

CX350B
Tier 3
Crawler Excavator

SERVICE MANUAL

Part number 84124934C

English

June 2010

Replaces part number 84124934BEN-US



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If the fuel is mixed with the engine oil, the oil is diluted to deteriorate its lubricating property resulting in acceleration of wear.

Water content allows inside of the fuel tank to rust which in turn blocking the fuel line and the fuel filter.

NOTICE : *In cold weather, fill the fuel tank at the end of the day's work, in order to prevent the formation of condensation.*

This may also cause wear and seizure of the machine components.

If atmospheric temperature goes below the freezing point, moisture content in the fuel forms fine particle of ice allowing the fuel line to be clogged.

NOTICE : *Obtain table of analysis for the fuel you are using from the fuel supplier to confirm that it meets the criteria described above.*

NOTICE : *If a fuel which does not meet the specifications and the requirements for the diesel engine, function and performance of the engine will not be delivered. In addition, never use such a fuel because a breakdown of the engine or an accident may be invited.*

Guarantee will not be given to a breakdown caused by the use of a improper fuel.

Some fuels are used with engine oil or additives mixed together with diesel engine fuel.

In this case, do not use these fuels because damage to the engine may result as the fuel has been contaminated.

It is natural that the emission control regulation of 3rd-stage will not be cleared in case where a fuel that does not meet the specifications and the requirements is used.

Use the specified fuel for compliance of the exhaust gas control.

NOTICE : *If you use diesel fuel which contains much sulphur content more than 2500 ppm, be sure to follow low the items below for the engine oil selection and maintenance of engine parts. Guarantee will not be given to breakdowns caused by not to follow these items.*

1 Selection of engine oil

Use API grade CF-4 or JASO grade DH-1.

2 Exchange the engine oil and engine oil filter element by the periodical interval reported on the Operator's Manual.

3 Inspect and exchange the EGR (*)parts and fuel injector parts of engine every 3000 hour of use.

* EGR: Exhaust Gas Recirculation

Maintenance of fuel filters

Be sure to use the genuine fuel filters.

The fuel injection system is precisely constructed and the genuine filter employs finer mesh than conventional filters to improve protection of machine equipment.

If a filter with coarse mesh is used, foreign object passing through the filter enters into the engine so that machine equipment can wear out in a short period of time.

NOTICE : *If a fuel filter other than the genuine filter is used, guaranty will not be applied to a fault caused by the use of a wrong filter.*

Two kinds of fuel filter, the pre-filter and the main filter, are mounted on the machine.

Be sure to use the genuine fuel filters and replace them at the periodic intervals reported on the operator's Manual.

NOTICE : *Since the pre-filter also has a function of water separation, discharge water and sediment when the float reaches lower part of the filter elements. CHECK EVERY DAY before to start the engine.*

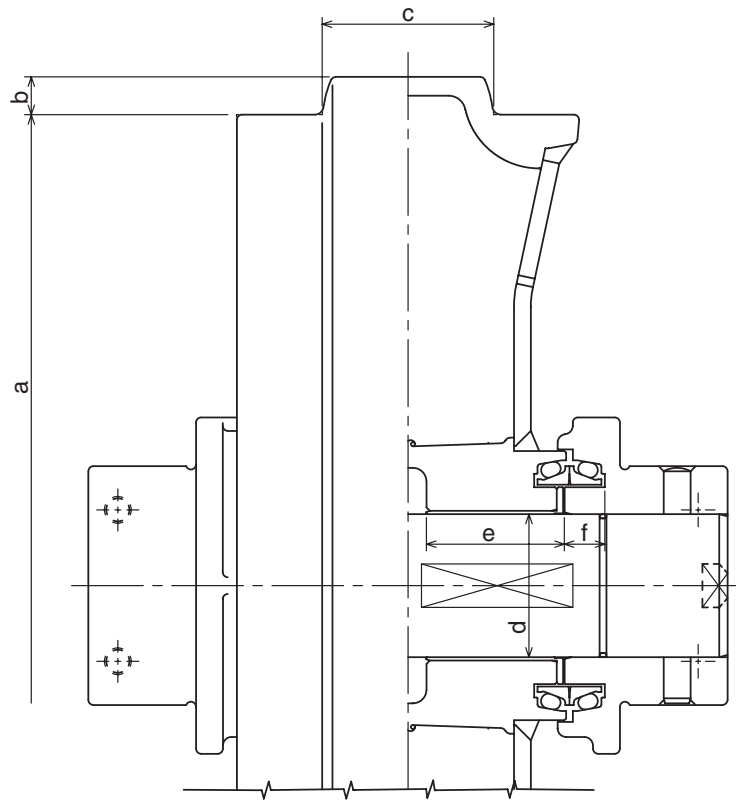
Time to replace filters may be advanced according to properties of the fuel being supplied.

- Therefore, take measures to prevent dust or water from being entered in the fuel tank when supplying fuel.
- When supplying fuel directly from a fuel drum can, leave the drum as it stands for a long period of time to supply clean fuel standing above a precipitate.
- If it is hard to leave the drum for a long period of time, install a fuel strainer and a water separator before the fuel tank of the machine to supply clean fuel.

Water drain cock is provided on the bottom side of the fuel tank.

- Drain water before starting the engine every morning.
- In addition, remove the cover under the tank once a year to clean up inside of the tank.

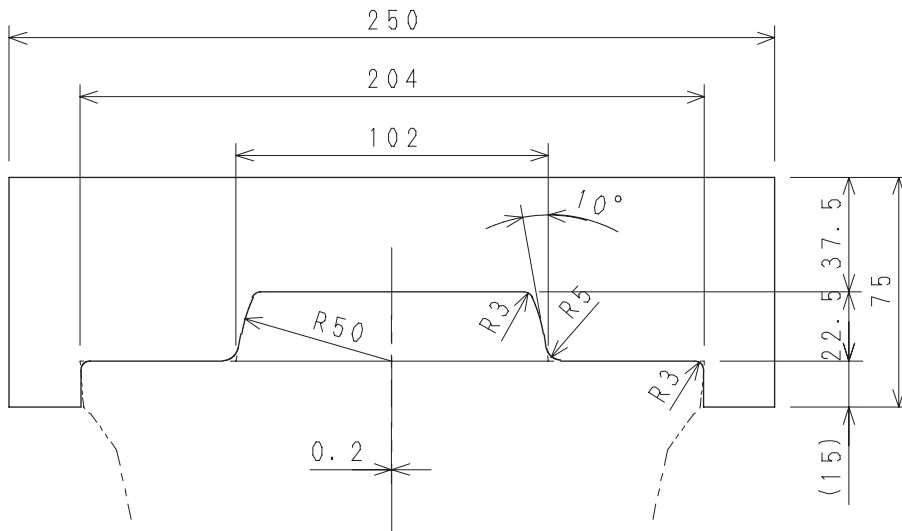
Idler wheel

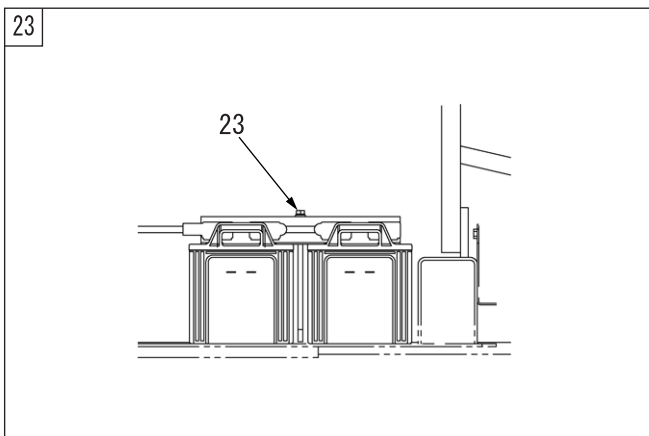
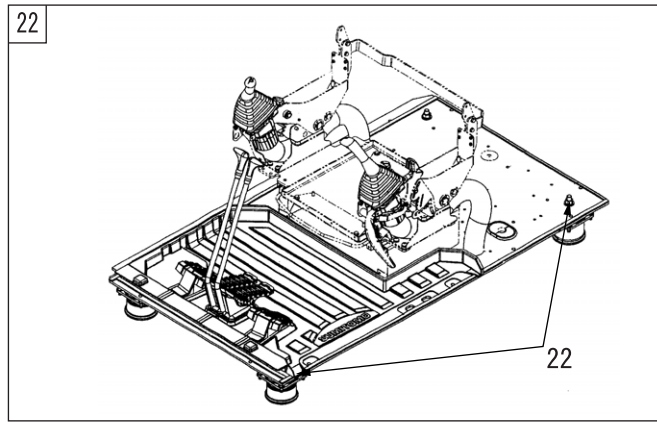
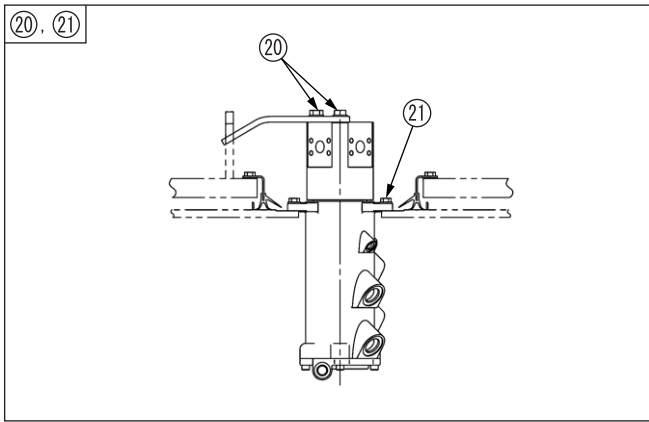
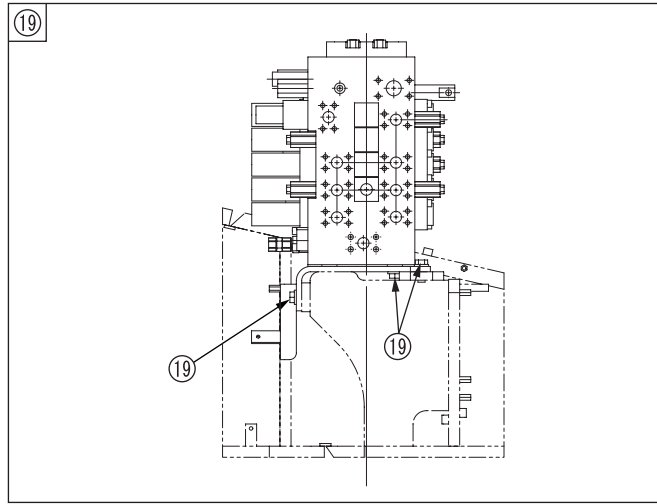
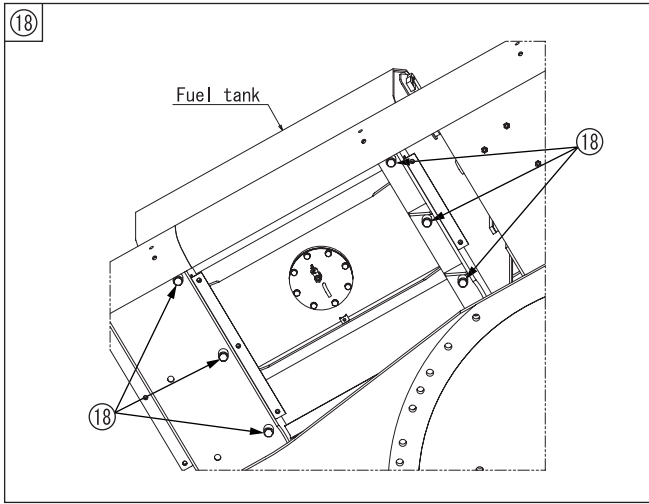


Part name	Code	Measured dimensions (mm)	Standard value (mm)	Usage limit (mm)	Judgment	Solution
Idler wheel	a	∅	∅560	∅550	Acceptable/Unacceptable	Cladding by welding or replacement
	b		22.5		Acceptable/Unacceptable	
	c		102	92	Acceptable/Unacceptable	
Shaft	d	∅	∅85	∅84	Acceptable/Unacceptable	Replacement
Bushing	d	∅	∅85	∅86	Acceptable/Unacceptable	Replacement
	e		82	81	Acceptable/Unacceptable	
Hub	f		24	23.6	Acceptable/Unacceptable	Replacement

Gauge

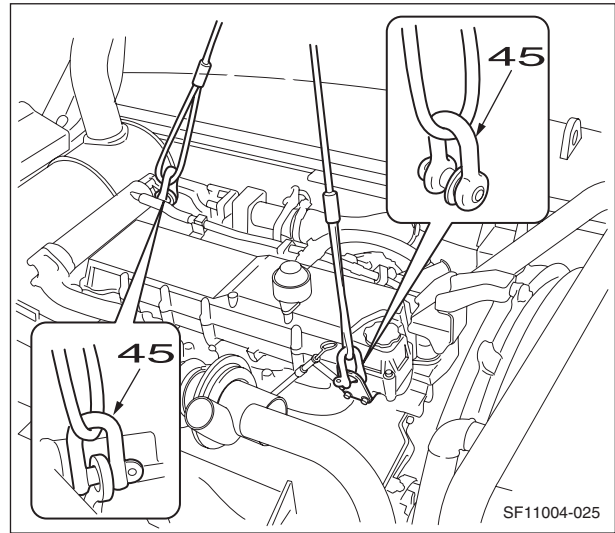
unit in mm



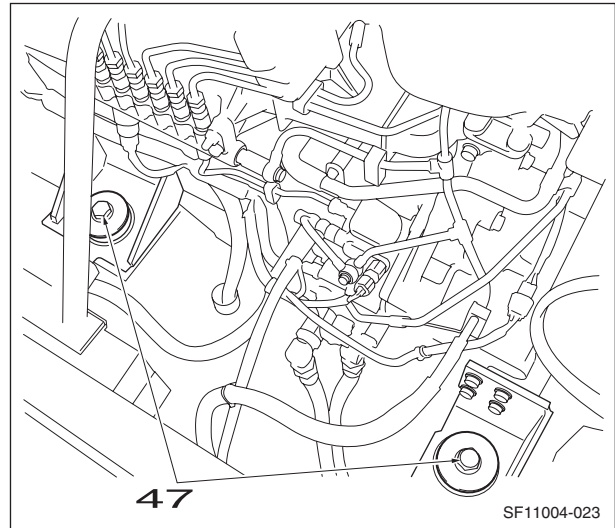
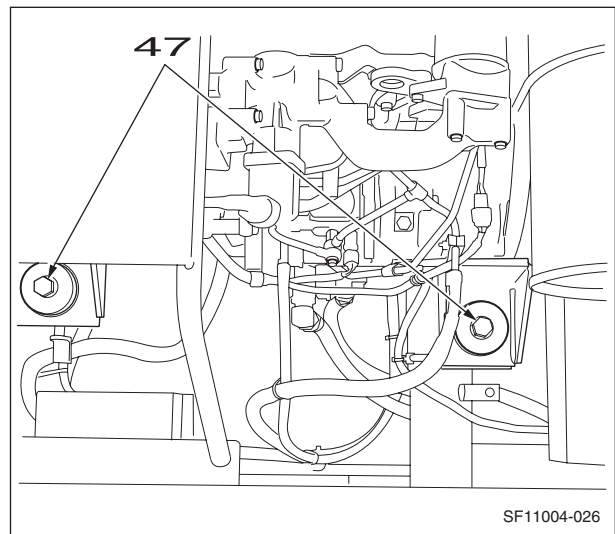


2000-12

[30] Connect the 2 shackles (45), and then use the wires and crane to secure the engine.

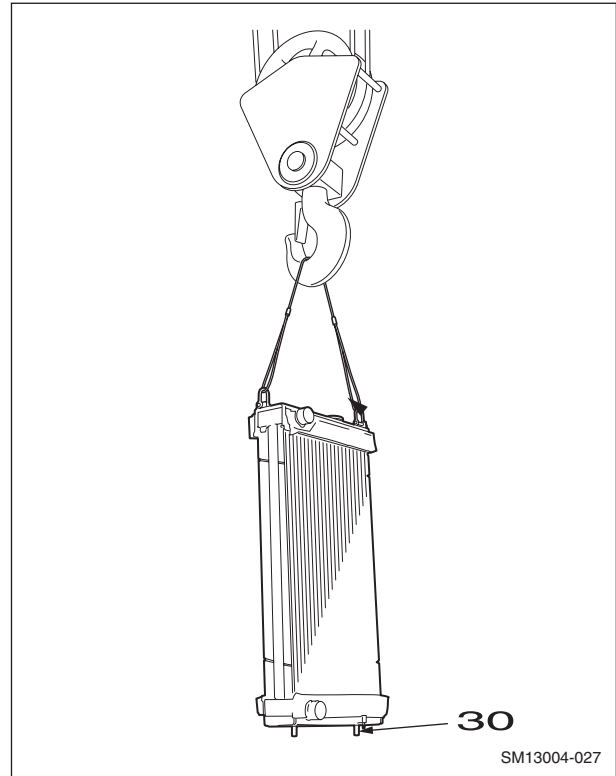


[31] Disassemble the retaining screws (47) from the mount.



2001-12

- [19] Thoroughly check that the location is safe before lowering the radiator on a crosstie.
When laying down the radiator, be careful not to bend or crush the bottom fixtures (30).



2 Installation of radiator

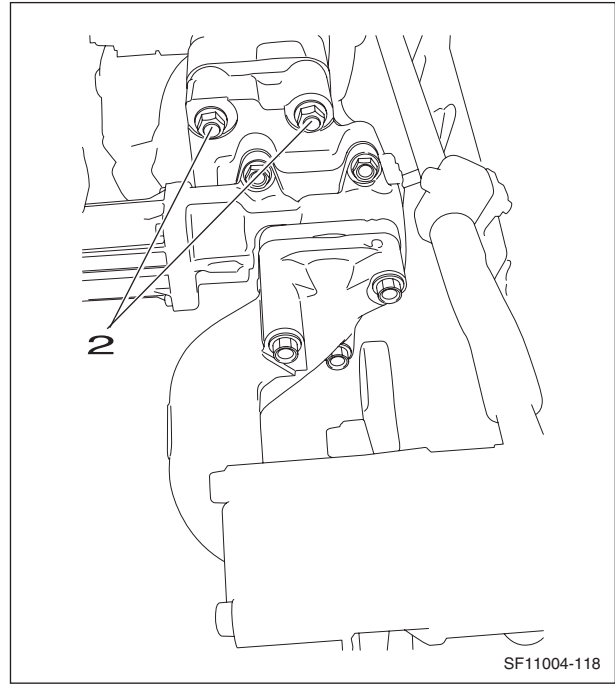
Perform the reverse of the removal procedure.

For details on the method for coolant filling, see the Operator's Manual.

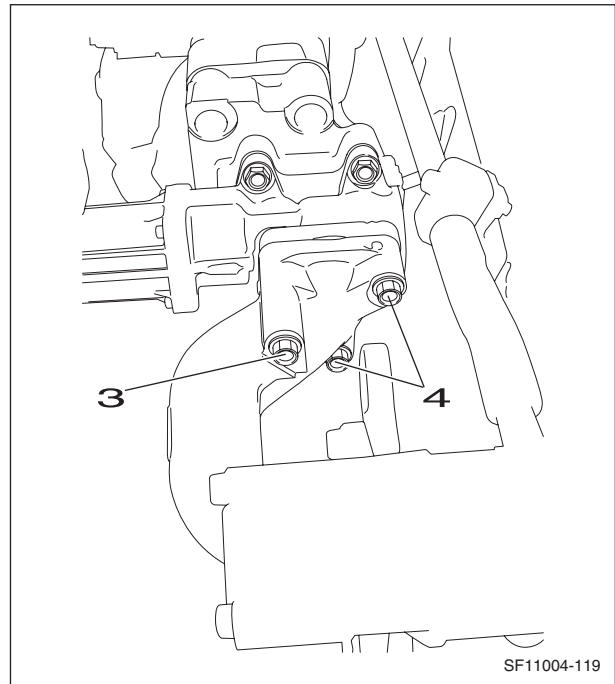
Finally, check that the level of coolant is correct.

2005-4

[2] Use a wrench (12 mm) to remove the 4 bolts (2).



[3] Use a wrench (12 mm) to remove the bolts (3) and (4).



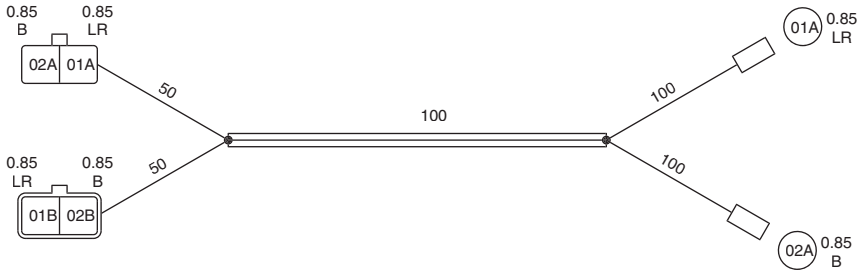
3001-8

2 Installation of fuel tank

When installing, perform the reverse of the removal procedure.

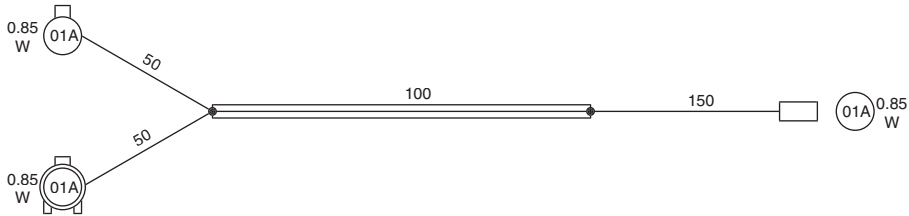
Finally, carefully check for any fuel leaks.

35) For fuel pump (2P)



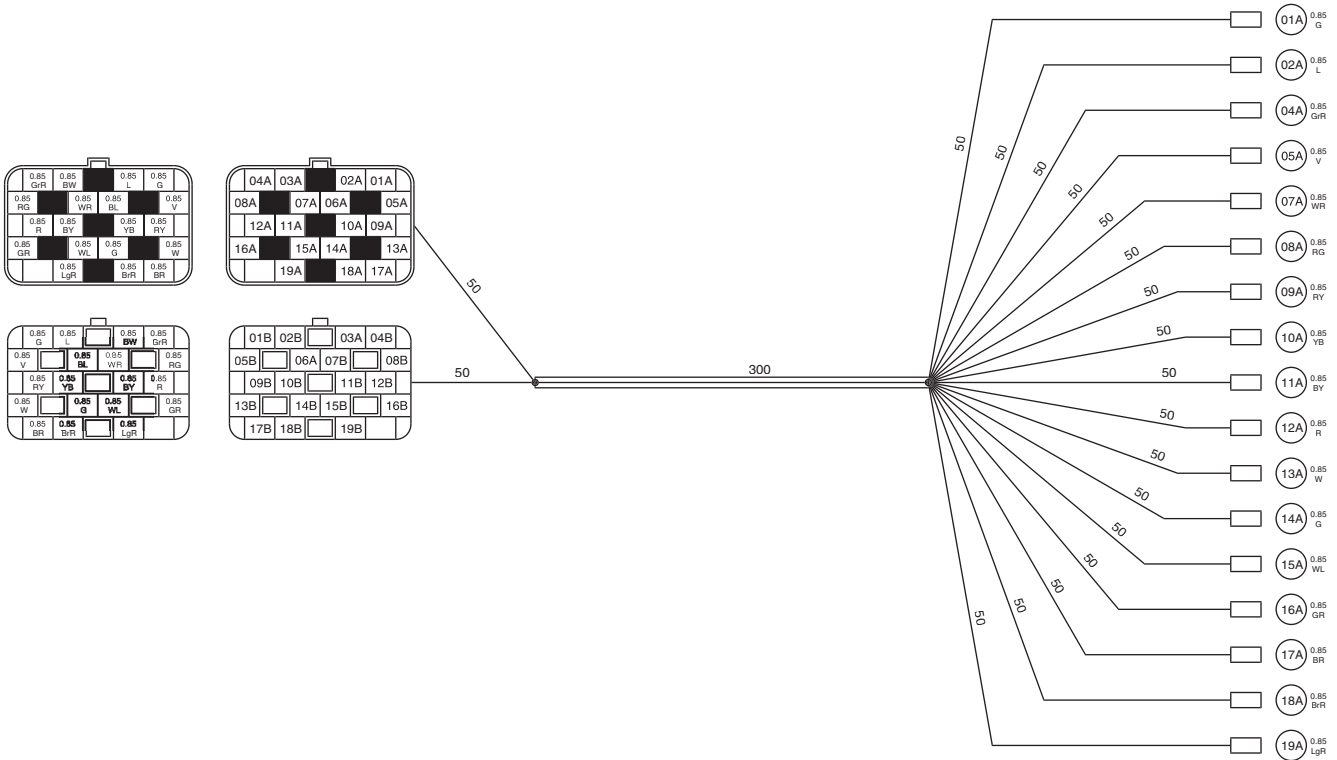
KHP13690

36) For air conditioner compressor (1P)



KHP13700

37) For engine sensor (20P)



KHP13710

f) Table

For the angle, voltage, and degree of opening for each detent position, see the following table.

Detent	Angle [degree]	Voltage [V]	Degree of opening [%]
1+	131.2	4.86	100.0
1	128.7	4.77	98.0
1-	126.2	4.67	96.1
2+	109.6	4.06	83.0
2	107.1	3.97	81.1
2-	104.6	3.87	79.1
3+	95.2	3.53	71.7
3	92.7	3.43	69.8
3-	90.2	3.34	67.8
4+	88.0	3.26	66.1
4	85.5	3.17	64.1
4-	83.0	3.07	62.2
5+	80.8	2.99	60.4
5	78.3	2.90	58.5
5-	75.8	2.81	56.5
6+	73.6	2.73	54.8
6	71.1	2.63	52.8
6-	68.6	2.54	50.9
7+	66.4	2.46	49.1
7	63.9	2.37	47.2
7-	61.4	2.27	45.2
8+	59.2	2.19	43.5
8	56.7	2.10	41.5
8-	54.2	2.01	39.6
9+	52.0	1.93	37.8
9	49.5	1.83	35.9
9-	47.0	1.74	33.9
10+	44.8	1.66	32.2
10	42.3	1.57	30.2
10-	39.8	1.47	28.3
11+	37.6	1.39	26.5
11	35.1	1.30	24.6
11-	32.6	1.21	22.6
12+	30.4	1.13	20.9
12	27.9	1.03	18.9
12-	25.4	0.94	17.0
13+	23.2	0.86	15.2
13	20.7	0.77	13.3
13-	18.2	0.67	11.3
14+	16.0	0.59	9.6
14	13.5	0.50	7.6
14-	11.0	0.41	5.7
15+	8.8	0.33	3.9
15	6.3	0.23	2.0
15-	3.8	0.14	0.0

b) Braking function during upper operation

When the upper pressure sensor is ON, the brake goes OFF, one second after upper pressure sensor goes OFF, the brake comes ON.

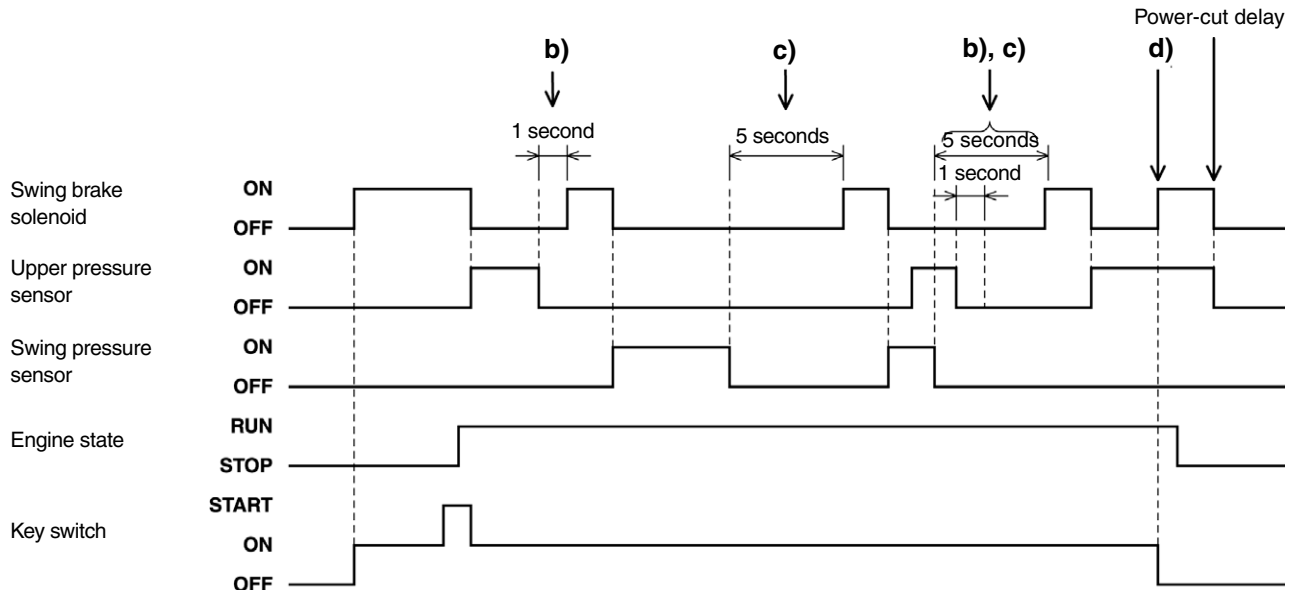
c) Braking control through swing operation

When the swing pressure sensor is ON, the swing brake goes OFF (Swing brake solenoid = OFF).

Five seconds after the swing pressure goes OFF, the swing brake comes ON (Swing brake solenoid = ON).

d) Swing lock with key OFF

When the key is OFF (during power-cut delay), the swing brake comes ON unconditionally

**2. Free Swing (North America Only)****a) Free swing switchover**

When the free swing switch is pressed, the free swing mode is switched ON <=> OFF. When the (momentary) key is OFF, always start with free swing OFF (Previous data reset).

b) Free swing control

When free swing is ON, the free swing solenoid is ON and the swing brake solenoid is OFF.

c) Mode display

When free swing is ON, the icon in the figure below is displayed on the monitor.

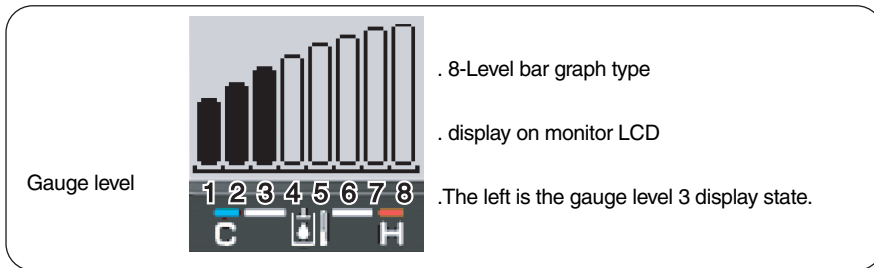
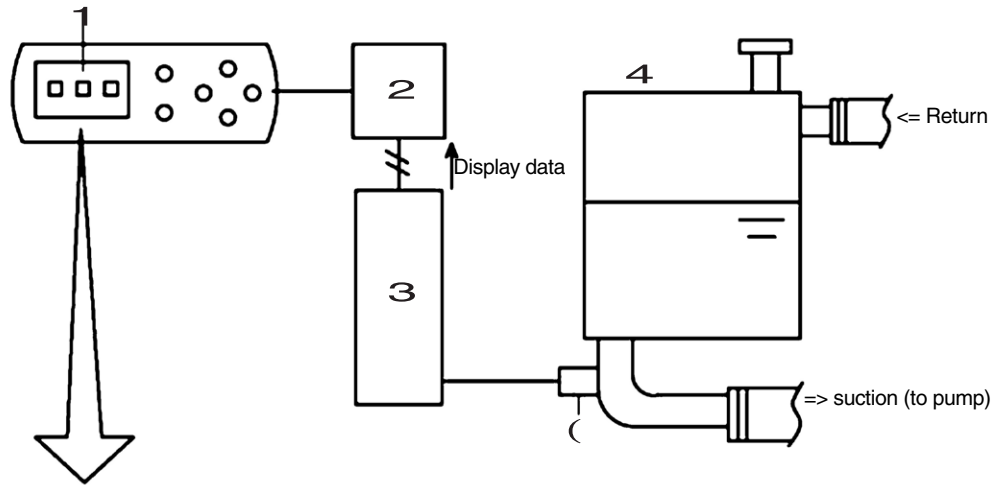
d) Battery save

While the engine is stopped with the key ON, if free swing is switched ON, the icon is displayed, but the free swing solenoid valve does not come ON. It does come ON after the engine starts.



2) Oil temperature gauge

a) Configuration



RE06004-018

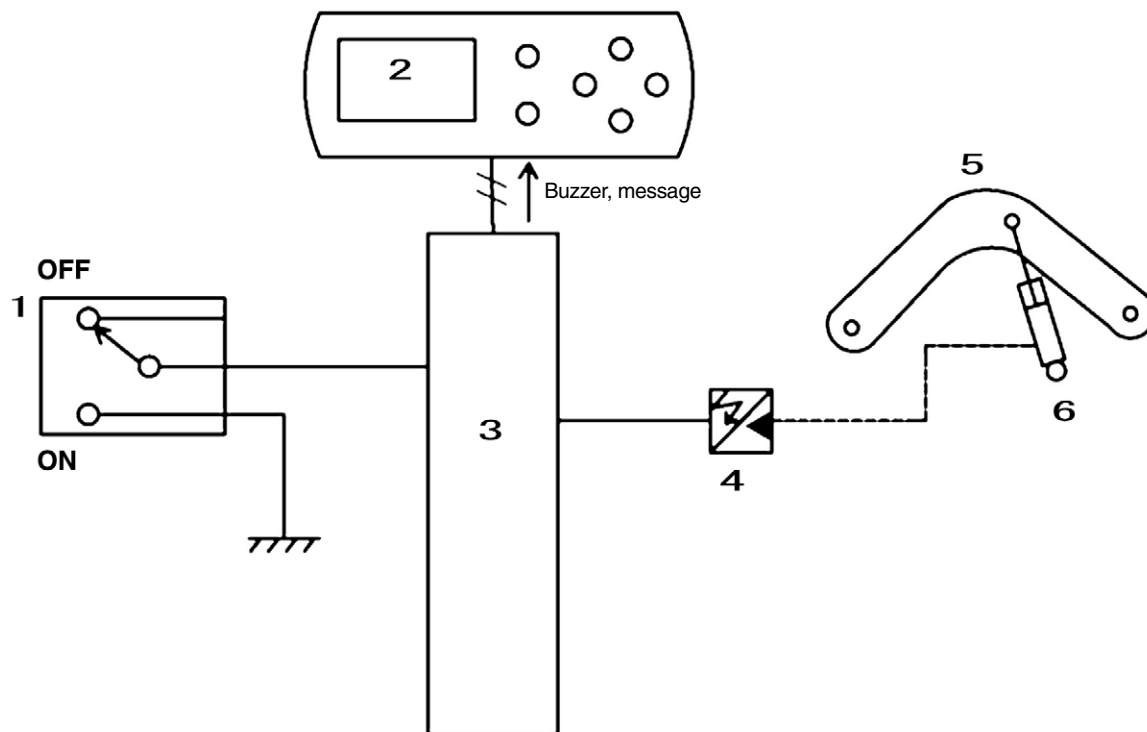
1	Oil temperature gauge	4	Hydraulic oil tank
2	Monitor	5	Oil temperature sensor
3	Computer A		

b) Operation summary

Computer A reads the oil temperature from the oil temperature sensor installed in the hydraulic oil tank outlet pipe and judges the gauge level. The gauge level is sent to the monitor with UART communications.

4. Overload Alarm (Europe only)

a) Configuration



1	Overload alarm switch (alternate)	4	Boom cylinder bottom pressure sensor
2	Monitor panel	5	Boom
3	Computer A	6	Boom cylinder

b) This function is only mounted on machines for Europe.

c) Alarm judgment

When the overload alarm switch is ON, the overload alarm is switched ON / OFF according to the following conditions.

ON: (Boom cylinder bottom pressure \geq set pressure) for 1 continuous second

OFF: (Boom cylinder bottom pressure \leq set pressure - 2 MPa (- 20 bar / - 290 psi)) continuous for 1 second

- For the set pressure for each model, see "Overload set pressure".
- The set pressure can be changed with CFG (see the "Service Support" chapter).

d) Operation when alarm judgment ON

The "OVER LOAD" message is displayed on the monitor and the buzzer buzzes intermittently.

This message is handled as an "alert". For details, see "Message Display List".

e) Ending the alarm

To end an alarm that has been issued, either switch the overload alarm switch OFF or operate the attachment in such a way that the judgment in **c)** goes OFF.

Note that there is no buzzer stop switch.

