CRAWLER EXCAVATOR CX700B
SERVICE MANUAL

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** Consult the Engine Service Manual*

Printed in France
April 2010

Engine fuel, maintenance of fuel filters and fuel storage

In order to meet the emission control regulation of 3rd-stage, the engine components have been made precisely and they are to be used under high-pressure conditions.

Therefore, the specified fuel must be used for the engine.

As a matter of course, not only the guarantee will not be given for the use of a fuel other than the specified but also it may invite a serious breakdown.

In addition, since suitable specifications for the fuel filter elements have been established for this engine, use of the genuine filter is essential.

The following describes the specifications and the requirements of the fuel to be applied, and maintenance of the fuel and the fuel elements.

Fuel to be applied

Selection of fuel

Following conditions must be met for the diesel engines, that is the one;

1 In which no dust even fine one is mixed,
2 With proper viscosity,
3 With high cetane rating,
4 With good flow properties in lower temperature,
5 With not much sulfur content, and
6 With less content of carbon residue

Applicable standards for diesel fuel

Applicable Standard	Recommendation
JIS (Japanese Industrial Standard)	NO.2
DIN (Deutsche Industrie Normen)	DIN 51601
SAE (Society of Automotive Engineers)	
Based on SAE-J-313C	NO. 2-D
BS (British Standard) Based on BS/2869-197	Class A-1
EN590	

If a standard applied to the fuel for the diesel engine is stipulated in your country, check the standard for details.

Requirements for diesel fuel

Although conditions required for the diesel fuel are illustrated above, there are other requirements exerting a big influence on its service durability and service life.

Be sure to observe the following requirements for selecting fuel.

Sulfur content ..... 2500 ppm or less
HFRR* ..... 460 mm or less
Water content ..... 0.05 wt% or less

* HFRR (High-Frequency Reciprocating Rig.): An index showing lubricating properties of the fuel.

Sulfur content reacts to moisture to change into sulfuric acid after combustion.

Use of a fuel containing much sulfur content allows it to accelerate internal corrosion and wear.

In addition, much sulfur content quickens deterioration of engine oil allowing its cleaning dispersive property to be worse which results in acceleration of wear of sliding portions.

HFRR is an index that indicates lubricating property of a fuel.

Large value of the index means poor lubrication so that seizure of the machine components may result if such a fuel is used.

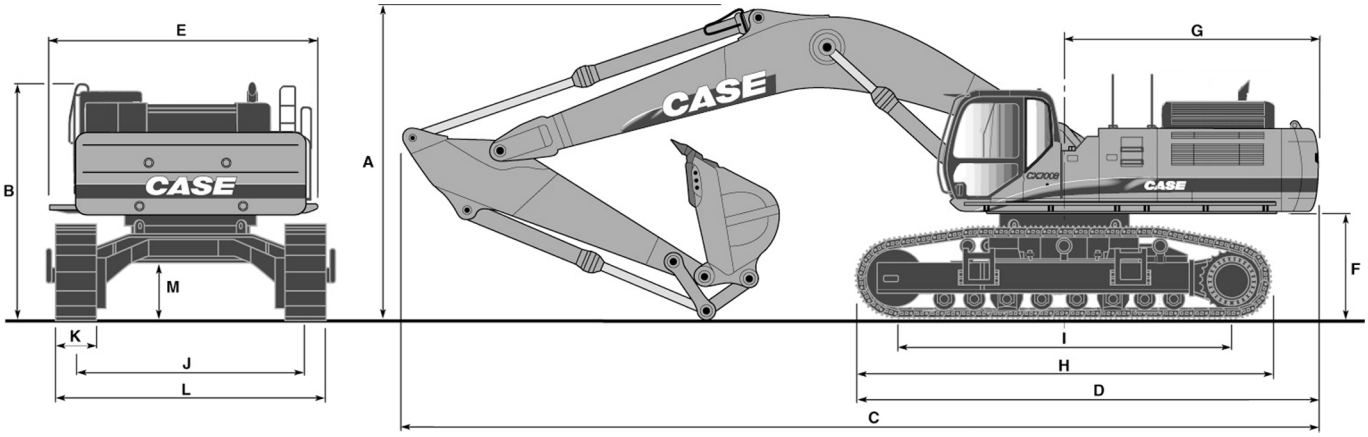
Since a fuel with high HFRR value also has lower viscosity, it can easily be leaked out.

