broken.** **• Ground fault** **Wiring harness which is not connected to chassis ground circuit is in contact with chassis ground circuit.** **• Hot short** **Wiring harness which is not connected to power source (24 V) circuit is in contact with power source (24 V) circuit.** **• Short circuit** **Independent wiring harnesses are in contact with each other abnormally.** **<Precautions for troubleshooting>** **(1) Method of indicating connector No. and handling of T-adapter** **Insert or connect T-adapter as explained below for troubleshooting, unless otherwise specified.** **• If connector No. has no marks of “male” and “female”, disconnect connector and insert T-adapters in both male side and female side.** **• If connector No. has marks of “male” and “female”, disconnect connector and connect T-adapter to only male side or female side.** **(2) Entry order of pin Nos. and handling of tester leads** **Connect positive (+) lead and negative (–) lead of tester as explained below for troubleshooting, unless otherwise specified.** **• Connect positive (+) lead to pin No. or wiring harness entered on front side.** **• Connect negative (–) lead to pin No. or harness entered on rear side.**
	2		
	3		
	4		

Relative Electrical Circuit Diagram

	This is part of the electrical circuit diagram which shows the portion where the failure occurred. • Connector No.: Indicates (Type – numbers of a pin) (color) • Arrow : Roughly indicates the location in the machine where it is installed.

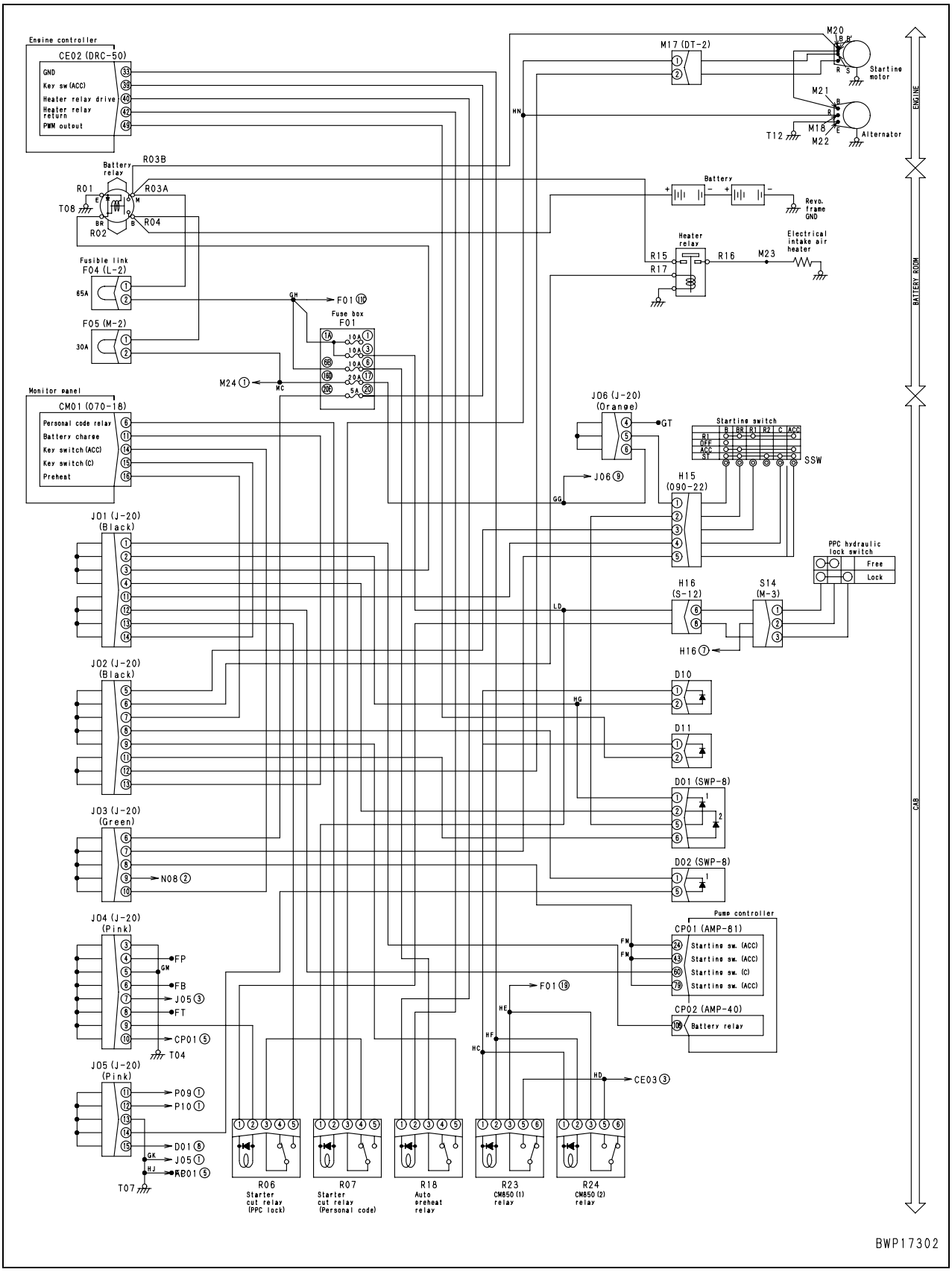
E-1 Engine does not start

Trouble	• Engine does not start (Engine does not turn).
Related information	• Engine starting circuit has following 2 start lock mechanisms: 1) Start lock by the machine monitor password 2) Start lock by the lock lever • In the case no error code for the engine controller mechanism is indicated

<table>
<tr><td rowspan="20">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="4">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Low charge level of battery</td><td colspan="2">Battery voltage</td><td colspan="2">Specific gravity of battery</td></tr>
<tr><td colspan="2">Min. 24 V</td><td colspan="2">Min. 1.26</td></tr>
<tr><td>2</td><td>Defective fuse No. 3, No. 17 or fusible link F04 and F05</td><td colspan="4">If fuse or fusible link is burnt out, the circuit probably has ground fault.
In the case the machine monitor does not light up, check the power circuit between the battery and the fuse.</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Defective starting switch (Internal disconnection)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td>H15 (male)</td><td>Position</td><td colspan="2">Resistance</td></tr>
<tr><td>Between (1) – (4)</td><td>OFF</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td></td><td></td><td>START</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Defective safety lock switch (internal short circuit)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td>S14 (female)</td><td>Lock lever</td><td colspan="2">Resistance</td></tr>
<tr><td>Between (1) – (3)</td><td>Free</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td></td><td></td><td>Lock</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td rowspan="5">5</td><td rowspan="5">Defective starting motor cut-out relay R06 or R07 (Internal short circuit or ground fault)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">R06 (male), R07 (male)</td><td colspan="2">Resistance</td></tr>
<tr><td colspan="3">Between (1) – (2)</td><td colspan="2">100 – 500 Ω</td></tr>
<tr><td colspan="3">Between (3) – (4)</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td colspan="3">Between (3) – (6)</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td rowspan="4">6</td><td rowspan="4">Defective starting motor (Internal disconnection or breakage)</td><td colspan="4">★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.
(If power supply and starting input and output are normal but starting motor does not turn, starting motor is defective.)</td></tr>
<tr><td colspan="2">Starting motor</td><td>Starting switch</td><td>Voltage</td></tr>
<tr><td colspan="2">Power supply: Between terminal B and chassis ground</td><td rowspan="2">When started</td><td>20 – 30 V</td></tr>
<tr><td colspan="2">Starting input: Terminal C – chassis ground</td><td>20 – 30 V</td></tr>
<tr><td rowspan="3">7</td><td rowspan="3">Defective alternator (Internal short circuit)</td><td colspan="4">★ Prepare with starting switch OFF, then turn starting switch ON or start engine and carry out troubleshooting.</td></tr>
<tr><td colspan="3">Alternator</td><td colspan="2">Voltage</td></tr>
<tr><td colspan="3">Terminal R – chassis ground</td><td colspan="2">Max. 1 V</td></tr>
</table>

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	8	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between F01-17 – H15 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between H15 (female) (4) – J01 – R06 (female) (6)	Resistance	Max. 1 Ω
			Wiring harness between R06 (female) (3) – M17 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between F01-3 outlet – S14 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between S14 (female) (3) – R06 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between R06 (female) (3) – R07 (female) (4)	Resistance	Max. 1 Ω
			Wiring harness between R06 (female) (2) – J04 – chassis ground	Resistance	Max. 1 Ω
	9	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between battery relay terminal B (R04) – F05 – F01-16D and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between F01-17 – H15 (female) (1) and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between H15 (female) (4) – J01 – R06 (female) (6) and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between R06 (female) (3) – M17 (female) (1) and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between F01-3 – S14 (female) (1) and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between S14 (female) (3) – R06 (female) (1) and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between R07 (female) (2) – CM01 (female) (8) and chassis ground	Resistance	Min. 1 MΩ
	10	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Wiring harness between CM01 (female) (11) – J02 – M17 (female) (2), – D01 (female) (6), – alternator terminal R and chassis ground	Voltage	Max. 1 V

Circuit diagram related to engine start and battery charging



E-2 Auto-decelerator does not operate

Trouble	• Auto-decelerator does not operate.
Related information	• Set speed of auto-decelerator is 1,300 rpm. Accordingly, set the fuel control dial to a higher rpm than this speed. If set speed is under 1,300 rpm, the auto-decelerator will not operate. • Check all the monitoring indications after starting the engine.

<table>
<tr><td rowspan="22">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="3">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Defective boom RAISE signal</td><td colspan="3">In the case monitoring is not normally indicated, proceed to troubleshooting No. E-21.</td></tr>
<tr><td>Monitoring code</td><td>Item</td><td>Normal display</td></tr>
<tr><td>01900</td><td>Boom RAISE</td><td>Operation of lever: ON
Lever in neutral: OFF</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Defective boom LOWER signal</td><td colspan="3">In the case monitoring is not normally indicated, proceed to troubleshooting No. E-22.</td></tr>
<tr><td>Monitoring code</td><td>Item</td><td>Normal display</td></tr>
<tr><td>01900</td><td>Boom LOWER</td><td>Operation of lever: ON
Lever in neutral: OFF</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Defective arm IN signal</td><td colspan="3">In the case monitoring is not normally indicated, proceed to troubleshooting No. E-23.</td></tr>
<tr><td>Monitoring code</td><td>Item</td><td>Normal display</td></tr>
<tr><td>01900</td><td>Arm IN</td><td>Operation of lever: ON
Lever in neutral: OFF</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Defective arm OUT signal</td><td colspan="3">In the case monitoring is not normally indicated, proceed to troubleshooting No. E-24.</td></tr>
<tr><td>Monitoring code</td><td>Item</td><td>Normal display</td></tr>
<tr><td>01900</td><td>Arm OUT</td><td>Operation of lever: ON
Lever in neutral: OFF</td></tr>
<tr><td rowspan="3">5</td><td rowspan="3">Defective bucket CURL signal</td><td colspan="3">In the case monitoring is not normally indicated, proceed to troubleshooting No. E-26.</td></tr>
<tr><td>Monitoring code</td><td>Item</td><td>Normal display</td></tr>
<tr><td>01901</td><td>Bucket CURL</td><td>Operation of lever: ON
Lever in neutral: OFF</td></tr>
<tr><td rowspan="3">6</td><td rowspan="3">Defective bucket DUMP signal</td><td colspan="3">In the case monitoring is not normally indicated, proceed to troubleshooting No. E-27.</td></tr>
<tr><td>Monitoring code</td><td>Item</td><td>Normal display</td></tr>
<tr><td>01901</td><td>Bucket DUMP</td><td>Operation of lever: ON
Lever in neutral: OFF</td></tr>
<tr><td rowspan="3">7</td><td rowspan="3">Defective swing signal</td><td colspan="3">In the case monitoring is not normally indicated, proceed to troubleshooting No. E-28.</td></tr>
<tr><td>Monitoring code</td><td>Item</td><td>Normal display</td></tr>
<tr><td>01900</td><td>Swing</td><td>Operation of lever: ON
Lever in neutral: OFF</td></tr>
</table>

<table>
<tr><td rowspan="6">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="3">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">8</td><td rowspan="3">Defective travel signal</td><td colspan="3">In the case monitoring is not normally indicated, proceed to trouble-shooting No. E-29.</td></tr>
<tr><td>Monitoring code</td><td>Item</td><td>Normal display</td></tr>
<tr><td>01900</td><td>Travel</td><td>Operation of lever: ON
Lever in neutral: OFF</td></tr>
<tr><td rowspan="3">9</td><td rowspan="3">Defective attachment signal</td><td colspan="3">In the case monitoring is not normally indicated, proceed to trouble-shooting No. E-30.</td></tr>
<tr><td>Monitoring code</td><td>Item</td><td>Normal display</td></tr>
<tr><td>01901</td><td>Service</td><td>Operation of lever: ON
Lever in neutral: OFF</td></tr>
<tr><td>10</td><td>Defective pump controller</td><td colspan="3">Since trouble is in system, troubleshooting cannot be carried out. (If causes 1 – 9 above are not detected, engine controller may be defective.)</td></tr>
</table>

E-3 Automatic warming-up system does not operate

Trouble	• Automatic warming-up system does not operate
Related information	• When engine coolant temperature is below 30°C, automatic warm-up system raises engine speed to 1,250 rpm. • If fuel control dial is opened more than 70% for 3 seconds or longer when starting switch is turned ON or after engine is started, automatic warm-up system is turned OFF.

<table>
<tr><td rowspan="4">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="3">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Defective engine coolant temperature signal</td><td colspan="3">In the case monitoring is not normally indicated, proceed to troubleshooting No. E-14.</td></tr>
<tr><td>Monitoring code</td><td>Item</td><td>Normal display</td></tr>
<tr><td>04102</td><td>Engine coolant temperature</td><td>Compare with actual engine coolant temperature</td></tr>
<tr><td>2</td><td>Defective pump controller</td><td colspan="3">Since trouble is in system, troubleshooting cannot be carried out. (If causes stated above are not detected, engine controller may be defective.)</td></tr>
</table>

E-4 Preheater does not operate

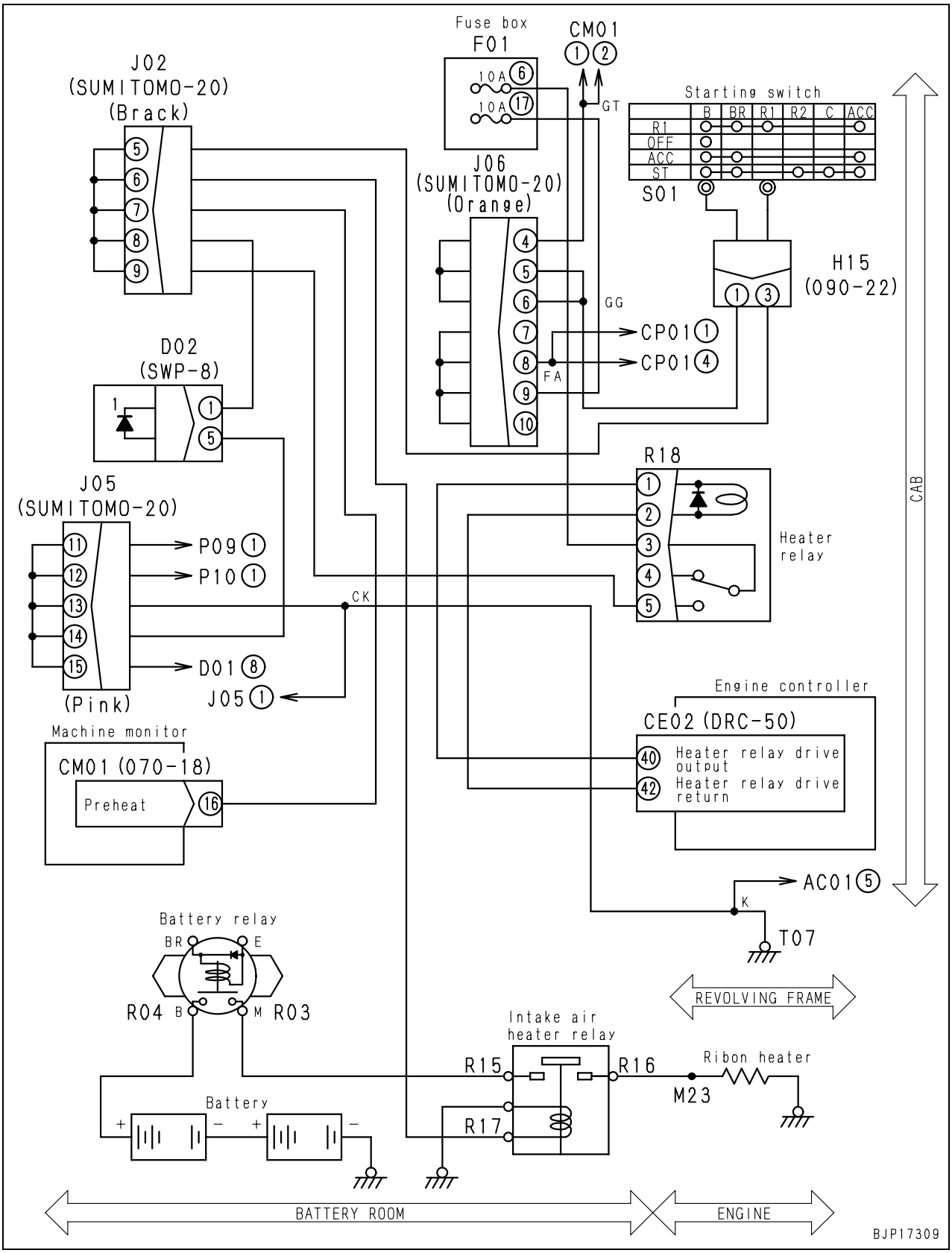
Trouble (1)	When starting switch is turned to HEAT position, preheating monitor does not light up.
Related information	Input of preheating signal (ON/OFF) can be checked with monitoring function. (Code 04500: Monitor Input 1)

<table>
<tr><td rowspan="6">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="5">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td>1</td><td>Defective starting switch system</td><td colspan="5">If preheating fails to operate (the heater does not warm up), refer to Trouble (2)</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Disconnection in wiring harness
(Disconnection in wiring or defective contact in connector)</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">Wiring harness between P02 (female) (18) – J02 (male) (7)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="4">3</td><td rowspan="4">Defective machine monitor</td><td colspan="5">★ Prepare with starting switch OFF</td></tr>
<tr><td>CM01</td><td colspan="2">Starting switch</td><td colspan="2">Voltage</td></tr>
<tr><td rowspan="2">Between (16) – chassis ground</td><td colspan="2">OFF</td><td colspan="2">Max. 1 V</td></tr>
<tr><td colspan="2">HEAT</td><td colspan="2">20 – 30 V</td></tr>
</table>

Trouble (2)	• When starting switch is turned to HEAT position, preheater does not warm up.
Related information	• During low temperature (coolant temperature below 30°C), pump controller drives the heater relay for 100 sec. after engine start to automatically preheat.

<table>
<tr><td rowspan="11">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="5">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Defective starting switch (Internal disconnection)</td><td colspan="5">★ Prepare with starting switch OFF</td></tr>
<tr><td>H15 (male)</td><td colspan="2">Starting switch</td><td colspan="2">Resistance</td></tr>
<tr><td rowspan="2">Between (1) – (3)</td><td colspan="2">OFF</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td colspan="2">HEAT</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">Defective heater relay (Internal disconnection)</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">Heater relay</td><td colspan="2">Resistance</td></tr>
<tr><td colspan="3">Coil terminal – chassis ground</td><td colspan="2"></td></tr>
<tr><td colspan="3">Between contact terminals</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Defective intake air heater (Internal disconnection).</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">Between heater terminals</td><td colspan="2">Normal if conductive</td></tr>
<tr><td></td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Disconnection in wiring harness
(Disconnection in wiring or defective contact in connector)</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">Wiring harness between H15 (female) (3) – J02 – Heater relay terminal R17</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="3">Wiring harness between battery relay terminal M (R03) – Heater relay terminal R15</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
</table>

Circuit diagram related to engine preheater

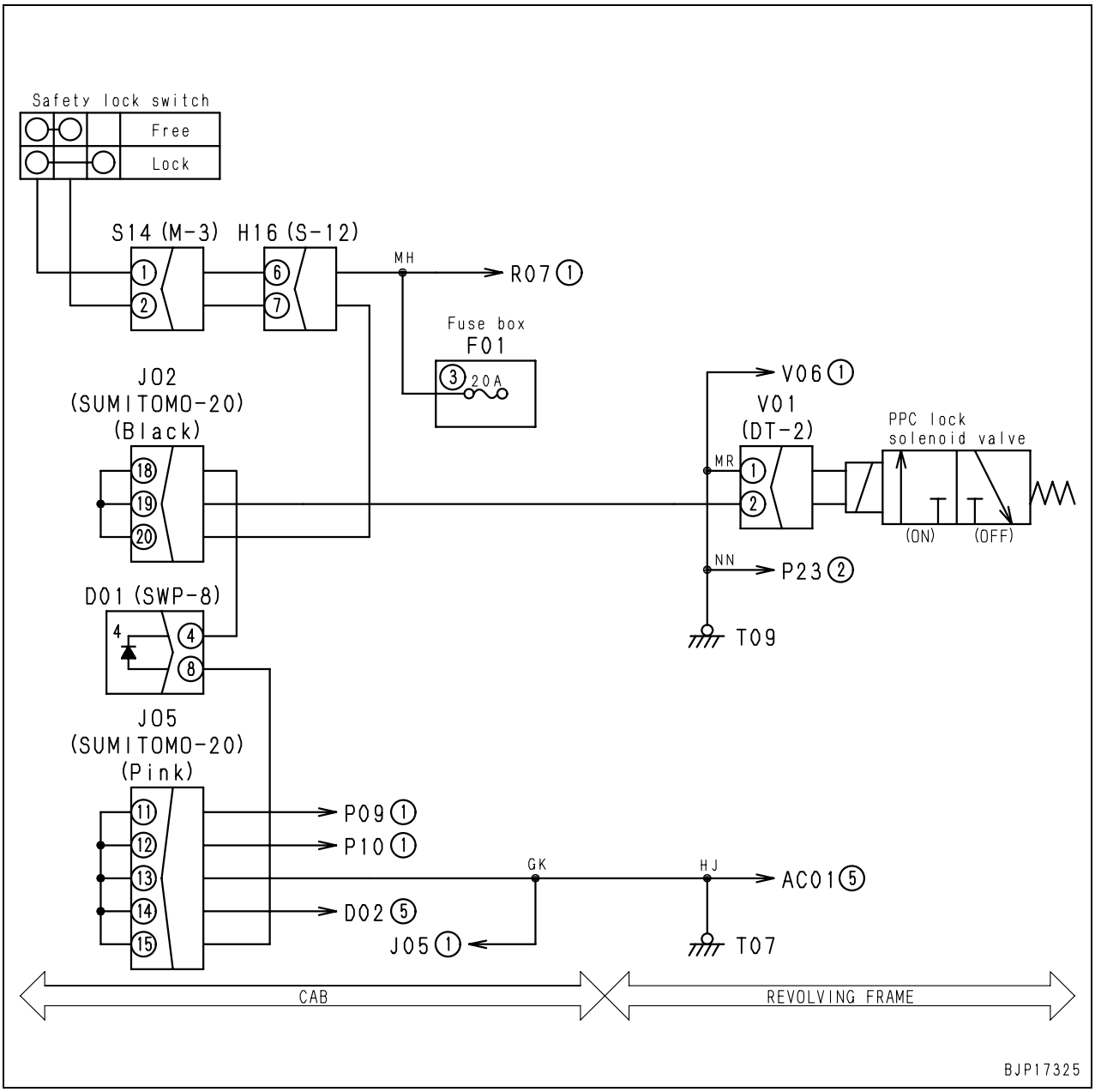


E-5 All work equipment, swing, and travel mechanism do not move

Trouble	• All travel, swing, and work equipment mechanism do not move.
Related information	—

<table>
<tr><td rowspan="16">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="4">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td>1</td><td>Defective fuse No. 3</td><td colspan="4">If fuse is burnt out, the circuit probably has ground fault.</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Defective safety lock switch (internal disconnection)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td>S14 (female)</td><td>Lock lever</td><td colspan="2">Resistance</td></tr>
<tr><td rowspan="2">Between (1) – (2)</td><td>Lock</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td>Free</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td rowspan="4">3</td><td rowspan="4">Defective PPC lock solenoid (Internal disconnection or short circuit)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="2">V01 (male)</td><td colspan="2">Resistance</td></tr>
<tr><td colspan="2">Between (1) – (2)</td><td colspan="2">20 – 60 Ω</td></tr>
<tr><td colspan="2">Between (2) – chassis ground</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td rowspan="4">4</td><td rowspan="4">Defective assembled-type diode D01 (Internal short circuit)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="2">D01 (male)</td><td colspan="2">Resistance</td></tr>
<tr><td colspan="2">Between (8) – (4)</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td rowspan="4">5</td><td rowspan="4">Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="2">Wiring harness between F01-3 outlet – S14 (male) (1)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Wiring harness between S14 (male) (2) – J02 – V01 (male) (2)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Wiring harness between V01 (female) (1) – chassis ground</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="4">6</td><td rowspan="4">Ground fault in wiring harness (Short circuit with GND circuit)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="2">Wiring harness between F01-3 outlet – S14 (male) (1) and chassis ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="2">Wiring harness between S14 (male) (2) – J02 – V01(female) (2), – D01(female) (8) and chassis ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
</table>

Circuit diagram related to PPC lock solenoid

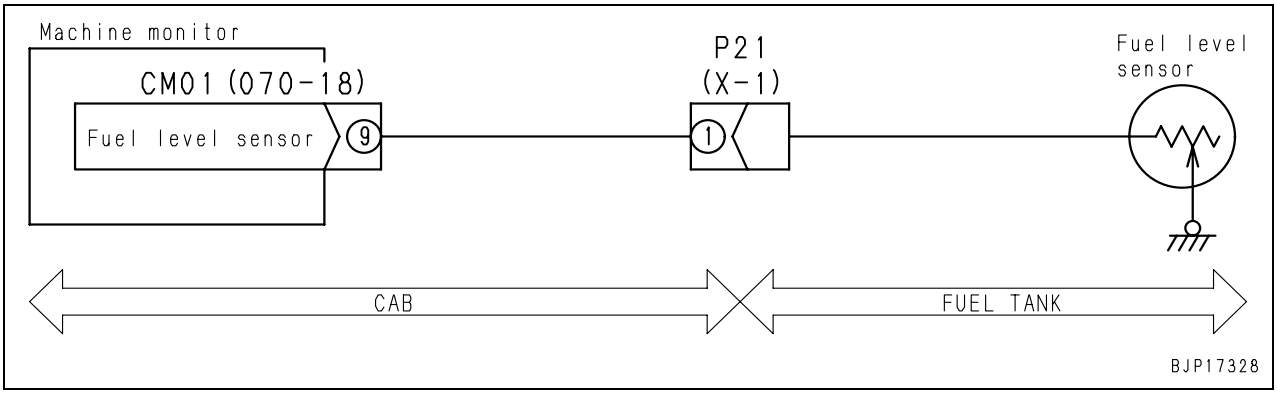


E-6 Power maximizing function does not operate

Trouble	• Power maximizing function does not work.
Related information	• Symbol mark is indicated on the machine monitor when the power maximizing switch is depressed during work equipment operation while the engine is running in P- or E-mode. • Input state of power maximizing switch (left knob switch) can be checked with monitoring function (Code 02200: Switch Input 1)

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective fuse No. 3	If fuse is burnt out, the circuit probably has ground fault.			
	2	Defective power maximizing switch (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			S11(male)	Switch	Resistance	
			Between (1) – (2)	Released	Min. 1 MΩ	
				Pressed	Max. 1 Ω	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between F01-9 outlet – S11 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between S11 (female) (2) – CP01 (female) (41)		Resistance	Max. 1 Ω
	4	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between F01-9 outlet – S11 (female) (1) and chassis ground		Resistance	Min. 1 MΩ
			Wiring harness between S11 (female) (2) – CP01 (female) (41) and chassis ground		Resistance	Min. 1 MΩ
	5	Defective pump controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			CP01	Switch	Voltage	
			Between (41) – chassis ground	Released	Max. 1 V	
				Pressed	20 – 30 V	

Circuit diagram related to power max. switch

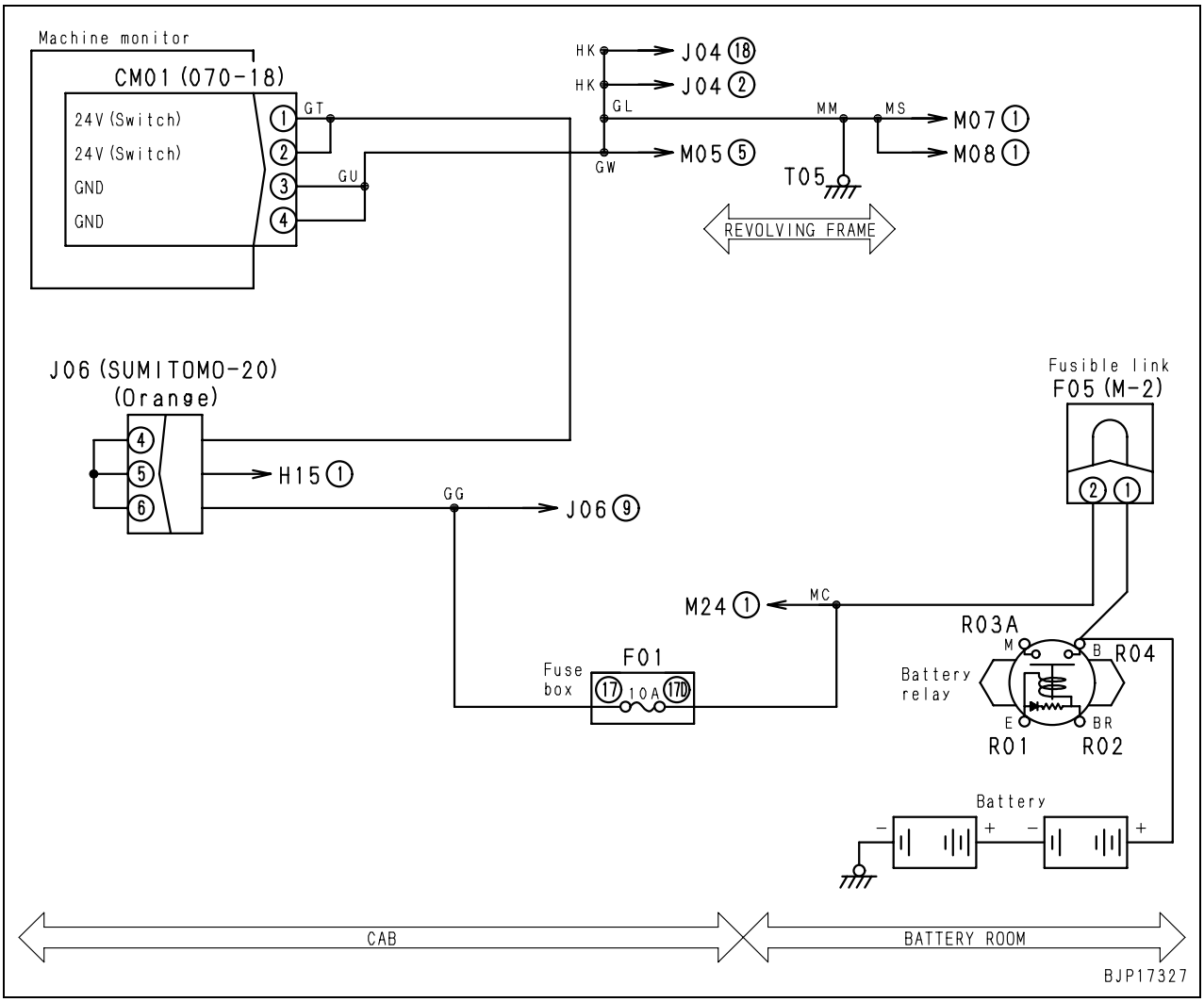


E-7 Machine monitor does not display at all

Trouble	• Machine monitor does not display at all when starting switch is turned ON
Related information	—

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective fuse No. 3	If fuse is burnt out, the circuit probably has ground fault.		
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CM01(female) (1) (2) – J06	Resistance	Max. 1 Ω
			Wiring harness between CM01 (female) (3), (4) – chassis ground	Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CM01(female) (1), (2) – J06 and chassis ground	Resistance	Min. 1 MΩ
	4	Defective machine monitor	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			CM01 (female)	Voltage/Resistance	
			Between (1), (2) – chassis ground	Voltage: 20 – 30 V	
			Between (3), (4) – chassis ground	Resistance: Max. 1 Ω	

Circuit diagram related to power source in monitor panel



E-8 Machine monitor does not display some items

Trouble	• Machine monitor does not display some items when starting switch is turned ON
Related information	—

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective machine monitor LCD	When following switches are operated, if all LCD panel is lighted up (all surface becomes white), LCD panel is normal. • Switch operation: [↶] + [A] (Simultaneous operation)
	2	Defective machine monitor	Since trouble is in system, troubleshooting cannot be carried out. (If causes stated above are not detected, engine controller may be defective.)