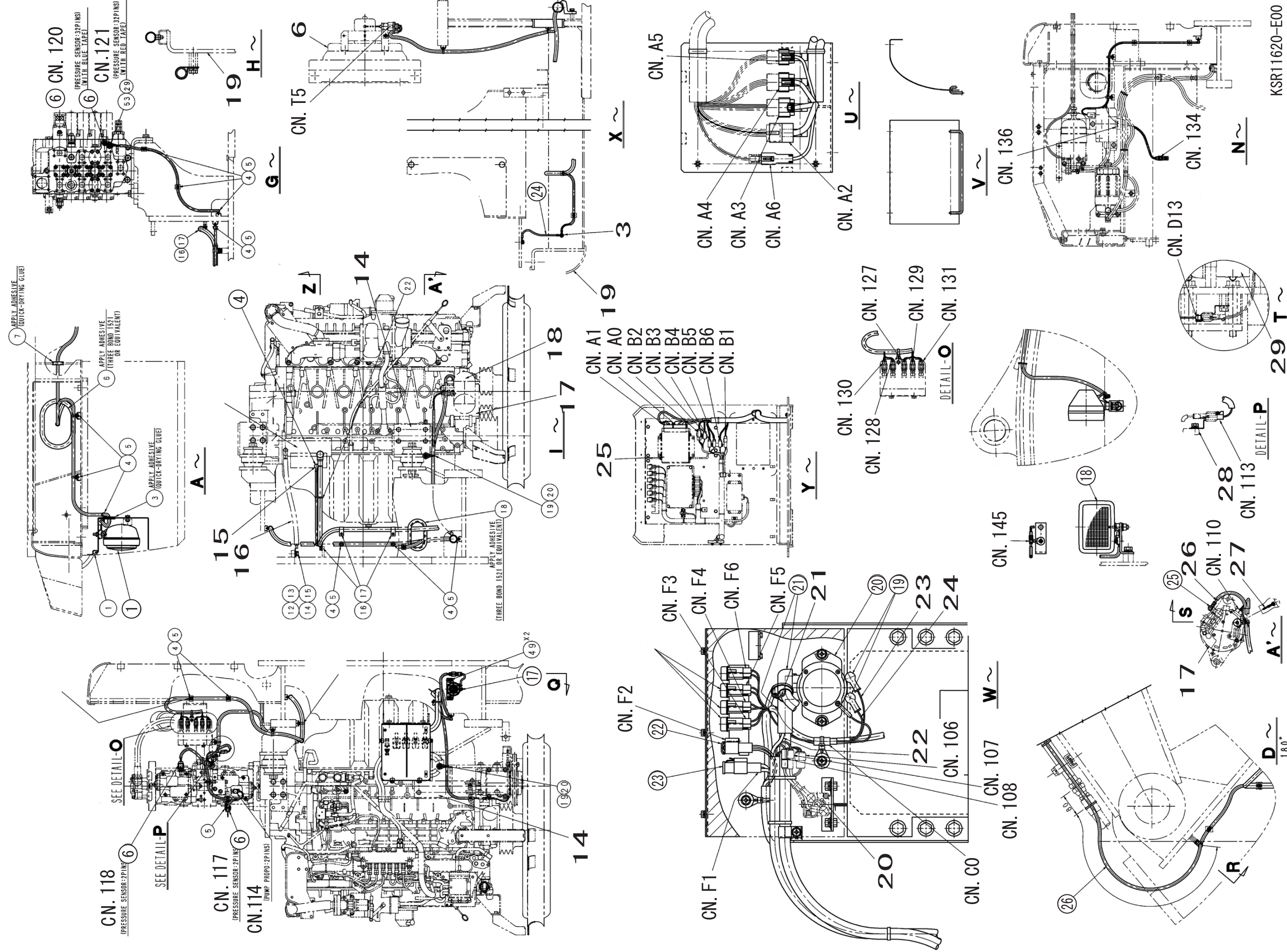
f) Trouble mode

If trouble occurs in the boom cylinder bottom pressure sensor, this function goes into trouble mode and the alarm judgment is fixed to OFF.

Even if the trouble is recovered from, trouble mode continues until the key is switched OFF.

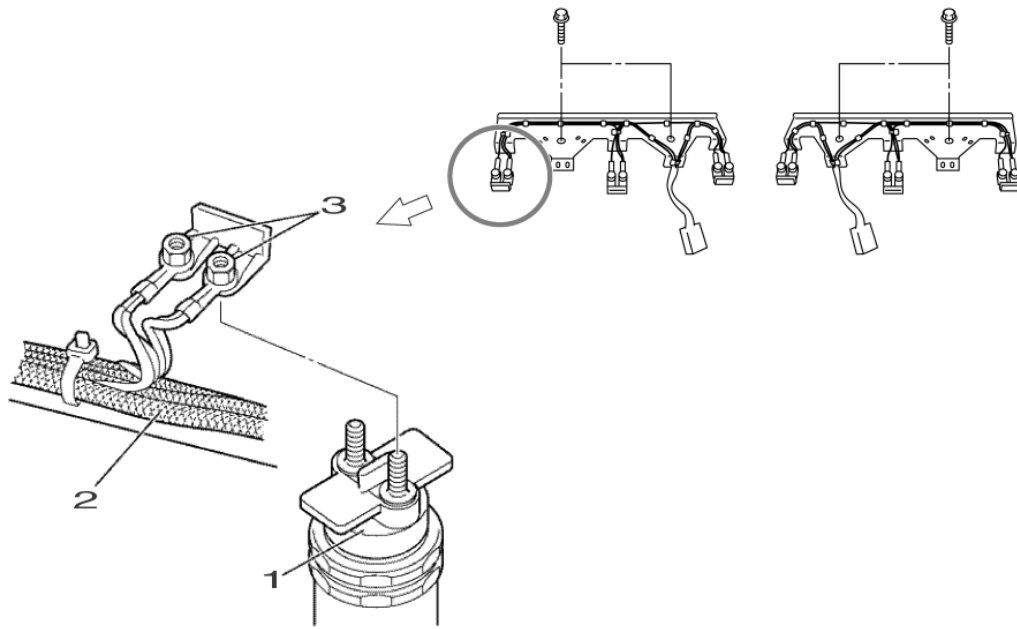
g) Trouble judgment

The boom cylinder bottom pressure sensor trouble judgment is made after the overload alarm switch has come ON once.



KSRI1620-E00

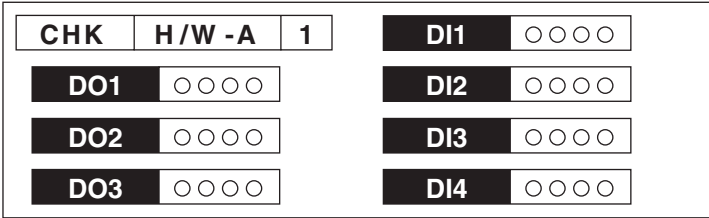
Be careful. High voltage of 118 V or higher is applied to the injectors. Disconnect the battery cable ground before replacing injectors.



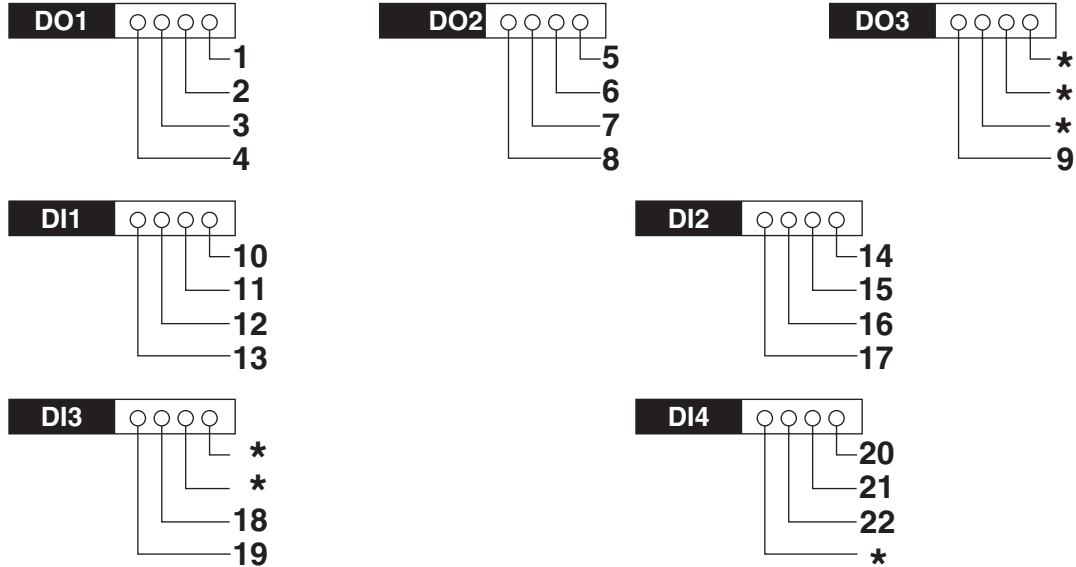
1. Injector
2. Injector harness
3. Injector nut

C) H / W-A

1) Digital input / output



Input /output state (○ = OFF, ● = ON)

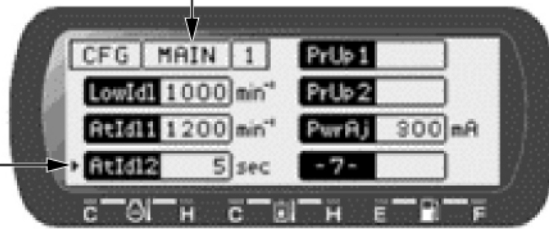


1	Solenoid; Power save	12	Switch; Anti-theft
2	Solenoid; Boost	13	Switch; One-touch idle
3	Solenoid; Travel high-speed switchover	14	Switch; Travel alarm / overload
4	Solenoid; Swing brake	15	Switch; Free Swing (North America)
5	Buzzer; Travel alarm	16	Switch; Pressure (2nd option)
6	Solenoid; Option line switchover	17	Switch; Pressure (Option)
7	Solenoid; Free swing (North America)	18	Switch; Fan reverse (large machine only)
8	Solenoid Fan reverse (large machine only)	19	Switch; Clog (Return filter)
9	Relay; Feed pump	20	Alternator
10	Switch; Clog (Air cleaner)	21	Switch; Engine emergency stop
11	Switch; Level Coolant	22	Switch; Key

4. CFG (setting change) Screen

The item where the cursor is located flashes.
Can be changed

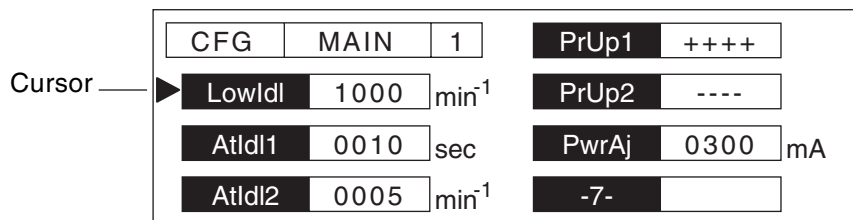
The cursor appears if the auto idle switch is held down



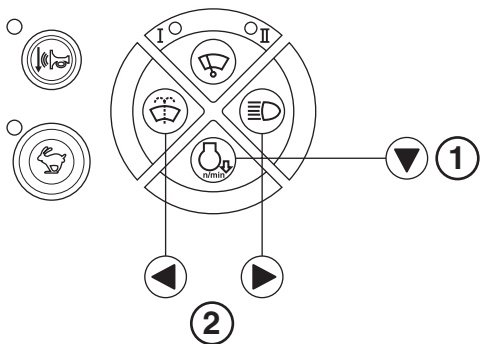
RE07003-010

- Hold down the auto idle switch for 1 second. The cursor ► is displayed and the value starts to flash.
- The flashing value can be changed with the washer switch /working light switch.
- When the travel high-speed switch is pressed, value is finalized and the change is reflected in the actual machine.
- When the horn volume select switch is pressed, the change is cancelled

A) Operation

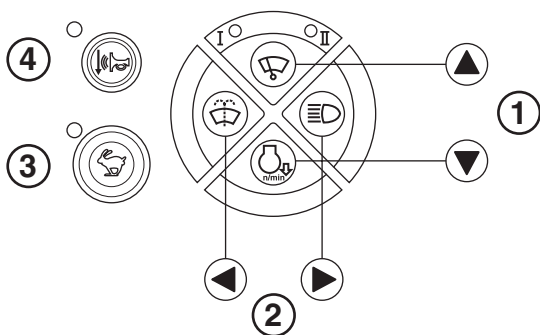


1) View mode (screen switching operation)



- 1) Switching to edit mode
Hold down the auto idle switch for one second.
The mode switches to edit mode and the cursor is displayed.
- 2) Page forward / back:
Forward operation => light switch
Back operation => washer switch

2) Edit mode (setting change operation)



- 1) Cursor up / down:
Up operation => wiper switch
Down operation => auto idle switch
- 2) Numeric value increase / decrease:
Increase value => light switch
Decrease value => washer switch
- 3) Enter: Enters the set contents.
- 4) Cancel: Cancels the set contents.
When (3) and (4) is executed, this exits edit mode and shifts the mode to view mode (the cursor disappears).

3) Reset

If the washer switch and the light switch are held down for 10 seconds, the setting contents are reset and all settings return to their default values.

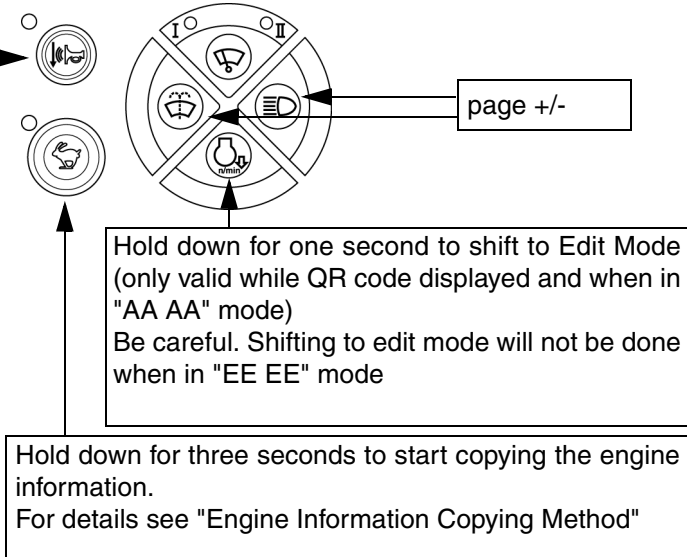
F) Monitor operation method

1) View Mode.

Display mode (switching between information in controller A / information in ECM)

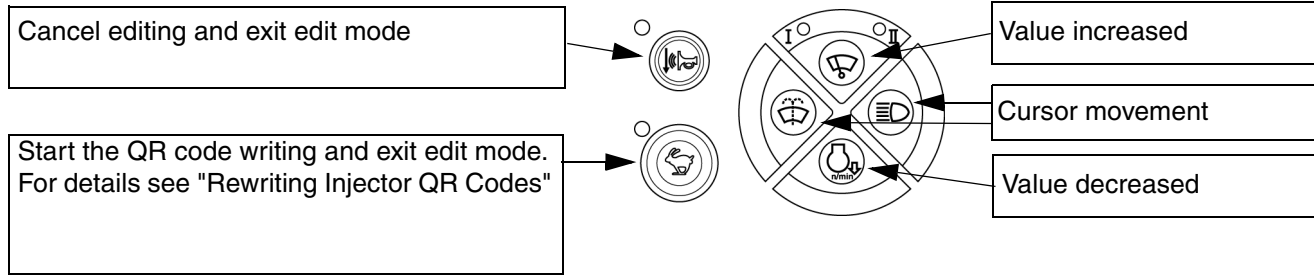
Each time this switch is pressed, the second line of each page is switched as follows.

AA AA (Mode displaying information in computer A)
 ↑
 ↓
 EE EE (Mode displaying information in ECM)



2) Edit Mode

Can only be shifted to during QR code display.

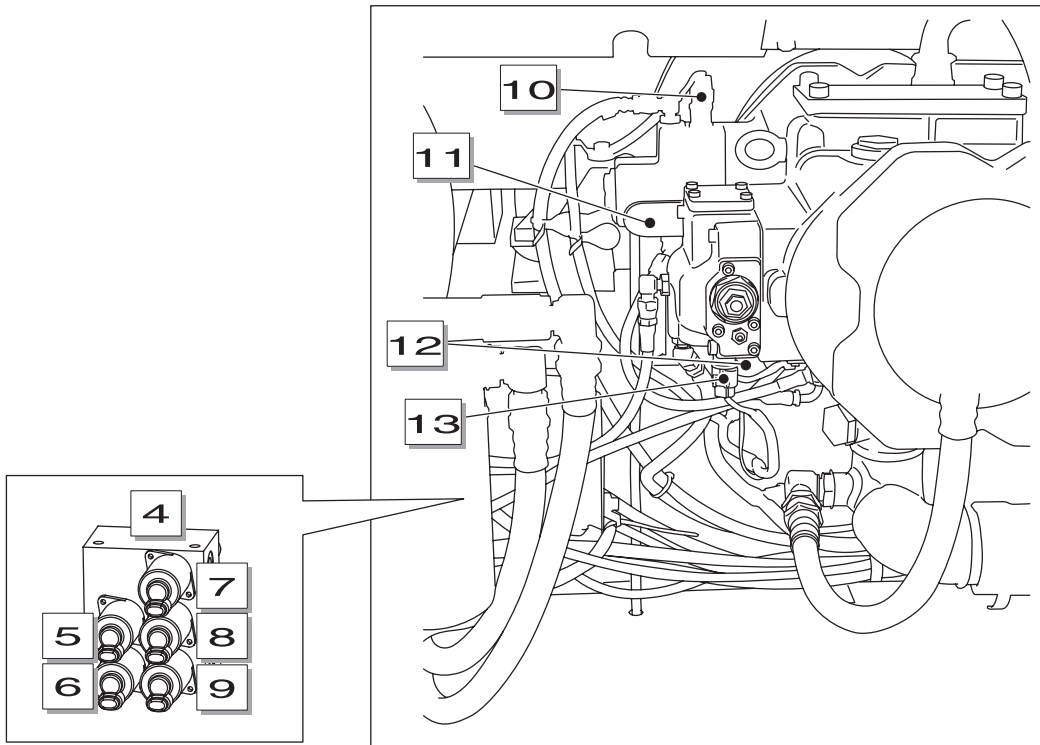
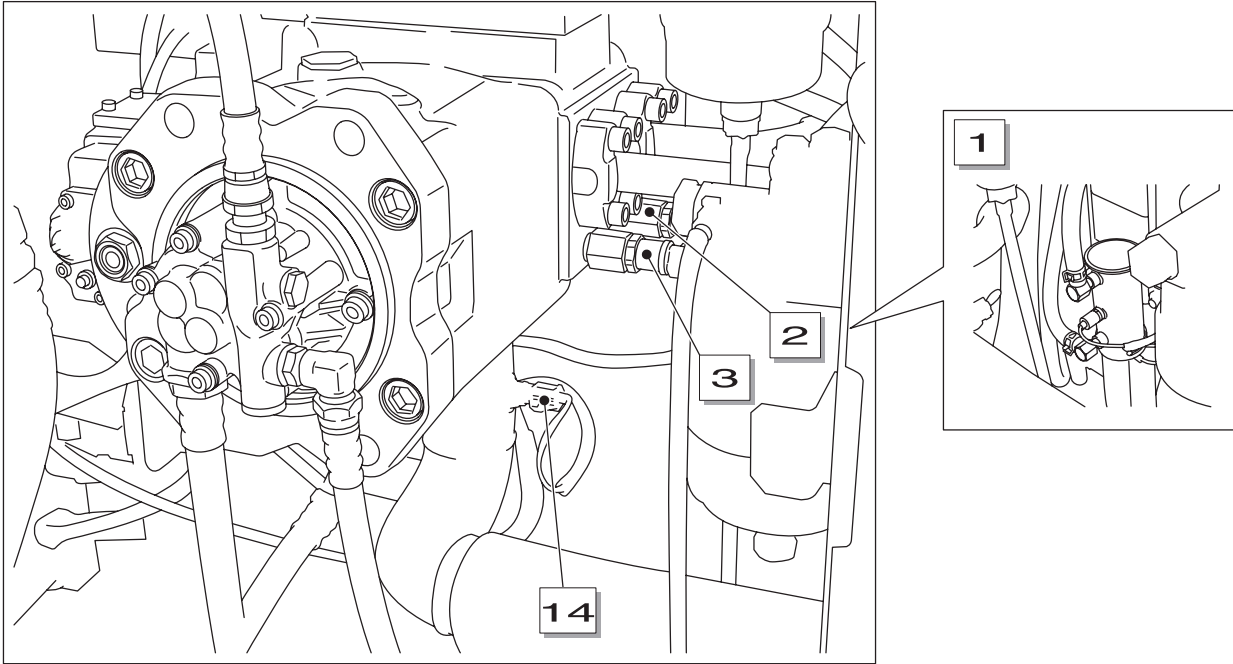


Trouble contents	Error Code	Main symptoms when trouble occurs	Diagnostic trouble code display conditions	Back-up function	Conceivable cause	Patterns for recovery from trouble
Faulty common rail pressure sensor (abnormally low voltage)	0192	Engine rev-up defect, hunting	The common rail pressure sensor voltage is 0.7 V or lower.	Default value setting 80 MPa (800 bar/ 11600 PSI)	Wiring defect (disconnection, short, high resistance) between ECM and common rail Common rail pressure sensor defect (common rail) ECM internal defect	2
Faulty common rail pressure sensor (abnormally high voltage)	0193	Possibility of drop of output power and engine stalling	The common rail pressure sensor voltage is 4.5 V or higher.	Default value setting 80 MPa (800 bar/ 11600 PSI)	Wiring defect (disconnection, short, high resistance) between ECM and common rail Common rail pressure sensor defect (common rail) ECM internal defect	2
Injection nozzle #1 drive system disconnection	0201	High engine vibration, idle instability, drop of output power, rev-up defect	No. 1 cylinder injector drive circuit disconnection/ short detected No. 1 cylinder injector monitor input No signal for 2.4s or longer	No. 1 cylinder injection stop EGR control stop	Wiring defect (disconnection, short, high resistance) between ECM and No. 1 injector intermediate connector No. 1 injector terminal looseness Wiring defect (disconnection, high resistance) between No. 1 injector intermediate connector and No. 1 injector terminal No. 1 injector defect ECM internal defect	1
Injection nozzle #2 drive system disconnection	0202	High engine vibration, idle instability, drop of output power, rev-up defect	No. 2 cylinder injector drive circuit disconnection/ short detected No. 2 cylinder injector monitor input No signal for 2.4s or longer	No. 2 cylinder injection stop EGR control stop	Wiring defect (disconnection, short, high resistance) between ECM and No. 2 injector intermediate connector No. 2 injector terminal looseness Wiring defect (disconnection, high resistance) between No. 2 injector intermediate connector and No. 2 injector terminal No. 2 injector defect ECM internal defect	1
Injection nozzle #3 drive system disconnection	0203	High engine vibration, idle instability, drop of output power, rev-up defect	No. 3 cylinder injector drive circuit disconnection/ short detected No. 3 cylinder injector monitor input No signal for 2.4s or longer	No. 3 cylinder injection stop EGR control stop	Wiring defect (disconnection, short, high resistance) between ECM and No. 3 injector intermediate connector No. 3 injector terminal looseness Wiring defect (disconnection, high resistance) between No. 3 injector intermediate connector and No. 3 injector terminal No. 3 injector defect ECM internal defect	1
Injection nozzle #4 drive system disconnection	0204	High engine vibration, idle instability, drop of output power, rev-up defect	No. 4 cylinder injector drive circuit disconnection/ short detected No. 4 cylinder injector monitor input No signal for 2.5s or longer	No. 4 cylinder injection stop EGR control stop	Wiring defect (disconnection, short, high resistance) between ECM and No. 4 injector intermediate connector No. 4 injector terminal looseness Wiring defect (disconnection, high resistance) between No. 4 injector intermediate connector and No. 4 injector terminal No. 4 injector defect ECM internal defect	1
Overrun	0219	Drop of output power	The engine speed is the set speed of 2000 min ⁻¹ or higher for 1 second or longer.	Injection quantity restriction When the speed drops, the restriction is ended.	Faulty engine main unit (common rail, supply pump, injector) It is necessary to check whether or not there is another diagnostic trouble code. Mechanical engine trouble (turbo damaged, engine oil mixed in) ECM internal defect	2
Faulty boost pressure sensor (abnormally low voltage)	0237	Nothing in particular	The boost pressure sensor voltage is 0.1 V or lower for 3s or longer.	Default value setting 150 kPa (21.75 PSI)	Wiring defect (disconnection, short, high resistance) between ECM and boost pressure sensor Boost pressure sensor defect ECM internal defect	2
Faulty boost pressure sensor (abnormally high voltage)	0238	Black smoke	The boost pressure sensor voltage is 4.9 V or higher for 3s or longer.	Default value setting 150 kPa	Wiring defect (disconnection, short, high resistance) between ECM and boost pressure sensor Boost pressure sensor defect ECM internal defect	2
Faulty crank position (CKP) sensor (no signal)	0335	Possibility of drop of output power, white smoke, engine vibration Possibility of engine stalling (when the CMP sensor is normal, restarting is possible).	There is a CMP signal, but not a CKP signal.	When the CMP sensor is normal, cam standard control	Wiring defect (disconnection, short, high resistance) between ECM and CKP sensor CKP sensor defect ECM internal defect	1
Faulty crank position (CKP) sensor (faulty signal)	0336	Possibility of drop of output power, white smoke, engine vibration Possibility of engine stalling (when the CMP sensor is normal, restarting is possible).	CKP signal pulses do not match	When the CMP sensor is normal, cam standard control	Wiring defect (short) between ECM and CKP sensor CKP sensor defect Flywheel ring gear tooth missing ECM internal defect	1

NOTES

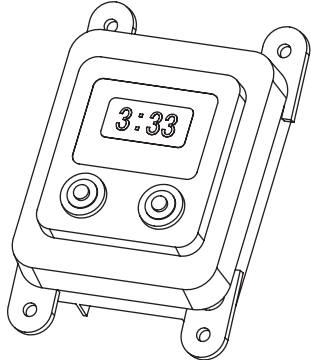
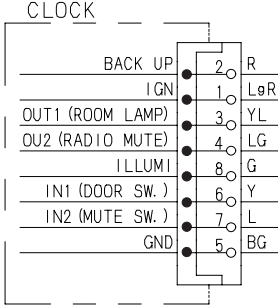
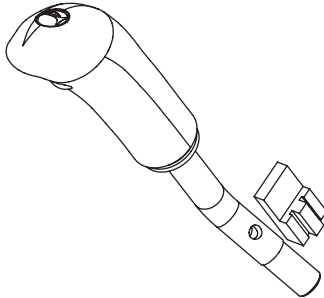
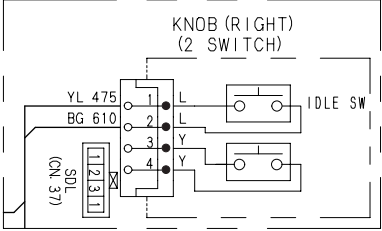
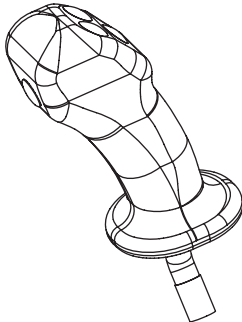
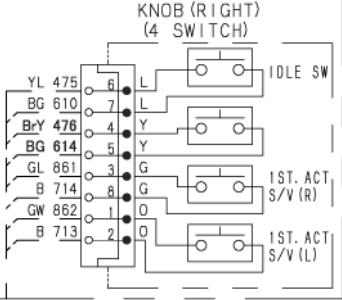
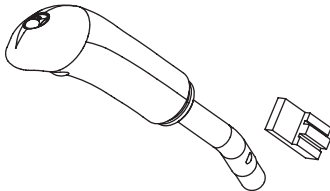
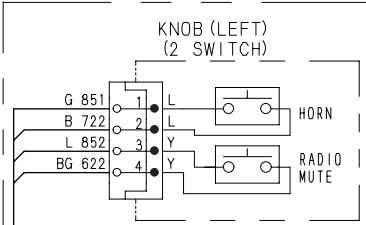
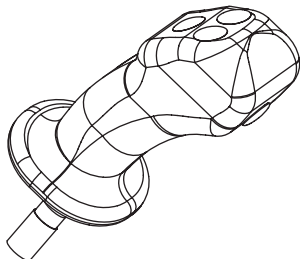
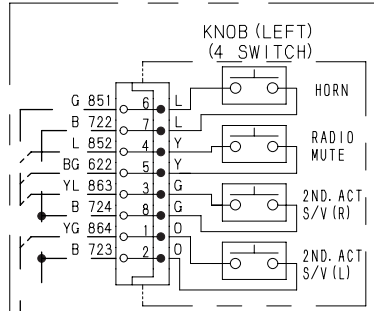
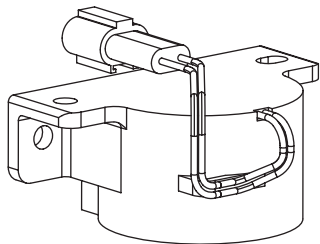
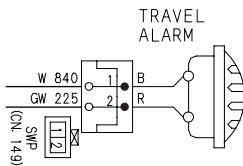
A series of horizontal dotted lines for writing notes.

Main Unit Right Side Layout Diagram (pump chamber)



SE01009-503

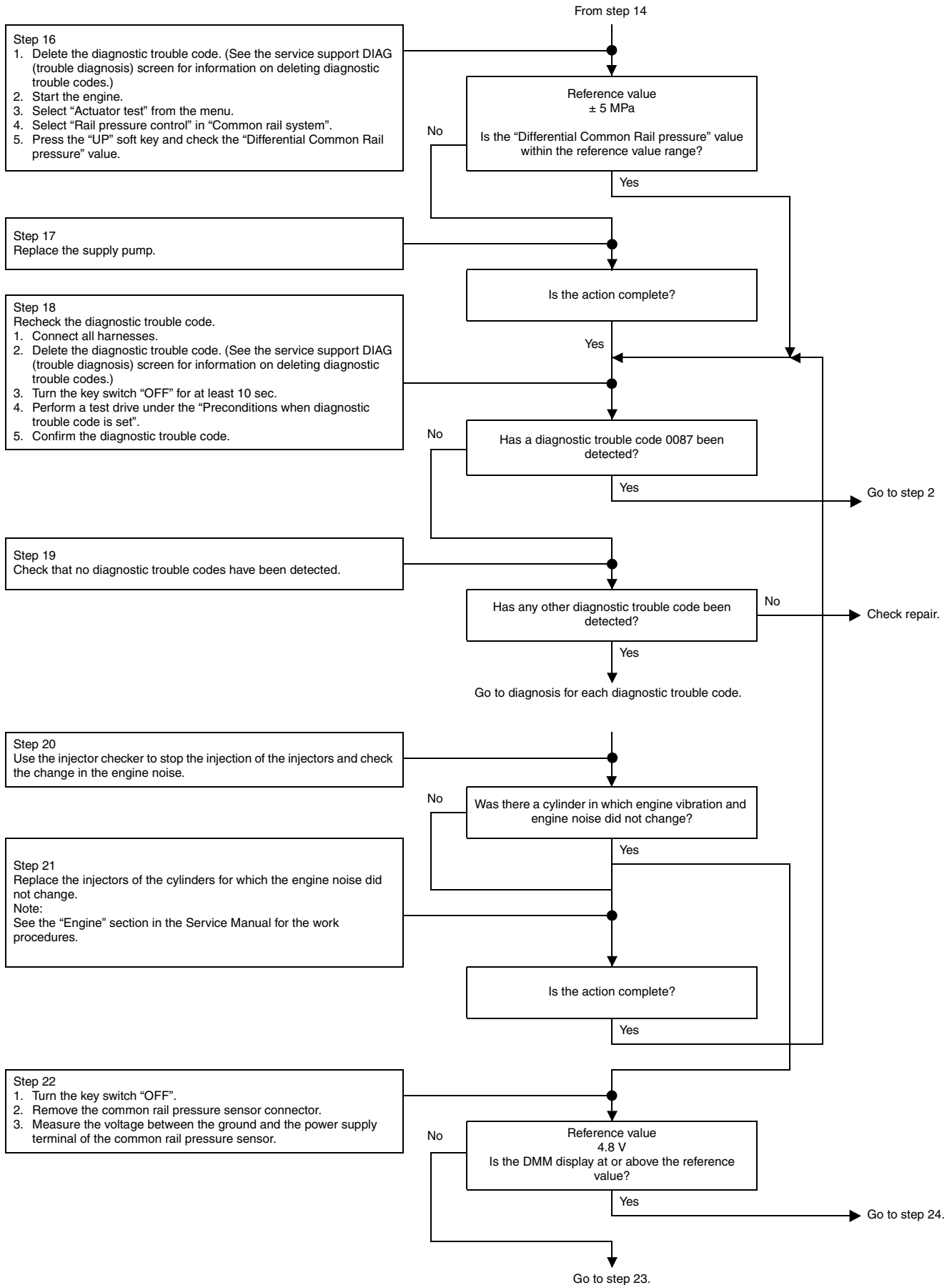
1	Charge fuel pump	8	Boosted pressure
2	P1 pressure sensor	9	Travel high speed
3	P2 pressure sensor	10	N1 pressure sensor
4	5 stack solenoid valve	11	P1 flow control proportional valve
5	Power save	12	Horsepower control proportional valve
6	Lever lock	13	N2 pressure sensor
7	Swing lock	14	Oil temperature sensor

Name	No.	Shape	Circuit	Remarks
Clock	P9			
Knob right (with one-touch switch)	P3			Model: with two switches
Knob right (with one-touch switch) (short type)	P3			Model: with four switches
Knob left (with horn switch and radio mute)	P2			Model: with two switches
Knob left (with horn switch and radio mute) (short type)	P2			Model: with four switches
Travel alarm	H2			Basic frequency: 2560 Hz North America only

Cab Sub Harness

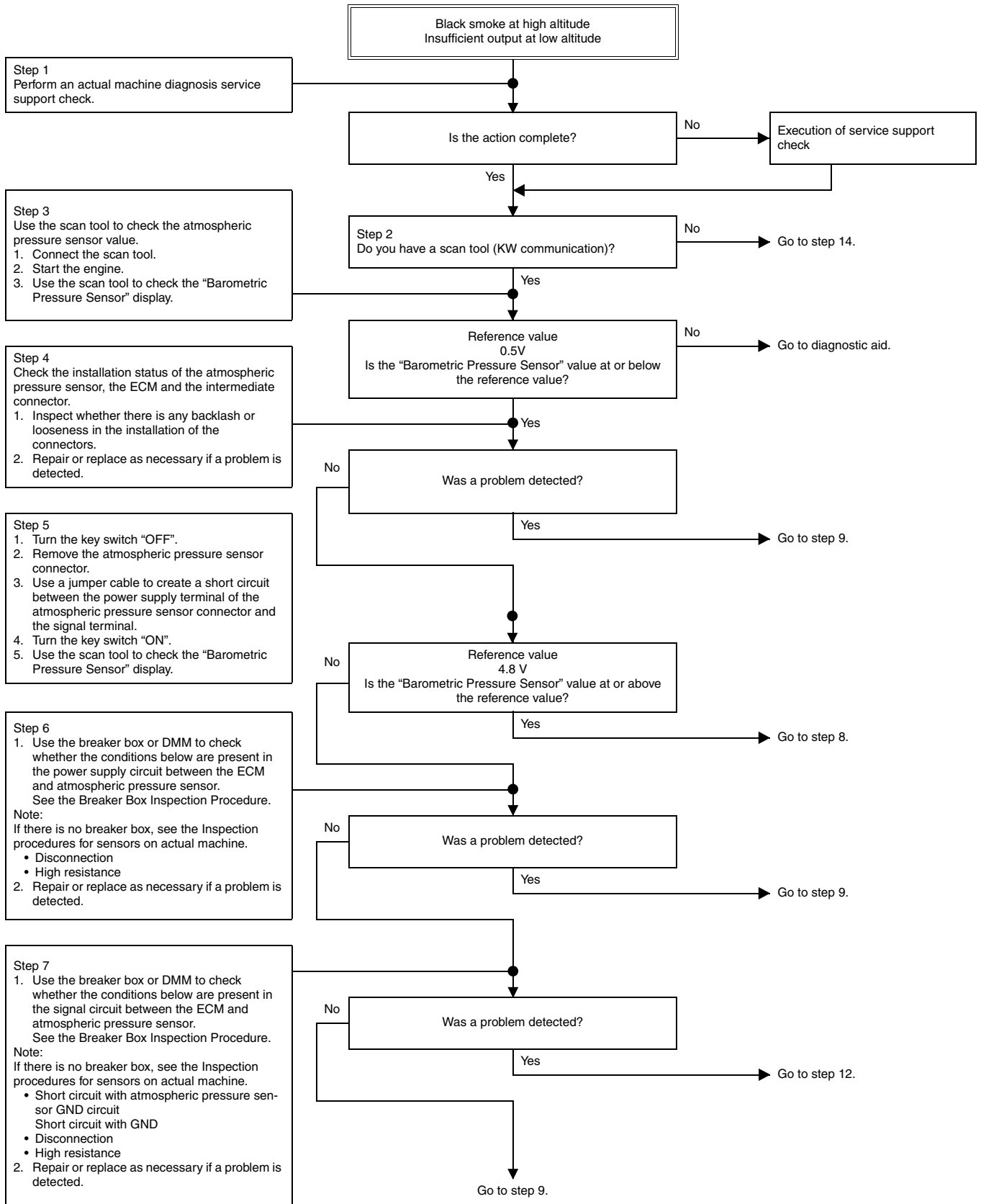
1	Blue tape
2	White tape
3	Red tape
4	Position of label
5	Diag. switch
6	Memory clear
7	Fix connector (CN.50M) with red tape.