Other component weight

Engine	Approximately 1214 kg (2676 lbs)
Air cleaner	40.3 kg (88.85 lbs)
Hydraulic pump	300 kg (661 lbs)
Control valve	430 kg (948 lbs)
Cushion valve	12.5 kg (27.56 lbs)
Swing motor and reduction gear assembly	463 kg (1021 lbs)
Travel motor and reduction gear assembly	761 kg (1678 lbs)
Rotary joint	107 kg (236 lbs)
Turtable bearing	1196 kg (2637 lbs)
5 solenoid valve bank	6.7 kg (14.67 lbs)
Hand control valve	1.9 kg (4.19 lbs)
Foot control valve	7.8 kg (17.20 lbs)
Cab	255 kg (562 lbs)
Muffler	21 kg (46.30 lbs)
Radiator total weight	680 kg (1499 lbs)
Oil cooler	215 kg (474 lbs)
Radiator	24 kg (53 lbs)
Air cooler	35 kg (77 lbs)
Fuel cooler	16 kg (35.27 lbs)
Idler wheel	611 kg (1347 lbs)
Upper roller	64 kg (141 lbs)
Lower roller	137 kg (302 lbs)
Tension damper assembly	710 kg (1565 lbs)
Recoil spring assembly	552 kg (1217 lbs)
Grease cylinder assembly	154 kg (340 lbs)
Track chains	
650 mm (25.59 in) (47 shoe)	3820 kg (8422 lbs)
750 mm (29.53 in) (47 shoe)	4230 kg (9326 lbs)
900 mm (35.43 in) (47 shoe)	4630 kg (10207 lbs)
Boom cylinder	598 kg (1318 lbs)
Arm (dipper) cylinder	757 kg (1669 lbs)
Bucket cylinder	479 kg (1056 lbs)
Fuel tank	510 kg (1124 lbs)
Hydraulic oil tank	427 kg (941 lbs)
Standard arm	2174 kg (4793 lbs)
Short arm	2115 kg (4663 lbs)
Long arm	2367 kg (5218 lbs)
Super long arm	2759 kg (6083 lbs)

MACHINE OVERALL DIMENSIONS

Standard attachment (7.70 m boom)



Dippers	3.00 m	3.55 m	4.10 m	5.00 m
(A)	4.37 m	4.30 m	4.47 m	5.16 m
(B)	3.79 m	3.79 m	3.79 m	3.79 m
(C)	13.25 m	13.29 m	13.30 m	13.17 m
(D)	6.91 m	6.91 m	6.91 m	6.91 m
(E)	3.99 m	3.99 m	3.99 m	3.99 m
(F)	1.51 m	1.51 m	1.51 m	1.51 m
(G)	3.97 m	3.97 m	3.97 m	3.97 m
(H)	5.88 m	5.88 m	5.88 m	5.88 m
(I)	4.70 m	4.70 m	4.70 m	4.70 m
(J)*	3.25 m	3.25 m	3.25 m	3.25 m
(J)**	2.74 m	2.74 m	2.74 m	2.74 m
(K) (standard pads)	0.65 m	0.65 m	0.65 m	0.65 m
(L)* (with 650 mm pads)	3.90 m	3.90 m	3.90 m	3.90 m
(L)** (with 650 mm pads)	3.39 m	3.39 m	3.39 m	3.39 m
(L)* (with 750 mm pads)	4.00 m	4.00 m	4.00 m	4.00 m
(L)** (with 750 mm pads)	3.49 m	3.49 m	3.49 m	3.49 m
(L)* (with 900 mm pads)	4.15 m	4.15 m	4.15 m	4.15 m
(L)** (with 900 mm pads)	3.64 m	3.64 m	3.64 m	3.64 m
(M)	0.83 m	0.83 m	0.83 m	0.83 m