E-9 Contents of display by machine monitor are different from applicable machine

Trouble	• Contents of display by machine monitor are different from applicable machine.
Related information	—

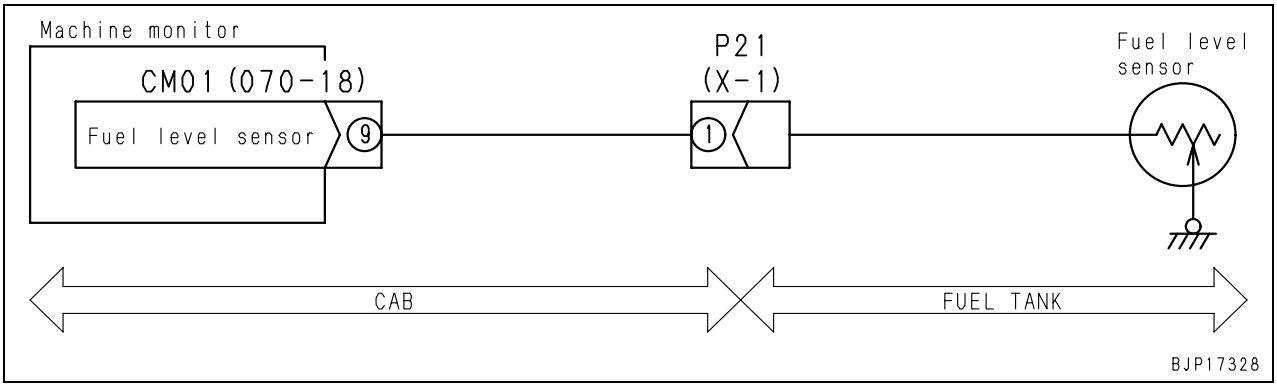
<table>
<tr><td rowspan="4">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="3">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Defective model code signal (Internal defect)</td><td colspan="3">In the case monitoring display is not normal, proceed to failure code [DA2SKQ].</td></tr>
<tr><td>Monitoring code</td><td>Item</td><td>Normal display</td></tr>
<tr><td>00200
00201</td><td>Controller model code
Select model</td><td>300</td></tr>
<tr><td>2</td><td>Defective machine monitor</td><td colspan="3">Since trouble is in system, troubleshooting cannot be carried out. (If causes stated above are not detected, engine controller may be defective.)</td></tr>
</table>

E-10 Fuel level monitor was lighted in red while engine running

Trouble	• Fuel level monitor was lighted in red while the engine running
Related information	• If fuel level gauge on the machine monitor indicates red range, fuel level monitor turns red. • Input signal (voltage) from the fuel level sensor can be checked with monitoring function. (Code 04200: Fuel level sensor voltage)

<table>
<tr><td rowspan="11">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="4">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td>1</td><td>Low fuel level
(When system is normal)</td><td colspan="4">★ Add fuel</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">Defective fuel level sensor
(Internal disconnection)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td>P21 (male)</td><td>Fuel level</td><td colspan="2">Resistance</td></tr>
<tr><td rowspan="2">Between (1) and chassis ground</td><td>FULL (Upper limit)</td><td colspan="2">Approx. 12 Ω</td></tr>
<tr><td>EMPTY (Lower limit)</td><td colspan="2">85 – 110 Ω</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Disconnection in wiring harness
(Disconnection in wiring or defective contact in connector)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="2">Wiring harness between CM01 (female) (9) – P21 (female) (1)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="4">4</td><td rowspan="4">Defective machine monitor</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td>CM01 (female)</td><td>Fuel level</td><td colspan="2">Resistance</td></tr>
<tr><td rowspan="2">Between (9) and chassis ground</td><td>FULL (Upper limit)</td><td colspan="2">Approx. 12 Ω</td></tr>
<tr><td>EMPTY (Lower limit)</td><td colspan="2">85 – 110 Ω</td></tr>
</table>

Circuit diagram related to fuel level sensor

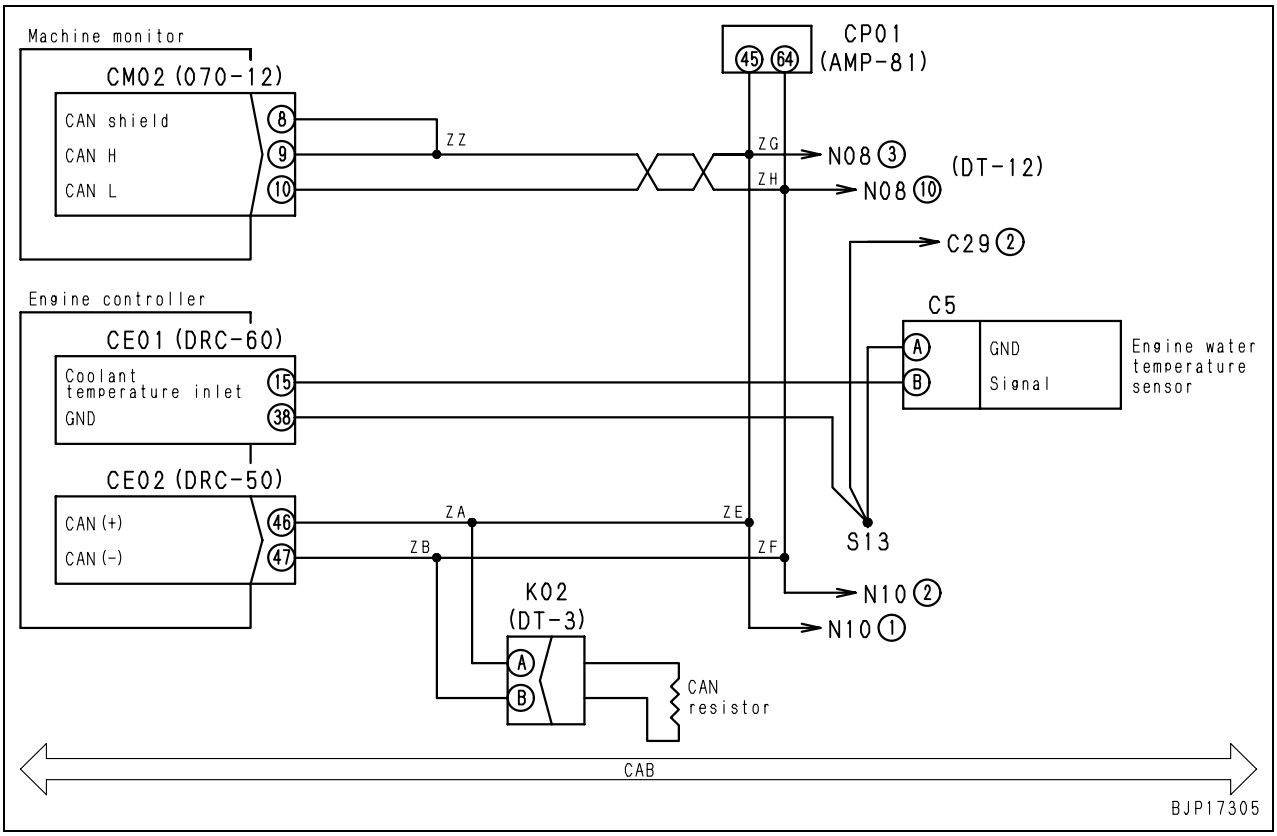


E-11 Engine coolant temperature gauge does not indicate normally

Trouble	• While engine coolant temperature is rising normally, temperature gauge does not rise from white range (C). • While engine coolant temperature is stabilized normally, temperature gauge rises to red range (H).
Related information	• Input from the engine coolant temperature sensor (temperature) can be checked with monitoring function. (Code: 04105: Engine coolant temperature) • Check if failure code for abnormal communication (machine monitor) system [**DAFRMC**] is indicated (if yes, diagnose that failure first.)

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective coolant temperature sensor (Internal disconnection or short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			C5 (male)	Engine coolant temperature	Resistance	
			Between (B) – (A)	10 – 100°C	90 – 3.5 kΩ	
			Between (B) – chassis ground		Min. 1 MΩ	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CE01 (female) (15) – C5 (female) (B)		Resistance	Max. 1 Ω
			Wiring harness between C5 (female) (A) – chassis ground		Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CE01 (female) (15) – C5 (female) (B) and chassis ground		Resistance	Min. 1 MΩ
	4	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CE01 (female) (15) – C5 (female) (B) and chassis ground		Voltage	Max. 1 V
	5	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CE01 (female)	Engine coolant temperature	Resistance	
			Between (15) – chassis ground	10 – 100°C	90 – 3.5 kΩ	

Circuit diagram related to engine coolant temperature sensor

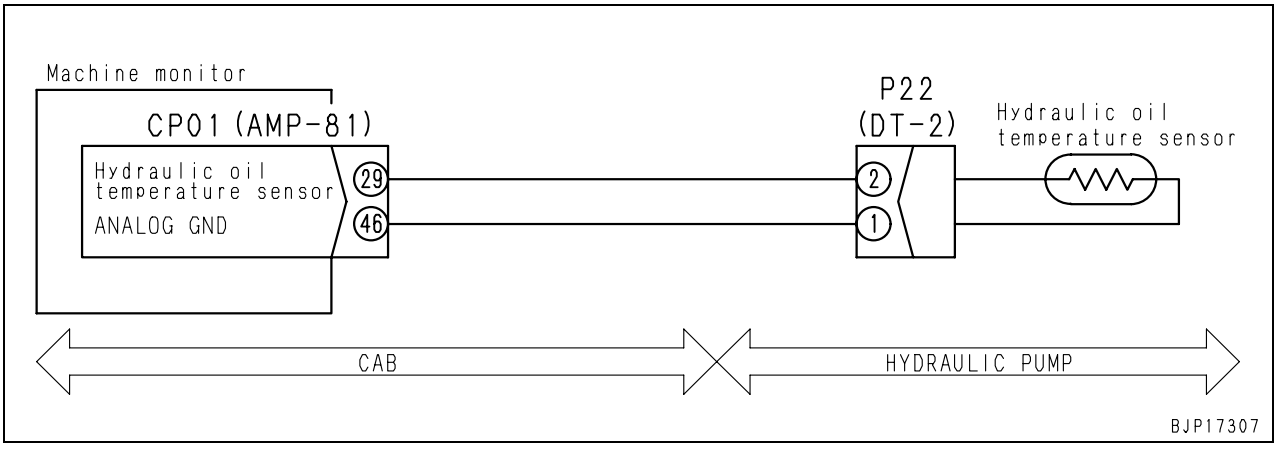


E-12 Hydraulic oil temperature gauge does not indicate normally

Trouble	• While hydraulic oil temperature is rising normally, temperature gauge does not rise from white range (C). • While hydraulic oil temperature is stabilized normally, temperature gauge rises to red range (H).
Related information	• Input from the hydraulic oil temperature sensor (temperature) can be checked with monitoring function. (Code 04402: Hydraulic oil temperature)

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective hydraulic oil temperature sensor (Internal disconnection or short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			P22 (male)	Engine coolant temperature	Resistance	
			Between (1) – (2)	10 – 100°C	90 – 3.5 kΩ	
			Between (2) – chassis ground		Min. 1 MΩ	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP01 (female) (29) – P22 (female) (2)		Resistance	Max. 1 Ω
			Wiring harness between CP01 (female) (46) – P22 (female) (1)		Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP01 (female) (29) – P22 (female) (2) and chassis ground		Resistance	Min. 1 MΩ
	4	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CP01 (female) (29) – P22 (female) (2) and chassis ground		Voltage	Max. 1 V
	5	Defective machine monitor	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CP01	Engine coolant temperature	Resistance	
			Between (29) – (46)	10 – 100°C	90 – 3.5 kΩ	
			Between (29) – chassis ground		Min. 1 MΩ	

Circuit diagram related to hydraulic oil temperature sensor

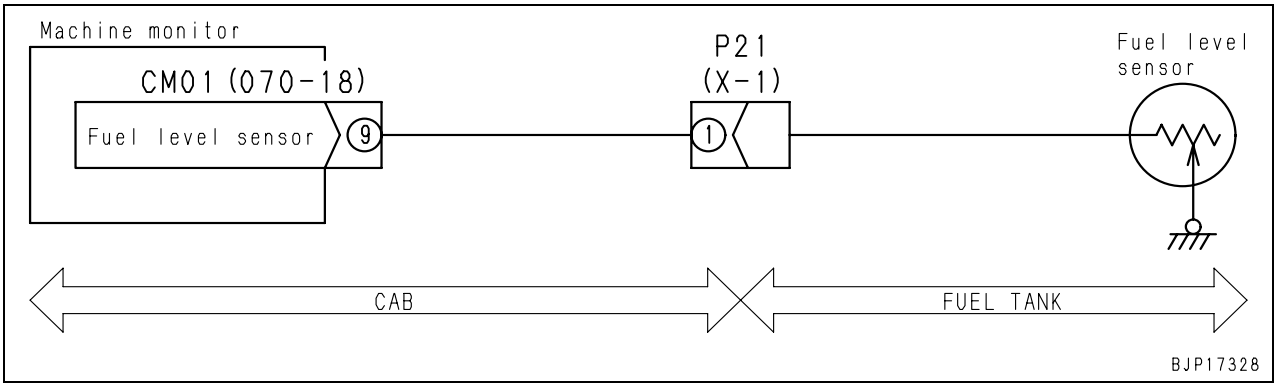


E-13 Fuel level gauge does not indicate normally

Trouble	• While fuel is added, fuel level gauge does not rise from red range (E). • While fuel level is low, fuel level gauge does not lower from green range (F)
Related information	• Input signal (voltage) from the fuel level sensor can be checked with monitoring function. (Code 04200: Fuel level sensor voltage)

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective fuel level sensor (Internal disconnection or short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			P21 (male)	Fuel level	Resistance	
			Between (1) – chassis ground	FULL (Upper limit)	Approx. 12 Ω	
				EMPTY (Lower limit)	85 – 110 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CM01 (female) (9) – P21 (female) (1)		Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CM01 (female) (9) – P21 (female) (1) and chassis ground		Resistance	Min. 1 MΩ
	4	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CM01 (female) (9) – P21 (female) (1) and chassis ground		Voltage	Max. 1 V
	5	Defective machine monitor	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CM01	Fuel level	Resistance	
			Between (9) – chassis ground	FULL (Upper limit)	Approx. 12 Ω	
				EMPTY (Lower limit)	85 – 110 Ω	

Circuit diagram related to fuel level sensor

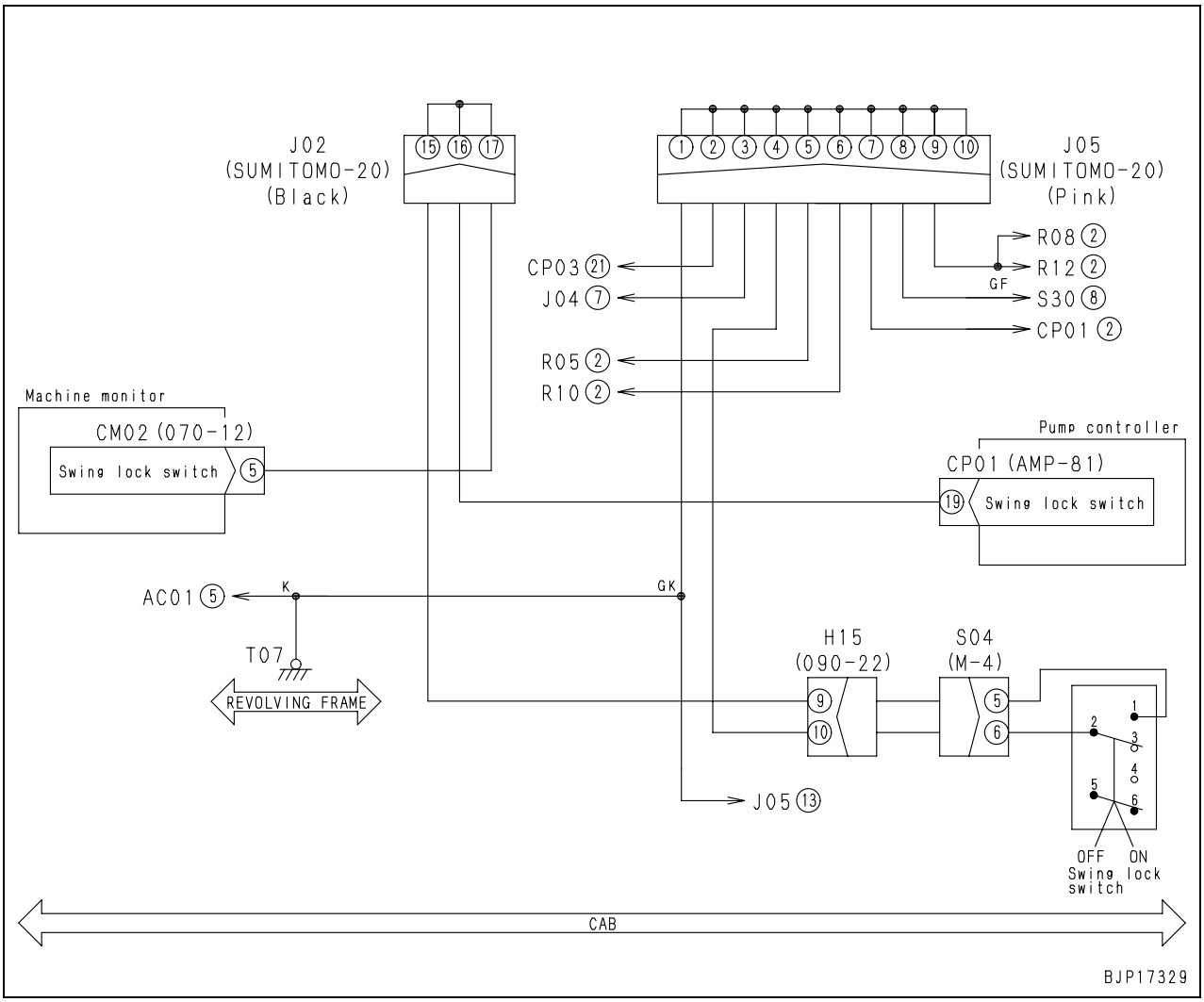


E-14 Swing lock monitor does not indicate normally

Trouble	• When swing lock switch is turned ON, swing lock monitor does not light up. • When swing lock switch is turned OFF, swing lock monitor lights up.
Related information	• Input from swing lock switch (ON/OFF) can be checked with monitoring function. (Code 04502: Monitor Input 3)

<table>
<tr><td rowspan="15">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="5">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Defective swing lock switch (Internal disconnection or short circuit)</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td>S04 (female)</td><td colspan="2">Swing lock switch</td><td colspan="2">Resistance</td></tr>
<tr><td>Between (1) – (2)</td><td colspan="2">OFF</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">Wiring harness between CM02 (female) (5) – J02 – S04 (male) (5)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="3">Wiring harness between S04 (male) (6) – J05 – chassis ground</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Ground fault in wiring harness (Short circuit with GND circuit)</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">Wiring harness between CM02 (female) (5) – J02 – S04 (male) (5) and chassis ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Hot short (Short circuit with 24V circuit) in wiring harness</td><td colspan="5">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td colspan="3">Wiring harness between CM02 (female) (5) – J02 – S04 (male) (5) and chassis ground</td><td>Voltage</td><td>Max. 1 V</td></tr>
<tr><td rowspan="3">5</td><td rowspan="3">Defective machine monitor</td><td colspan="5">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td>CM02</td><td colspan="2">Swing lock switch</td><td colspan="2">Voltage</td></tr>
<tr><td>Between (5) – chassis ground</td><td colspan="2">OFF</td><td colspan="2">20 – 30 V</td></tr>
<tr><td></td><td></td><td></td><td colspan="2">ON</td><td colspan="2">Max. 1 V</td></tr>
</table>

Circuit diagram related to swing lock switch



E-15 When monitor switch is operated, monitor displays nothing

Trouble (1)	• Operating the working mode select switch fails to display working mode monitor.
Related information	—

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective machine monitor	Since trouble is in system, troubleshooting cannot be carried out.

Trouble (2)	• When auto-decelerator switch is operated, auto-decelerator monitor is not displayed.
Related information	★ If auto-decelerator fails to operate, proceed with troubleshooting No. E-2.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective machine monitor	Since trouble is in system, troubleshooting cannot be carried out.

Trouble (3)	• Operating the travel speed select switch fails to display travel speed monitor.
Related information	★ If travel speed selection fails, proceed with troubleshooting No. H-21.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective machine monitor	Since trouble is in system, troubleshooting cannot be carried out.

Trouble (4)	• When wiper switch is operated, wiper monitor is not displayed.
Related information	★ If wiper fails to operate, proceed with troubleshooting No. E-16.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective machine monitor	Since trouble is in system, troubleshooting cannot be carried out.

Trouble (5)	• When select switch is operated, adjust screen is not displayed. • When LCD monitor adjust switch is operated, adjust screen is not displayed. • When maintenance switch is operated, maintenance item screen is not displayed.
Related information	—

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective machine monitor	Since trouble is in system, troubleshooting cannot be carried out.

E-16 Windshield wiper and window washer do not operate

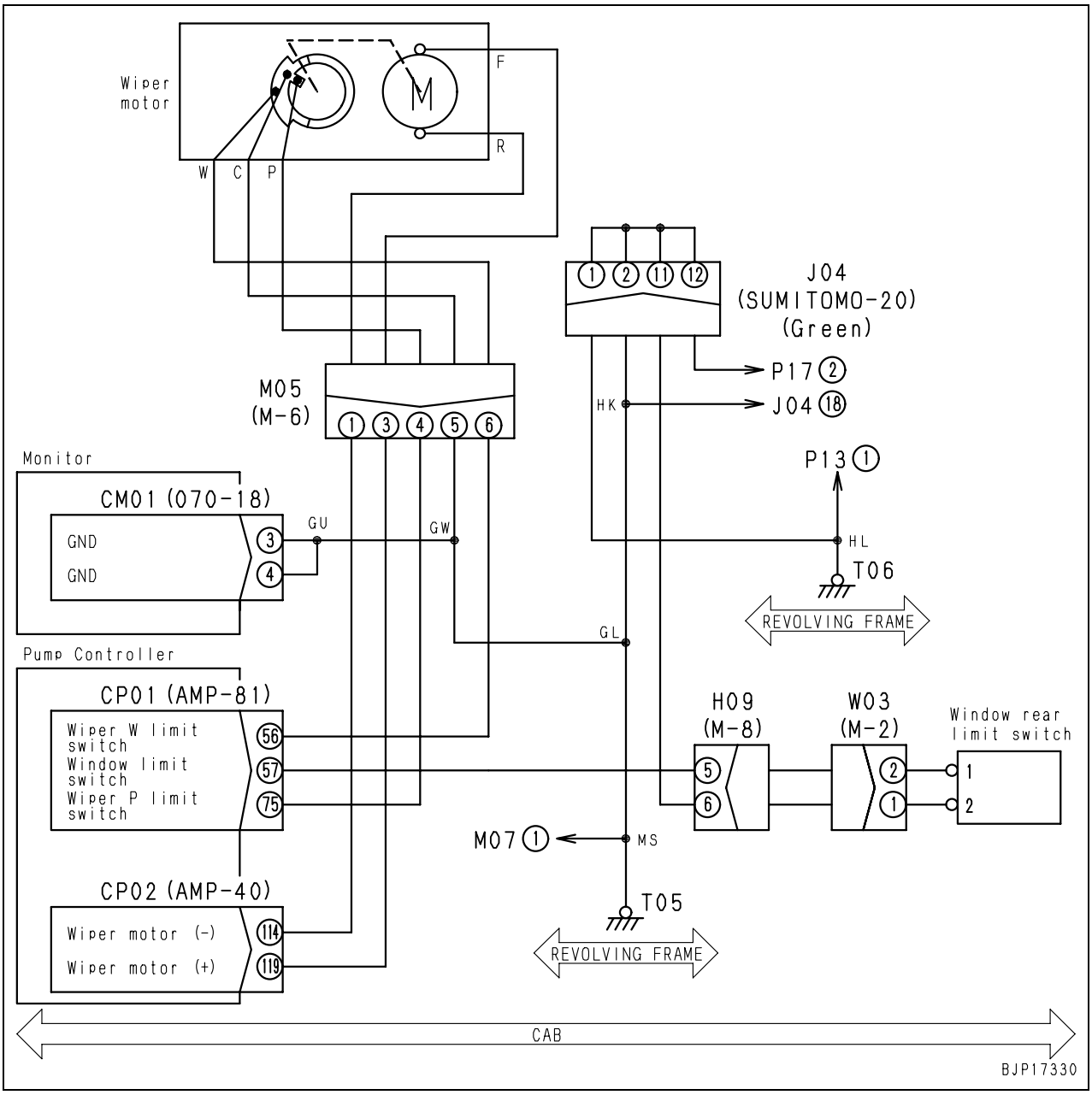
Trouble	(1) When wiper switch is operated, wiper monitor does not light up or go off.
Related information	• Condition of wiper switch signal can be checked with monitoring function. (Code: **04504** Monitor 1st, 2nd line switches)

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective machine monitor	Machine monitor may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)

Trouble	(2) When wiper switch is operated, wiper does not operate.
Related information	• Condition of window rear limit switch signal can be checked with monitoring function. (Code: **02204** Switch input 5)

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective window rear limit switch (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			W03 (male)	Front window	Resistance	
			Between (1) – (2)	When installed to front	Min. 1 MΩ	
				When retracted to rear	Max. 1 Ω	
	2	Defective wiper motor (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			M05 (female)		Continuity	
			Between (1) – (3)		There is continuity	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP02 (female) (119) – M05 (male) (3)		Resistance	Max. 1 Ω
			Wiring harness between CP02 (female) (114) – M05 (male) (1)		Resistance	Max. 1 Ω
	4	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CP01 (female) (57) – W03 (male) (1)		Resistance	Min. 1 MΩ
	5	Defective pump controller (Rear limit switch system)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CP01 (female)	Front window	Resistance	
			Between (57) – chassis ground	When installed to front	Min. 1 MΩ	
				When retracted to rear	Max. 1 Ω	
		Defective pump controller (Wiper motor system)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CP02 (female)		Continuity	
			Between (119) – (114)		There is continuity	

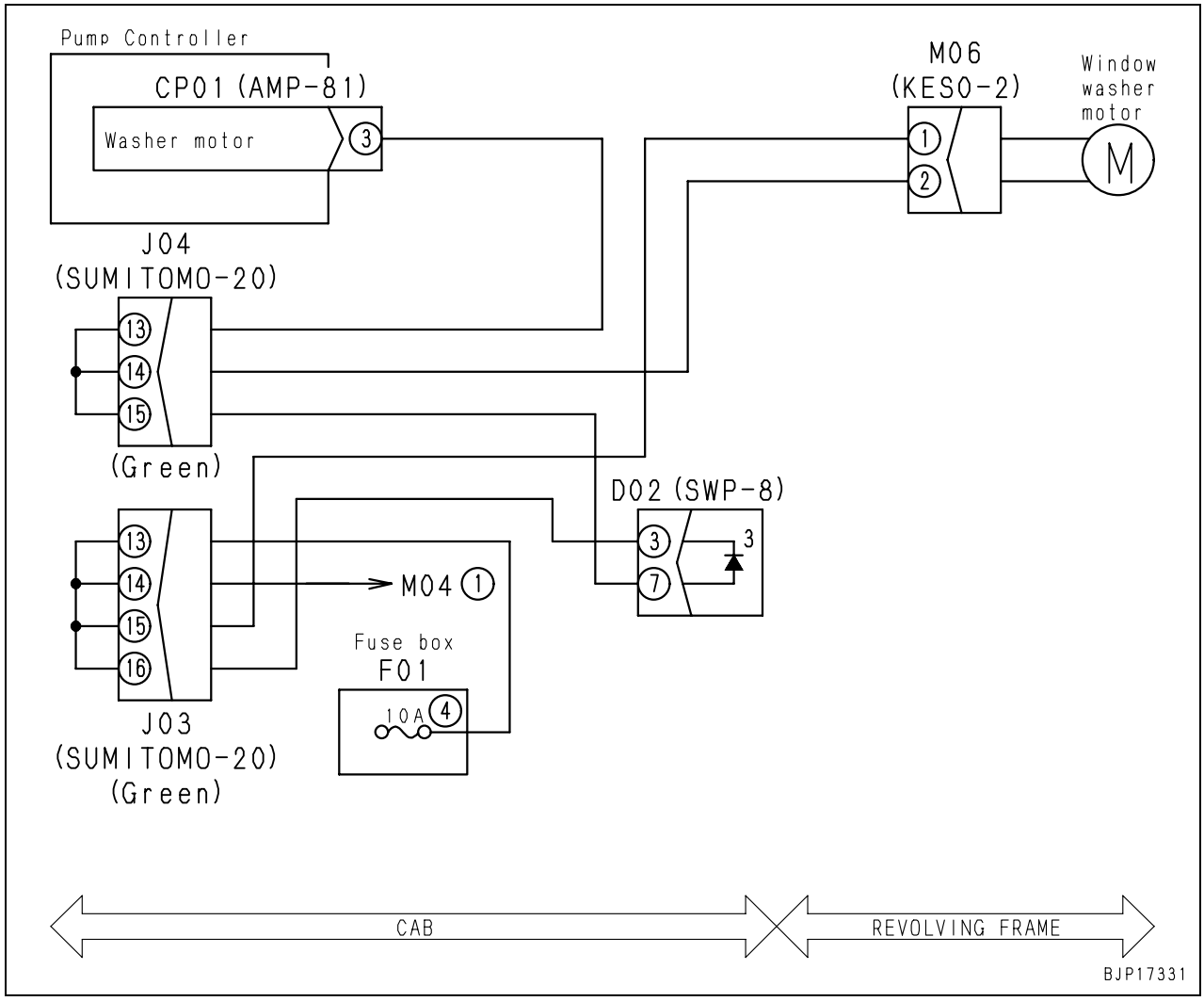
Circuit diagram related to window washer motor of machine monitor



Trouble	(3) When window washer switch is operated, window washer does not operate.
Related information	• Condition of window washer switch signal can be checked with monitoring function. (Code: **04504** Monitor 1st, 2nd line switches)

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective machine monitor	Machine monitor may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)

Circuit diagram related to window washer motor of machine monitor



E-17 Machine push-up function does not operate normally

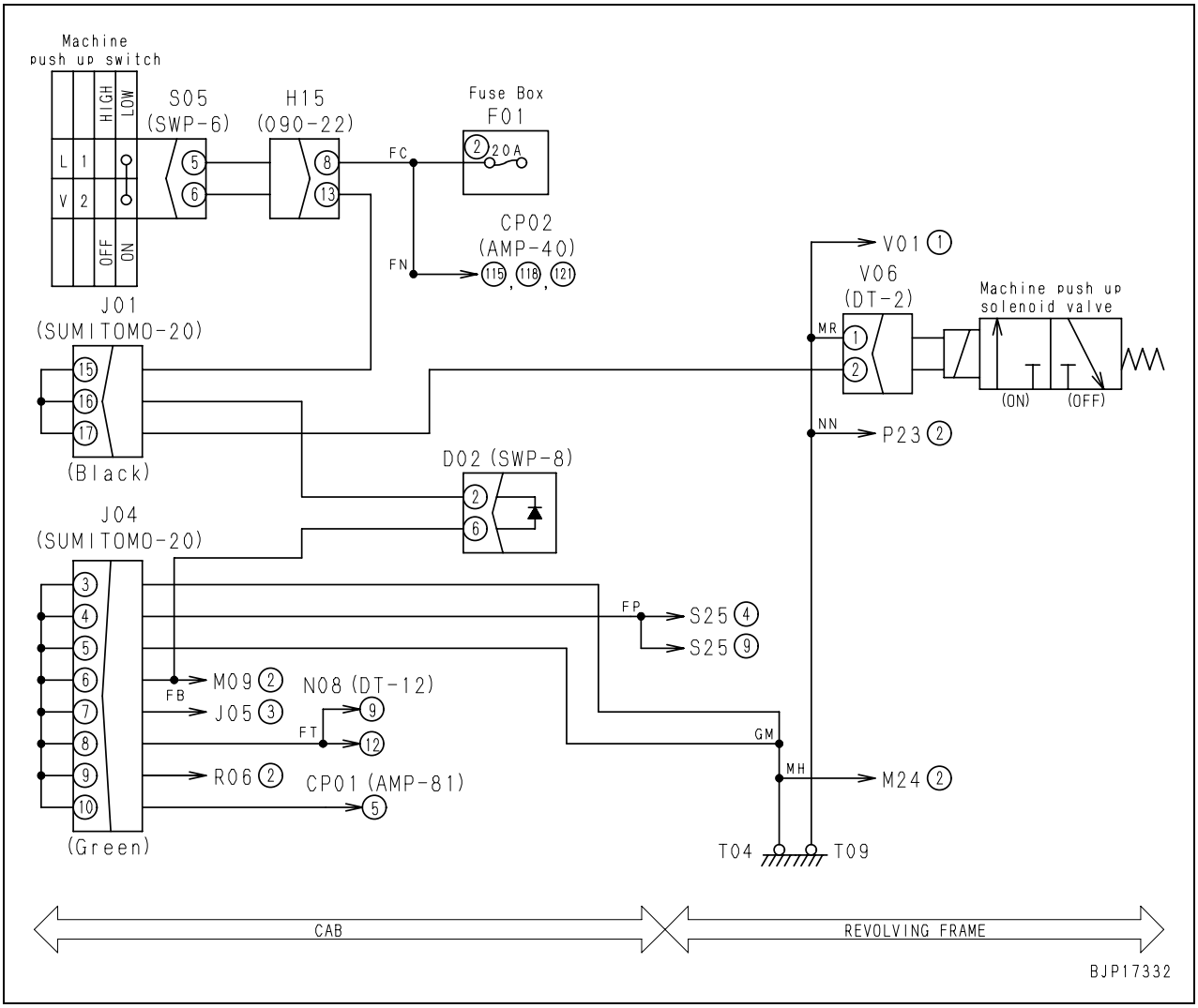
Trouble	• Machine push-up function does not operate normally	(1) Machine push-up function does not operate.
Related information	• When machine push-up function is set to high pressure, solenoid is de-energized.	