CN2F	Cab harness: B
CN4F	Cab main harness: A
CN5F	Cab main harness: B
CN6F	Console (L) harness
CN50M	J1939 Connector
CN51F	Diag. connector
CN52F	EST Connector: A
CN53M	EST Connector: B
CN54F	GPS jumper harness
CN54M	GPS service connector



DTC: 0107

Atmospheric Pressure Sensor Circuit Abnormality (abnormally low voltage)



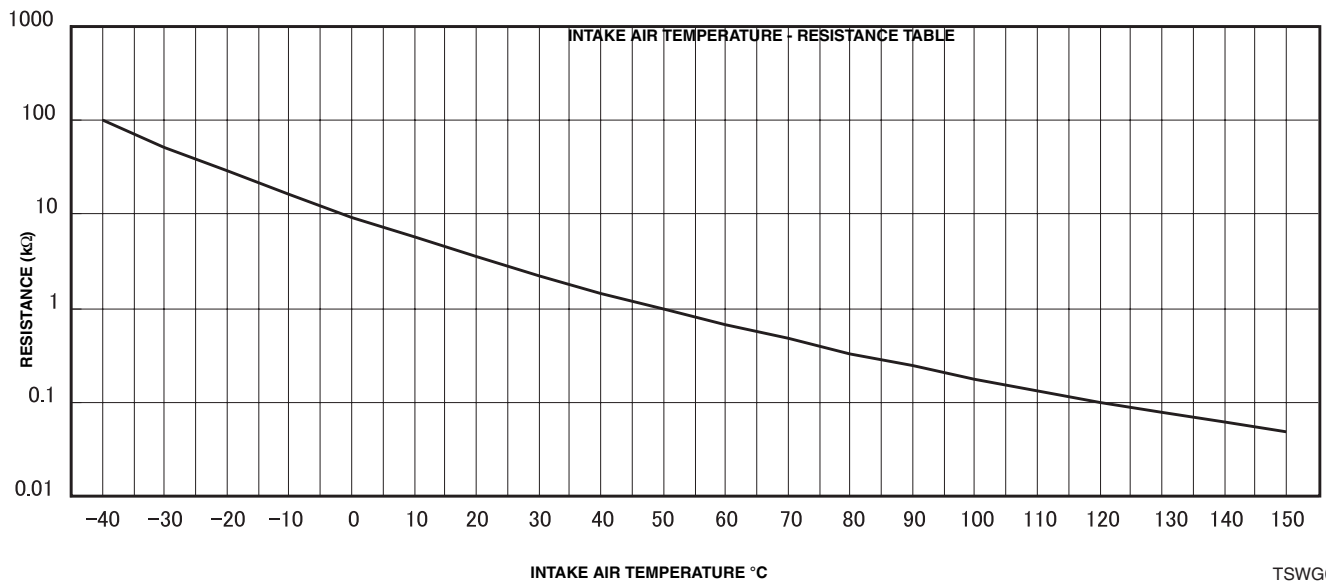
Breaker box inspection procedure

For steps in which breaker box usage is indicated, perform inspection with the following procedure.
Return to diagnosis step after inspection.

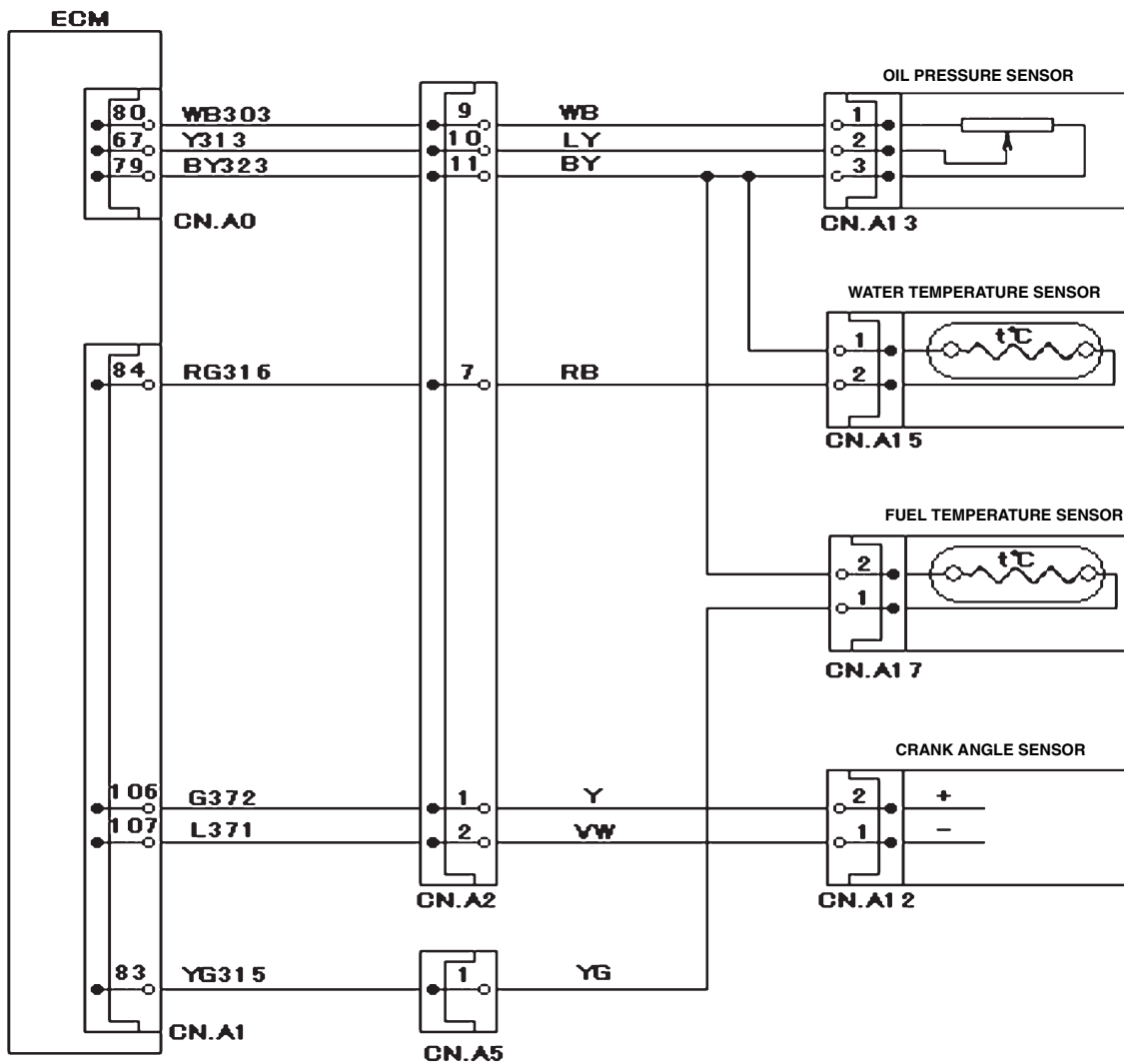
Step	Inspection item	Inspection method	Measurement condition	Measurement terminal No.	Normal value	Abnormal value
6, 15	Short circuit with GND circuit/GND	Resistance measurement	<ul style="list-style-type: none"> Remove the sensor connector. Key switch "OFF" 	72-60 72-GND	10 M Ω or higher	100 Ω or lower

Inspection procedures for sensors on actual machine

1. Disconnect the intermediate connectors and perform sensor inspection from the engine harness connector.
2. Disconnect the connector from the sensor and short circuit the sensor connector wiring.
3. Inspect the harness disconnection from the intermediate connector.
 - If there is an abnormality in both procedures 1 and 2, repair the harness and repeat inspection from procedure 1.
 - If there is an abnormality in procedure 1 only, replace the sensor.



Block diagram



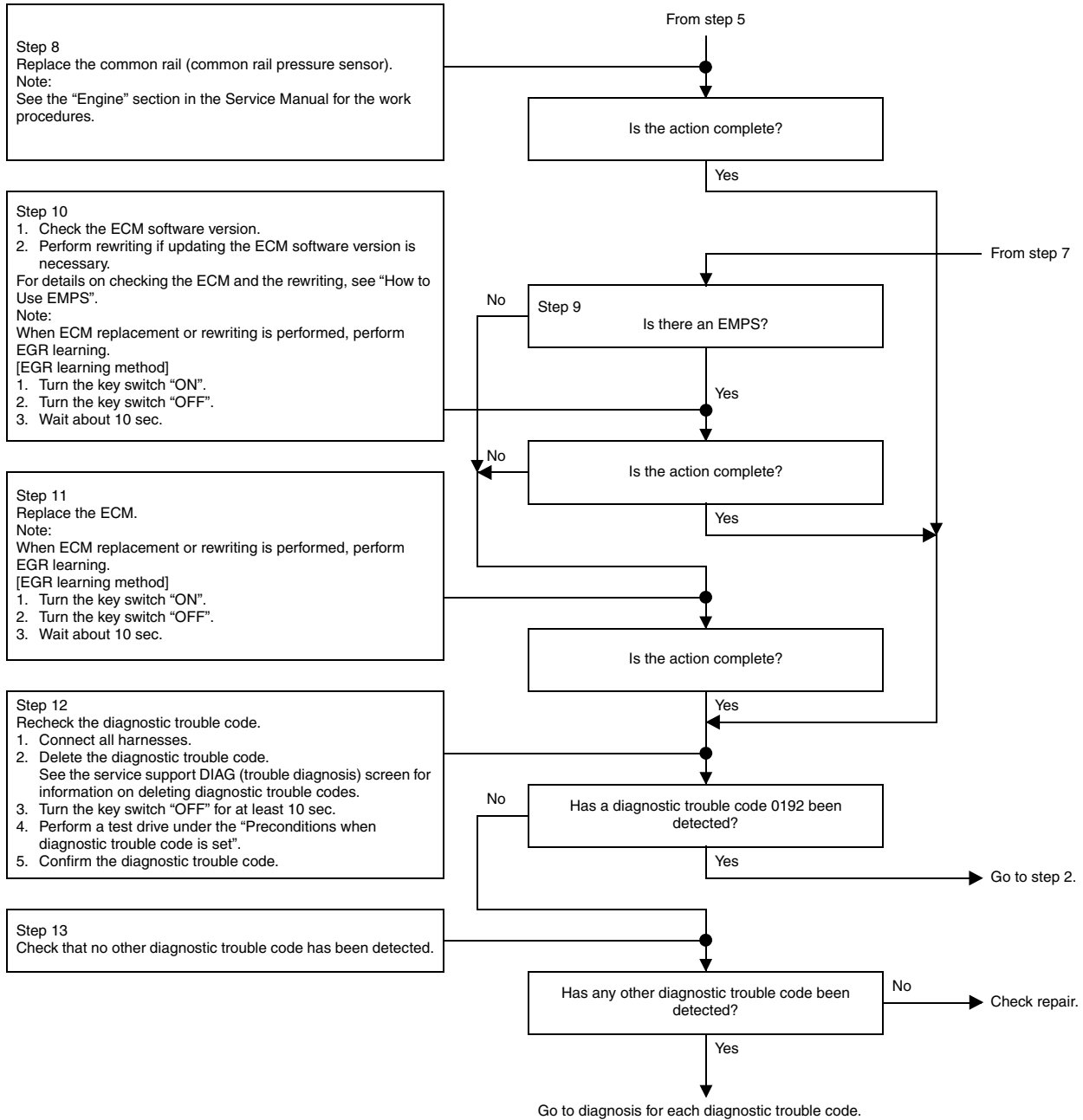
TSHK0030

Recovery from failure

3 - 10 min. required for trouble judgment

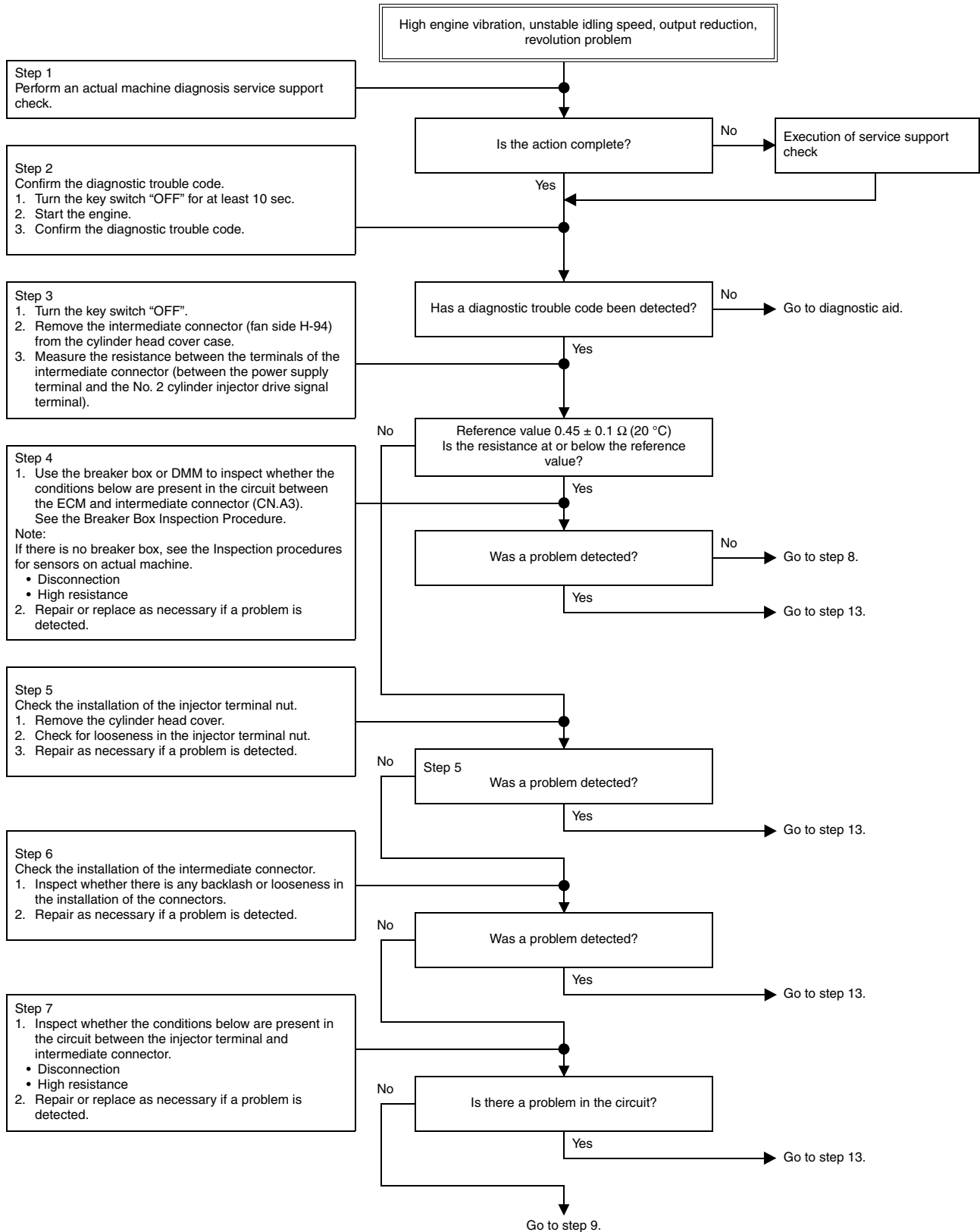
Preconditions when DTC is set

- Key switch input voltage is 18 V or higher.
- DTC: 1630, 1633 are not detected.
- At least 3 min. passed after engine start.



DTC: 0202

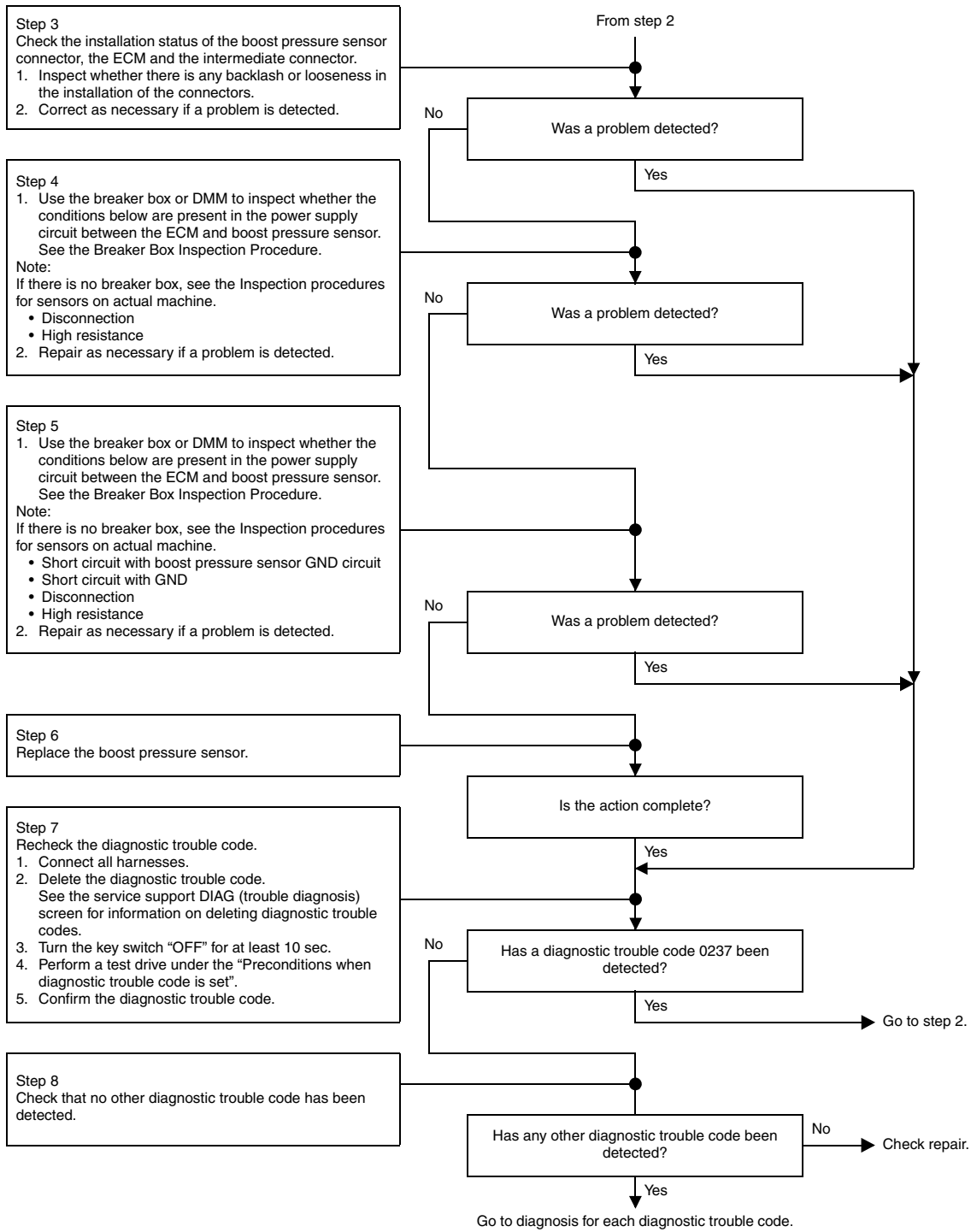
No. 2 Cylinder Injector Drive System Disconnection



Breaker box inspection procedure

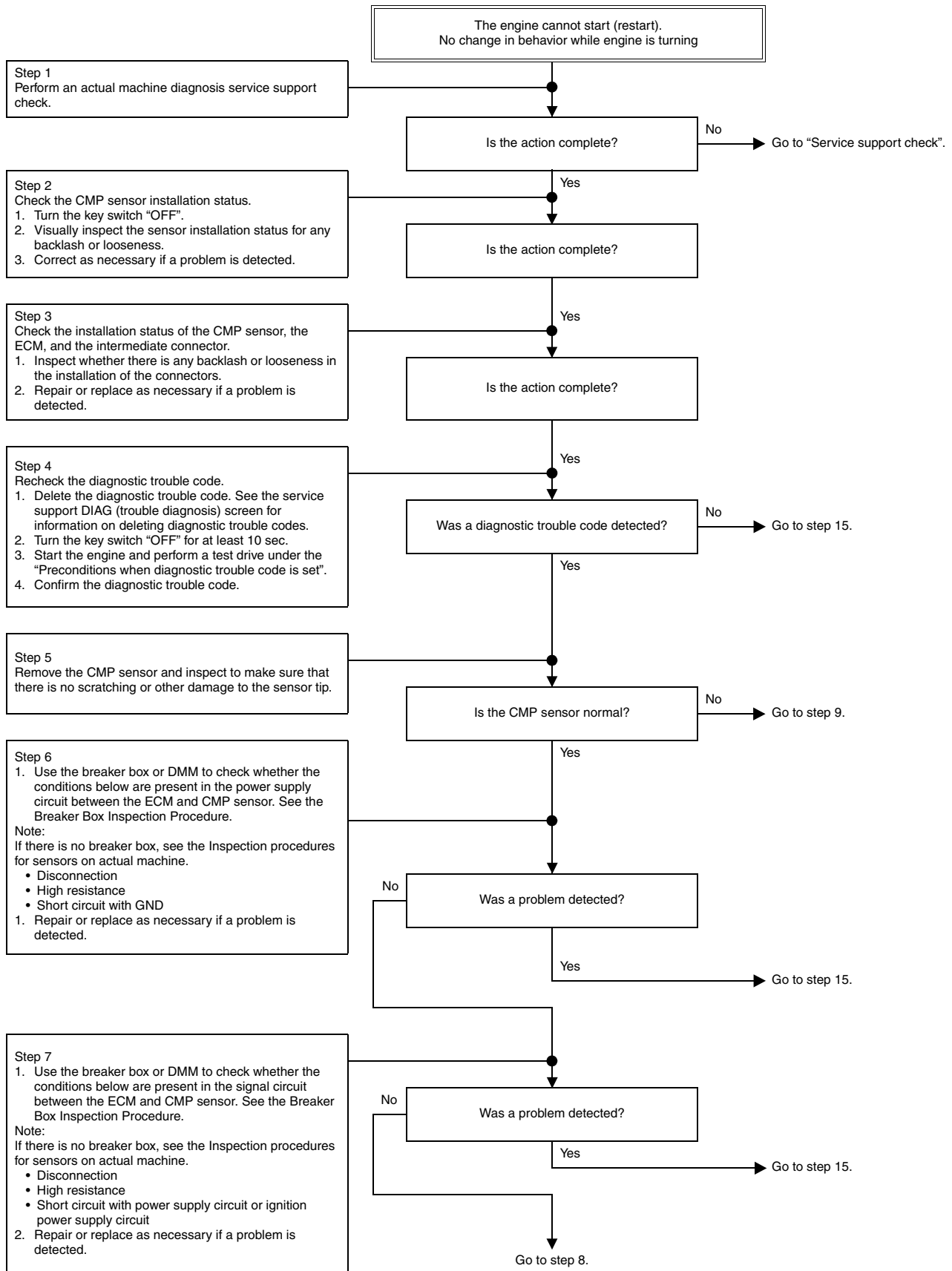
For steps in which breaker box usage is indicated, perform inspection with the following procedure.
Return to diagnosis step after inspection.

Step	Inspection item	Inspection method	Measurement condition	Measurement terminal No.	Normal value	Abnormal value
4	Disconnection/ high resistance	Resistance measurement	<ul style="list-style-type: none">• Remove the intermediate connector.• Key switch "OFF"	115-Intermediate connector terminal (CN.A3 No. 10)	100 Ω or lower	10 M Ω or higher



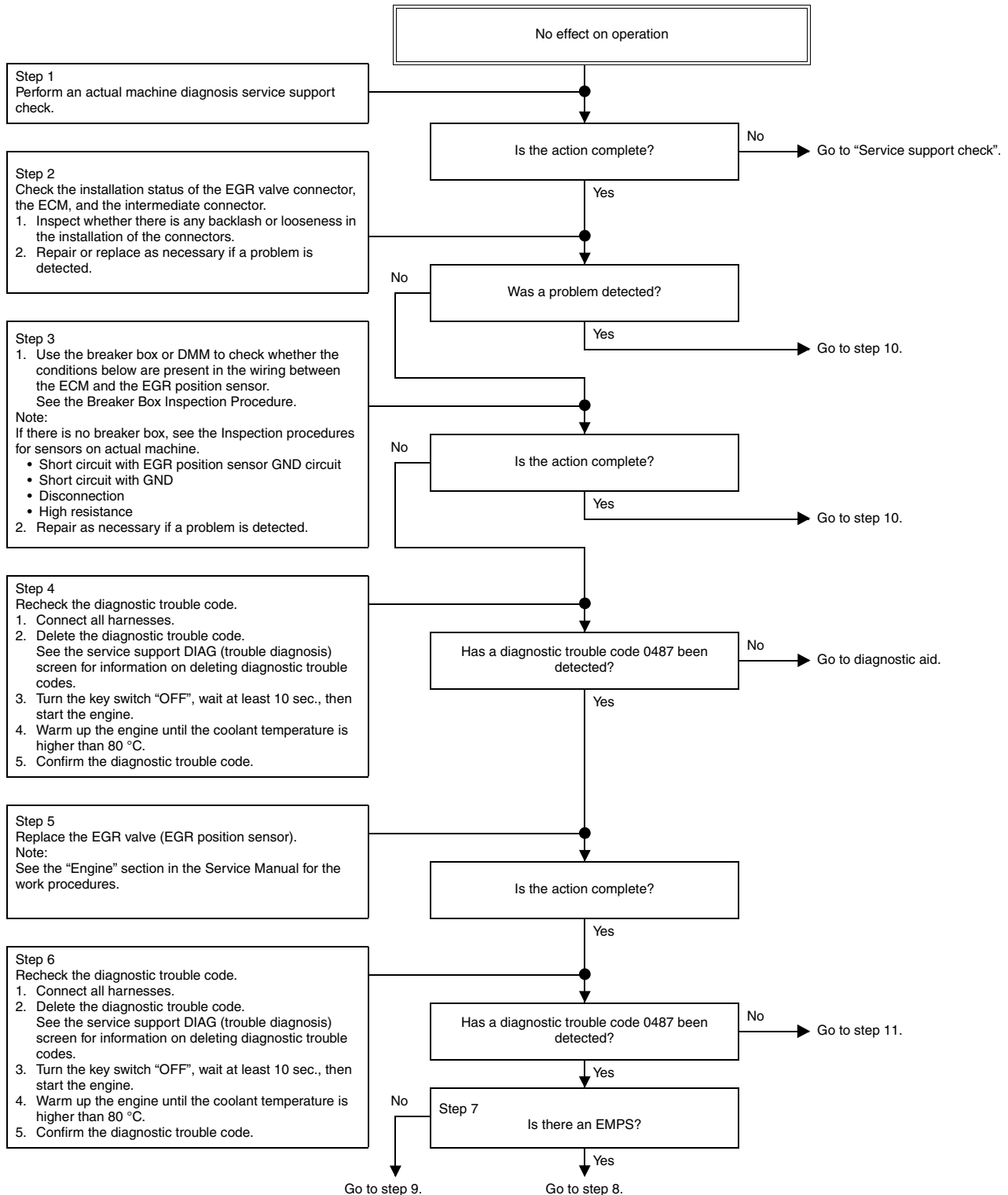
DTC: 0340

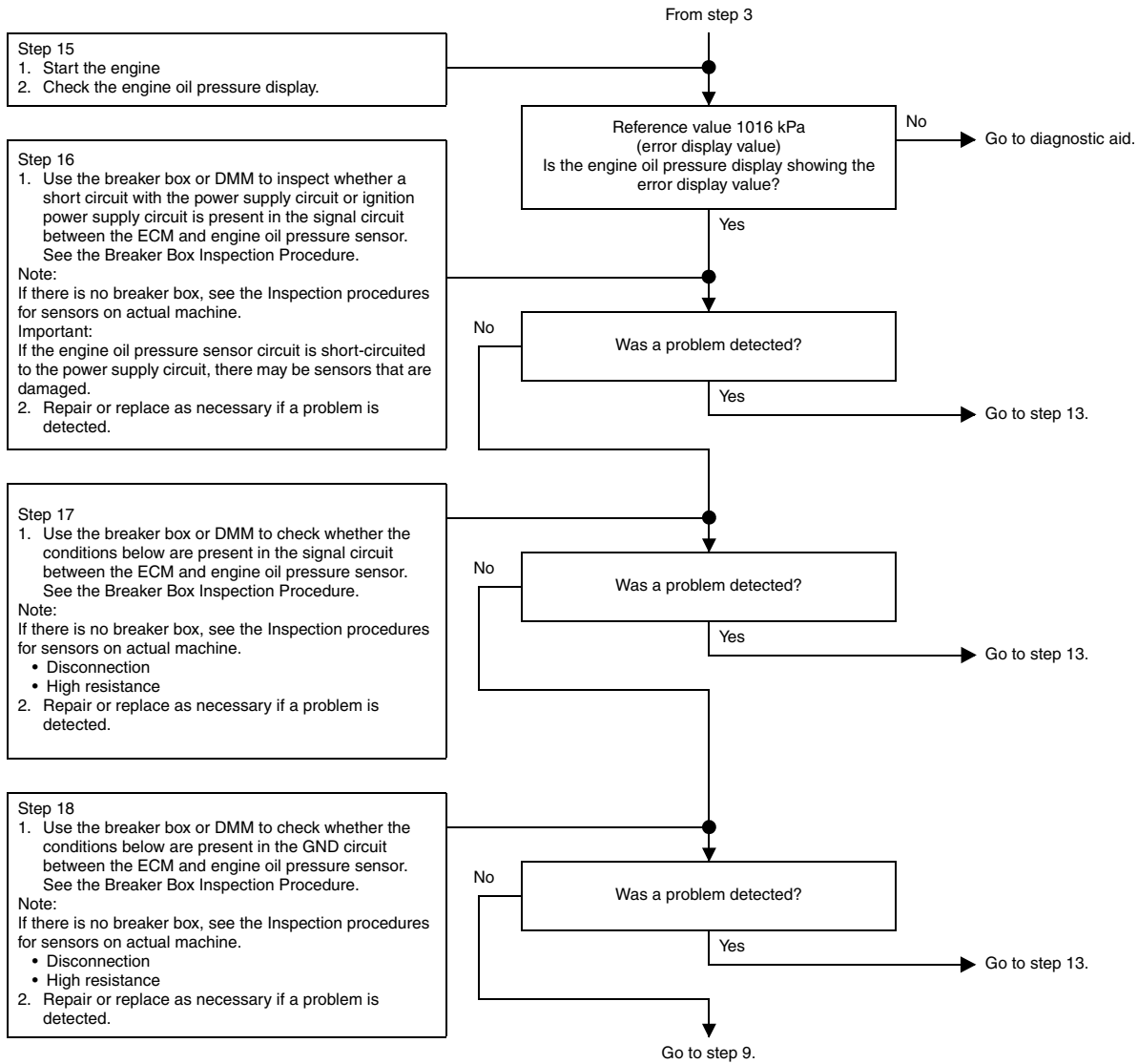
CMP (cam position) Sensor Abnormality (no signal)

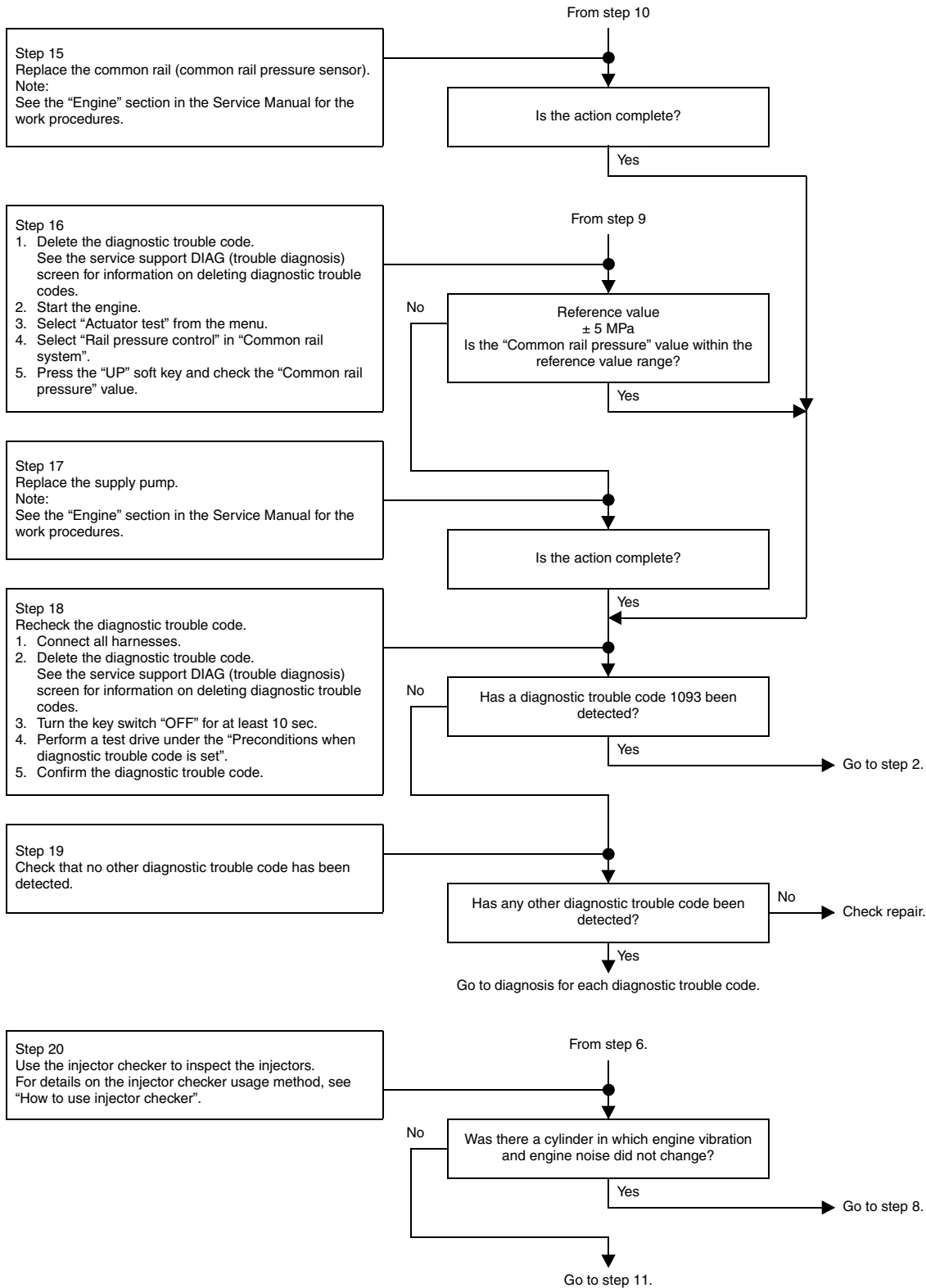


DTC: 0487

EGR Position Sensor Abnormality

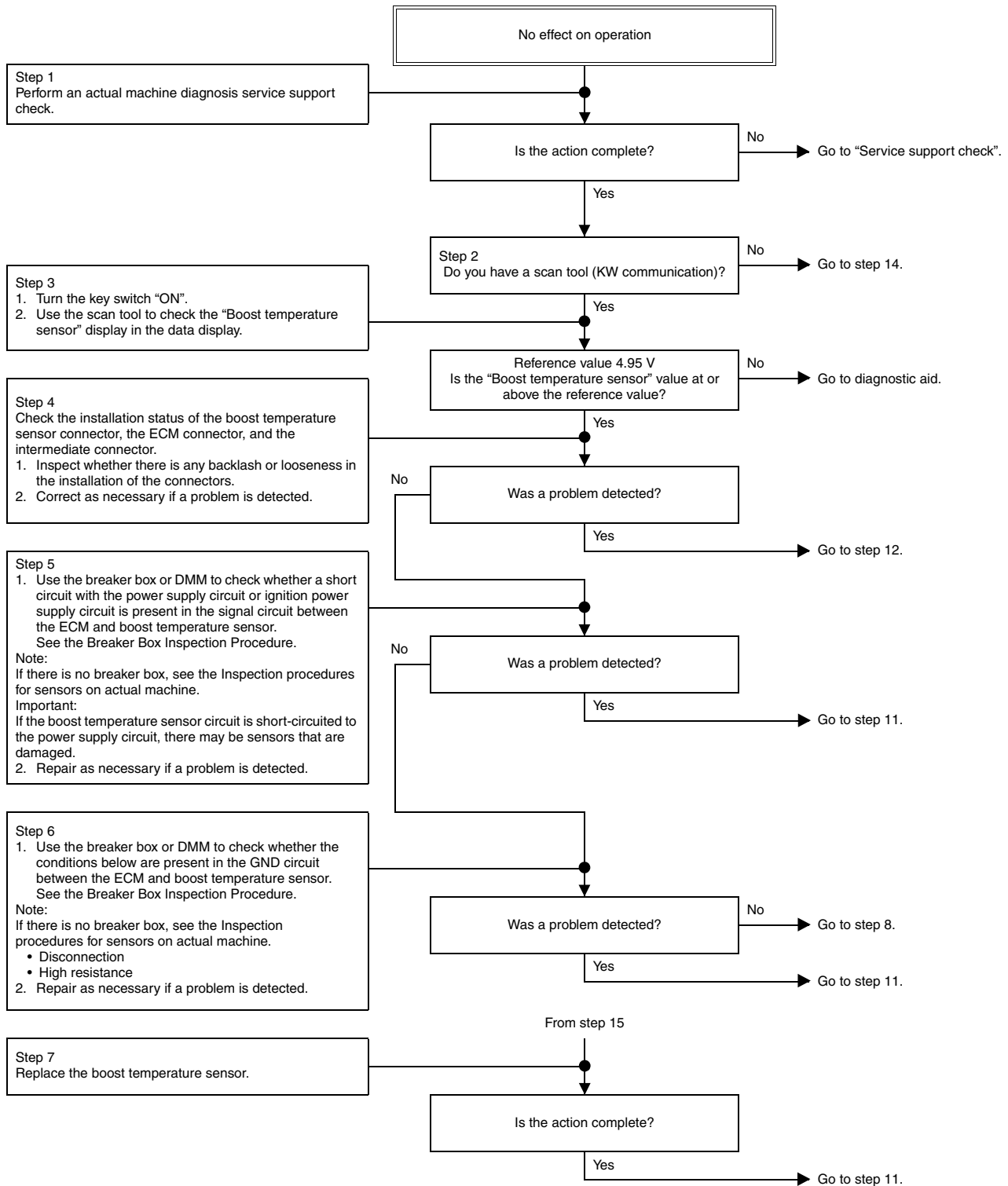






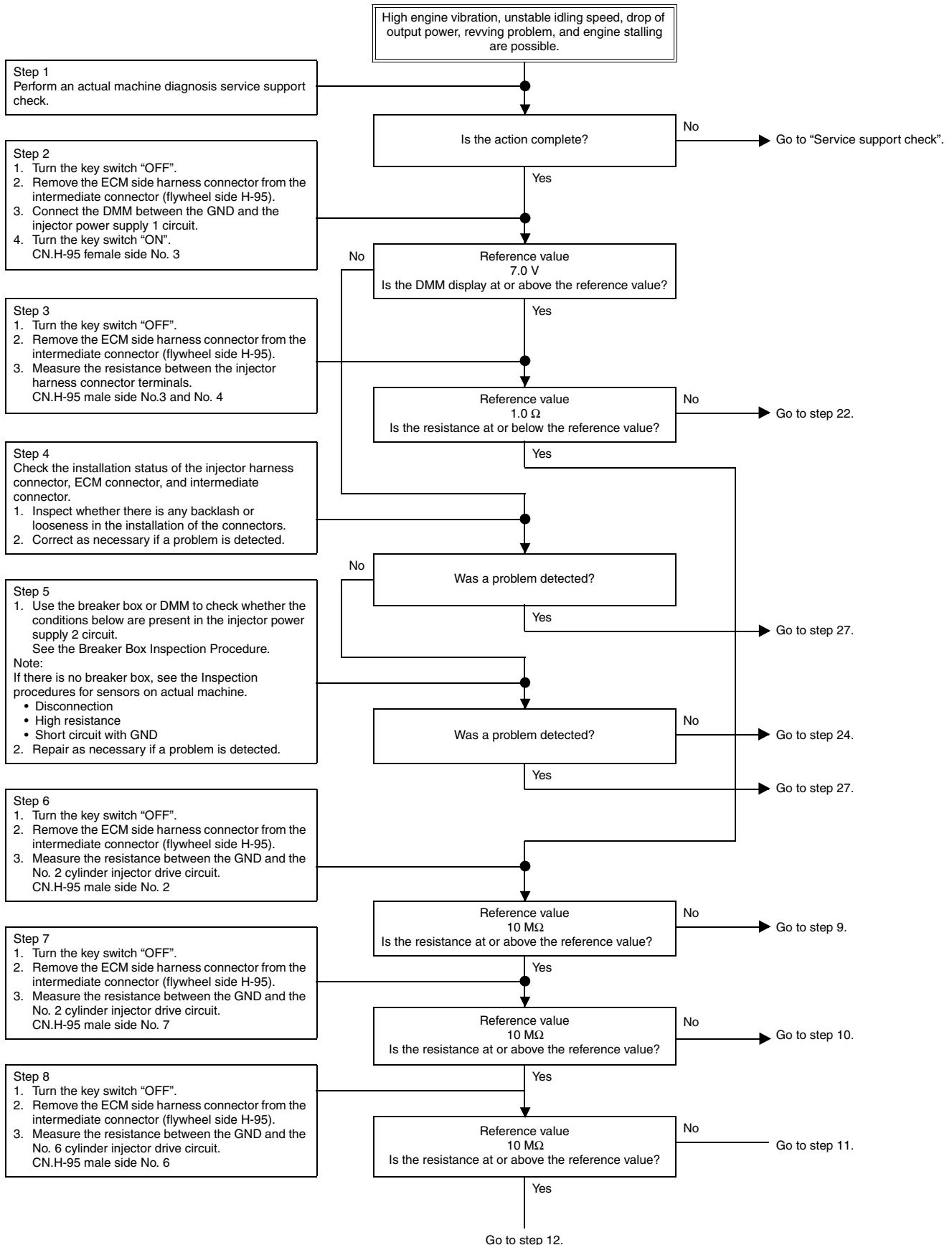
DTC: 1113

Boost Temperature Sensor Abnormality (abnormally high voltage)



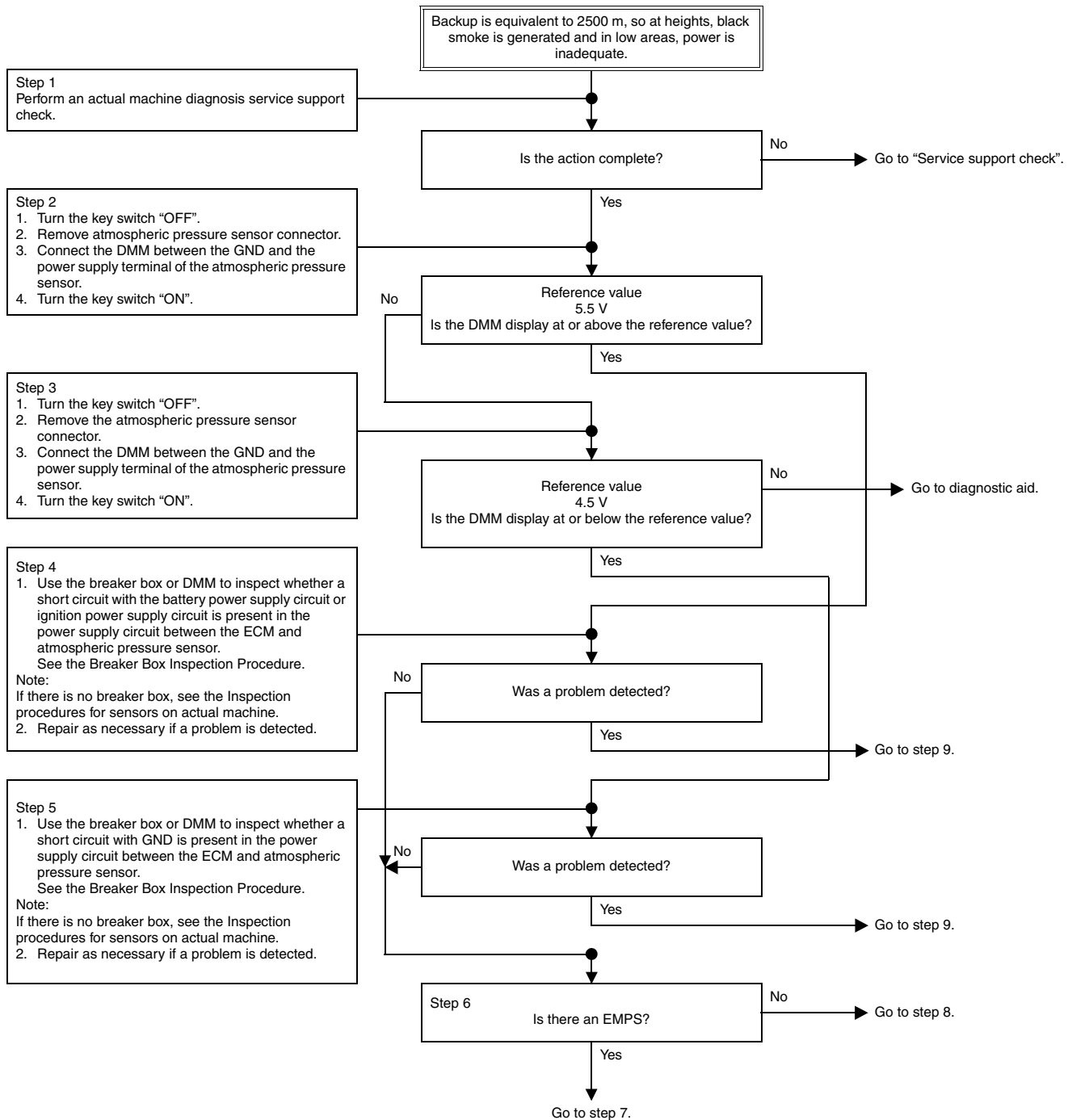
DTC: 1262

Injector Common 2 Drive System Abnormality



DTC: 1632

5 V Power Supply 2 Voltage Abnormality (atmospheric pressure sensor power supply)



Step 8
 1. Use the breaker box or DMM to check whether a short circuit with the power supply circuit or ignition power supply circuit is present in the CAN-Low circuit and CAN-High circuit between the ECM and computer A. See the Breaker Box Inspection Procedure.
 Note:
 If there is no breaker box, see the Inspection procedures for sensors on actual machine.
 2. Repair as necessary if a problem is detected.

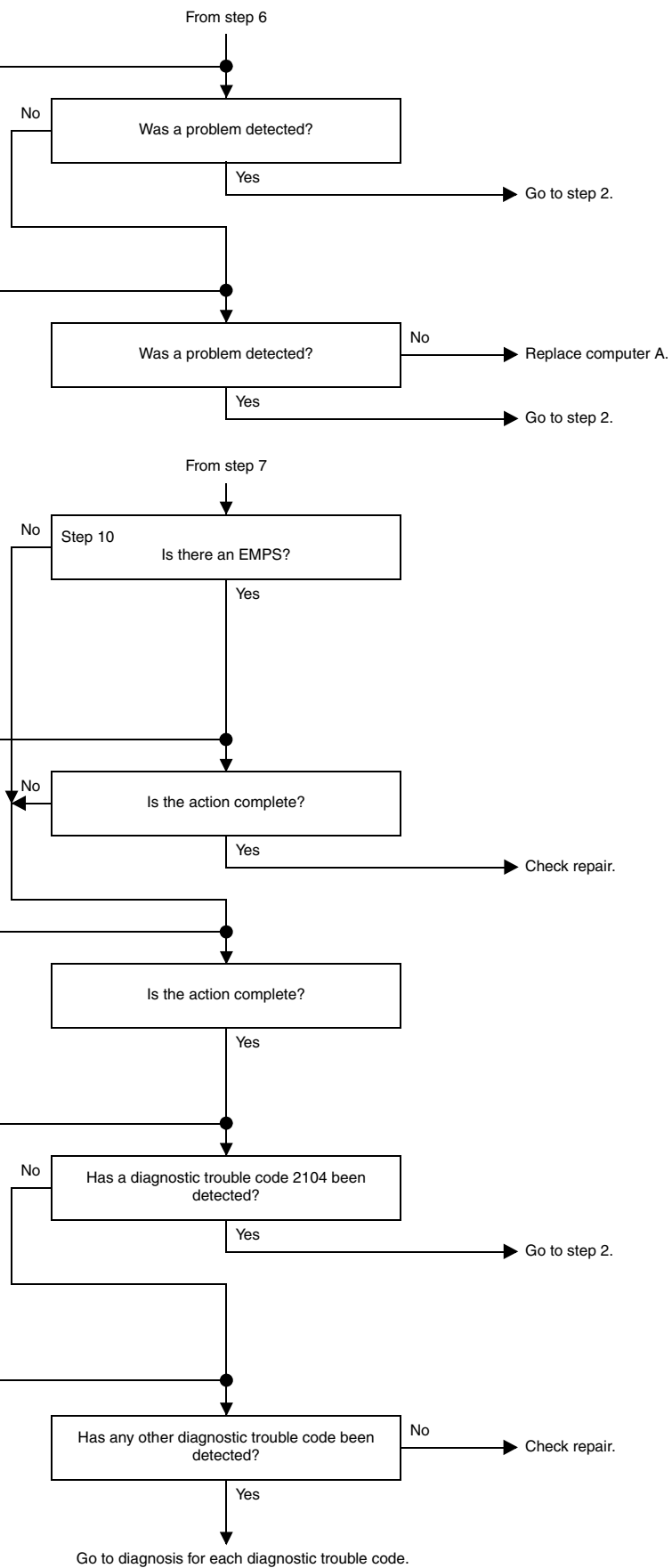
Step 9
 1. Use the breaker box or DMM to check whether the conditions below are present in the CAN-Low circuit and CAN-High circuit between the ECM and computer A. See the Breaker Box Inspection Procedure.
 Note:
 If there is no breaker box, see the Inspection procedures for sensors on actual machine.
 • Disconnection
 • High resistance
 • Short circuit with GND
 2. Repair as necessary if a problem is detected.

Step 11
 1. Check the ECM software version.
 2. Perform rewriting if updating the ECM software version is necessary.
 For details on checking the ECM and the rewriting, see "How to Use EMPS".
 Note:
 When ECM replacement or rewriting is performed, perform EGR learning.
 [EGR learning method]
 1. Turn the key switch "ON".
 2. Turn the key switch "OFF".
 3. Wait about 10 sec.

Step 12
 Replace the ECM.
 Note:
 When ECM replacement or rewriting is performed, perform EGR learning.
 [EGR learning method]
 1. Turn the key switch "ON".
 2. Turn the key switch "OFF".
 3. Wait about 10 sec.

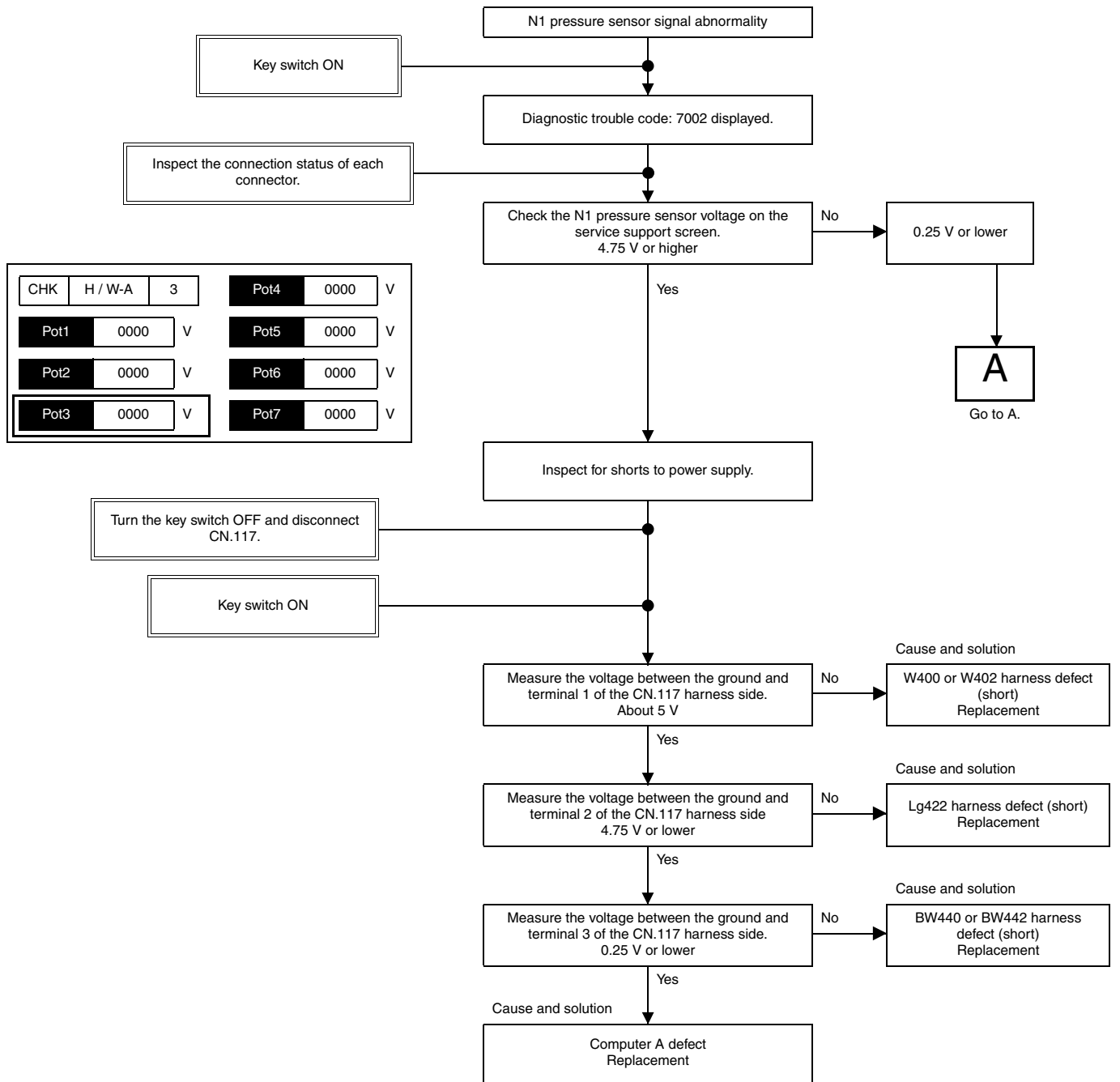
Step 13
 Recheck the diagnostic trouble code.
 1. Connect all harnesses.
 2. Delete the diagnostic trouble code. See the service support DIAG (trouble diagnosis) screen for information on deleting diagnostic trouble codes.
 3. Turn the key switch "OFF" for at least 10 sec.
 4. Perform a test drive under the "Preconditions when diagnostic trouble code is set".
 5. Confirm the diagnostic trouble code.

Step 14
 Check that no other diagnostic trouble code has been detected.



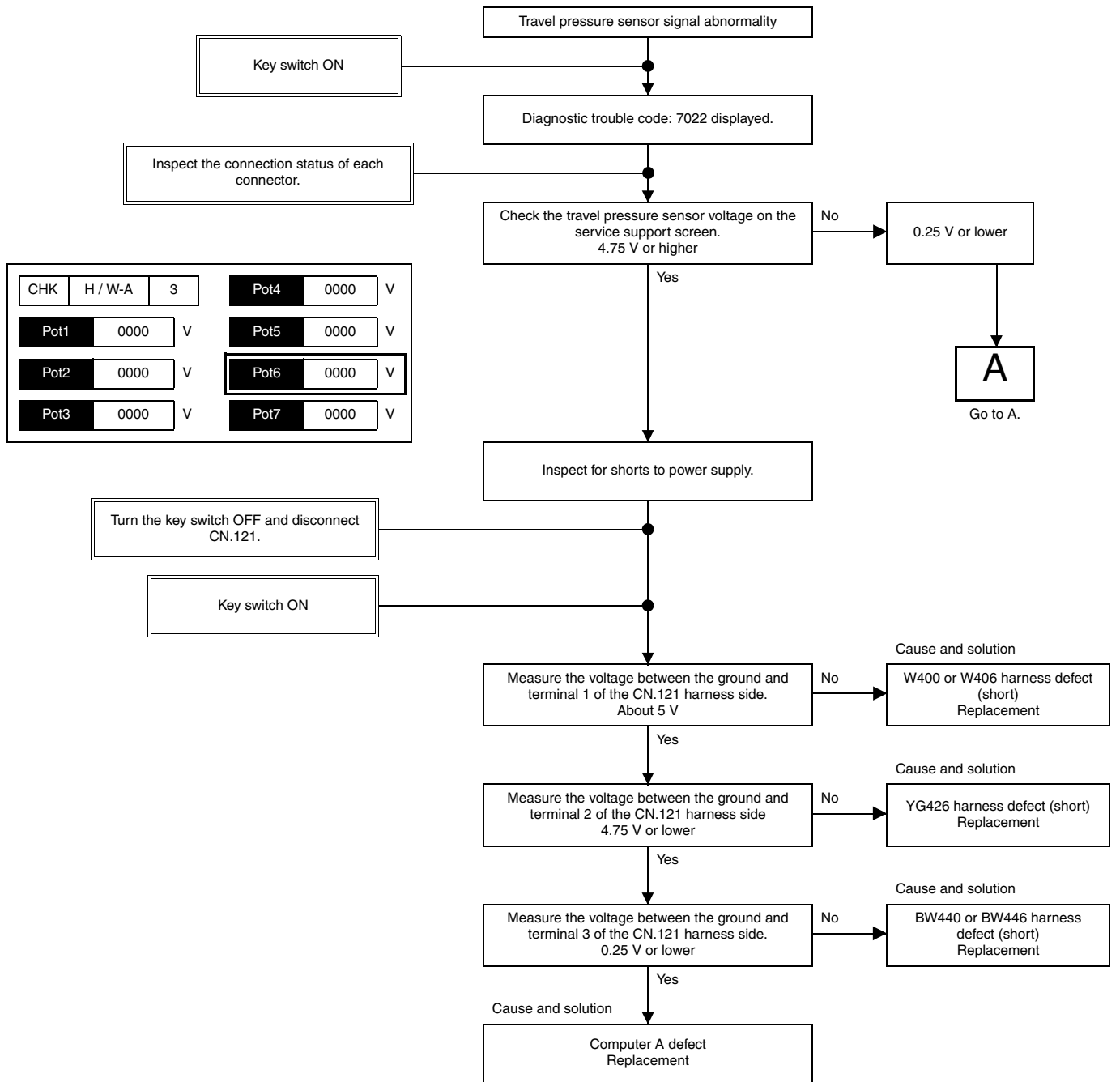
DTC: 7002

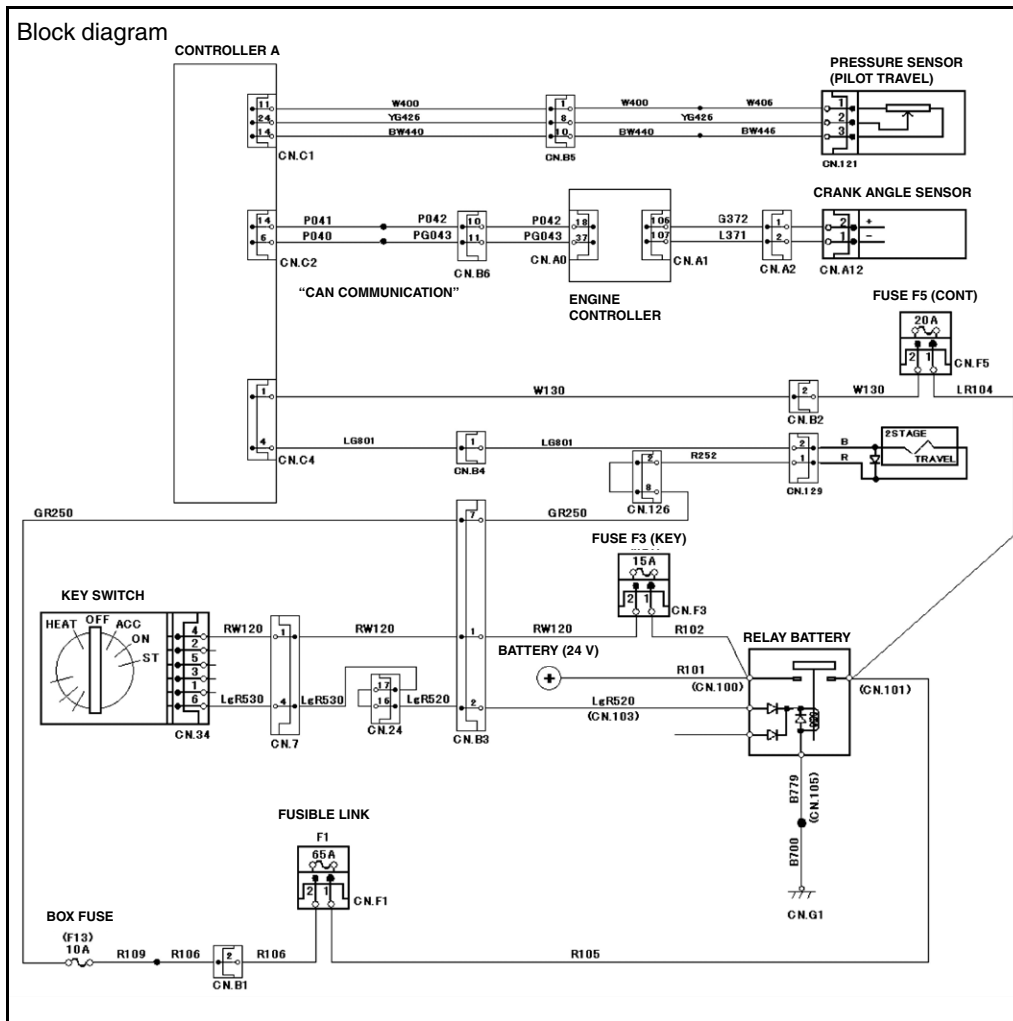
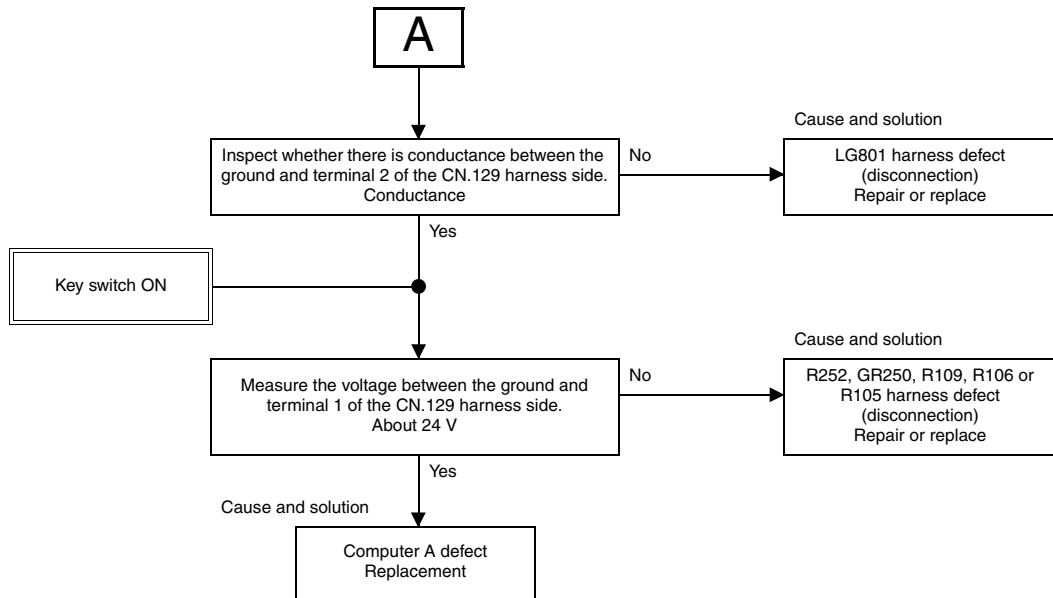
N1 Pressure Sensor Signal Abnormality

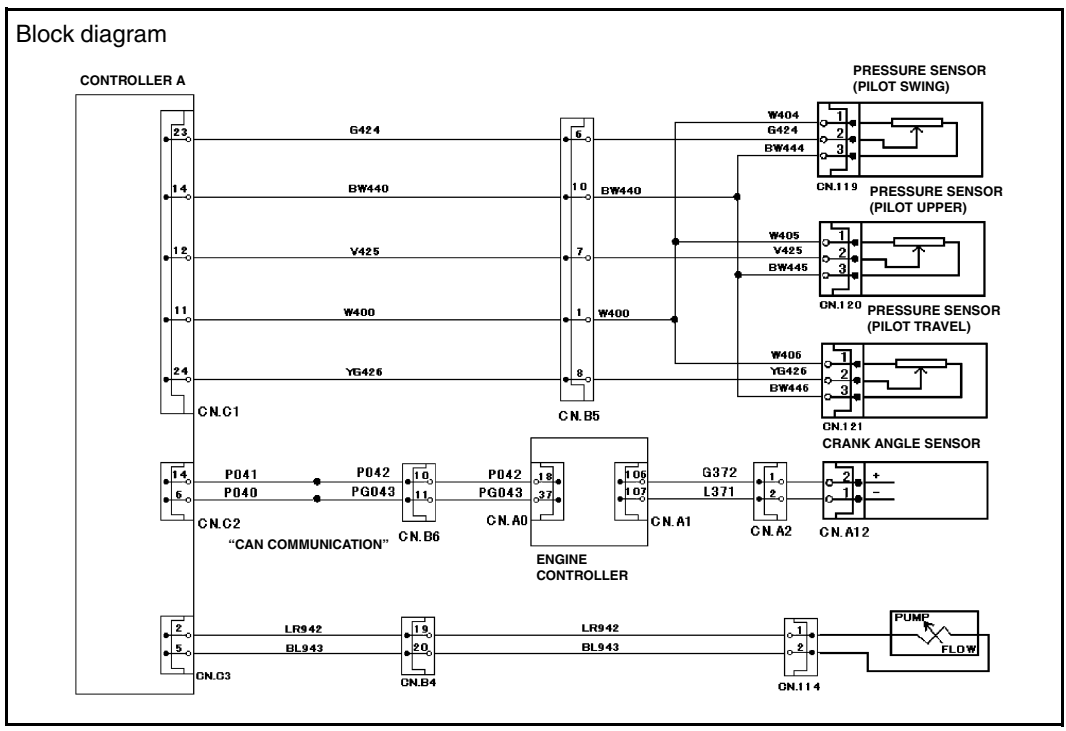
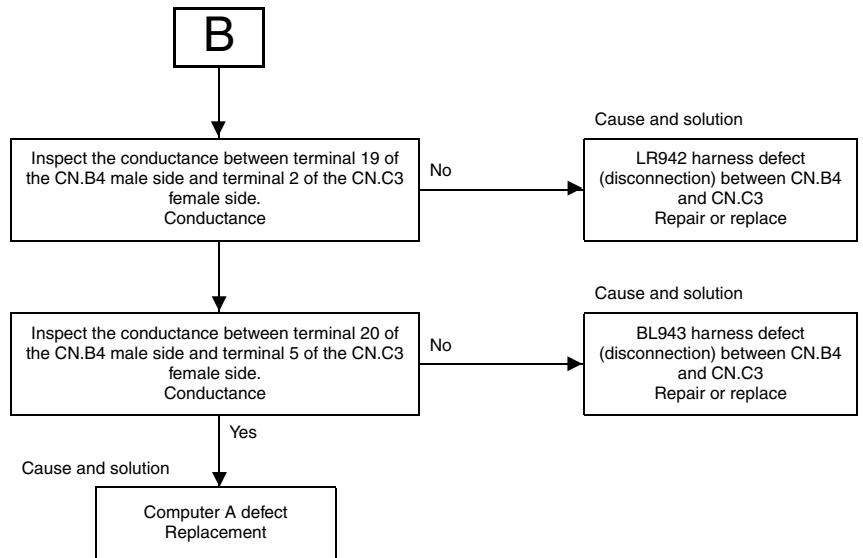


DTC: 7022

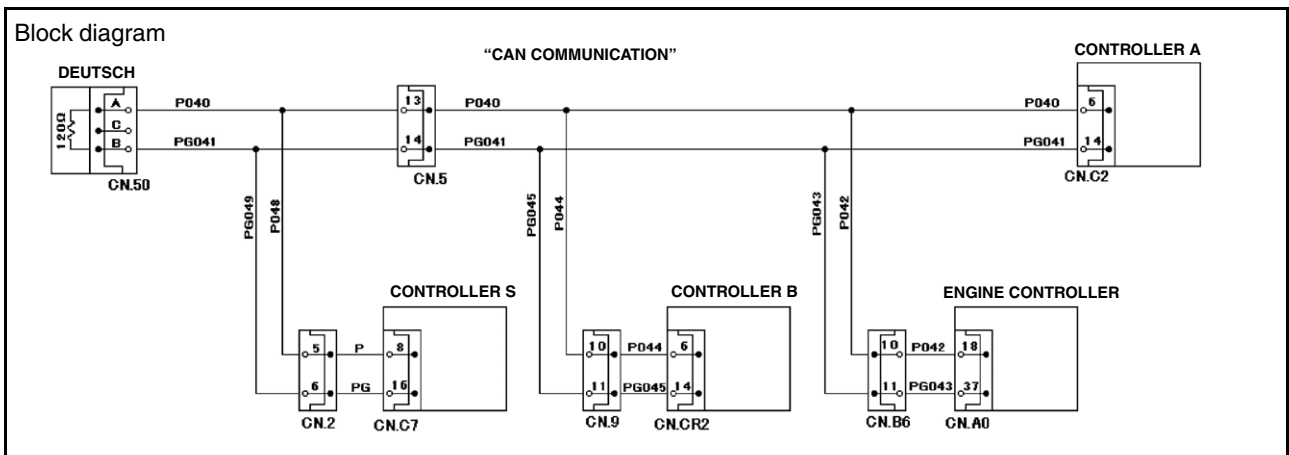
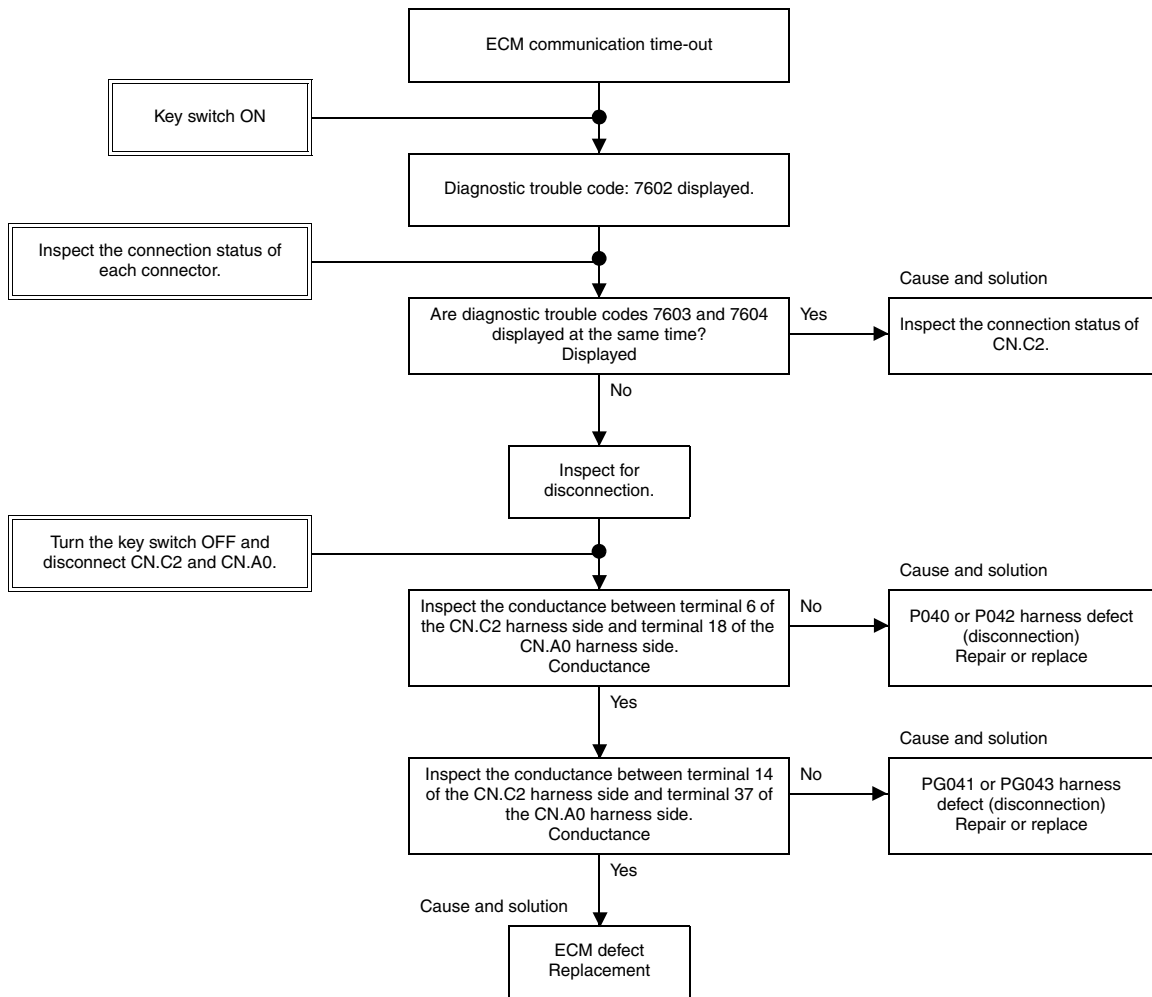
Travel Pressure Sensor Signal Abnormality







DTC: 7602 ECM Communication Abnormality



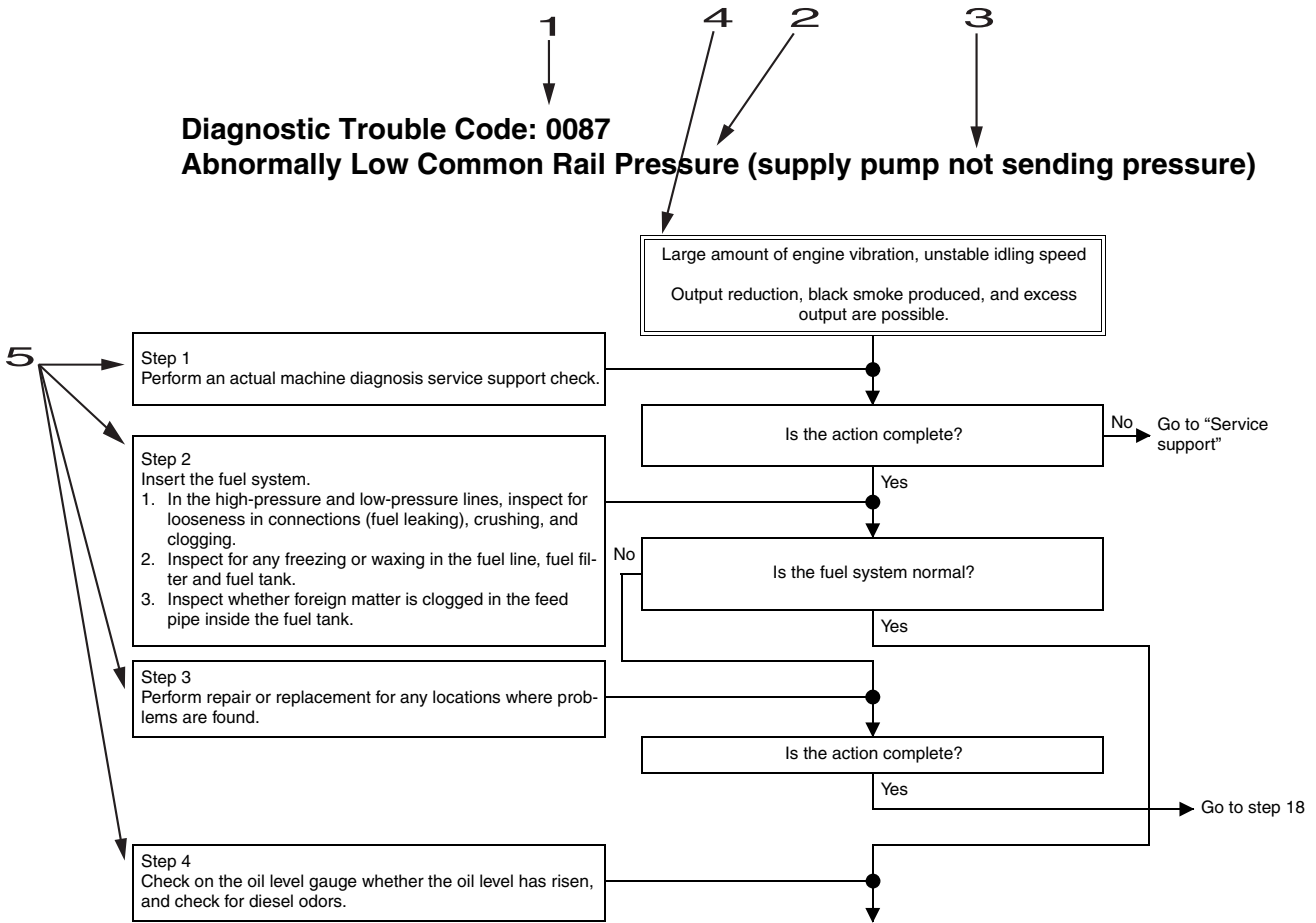
Reading Trouble Diagnosis

The diagram below is excerpted from trouble diagnosis. See the diagram and the explanation on the next page.