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective fuse No.2	If fuse is broken, circuit probably has ground fault. (See Cause 6)			
	2	Defective machine push-up switch (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			S05 (female)	Machine push-up switch	Resistance	
			Between (5) – (6)	Low pressure set	Max. 1 Ω	
				High pressure set	Min. 1 MΩ	
	3	Defective machine push-up solenoid (Internal disconnection or short circuit or ground fault)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			V06 (male)	Resistance		
			Between (1) – (2)	20 – 60 Ω		
			Between (2) – chassis ground	Min. 1 MΩ		
	4	Defective assembled-type diode D02 (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			D02 (male)	Resistance (Continuity)		
			Between (2) – (6)	Min. 1 MΩ (without continuity)		
	5	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between F01-2 outlet – S05 (male) (5)	Resistance	Max. 1 Ω	
			Wiring harness between S05 (male) (6) – J01 – V06 (female) (2)	Resistance	Max. 1 Ω	
			Wiring harness between V06 (female) (1) – chassis ground	Resistance	Max. 1 Ω	
	6	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between F01-2 outlet – S05 (male) (5), – other harnesses between related circuits and chassis ground	Resistance	Min. 1 MΩ	
			Wiring harness between S05 (male) (6) – J01 – V06 (female) (2), – D02 (female) (2) and chassis ground	Resistance	Min. 1 MΩ	

Trouble	• Machine push-up function does not operate normally	(2) Machine push-up function does not release.
Related information	• When machine push-up function is set to low pressure, solenoid is energized.	

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective machine push-up switch (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			S05 (female)	Machine push-up switch	Resistance	
			Between (5) – (6)	Low pressure set	Max. 1 Ω	
				High pressure set	Min. 1 MΩ	
	2	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between S05 (male) (6) – J01 – V06 (female) (2), – D02 (female) (2) and chassis ground		Voltage	Max. 1 V

Circuit diagram related to machine push-up solenoid

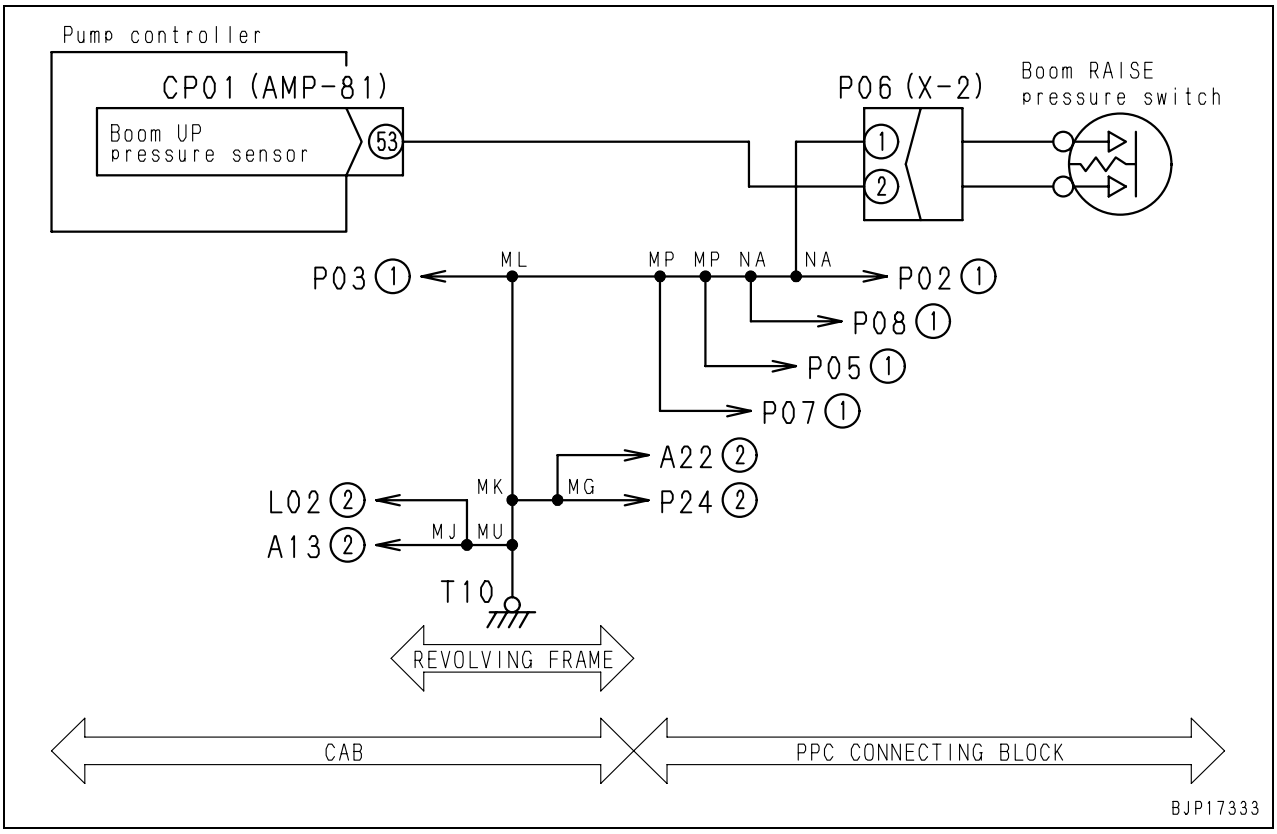


E-18 Monitoring function fails to display “boom raise” normally

Trouble	• Boom RAISE operation is not displayed normally by machine monitoring function (Special functions)
Related information	• Monitoring code: 01900 (Pressure Switch 1)

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective boom RAISE PPC oil pressure switch (Internal disconnection or short circuit)	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			P06 (male)	Boom lever	Resistance	
			Between (1) – (2)	Neutral	Min. 1 MΩ	
				Boom RAISE	Max. 1 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP01 (female) (53) – P06 (female) (2)		Resistance	Max. 1 Ω
			Wiring harness between P06 (female) (1) – chassis ground		Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP01 (female) (53) – P06 (female) (2) and chassis ground		Resistance	Min. 1 MΩ
	4	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CP01 (female) (53) – P06 (female) (2) and chassis ground		Voltage	Max. 1 V
	5	Defective pump controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			CP01	Boom lever	Voltage	
			Between (53) – chassis ground	Neutral	20 – 30 V	
				Boom RAISE	Max. 1 V	

Circuit diagram related to boom RAISE PPC oil pressure switch

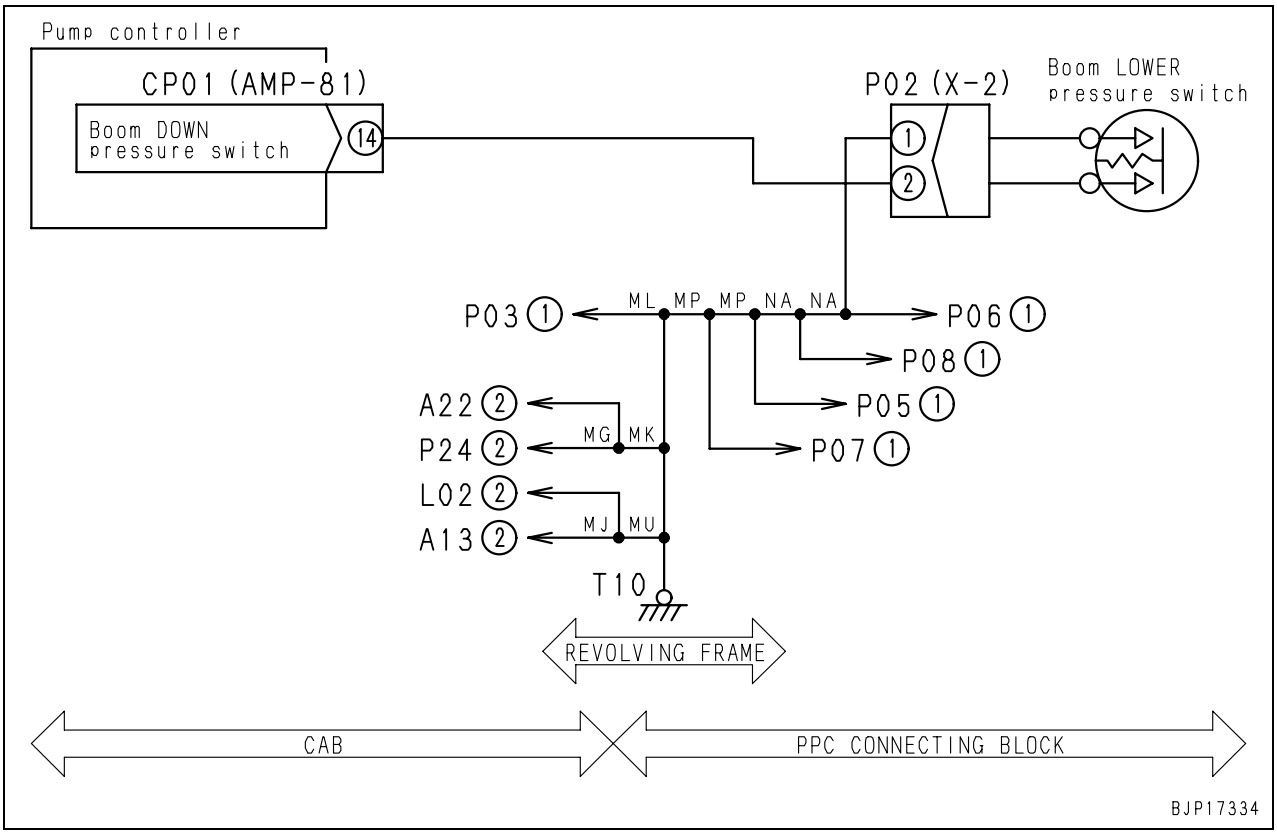


E-19 Monitoring function fails to display “boom lower” normally

Trouble	• Boom LOWER operation is not displayed normally by machine monitoring function (Special functions)
Related information	• Monitoring code: 01900 (Output Switch 1)

<table>
<tr><td rowspan="12">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="5">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Defective boom LOWER PPC oil pressure switch (Internal disconnection or short circuit)</td><td colspan="5">★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.</td></tr>
<tr><td>P02 (male)</td><td colspan="2">Boom lever</td><td colspan="2">Resistance</td></tr>
<tr><td rowspan="2">Between (1) – (2)</td><td colspan="2">Neutral</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td colspan="2">Boom LOWER</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">Wiring harness between CP01 (female) (14) – P02 (female) (2)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="3">Wiring harness between P02 (female) (1) – chassis ground</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Ground fault in wiring harness (Short circuit with GND circuit)</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">Wiring harness between CP01 (female) (14) – P02 (female) (2) and chassis ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Hot short (Short circuit with 24V circuit) in wiring harness</td><td colspan="5">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td colspan="3">Wiring harness between CP03 (female) (20) – P02 (female) (2) and chassis ground</td><td>Voltage</td><td>Max. 1 V</td></tr>
<tr><td rowspan="4">5</td><td rowspan="4">Defective pump controller</td><td colspan="5">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td>CP01</td><td colspan="2">Boom lever</td><td colspan="2">Voltage</td></tr>
<tr><td rowspan="2">Between (14) – chassis ground</td><td colspan="2">Neutral</td><td colspan="2">20 – 30 V</td></tr>
<tr><td colspan="2">Boom LOWER</td><td colspan="2">Max. 1 V</td></tr>
</table>

Circuit diagram related to boom LOWER PPC oil pressure switch

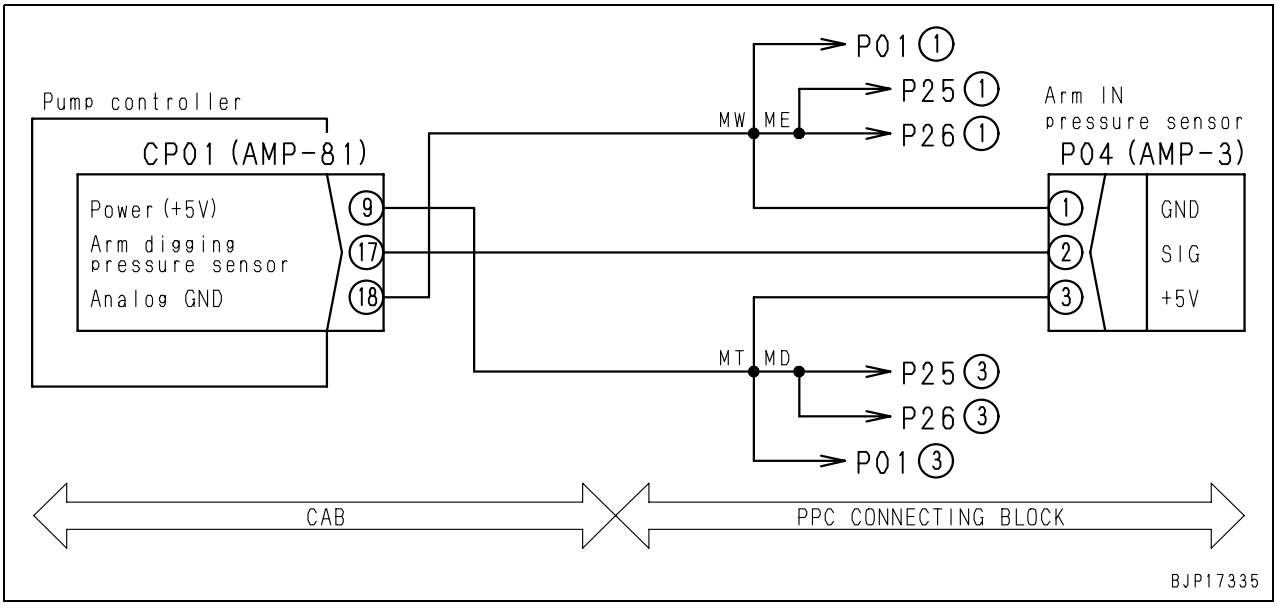


E-20 Monitoring function fails to display “arm IN” normally

Trouble	• Arm IN operation is not displayed normally by machine monitoring function (Special functions)
Related information	• Monitoring code: 01900 (Output Switch 1)

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective arm IN pressure sensor (Internal disconnection or short circuit)	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			P04 (male)	Voltage		
			Between (3) – (1)	4.5 – 5.5 V		
			Between (2) – (1)	0.5 – 4.5 V		
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP01 (female) (17) – P04 (female) (2)	Resistance	Max. 1 Ω	
			Wiring harness between P04 (female) (1) – chassis ground	Resistance	Max. 1 Ω	
	3	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP01 (female) (17) – P04 (female) (2) and chassis ground	Resistance	Min. 1 MΩ	
	4	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CP01 (female) (17) – P04 (female) (2) and chassis ground	Voltage	Max. 1 V	
	5	Defective pump controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			CP01	Voltage		
			Between (9) – (18)	4.5 – 5.5 V		
			Between (17) – (18)	0.5 – 4.5 V		

Circuit diagram related to arm IN PPC oil pressure switch

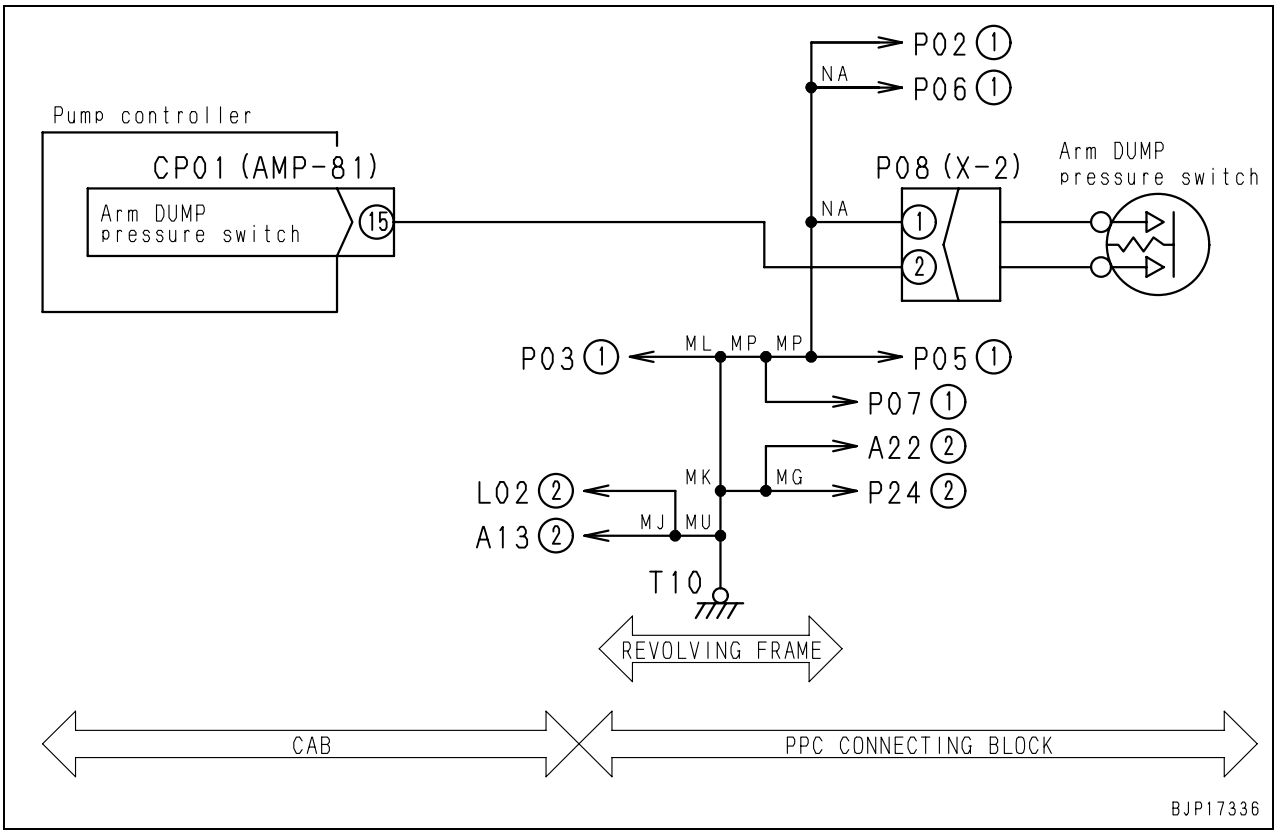


E-21 Monitoring function fails to display “arm OUT” normally

Trouble	• Arm OUT operation is not displayed normally by machine monitoring function (Special functions)
Related information	• Monitoring code: 01900 (Output Switch 1)

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective arm OUT PPC oil pressure switch (Internal disconnection or short circuit)	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			P08 (male)	Arm lever	Resistance	
			Between (1) – (2)	Neutral	Min. 1 MΩ	
				Arm OUT	Max. 1 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP01 (female) (15) – P08 (female) (2)		Resistance	Max. 1 Ω
			Wiring harness between P08 (female) (1) – chassis ground		Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP01 (female) (15) – P08 (female) (2) and chassis ground		Resistance	Min. 1 MΩ
	4	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CP01 (female) (15) – P08 (female) (2) and chassis ground		Voltage	Max. 1 V
	5	Defective pump controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			CP01	Arm lever	Voltage	
			Between (15) – chassis ground	Neutral	20 – 30 V	
				Arm OUT	Max. 1 V	

Circuit diagram related to arm OUT PPC oil pressure switch

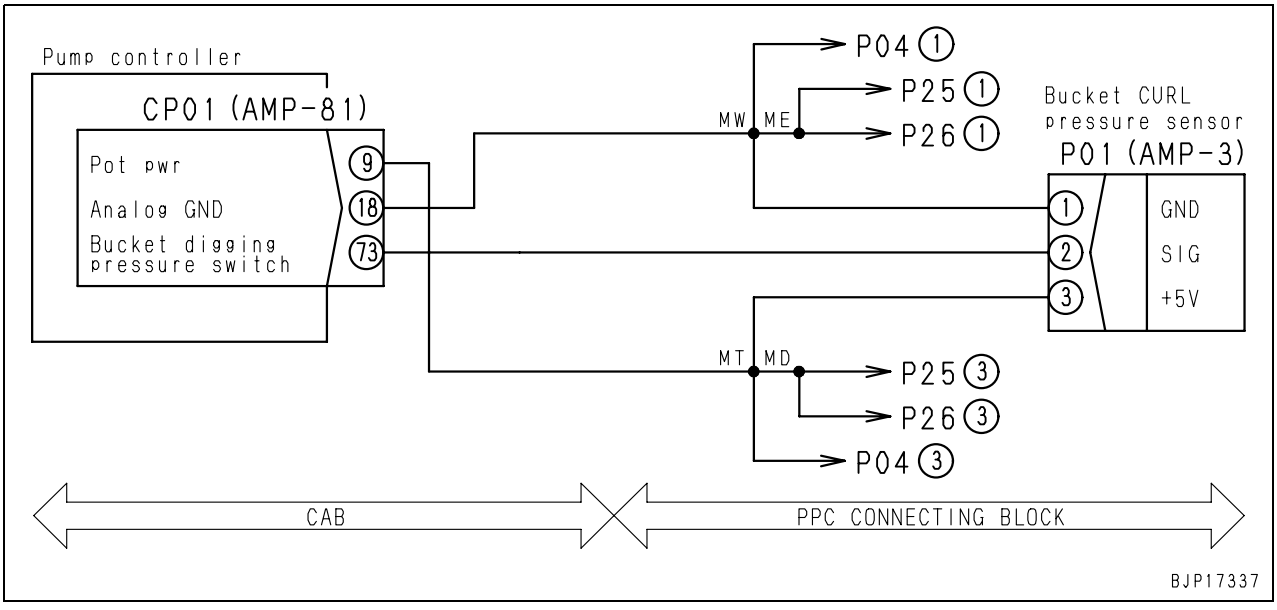


E-22 Monitoring function fails to display “bucket CURL” normally

Trouble	• Bucket CURL is not displayed normally by machine monitoring function (Special functions)
Related information	• Monitoring code:01901 (Output Switch 2)

<table>
<tr><td rowspan="15">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="4">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Defective bucket CURL pressure sensor (internal disconnection or short circuit)</td><td colspan="4">★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.</td></tr>
<tr><td>P01 (male)</td><td>Bucket lever</td><td colspan="2">Voltage</td></tr>
<tr><td>Between (3) – (1)</td><td>Neutral</td><td colspan="2">4.5 – 5.5 V</td></tr>
<tr><td>Between (2) – (1)</td><td>CURL</td><td colspan="2">0.5 – 4.5V</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Disconnection in wiring harness
(Disconnection in wiring or defective contact in connector)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="2">Wiring harness between CP01 (female) (73) – P01 (female) (2)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Wiring harness between P01 (female) (1) – chassis ground</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Ground fault in wiring harness
(Short circuit with GND circuit)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="2">Wiring harness between CP01 (female) (73) – P01 (female) (2) and chassis ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Hot short (Short circuit with 24V circuit) in wiring harness</td><td colspan="4">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td colspan="2">Wiring harness between CP01 (female) (73) – P01 (female) (2) and chassis ground</td><td>Voltage</td><td>Max. 1 V</td></tr>
<tr><td rowspan="4">5</td><td rowspan="4">Defective pump controller</td><td colspan="4">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td colspan="2">CP01</td><td colspan="2">Voltage</td></tr>
<tr><td colspan="2">Between (9) – (18)</td><td colspan="2">4.5 – 5.5V</td></tr>
<tr><td colspan="2">Between (73) – (18)</td><td colspan="2">0.5 – 4.5V</td></tr>
</table>

Circuit diagram related to Bucket CURL PPC oil pressure switch

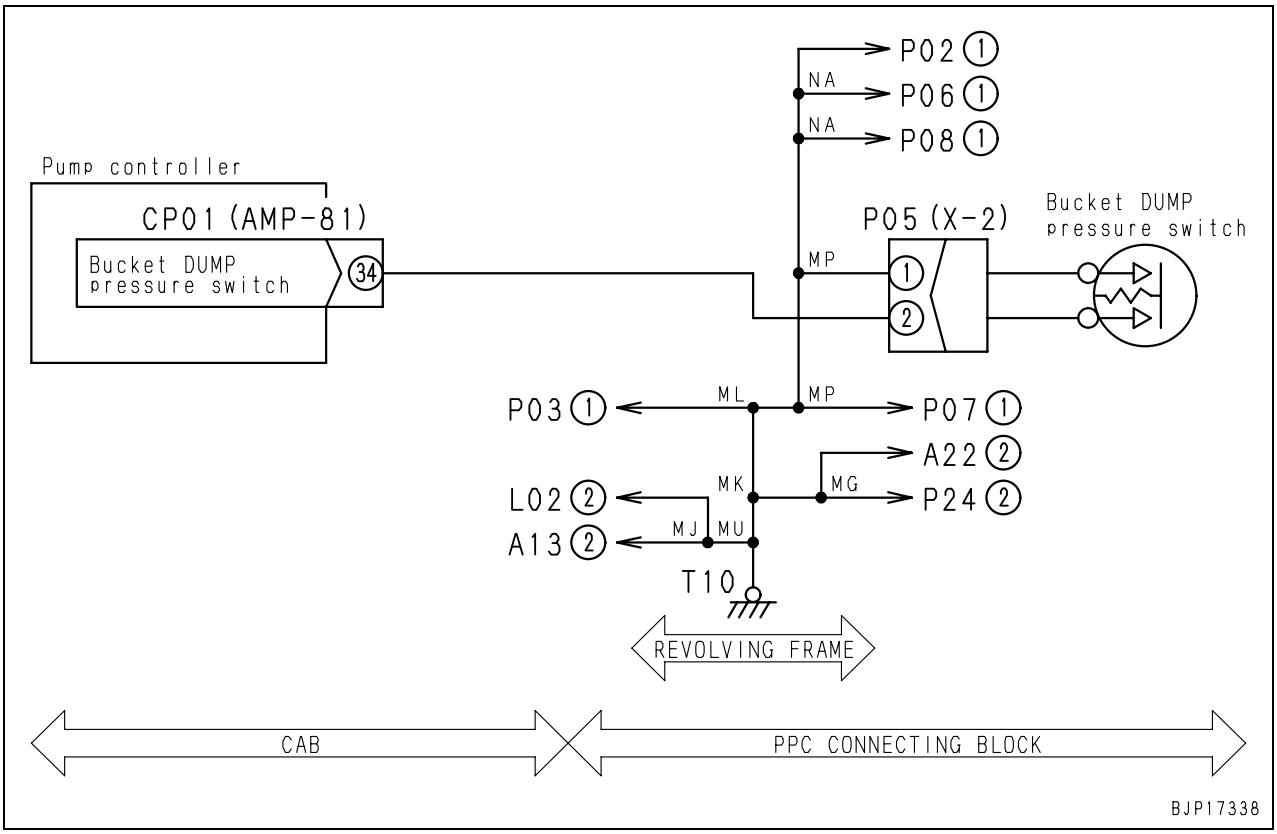


E-23 Monitoring function fails to display “bucket DUMP” normally

Trouble	• Bucket DUMP operation is not displayed normally by machine monitoring function (Special functions)
Related information	• Monitoring code: 01900 (Output Switch 2)

<table>
<tr><td rowspan="14">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="5">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Defective bucket DUMP PPC oil pressure switch (Internal disconnection or short circuit)</td><td colspan="5">★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.</td></tr>
<tr><td>P05 (male)</td><td>Bucket lever</td><td colspan="2">Resistance</td></tr>
<tr><td rowspan="2">Between (1) – (2)</td><td>Neutral</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td>Bucket DUMP</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Disconnection in wiring harness
(Disconnection in wiring or defective contact in connector)</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">Wiring harness between CP01 (female) (34) – P05 (female) (2)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="3">Wiring harness between P05 (female) (1) – chassis ground</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Ground fault in wiring harness
(Short circuit with GND circuit)</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">Wiring harness between CP01 (female) (34) – P05 (female) (2) and chassis ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Hot short (Short circuit with 24V circuit) in wiring harness</td><td colspan="5">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td colspan="3">Wiring harness between CP01 (female) (34) – P05 (female) (2) and chassis ground</td><td>Voltage</td><td>Max. 1 V</td></tr>
<tr><td rowspan="4">5</td><td rowspan="4">Defective pump controller</td><td colspan="5">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td>CP01</td><td>Bucket lever</td><td colspan="2">Voltage</td></tr>
<tr><td rowspan="2">Between (34) – chassis ground</td><td>Neutral</td><td colspan="2">20 – 30 V</td></tr>
<tr><td>Bucket DUMP</td><td colspan="2">Max. 1 V</td></tr>
</table>

Circuit diagram related to bucket DUMP PPC oil pressure switch

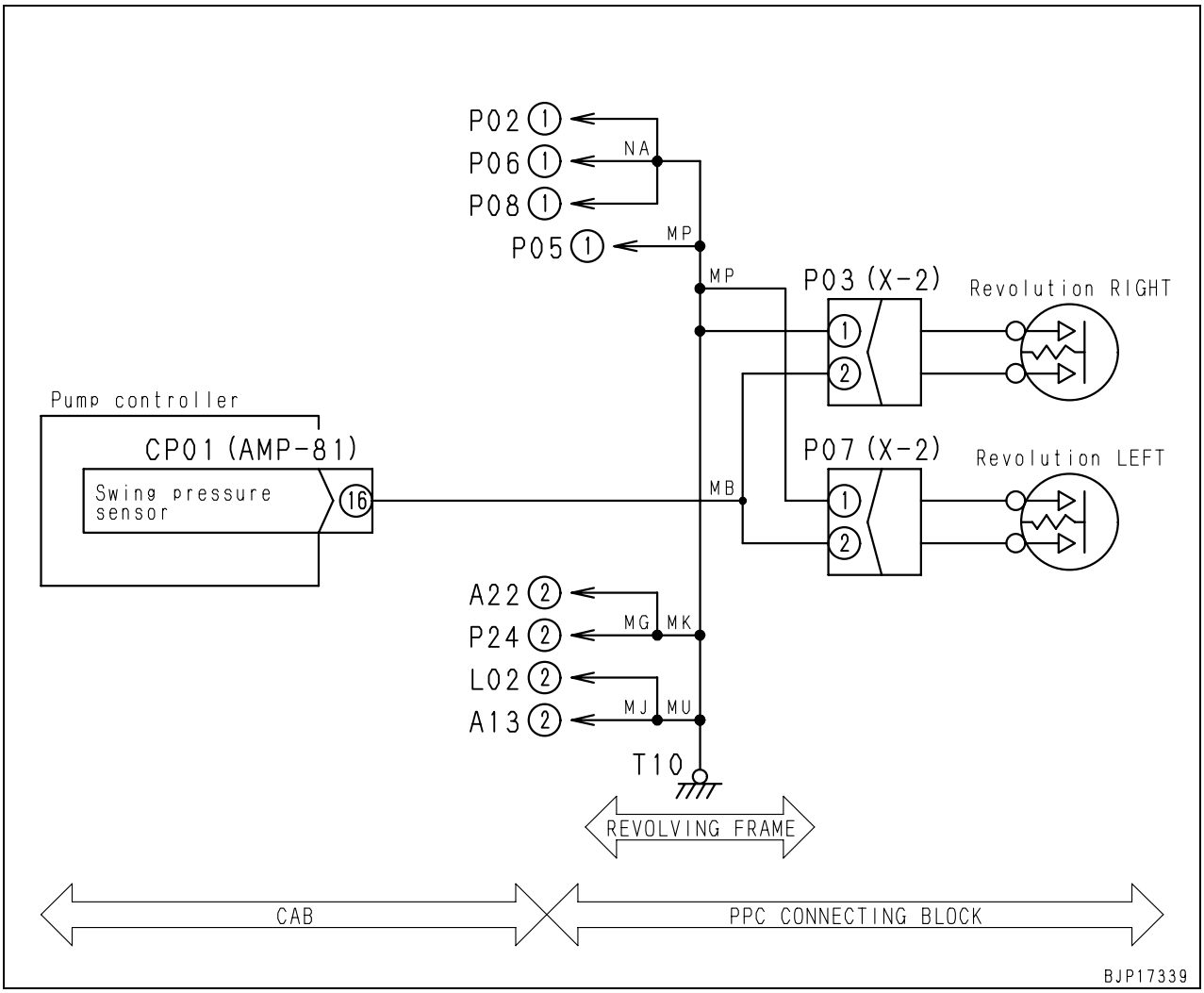


E-24 Monitoring function fails to display “swing” normally

Trouble	• Swing is not displayed normally by machine monitoring function (Special function)
Related information	• Monitoring code: 01900 (Output Switch 1)