Engine side trouble diagnosis

Trouble diagnosis page explanation

The numbers listed below correspond to numbers in the diagram and an explanation for each is listed.



TSSA-0003E

1	Diagnostic trouble code Indicates the diagnostic trouble code number.
2	Diagnostic trouble code name Shows the name of the trouble.
3	System condition that constitute diagnostic trouble code
4	Primary problems Expected engine conditions due to system trouble
5	Trouble diagnosis steps Trouble diagnosis inspection, checking procedures

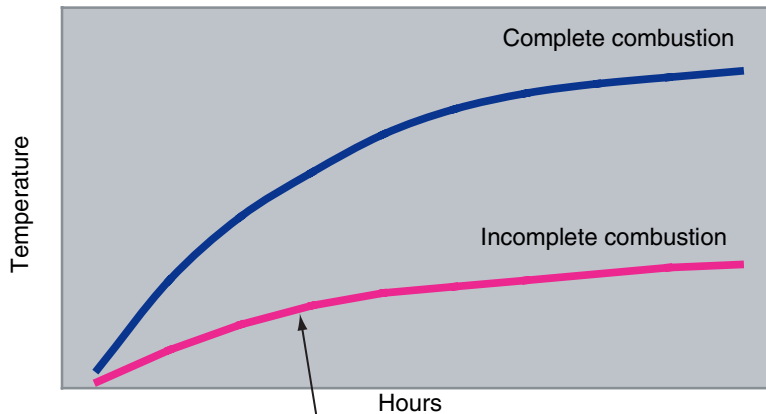
Injector Inspection Methods Using A Thermogun

Common rail-type fuel injection device injectors are located inside the head cover, and inspection (removal and installation of couplers, outside injection from cylinder) cannot be performed. An inspection method for mechanical problems (spray deficiencies, clogging, seizing) for which a diagnostic trouble code does not appear is necessary.

Judgment through temperature measurement

For engines in which combustion conditions are normal, the temperature of each cylinder will ordinarily increase. However, for cylinders in which there is trouble and combustion conditions are poor, it is difficult for the temperature to increase. Use these characteristics and observe the temperature change in each cylinder to judge whether there are cylinder problems.

«Difference in temperature change by state of combustion»



Cylinders with low temperature have poor status of combustion.

Therefore, you can judge that there has been some kind of trouble.

TSSA0001

The cause of the problem is often a defect (spray deficiencies, clogging, seizing) with the injector itself. Also investigate other causes and thoroughly perform trouble diagnosis before deciding what the problem is.

Thermogun

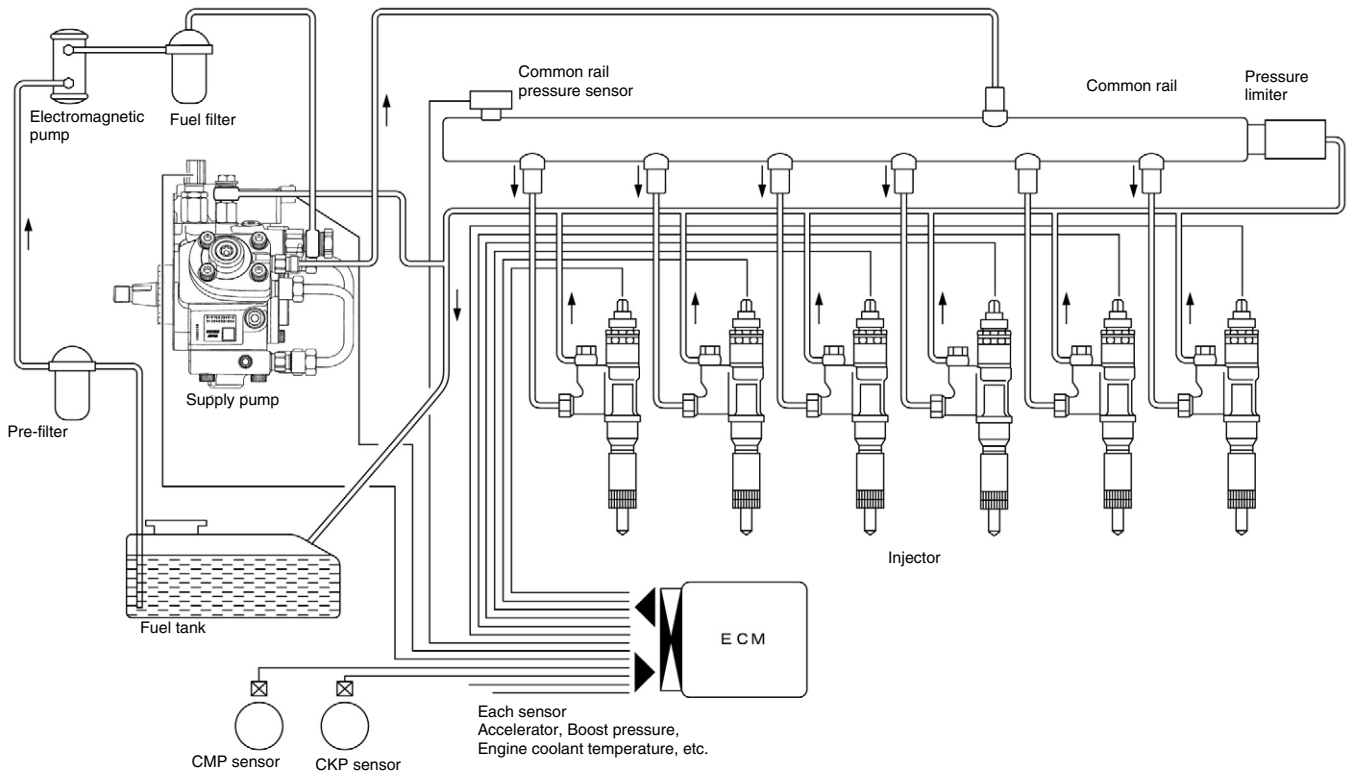
A thermogun is an infrared thermometer capable of non-contact temperature measurement. As a maintenance tool, this is sold as a thermogun and infrared thermometer.

- Ideal for measuring temperatures from 0 °C to 500 °C.
- Includes laser pointer
- Includes spot measurement function (convergence ratio of about 10:1)



TSSA0004

System summary diagram



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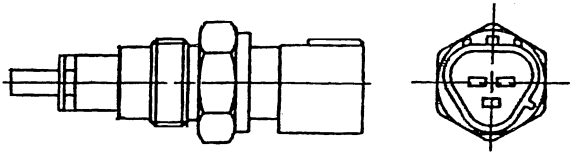
- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: www.heydownloads.com by clicking the link below



- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

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Coolant temperature sensor

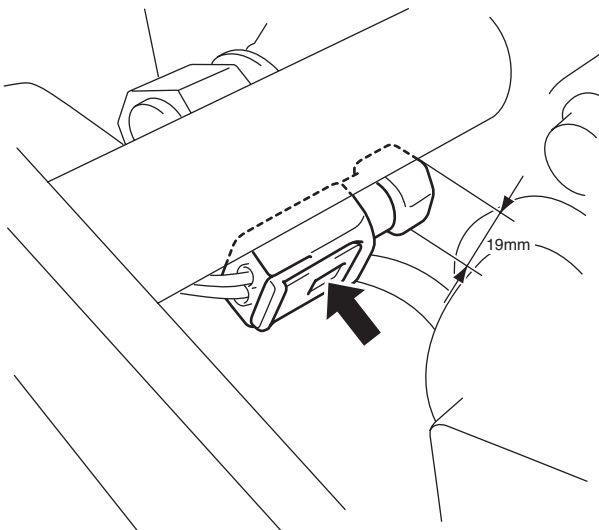


TSWG0017

The coolant temperature sensor is installed on the engine block, and the thermistor changes the resistance in accordance with the temperature. Resistance is low when the engine coolant temperature is high and high when engine coolant temperature is low. The engine control module (ECM) applies 5 V to the coolant temperature sensor through pull-up resistance, calculates the engine coolant temperature from the voltage change, and this is used in various types of control such as fuel injection control. Voltage is low if the resistance is small (high temperature) and high if the resistance is large (low temperature).

Removal

- Remove the connector, then remove the sensor with a 19 mm wrench.



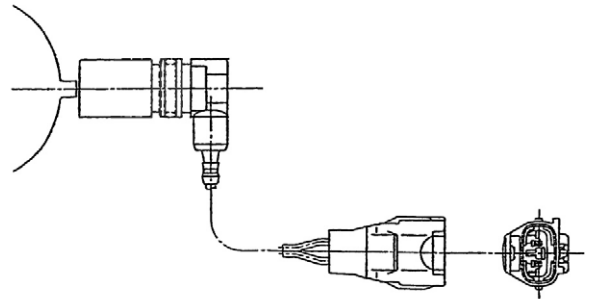
TSHK0116

Installation

- Apply Loctite 572 to install.

Tightening torque: 19.6 - 29.4 N•m

Crankshaft position (CKP) sensor

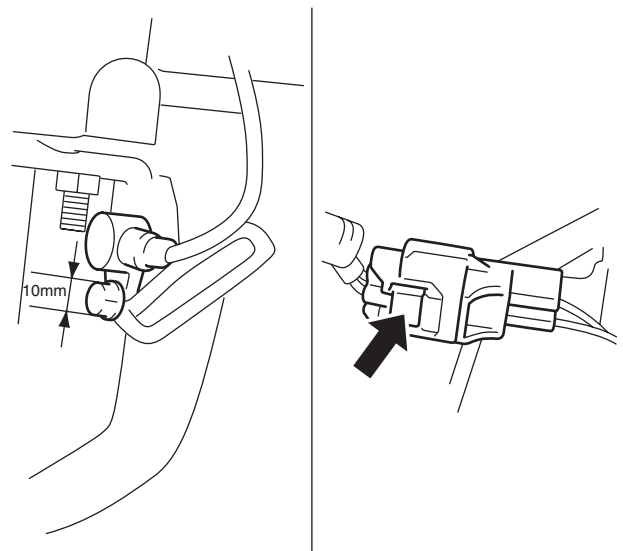


TSWG0019

The crankshaft position (CKP) sensor is installed on the flywheel housing, and the CKP signal is produced from the protruding part of the flywheel passing the sensor. The engine control module (ECM) identifies the cylinders through CMP signals input from the CMP sensor, determines the crank angle, and uses this information for fuel injection control and to calculate engine speed. These controls are performed based on CKP signals, but they are done based on CMP signals when there is an abnormality with the CKP sensor

Removal

- Disconnect the connector, remove the 10 mm installation bolt, and remove the sensor.



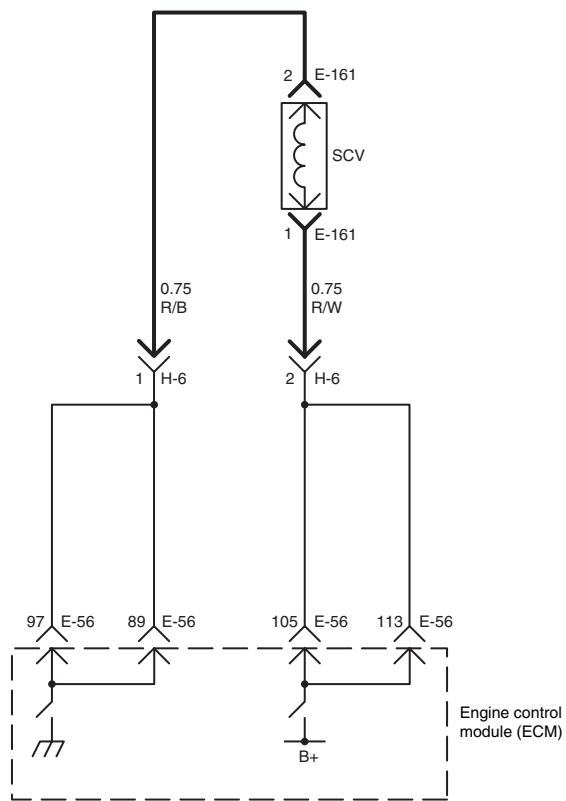
TSHK0118

Installation

Tightening torque: 14.7 - 24.5 N•m

4023-66

SCV (suction control valve) circuit



Trouble Diagnosis by Service Support

Trouble diagnosis by service support

Trouble diagnosis by service support is a systematic method for confirming problems that occur due to function deficiencies of the engine control system, and is the starting point for all mechanical operability complaint diagnosis. By correctly utilizing this diagnosis step, diagnosis time is shortened and replacement of non-defective parts is prevented.

Test explanation

4. When a diagnostic trouble code is detected, see "Proceed to the relevant DTC diagnosis" and go to the appropriate diagnostic trouble code diagnosis. When multiple diagnostic trouble codes have been detected, as long as there is no other indication within the diagnostic steps, start diagnosis from the diagnostic trouble code with the smallest number.

Cautions in trouble diagnosis by service support

Important:

- When there are no complaints about mechanical operability, do not perform this diagnosis step as long as there are no other indications in other items.
- Before beginning diagnosis, check the service information.
- As long as there is no other indication within the diagnostic steps, do not delete the diagnostic trouble codes.
- When an abnormality is found in the engine start system, see "Electrical System" in "Engine" of the Service Manual.
- The battery should be fully charged.
- The condition of the battery cable should be normal and it should be securely connected.
- The ground of the ECM should be securely connected in the correct position.

Step	Action	Value	Yes	No
1	1. Turn the key switch "ON". 2. Confirm the diagnostic trouble code. * Make sure to confirm this as there are some diagnostic trouble codes in which ELECTRIC PROBLEM does not display. 3. Did a diagnostic trouble code display?	-	Go to relevant diagnostic trouble code display.	Go to step 2.
2	Turn the key switch to the "START" position. Did the starter operate?	-	Go to step 3.	Go to "Checking the Start Circuit System".
3	Turn the key switch to the "START" position. Did the engine start?	-	Go to step 4.	Go to "Checking the Start System".
4	Check that no diagnostic trouble codes have been detected. Was a diagnostic trouble code detected?	-	Go to relevant diagnostic trouble code diagnosis.	Go to step 5.
5	1. Check whether there are any of the following problems. <ul style="list-style-type: none"> • Engine stalling • Engine hunting, rough idling • Engine output deficiency, revving problem, engine hesitation • Great deal of white smoke in exhaust gas • Great deal of black smoke in exhaust gas • Idling speed cannot be adjusted • Idling speed does not go down Was a problem detected?	-	Go to relevant problem phenomenon diagnosis.	System normal

Engine Start Problem

Preliminary inspection

Before using this section, implement a "Service support monitor check" and check all of the following items.

- Check whether there is an excessive load on the main unit side.
- The ECM and shovel controller are operating correctly.
- Check diagnostic trouble codes.
- Check the condition of the main unit and find applicable symptoms in the problem symptom list. Implement the procedure indicated in the symptom chart.
- Confirm with the customer that the stipulated engine oil and fuel are being used.

Visual inspection

Some symptoms detection procedures require careful visual inspection. This allows for problems to be repaired without performing further inspection, which saves valuable time.

The following items are included in this inspection.

- Check whether the fuel filter is dirty or clogged.
- Check for connector connection problems (connections are properly connected up to a clicking sound being heard). Especially important for CKP and CMP sensors.
- Check whether the battery terminal voltage is low.
- Check for correct wiring connections, tightness, and disconnections
- Check whether the power supply for commercially-available accessories is being diverged from the ECM power supply.
- Check whether the ECM ground is dirty and check that it is securely installed in the correct location.
- Check that pipes and hoses for fuel, air, and oil are not broken or twisted and that they are correctly connected. Thoroughly check for any leaking or clogging.
- Check for fuel leaks and damage and denting on pipes in the fuel system.
- Suction air system parts abnormality
- Exhaust system parts abnormality

Diagnostic aid

- If there is a CKP sensor abnormality, the engine should be cranked for at least 14 sec. at a speed of at least 60 min⁻¹ because the abnormality will not be diagnosed unless the crank rotates at least 14 times.
- CKP sensor diagnostic trouble codes for CKP sensor problems may not be detected during low rotation of the engine. For intermittent trouble, increase engine rotation to the maximum and check whether a diagnostic trouble code related to the CKP sensor is detected.
- Fuel system abnormality (fuel cut-off, fuel freezing, air entering fuel line, filter abnormality (main, gauze clogging), line abnormality, fuel quality, fuel tank (debris, fuel suction abnormality)
- Suction air system abnormality (filter clogging, suction air line abnormality)
- Supply pump abnormality (no fuel pressure feed)
- Common rail abnormality (flow damper, pressure limiter operation/internal sealant deterioration)
- Injector abnormality (Fuel is not injected.)
- System is down due to trouble
- Engine main unit abnormality (seizing, compression pressure deficiency, other mechanical trouble)
- ACG trouble
- Trouble related to main unit-side devices (hydraulic pump, etc.)
- Effect of electrical components installed after purchasing (wireless devices, lights, etc.)
- ECM trouble (main unit, power supply, GND)
- Perform inspection to check whether there are any connector connection problems, abnormalities involving friction or breaking in harnesses, and whether any wires inside harnesses are touching another circuit and causing a short. Also, perform function diagnosis inspection, check operations and control in each area, and repair any abnormalities.

Step	Action	Value	Yes	No
1	Is the emergency stop switch LED flashing?	-	Turn the switch "OFF" and go to step 2.	Go to step 2.
2	Check the diagnostic trouble code with service support. Has the diagnostic trouble code been checked?	-	Go to step 3.	Go to "Trouble Diagnosis by Service Support".
3	Check whether any diagnostic trouble codes have been detected. Check whether any of the diagnostic trouble codes below have been detected. Diagnostic trouble code: 0335, 0336, 0340, 0341, 0601, 1261, 1262 Has a diagnostic trouble code been detected?	-	Go to "Inspection methods for corresponding diagnostic trouble codes".	Go to step 4.
4	Check cranking rotation. Check that the engine is cranking at or above the necessary speed for the ECM to judge engine rotation. Is the cranking speed at or above the reference value?	60 min ⁻¹	Go to step 5.	Go to step 6.

Excessive Black Smoke in Exhaust Gas

Preliminary inspection

Before using this section, implement a "Service support monitor check" and check all of the following items.

- The ECM and shovel controller are operating correctly.
- Check diagnostic trouble codes.
- Check the condition of the main unit and find applicable symptoms in the problem symptom list. Implement the procedure indicated in the symptom chart.
- Confirm with the customer that the stipulated engine oil and fuel are being used.

Visual inspection

Some symptoms detection procedures require careful visual inspection. This allows for problems to be repaired without performing further inspection, which saves valuable time.

The following items are included in this inspection.

- Check whether the air cleaner element is dirty or clogged.
- Check for correct wiring connections, tightness, and disconnections
- Check whether the power supply for commercially-available accessories is being diverged from the ECM power supply.

- Check whether the ECM ground is dirty and check that it is securely installed in the correct location.
- Check that pipes and hoses for fuel, air, and oil are not broken or twisted and that they are correctly connected. Thoroughly check for any leaking or clogging.
- Check for fuel leaks and damage and denting on pipes in the fuel system.
- Suction air system parts abnormality
- Exhaust system parts abnormality

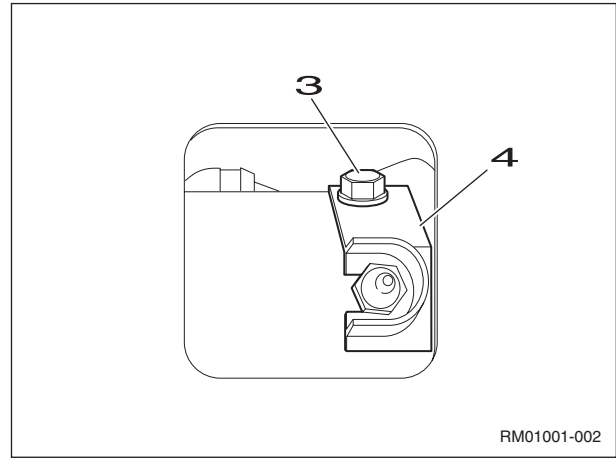
Diagnostic aid

- Fuel quality (non-regulation product being used)
- Suction air system abnormality (filter clogging, suction air line abnormality)
- EGR control system abnormality
- Exhaust system abnormality (exhaust pipe abnormality)
- Coolant temperature sensor abnormality
- Boost pressure sensor trouble (sensor, line)
- Engine main unit trouble (compression pressure deficiency, piston-related, turbo charger, rise of oil)

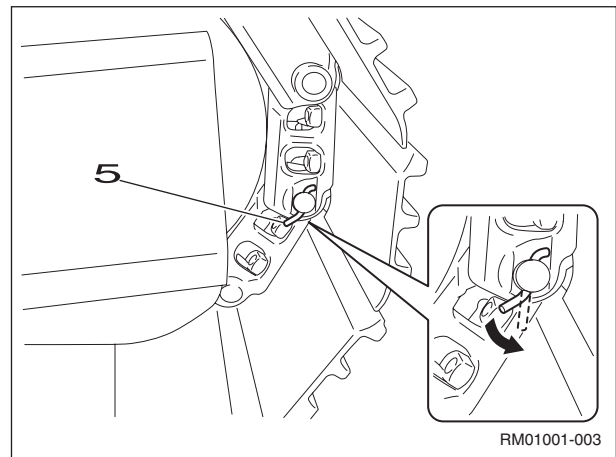
Step	Action	Value	Yes	No
1	Perform "Trouble Diagnosis by Service Support" Is the action complete?	-	Go to step 2.	-
2	Perform checking of the suction air system. Is the action complete?	-	Go to step 3.	Go to "Checking the Suction Air System".
3	Perform checking of the EGR control system. Is the action complete?	-	Go to step 4.	Go to "Checking the EGR Control System".
4	Check the reed valve of the EGR. If the fault is detected, repair as required. Is the procedure completed?	-	Go to step 5.	-
5	Perform checking of the fuel system. Is the action complete?	-	Go to step 6.	Go to "Checking the Fuel System".
6	Perform checking of the exhaust system. Is the action complete?	-	Go to step 7.	Go to "Checking the Exhaust System".
7	Check the engine symptoms again. Have the engine symptoms normalized?	-	Go to step 14.	Go to step 8.
8	Check the mechanical parts of the engine and repair any abnormalities. 1. Valve system (valve clearance) Is the action complete?	-	Go to step 9.	-
9	Check the engine symptoms again. Have the engine symptoms normalized?	-	Go to step 14.	Go to step 10.
10	Is there an EMPS?	-	Go to step 11.	Go to step 12.
11	1. Check the ECM software version. 2. Perform rewriting if updating the ECM software version is necessary. Note: When ECM replacement or rewriting is performed, perform EGR learning. Is the action complete?	-	Go to step 12.	Go to step 12.
12	Check the engine symptoms again. Have the engine symptoms normalized?	-	Go to step 14.	Go to step 13.

5001-4

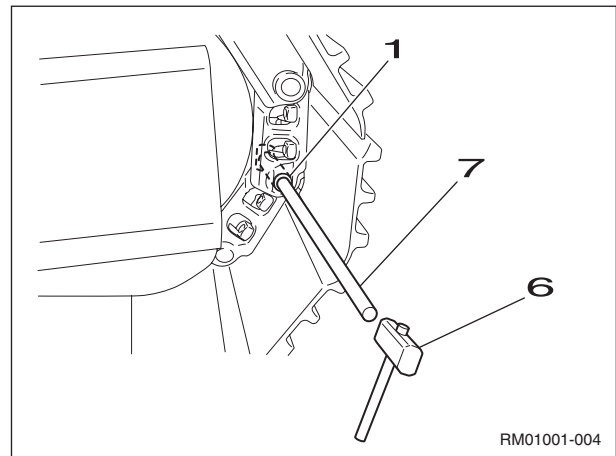
- [3] Use a wrench (19 mm) to remove the bolt (3), and then remove the check valve stopper (4).
- If the check valve is removed, it is easier to loosen the track shoe tension.



- [4] Straighten out the S-pin (5) attached to the master pin by striking one side of it with a hammer, and use a crowbar, etc. to remove it.



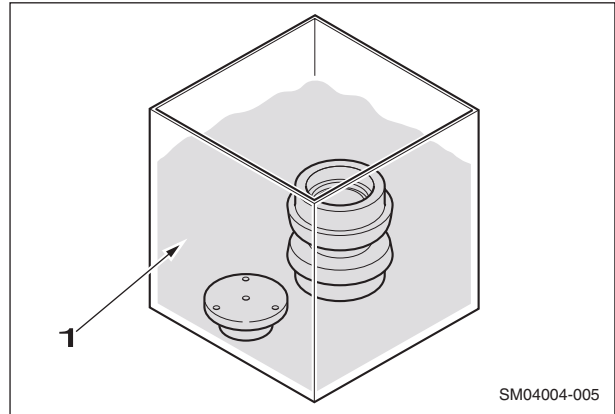
- [5] Use a hammer (6) and striking rod (7) to push the master pin (1) out.



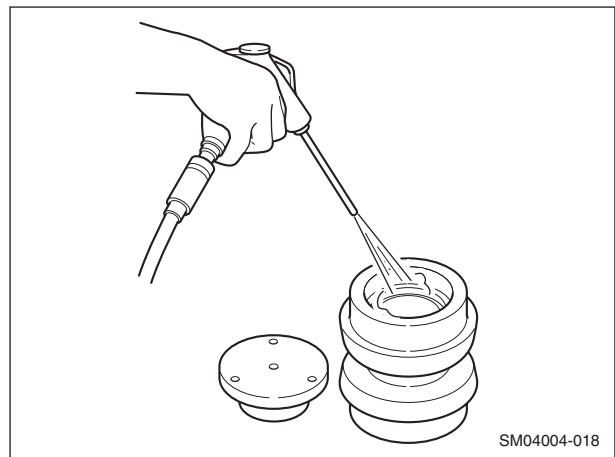
4 Assembly procedure

[1] Clean all parts.

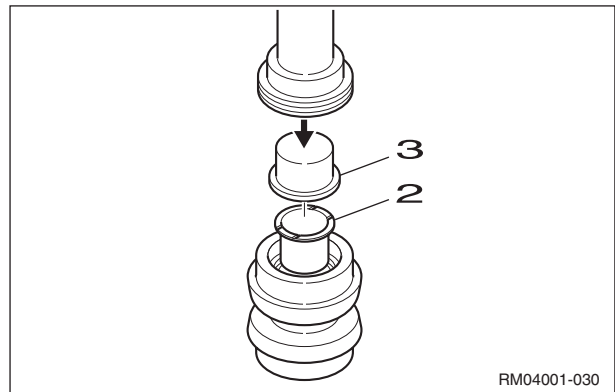
- Find a clean location.
- Place a rubber plate or cloth on the work surface so as not to damage the parts.



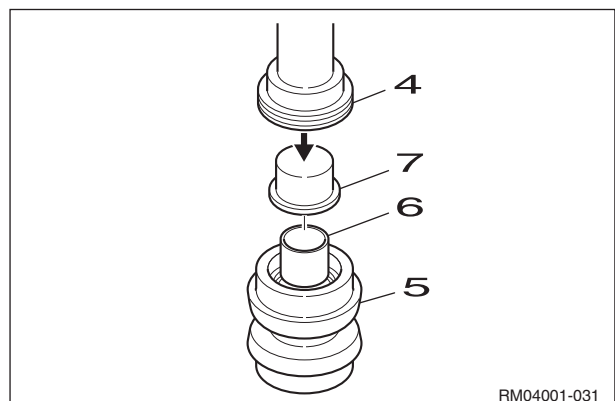
[2] After cleaning the parts, air blow them to remove any remaining cleaning fluid or debris.



[3] If the bushing (2) was removed during disassembly, put it into the roller. Face up the thrust plate installation side, restrain from above using jig B2 (3), and push in with the pressing machine.

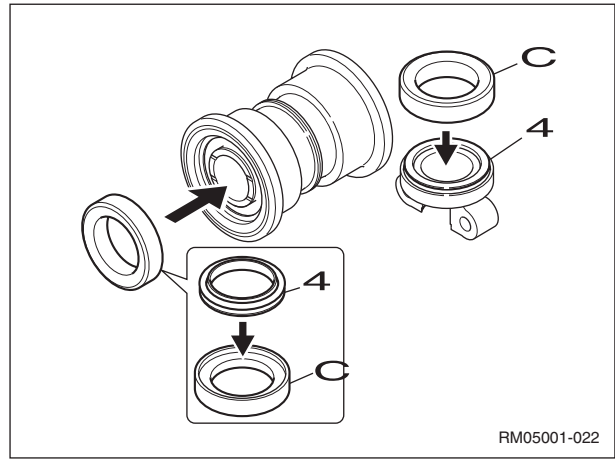


[4] Invert the roller (5) and insert the bushing (6). Restraining from above using jig B1 (7), push in with the pressing machine (4). Push in all the way to the position where jig B1 stops.

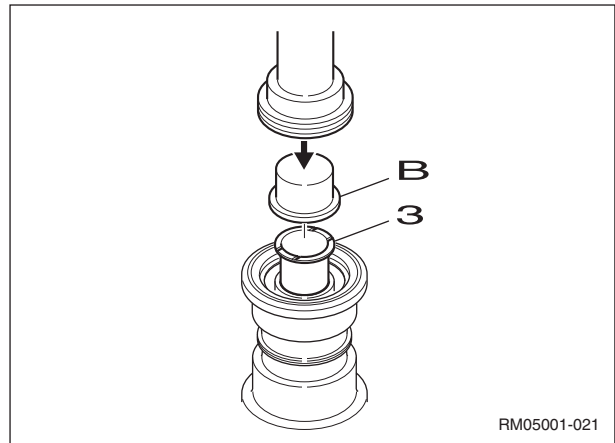


5003-24

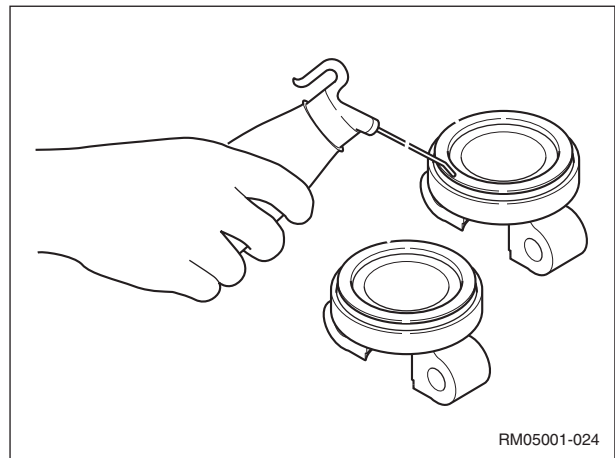
- [4] Attach the floating seals (4) to the collars. Use a jig (C) to press them into position by hand.



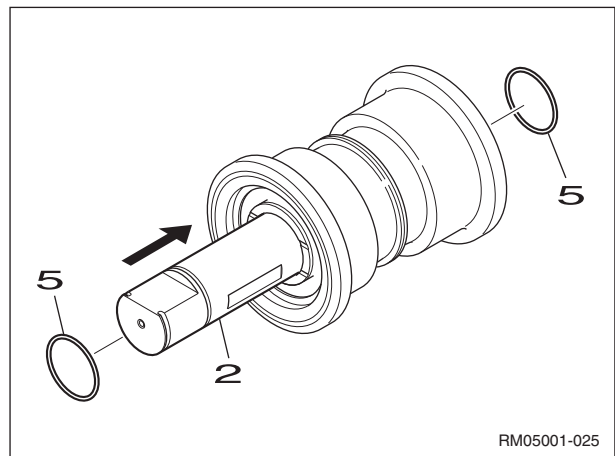
- [5] Use a special fiber cloth to wipe the surfaces of the floating seals to increase adhesion and prevent dust from entering.