		Cause	Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective swing left PPC oil pressure switch (Internal disconnection or short circuit)	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			P07 (male)	Swing lever	Resistance	
			Between (1) – (2)	Neutral	Min. 1 MΩ	
				Left	Max. 1 Ω	
	2	Defective swing right PPC oil pressure switch (Internal disconnection or short circuit)	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			P03 (male)	Swing lever	Resistance	
			Between (1) – (2)	Neutral	Min. 1 MΩ	
				Right	Max. 1 Ω	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harnesses between CP01 (female) (16) – P03 (male) (2), – P07 (female) (2)		Resistance	Max. 1 Ω
			Wiring harness between P03 (female) (1) – chassis ground		Resistance	Max. 1 Ω
			Wiring harness between P07 (female) (1) – chassis ground		Resistance	Max. 1 Ω
	4	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harnesses between CP01 (female) (16) – P03 (female) (2), – P07 (female) (2) and chassis ground		Resistance	Min. 1 MΩ
	5	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harnesses between CP01 (female) (16) – P03 (female) (2), – P07 (female) (2) and chassis ground		Voltage	Max. 1 V
	6	Defective pump controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			CP01	Bucket lever	Voltage	
			Between (16) – chassis ground	Neutral	20 – 30 V	
				Left or Right	Max. 1 V	

Circuit diagram related to right and left swing PPC oil pressure switches

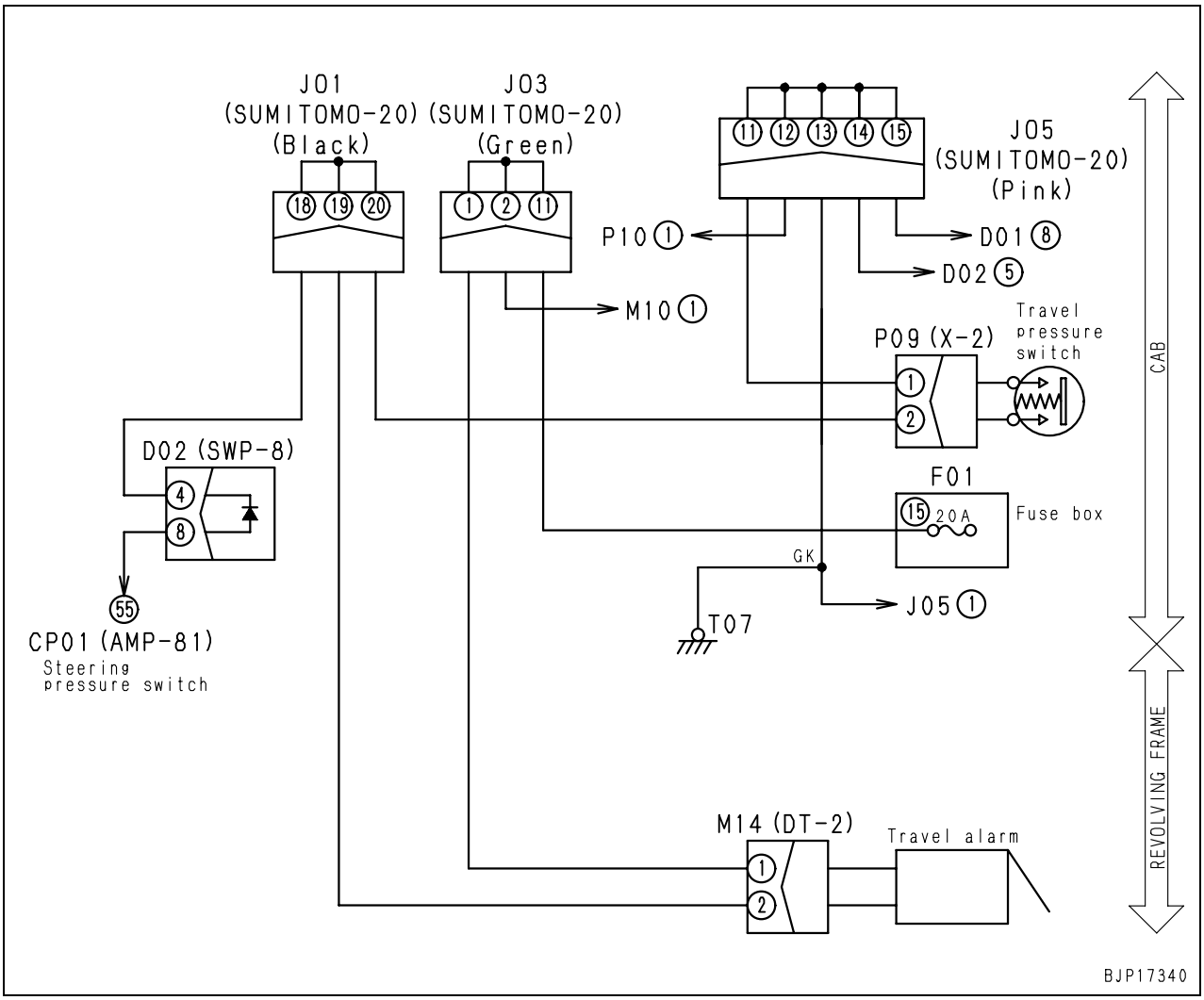


E-25 Monitoring function fails to display “travel” normally

Trouble	• Travel is not displayed normally by machine monitoring function (Special functions)
Related information	• Monitoring code: 01900 (Output Switch 1)

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective travel PPC oil pressure switch (Internal disconnection or short circuit)	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			P09 (male)	Travel lever	Resistance	
			Between (1) – (2)	Neutral	Min. 1 MΩ	
				Forward or reverse	Max. 1 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP01 (female) (55) – J01 – P09 (female) (2)		Resistance	Max. 1 Ω
			Wiring harness between P09 (female) (1) – J05 – chassis ground		Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness of CP01 (female) (55) – J01 – P09 (female) (2), – M14 (female) (2) and chassis ground		Resistance	Min. 1 MΩ
	4	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness of CP01 (female) (55) – J01 – P09 (female) (2), – M14 (female) (2) and chassis ground		Voltage	Max. 1 V
	5	Defective pump controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			CP01	Travel lever	Voltage	
			Between (55) – chassis ground	Neutral	20 – 30 V	
				Forward or reverse	Max. 1 V	

Circuit diagram related to travel PPC oil pressure switch and travel alarm

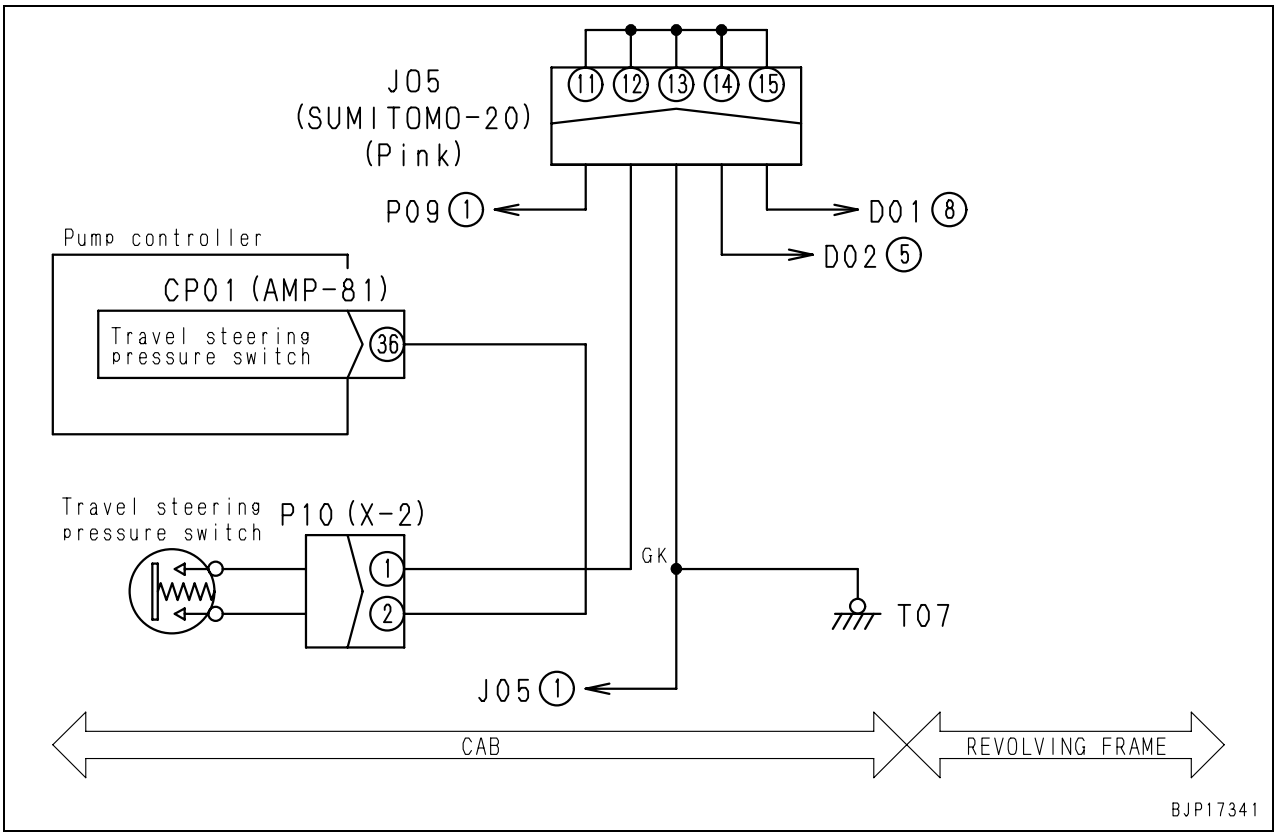


E-26 Monitoring function fails to display “travel differential pressure” normally

Trouble	• Travel differential pressure is not displayed normally by machine monitoring function (Special functions)
Related information	• Travel differential pressure is turned on as a pressure difference occurred between the right and left travel PPC circuits (during steering). • Monitoring code: 01901 (Output Switch 2)

<table>
<tr><td rowspan="14">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="4">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Defective travel steering PPC oil pressure switch (Internal disconnection or short circuit)</td><td colspan="4">★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.</td></tr>
<tr><td>P10 (male)</td><td>Travel lever</td><td colspan="2">Resistance</td></tr>
<tr><td rowspan="2">Between (1) – (2)</td><td>Neutral</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td>Left or right only</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="2">Wiring harness between CP01 (female) (36) – P10 (female) (2)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Wiring harness between P10 (female) (1) – J05 – chassis ground</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Ground fault in wiring harness (Short circuit with GND circuit)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="2">Wiring harness between CP01 (female) (36) – P10 (female) (2) and chassis ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Hot short (Short circuit with 24V circuit) in wiring harness</td><td colspan="4">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td colspan="2">Wiring harness between CP01 (female) (36) – P10 (female) (2) and chassis ground</td><td>Voltage</td><td>Max. 1 V</td></tr>
<tr><td rowspan="4">5</td><td rowspan="4">Defective pump controller</td><td colspan="4">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td>CP01</td><td>Travel lever</td><td colspan="2">Voltage</td></tr>
<tr><td rowspan="2">Between (36) – chassis ground</td><td>Neutral</td><td colspan="2">20 – 30 V</td></tr>
<tr><td>Left or right only</td><td colspan="2">Max. 1 V</td></tr>
</table>

Circuit diagram related to travel steering PPC oil pressure switch

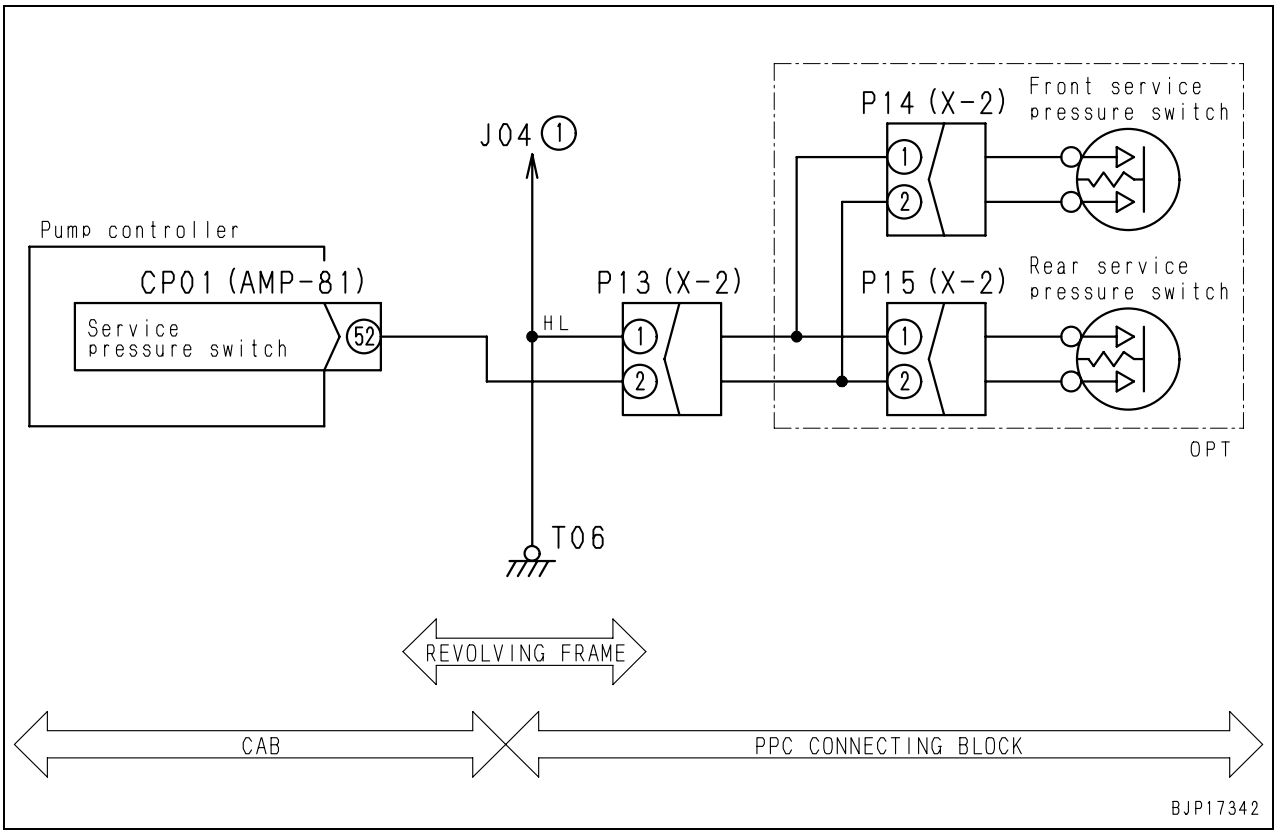


E-27 Monitoring function fails to display “service” normally

Trouble	• Service is not displayed normally by machine monitoring function (Special functions)
Related information	• Monitoring code: 01901 (Output Switch 2)

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective service (front) PPC oil pressure switch (Internal disconnection or short circuit)	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			P14 (male)	Service pedal	Resistance	
			Between (1) – (2)	Neutral	Min. 1 MΩ	
				Front	Max. 1 Ω	
	2	Defective service (rear) PPC oil pressure switch (Internal disconnection or short circuit)	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			P15 (male)	Service pedal	Resistance	
			Between (1) – (2)	Neutral	Min. 1 MΩ	
				Rear	Max. 1 Ω	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP01 (female) (52) – P14 (female) (2), – P15 (female) (2)		Resistance	Max. 1 Ω
			Wiring harness between P14 (female) (1) – chassis ground		Resistance	Max. 1 Ω
			Wiring harness between P15 (female) (1) – chassis ground		Resistance	Max. 1 Ω
	4	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CP01 (female) (52) – P14 (female) (2), – P15 (female) (2) and chassis ground		Resistance	Min. 1 MΩ
	5	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CP01 (female) (52) – P14 (female) (2), – P15 (female) (2) and chassis ground		Voltage	Max. 1 V
	6	Defective pump controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			CP01	Service pedal	Voltage	
			Between (52) – chassis ground	Neutral	20 – 30 V	
				Front or rear	Max. 1 V	

Circuit diagram related to service PPC oil pressure switch

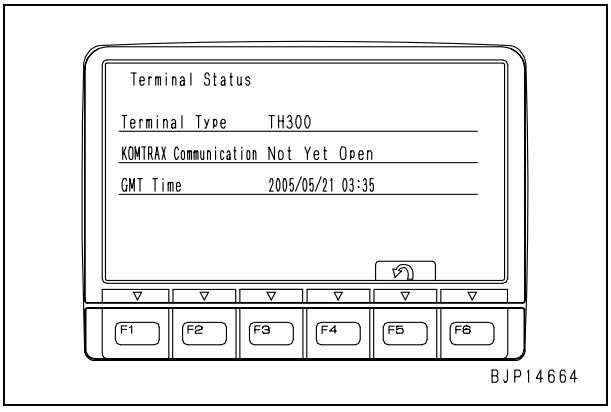


E-28 KOMTRAX system does not operate normally

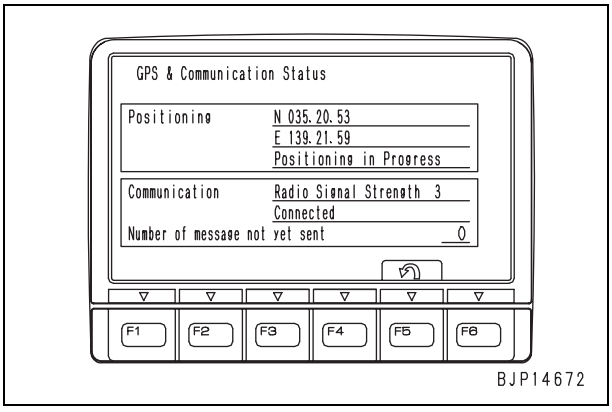
Trouble	• KOMTRAX system does not operate normally.
Related information	• If KOMTRAX system administrator makes request for checking system on machine side for trouble, carry out following troubleshooting. • Even if KOMTRAX system has trouble, it does not particularly appear on machine. • Carry out all troubleshooting on service menu screen of machine monitor.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Defective communication 1	★ Turn starting switch ON and check "Setting condition or terminal" screen.	
			Check item	Normal display
			Communication start check	Completion
	2	Defective GPS	★ Turn starting switch ON and check "Condition of positioning and communication" screen.	
			Check item	Normal display
			Positioning	N ###,##,## (Latitude)
				E ###,##,## (Longitude)
				In positioning
			If latitude and longitude are not displayed in 5 minutes on open ground, notify KOMTRAX service hot line.	
	3	Defective communication environment	★ Turn starting switch ON and check "Condition of positioning and communication" screen.	
			Check item	Normal display
			Communication	Zone level 1 – Zone level 3
			If zone level 1 – 3 is not displayed within communication zone of ORBCOMM, notify KOMTRAX service hot line.	
	4	Defective communication 2	★ Turn starting switch ON and check "Condition of positioning and communication" screen.	
			Check item	Normal display
			Number of items not transmitted	0 – 9 (Normally 0)

★ Select "Terminal Status" from "12 Display of KOMTRAX setting" in the service menu of the machine monitor.



★ Select "GPS & Communication Status" from "12 Display of KOMTRAX setting" in the service menu of the machine monitor.

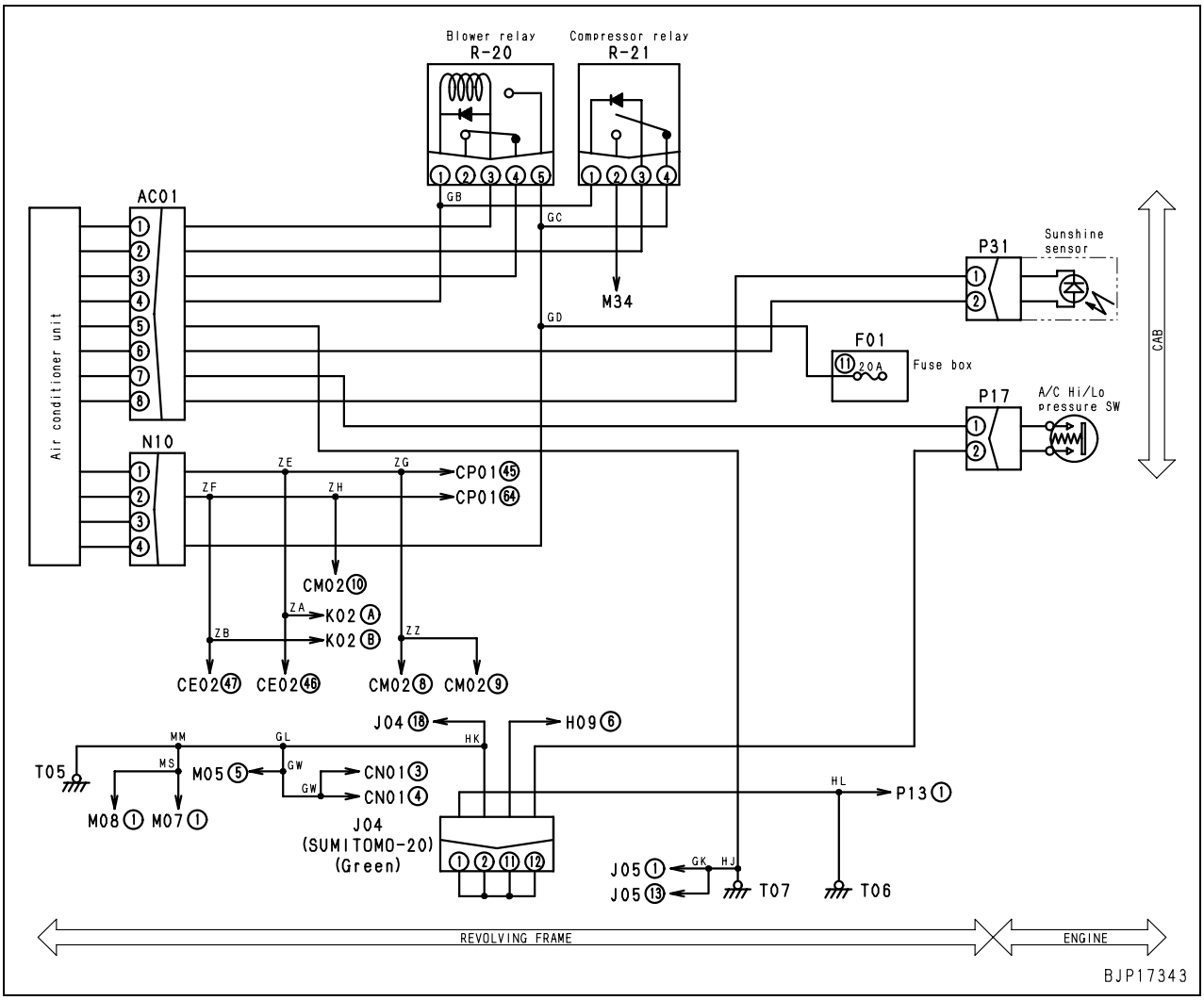


E-29 Air conditioner does not operate

Trouble	• Air conditioner does not start.
Related information	• For electrical circuit inside the air conditioner unit, refer to the structure, function and maintenance standard, “Air conditioner system.”

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective fuse No. 11	If fuse is burnt, circuit probably has ground fault.		
	2	Defective A/C Hi/Lo pressure switch (Internal disconnection or defective contact)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			P17 (male)	Resistance	
			Between (1) – (2)	Max. 1 Ω	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between F01-11 outlet – AC01 (male) (4)	Resistance	Max. 1 Ω
			Wiring harness between M26 (male) (7) – P17 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between AC01 (male) (5) – chassis ground	Resistance	Max. 1 Ω
			Wiring harness between P17 (female) (2) – J04 – chassis ground	Resistance	Max. 1 Ω
	4	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between F01-11 outlet – AC01 (male) (4) and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between AC01 (male) (7) – P17 (female) (1) and chassis ground	Resistance	Min. 1 MΩ
	5	Defective air conditioner unit	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting. (The table indicates internal defect of an air conditioner)		
			AC01	Voltage	
			Between (1) – (3)	20 – 30 V	

Circuit diagram related to air conditioner

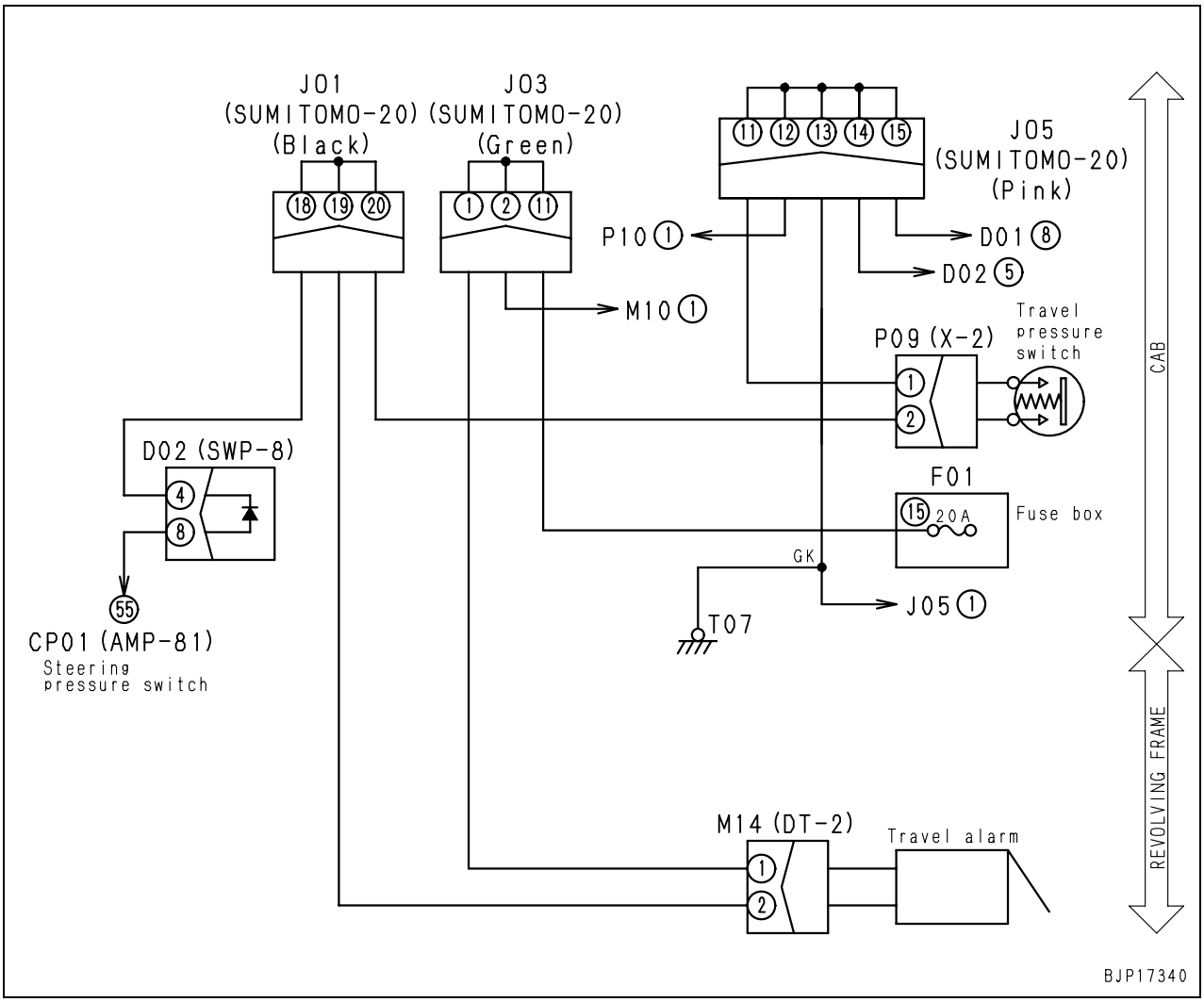


E-30 Travel alarm does not sound or does not stop sounding

Trouble	• Alarm does not sound during travel. • Alarm sounds in stopped state.
Related information	—

<table>
<tr><td rowspan="15">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="4">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td>1</td><td>Defective fuse No. 15</td><td colspan="4">If fuse is burnt out, the circuit probably has ground fault.</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">Defective travel signal</td><td colspan="4">In the case monitoring is not normally indicated, proceed to troubleshooting No. E-21.</td></tr>
<tr><td>Monitoring code</td><td colspan="2">Item</td><td>Normal display</td></tr>
<tr><td>019</td><td colspan="2">Travel</td><td>Operation of lever: ON
Lever in neutral: OFF</td></tr>
<tr><td colspan="4">When the monitoring display is not correct, proceed to diagnosis for “'Travel is not normally indicated' in the monitoring function”</td></tr>
<tr><td rowspan="4">3</td><td rowspan="4">Defective travel alarm (Internal disconnection or short circuit)</td><td colspan="4">★ Prepare with starting switch OFF, then start engine and carry out troubleshooting (insert T-adapter).</td></tr>
<tr><td>M14</td><td>Travel lever</td><td colspan="2">Voltage</td></tr>
<tr><td rowspan="2">Between (1) – (2)</td><td>Neutral</td><td colspan="2">Max. 1 V</td></tr>
<tr><td>Operated</td><td colspan="2">20 – 30 V</td></tr>
<tr><td colspan="4">If above voltage is normal and travel alarm does not sound, travel alarm is defective.</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">Wiring harness between F01-15 outlet – J03 – M14 (female) (1)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="3">Wiring harness between M14 (female) (2) – J01 (19)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="3">5</td><td rowspan="3">Ground fault in wiring harness (Short circuit with GND circuit)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">Wiring harness between F01-15 outlet – J03 – M14 (female) (1) and chassis ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td>6</td><td>Defective pump controller</td><td colspan="4">Since trouble is in system, troubleshooting cannot be carried out. (If causes 1 – 5 above are not detected, travel alarm may be defective.)</td></tr>
</table>

Circuit diagram related to travel PPC oil pressure switch and travel alarm

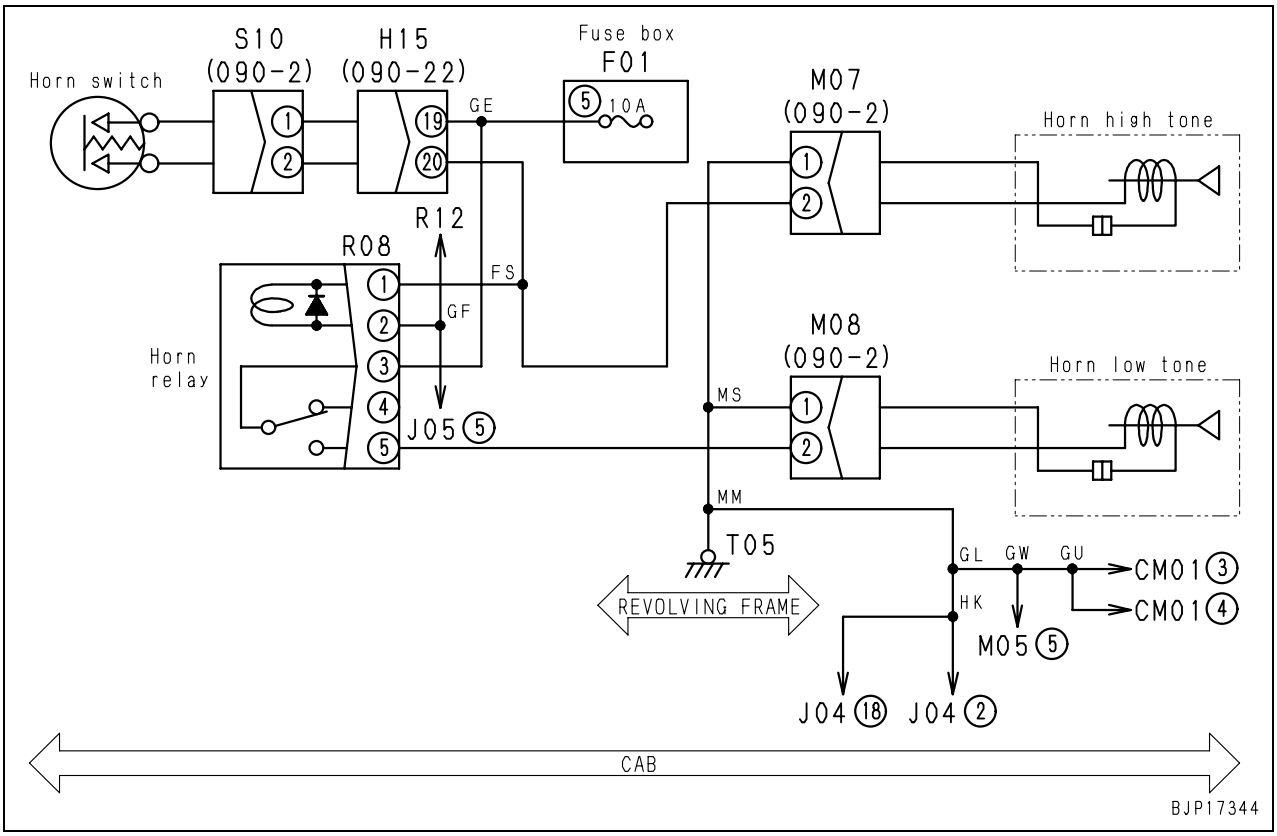


E-31 Horn does not sound

Trouble	Horn does not sound
Related information	

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective fuse No. 5	If fuse is broken, circuit probably has ground fault. (See Cause 6)		
	2	Defective horn relay	If the horn sounds after replacing the relay, the relay was defective		
	3	Defective high tone horn	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Between M07 (2) – chassis ground (with horn switch turned ON)	Voltage	20 – 30 V
			★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between M07 (female) (1) – chassis ground	Resistance	Max. 1 Ω
			If above is normal, the horn is defective		
	4	Defective low tone horn	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Between M08 (2) – chassis ground (with horn switch turned ON)	Voltage	20 – 30 V
			★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between M08 (female) (1) – chassis ground	Resistance	Max. 1 Ω
			If above is normal, the horn is defective		
	5	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between F01 (5) – S10 (female) – R08 (female) (3)	Resistance	Max. 1 Ω
			Wiring harness between S10 (female) (2) – R08 (female) – M07 (female) (2)	Resistance	Max. 1 Ω
			Wiring harness between R08 (female) (5) – M08 (female) (2)	Resistance	Max. 1 Ω
	6	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between F01 (5) – S10 (female) – R08 (female) (3) and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between S10 (female) (2) – R08 (female) – M07 (female) (2) and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between R08 (female) (5) – M08 (female) (2) and chassis ground	Resistance	Min. 1 MΩ