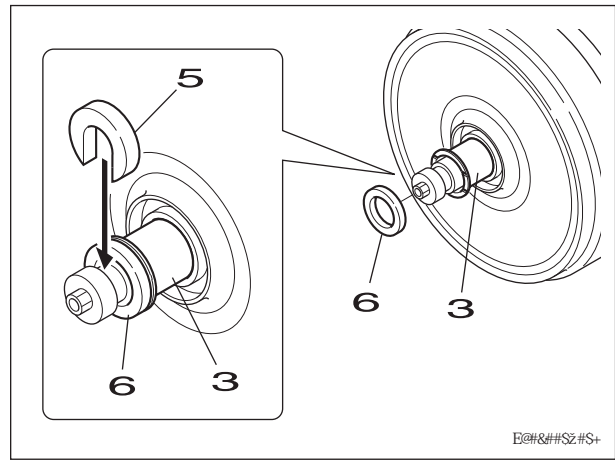
- [6] Apply gear oil to the floating seals on the collars.



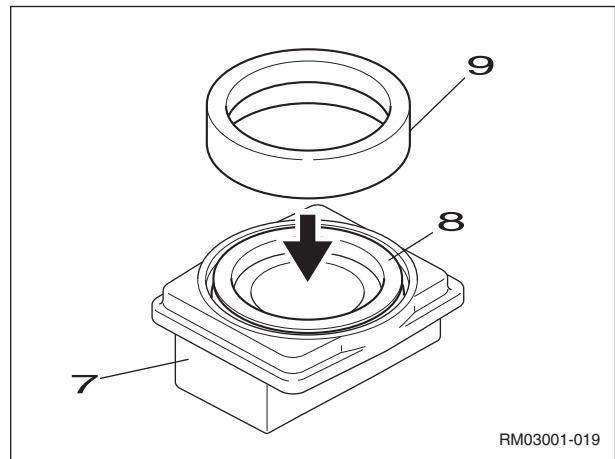
- [7] Attach O-rings (5) to the roller shaft (2) and mount them to the track roller.



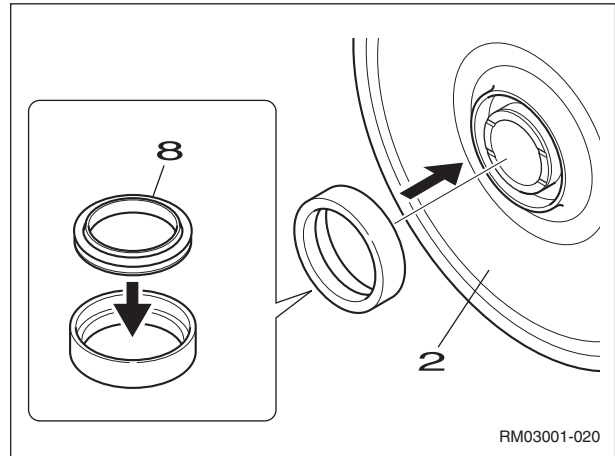
- [4] Use the jigs (5) and (6) attached to the pressing machine to attach the bushing (3).
 Use the pressing machine to press from the opposite side.
 Use a special fiber cloth or similar item and completely remove all dust and debris.



- [5] Attach the floating seal (8) to the hub (7).
 Use jig C (9) to press it into position.



- [6] Use jig C (9) to attach the floating seal (8) to the roller (2) side.



- [7] Use a special fiber cloth to thoroughly wipe the contact surface of the floating seal to prevent dust or scratches.

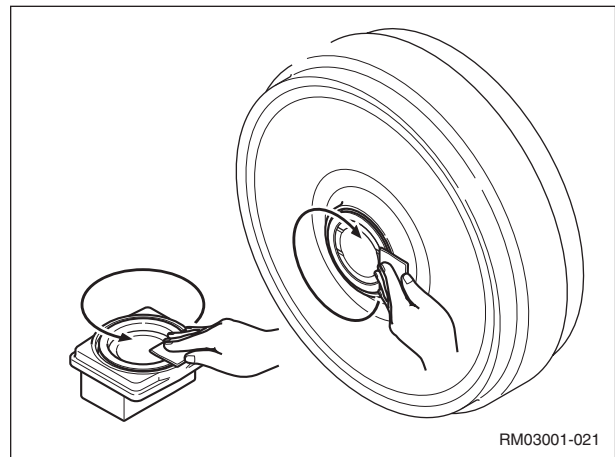


TABLE OF CONTENTS

DISASSEMBLY AND ASSEMBLY OF TRAVEL MOTOR	3
TOOLS FOR ASSEMBLY AND DISASSEMBLY	3
Standard tools.....	3
Required tools for motor.....	3
Required tools reduction gear.....	4
Special tools.....	4
Measurement device.....	4
DISASSEMBLY	5
Precautions.....	5
Tightening torque.....	5
Disassembly procedure.....	6
Disassembly of motor.....	6
Reduction gear disassembly procedures.....	12
MAINTENANCE STANDARDS	20
Motor parts maintenance standards.....	20
Measurement item and measurement method.....	20
Reduction gear parts maintenance standards.....	22
Inspection prior to reassembly.....	22
Parts maintenance.....	23
ASSEMBLY	24
Precautions before motor assembly.....	24
Assembly procedures.....	25
Reduction gear assembly procedure.....	25
Motor assembly procedure.....	33
Initial pre-conditioning operation.....	36
TROUBLESHOOTING	37
General cautions.....	37
Think before attempting to fix a problem.....	37
Be careful about dust and dirt.....	37
Parts handling.....	37
Seals handling.....	37
Causes of troubles and countermeasures.....	37
Hydraulic motor does not operate.....	37
Weak startup of the hydraulic motor.....	38
Rotation speed does not reach the setting value.....	38
Rotation speed does not reach the setting value.....	38
Oil leak.....	38
Cannot shift from high speed to low speed.....	39
Abnormal noise emitted.....	39
Hunting occurs when lowering the plate.....	39
STRUCTURAL DIAGRAM	40
Travel motor.....	40
Reduction gear.....	41

g) Disassembly of housing assembly

- [1] Install 3 M20 eyebolts into the M20 threaded holes on the housing (1) at approximately the same distance apart, and place it on the receiving platform with the ring gear (3) in the lowered position and the housing (1) in the raised position.

Make reference marks to the outer circumference of the housing and ring gear.

NOTICE: Lift the part in a horizontal position.



WARNING: Handle all parts carefully. Do not put your hands or fingers between parts. Always wear suitable safety items such as fitted clothing, safety goggles, gloves, shoes, etc. Failure to comply could result in death or serious injury. M954A

- [2] Remove the floating seal (5) from the housing (1).
 [3] Remove the hexagon socket head bolts M18x110 (4) while leaving 2 diagonally opposite bolts.
 [4] With the remaining 2 hexagon socket head bolts M18x110 (4) loosened, tap the heads of the bolts with a hammer to easily remove the ring gear (3) from the housing (1)

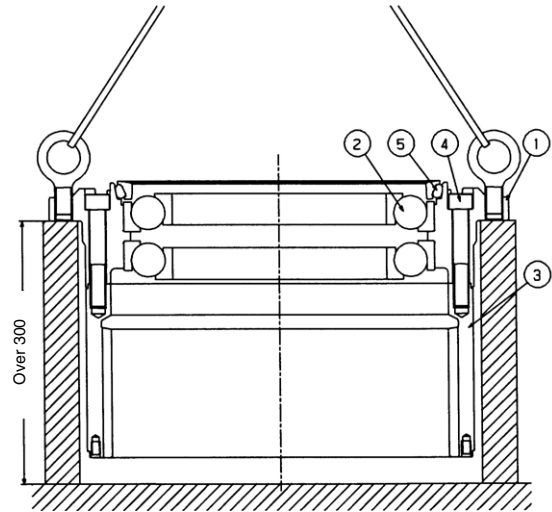


WARNING: Handle all parts carefully. Do not put your hands or fingers between parts. Always wear suitable safety items such as fitted clothing, safety goggles, gloves, shoes, etc. Failure to comply could result in death or serious injury. M954A

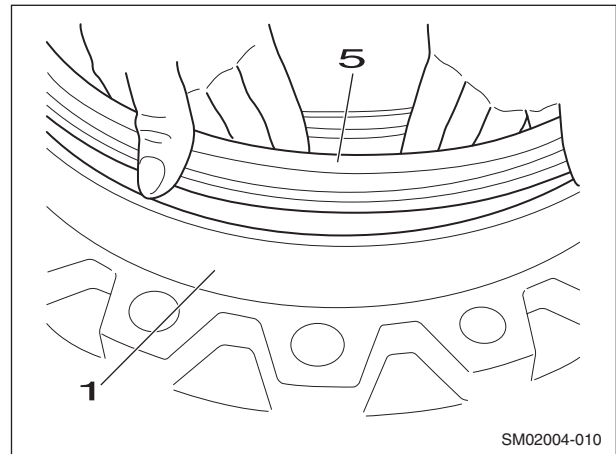
- Be careful not to scratch the sliding surface of the floating seal (5) and its O-ring.
- The bearing (2) outer race and housing (1) inner diameter form a very tight fit. Do not disassemble this unless it is necessary to replace the bearing (2). When removing the bearing (2) from the housing (1), replace with a new part instead of reusing the part.

h) Removal of floating seal from motor

- [1] Remove the floating seal (5) from the housing (1).



Disassembling housing assy.



Removal of floating seal

SM02004-010

f) Installation of the housing assembly

- [1] Place the motor shaft upwards on the work platform, and place the shim (6) selected by item e) (Determining the thickness of the angular bearing shim) on the end surface of the bearing insertion part of the motor casing.



WARNING: Handle all parts carefully. Do not put your hands or fingers between parts. Always wear suitable safety items such as fitted clothing, safety goggles, gloves, shoes, etc. Failure to comply could result in death or serious injury. M954A

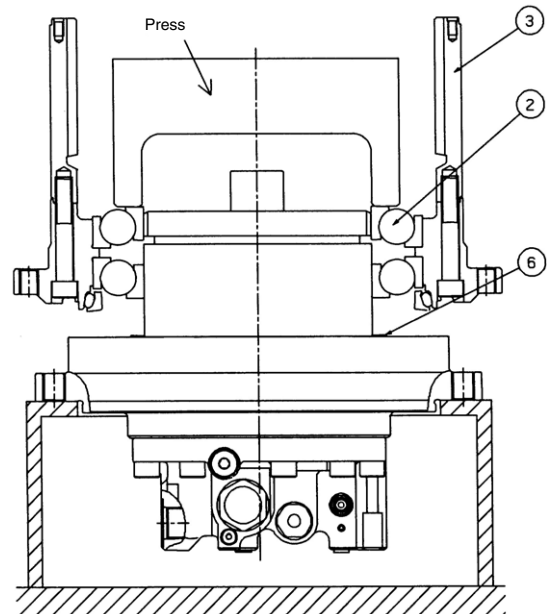
- [2] Install and suspend 3 M10 eyebolts to the ring gear (3), slowly lower it vertically while aligning it with the motor core, and insert the bearings (2) installed in the inner diameter of the housing (1) into the motor. Use a pressing machine to press the inner race parts of the bearings (2), and insert them completely to the bottom.



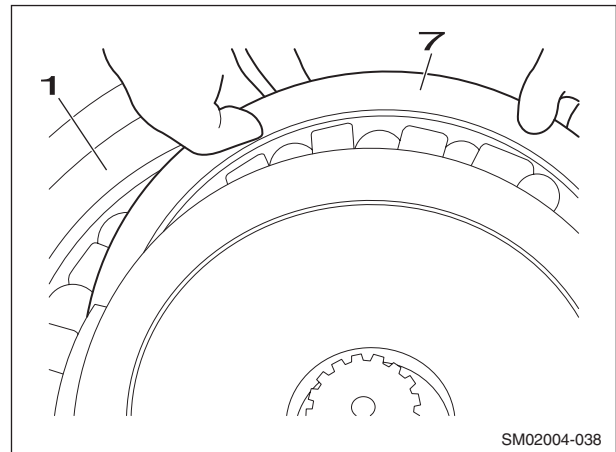
WARNING: Handle all parts carefully. Do not put your hands or fingers between parts. Always wear suitable safety items such as fitted clothing, safety goggles, gloves, shoes, etc. Failure to comply could result in death or serious injury. M954A

- [3] Insert the lock washer (7) into the groove while pressing the flange part of the housing (1).

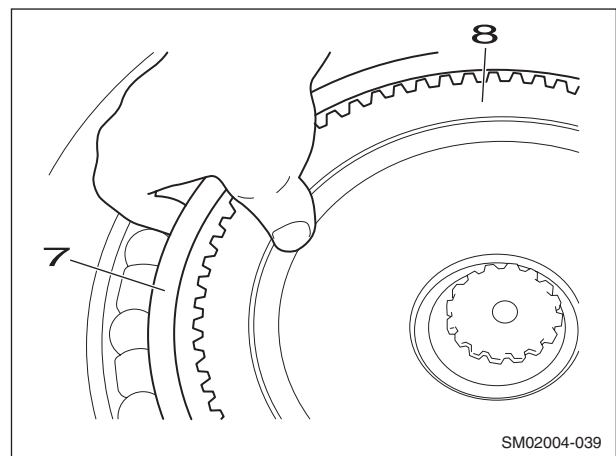
- [4] Insert the support ring (8) into the outside of the lock washer (7).



Press fitting of the housing assembly



SM02004-038



SM02004-039

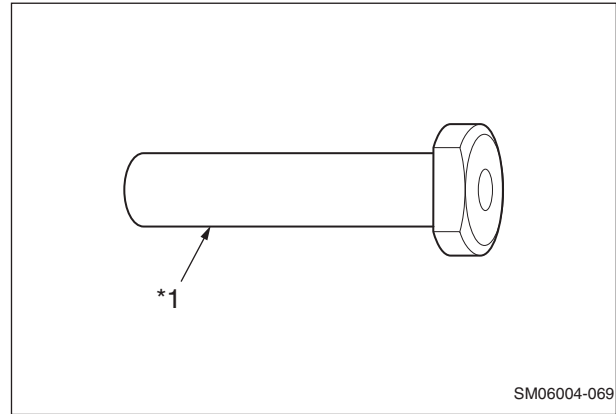
TABLE OF CONTENTS

SWING MOTOR AND SWING REDUCTION GEAR.....	3
REMOVAL	3
INSTALLATION	7

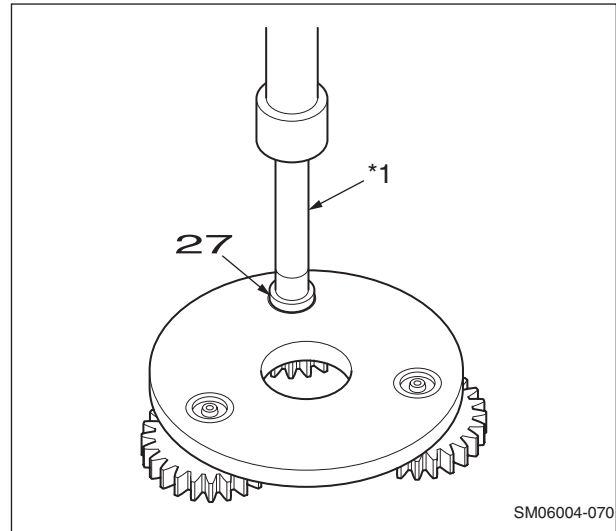
6004-8

[5] Use a caulking jig (*1) to caulk the planetary pin No.1 (27) end section by opening the end section.

- If linear chips form during caulking, be sure to remove the chips.



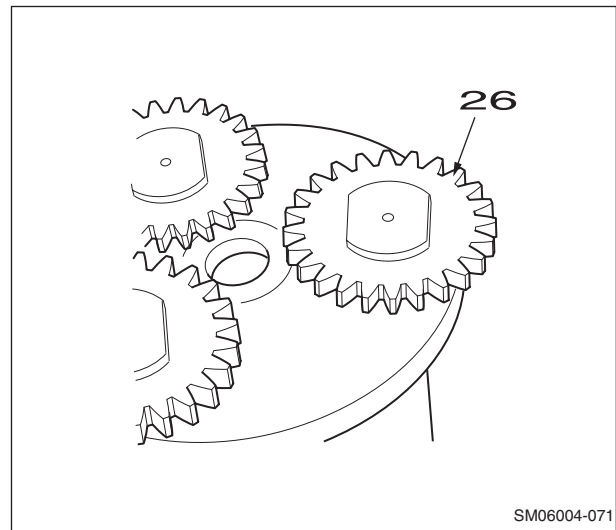
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SM06004-070

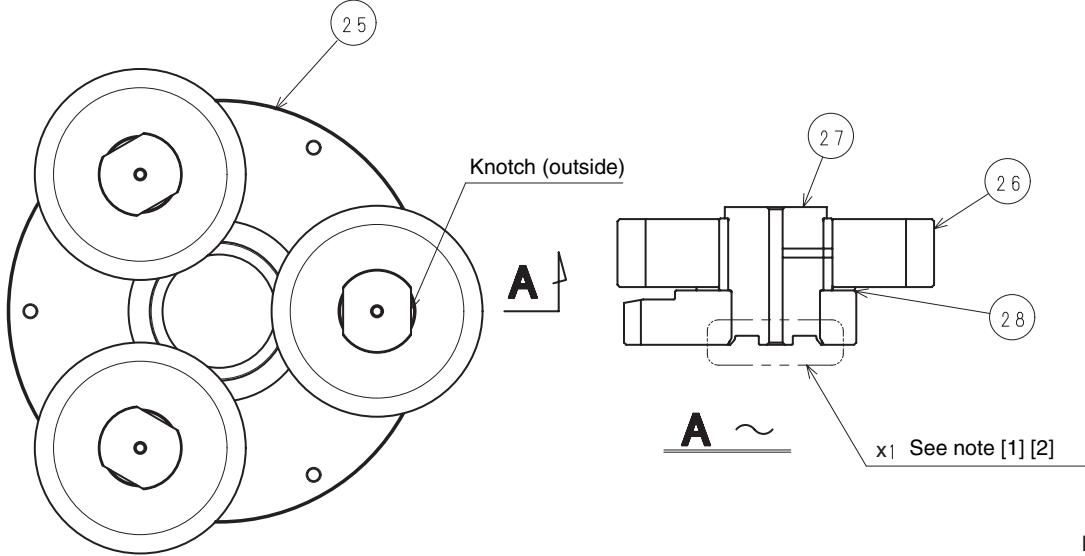
[6] Rotate the planetary gear No.1 (26) by hand and check again that there is no rotation unevenness or catching. If there is any rotation unevenness or catching, reassemble using a new part.

Perform steps [1] - [6] at 3 locations to complete operations.



SM06004-071

Planetary carrier No. 1 assembly diagram



KSC0245X-B00

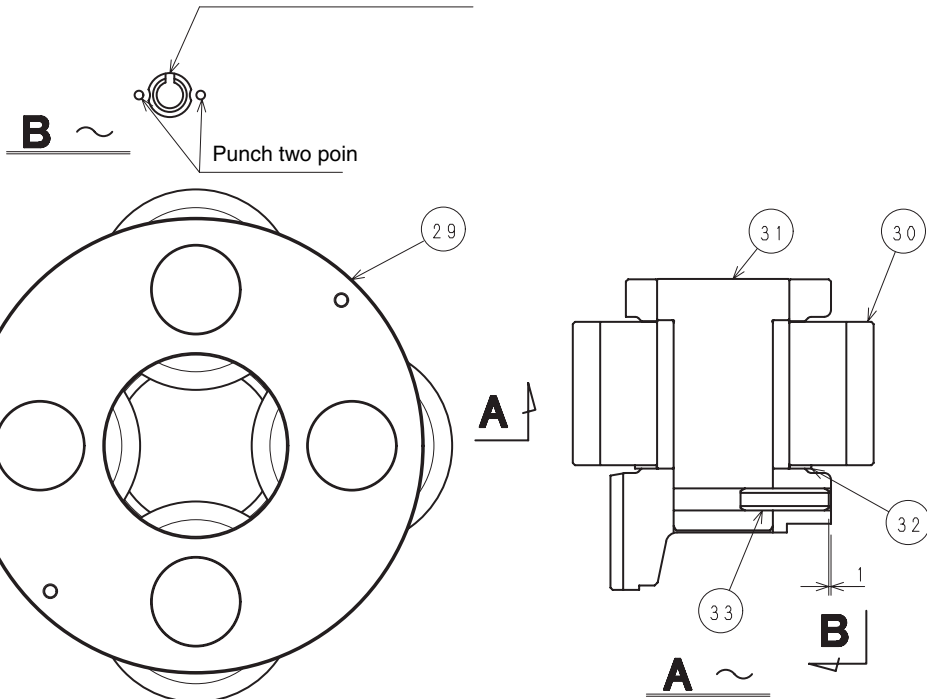
Code	Part name	Qty
25	Planetary carrier No.1	1
26	Planetary gear No.1	3
27	Planetary pin No.1	3
28	Side plate No.1	3

Notes

- [1] Punch as X1 marked drawing after insert planetary pin (27) to planetary carrier (25).
Keep press over 10 second after punch.
- [2] Free from harmful lap and burr after punch.

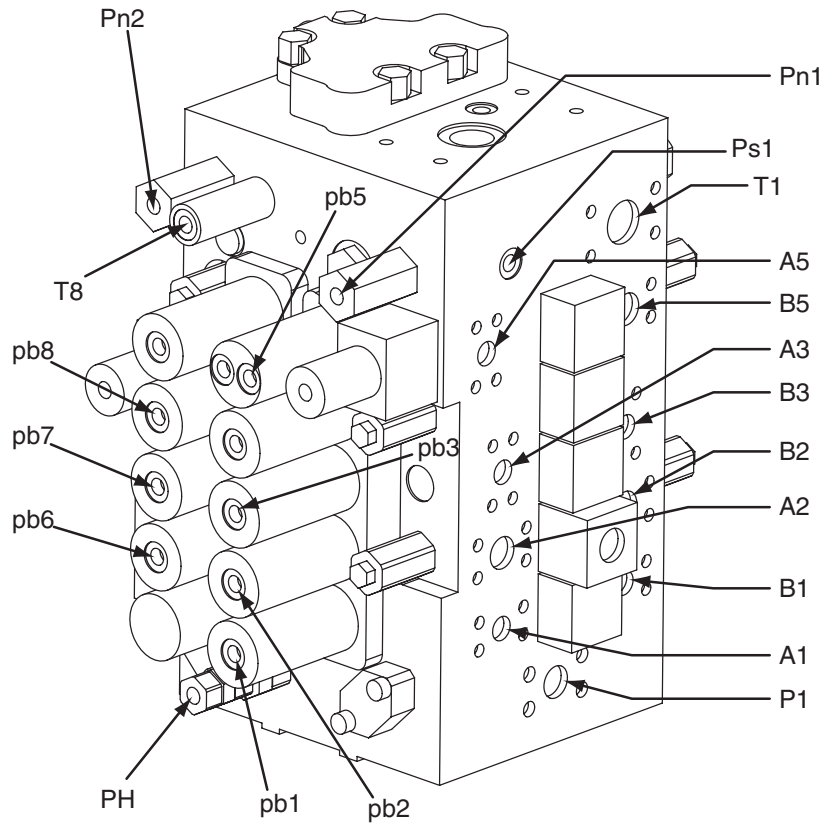
Planetary carrier No. 1 assembly diagram

The slit must be positioned at the indicate direction



KSC0246X-B00

Code	Part name	Qty
29	Planetary carrier No.2	1
30	Planetary gear No.2	4
31	Planetary pin No.2	4
32	Side plate No.2	4
33	Spring pin 10x40	4



BD06003-002

Port	Port size	Description
P1	SAE 6000psi 1	Pressure line
A1	SAE 5000psi 1	Left travel (forward) line
B1	SAE 5000psi 1	Left travel (backward) line
A2	SAE 5000psi 1	Option line
B2	SAE 5000psi 1	Option line
A3	SAE 5000psi 1	Swing right line
B3	SAE 5000psi 1	Swing left line
A5	SAE 5000psi 1	Arm-out line
B5	SAE 5000psi 1	Arm-in line
T1		Return line
pb1	G 1/4	Left travel backward pilot line
pb6	G 1/4	Right travel backward pilot line
pb3	G 1/4	Left swing pilot line
pb4	G 1/4	Boom 2-down drain line
pb5	G 1/4	Arm 1 in pilot line
pb7	G 1/4	Bucket-close pilot line
pb8	G 1/4	Boom 1-down pilot line
pb9	G 1/4	Arm 2-in pilot line
Pn1	G 1/4	Negative control power save signal
Pn2	G 1/4	Negative control power save signal
PH	G 1/4	Pressure boost signal port
Ps1	G 1/4	Negative control line
T8	G 1/4	Heat circuit line
pb2	G 1/4	Option line

PREPARATION BEFORE INSPECTION



WARNING: This machine is powered by hydraulics. Caution must be exercised around the machine. Hydraulic fluid under pressure can penetrate the skin, causing serious injury, and even death. When looking for a leak, use a piece of cardboard or other suitable material. Never use your hands to locate the leak. Always wear eye protection, gloves and long sleeve clothing when working with hydraulics. The fluid stream from small leaks can be invisible. Always exercise caution when working around hydraulics. Failure to comply could result in death or serious injury. M1307



WARNING: The accumulator must be serviced by qualified service personnel only. DO NOT service the accumulator before referring to the Service Manual. The accumulator contains compressed gas and must be discharged before servicing. Failure to comply could result in death or serious injury. M424A



WARNING: Before starting engine, study operator's manual safety messages. Read all safety signs on machine. Clear the area of other persons. Learn and practice safe use of controls before operating. It is your responsibility to understand and follow manufacturer's instructions on machine operation, service, and to observe pertinent laws and regulations. Operators and service manuals can be obtained from your equipment dealer. D46-59C

Releasing pressure in the hydraulic system and pressure measurement preparations

NOTICE: Operation to be carried out before every service operation on the hydraulic system.

1. Position the machine on hard, flat ground.
2. Open the bucket until the cylinder rod is completely retracted.
3. Extend the dipper until the cylinder rod is completely retracted. Lower the boom so that the end of the dipper is resting on the ground. Lower the tool to the ground.
4. Check with the diagnostic display in "SP" mode that the following values are shown.

CHK	MAIN	1	P1	0174	psi
Eng	1800	rpm	P2	0174	psi
Power	0600	mA	N1	442.4	psi
Flow	0727	mA	N2	587.4	psi

RST-09-01-001H

Eng = Engine rpm	1900 rpm
Power = Electric current value	500 mA (operating)

5. Lower the engine speed to idle for 30 seconds, then shut down the engine.
6. Turn the starter key switch to "ON", without starting the engine.

7. Use the service check to check the hydraulic oil temperature.

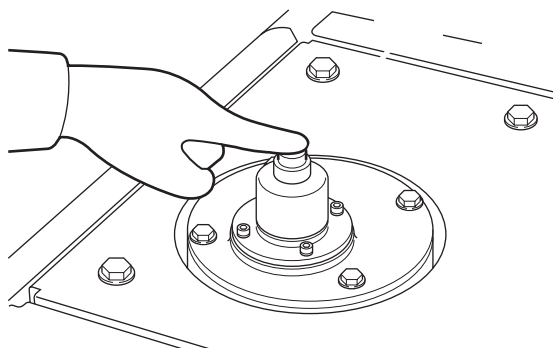
CHK	MAIN	2	Baro	003.9	in Hg
CoolInt	0185	° F	EngOil	0000	psi
HydOil	0122	° F	Bst T	0104	° F
Fuel T	0113	° F	Air	0086	° F

RST-09-01-001K

Oil temperature	45 to 55°C 113 to 131°F
-----------------	----------------------------

If the oil temperature is low, raise the oil temperature according to the warm-up operation procedure in the operator's manual.

8. Lower the pilot control cancellation lever.
9. Operate each control more than 10 times in both directions to release pressure in the circuits.
10. Press the button located on the hydraulic reservoir breather to release pressure in the reservoir.



RST-09-01-001N

Overload relief pressure adjustment

Engine speed	1900 min ⁻¹
Work mode	SP mode
Oil temperature	45 to 55°C 113 to 131°F
Measuring port	P1 / P2 port
Measurement pressure	Boom down: 27.4 MPa 3974 psi
	Others: 39.2 MPa 5685 psi
Pressure per rotation of adjusting screw	21.2 MPa / rotation 3074 psi / rotation

15	Control valve
16	Boom-up
18	Bucket-open
20	Bucket-close

1. Since the overload relief pressure is set higher than the main relief pressure, it is necessary to provisionally set the main relief pressure higher than the overload relief pressure. (Except for boom down)
2. Main Relief Pressure Provisional Setting
 - Using the main pressure adjustment procedure for reference, temporarily set the boosted pressure and standard pressure to at least 39.2 MPa.

NOTICE: For boom down (19), since the overload set pressure is lower than the main relief set pressure, there is no need to temporarily set the main relief pressure.

3. Pressure adjustment

NOTICE: For the position of each overload relief, see the "Control Valve Relief Locations".

Example: Arm-out (17) overload relief adjustment

A Loosen the lock nut (21) and adjust by the turning the adjusting screw (22).

- When lower than the set pressure, tighten.
- When higher than the set pressure, first loosen to a pressure lower than the set pressure, then adjust on the tightening side.

B After adjustment, lock the lock nut (21).

C After adjusting the overload relief pressure, adjust the boosted pressure and standard pressure to their normal values referencing the main pressure adjustment procedure.

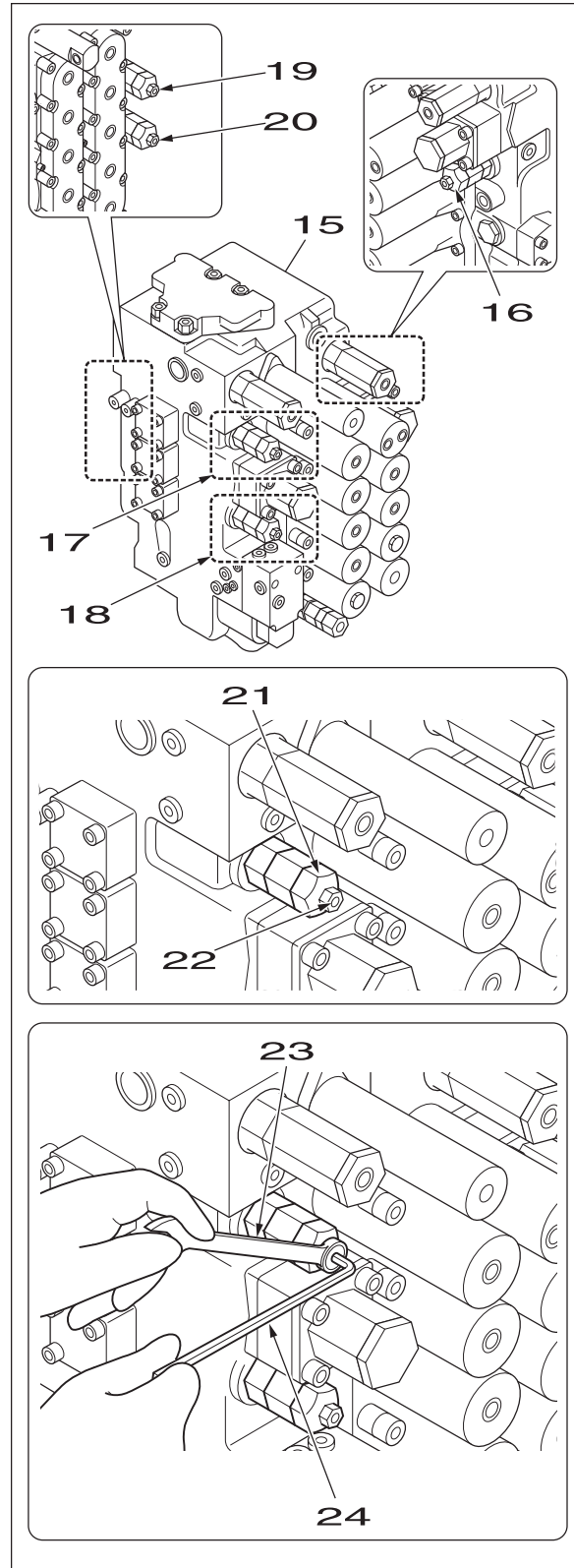
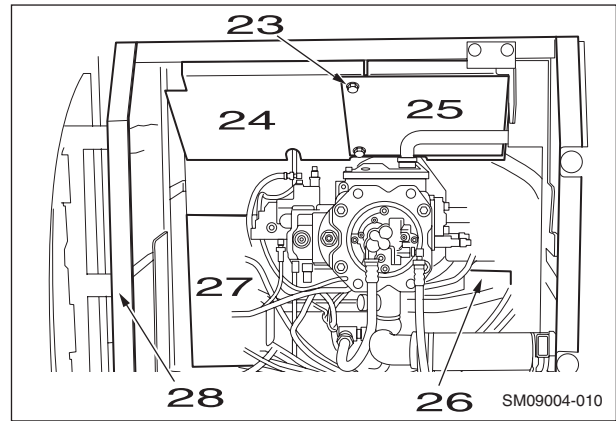


TABLE OF CONTENTS

- REMOVAL AND INSTALLATION OF HYDRAULIC OIL TANK..... 3
- REMOVAL OF HYDRAULIC OIL TANK 3
- INSTALLATION OF HYDRAULIC OIL TANK..... 8

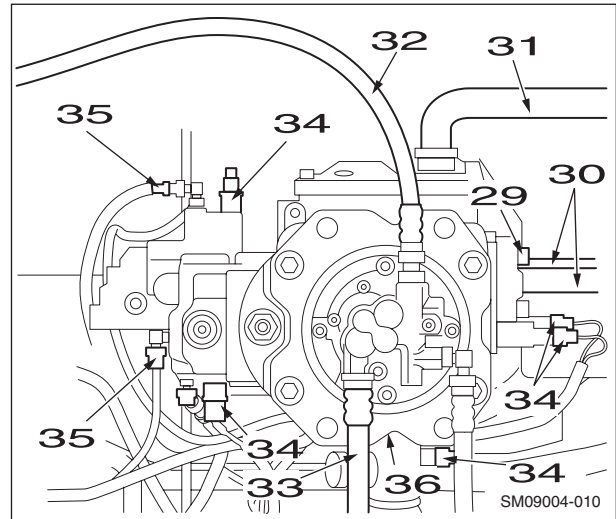
[19] Use a wrench (19 mm) to remove the 17 bolts (23), and then remove the 4 covers (24), (25), (26), and (27).

[20] Use a wrench (19 mm) to remove the bolts, and then remove the right housing frame (28).

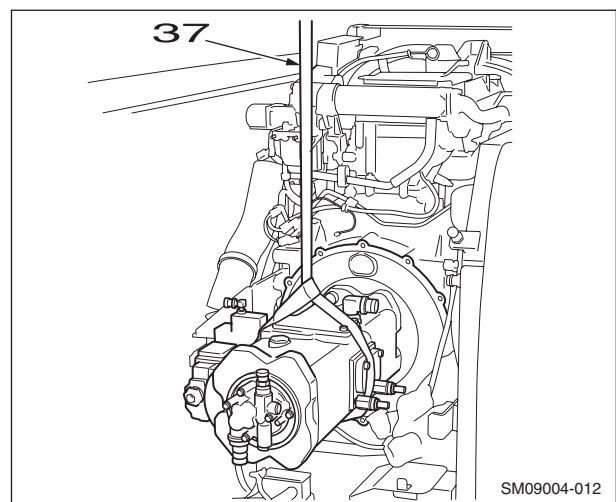


[21] Remove the hoses and connectors that are connected to the pump.

- Use a hexagon wrench (10 mm) to remove the 8 hose bolts (29), and remove the pressure hoses (30).
- Use a wrench (41 mm) to remove the drain hose (31).
- Use a wrench (27 mm) to remove the pilot hose (32).
- Use a wrench (36 mm) to remove the suction hose (33).
- Remove the connectors (34).
- Use a wrench (19 mm) to remove the hydraulic pilot hoses (35).
- Use a hexagon wrench (14 mm) to remove the suction line bolt and remove the suction line (36).
- Mark the pump and hoses so that the connectors match at the time of assembly.
- Attach caps or plugs to the pump and hoses to prevent any entry of water, dust or dirt.
- Clean the pump and hoses by spraying with a parts cleaner to prevent scratches and prevent dirt from accumulating on the connectors.