Circuit diagram related to horn



PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN02632-00

HYDRAULIC EXCAVATOR

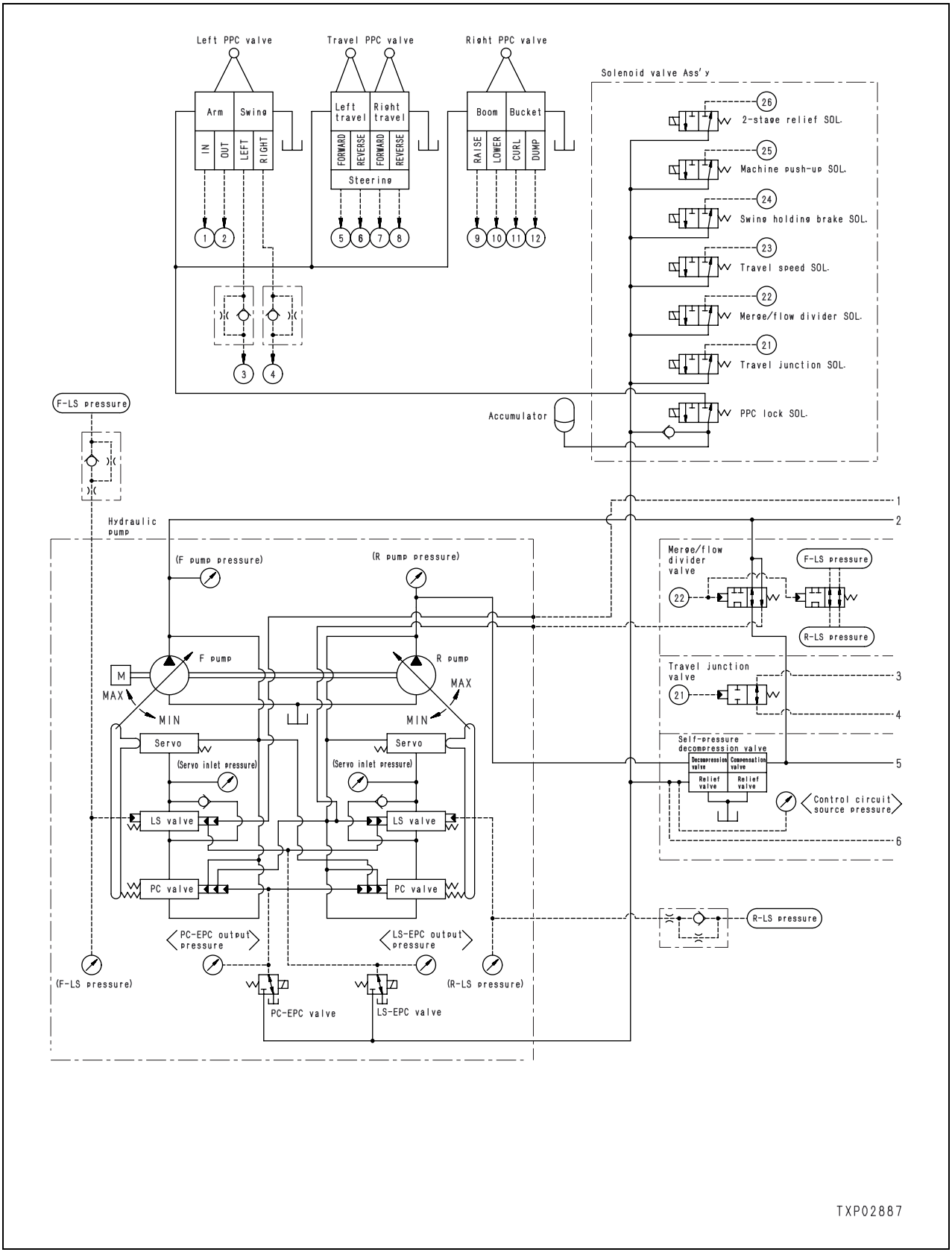
PC300-8
PC300LC-8
PC350-8
PC350LC-8

Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

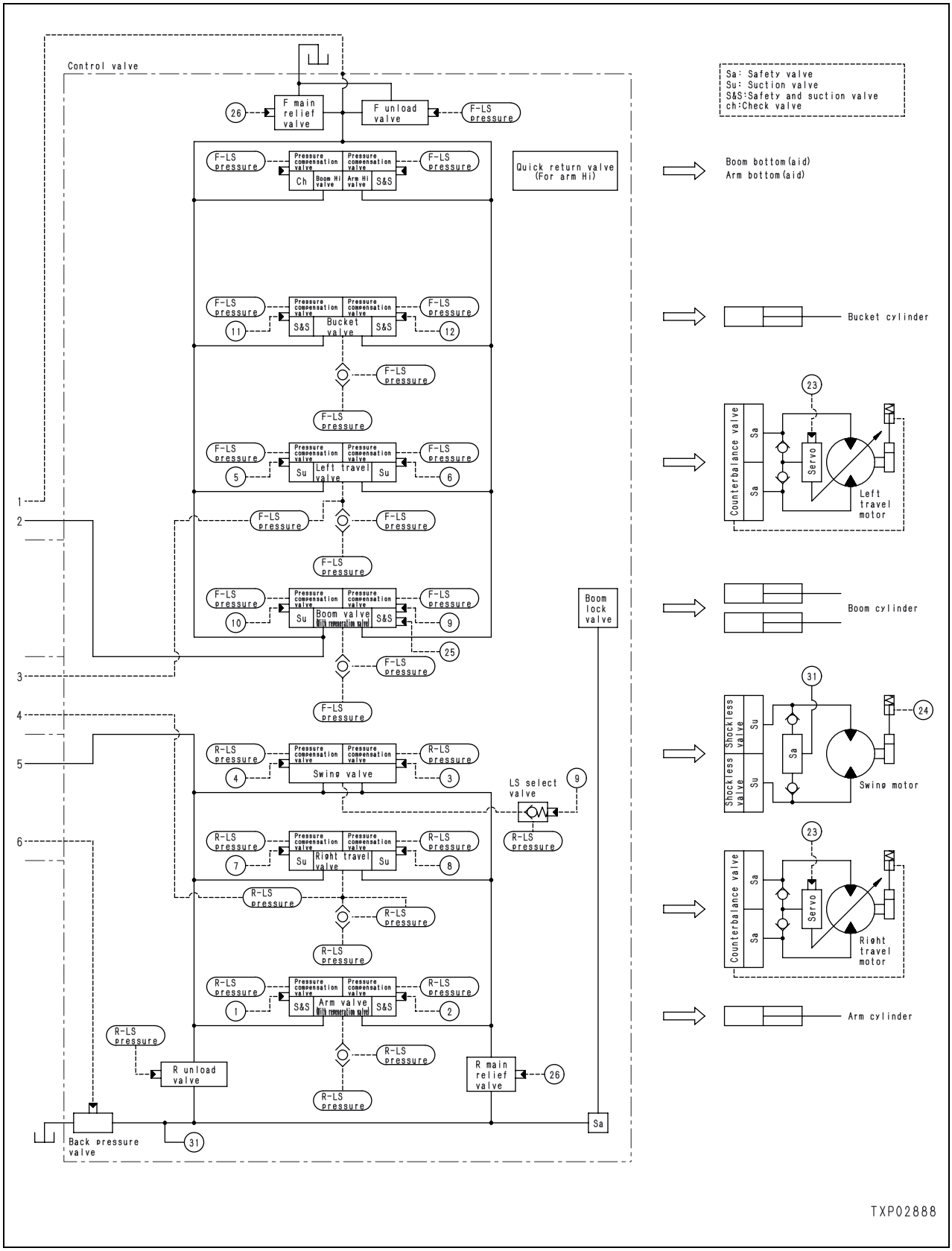
40 Troubleshooting

Troubleshooting of hydraulic and mechanical system (H-mode)

System chart for hydraulic and mechanical system



★ This is a system chart that has been drawn up by simplifying the whole hydraulic circuit chart. Use it as a reference material when troubleshooting the hydraulic and mechanical system.



Information contained in troubleshooting table

★ Troubleshooting table and related circuit diagram collectively carry the following information. Carry out troubleshooting work after fully grasping their contents.

Failure phenomenon	**Phenomenon occurring on machine**
Relative information	**Information on the failure occurred as well as the troubleshooting**

	Cause		Standard value in normalcy and references for troubleshooting
Presumed cause and standard value in normalcy	1	**Cause for presumed failure (The attached No. is for filing and reference purpose only. It does not stand for any priority.)**	**[Contents]** • **The standard values in normalcy by which to judge "Good" or "No Good" about presumed causes.** • **References for making judgement of "good" or "No Good"**
	2		
	3		
	4		
	5		

H-1 All work equipment lack power, or travel and swing speeds are slow

Trouble	• Speed or power of whole work equipment, travel, and swing is low
Related information	• Set the working mode in P-mode before start.

<table>
<tr><td rowspan="16">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="4">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Malfunction of unload valve</td><td colspan="4">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td colspan="2">Control lever</td><td colspan="2">Unload pressure</td></tr>
<tr><td colspan="2">All lever in neutral</td><td colspan="2">3.9 ± 1.0 MPa
{40 ± 10 kg/cm^2}</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Defective adjustment or malfunction of main relief valve</td><td colspan="4">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td colspan="2">Control lever</td><td colspan="2">Main relief pressure</td></tr>
<tr><td colspan="2">Arm IN</td><td colspan="2">33.34 – 36.77 MPa
{340 – 375 kg/cm^2}</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Malfunction of self pressure reducing valve</td><td colspan="4">If oil pressure does not become normal after adjustment, main relief valve may have malfunction or internal defect. Check main relief valve directly.</td></tr>
<tr><td colspan="4">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td colspan="2">Control lever</td><td colspan="2">Control circuit basic pressure</td></tr>
<tr><td colspan="2">All levers in neutral</td><td colspan="2">2.83 – 3.43 MPa
{29 – 35 kg/cm^2}</td></tr>
<tr><td rowspan="4">4</td><td rowspan="4">Defective adjustment or malfunction of PC valve</td><td colspan="4">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Measured oil pressure</td><td>Measurement condition</td><td>Oil pressure ratio</td></tr>
<tr><td>Pump discharge pressure</td><td rowspan="2">Swing lock: ON
Arm IN relief</td><td>1</td></tr>
<tr><td>PC valve output pressure</td><td>Approx. 3/5</td></tr>
<tr><td rowspan="4">5</td><td rowspan="4">Malfunction of LS-EPC valve</td><td colspan="4">If oil pressure does not become normal after adjustment, PC valve may have malfunction or internal defect. Check PC valve directly.</td></tr>
<tr><td colspan="4">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Travel speed</td><td>Travel lever</td><td>LS-EPC output pressure</td></tr>
<tr><td>Lo</td><td>Neutral</td><td>Approx. 1.4 MPa
{Approx. 14 kg/cm^2}</td></tr>
<tr><td>Hi</td><td>Lifting operation</td><td>0 MPa {0 kg/cm^2}</td></tr>
</table>

<table>
<tr><td rowspan="8">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="3">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="5">6</td><td rowspan="5">Defective adjustment or malfunction of LS valve</td><td colspan="3">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td rowspan="2">Measured oil pressure</td><td colspan="2">Oil pressure ratio</td></tr>
<tr><td>All levers in neutral</td><td>Travel with no load (Lever operated halfway)</td></tr>
<tr><td>Pump discharge pressure</td><td rowspan="2">Almost same pressure</td><td>1</td></tr>
<tr><td>LS valve output pressure</td><td>Approx. 3/5</td></tr>
<tr><td colspan="3">If oil pressure does not become normal after adjustment, LS valve may have malfunction or internal defect. Check LS valve directly.</td></tr>
<tr><td>7</td><td>Malfunction of servo piston</td><td colspan="3">Servo piston may have malfunction. Check it directly.</td></tr>
<tr><td>8</td><td>Defective piston pump</td><td colspan="3">If any cause above is detected, cause may be lowering of performance, malfunction, or internal defect of piston pump.</td></tr>
</table>

H-2 Engine speed sharply drops or engine stalls

Trouble	• Engine speed lowers extremely or engine stalls.
Related information	• Set the working mode in P-mode before start.

<table>
<tr><td rowspan="13">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="4">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Defective adjustment or malfunction of main relief valve</td><td colspan="4">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td colspan="2">Control lever</td><td colspan="2">Main relief pressure</td></tr>
<tr><td colspan="2">Arm IN</td><td colspan="2">33.34 – 36.77 MPa
{340 – 375 kg/cm^2}</td></tr>
<tr><td colspan="5">If oil pressure does not become normal after adjustment, main relief valve may have malfunction or internal defect. Check main relief valve directly.</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">Defective adjustment or malfunction of PC valve</td><td colspan="4">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Measured oil pressure</td><td>Measurement condition</td><td colspan="2">Oil pressure ratio</td></tr>
<tr><td>Pump discharge pressure</td><td rowspan="2">Swing lock: ON
Arm IN relief</td><td colspan="2">1</td></tr>
<tr><td>PC valve output pressure</td><td colspan="2">Approx. 3/5</td></tr>
<tr><td colspan="5">If oil pressure does not become normal after adjustment, PC valve may have malfunction or internal defect. Check PC valve directly.</td></tr>
<tr><td rowspan="4">3</td><td rowspan="4">Defective adjustment or malfunction of LS valve</td><td colspan="4">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td rowspan="2">Measured oil pressure</td><td colspan="2">Oil pressure ratio</td></tr>
<tr><td>All lever in neutral</td><td>Travel with no load (Lever operated halfway)</td></tr>
<tr><td>Pump discharge pressure</td><td rowspan="2">Almost same pressure</td><td>1</td></tr>
<tr><td>LS valve output pressure</td><td>Approx. 3/5</td></tr>
<tr><td colspan="5">If oil pressure does not become normal after adjustment, LS valve may have malfunction or internal defect. Check LS valve directly.</td></tr>
<tr><td>4</td><td>Clogging of orifice or filter in servo devices</td><td colspan="4">Orifices or filters in pump servo devices may be clogged. Check them directly.</td></tr>
<tr><td>5</td><td>Malfunction of servo piston</td><td colspan="4">Servo piston may have malfunction. Check it directly.</td></tr>
</table>

H-3 No work equipment, swing or travel move

Trouble	• All work equipment, swing, and travel mechanism do not move.
Related information	• Set the working mode in P-mode before start.

<table>
<tr><td rowspan="8">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="2">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Malfunction of PPC lock solenoid valve</td><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Lock lever</td><td>Solenoid output pressure</td></tr>
<tr><td>Lock</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Malfunction of self pressure reducing valve</td><td>Released</td><td>2.84 – 3.43 MPa
{29 – 35 kg/cm^2}</td></tr>
<tr><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Control lever</td><td>Control circuit basic pressure</td></tr>
<tr><td>3</td><td>Defective piston pump</td><td>All levers in neutral</td><td>2.83 – 3.43 MPa
{29 – 35 kg/cm^2}</td></tr>
<tr><td>4</td><td>Defective damper</td><td colspan="2">Piston pump may have malfunction or internal defect. Check it by following method.
• Crank the engine with oil pressure measurement plug removed. If oil flows out, the piston pump is normal.</td></tr>
<tr><td></td><td colspan="3">Pump shaft may not revolve because of defect in damper. Check damper directly.</td></tr>
</table>

H-4 Abnormal noise is heard from around hydraulic pump

Failure phenomenon	• An abnormal noise is heard from around hydraulic pump.
Relative information	

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting
	1	Hydraulic oil level lowered	Make a visual check.
	2	Quality of hydraulic oil bad	Air may have get mixed with the oil. Make a visual check.
	3	Hydraulic tank cap clogged	It is presumed that the cap of hydraulic tank is clogged, thereby causing negative pressure inside the tank. Make a visual check.
	4	Hydraulic tank strainer clogged	It is presumed that the strainer in the hydraulic tank is clogged, thereby causing negative pressure in the suction circuit. Make a visual check.
	5	Piston pump defective	The piston pump is suspected of an internal failure. Check the pump itself.

H-5 Auto-decelerator does not work

Trouble	• Auto-decelerator does not operate.
Related information	• Carry out this troubleshooting if auto-decelerator does not operate when travel lever is operated. (Shuttle valve (in PPC valve) is installed between PPC valve and oil pressure switch of only in travel circuit.) • Set the working mode in P-mode before start.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Malfunction of travel PPC valve (shuttle valve)	★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.	
			Travel lever	PPC valve output pressure
			Neutral	0 MPa {0 kg/cm^2}
			Operated	Min. 2.7 MPa {Min. 28 kg/cm^2}

H-6 Fine control mode does not function or responds slow

Trouble	• Fine control performance or response is low.
Related information	• Set the working mode in P-mode before start.

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Malfunction of LS-EPC valve	★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.		
			Travel speed	Travel lever	LS-EPC output pressure
			Lo	Neutral	Approx. 1.4 MPa {Approx. 14 kg/cm^2}
			Hi	Lifting operation	0 MPa {0 kg/cm^2}
	2	Clogging of LS circuit orifice	Orifice of LS circuit may be clogged. Check it directly.		
	3	Defective adjustment or malfunction of LS valve	★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.		
			Measured oil pressure	Oil pressure ratio	
				All levers in neutral	Travel with no load (Lever operated halfway)
			Pump discharge pressure	Almost same pressure	1
			LS valve output pressure		Approx. 3/5
			If oil pressure does not become normal after adjustment, LS valve may have malfunction or internal defect. Check LS valve directly.		
	4	Malfunction of servo piston	Servo piston may have malfunction. Check it directly.		

H-7 Boom moves slowly or lacks power

Trouble	• Speed or power of boom is low
Related information	• Set the working mode in P-mode before start.

<table>
<tr><td rowspan="20">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="2">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Malfunction of right PPC valve (boom circuit)</td><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Boom lever</td><td>PPC valve output pressure</td></tr>
<tr><td>Neutral</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td>Boom Raise or Boom Lower</td><td>Min. 2.7 MPa
{Min. 28 kg/cm^2}</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">Malfunction of merge-divider solenoid valve</td><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Travel lever</td><td>Solenoid output pressure</td></tr>
<tr><td>Neutral</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td>Either side operated</td><td>2.84 – 3.43 MPa
{29 – 35 kg/cm^2}</td></tr>
<tr><td>3</td><td>Malfunction of merge-divider valve (main/LS)</td><td colspan="2">Merge-divider valve (main/LS) may have malfunction. Check it directly.</td></tr>
<tr><td>4</td><td>Malfunction of boom control valve (spool)</td><td colspan="2">Spool of boom control valve (Lo/Hi) may have malfunction. Check it directly.</td></tr>
<tr><td>5</td><td>Malfunction of boom control valve (pressure compensation valve)</td><td colspan="2">Pressure compensation valve of boom control valve (Lo/Hi) may have malfunction. Check it directly.</td></tr>
<tr><td>6</td><td>Malfunction of boom control valve (regeneration valve)</td><td colspan="2">Regeneration valve of boom control valve (Lo) may have malfunction or defective seal. Check it directly.</td></tr>
<tr><td>7</td><td>Malfunction of boom control valve (lock valve)</td><td colspan="2">Lock valve of boom control valve (Lo) may have malfunction. Check it directly.</td></tr>
<tr><td>8</td><td>Malfunction of boom control valve (check valve)</td><td colspan="2">Check valve of boom control valve (Hi) may have malfunction. Check it directly.</td></tr>
<tr><td>9</td><td>Malfunction or defective seal of safety valve for lock valve</td><td colspan="2">Safety valve for lock valve may have malfunction or defective seal. Check it directly.</td></tr>
<tr><td>10</td><td>Malfunction or defective seal of boom control valve (suction valve)</td><td colspan="2">Suction valve of boom control valve (Lo) may have malfunction or defective seal. Check it directly.</td></tr>
<tr><td>11</td><td>Malfunction or defective seal of boom control valve (safety-suction valve)</td><td colspan="2">Safety-suction valve of boom control valve (Lo) may have malfunction or defective seal. Check it directly.</td></tr>
<tr><td>12</td><td>Malfunction of LS shuttle valve (left travel, bucket, or service)</td><td colspan="2">LS shuttle valve of left travel control valve, bucket control valve, or service control valve may have malfunction. Check it directly.</td></tr>
<tr><td rowspan="3">13</td><td rowspan="3">Defective boom cylinder</td><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Boom lever</td><td>Leakage from cylinder</td></tr>
<tr><td>Raise relief</td><td>20 cc/min</td></tr>
</table>

H-8 Arm moves slowly or lacks power

Trouble	• Speed or power of arm is low
Related information	• Set the working mode in P-mode before start.

<table>
<tr><td rowspan="18">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="2">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Malfunction of left PPC valve (arm circuit)</td><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Arm lever</td><td>PPC valve output pressure</td></tr>
<tr><td>Neutral</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td>IN or OUT</td><td>Min. 2.7 MPa
{Min. 28 kg/cm^2}</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">Malfunction of merge-divider solenoid valve</td><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Travel lever</td><td>Solenoid output pressure</td></tr>
<tr><td>Neutral</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td>Either side operated</td><td>2.84 – 3.43 MPa
{29 – 35 kg/cm^2}</td></tr>
<tr><td>3</td><td>Malfunction of pump merge-divider valve (main/LS)</td><td colspan="2">Pump merge-divider valve (main/LS) may have malfunction. Check it directly.</td></tr>
<tr><td>4</td><td>Malfunction of arm control valve (spool)</td><td colspan="2">Spool of arm control valve (Lo/Hi) may have malfunction. Check it directly.</td></tr>
<tr><td>5</td><td>Malfunction of arm control valve (pressure compensation valve)</td><td colspan="2">Pressure compensation valve of arm control valve (Lo/Hi) may have malfunction. Check it directly.</td></tr>
<tr><td>6</td><td>Malfunction of arm control valve (regeneration valve)</td><td colspan="2">Regeneration valve of arm control valve (Lo) may have malfunction or defective seal. Check it directly.</td></tr>
<tr><td>7</td><td>Malfunction or defective seal of arm control valve (safety-suction valve)</td><td colspan="2">Safety-suction valve of arm control valve (Lo/Hi) may have malfunction or defective seal. Check it directly.</td></tr>
<tr><td>8</td><td>Malfunction of arm control valve (quick return valve)</td><td colspan="2">Quick return valve of arm control valve (Hi) may have malfunction. Check it directly.</td></tr>
<tr><td>9</td><td>Malfunction of LS shuttle valve (right travel, boom, left travel, bucket, or service)</td><td colspan="2">LS shuttle valve of right travel control valve, boom control valve, left travel control valve, bucket control valve, or service control valve may have malfunction. Check it directly.</td></tr>
<tr><td rowspan="3">10</td><td rowspan="3">Defective arm cylinder</td><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Arm lever</td><td>Leakage from cylinder</td></tr>
<tr><td>IN relief</td><td>20 cc/min</td></tr>
</table>

H-9 Bucket moves slowly or lacks power

Trouble	• Speed or power of bucket is low
Related information	• Set the working mode in P-mode before start.

<table>
<tr><td rowspan="11">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="2">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Malfunction of right PPC valve (bucket circuit)</td><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Bucket lever</td><td>PPC valve output pressure</td></tr>
<tr><td>Neutral</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td>CURL or DUMP</td><td>Min. 2.7 MPa
{Min. 28 kg/cm^2}</td></tr>
<tr><td>2</td><td>Malfunction of bucket control valve (spool)</td><td colspan="2">Spool of bucket control valve may have malfunction. Check it directly.</td></tr>
<tr><td>3</td><td>Malfunction of bucket control valve (pressure compensation valve)</td><td colspan="2">Pressure compensation valve of bucket control valve may have malfunction. Check it directly.</td></tr>
<tr><td>4</td><td>Malfunction or defective seal of bucket control valve (safety-suction valve)</td><td colspan="2">Safety-suction valve of bucket control valve may have malfunction or defective seal. Check it directly.</td></tr>
<tr><td>5</td><td>Malfunction of LS shuttle valve (service)</td><td colspan="2">LS shuttle valve of service control valve may have malfunction. Check it directly.</td></tr>
<tr><td rowspan="3">6</td><td rowspan="3">Defective bucket cylinder</td><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Bucket lever</td><td>Leakage from cylinder</td></tr>
<tr><td>CURL relief</td><td>20 cc/min</td></tr>
</table>

H-10 Work equipment does not move in its single operation

Trouble	• Boom does not move singly. • Arm does not move singly. • Bucket does not move singly.
Related information	• Set the working mode in P-mode before start.

<table>
<tr><td rowspan="6">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="2">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Malfunction of PPC valve</td><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Work equipment lever</td><td>PPC valve output pressure</td></tr>
<tr><td>Neutral</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td>Operated</td><td>Min. 2.7 MPa
{Min. 28 kg/cm^2}</td></tr>
<tr><td>2</td><td>Malfunction of control valve (spool)</td><td colspan="2">Spool of control valve may have malfunction. Check it directly.</td></tr>
</table>

H-11 Work equipment has a bit too fast hydraulic drift

Trouble (1)	• Hydraulic drift of boom is large.
Related information	• Set the working mode in P-mode before start.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Defective boom cylinder	★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.	
			Boom lever	Leakage from cylinder
			RAISE relief	20 cc/min
	2	Defective seal of boom control valve (lock valve)	Seal of lock valve of boom control valve (Lo) may be defective. Check it directly.	
	3	Defective seal of safety valve for lock valve	Seal of safety valve for lock valve may be defective. Check it directly.	

Trouble (2)	• Hydraulic drift of arm is large.
Related information	• Set the working mode in P-mode before start.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Defective arm cylinder	★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.	
			Arm lever	Leakage from cylinder
			IN relief	20 cc/min
	2	Defective seal of arm control valve (safety-suction valve)	Seal of safety-suction valve of arm control valve (Lo/Hi) may be defective. Check it directly. ★ This safety-suction valve may be checked by replacing it with another one and seeing change of condition. (However, do not use a safety-suction valve for lowering the boom or lock valve for this purpose because its set pressure is different.)	
	3	Defective seal of arm control valve (spool)	Seal of spool of arm control valve (Lo/Hi) may be defective. Check it directly.	
	4	Defective seal of arm control valve (pressure compensation valve)	Seal of pressure compensation valve of arm control valve (Lo/Hi) may be defective. Check it directly.	

Trouble (3)	• Hydraulic drift of bucket is large.
Related information	• Set the working mode in P-mode before start.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Defective bucket cylinder	★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.	
			Bucket lever	Leakage from cylinder
			CURL relief	20 cc/min
	2	Defective seal of bucket control valve (safety-suction valve)	★ Seal of safety-suction valve of bucket control valve may defective. Check it directly. This safety-suction valve may be checked by replacing it with another one and seeing change of condition. (However, do not use a safety-suction valve for lowering the boom or lock valve for this purpose because its set pressure is different.)	
	3	Defective seal of bucket control valve (spool)	Seal of bucket control valve spool may be defective. Check it directly.	
	4	Defective seal of valve control valve (pressure compensation valve)	Seal of pressure compensation valve of bucket control valve may be defective. Check it directly.	

H-12 Work equipment has big time lag

Trouble	Time lag of work equipment is large.
Related information	Set the working mode in P-mode before start.

<table>
<tr><td rowspan="6">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="3">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Malfunction of LS-EPC valve</td><td colspan="3">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Travel speed</td><td>Travel lever</td><td>LS-EPC output pressure</td></tr>
<tr><td>Lo</td><td>Neutral</td><td>Approx. 1.4 MPa {Approx. 14 kg/cm^2}</td></tr>
<tr><td>Hi</td><td>Lifting operation</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td>2</td><td>Malfunction of control valve (regeneration valve) [boom and arm only]</td><td colspan="3">Regeneration valve of control valve may have malfunction. Check it directly.</td></tr>
<tr><td>3</td><td>Malfunction of control valve (safety-suction valve)</td><td colspan="3">Safety-suction valve of control valve may have malfunction. Check it directly.
★ The safety-suction valve of the arm or boom may be checked by replacing it with another one and seeing change of condition. (However, do not use a safety-suction valve for lowering the boom or lock valve for this purpose because its set pressure is different.)</td></tr>
<tr><td>4</td><td>Malfunction of control valve (pressure compensation valve)</td><td colspan="3">Pressure compensation valve of control valve may have malfunction. Check it directly.</td></tr>
</table>

H-13 Other work equipment moves when relieving single circuit

Trouble	• When part of work equipment is relieved singly, other parts of work equipment move
Related information	• Set the working mode in P-mode before start.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective seal of control valve (pressure compensation valve)	Seal of pressure compensation valve of control valve may be defective. Check it directly.

H-14 Power max. switch does not operate

Trouble	• The power maximizing function does not work.
Related information	• Set the working mode in P-mode before start.

<table>
<tr><td rowspan="5">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="2">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Malfunction of 2-stage relief solenoid valve</td><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Swing lock switch</td><td>Solenoid output pressure</td></tr>
<tr><td>OFF</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td>ON</td><td>2.84 – 3.43 MPa
{29 – 35 kg/cm^2}</td></tr>
<tr><td>2</td><td>Malfunction of main relief valve</td><td colspan="2">Main relief valve may have malfunction. Check it directly.</td></tr>
</table>

H-15 In compound operation, work equipment with larger load moves slowly

Failure phenomenon	• In a compound operation, work equipment with larger load tends to move slowly.
Relative information	—

<table>
<tr><td rowspan="8">Presumed cause and standard value in normalcy</td><td colspan="2">Cause</td><td colspan="2">Standard value in normalcy and references for troubleshooting</td></tr>
<tr><td rowspan="7">1</td><td rowspan="7">Malfunctioning of pressure compensation valve for work equipment with smaller load</td><td colspan="2">The pressure compensation valve for the work equipment with smaller load is presumed to malfunction. Check the valve itself.</td></tr>
<tr><td>Combination of compound operation</td><td>Work equipment with larger load</td></tr>
<tr><td>Boom RAISE + arm IN</td><td>Boom RAISE</td></tr>
<tr><td>Boom RAISE + arm OUT</td><td>Arm OUT</td></tr>
<tr><td>Boom RAISE + bucket CURL</td><td>Boom RAISE</td></tr>
<tr><td>Arm OUT + bucket CURL</td><td>Arm OUT</td></tr>
<tr><td>Boom LOWER + arm OUT</td><td>Arm OUT</td></tr>
</table>

H-16 In swing + boom RAISE operation, boom moves slowly

Trouble	• When machine swings and raises boom simultaneously, boom rising speed is low.
Related information	• If speed of single boom raise operation is also low, carry out troubleshooting **H-7** first.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Malfunction or defective seal of LS selector valve	LS selector valve may have malfunction or defective seal. Check it directly.

H-17 In swing + travel operation, travel speed drops sharply

Failure phenomenon	• In a compound operation of swing + travel, the travel speed drops sharply.
Relative information	• If the travel speed is slow in the single operation of travel, carry out the **H-19** check first.

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting
	1	Malfunctioning of LS shuttle valve (left travel and swing)	The LS shuttle valve in the left travel control valve or the swing control valve is presumed to malfunction. Check the valves themselves.

H-18 Machine swerves in travel

Trouble	• Machine deviates during travel.
Related information	• Set the working mode in P-mode before start.

<table>
<tr><td rowspan="20">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="4">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Malfunction of travel PPC valve</td><td colspan="4">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td colspan="2">Travel lever</td><td colspan="2">PPC valve output pressure</td></tr>
<tr><td colspan="2">Travel forward or reverse</td><td colspan="2">Min. 2.7 MPa
{Min. 28 kg/cm^2}</td></tr>
<tr><td colspan="2">Difference between right and left outputs</td><td colspan="2">Within 0.4 MPa
{Within. 4 kg/cm^2}</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Malfunction of self pressure reducing valve</td><td colspan="4">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td colspan="2">Control lever</td><td colspan="2">Control circuit basic pressure</td></tr>
<tr><td colspan="2">All levers at neutral</td><td colspan="2">2.83 – 3.43 MPa
{29 – 35 kg/cm^2}</td></tr>
<tr><td rowspan="4">3</td><td rowspan="4">Defective adjustment or malfunction of LS valve</td><td colspan="4">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td rowspan="2">Measured oil pressure</td><td colspan="2">Oil pressure ratio</td></tr>
<tr><td>All lever in neutral</td><td>Travel with no load (Lever operated halfway)</td></tr>
<tr><td>Pump discharge pressure</td><td rowspan="2">Almost same pressure</td><td>1</td></tr>
<tr><td>LS valve output pressure</td><td>Approx. 3/5</td></tr>
<tr><td rowspan="4">4</td><td rowspan="4">Malfunction of travel junction solenoid valve</td><td colspan="4">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td colspan="2">Travel lever</td><td colspan="2">Solenoid output pressure</td></tr>
<tr><td colspan="2">Either side operated</td><td colspan="2">0 MPa {0 kg/cm^2}</td></tr>
<tr><td colspan="2">Both sides operated</td><td colspan="2">2.84 – 3.43 MPa
{29 – 35 kg/cm^2}</td></tr>
<tr><td>5</td><td>Malfunction of travel junction valve</td><td colspan="4">Travel junction valve may have malfunction. Check it directly.</td></tr>
<tr><td>6</td><td>Malfunction of travel control valve (spool)</td><td colspan="4">Spool of travel control valve may have malfunction. Check it directly.</td></tr>
<tr><td rowspan="3">7</td><td rowspan="3">Defective travel motor</td><td colspan="4">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td colspan="2">Travel lever</td><td colspan="2">Leakage from travel motor</td></tr>
<tr><td colspan="2">Travel relief</td><td colspan="2">Max. 30 ℓ/min</td></tr>
<tr><td>8</td><td>Defective final drive</td><td colspan="4">Final drive may have internal defect. Check it directly.
★ It may be checked by abnormal sound, abnormal heating, metal chips in drain oil, etc.</td></tr>
</table>

H-19 Machine travels slowly

Trouble	• Travel speed is low.
Related information	• Set the working mode in P-mode before start.

<table>
<tr><td rowspan="20">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="4">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Malfunction of travel PPC valve</td><td colspan="4">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td colspan="2">Travel lever</td><td colspan="2">PPC valve output pressure</td></tr>
<tr><td colspan="2">Travel forward or reverse</td><td colspan="2">Min. 2.7 MPa
{Min. 28 kg/cm^2}</td></tr>
<tr><td colspan="2">Difference between right and left/ forward and reverse outputs</td><td colspan="2">Within 0.4 MPa
{Within. 4 kg/cm^2}</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">Malfunction of self pressure reducing valve</td><td colspan="4">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td colspan="2">Control lever</td><td colspan="2">Control circuit basic pressure</td></tr>
<tr><td colspan="2">All levers at neutral</td><td colspan="2">2.83 – 3.43 MPa
{29 – 35 kg/cm^2}</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td rowspan="5">3</td><td rowspan="5">Malfunction of LS-EPC valve</td><td colspan="4">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Travel speed</td><td>Travel lever</td><td>LS-EPC output pressure</td></tr>
<tr><td>Lo</td><td>Neutral</td><td>Approx. 1.4 MPa
{Approx. 14 kg/cm^2}</td></tr>
<tr><td>Hi</td><td>Lifting operation</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td>4</td><td>Malfunction of travel control valve (spool)</td><td colspan="4">Spool of travel control valve may have malfunction. Check it directly.</td></tr>
<tr><td>5</td><td>Malfunction of travel control valve (pressure compensation valve)</td><td colspan="4">Pressure compensation valve of travel control valve may have malfunction. Check it directly.</td></tr>
<tr><td>6</td><td>Malfunction of travel control valve (suction valve)</td><td colspan="4">Suction valve of travel control valve may have malfunction. Check it directly.</td></tr>
<tr><td>7</td><td>Malfunction of LS shuttle valve (bucket)</td><td colspan="4">LS shuttle valve of bucket control valve may have malfunction. Check it directly.</td></tr>
<tr><td rowspan="3">8</td><td rowspan="3">Defective travel motor</td><td colspan="4">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td colspan="2">Travel lever</td><td colspan="2">Leakage from travel motor</td></tr>
<tr><td colspan="2">Travel relief</td><td colspan="2">Max. 30 ℓ/min</td></tr>
<tr><td>9</td><td>Defective final drive</td><td colspan="4">Final drive may have internal defect. Check it directly.
★ It may be checked by abnormal sound, abnormal heating, metal chips in drain oil, etc.</td></tr>
</table>

H-20 Machine cannot be easily steered or lacks power

Trouble	• Machine is not steered well or steering power is low
Related information	• Set the working mode in P-mode before start.

<table>
<tr><th rowspan="2"></th><th colspan="2" rowspan="2">Cause</th><th colspan="2">Standard value in normal state/Remarks on troubleshooting</th></tr>
<tr><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td rowspan="15">Possible causes and standard value in normal state</td><td rowspan="4">1</td><td rowspan="4">Malfunction of travel PPC valve (steering spool)</td><td>Travel lever</td><td>PPC valve output pressure (steering)</td></tr>
<tr><td>Both sides in neutral</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td>Either side operated</td><td>Min. 2.7 MPa
{Min. 28 kg/cm^2}</td></tr>
<tr><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">Malfunction of travel junction solenoid valve</td><td>Travel lever</td><td>Solenoid output pressure</td></tr>
<tr><td>Both sides operated</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td>Either side operated</td><td>2.84 – 3.43 MPa
{29 – 35 kg/cm^2}</td></tr>
<tr><td>3</td><td>Malfunction of travel junction valve</td><td colspan="2">Travel junction valve may have malfunction. Check it directly.</td></tr>
<tr><td rowspan="4">4</td><td rowspan="4">Malfunction of merge-divider solenoid valve</td><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Travel lever</td><td>Solenoid output pressure</td></tr>
<tr><td>Both sides in neutral</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td>Either side operated</td><td>2.84 – 3.43 MPa
{29 – 35 kg/cm^2}</td></tr>
<tr><td>5</td><td>Malfunction of merge-divider valve</td><td colspan="2">Merge-divider valve may have malfunction. Check it directly.</td></tr>
<tr><td>6</td><td>Malfunction of travel control valve (spool)</td><td colspan="2">Spool of travel control valve may have malfunction. Check it directly.</td></tr>
<tr><td>7</td><td>Malfunction of travel control valve (pressure compensation valve)</td><td colspan="2">Pressure compensation valve of travel control valve may have malfunction. Check it directly.</td></tr>
<tr><td>8</td><td>Malfunction of travel control valve (suction valve)</td><td colspan="2">Suction valve of travel control valve may have malfunction. Check it directly.</td></tr>
<tr><td>9</td><td>Malfunction of LS shuttle valve (bucket)</td><td colspan="2">LS shuttle valve of bucket control valve may have malfunction. Check it directly.</td></tr>
<tr><td>10</td><td>Defective seal of check valve of LS pressure sensing part</td><td colspan="2">Seal of check valve of LS pressure sensing part may be defective. Check it directly.</td></tr>
<tr><td>11</td><td>Malfunction of travel motor (safety valve)</td><td colspan="2">Seal of safety valve of travel motor may have malfunction. Check it directly.
★ Motors of same type on forward and reverse sides or on right and left sides may be checked by replacing them with each other and seeing change of condition.</td></tr>
<tr><td>12</td><td>Malfunction of travel motor (check valve)</td><td colspan="2">Seal of check valve of travel motor may have malfunction. Check it directly.
★ Motors of same type on forward and reverse sides or on right and left sides may be checked by replacing them with each other and seeing change of condition.</td></tr>
</table>

H-21 Travel speed does not shift, or it is too slow or fast

Trouble	• Travel speed does not change or travel speed is low or high
Related information	• Set the working mode in P-mode before start.

<table>
<tr><td rowspan="15">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="3">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="8">1</td><td rowspan="8">Malfunction of LS-EPC valve</td><td colspan="3">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Travel speed</td><td>Travel lever</td><td>Monitoring [15]</td></tr>
<tr><td>Lo</td><td rowspan="3">Fine control (such as releasing decelerator)</td><td>690 mA</td></tr>
<tr><td>Mi</td><td>740 mA</td></tr>
<tr><td>Hi</td><td>0 mA</td></tr>
<tr><td colspan="3">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Travel speed</td><td>Travel lever</td><td>LS-EPC output pressure</td></tr>
<tr><td>Lo</td><td>Neutral</td><td>Approx. 1.4 MPa {Approx. 14 kg/cm^2}</td></tr>
<tr><td>Hi</td><td>Lifting operation</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">Malfunction of travel speed selector solenoid valve</td><td colspan="3">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Travel speed</td><td>Travel lever</td><td>Solenoid valve output pressure</td></tr>
<tr><td>Lo</td><td>Neutral</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td>Hi</td><td>Operated</td><td>2.84 – 3.43 MPa {29 – 35 kg/cm^2}</td></tr>
<tr><td>3</td><td>Malfunction of travel motor (speed shifting section)</td><td colspan="3">Speed shifting section of travel motor may have malfunction. Check it directly.</td></tr>
</table>

H-22 Track shoe does not turn (on one side only)

Trouble	• Travel system does not move (only one side).
Related information	• Set the working mode in P-mode before start.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Defective seal of travel control valve (suction valve)	Suction valve of travel control valve may have defective seal. Check it directly.	
	2	Defective seal of travel motor (safety valve)	Safety valve of travel motor may have defective seal. Check it directly.	
	3	Defective seal of travel motor (check valve)	Check valve of travel motor may have defective seal. Check it directly.	
	4	Lowering of travel motor output	★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.	
			Travel lever	Leakage from travel motor
			Travel relief	Max. 30 ℓ/min
	5	Defective final drive	Final drive may have internal defect. Check it directly. ★ It may be checked by abnormal sound, abnormal heating, metal chips in drain oil, etc.	

H-23 Machine does not swing

Trouble (1)	• Upper structure does not swing in either direction.
Related information	• Set the working mode in P-mode before start.

<table>
<tr><td rowspan="13">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="3">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Malfunction of swing holding brake solenoid valve</td><td colspan="3">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td colspan="2">Swing</td><td>Solenoid valve</td></tr>
<tr><td colspan="2">Neutral</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td colspan="2">Operated</td><td>2.84 – 3.43 MPa
{29 – 35 kg/cm^2}</td></tr>
<tr><td>2</td><td>Malfunction of swing motor (holding brake section)</td><td colspan="3">Holding brake section of swing motor may have malfunction. Check it directly.</td></tr>
<tr><td rowspan="4">3</td><td rowspan="4">Defective adjustment or malfunction of swing motor (safety valve)</td><td colspan="3">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Swing lock switch</td><td>Swing lever</td><td>Swing relief pressure</td></tr>
<tr><td>ON</td><td>Swing relief</td><td>27.95 – 32.85 MPa
{285 – 335 kg/cm^2}</td></tr>
<tr><td colspan="3">If oil pressure does not become normal after adjustment, safety valve may have malfunction or internal defect. Check safety valve directly.</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Defective swing motor</td><td colspan="3">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td colspan="2">Swing lever</td><td>Leakage from swing motor</td></tr>
<tr><td colspan="2">Swing relief</td><td>Max. 11 ℓ/min</td></tr>
<tr><td>5</td><td>Defective swing machinery</td><td colspan="3">Swing machinery may have internal defect. Check it directly.
★ It may be checked by abnormal sound, abnormal heating, metal chips in drain oil, etc.</td></tr>
</table>

Trouble (2)	• Upper structure swings only in one direction.
Related information	• Set the working mode in P-mode before start.

<table>
<tr><td rowspan="6">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="2">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Malfunction of swing PPC valve</td><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Left lever</td><td>PPC valve output pressure</td></tr>
<tr><td>Neutral</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td>Swing</td><td>Min. 2.7 MPa
{Min. 28 kg/cm^2}</td></tr>
<tr><td>2</td><td>Malfunction of swing control valve (spool)</td><td colspan="2">Spool of swing control valve may have malfunction. Check it directly.</td></tr>
<tr><td>3</td><td>Defective seal of swing motor (suction valve)</td><td colspan="2">Seal of suction valve of swing motor may be defective. Check it directly.
★ Suction valves on right side and left side may be checked by replacing them with each other and seeing change of condition.</td></tr>
<tr><td>4</td><td>Defective seal of swing motor (check valve)</td><td colspan="2">Seal of check valve of swing motor may be defective. Check it directly.
★ Check valves on right side and left side may be checked by replacing them with each other and seeing change of condition.</td></tr>
</table>

H-24 Swing acceleration is poor, or swing speed is slow

Trouble (1)	• Swing acceleration or swing speed is low in both directions.
Related information	• Set the working mode in P-mode before start.

<table>
<tr><td rowspan="8">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="3">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td>1</td><td>Malfunction of LS shuttle valve (all control valves)</td><td colspan="3">LS shuttle valves of all control valves may have malfunction. Check them directly.</td></tr>
<tr><td>2</td><td>Malfunction of swing motor (holding brake)</td><td colspan="3">Holding brake section of swing motor may have malfunction. Check it directly.</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Defective adjustment or malfunction of swing motor (safety valve)</td><td colspan="3">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Swing lock switch</td><td>Swing lever</td><td>Swing relief pressure</td></tr>
<tr><td>ON</td><td>Swing relief</td><td>27.95 – 32.85 MPa
{285 – 335 kg/cm^2}</td></tr>
<tr><td colspan="4">If oil pressure does not become normal after adjustment, safety valve may have malfunction or internal defect. Check safety valve directly.</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Defective swing motor</td><td colspan="3">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td colspan="2">Swing lever</td><td>Leakage from swing motor</td></tr>
<tr><td colspan="2">Swing relief</td><td>Max. 11 ℓ/min</td></tr>
</table>

Trouble (2)	• Swing acceleration or swing speed is low in only one direction.
Related information	• Set the working mode in P-mode before start.

<table>
<tr><td rowspan="8">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="2">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Malfunction of swing PPC valve</td><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Swing lever</td><td>PPC valve output pressure</td></tr>
<tr><td>Neutral</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td>Left or Right</td><td>Min. 2.7 MPa
{Min. 28 kg/cm^2}</td></tr>
<tr><td>2</td><td>Malfunction of swing control valve (spool)</td><td colspan="2">Spool of swing control valve may have malfunction. Check it directly.</td></tr>
<tr><td>3</td><td>Malfunction of swing control valve (pressure compensation valve)</td><td colspan="2">Pressure compensation valve of swing control valve may have malfunction. Check it directly.</td></tr>
<tr><td>4</td><td>Defective seal of swing motor (suction valve)</td><td colspan="2">Seal of suction valve of swing motor may be defective. Check it directly.
★ Suction valves on right side and left side may be checked by replacing them with each other and seeing change of condition.</td></tr>
<tr><td>5</td><td>Defective seal of swing motor (check valve)</td><td colspan="2">Seal of check valve of swing motor may be defective. Check it directly.
★ Check valves on right side and left side may be checked by replacing them with each other and seeing change of condition.</td></tr>
</table>

H-25 Excessive overrun when stopping swing

Trouble (1)	• Upper structure overruns remarkably when it stops swinging in both directions.
Related information	• Set the working mode in P-mode before start.

<table>
<tr><td rowspan="6">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="3">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Defective adjustment or malfunction of swing motor (safety valve)</td><td colspan="3">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Swing lock switch</td><td>Swing lever</td><td>Swing relief pressure</td></tr>
<tr><td>ON</td><td>Swing relief</td><td>27.95 – 32.85 MPa
{285 – 335 kg/cm^2}</td></tr>
<tr><td colspan="3">If oil pressure does not become normal after adjustment, safety valve may have malfunction or internal defect. Check safety valve directly.</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Defective swing motor</td><td colspan="3">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td colspan="2">Swing lever</td><td>Leakage from swing motor</td></tr>
<tr><td colspan="2">Swing relief</td><td>Max. 11 ℓ/min</td></tr>
</table>

Trouble (2)	• Upper structure overruns remarkably when it stops swinging in only one direction.
Related information	• Set the working mode in P-mode before start.

<table>
<tr><td rowspan="8">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="2">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Malfunction of swing PPC valve</td><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Swing lever</td><td>PPC valve output pressure</td></tr>
<tr><td>Neutral</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td>2</td><td>Clogging of swing PPC slow return valve</td><td colspan="2">Swing PPC slow return valve may be clogged. Check it directly.
★ Slow return valves on right side and left side may be checked by replacing them with each other and seeing change of condition.</td></tr>
<tr><td>3</td><td>Malfunction of swing control valve (spool)</td><td colspan="2">Swing control valve spool may be malfunctioning. Check it directly.</td></tr>
<tr><td>4</td><td>Defective seal of swing motor (suction valve section)</td><td colspan="2">Seal of suction valve of swing motor may be defective. Check it directly.
★ Suction valves on right side and left side may be checked by replacing them with each other and seeing change of condition.</td></tr>
<tr><td>5</td><td>Defective seal of swing motor (check valve)</td><td colspan="2">Seal of check valve of swing motor may be defective. Check it directly.
★ Check valves on right side and left side may be checked by replacing them with each other and seeing change of condition.</td></tr>
</table>

H-26 There is big shock when stopping swing

Trouble	• Large shock is made when upper structure stops swinging.
Related information	• Set the working mode in P-mode before start.

<table>
<tr><td rowspan="5">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="2">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Malfunction of swing PPC valve</td><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Swing lever</td><td>PPC valve output pressure</td></tr>
<tr><td>Neutral</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td>Left or Right</td><td>Min. 2.7 MPa
{Min. 28 kg/cm^2}</td></tr>
<tr><td>2</td><td>Malfunction of swing PPC slow return valve</td><td colspan="2">Swing PPC slow return valve may have malfunction. Check it directly.
★ Slow return valves on right side and left side may be checked by replacing them with each other and seeing change of condition.</td></tr>
</table>

H-27 Large sound is made when upper structure stops swinging.

Trouble	• Large sound is made when upper structure stops swinging.
Related information	• Set the working mode in P-mode before start.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Malfunction of back pressure valve	Back pressure valve of control valve may have malfunction. Check it directly.
	2	Malfunction of swing motor (safety valve)	Safety valve of swing motor may have malfunction. Check it directly.
	3	Malfunction of swing motor (suction valve)	Suction valve of swing motor may have malfunction. Check it directly. ★ Suction valves on right side and left side may be checked by replacing them with each other and seeing change of condition.
	4	Defective swing machinery	Swing machinery may have internal defect. Check it directly. ★ It may be checked by abnormal sound, abnormal heating, metal chips in drain oil, etc.

H-28 Swing hydraulic drift is too big

Trouble (1)	• Hydraulic drift of swing is large (when swing holding brake is applied).
Related information	• When swing emergency reset switch is turned OFF (normal position), swing holding brake operates and upper structure is fixed with disc brake.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Malfunction of swing holding brake solenoid valve	★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.	
			Swing lever	Solenoid valve output pressure
			Neutral	0 MPa {0 kg/cm^2}
			Left or Right	2.84 – 3.43 MPa {29 – 35 kg/cm^2}
	2	Malfunction of swing motor (holding brake)	Holding brake section of swing motor may have malfunction or internal defect. Check it directly.	

Trouble (2)	• Hydraulic drift of swing is large (when swing holding brake is released).
Related information	• When swing emergency reset switch is turned ON (in an emergency), swing holding brake is released and upper structure is secured by only hydraulic pressure.

	Cause		Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Malfunction of swing control valve (spool)	Seal of spool of swing control valve may be defective. Check it directly.
	2	Malfunction of swing control valve (pressure compensation valve)	Seal of pressure compensation valve section of swing control valve may be defective. Check it directly.
	3	Defective seal of swing motor (safety valve)	Seal of safety valve of swing motor may be defective. Check it directly.
	4	Defective seal of swing motor (suction valve)	Seal of suction valve of swing motor may be defective. Check it directly.
	5	Defective seal of swing motor (check valve)	Seal of check valve of swing motor may be defective. Check it directly.

PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN02633-00

HYDRAULIC EXCAVATOR

PC300-8
PC300LC-8
PC350-8
PC350LC-8

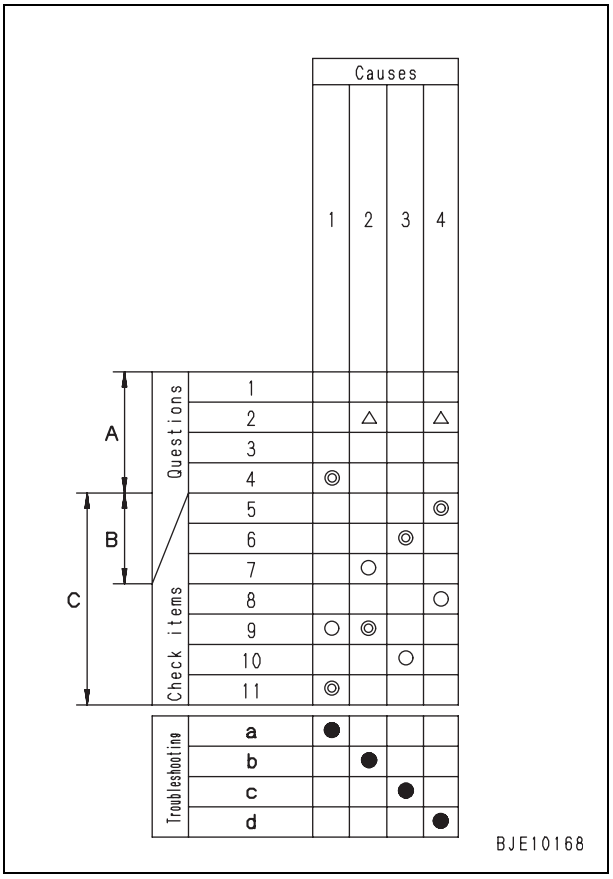
Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

40 Troubleshooting

Troubleshooting of engine (S-mode)

Method of using troubleshooting chart

The troubleshooting chart consists of the “questions”, “check items”, “causes”, and “troubleshooting” blocks.
The questions and check items are used to pinpoint high probability causes by simple inspection or from phenomena without using troubleshooting tools.
Next, troubleshooting tools or direct inspection are applied to check the narrowed causes in order from the most probable one to make final confirmation according to the troubleshooting procedure.



[Questions]:
Items to be drawn from the user or operator.
They correspond to A and B in the chart on the right.
The items in A are basic ones.
The items in B can be drawn from the user or operator, depending on their level.

[Check items]:
Items to be simply checked by the serviceman to narrow down causes.
They corresponds to C in the chart on the right.

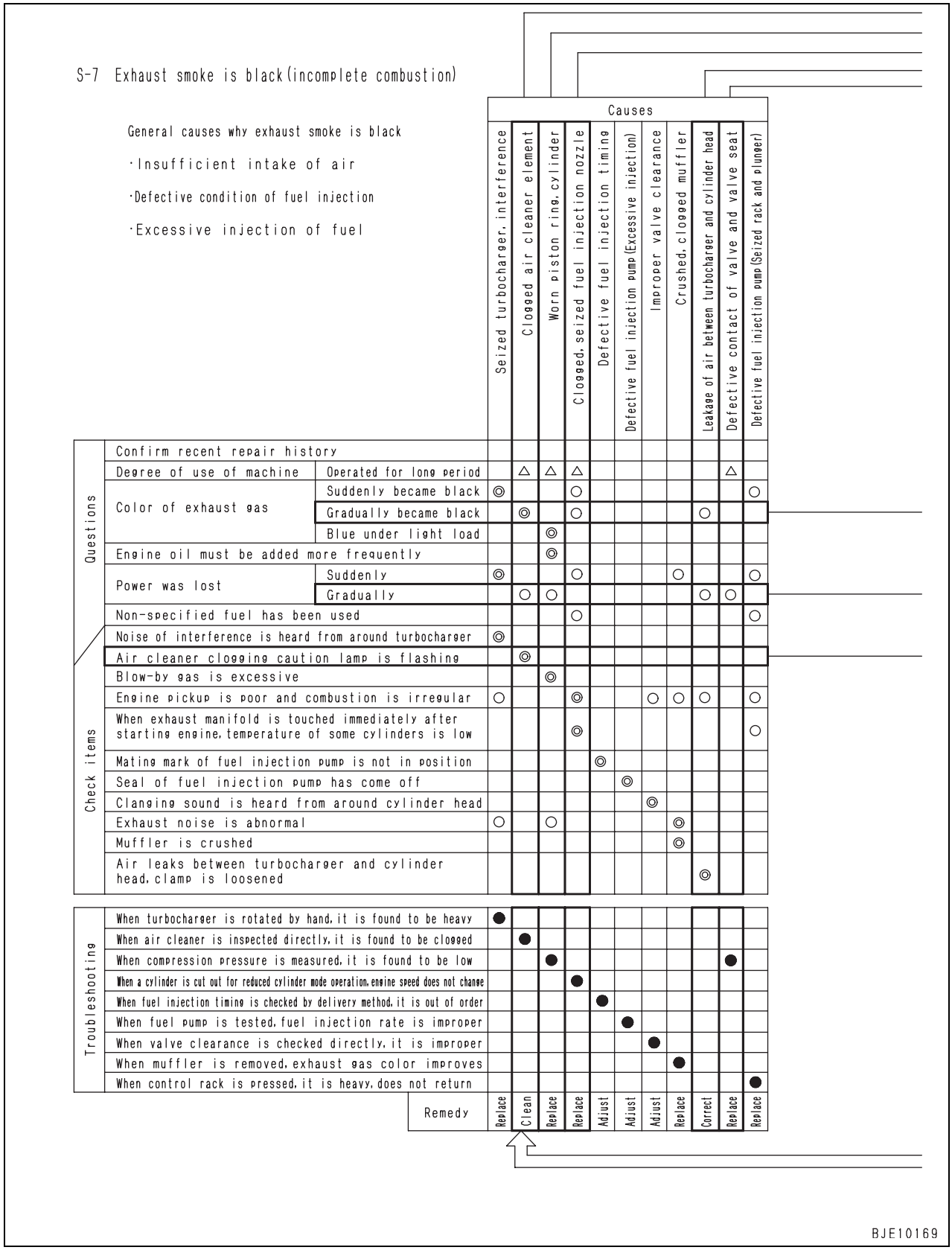
[Causes]:
Items to be narrowed from the questions and check items.
The serviceman narrows down the probable causes from A, B, and C.

[Troubleshooting]:
Items to finally verify whether the narrowed down causes are undoubtedly the real causes using the troubleshooting tools and direct inspections.

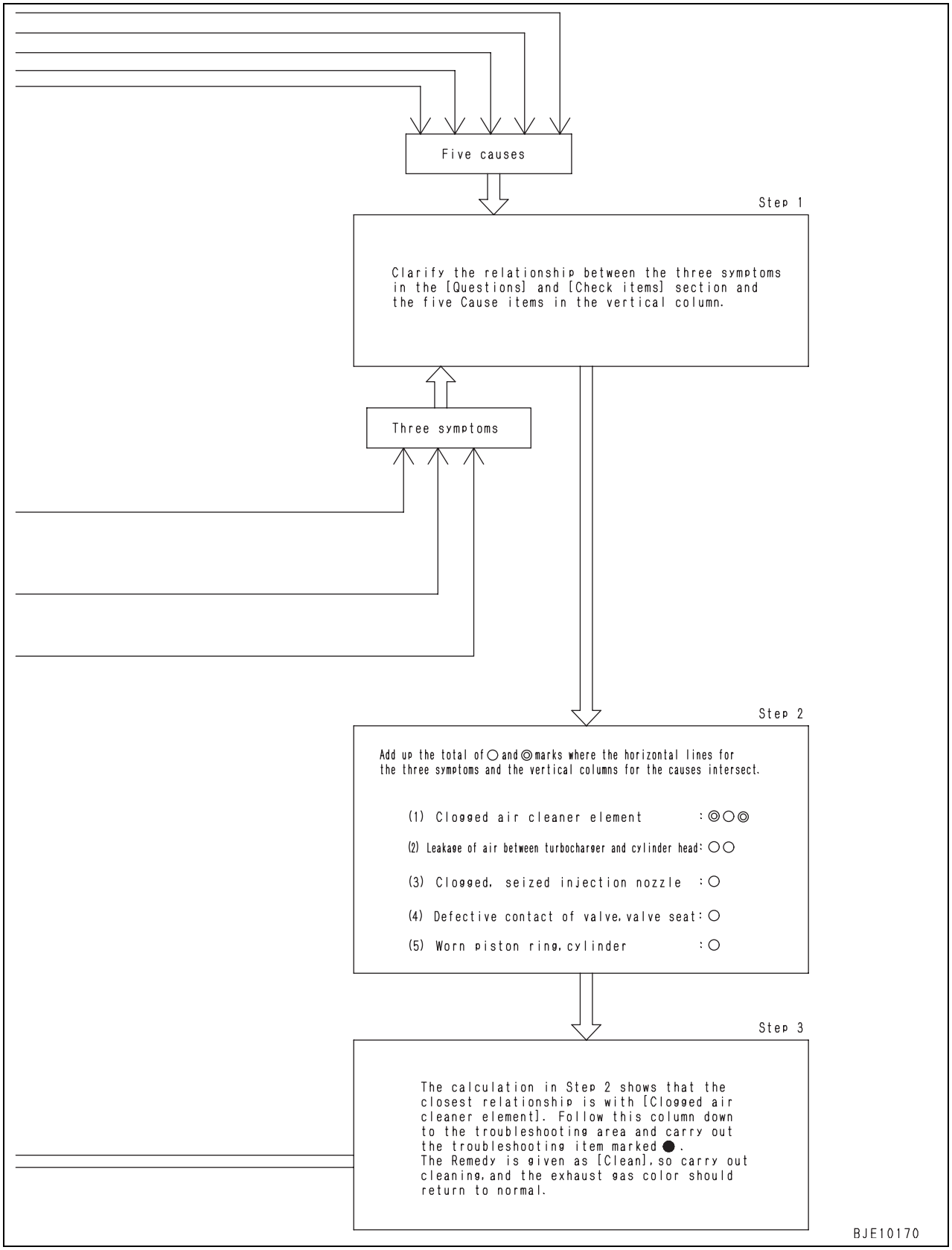
Items listed in the [Questions] and [Check items] and related to the [Causes] are marked with △, ○, or ◎.
△: Causes to be referred to for questions and check items
○: Causes related to questions and check items
◎: Causes highly probable among ones marked with ○

★ When narrowing the “causes”, apply the items marked with ◎ before those marked with ○.
When narrowing the causes, do not apply the items marked with △. (If no items have other marks and the causes cannot be narrowed, however, you may apply them.)

<Example of troubleshooting> Exhaust smoke is black
Let us assume that [Clogged air cleaner] is taken to be the cause of black exhaust gas. 3 symptoms have causal relationship with this problem: [Color of exhaust gas gradually became black], [Power was lost gradually], and [Air cleaner clogging caution lamp is flashing].



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



S-1 Starting performance is poor

General causes why starting performance is poor

- Defective electrical system
- Insufficient supply of fuel
- Insufficient intake of air
- Improper selection of fuel

★ The common rail fuel injection system (CRI) recognizes the fuel injection timing electrically. Accordingly, even if the starting operation is carried out, the engine may not start until the crankshaft revolves 2 turns at maximum. This phenomenon does not indicate a trouble, however.