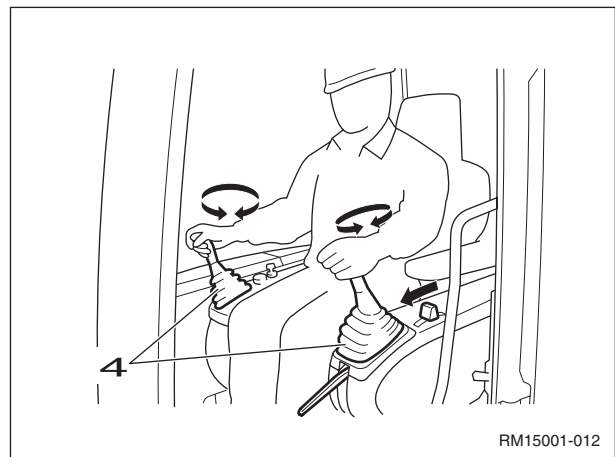
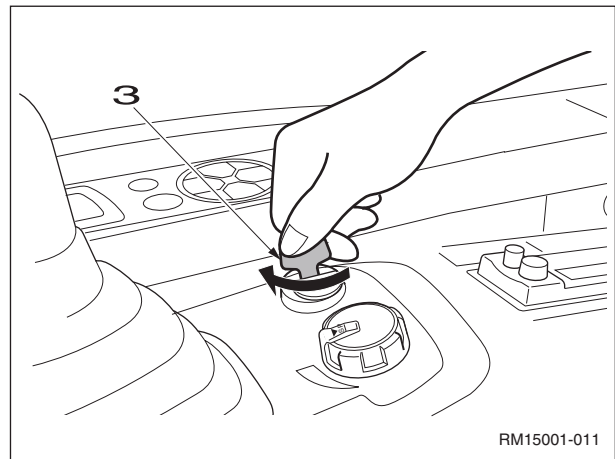


[22] Secure the pump with a liftcrane and nylon sling (37) so that it does not fall during removal and installation operations.

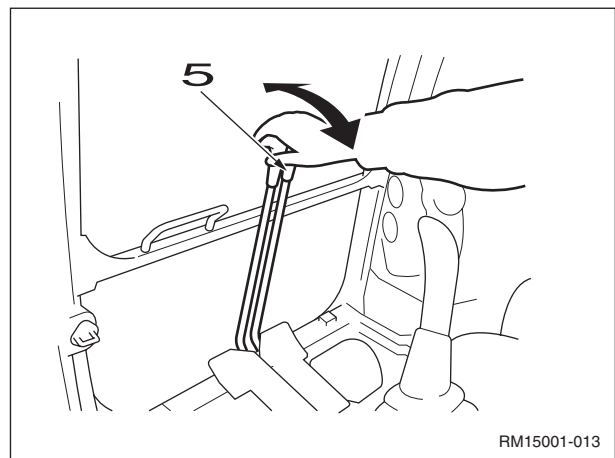


- [5] Switch the key switch (3) OFF to stop the engine. Switch the key switch ON again, and then turn the control lever (4) about 10 times to bleed off any pressure.

NOTICE: Do not operate the bucket at this time.



- [6] Move the travel lever (5) back and forth about 5 times to bleed out the pressure.
- [7] Return the key switch to OFF.



- [8] Press the air breather button (6) on top of the hydraulic oil tank to release the pressure inside the tank.

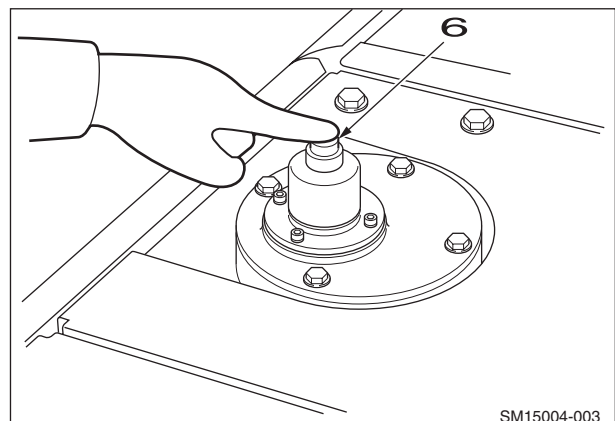
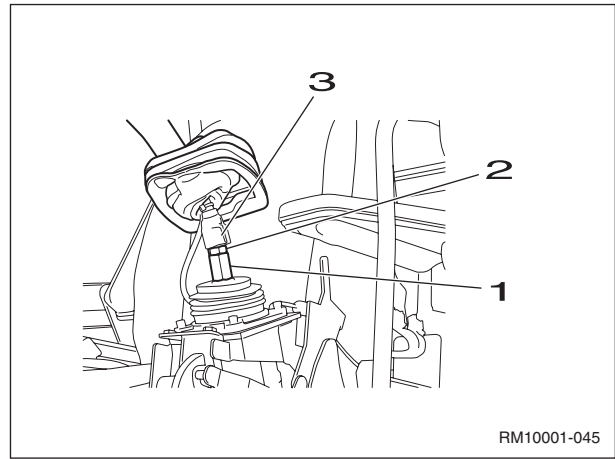


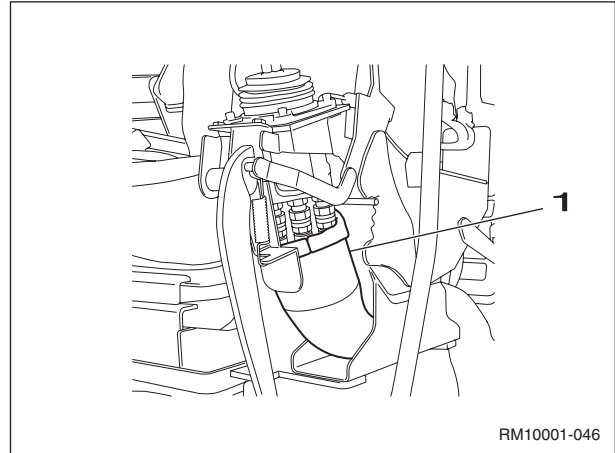
TABLE OF CONTENTS

REMOVAL AND INSTALLATION OF CENTER JOINT 3
REMOVAL OF CENTER JOINT 3
INSTALLATION OF CENTER JOINT 7

[9] With a wrench holding the rod (1), loosen the lock-nut (2) and remove the control lever (3).



[10] Roll up and open the hose cover (1).



[11] Remove the hoses (1).

- Mark the joystick remote control valve and hose joints so that they can be connected correctly at the time of assembly.
- Use caps or plugs to cover the joystick remote control valve and hoses to prevent the entry of water, dust or dirt.
- Clean the joystick remote control valve and hoses by spraying with a parts cleaner to prevent scratches and prevent dirt from accumulating on the connectors

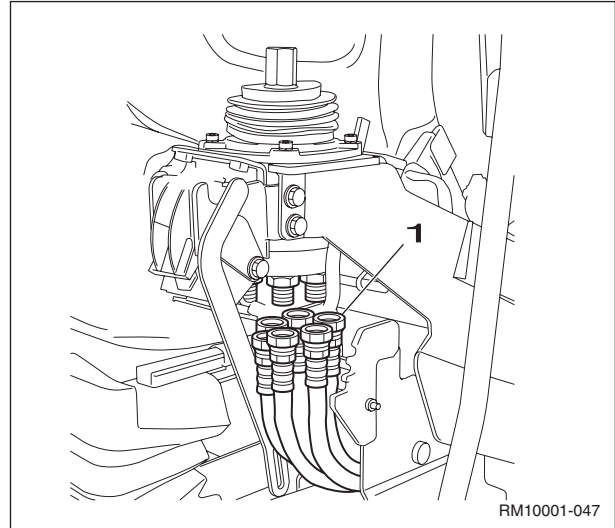


TABLE OF CONTENTS

ASSEMBLY AND DISASSEMBLY OF PUMP MAIN UNIT SECTION.....	3
DISASSEMBLY PROCEDURE.....	3
ASSEMBLY PROCEDURE	6
PUMP MAIN UNIT SECTION MAINTENANCE STANDARDS	9
STANDARDS FOR REPLACING WORM PARTS.....	9
STANDARDS FOR REPAIRING CYLINDER, VALVE PLATE, AND SWASH PLATE (SHOE PLATE).....	10
TIGHTENING TORQUE.....	10
OVERALL VIEW.....	11
Diagram 1 - Pump assembly cross-section diagram.....	11
Drive shaft front side	11
Drive shaft rear side	12
Description of diagrams	13
OPERATION EXPLANATION	14
Flow control.....	14
Horsepower control.....	15
REGULATOR ADJUSTMENT	16
Maximum flow adjustment.....	16
Minimum flow adjustment.....	16
Input horsepower adjustment.....	17
Flow control characteristics adjustment	17
TABLES AND DIAGRAMS	18
Regulator adjustment amount table	18
Regulator operation explanation diagram	18
Regulator breakdown diagram	19
ASSEMBLY AND DISASSEMBLY OF REGULATOR.....	20
DISASSEMBLY PREPARATIONS.....	20
DISASSEMBLY PROCEDURE	20
ASSEMBLY PROCEDURE.....	23
REGULATOR ASSEMBLY STRUCTURAL DIAGRAM	26

6 Regulator adjustment

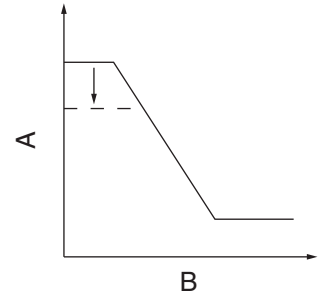
The adjusting screws on this regulator can be used to adjust the maximum flow, minimum flow, horsepower control properties, and flow control properties. (Each of the adjustment amounts is shown in "7. (1) Regulator adjustment amount list".)

1 Maximum flow adjustment

Loosen the hexagon nuts (808) and tighten (or loosen) the locking screws (954) to adjust the maximum flow. This only changes the maximum flow. It does not change the other control characteristics.

A : Discharge flow amount Q.

B : Pilot pressure P_i .



2 Minimum flow adjustment

Loosen the hexagon nut (808) and tighten (or loosen) the hexagon socket head locking screw (953) to adjust (or tighten) the minimum flow. Similar to the maximum flow adjustment, this does not change other control properties. However, if the hexagon socket head locking screw is tightened too much, the required power may increase at the time of maximum discharge pressure (during relief), so adjust this carefully.

A : Discharge flow amount Q.

B : Pilot pressure P_i .

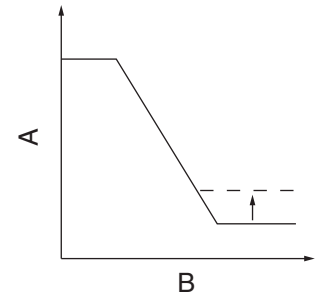


TABLE OF CONTENTS

CONTROL VALVE	3
DISASSEMBLING	3
Disassembling Precautions	3
Disassembling Procedures	3
CLEANING	8
INSPECTION	8
ASSEMBLING	9
Cautions for assembly.....	9
Procedure for assembly of sub-assembly	10
Procedure for assembly of control valve main unit	11
INTERNAL STRUCTURE DIAGRAM	13
Parts list	19
RELIEF VALVES	20
Instructions for Disassembling and Assembling the Main Relief Valves	20
Instructions for Disassembling and Assembling the Overload Relief Valves	21
Instructions for Disassembling and Assembling the Low-pressure Relief Valves	22
Instructions for Disassembling and Assembling the Add-on Relief Valves	23
Adjusting the Relief Valves	24
INSTALLATION	25
OPERATION	25
TROUBLESHOOTING	26
Control valves in general.....	26
Relief valves.....	27
Hydraulic system in general	27

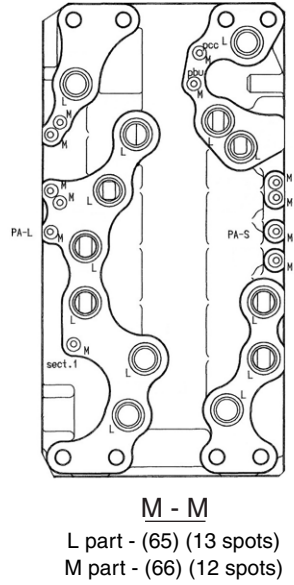
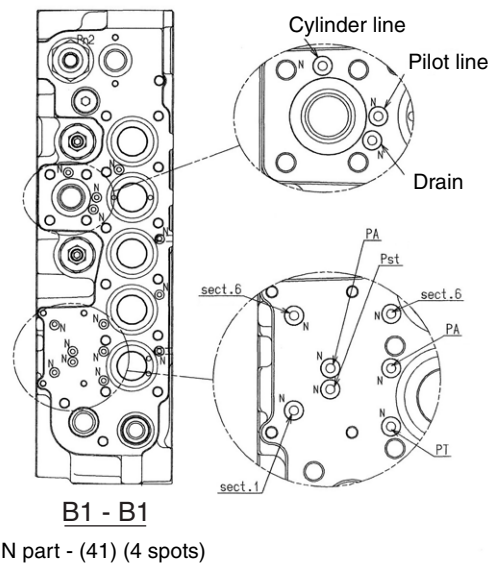
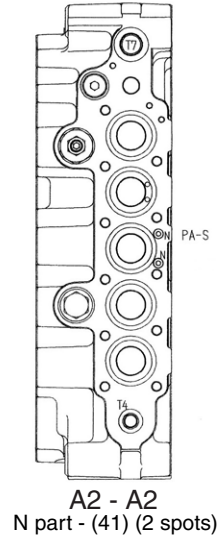
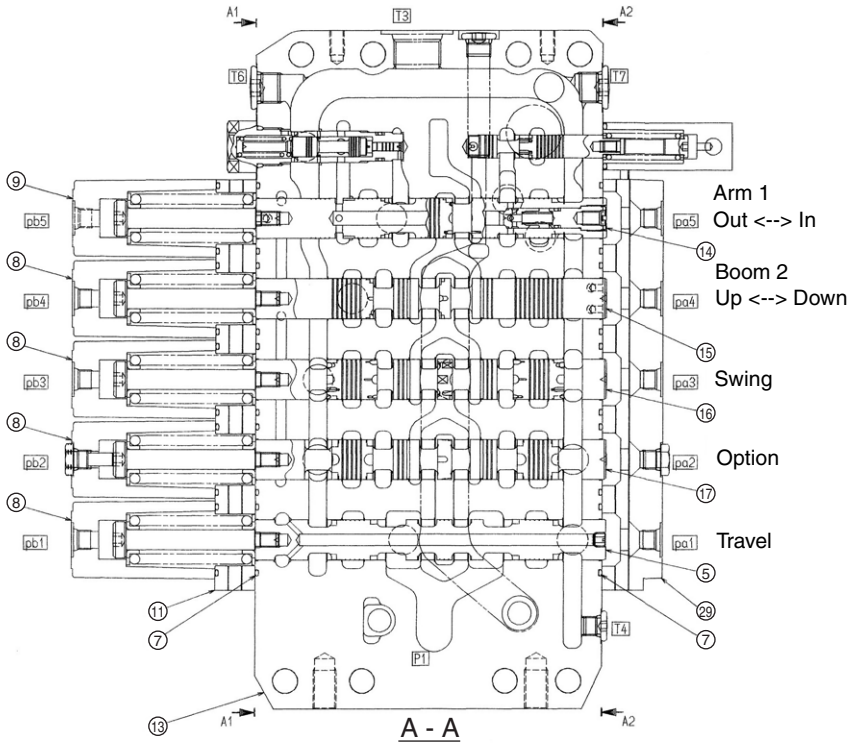
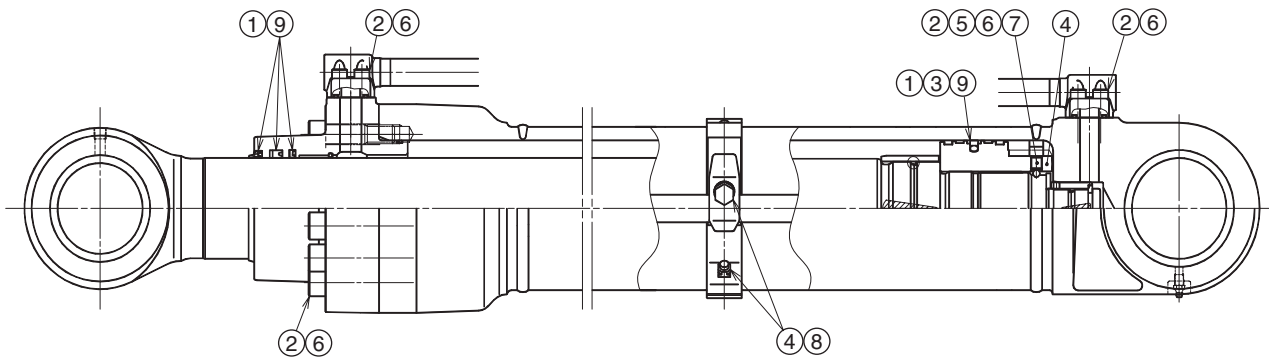


TABLE OF CONTENTS

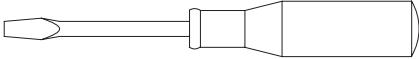
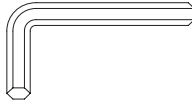
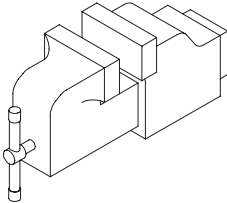
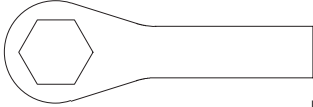
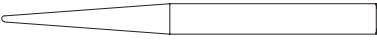
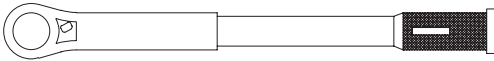
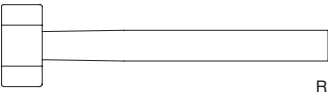
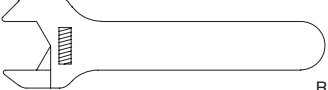
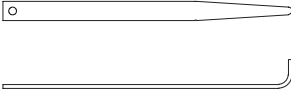
OPERATION AND ASSEMBLY/DISASSEMBLY OF HYDRAULIC CYLINDER.....	3
SPECIFICATIONS AND STRUCTURE DIAGRAM	
(INCLUDING THE ASSEMBLY DIAGRAM AND PARTS TABLE).....	3
OPERATION EXPLANATION	3
Basic functions	3
Function of each location.....	3
Cylinder head assembly.....	3
Piston assembly	4
Pipe assembly.....	6
HANDLING PRECAUTIONS	7
Precautions for installing the cylinder on the machine body	7
Usage cautions.....	7
Maintenance and inspection cautions	8
MAINTENANCE INSPECTION AND SERVICE	9
TROUBLE DIAGNOSTICS	10
STORAGE STANDARDS.....	13
Storing the cylinder alone (In principle, store indoors.).....	13
Mounted on vehicle body	13
Recommended anti-rust oil.....	13
ASSEMBLY AND DISASSEMBLY PROCEDURES	14
Preparations	14
General work precautions	14
Maintenance standards	14
Inspection after assembly	15
Required tools	16
General tools.....	16
Special jig.....	17
Special jigs part number list	18
Disassembly procedure.....	19
Drain the oil.	19
Secure the cylinder.	19
Removal of cylinder head.....	19
Pull out the piston rod.	20
Secure the piston rod.	20
Remove the piston nut.	21
Removal of piston etc.....	21
Retraction side cushion ring disassembly.	22
Removal of the piston seal.....	22
Disassembly of buffer ring.....	23
Disassembly of U-ring and wiper ring.	23
Removal of O-ring and backup ring.	23
Disassembly of bushing.	23
Removal of pin bushing.....	23
Cleaning and storage.	23
Assembly procedure.....	24
Installation of pin bushing.....	24
Replacement of seal.	24
Assembly of cylinder head assembly.....	25
Assembly of piston assembly.....	26
Assembly of piston rod assembly.....	26
Insertion of piston rod into the tube.....	28
Cylinder head tightening.	28
Installation of line	29
Test operation	29
Usage limits	29

5 Required tools

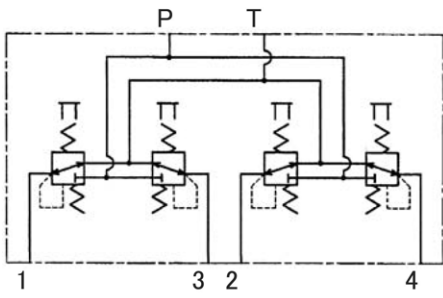
1 General tools



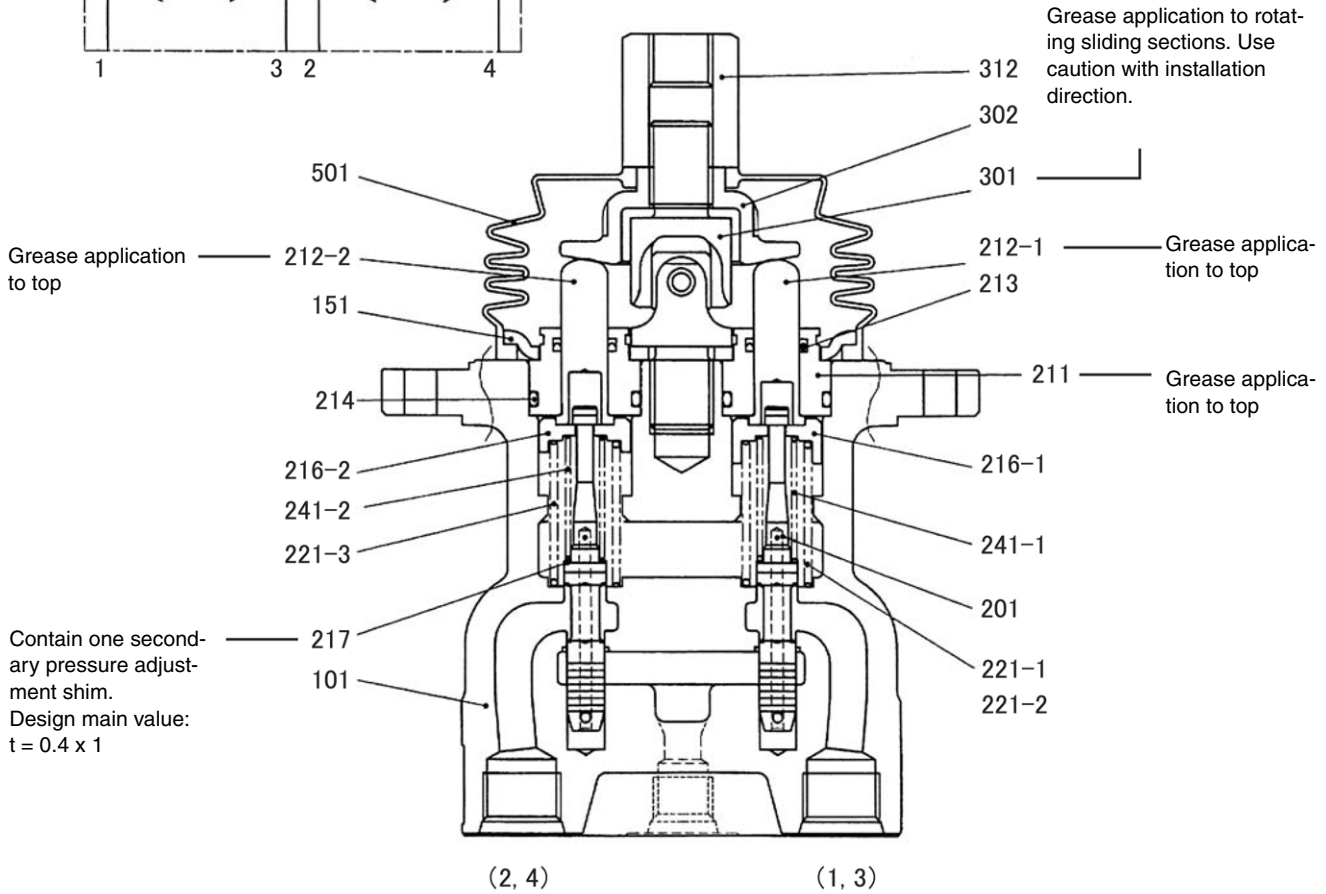
RM15001-080

No.	Tool name		Qty
1	Screwdriver (flathead screwdriver)	 RM15001-081	1
2	Hexagon wrench	 RM15001-082	1 set
3	Vise	 RM15001-083	1
4	Wrench (for piston nuts)	 RM15001-084	1 set
5	Punch	 RM15001-085	1
6	Torque wrench	 RM15001-086	1 set
7	Hammer (plastic hammer)	 RM15001-087	1
8	Monkey wrench	 RM15001-088	1
9	Scoop	 RM15001-089	1 set

5 Attached diagram 1. Remote control valve assembly cross-section diagram



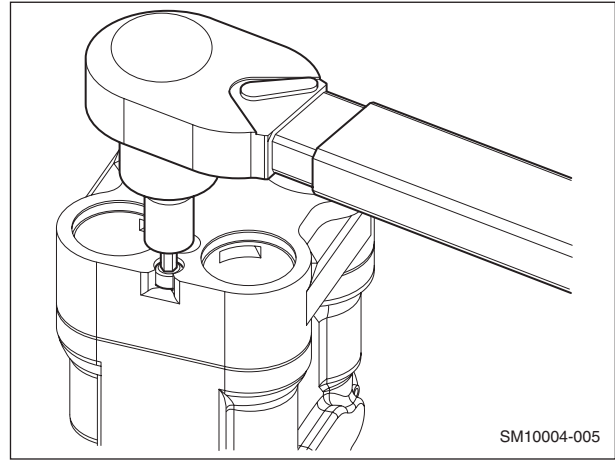
	Screw side	Tightening torque
301	M14	47.1 ± 2.9 N · m
302 312	M14	68.6 ± 4.9 N · m



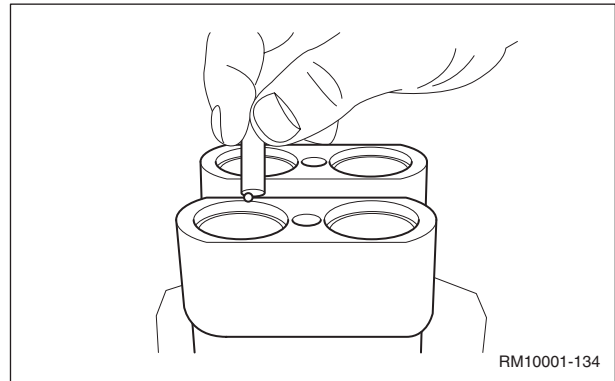
RM10001-084

Code	Part name	Qty	Code	Part name	Qty
101	Casing	1	217	Washer	4
151	Plate	1	221-1	Return spring (port 1)	1
201	Spool	4	221-2	Return spring (port 3)	1
211	Plug	4	221-3	Return spring (port 2, 4)	2
212-1	Push rod (port 1, 3)	2	241-1	Secondary pressure spring (port 1, 3)	2
212-2	Push rod (port 2, 4)	2	241-2	Secondary pressure spring (port 2, 4)	2
213	Seal	4	301	Joint	1
214	O-ring	4	302	Disk	1
216-1	Spring seating (port 1, 3)	2	312	Adjusting nut	1
216-2	Spring seating (port 2, 4)	2	501	Bellows	1

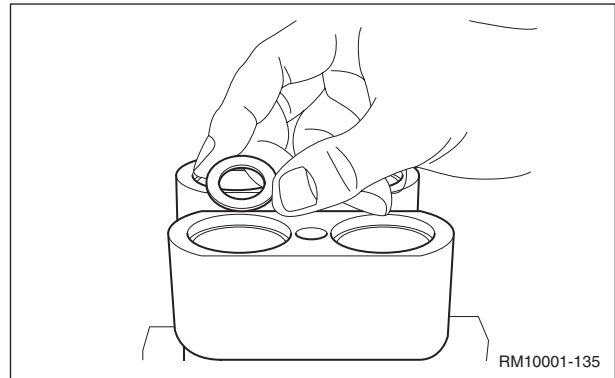
- [6] Tighten the damper casing (102) and casing (101) with the hexagon socket head bolts (220) to the specified torque 8.8 ± 1 Nm. (6.4 ± 0.7 lb. ft.) Install them in the positions they were in before disassembly.
Tighten the 2 hexagon socket head bolts (220) evenly, and tighten the damper casing (102) in a parallel orientation.



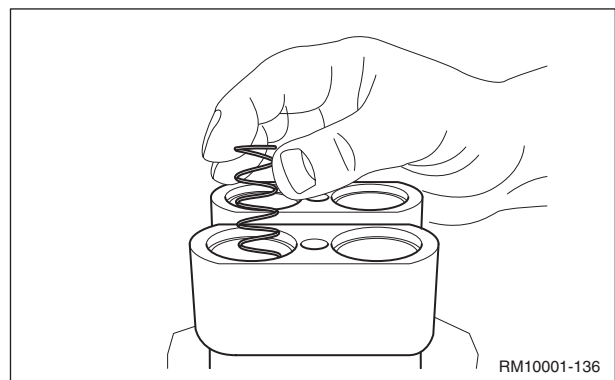
- [7] Install the steel balls (225) into the bushings (412).



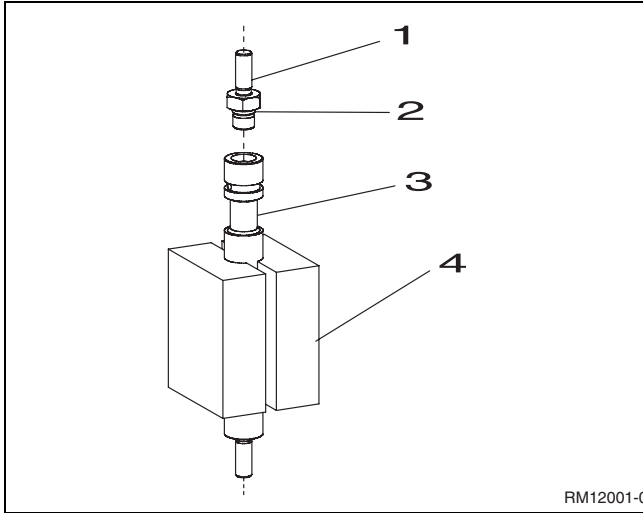
- [8] Install the spring seats (218) into the bushings (412).
Install them in the positions they were in before disassembly.



- [9] Install the damping springs (336) in the casing (101).
Install them in the positions they were in before disassembly.



[5] Remove the cap screw (1) and O-ring (2).



3	Spool
4	Piece of wood (jig)

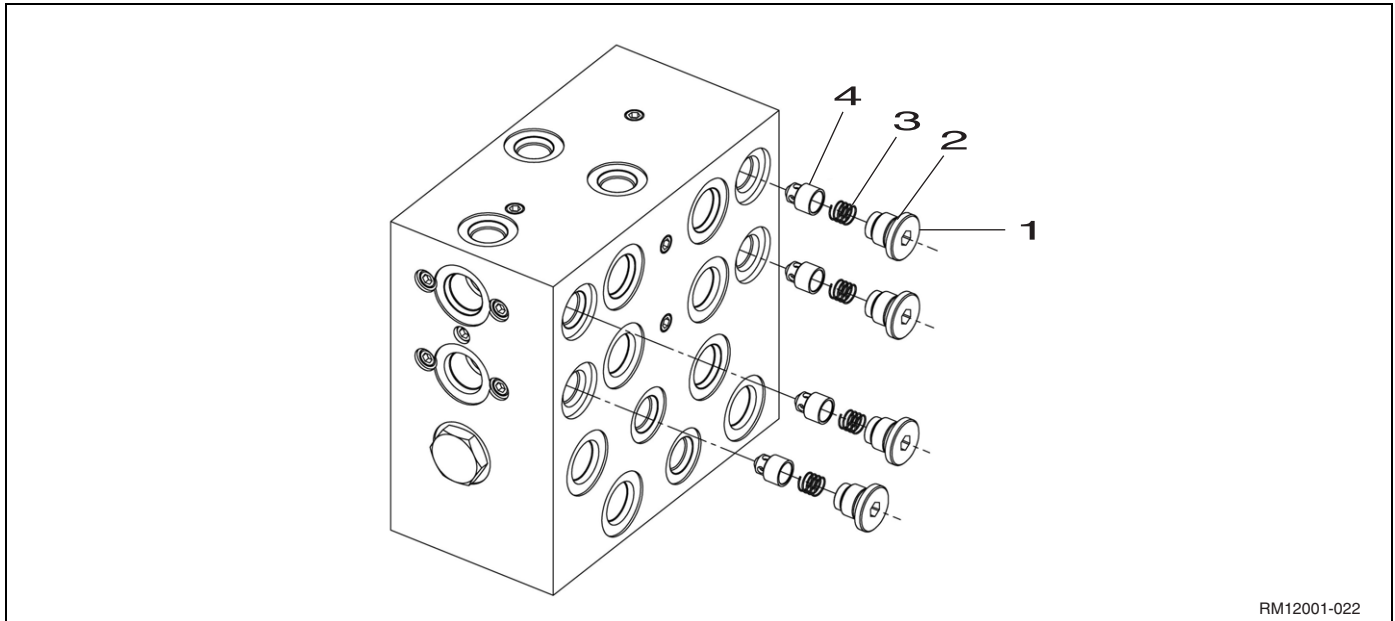
RM12001-0

2 Check plunger section with throttle

[1] Remove the plugs (1) and O-rings (2).

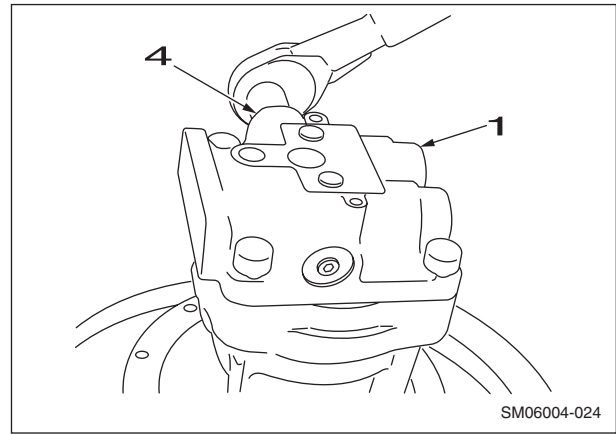
[2] Remove the springs (3) and remove the check plungers (4).

NOTICE: *The check plungers have similar shapes, so identify them in such a way that no one will mix them up with each other.*



RM12001-022

- [5] Remove the plug (4) from the cover (1) and take out the spring and plunger.
Be careful not to scratch the plunger seating sections.

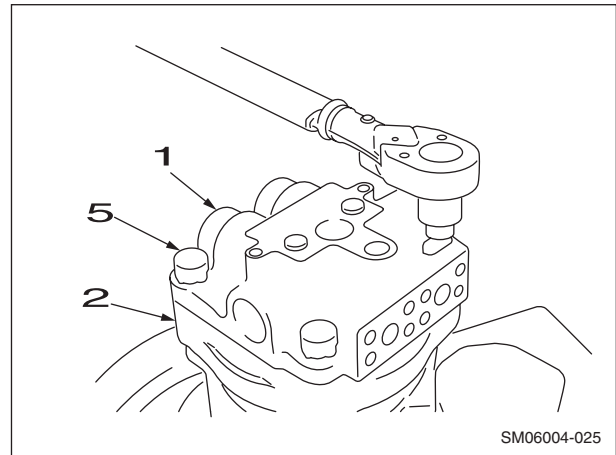


- [6] Loosen the bolts (5) and remove the cover (1) from the housing (2).

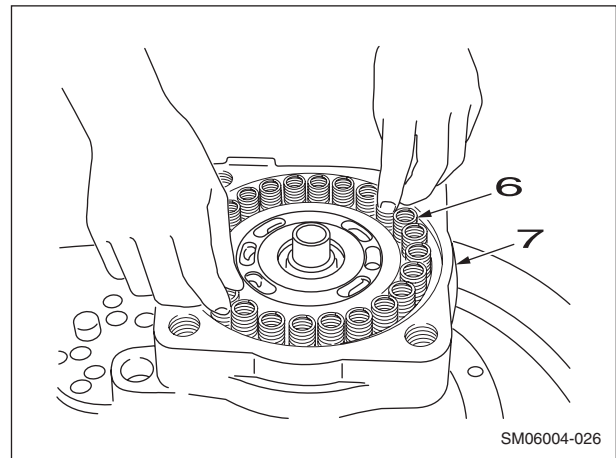
- The cover will rise up from the housing when the bolts are removed due to the force of the brake springs.

- [7] Remove the valve plate from the cover.

- Do this carefully so as not to let the valve plate fall from the cover. (The valve plate may be attached to the cylinder side.)
- When prying open the matching surface with a screwdriver, be careful not to scratch the surface.

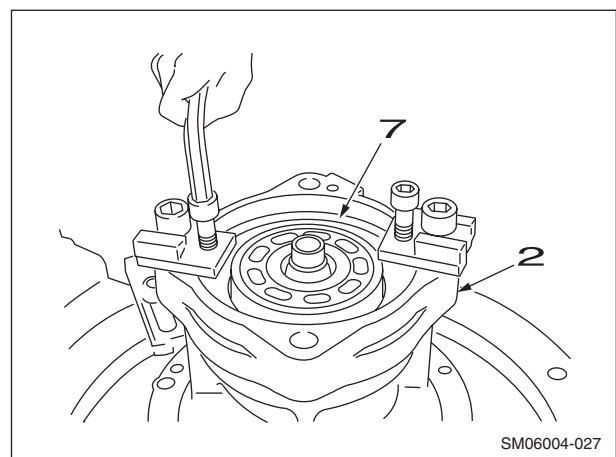


- [8] Take out the brake springs (6) from the brake piston (7).



- [9] Use a jig and remove the brake piston (7) from the housing (2).

- Apply the tips of the jig to the grooves of the brake piston, and pull straight up.



Swing Relief Cut-off Control Circuit

This control aims for an energy-saving effect by controlling the pump in such a way as to minimize the excess oil drained from the swing motor relief valve for the starting pressure boost for a independent sharp swing operation.

When a swing operation starts, due to the swing pilot pressure sensor and P1 pressure sensor input electrical signals, computer A outputs a signal to the hydraulic pump P1 flow control proportional valve.






The discharge oil from the hydraulic pump A3 is fed to the P1 flow control proportional valve.

The output signal from computer A to the P1 flow control proportional valve controls the pilot pressure to reduce the hydraulic pump A1 side discharge flow. Also, the input signal from hydraulic pump P1 pressure sensor controls the pilot pressure to gradually increase the discharge flow.

- [1] Swing relief cut-off control is executed when all the conditions below are satisfied.
 - Travel non-operation
 - Sharp independent swing operation or swing + boom-down operation
- [2] Swing relief cut-off control ends when a condition below is satisfied.
 - When swing operation is stopped
 - Travel, boom-up, arm-out/in, or bucket-open/close operation

1	Swing motor	13	Swing brake
2	Swing	14	5 stack solenoid valve
3	Cushion valve	15	Console lever lock switch
4	Right swing	16	N1 negative control pressure sensor
5	Left swing	17	P1 pressure sensor
6	Swing pilot pressure sensor	18	P1 flow control proportional valve
7	Remote control valve (arm, swing)	19	Hydraulic pump
8	Control valve	20	Horsepower control proportional valve
9	Travel pilot pressure sensor	21	P2 pressure sensor
10	Upper pilot pressure sensor	22	Check valve
11	Computer A	23	Oil cooler
12	Lever lock		

Legend

-  Pressure Line
-  Tank line
-  Pilot pressure line
-  Pilot tank line
-  Electric Line

Boom-up Circuit (compound boom-up + arm-in)

As an example, this section explains the boom-up + arm-in compound operation (leveling work).

For leveling work, the boom-up pilot pressure oil is fed to the pbu port, the swing priority variable orifice is moved to the left side and the restriction on the flow to the arm is released to smooth the arm movement.

By operating the remote control valve to the boom-up side and arm-in side, the pilot pressure oil is fed via the cushion valve to the control valve pa4 port and pb5 port and switches the boom (1) and arm (1) spools. At the same time, pressurized oil separated from the boom (1) side pilot internal path is fed from the pa8 port to the pbu port and the swing priority variable orifice spool is switched to the left side.

The discharge oil from hydraulic pump A1 enters the control valve P1 port and is fed from the parallel oil path to the boom (2) and arm (1) spools. Because the swing priority variable orifice spool in the parallel oil path is moved, the restriction on flow to the arm is released and the oil flows through the arm (1) spool and into the arm cylinder bottom side. This makes arm-in operation movement smooth.

The arm cylinder rod side return oil goes through the load holding valve check valve and the arm (1) spool and returns to the hydraulic oil tank.

The discharge oil from hydraulic pump A2 enters the control valve P2 port and is fed from the parallel oil path to the boom (1) spool. Switching the spool lets the oil flow through the boom load holding valve check valve and into the boom cylinder bottom side and the boom-up operation is carried out.






When the circuit has an HBCV, the discharge oil from hydraulic pump A2 enters the control valve P2 port and is fed from the parallel oil path to the boom (1) spool.

Switching the spool lets the oil flow through the boom load holding valve check valve and HBCV check valve and into the boom cylinder bottom side and the boom-up operation is carried out.

The boom cylinder rod side return oil goes through the boom (1) spool and returns to the hydraulic oil tank.

1	Arm cylinder	12	Arm (1)	23	Travel pilot pressure sensor
2	Arm (in)	13	Boom (2)	24	Upper pilot pressure sensor
3	Arm (out)	14	Arm load holding valve spool	25	Console lever lock switch
4	Boom (up)	15	Load holding valve check valve	26	Monitor display
5	Boom (down)	16	Regeneration release valve	27	Computer A
6	Cushion valve	17	Control valve	28	P1 pressure sensor
7	Remote control valve (boom, bucket)	18	Swing priority variable orifice	29	P2 pressure sensor
8	Remote control valve (arm, swing)	19	Arm (2)	30	Hydraulic pump
9	Lever lock	20	Boom load holding valve check valve	31	Check valve
10	Boost pressure relief	21	Boom (1)	32	Oil cooler
11	5 stack solenoid valve	22	Boom cylinder		

Legend

	Pressure Line
	Tank line
	Pilot pressure line
	Pilot tank line
	Electric Line

Bucket Circuits

Bucket-open circuit






By moving the remote control valve to the bucket-open side, the pilot pressure oil is fed via the cushion valve to the control valve pa7 port and switches the bucket spool to the open side.

The discharge oil from hydraulic pump A2 enters the control valve P2 port and is fed from the parallel oil path to the bucket spool. Switching the spool lets the oil flow into the bucket cylinder rod side and the bucket-open operation is carried out.

The bucket cylinder bottom side pressurized oil goes through the bucket spool and returns to the hydraulic oil tank.

1	Cushion valve	11	Travel pilot pressure sensor
2	Bucket (close)	12	Upper pilot pressure sensor
3	Bucket (open)	13	Console lever lock switch
4	Remote control valve (boom, bucket)	14	Monitor display
5	Lever lock	15	Computer A
6	Boost pressure relief	16	P1 pressure sensor
7	5 stack solenoid valve	17	P2 pressure sensor
8	Control valve	18	Hydraulic pump
9	Bucket	19	Check valve
10	Bucket cylinder	20	Oil cooler

Legend

	Pressure Line
	Tank line
	Pilot pressure line
	Pilot tank line
	Electric Line

Cushion Circuit (arm-out -> arm-in operation)






When the lever is operating all at once from an arm-out operation to an arm-in operation (arm rattling operation), the pilot pressure oil is fed from the remote control valve 2 port into the cushion valve A port, pushes up the internal check valve, and reaches the control valve pb5 port and pb9 port.

At the same time, the cushion valve cushion spool is switched to the right.

At this time, the oil pushed out from the pa5 and pa9 ports does not pass through the cushion orifice, but passes through the cushion spool that has been switched to the right and returns to the hydraulic oil tank, so response is improved.

1	Arm (in)	9	Control valve
2	Arm (out)	10	Arm (1)
3	Cushion spool	11	Arm (2)
4	Orifice	12	Console lever lock switch
5	Cushion valve	13	Hydraulic pump
6	Remote control valve (arm, swing)	14	Check valve
7	Lever lock	15	Oil cooler
8	5 stack solenoid valve		

Legend

	Pressure Line
	Tank line
	Pilot pressure line
	Pilot tank line
	Electric Line

2nd Option Circuit (hydraulic rotation fork)

WhenAs an example, this section explains the case in which the hydraulic rotation fork attachment is used.

By operating the 2nd option remote control valve to the right swing side, the pilot pressure oil is fed to the control valve par2 port.

The 4th hydraulic pump OUT discharge oil is fed to the control valve Pr port, goes through the 2nd option spool and flows to the hydraulic rotation fork to operate to the right swing side.






At this time, the 2nd option pilot pressure switch signal is detected and the auto idle function is released.

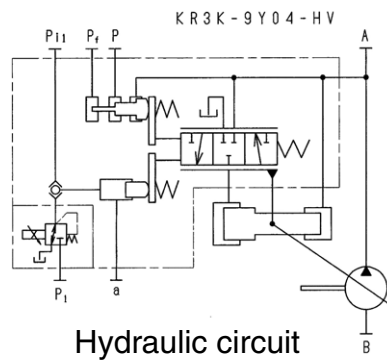
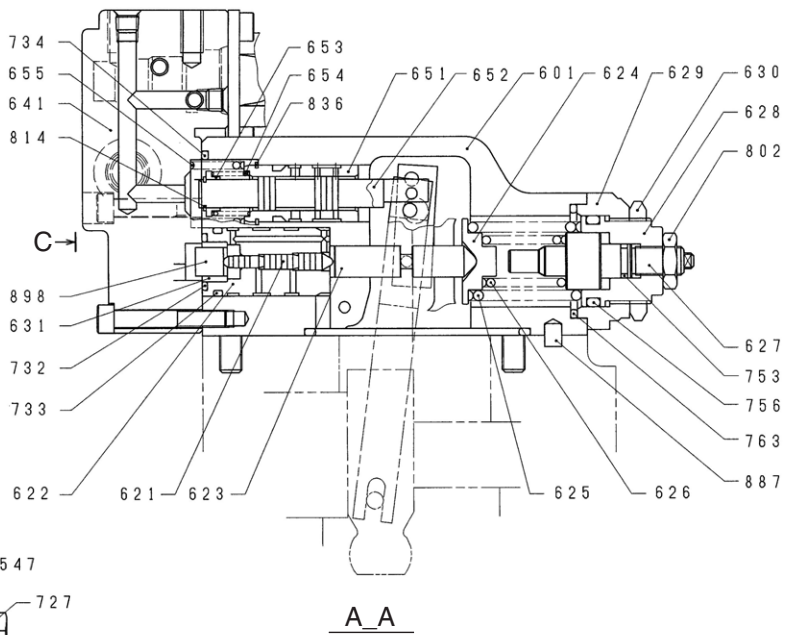
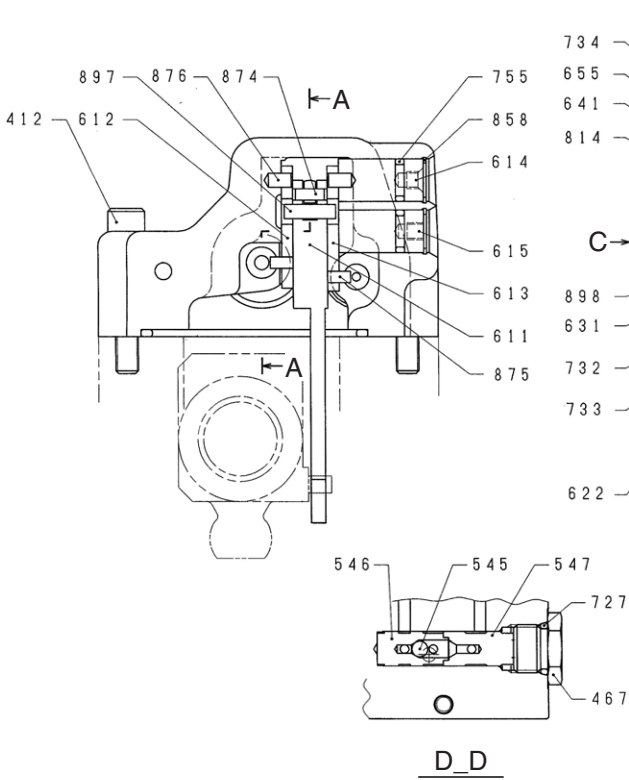
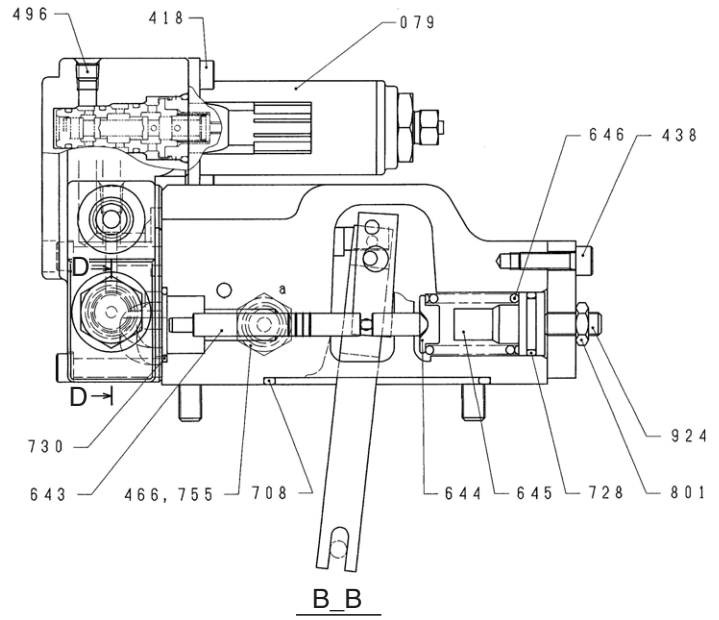
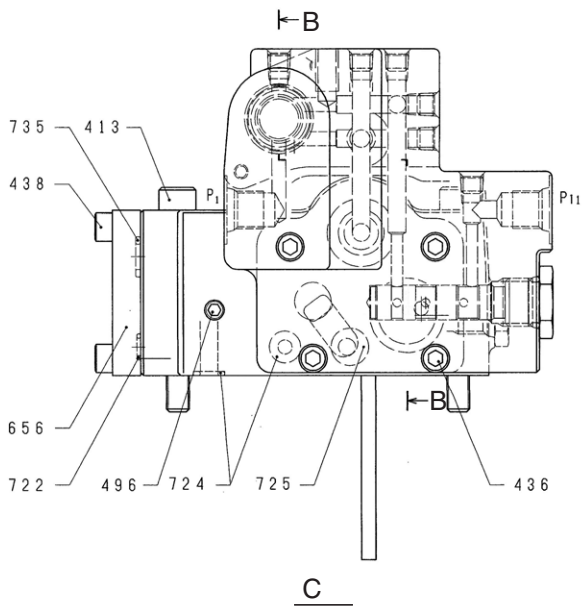
The return oil from the hydraulic rotation fork goes through the 2nd option spool and returns to the hydraulic oil tank.

The oil in the 2nd option drain line returns to the hydraulic oil tank without going through the control valve.

1	Control valve	9	Oil cooler
2	Travel pilot pressure sensor	10	Hydraulic rotation fork
3	Upper pilot pressure sensor	11	2nd option pilot pressure switch
4	Lever lock	12	Monitor display
5	5 stack solenoid valve	13	Computer A
6	Console lever lock switch	14	4th pump
7	2nd option remote control valve	15	Hydraulic pump
8	Check valve		

Legend

	Pressure Line
	Tank line
	Pilot pressure line
	Pilot tank line
	Electric Line



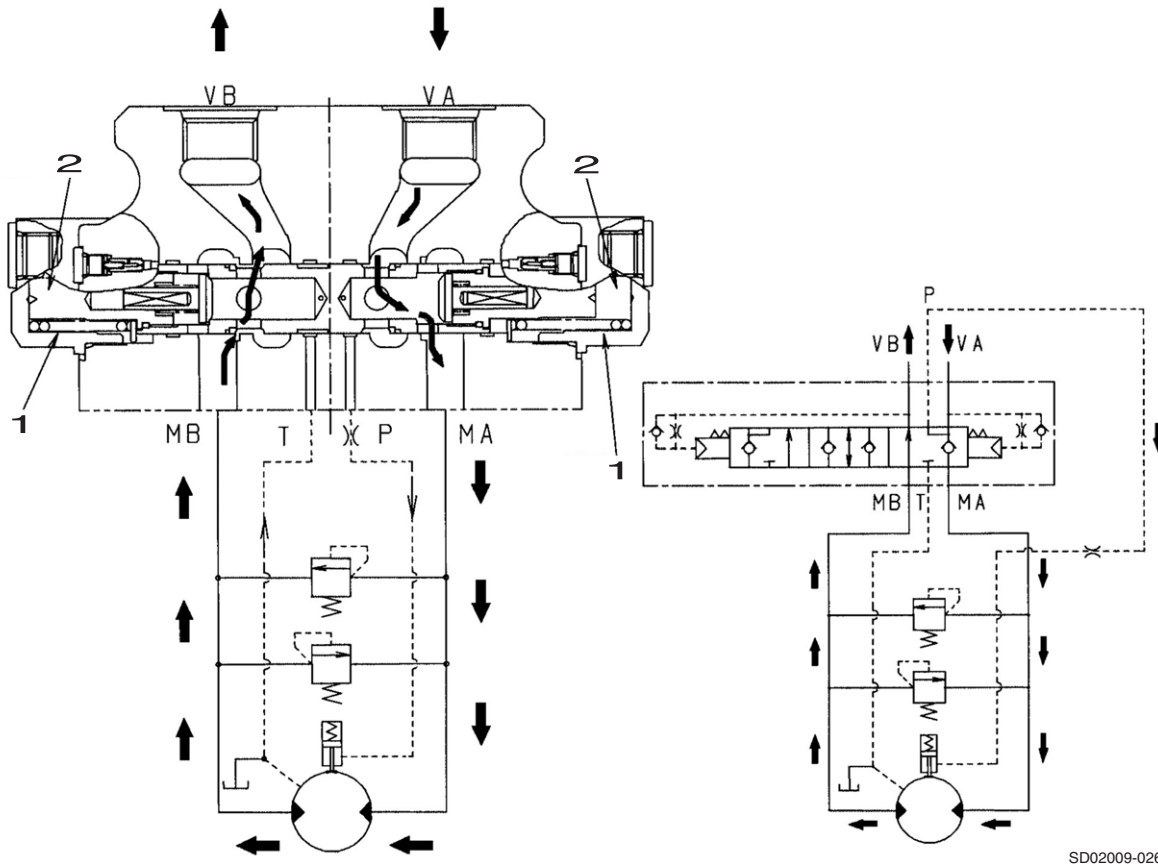
2- Acceleration operation (see diagram 10).

When the VA port connects to the hydraulic pump and the VB port connects to the tank through switching of the switchover valve, pressurized oil from the hydraulic pump pushes up the check valve within the spool from the VA port, this oil is fed to the hydraulic motor from the MA port, and this makes the hydraulic motor rotate.

Also, pressurized oil is fed to the pilot chamber on the VA port side, and the spool (26) which overcomes the spring force on the VB port side moves to the left. If this occurs, along with the MB -> VB return path being formed, pressurized oil is fed to the parking brake release line and the parking brake is released. Accordingly, the hydraulic motor rotates.

If the inertial load of the hydraulic motor is large, pressure required for acceleration is achieved with the overload relief valve set pressure and the hydraulic motor increases the rotation speed while relieving pressurized oil.

As the rotation of the hydraulic motor increases, the relief volume decreases and a constant speed is eventually achieved.



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Figure 10 Acceleration operation

1	Spring
2	Pilot chamber

2)Arm in (2 pumps flow) [Fig. 13]

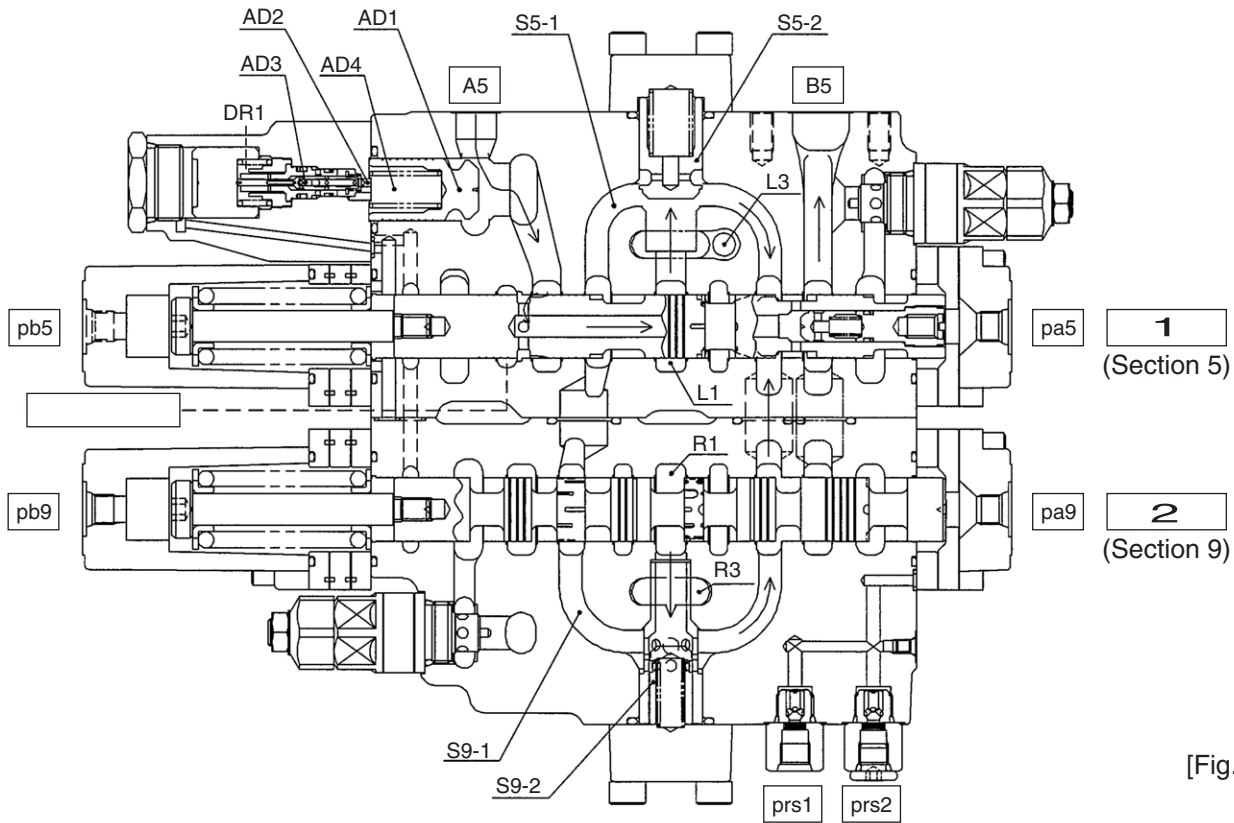
When the arm 1 spool is switched by pressurizing from the arm 1 (section 5) pilot port Pb5, the oil fed from the P1 port flows from the neutral path (L1) through the load check valve (S5-2), path (S5-1), and the spool neck section and into the B5 port. When the arm 2 spool is switched by pressurizing from the arm 2 (section 9) pilot port Pb9, the oil fed from the P2 port flows from the neutral path (R1) through the load check valve (S9-2), path (S9-1), the spool neck section, and path (6) and merges into the B5 port.

The pilot pressure applied to pb5 at this time moves the anti-drift valve spool (AD3) through the path built into the housing at the same time that the spool is switched and reduces the pressure of the spring chamber (AD4) to open the poppet (AD1). Through this movement, the cutoff of the A5 port is released before the spool is switched.

After that, the return oil from the A5 port splits into the flow through the regeneration check valve in the spool that is regenerated at the B5 port and the flow returning to the tank path (Ta) through the regeneration control valve.

(For details on the regeneration function, see the regeneration valve operation explanation in next section 3.)

Arm in (2 pumps flow)



[Fig.13]

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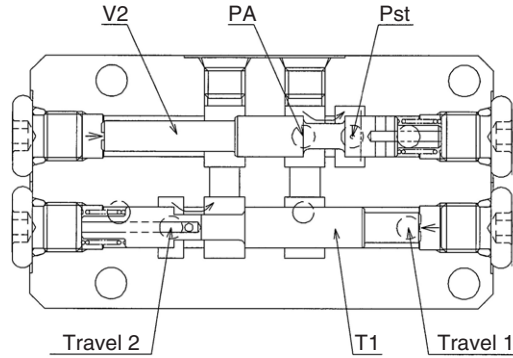
1	Arm 1
2	Arm 2

8] Straight travel signal control valve [Fig. 19, Fig. 23]

This valve integrates the pilot pressure for the spool of the front system and travel selected with each plate assembly and is used to switch the straight travel spool.

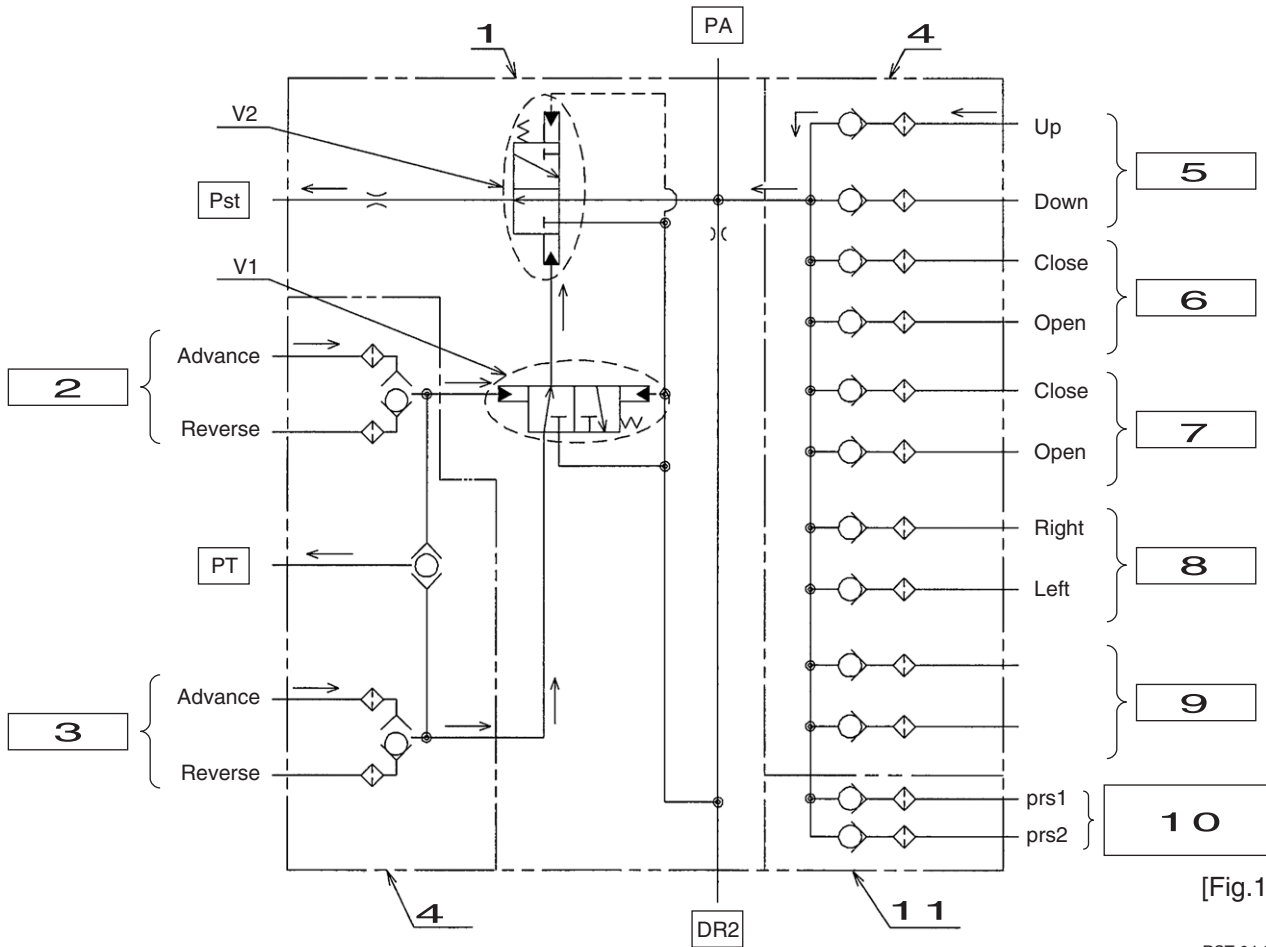
When the Travel 1 pilot pressure is pressurized, the spool [V1] is switched.

When the Travel 2 pilot pressure is pressurized at the same time, the spool [V2] can be switched. Here, when the front system pilot pressure [PA] is pressurized, the PA pressure flows into Pst and is led to the straight travel spool pilot chamber and the spool is switched.



[Fig.23]

RST-04-02-001ce



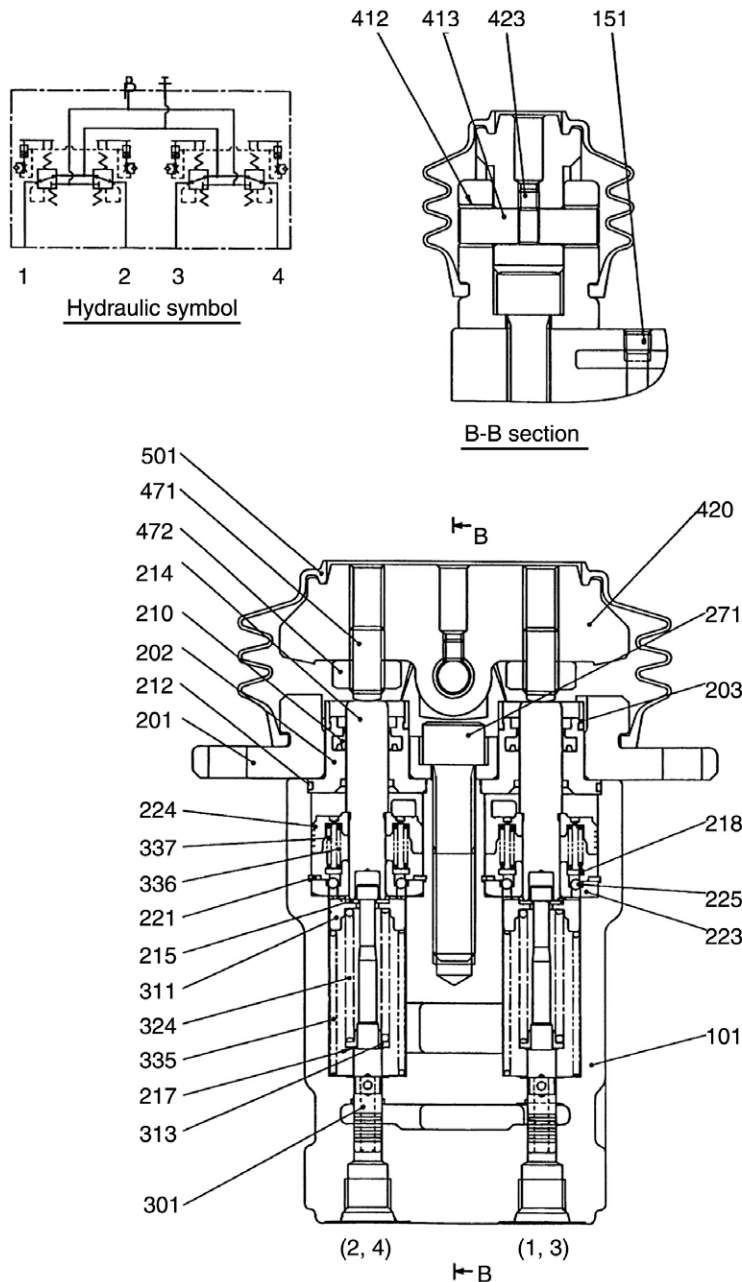
[Fig.19]

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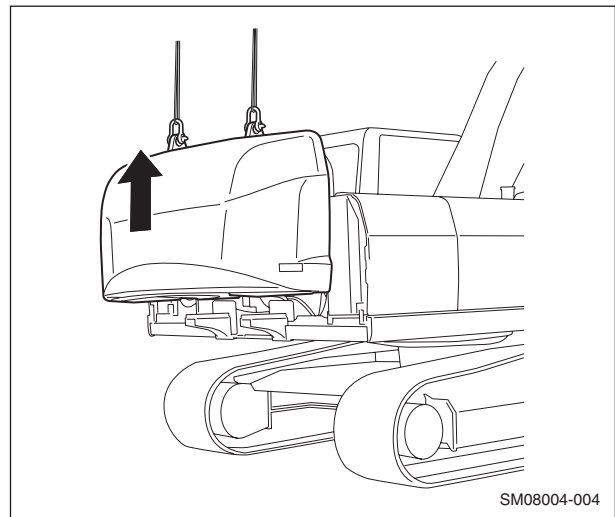
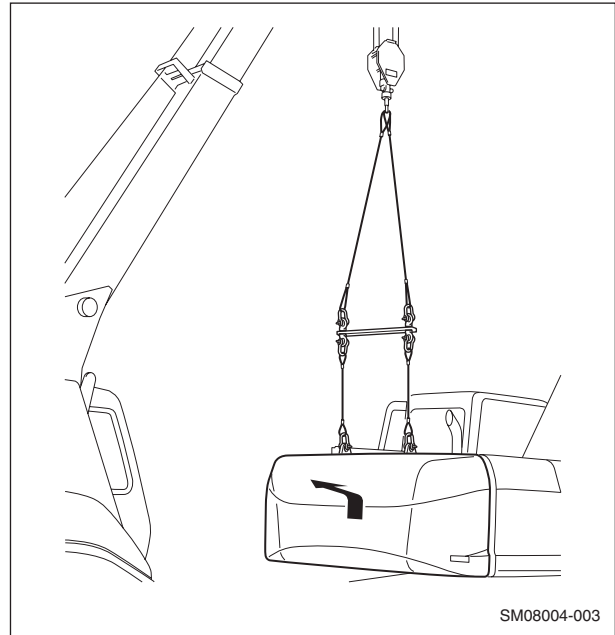
1	Straight travel signal control valve	5	Boom	9	Option
2	Travel 1	6	Arm	10	Add-on (main pump)
3	Travel 2	7	Bucket	11	Main unit housing section (option)
4	Plate assembly	8	Swing		

1) Assembly and section diagram

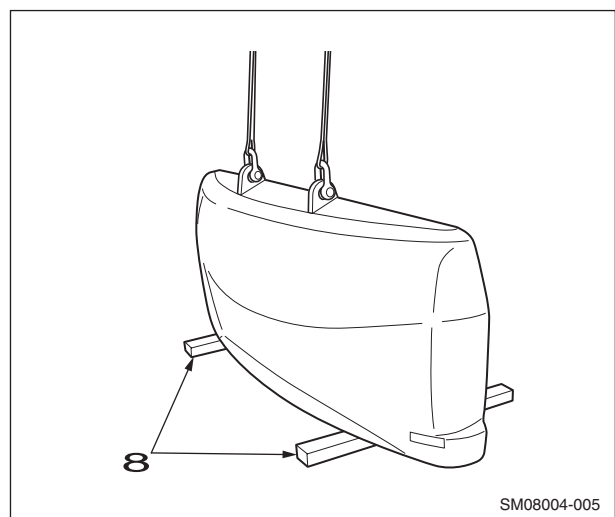
Code	Part name	Qty	Code	Part name	Qty
101	Casing	1	271	Hexagon socket head bolt	2
151	Plug	2	301	Spool	4
201	Cover	2	311	Spring seating	4
202	Plug	4	313	Washer 3	4
203	Grease cup	4	324	Spring	4
210	NHU packing	4	335	Spring	4
212	O-ring	4	336	Spring	4
214	Push rod	4	337	Spring	4
215	Washer 1	8	412	Bushing	4
217	Washer 2	4	413	Camshaft	2
218	Spring seating	4	420	Cam	2
221	Locking ring	4	423	Hexagon socket head stop screw	2
223	Bushing	4	471	Stop screw	4
224	Piston 2D085	4	472	Lock nut	4
225	Steel ball	12	501	Bellows	2



- [3] Use the wire ropes and crane to lift and remove the counterweight.
- Move the counterweight about 50 cm (1.6 ft.) to the rear while lifting it so that it does not interfere with the housing, engine parts and pipes.



- [4] Thoroughly check that the location is safe before lowering the counterweight on wood planks (8).
- Thoroughly secure the counterweight with the wire ropes and crane so that it does not fall over.



2 Installation of counterweight

Perform the reverse of the removal procedure.

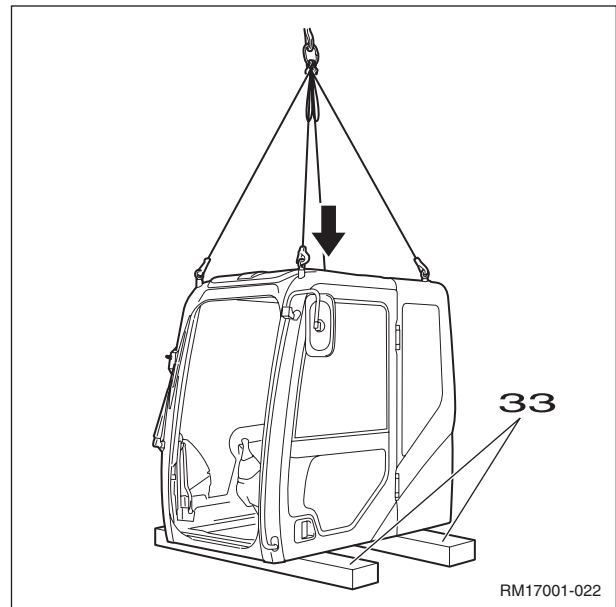
The tightening torque for the counterweight bolts is 1862 - 2058 Nm (1373 - 1517 lb. ft.)

Do not apply oil, etc. to the bolts.

9005-10

[21] Thoroughly check that the location is safe before lowering the cab on wood planks (33).

- Thoroughly secure the cab with the chains and crane so that it does not fall down.



RM17001-022

2 Installation of cab assembly

To install, perform the reverse of the removal procedure.

The tightening torque for the cab assembly installation bolts is 157 Nm (115 lb. ft.).

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