			Cause													
			Clogged air cleaner element	Defective contact of valve and valve seat	Worn piston ring, cylinder	Clogged air breather hole of fuel tank cap	Leaking or clogged fuel piping, entry of air	Clogged fuel filter/strainer	Stuck, seized supply pump plunger	Defective electric lift pump	Defective injector	Defective intake air heater system	Defective alternator (regulator section)	Defective alternator (generator section)	Defective or deteriorated battery
Questions	Confirm recent repair history															
	Degree of use of machine	Operated for long period	△					△							△
	Starting performance	Became worse gradually	○	◎	◎			○							
		Engine starts easily when warm										◎			◎
	Non-specified fuel is being used							○	○		○				
	Replacement of filters has not been carried out according to Operation and Maintenance Manual		◎					◎	○		○				
	Engine oil must be added more frequently				◎										
	When engine is preheated or when temperature is low, preheating monitor does not indicate normally (if monitor is installed)											◎			
	During operation, charge level monitor indicates abnormal charge (if monitor is installed)												◎	◎	
Check items	Dust indicator is red (if indicator is installed)		◎												
	Air breather hole of fuel tank cap is clogged					◎									
	Fuel is leaking from fuel piping						◎		○						
	Starting motor cranks engine slowly														◎
	While engine is cranked with starting motor	If air bleeding plug of fuel filter is removed, fuel does not flow out						◎		○					
		If spill hose from injector is disconnected, little fuel spills							◎						
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low										◎				
	Engine does not pick up smoothly and combustion is irregular			○	○						◎				
	There is hunting from engine (rotation is irregular)					○	◎	○		○					
	Blow-by gas is excessive				◎										
Troubleshooting	Inspect air cleaner directly		●												
	When compression pressure is measured, it is found to be low			●	●										
	Inspect fuel filter, strainer directly							●							
	Carry out troubleshooting for “Rail Press (Very) Low Error.” See *1 for failure code.								●						
	Carry out troubleshooting for “Power Lift Pump Error.” See *2 for failure code.									●					
	When a cylinder is cut out for reduced cylinder mode operation, engine speed does not change										●				
	When starting switch is turned to HEAT, intake air heater mount does not become warm											●			
	Is voltage 20 – 30 V between alternator terminal B and terminal E with engine at low idle?	Yes											●		
		No												●	
	When specific gravity of electrolyte and voltage of battery are measured, they are low														●
		Remedy	Clean	Replace	Replace	Clean	Correct	Clean	Replace	Replace	Replace	Replace	Replace	Replace	Replace

*1: Failure codes [CA559] and [CA2249]
*2: Failure codes [CA2265] and [CA2266]

S-2 Engine does not start

a) Engine does not turn

General causes why engine does not turn

- Internal parts of engine seized:
  See “S-4 Engine stops during operations”
- Defective electrical system
- Defective hydraulic pump

			Cause									
			Broken flywheel ring gear	Defective or deteriorated battery	Defective connection of battery terminal	Defective battery relay	Defective starting switch	Defective safety relay	Defective starting motor (motor section)	Defective starting circuit wiring	Defective hydraulic pump
Questions / Check items	Confirm recent repair history										
	Degree of use of machine	Operated for long period	△	△							
	Condition of horn when starting switch is turned ON	Horn does not sound			○		○			◎	
		Horn volume is low		◎							
	Battery electrolyte is low			◎							
	Battery terminal is loose				◎						
	When starting switch is turned ON, there is no operating sound from battery relay			○		◎					
	When starting switch is turned to START, starting pinion does not move out			○			○			◎	
	When starting switch is turned to START, starting pinion moves out, but	Speed of rotation is low		◎							
		Makes grating noise	◎						◎		
		Soon disengages again						◎			
		Makes rattling noise and does not turn		○				○	○		
Troubleshooting	Inspect flywheel ring gear directly		●							Carry out troubleshooting in E-mode.	
	When specific gravity of electrolyte and voltage of battery are measured, they are low			●							Carry out troubleshooting in H-mode.
	Turn starting switch OFF, connect cord, and carry out troubleshooting at ON	There is not voltage (20 – 30 V) between battery relay terminal B and terminal E				●					
		When terminal B and terminal C of starting switch are connected, engine starts					●				
		When terminal B and terminal C at safety relay outlet are connected, engine starts						●			
		Even if terminal B and terminal C at safety relay outlet are connected, engine does not start							●		
		When safety switch terminal and terminal B of starting motor are connected, engine starts							●		
		Remedy	Replace	Replace	Correct	Replace	Replace	Replace	Replace	—	—

b) Engine turns but no exhaust smoke comes out

General causes why engine turns but no exhaust smoke comes out

- Fuel is not being supplied
- Supply of fuel is extremely small
- Improper selection of fuel (particularly in winter)

			Cause													
			Use of improper fuel	Insufficient fuel in tank	Clogged air breather hole of fuel tank cap	Leaking or clogged fuel piping, entry of air	Clogged fuel filter element	Seized, abnormally worn feed pump	Broken supply pump shaft	Stuck, seized supply pump plunger	Defective supply pump MPROP	Defective electric lift pump	Defective operation of overflow valve (Does not close)	Defective common rail pressure limiter	Defective fuel injector
Questions / Check items	Confirm recent repair history														
	Degree of use of machine	Operated for long period				△	△								
	Exhaust smoke suddenly stopped coming out (when starting again)							◎	○	◎	◎				△
	Replacement of filters has not been carried out according to Operation and Maintenance Manual						◎			△					○
	When fuel tank is inspected, it is found to be empty			◎											
	Air breather hole of fuel tank cap is clogged			○	◎										
	Rust and water are found when fuel tank is drained						○	△		△	△				
	When fuel filter is removed, there is not fuel in it		◎			◎						○			
	Fuel is leaking from fuel piping					◎									
	While engine is cranked with starting motor	If air bleeding plug of fuel filter is removed, fuel does not flow out		○		○		◎	○			○			
		If spill hose from injector is disconnected, little fuel spills				○			◎	◎	◎				○
Troubleshooting	Inspect fuel filter directly						●								
	Inspect feed pump directly							●							
	Carry out troubleshooting for “Rail Press (Very) Low Error.” See *1 for failure code.								●	●					
	Carry out troubleshooting for “IMV/PCV1 Short (Open) Error.” See *2 for failure code.										●				
	Carry out troubleshooting for “Power Lift Pump Error.” See *3 for failure code.											●			
	Inspect overflow valve directly												●		
	Engine can be started in reduced cylinder mode.														●
	If pressure limiter return pipe is disconnected, fuel flows out													●	
		Remedy	Replace	Add	Clean	Correct	Replace	Replace	Replace	Replace	Replace	Replace	Replace	Replace	Replace

*1: Failure codes [CA559] and [CA2249]
*2: Failure codes [CA271] and [CA272]
*3: Failure codes [CA2265] and [CA2266]

c) Exhaust smoke comes but engine does not start (fuel is being injected)

General causes why exhaust smoke comes out but engine does not start

- Lack of rotating force due to defective electrical system
- Insufficient supply of fuel
- Insufficient intake of air
- Improper selection of fuel

			Cause													
			Clogged air cleaner element	Worn dynamic valve system (Valve, rocker lever, etc.)	Excessive wear of piston ring, cylinder liner	Use of improper fuel	Clogged air breather hole of fuel tank cap	Leaking or clogged fuel system, entry of air	Clogged fuel filter	Stuck, seized supply pump plunger	Defective electric lift pump	Clogged injector, defective spray	Defective, deteriorated battery	Defective coolant temperature sensor, wiring harness	Defective intake air heater system
Questions	Confirm recent repair history														
	Degree of use of machine	Operated for long period			△				△			△			
	Suddenly failed to start			◎						◎				○	
	Non-specified fuel is being used					◎				○		○			
	Replacement of filters has not been carried out according to Operation and Maintenance Manual		◎						◎						
	Engine oil must be added more frequently				◎										
	When engine is preheated or when temperature is low, preheating monitor does not indicate normally (if monitor is installed)														◎
Check items	Dust indicator is red (if indicator is installed)		◎												
	Air breather hole of fuel tank cap is clogged						○								
	Rust and water are found when fuel tank is drained								◎						
	When fuel filter is removed, there is not fuel in it					◎					○				
	Fuel is leaking from fuel piping							◎							
	Starting motor cranks engine slowly												◎		
	When engine is cranked, abnormal sound is generated around cylinder head			◎											
	While engine is cranked with starting motor	If air bleeding plug of fuel filter is removed, fuel does not flow out				○			◎		○				
		If spill hose from injector is disconnected, little fuel spills								◎					
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low											◎			
Troubleshooting	Inspect air cleaner directly		●												
	Inspect dynamic valve system directly			●											
	When compression pressure is measured, it is found to be low				●										
	When air is bled from fuel system, air comes out							●							
	Inspect fuel filter directly								●						
	Carry out troubleshooting for “Rail Press (Very) Low Error.” See *1 for failure code.									●					
	Carry out troubleshooting for “Power Lift Pump Error.” See *2 for failure code.										●				
	Engine can be started in reduced cylinder mode.											●			
	When specific gravity of electrolyte and voltage of battery are measured, they are low												●		
	Coolant temperature gauge does not indicate normally (if coolant temperature gauge is installed)													●	
	When starting switch is turned to HEAT, intake air heater mount does not become warm														●
		Remedy	Clean	Replace	Replace	Replace	Clean	Correct	Replace	Replace	Replace	Replace	Replace	Replace	Replace

*1: Failure codes [CA559] and [CA2249]
*2: Failure codes [CA2265] and [CA2266]

S-3 Engine does not pick up smoothly

General causes why engine does not pick up smoothly

- Insufficient intake of air
- Insufficient supply of fuel
- Defective condition of fuel spray
- Improper selection of fuel
- Controller is controlling in derate mode
  (limiting injection rate (output) because of an error in electrical system)

			Cause									
			Clogged air cleaner element	Defective contact of valve and valve seat	Improper valve clearance	Seized turbocharger, interference of turbocharger	Excessive wear of piston ring, cylinder liner	Clogged air breather hole of fuel tank cap	Leaking or clogged fuel piping, entry of air	Clogged fuel filter	Stuck, seized supply pump plunger	Clogged injector, defective spray
Questions	Confirm recent repair history											
	Degree of use of machine	Operated for long period	△	△			△			△		
	Engine pick-up suddenly became worse					◎		○	○			○
	Non-specified fuel is being used									◎	◎	◎
	Replacement of filters has not been carried out according to Operation and Maintenance Manual		◎							◎		
	Oil must be added more frequently						◎					
Check items	Dust indicator is red (if indicator is installed)		◎									
	Air breather hole of fuel tank cap is clogged							◎				
	Rust and water are found when fuel tank is drained									◎		
	Fuel is leaking from fuel piping								◎			
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low										○	◎
	Color of exhaust gas	Blue under light load					◎					
		Black	◎	○		◎						◎
	When engine is cranked, abnormal sound is generated around cylinder head				◎							
	When engine is cranked, interference sound is generated around turbocharger					◎						
	High idle speed under no load is normal, but speed suddenly drops when load is applied							○		◎		
	There is hunting from engine (rotation is irregular)							○		○		○
	Blow-by gas is excessive						◎					
Troubleshooting	Inspect air cleaner directly		●									
	When compression pressure is measured, it is found to be low			●			●					
	Inspect valve clearance directly				●							
	When turbocharger is rotated by hand, it is found to be heavy					●						
	When air is bled from fuel system, air comes out								●			
	Inspect fuel filter, strainer directly									●		
	Carry out troubleshooting for “Rail Press (Very) Low Error.” See *1 for failure code.										●	
	When a cylinder is cut out for reduced cylinder mode operation, engine speed does not change											●
		Remedy	Clean	Replace	Adjust	Replace	Replace	Clean	Correct	Replace	Replace	Replace

*1: Failure codes [CA559] and [CA2249]

S-4 Engine stops during operations

General causes why engine stops during operations

- Seized parts inside engine
- Insufficient supply of fuel
- There is overheating
- Defective hydraulic pump

			Cause												
			Broken dynamic valve system (valve, rocker lever, etc.)	Broken, seized piston, connecting rod	Broken, seized crankshaft bearing	Broken, seized gear train	Insufficient fuel in tank	Clogged air breather hole of fuel tank cap	Leaking, clogged fuel piping	Clogged fuel filter	Broken, seized feed pump	Broken supply pump shaft	Stuck, seized supply pump plunger	Defective hydraulic pump
Questions	Confirm recent repair history													
	Degree of use of machine	Operated for long period								△				
	Condition when engine stopped	Abnormal noise was heard and engine stopped suddenly	◎	◎	◎	◎					○	◎	○	◎
		Engine overheated and stopped		◎	○									
		Engine stopped slowly					◎			○				
		There was hunting and engine stopped					◎	○		○	○			
	Non-specified fuel is being used									○	○		○	
	Replacement of filters has not been carried out according to Operation and Maintenance Manual									◎				
Check items	Fuel level monitor indicates low level (if monitor is installed)						◎							
	When fuel tank is inspected, it is found to be empty						◎							
	Air breather hole of fuel tank cap is clogged							◎						
	Fuel is leaking from fuel piping								◎					
	Rust and water are found when fuel tank is drained									◎				
	Metal particles are found when oil pan is drained		◎	◎	◎						○			
	When engine is cranked by hand	Does not turn at all		◎	◎									
		Turns in opposite direction	◎											
		Moves by amount of gear backlash				◎								
		Supply pump shaft does not turn										◎		
	Engine turns, but stops when load is applied to machine													◎
Troubleshooting	Inspect dynamic valve system directly		●											Carry out troubleshooting in H-mode.
	Inspect piston, connecting rod directly			●										
	Inspect crankshaft bearing directly				●									
	Inspect gear train directly					●								
	Inspect fuel filter, strainer directly									●				
	Inspect feed pump directly										●			
	Carry out troubleshooting for “Rail Press (Very) Low Error.” See *1 for failure code.											●	●	
		Remedy	Replace	Replace	Replace	Replace	Add	Clean	Correct	Replace	Replace	Replace	Replace	—

*1: Failure codes [CA559] and [CA2249]

S-5 Engine does not rotate smoothly

General causes why engine does not rotate smoothly

- Air in fuel system
- Defective speed sensor (Error at degree that it is not indicated)

			Cause							
			Insufficient fuel in tank	Clogged air breather hole of fuel tank cap	Leaking or clogged fuel piping, entry of air	Clogged fuel filter	Clogged injector, defective spray (dirt in injector)	Defective Ne speed sensor, wiring harness	Defective Bkup speed sensor, wiring harness
Questions	Confirm recent repair history								
	Degree of use of machine	Operated for long period				△			
	Condition of hunting	Occurs at a certain speed range						○	○
		Occurs at low idle			○	○	○	○	○
		Occurs even when speed is raised		○				○	○
		Occurs on slopes	◎						
	Replacement of filters has not been carried out according to Operation and Maintenance Manual					◎			
Check items	When fuel tank is inspected, it is found to be empty		◎						
	Air breather hole of fuel tank cap is clogged			◎					
	Rust and water are found when fuel tank is drained					○			
	Fuel is leaking from fuel piping				◎				
Troubleshooting	Inspect fuel filter, strainer directly					●			
	When a cylinder is cut out for reduced cylinder mode operation, engine speed does not change						●		
	Carry out troubleshooting for “Eng Ne Speed Sensor Error.” See *1 for failure code.							●	
	Carry out troubleshooting for “Eng Bkup Speed Sensor Error.” See *2 for failure code.								●
		Remedy	Add	Clean	Replace	Replace	Replace	Replace	Replace

*1: Failure code [CA689]
*2: Failure code [CA778]

S-6 Engine lacks output (or lacks power)

General causes why engine lacks output

- Insufficient intake of air
- Insufficient supply of fuel
- Defective condition of fuel spray
- Improper selection of fuel
- There is over heating
  ⇒ See “S-14 Coolant temperature becomes too high (Overheating)”.
- Controller is controlling in derate mode
  (limiting injection rate (output) because of an error in electrical system)

			Cause															
			Clogged air cleaner element	Air leakage from air intake piping	Seized turbocharger, interference of turbocharger	Defective contact of valve and valve seat	Improper valve clearance	Excessive wear of piston ring, cylinder liner	Clogged air breather hole of fuel tank cap	Leaking, clogged fuel piping	Clogged fuel filter	Stuck, seized supply pump plunger	Clogged injector, defective spray (dirt in injector)	Defective drive of injector (signal, solenoid)	Defective installation of boost pressure sensor (air leakage)	Defective boost pressure sensor, wiring harness	Clogged spill piping
Questions	Confirm recent repair history																
	Degree of use of machine	Operated for long period	△			△		△			△						
	Power was lost	Suddenly		○	◎									○	○	○	○
		Gradually	○			○		○			○		○		○		
	Non-specified fuel is being used										○	○	○				
	Replacement of filters has not been carried out according to Operation and Maintenance Manual		◎								◎						
	Engine oil must be added more frequently					○		○									
Check items	Dust indicator is red (if indicator is installed)		◎	◎													
	Air breather hole of fuel tank cap is clogged				◎				◎								
	Fuel is leaking from fuel piping									◎							
	Output becomes insufficient after short stop of operation			◎													
	Color of exhaust gas	Black			◎		◎										
		Blue under light load						◎									
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low												◎	◎			
	When engine is cranked, interference sound is generated around turbocharger				◎												
	When engine is cranked, abnormal sound is generated around cylinder head						◎										
	High idle speed is too low													○			
	High idle speed under no load is normal, but speed suddenly drops when load is applied								○		◎	○	○				
	Engine does not pick up smoothly and combustion is irregular			◎	◎				○	○			◎				
	There is hunting from engine (rotation is irregular)								○	○	○		○	○			
	Blow-by gas is excessive				◎			◎									
Troubleshooting	Inspect air cleaner directly		●														
	Inspect air intake piping directly			●													
	When boost pressure is measured, it is found to be low		●	●	●												
	When compression pressure is measured, it is found to be low					●		●									
	Inspect valve clearance directly						●										
	Inspect fuel piping									●							
	Inspect fuel filter, strainer directly										●						
	Inspect spill port check valve directly																●
	Carry out troubleshooting for “Rail Press (Very) Low Error.” See *1 for failure code.											●					
	When a cylinder is cut out for reduced cylinder mode operation, engine speed does not change												●	●			
	Inspect boost pressure sensor mount directly														●		
	Carry out troubleshooting for “Chg Air Press Sensor High (Low) Error.” See *2 for failure code.															●	
		Remedy	Clean	Correct	Replace	Replace	Adjust	Replace	Clean	Correct	Replace	Replace	Replace	Replace	Correct	Replace	Replace

*1: Failure codes [CA559] and [CA2249]
*2: Failure codes [CA122] and [CA123]

S-7 Exhaust smoke is black (incomplete combustion)

General causes why exhaust smoke is black

- Insufficient intake of air
- Defective condition of fuel injection
- Improper selection of fuel
- There is over heating:
  See “S-14 Coolant temperature becomes too high (Overheating)”.
- Controller is controlling in derate mode
  (limiting injection rate (output) because of an error in electrical system)

			Cause													
			Clogged air cleaner element	Seized turbocharger, interference of turbocharger	Defective contact of valve and valve seat	Improper valve clearance	Leakage of air between turbocharger and cylinder head	Crushed, clogged muffler	Excessive wear of piston ring, cylinder liner	Stuck, seized supply pump plunger	Clogged, seized injector	Abnormally worn injector	Improper fuel injection timing	Improper fuel injection pressure	Defective coolant temperature sensor, wiring harness
Questions	Confirm recent repair history														
	Degree of use of machine	Operated for long period	△		△				△		△				
	Color of exhaust gas	Suddenly became black		◎			◎			○	○				
		Gradually became black	◎				○				○	○			
		Black during light-load operation							◎						
	Non-specified fuel is being used									○	○				
	Oil must be added more frequently								◎						
	Power was lost	Suddenly		◎				○		○	○				
		Gradually	○		○		○		○						
Check items	Dust indicator is red (if indicator is installed)		◎												
	Muffler is crushed							◎							
	Air leaks between turbocharger and cylinder head, clamp is loosened						◎								
	Engine is operated in low-temperature mode at normal temperature												○	○	○
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low									○	◎				
	When engine is cranked, interference sound is generated around turbocharger			◎											
	When engine is cranked, abnormal sound is generated around cylinder head					◎									
	Torque converter stall occurred or pump relief speed is high (Fuel is injected excessively)											○			
	Exhaust noise is abnormal			○				◎			○				
	Engine does not pick up smoothly and combustion is irregular			○		○	○	○		○	◎				
	Blow-by gas is excessive								◎						
	If spill hose from injector is disconnected, abnormally much fuel spills											◎			
Troubleshooting	Inspect air cleaner directly		●												
	When turbocharger is rotated by hand, it is found to be heavy			●											
	When compression pressure is measured, it is found to be low				●				●						
	Inspect valve clearance directly					●									
	When muffler is removed, exhaust gas color improves							●							
	Carry out troubleshooting for “Rail Press (Very) Low Error.” See *1 for failure code.									●		●			
	When a cylinder is cut out for reduced cylinder mode operation, engine speed does not change										●				
	Carry out troubleshooting for “Coolant Temp Sens High (Low) Error.” See *2 for failure code.														●
	Confirm with INSITE or monitoring function on applicable machine side												●	●	
		Remedy	Clean	Replace	Replace	Adjust	Correct	Replace	Replace	Replace	Replace	Replace	Replace	Replace	Replace

*1: Failure codes [CA559] and [CA2249]
*2: Failure codes [CA144] and [CA145]

S-8 Oil consumption is excessive (or exhaust smoke is blue)

General causes why oil consumption is excessive

- Abnormal consumption of oil
- Long-time operation of engine at low idle or high idle
  (Do not run engine at idle for more than 20 minutes continuously)
- External leakage of oil
- Wear of pats in lubrication system

			Cause														
			Dust sucked in from intake system	Worn, damaged valve (stem, guide, seal)	Turbocharger: Worn seal at turbocharger end	Turbocharger: Worn seal at blower end	Clogged breather, breather hose	Broken piston ring	Excessive wear of piston ring, cylinder liner	Worn, damaged rear oil seal	Broken oil cooler	Oil leakage from oil cooler	Oil leakage from oil filter	Oil leakage from oil piping	Oil leakage from oil drain plug	Oil leakage from oil pan, cylinder head, etc.
Questions	Confirm recent repair history																
	Degree of use of machine	Operated for long period		△	△	△			△								
	Oil consumption suddenly increased							◎			○						
	Oil must be added more frequently								◎		○						
	Oil becomes contaminated quickly						○	○	◎								
Check items	Outside of engine is dirty with oil											◎	◎	◎	◎	◎
	There are loose piping clamps in intake system		◎														
	Inside of turbocharger intake outlet pipe is dirty with oil					◎											
	Inside of turbocharger exhaust outlet pipe is dirty with oil			○	◎												
	There is oil in coolant										◎						
	Oil level in clutch or damper chamber of applicable machine is high									◎							
	Exhaust smoke is blue under light load							◎	◎								
	Amount of blow-by gas	Excessive		○		○		◎	◎								
		None					◎										
Troubleshooting	When intake manifold is removed, dust is found inside		●														
	When intake manifold is removed, inside is found to be dirty abnormally			●													
	Excessive play of turbocharger shaft				●	●											
	Check breather and breather hose directly						●										
	When compression pressure is measured, it is found to be low							●	●								
	Inspect rear oil seal directly									●							
	Pressure-tightness test of oil cooler shows there is leakage										●	●					
	There is external leakage of oil from engine												●	●	●	●	
		Remedy	Correct	Correct	Replace	Replace	Clean	Replace	Replace	Correct	Replace	Replace	Correct	Correct	Correct	Correct	

S-9 Oil becomes contaminated quickly

General causes why oil becomes contaminated quickly

- Entry of exhaust gas into oil due to internal wear
- Clogging of lubrication passage
- Use of improper fuel
- Use of improper oil
- Operation under excessive load

			Cause								
			Defective seal at turbocharger turbine end	Worn valve, valve guide	Excessive wear of piston ring, cylinder liner	Clogged breather, breather hose	Clogged oil cooler	Clogged oil filter	Defective oil filter safety valve	Clogged turbocharger lubrication drain tube	Exhaust smoke is bad
Check items / Questions	Confirm recent repair history										
	Degree of use of machine	Operated for long period	△	△	△						
	Non-specified fuel is being used				○			○			
	Engine oil must be added more frequently				◎						
	Metal particles are found when oil filter is drained			○	○			◎			
	Inside of exhaust pipe is dirty with oil			◎							
	Engine oil temperature rises quickly						◎				
	Color of exhaust gas	Blue under light load			◎						
		Black									◎
	Amount of blow-by gas	Excessive	○	○	◎					○	
		None				◎					
Troubleshooting	Excessive play of turbocharger shaft		●								See S-7
	When compression pressure is measured, it is found to be low			●	●						
	Check breather and breather hose directly					●					
	Inspect oil cooler directly						●				
	Inspect oil filter directly							●			
	Spring of oil filter safety valve is hitched or broken								●		
	Inspect turbocharger lubrication drain tube directly									●	
		Remedy	Replace	Replace	Replace	Clean	Clean	Replace	Replace	Clean	—

S-10 Fuel consumption is excessive

General causes why fuel consumption is excessive

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

			Cause									
			Fuel leakage inside head cover	Fuel leakage from fuel filter, piping, etc.	Defective feed pump oil seal	Defective supply pump plunger	Defective common rail pressure	Defective spray by injector	Defective operation of injector	Improper fuel injection timing	Defective coolant temperature sensor, wiring harness
Questions	Confirm recent repair history										
	Degree of use of machine	Operated for long period			△	△		△			
	Condition of fuel consumption	More than for other machines of same model					○		○	○	○
		Gradually increased				○		○			
		Suddenly increased	○	○							
Check items	There is external leakage of fuel from engine			◎							
	Combustion is irregular							◎			
	Engine oil level rises and oil smells of diesel fuel		◎		◎						
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low							◎			
	Low idle speed is high								○		
	Torque converter stall occurred or pump relief speed is high								○		
	Color of exhaust gas	Black					○	○		○	○
		White	○								
Troubleshooting	Remove and inspect head cover directly		●								
	Inspect feed pump oil seal directly				●						
	Carry out troubleshooting for “Rail Press (Very) Low Error.” See *1 for failure code.					●					
	When a cylinder is cut out for reduced cylinder mode operation, engine speed does not change							●			
	If spill tube from injector is disconnected, much fuel spills								●		
	Carry out troubleshooting for “Coolant Temp Sens High (Low) Error.” See *2 for failure code.										●
	Check with monitoring function of the machine monitor.						●			●	
		Remedy	Correct	Correct	Replace	Replace	Correct	Replace	Replace	Replace	Replace

*1: Failure codes [CA559] and [CA2249]
*2: Failure codes [CA144] and [CA145]

S-11 Oil is in coolant (or coolant spurts back or coolant level goes down)

General causes why oil is in coolant

- Internal leakage in lubrication system
- Internal leakage in cooling system

			Cause				
			Broken cylinder head, head gasket	Cracks inside cylinder block	Holes caused by pitting	Broken oil cooler core, O-ring	Broken hydraulic oil cooler or power train oil cooler
Questions / Check items	Confirm recent repair history						
	Degree of use of machine	Operated for long period			△	△	
	Increase of oil level	Sudden occurred	○			○	
		Gradually occurred		○	○		
	Hard water is being used as coolant				○	○	
	Oil level has risen, oil is milky			○	○	◎	
	There are excessive air bubbles in radiator, coolant spurts back		◎				
	Hydraulic oil or power train oil is milky						◎
	When hydraulic oil or power train oil is drained, water is found						◎
Troubleshooting	Pressure-tightness test of cylinder head shows there is leakage		●				
	Inspect cylinder block, liner directly			●	●		
	Pressure-tightness test of oil cooler shows there is leakage					●	●
		Remedy	Replace	Replace	Replace	Replace	Replace

S-12 Oil pressure drops

General causes why oil pressure drops

- Leakage, clogging, wear of lubrication system
- Defective oil pressure control
- Improper selection of fuel (improper viscosity)
- Deterioration of oil due to overheating

			Cause										
			Worn journal of bearing	Lack of oil in oil pan	Coolant, fuel in oil	Clogged strainer in oil pan	Clogged, broken pipe in oil pan	Defective oil pump	Defective regulator valve	Clogged oil filter	Leaking, crushed, clogged hydraulic piping	Defective oil level sensor, wiring harness
Questions	Confirm recent repair history											
	Degree of use of machine	Operated for long period	△					△		△		
	Oil pressure monitor indicates low oil pressure (if monitor is installed)								○	◎		
	Non-specified oil is being used		○							○		
	Replacement of filters has not been carried out according to Operation and Maintenance Manual									◎		
Check items	Oil pressure monitor (if installed)	Indicates pressure drop at low idle	◎									
		Indicates pressure drop at low, high idle		○		◎	◎	◎	○			
		Indicates pressure drop on slopes		◎								
		Sometimes indicates pressure drop							◎			○
	Oil level monitor indicates oil level drop (if monitor is installed)			◎								◎
	Oil level in oil pan is low			◎								
	External hydraulic piping is leaking, crushed										◎	
	Oil is milky or smells of diesel oil				◎							
	Metal particles are found when oil pan is drained		◎									
	Metal particles are found when oil filter is drained		◎					○				
Troubleshooting	Metal particles are found in oil filter		●		See S-13							
	Inspect oil pan strainer, pipe directly					●	●					
	Oil pump rotation is heavy, there is play in oil pump							●				
	Valve spring of regulator valve is fatigued, damaged								●			
	Inspect oil filter directly									●		
	If oil level sensor is replaced, oil level monitor indicates normally											●
		Remedy	Replace	Add	—	Clean	Clean	Replace	Adjust	Replace	Correct	Replace

S-13 Oil level rises (Entry of coolant or fuel)

General causes why oil level rises

- Coolant in oil (milky)
- Fuel in oil (smells diluted diesel fuel)

★ If oil is in coolant, carry out troubleshooting for “S-11 Oil is in coolant.”

			Cause							
			Broken cylinder head, head gasket	Broken injector O-ring	Cracks inside cylinder block	Holes caused by pitting	Worn, damaged rear oil seal	Broken oil cooler core, O-ring	Defects in supply pump
Questions	Confirm recent repair history								
	Degree of use of machine	Operated for long period		△		△	△		
	Fuel must be added more frequently			◎					◎
	Coolant must be added more frequently		○		○				
Check items	There is oil in coolant		○	○	○	○		◎	
	Oil smells of diesel fuel			◎					◎
	Oil is milky		○			○			
	When engine is started, drops of water come from muffler		○						
	When radiator cap is removed and engine is run at low idle, an abnormal number of bubbles appear, or coolant spurts back		◎			○			
	Exhaust smoke is white			○					
	Oil level in clutch or damper chamber of applicable machine is low						◎		
Troubleshooting	When compression pressure is measured, it is found to be low		●						
	Remove injector and inspect O-ring			●					
	Inspect cylinder block, liner directly				●	●			
	Inspect rear oil seal directly						●		
	Pressure-tightness test of oil cooler shows there is leakage							●	
	Remove and inspect supply pump directly								●
		Remedy	Replace	Correct	Replace	Replace	Correct	Replace	Replace

S-14 Coolant temperature becomes too high (overheating)

General causes why coolant temperature becomes too high

- Lack of cooling air (deformation, damage of fan)
- Drop in heat dissipation efficiency
- Problem in coolant circulation system

			Cause												
			Broken cylinder head, head gasket	Holes caused by pitting	Clogged, broken oil cooler	Lack of coolant	Broken water pump	Defective operation of thermostat	Clogged, crushed radiator fins	Clogged radiator core	Defective radiator cap (pressure valve)	Slipping fan belt, worn fan pulley	Defective coolant temperature gauge	Rise of oil temperature in hydraulic pump system
Questions	Confirm recent repair history													
	Degree of use of machine	Operated for long period	△	△					△	△				
	Condition of overheating	Sudden overheated				○	◎					○		
		Always tends to overheat						○	◎	◎		○		
	Coolant temperature gauge (if installed)	Rises quickly				○		◎						
		Does not go down from red range											◎	
Check items	Radiator coolant level monitor indicates drop of coolant level (if monitor is installed)					◎								
	Engine oil level has risen and oil is milky			◎	○									
	Fan belt tension is low											◎		
	When fan belt is turned, it has play						◎							
	Milky oil is floating on coolant				◎									
	There are excessive air bubbles in radiator, coolant spurts back		◎											
	When light bulb is held behind radiator core, no light passes through								◎					
	Radiator shroud, inside of underguard are clogged with dirt or mud								◎			◎		
	Coolant is leaking because of cracks in hose or loose clamps					◎								
	Coolant flows out from radiator overflow hose										◎			
	Fan belt whines under sudden acceleration											◎		
	Hydraulic oil temperature gauge indicates red range faster than engine coolant temperature gauge does (if they are installed)													◎
Troubleshooting	When compression pressure is measured, it is found to be low		●											Carry out troubleshooting in H-mode.
	Inspect cylinder liner directly			●										
	Inspect oil cooler directly				●									
	Temperature difference between upper and lower tanks of radiator is large						●							
	When operation test of thermostat is carried out, it does not open at cracking temperature							●						
	Temperature difference between upper and lower tanks of radiator is slight								●					
	Inspect radiator core directly									●				
	When operation of radiator cap is carried out, its cracking pressure is low										●			
	Inspect fan belt, pulley directly											●		
	When coolant temperature is measured, it is fount to be normal												●	
		Remedy	Replace	Replace	Replace	Add	Replace	Replace	Correct	Correct	Replace	Correct	Replace	—

S-15 Abnormal noise is made

General causes why abnormal noise is made

- Abnormality due to defective parts
- Abnormal combustion
- Air sucked in from intake system

★ Judge if the noise is an internal noise or an external noise before starting troubleshooting.

★ The engine is operated in the low-temperature mode while it is not warmed up sufficiently. Accordingly, the engine sound becomes a little larger. This does not indicate abnormality, however.

★ When the engine is accelerated, it is operated in the acceleration mode and its sound becomes a little larger for up to about 3 seconds. This does not indicate abnormality, however.

			Cause												
			Leakage of air between turbocharger and cylinder head	Interference of turbocharger, seized turbocharger	Broken dynamic valve system (valve, rocker lever)	Defective inside of muffler (dividing board out of position)	Improper valve clearance	Excessive wear of piston ring, cylinder liner	Improper gear train backlash	Removed, seized bushing	Deformed cooling fan, loose fan belt, interference of fan belt	Clogged, seized injector	Dirt caught in injector	Improper fuel injection timing (abnormality in coolant low temperature sensor, boost temperature sensor)
Questions	Confirm recent repair history													
	Degree of use of machine	Operated for long period						△						
	Condition of abnormal noise	Gradually occurred						○			○			
		Suddenly occurred		○	○					○				
	Non-specified fuel is being used											○		
	Oil must be added more frequently							◎						
Check items	Metal particles are found when oil filter is drained							◎		◎				
	Air leaks between turbocharger and cylinder head		◎											
	When engine is cranked, interference sound is generated around turbocharger			◎										
	When engine is cranked, abnormal sound is generated around cylinder head				◎		◎							
	When engine is cranked, beat noise is generated around muffler					◎								
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low											◎	○	
	Color of exhaust gas	Blue under light load						◎						
		Black	○	◎			○							
	Engine does not pick up smoothly and combustion is irregular											◎		
	Abnormal noise is loud when engine is accelerated						○		○		○	○		
	Blow-by gas is excessive							◎						
Troubleshooting	When turbocharger is rotated by hand, it is found to be heavy			●										
	Inspect dynamic valve system directly				●									
	When muffler is removed, abnormal noise disappears					●								
	Inspect valve clearance directly						●							
	When compression pressure is measured, it is found to be low							●						
	Inspect gear train directly								●	●				
	Inspect fan and fan belt directly										●			
	When a cylinder is cut out for reduced cylinder mode operation, engine speed does not change											●	●	
	Abnormal noise is heard only when engine is started												●	
	Check with monitoring function of the machine monitor.													●
		Remedy	Replace	Replace	Correct	Replace	Adjust	Replace	Replace	Replace	Correct	Replace	Replace	Replace

S-16 Vibration is excessive

General causes why vibration is excessive

- Defective parts (abnormal wear, breakage)
- Misalignment between engine and chassis
- Abnormal combustion

★ If abnormal noise is made and vibration is excessive, carry out trouble-shooting for “S-15 Abnormal noise is made”, too.

			Cause								
			Stuck dynamic valve system (valve, rocker lever)	Worn main bearing, connecting rod bearing	Improper gear train backlash	Worn camshaft bushing	Improper injection timing (Abnormality in coolant temperature sensor, boost temperature sensor)	Loose engine mounting bolts, broken cushions	Misalignment between engine and devices on applicable machine side	Broken output shaft, parts in damper on applicable machine side
Questions / Check items	Confirm recent repair history									
	Degree of use of machine	Operated for long period		△		△		△		
	Condition of vibration	Suddenly increased	○							○
		Gradually increased		○		○		○		
	Non-specified oil is being used			○		○				
	Metal particles are found when oil filter is drained			◎		◎				
	Metal particles are found when oil pan is drained			◎		◎				
	Oil pressure is low at low idle			○		○				
	Vibration occurs at mid-range speed							○		○
	Vibration follows engine speed				○			○	○	○
	Exhaust smoke is black		◎				○			
Troubleshooting	Inspect dynamic valve system directly		●							
	Inspect main bearing and connecting rod bearing directly			●						
	Inspect gear train directly				●					
	Inspect camshaft bushing directly					●				
	Check with monitoring function of machine monitor						●			
	Inspect engine mounting bolts and cushions directly							●		
	When alignment is checked, radial runout or facial runout is detected								●	
	Inspect output shaft or inside of damper directly									●
		Remedy	Replace	Replace	Replace	Replace	Replace	Replace	Adjust	Replace

PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN02634-00

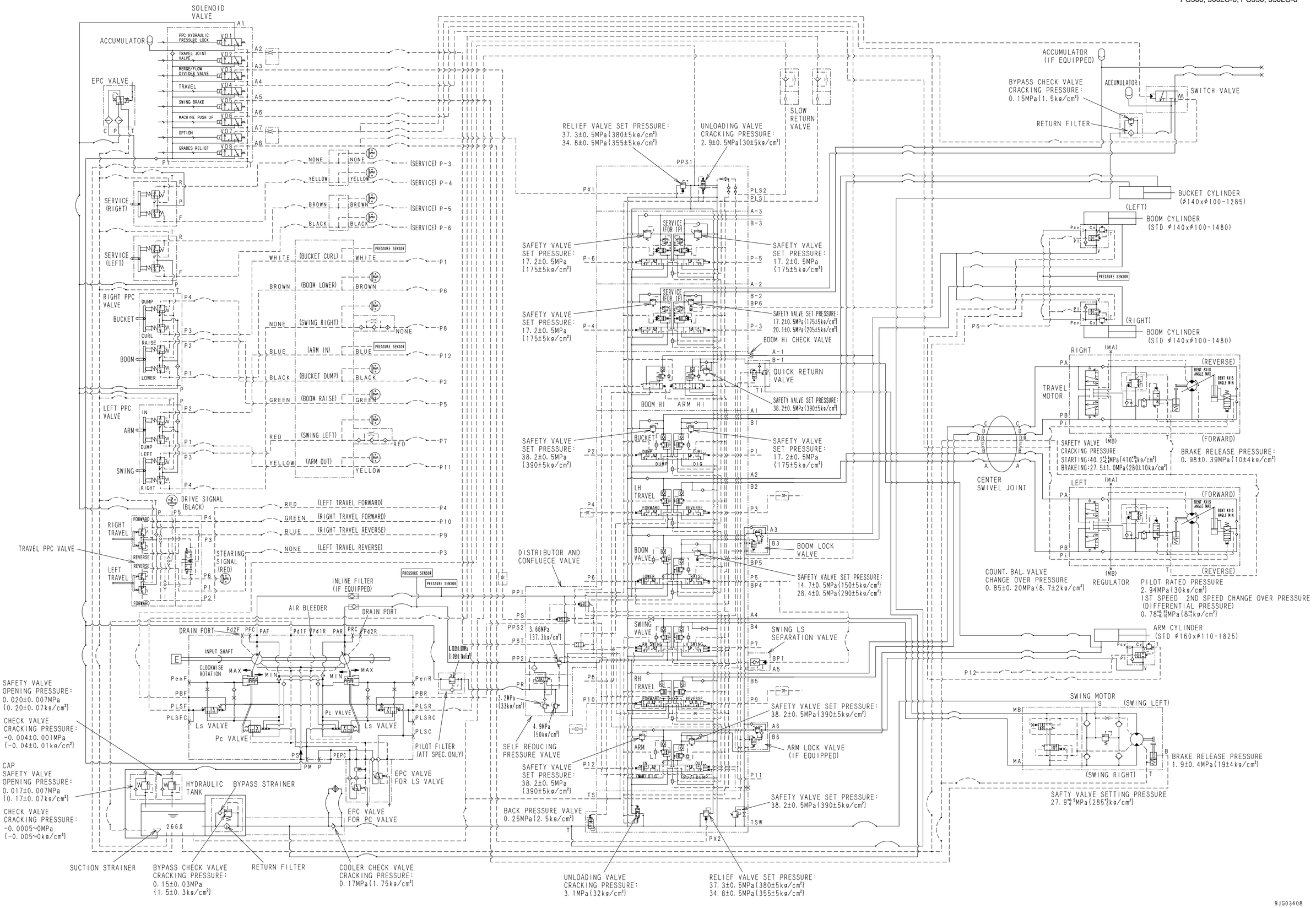
HYDRAULIC EXCAVATOR

PC300-8
PC300LC-8
PC350-8
PC350LC-8

Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

90 Diagrams and drawings

Hydraulic diagrams and drawings


SOLENOID VALVE
ACCUMULATOR
PPC HYDRAULIC PRESSURE LOCK
TRAVEL JOINT VALVE
MERGE/FLOW DIVIDER VALVE
TRAVEL
SWING BRAKE
MACHINE PUSH UP
OPTION
GRADES RELIEF
EPC VALVE
SERVICE (RIGHT)
SERVICE (LEFT)
RIGHT PPC VALVE
BUCKET
BOOM
LEFT PPC VALVE
ARM
SWING
DRIVE SIGNAL (BLACK)
RIGHT TRAVEL
LEFT TRAVEL
TRAVEL PPC VALVE
STEERING SIGNAL (RED)
(SERVICE) P-3
(SERVICE) P-4
(SERVICE) P-5
(SERVICE) P-6
(BUCKET CURL)
(BOOM LOWER)
(SWING RIGHT)
(ARM IN)
(BUCKET DUMP)
(BOOM RAISE)
(SWING LEFT)
(ARM OUT)
(LEFT TRAVEL FORWARD)
(RIGHT TRAVEL FORWARD)
(RIGHT TRAVEL REVERSE)
(LEFT TRAVEL REVERSE)
PRESSURE SENSOR
INLINE FILTER (IF EQUIPPED)
AIR BLEEDER
DRAIN PORT
INPUT SHAFT
CLOCKWISE ROTATION
Ls VALVE
Pc VALVE
PILOT FILTER (ATT SPEC. ONLY)
SAFETY VALVE OPENING PRESSURE: 0.020±0.007MPa {0.20±0.07kg/cm²}
CHECK VALVE CRACKING PRESSURE: -0.004±0.001MPa {-0.04±0.01kg/cm²}
CAP SAFETY VALVE OPENING PRESSURE: 0.017±0.007MPa {0.17±0.07kg/cm²}
CHECK VALVE CRACKING PRESSURE: -0.0005~0MPa {-0.005~0kg/cm²}
HYDRAULIC TANK
BYPASS STRAINER
EPC VALVE FOR LS VALVE
EPC VALVE FOR PC VALVE
266ℓ
SUCTION STRAINER
BYPASS CHECK VALVE CRACKING PRESSURE: 0.15±0.03MPa {1.5±0.3kg/cm²}
RETURN FILTER
COOLER CHECK VALVE CRACKING PRESSURE: 0.17MPa{1.75kg/cm²}
RELIEF VALVE SET PRESSURE: 37.3±0.5MPa{380±5kg/cm²} 34.8±0.5MPa{355±5kg/cm²}
UNLOADING VALVE CRACKING PRESSURE: 2.9±0.5MPa{30±5kg/cm²}
SLOW RETURN VALVE
SAFETY VALVE SET PRESSURE: 17.2±0.5MPa {175±5kg/cm²}
SAFETY VALVE SET PRESSURE: 17.2±0.5MPa{175±5kg/cm²} 20.1±0.5MPa{205±5kg/cm²}
BOOM Hi CHECK VALVE
QUICK RETURN VALVE
SAFETY VALVE SET PRESSURE: 38.2±0.5MPa {390±5kg/cm²}
SAFETY VALVE SET PRESSURE: 17.2±0.5MPa {175±5kg/cm²}
DISTRIBUTOR AND CONFLUECE VALVE
3.66MPa {37.3kg/cm²}
3.2MPa {33kg/cm²}
4.9MPa {50kg/cm²}
SELF REDUCING PRESSURE VALVE
BACK PRESSURE VALVE 0.25MPa{2.5kg/cm²}
LH TRAVEL
RH TRAVEL
BOOM VALVE
BOOM LOCK VALVE
SAFETY VALVE SET PRESSURE: 14.7±0.5MPa{150±5kg/cm²} 28.4±0.5MPa{290±5kg/cm²}
SWING VALVE
SWING LS SEPARATION VALVE
ARM VALVE
ARM LOCK VALVE (IF EQUIPPED)
SAFETY VALVE SET PRESSURE: 38.2±0.5MPa{390±5kg/cm²}
UNLOADING VALVE CRACKING PRESSURE: 3.1MPa{32kg/cm²}
RELIEF VALVE SET PRESSURE: 37.3±0.5MPa{380±5kg/cm²} 34.8±0.5MPa{355±5kg/cm²}
ACCUMULATOR (IF EQUIPPED)
BYPASS CHECK VALVE CRACKING PRESSURE: 0.15MPa{1.5kg/cm²}
RETURN FILTER
SWITCH VALVE
BUCKET CYLINDER (φ140xφ100-1285)
BOOM CYLINDER (STD φ140xφ100-1480)
ARM CYLINDER (STD φ160xφ110-1825)
TRAVEL MOTOR
CENTER SWIVEL JOINT
SAFETY VALVE CRACKING PRESSURE STARTING: 40.2+5.0 MPa{410+51 kg/cm²} BRAKING: 27.5±1.0MPa{280±10kg/cm²}
BRAKE RELEASE PRESSURE: 0.98±0.39MPa{10±4kg/cm²}
COUNT. BAL. VALVE CHANGE OVER PRESSURE 0.85±0.20MPa{8.7±2kg/cm²}
REGULATOR
PILOT RATED PRESSURE 2.94MPa{30kg/cm²} 1ST SPEED 2ND SPEED CHANGE OVER PRESSURE (DIFFERENTIAL PRESSURE) 0.78+0.39 MPa{8+4 kg/cm²}
SWING MOTOR
BRAKE RELEASE PRESSURE 1.9±0.4MPa{19±4kg/cm²}
SAFTY VALVE SETTING PRESSURE 27.9+5.9 MPa{285+61 kg/cm²}

PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN02004-00

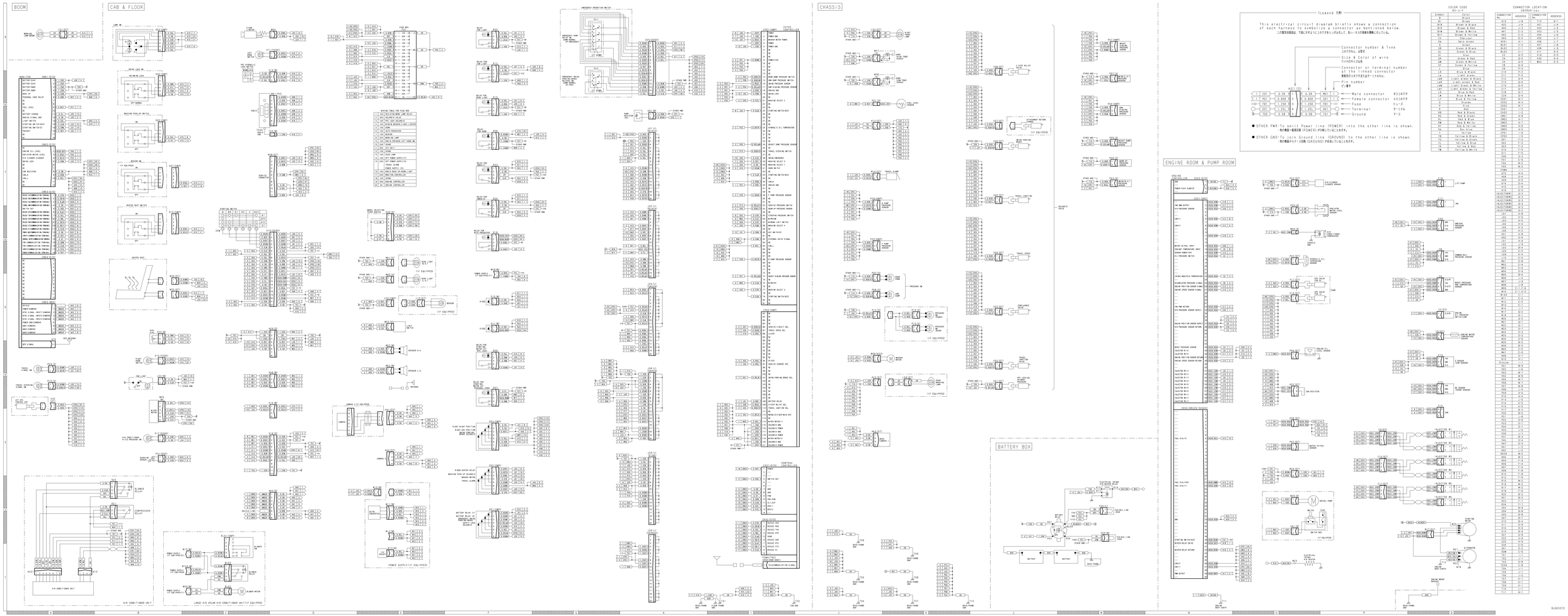
HYDRAULIC EXCAVATOR

PC300-8
PC300LC-8
PC350-8
PC350LC-8

Machine model	Serial number
PC300-8	60001 and up
PC300LC-8	60001 and up
PC350-8	60001 and up
PC350LC-8	60001 and up

90 Diagrams and drawings

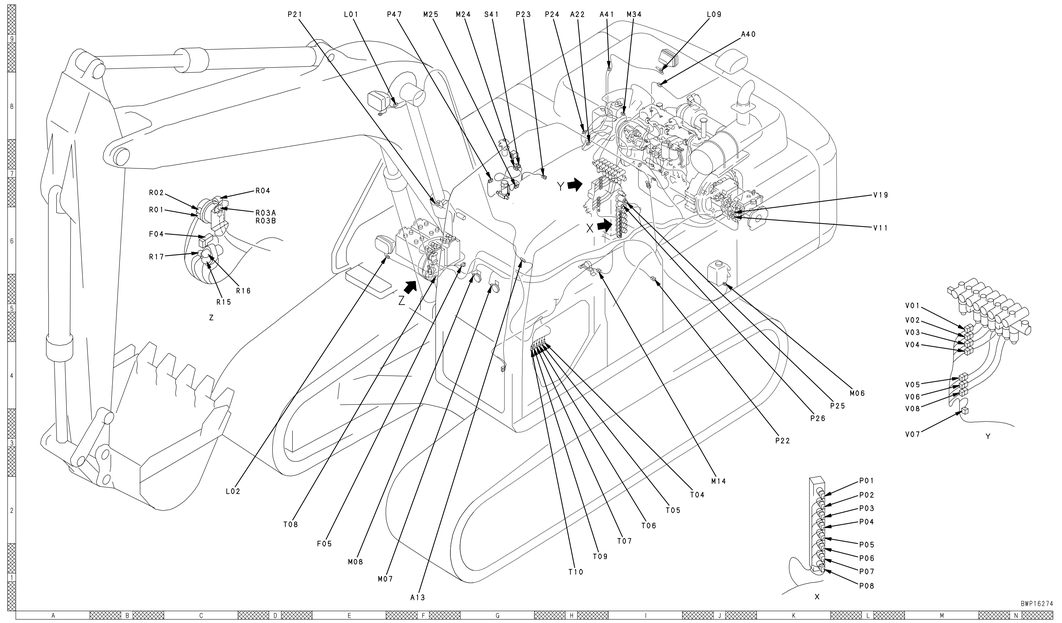
Electrical diagrams and drawings

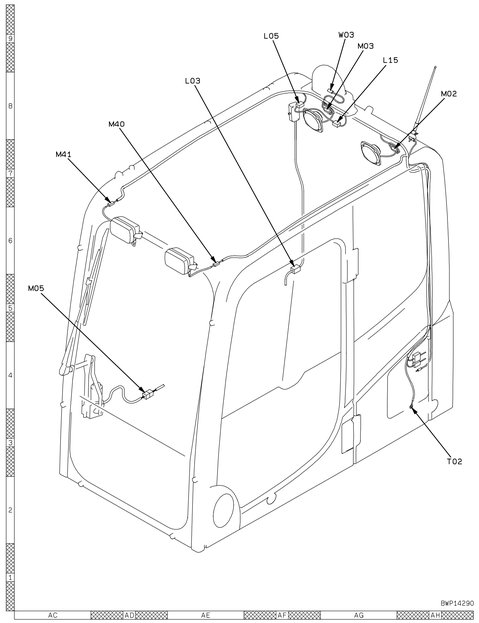

BOOM
CAB & FLOOR
CHASSIS
ENGINE ROOM & PUMP ROOM
BATTERY BOX
POWER SUPPLY(I/F EQUIPPED)
LARGE AIR VOLUM AIR-CONDITIONER UNIT(I/F EQUIPPED)
AIR-CONDITIONER UNIT
(Legend 凡例)
This electrical circuit diagram briefly shows a connection of each harness to symbolize a connector as mentioned below.
この電気回路図は、下図に示すようにコネクタ1つ1つを表わして、各ハーネスの接続を表現しています。
Connector number & Type
コネクタ番号、種類
Size & Color of wire
ワイヤサイズと色
Connector or terminal number at the linked connector
接続先のコネクタ又は端子番号
Pin number
ピン番号
Male connector
Female connector
Fuse
Terminal
Ground
OTHER PWR:To split Power line (POWER) into the other line is shown.
他の電源へ電源線(POWER)が分岐していることを示す。
OTHER GND:To join Ground line (GROUND) to the other line is shown.
他の機器アース(GROUND)が合流していることを示す。
COLOR CODE
CONNECTOR LOCATION
CONNECTOR ADDRESS

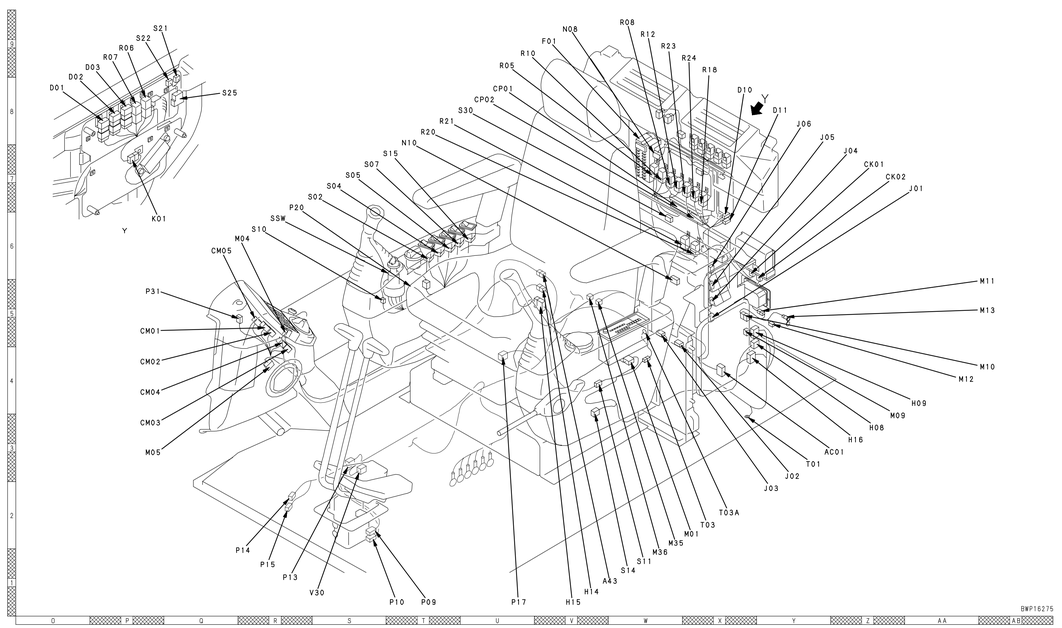
Connector arrangement diagram PC300, 300LC-8, PC350, 350LC-8

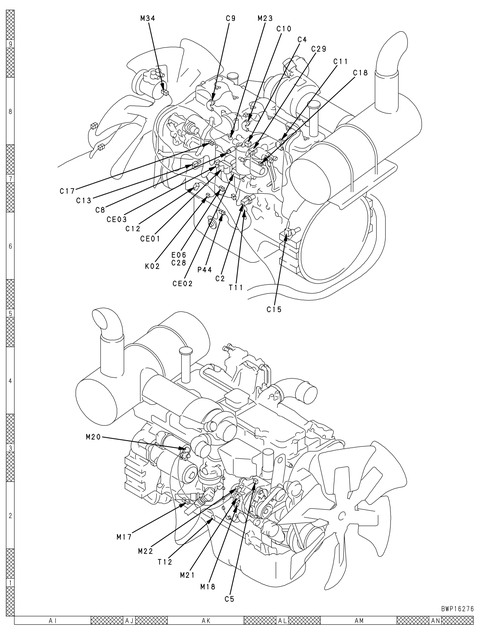
Connector No.	Type	Number of pins	Component name	Arrangement drawing
A13	DT	2	Intermediate connector	F-1
A22	DT	2	Intermediate connector	H-9
A40	DT	4	Back camera 1	J-9
A41	DT	4	Camera 2	H-9
A42	DT	4	Camera 3	
A43	S	8	Monitor cable	V-1
AC01	—	8	A/C unit	Y-3
C2		2	Engine oil pressure switch	AK-6
C4		3	Boost pressure sensor	AL-9
C5		2	Engine water temperature sensor	AK-1
C8		3	Common rail pressure sensor	AJ-7
C9	DT	4	Intermediate connector	AK-9
C10	DT	4	Intermediate connector	AL-9
C11	DT	4	Intermediate connector	AM-9
C12		3	CAN	AJ-6
C13		3	G sensor	AI-7
C15		3	NE sensor	AL-5
C17	—	2	Intermit metering valve	AI-7
C18	—	2	Lift pump	AM-9
C28	DT	2	Intermediate connector	AK-6
C29		3	Ambient pressure sensor	AL-9
CE01	DRC	60	Engine controller	AJ-6
CE02	DRC26-50S40	50	Engine controller	AK-5
CE03	DTP	4	Engine controller	AJ-6
CK01	070	14	KOMTRAX communication module	Z-7
CK02	070	10	KOMTRAX communication module	Z-7
CM01	070	18	Monitor	P-5
CM02	070	12	Monitor	P-4
CM03	070	18	Monitor	P-3
CM04	070	12	Monitor (disconnection)	P-4
CM05	070	8	Monitor (for camera)	Q-6
CP01	AMP	81	Controller	U-8
CP02	AMP	40	Controller	U-8
D01	SWP	8	Set of diode	O-8
D02	SWP	8	Set of diode	O-8
D03	SWP	8	Set of diode	P-9
D10	M	2	Diode	X-8
D11	M	2	Diode	Y-8
E06	DT	2	Intermediate connector (pair with C28)	AK-6
F01	—	—	Fuse box	V-9
F04	L	2	Fusible link	B-6
F05	M	2	Fusible link	E-2
H08	M	4	Intermediate connector	Z-3
H09	M	8	Intermediate connector	AA-4
H14	M	4	Intermediate connector	V-1
H15	S090	22	Intermediate connector	V-1
H16	S	12	Intermediate connector	Z-3
J01	J	20	Junction connector (Black)	AA-7
J02	J	20	Junction connector (Black)	Y-3
J03	J	20	Junction connector (Green)	Y-2
J04	J	20	Junction connector (Green)	Z-7
J05	J	20	Junction connector (Orange)	Y-8
J06	J	20	Junction connector (Orange)	Y-8
K01	M	2	Pump resistor	P-6
K02	DT	3	CAN terminal resistance	AJ-6
L01	DT	2	Working lamp (Boom)	E-9
L02	DT	2	Working lamp (R.H)	C-2
L03	M	2	Room lamp	AE-8
L05	SWP	2	Beacon	AF-9
L09	DT	2	Working lamp (Rear)	J-9
L15	DT	2	Beacon	AG-9
M01	DA	9	Radio	X-1
M02	M	2	Speaker (left)	AH-8
M03	M	2	Speaker (right)	AG-9
M04		2	Cigar lighter	R-6
M05	M	6	Wiper motor	P-3, AC-5
M06	KES	2	Washer motor	L-4
M07	X	2	Horn (High tone)	F-1
M08	X	2	Horn (Low tone)	E-1
M09	M	2	Power supply (1)	Z-3
M10	M	2	Power supply (2)	AB-4
M11	M	4	DC/DC converter	AB-5
M12	M	2	Power supply (12V)	AA-4
M13	M	2	12V socket	AB-5
M14	DT	2	Travel alarm	J-2
M17	DT	2	Starter safety relay	AJ-2
M18	Terminal	1	Alternator (Terminal R)	AK-1
M20	Terminal	1	Starting motor (Terminal B)	AJ-3
M21	Terminal	1	Alternator (Terminal B)	AK-1
M22	Terminal	1	Alternator (Terminal E)	AJ-1
M23	Terminal	1	Ribbon heater	AL-9
M24	X	2	Intermediate connector	G-9
M25	D	2	Refuel pump (OPT)	F-9
M34	X	1	Air conditioner compressor	I-9, AJ-9
M35	DT	2	Heated seat	W-2
M36	DT	2	Air suspension	W-1
M40	X	2	Head lamp (left) (OP)	AD-8
M41	X	2	Head lamp (right) (OP)	AC-7
N08	DT	12	Service connector	V-9

Connector No.	Type	Number of pins	Component name	Arrangement drawing
N10		4	A/C unit	T-8
P01	AMP	3	Bucket DIG pressure sensor	L-2
P02	X	2	Boom down pressure switch	L-2
P03	X	2	Swing right pressure switch	L-2
P04	AMP	3	Arm DIG pressure sensor	L-2
P05	X	2	Bucket dump pressure switch	L-1
P06	X	2	Boom raise pressure switch	L-1
P07	X	2	Swing left pressure switch	L-1
P08	X	2	Arm dump pressure switch	L-1
P09	X	2	Travel signal pressure switch	T-1
P10	X	2	Travel steering pressure switch	T-1
P13	X	2	Intermediate connector	R-1
P14	X	2	Service pressure switch (front)	R-2
P15	X	2	Service pressure switch (rear)	R-1
P17	S090	2	A/C HI/LO pressure switch	U-1
P20	M	3	Fuel dial	R-7
P21	X	1	Fuel level sensor	D-9
P22	DT	2	Hydraulic oil temperature sensor	K-3
P23	DT	2	Air cleaner clogged sensor	G-9
P24	X	2	Radiator water level sensor	H-9
P25	AMP	3	F pump pressure sensor	L-4
P26	AMP	3	R pump pressure sensor	K-3
P31		2	Sunshine sensor	P-5
P44	DT	2	Engine oil level sensor	AK-6
P47	DT	2	WATER-IN-FUEL sensor	F-9
R01	Terminal	1	Battery relay (E terminal)	B-6
R02	Terminal	1	Battery relay (BR terminal)	B-7
R03A	Terminal	1	Battery relay (M terminal)	D-6
R03B	Terminal	1	Battery relay (M terminal)	D-6
R04	Terminal	1	Battery relay (B terminal)	D-7
R05	Relay	5	Lamp relay	U-9
R06	Relay	5	Relay for starter cut (PPC LOCK)	P-9
R07	Relay	5	Relay for starter cut (PERSONAL CODE)	P-9
R08	Relay	5	Relay for horn	W-9
R10	Relay	5	Relay for rear working lamp	U-9
R12	Relay	5	Relay for cab head lamp	W-9
R15	Terminal	1	Ribbon heater relay (coil circuit)	C-5
R16	Terminal	1	Robin heater relay (contact circuit)	D-5
R17	Terminal	1	Robin heater relay	B-6
R18	Relay	5	Relay for auto preheater	X-9
R20	Relay	5	Blower relay	T-8
R21	Relay	5	Compressor relay	T-8
R23	Relay	5	Engine controller relay (1)	W-9
R24	Relay	5	Engine controller relay (2)	X-9
S02	SWP	6	Lamp switch	S-7
S04	SWP	6	Swing lock switch	S-7
S05	SWP	6	Machine push up switch	S-7
S07	SWP	6	Beacon switch	S-7
S10	S090	2	Right knob switch	R-6
S11	Y090	2	Left knob switch	W-1
S14	M	3	PPC hydraulic lock switch	W-1
S15	SWP	6	Heated seat	T-7
S21	—	12	Emergency pump drive switch	P-9
S22	—	6	Emergency swing parking brake release switch	P-9
S25	S090	16	Intermediate connector	Q-8
S30	S	8	Model selection connector	U-8
S41	D	2	Switch box	G-9
SSW			Starter switch	R-6
T01	Terminal	1	Floor frame	Y-3
T02	Terminal	1	Cab GND	AH-3
T03	M	1	Intermediate connector	X-2
T03A	Terminal	1	Radio GND	X-2
T04	Terminal	1	Revolving frame	J-2
T05	Terminal	1	Revolving frame	I-2
T06	Terminal	1	Revolving frame	I-2
T07	Terminal	1	Revolving frame	I-2
T08	Terminal	1	Revolving frame	D-2
T09	Terminal	1	Revolving frame	H-1
T10	Terminal	1	Revolving frame	H-1
T11	Terminal	1	Engine body earth	AK-5
T12	Terminal	1	Alternator GND	AJ-1
V01	DT	2	Locking primary press PPC solenoid valve	M-5
V02	DT	2	Travel junction solenoid valve	M-5
V03	DT	2	Confluence valve solenoid valve	M-5
V04	DT	2	Travel speed solenoid valve	M-4
V05	DT	2	Swing parking brake solenoid valve	M-4
V06	DT	2	Machine push up solenoid valve	M-4
V07	DT	2	ATT return change solenoid valve	M-3
V08	DT	2	2 step relief solenoid valve	M-4
V11	DT	2	PC-EPC valve	L-6
V19	DT	2	LS-EPC valve	L-7
V30	DT	2	ATT current control EPC	S-1
W03	M	2	Rear limit switch	AG-9









PC300, 350(LC)-8 Hydraulic excavator

Form No. SEN02005-01