NOTE: ** (working position) ** (transport position)*

Section

2001

REMOVAL AND INSTALLATION OF THE FUEL-COOLER, ENGINE INTER-COOLER, RADIATOR AND OIL-COOLER

February 2009

REMOVAL AND INSTALLATION OF TURBO CHARGER

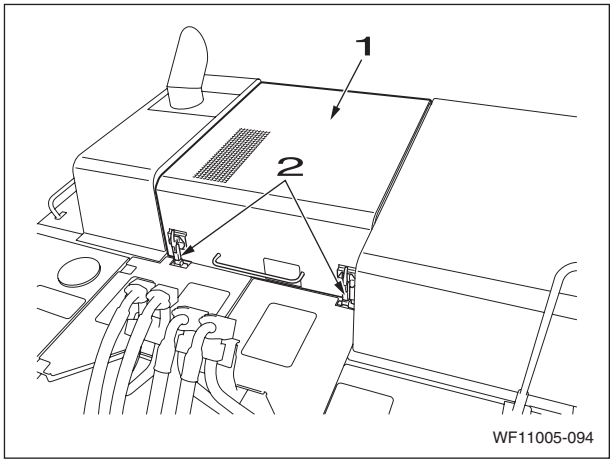
Caution:	The turbo charger is extremely hot just after stopping the engine. Wait for them to sufficiently cool before beginning work.

Caution:	Be sure to stop the engine before beginning work.

1 Removal of turbo charger

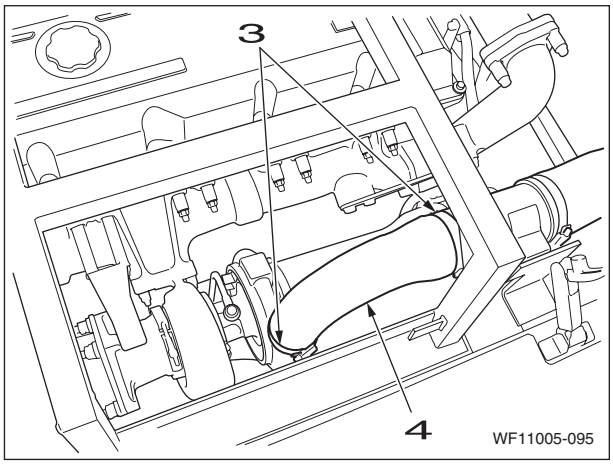
The engine oil line and coolant line will be removed, so either drain the engine oil and coolant beforehand or use stoppers on the ends of the lines to prevent leaking.

[1] Release the 2 lock levers (2) and open the center engine hood (1).



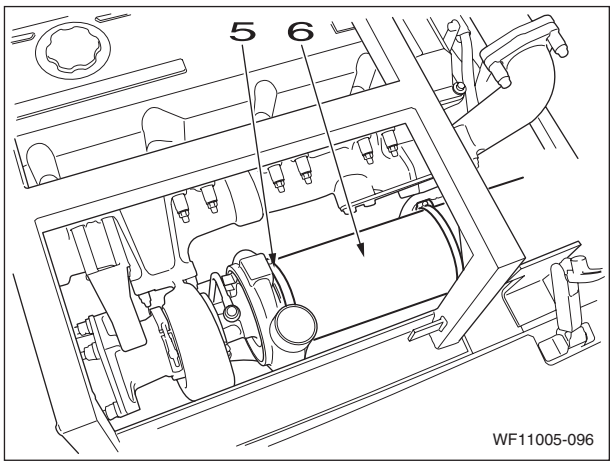
[2] Loosen the hose bands (3), and then remove the air hose (4).

- Use caps to cover the turbo charger and the hose to prevent any entry of water, dust or dirt.

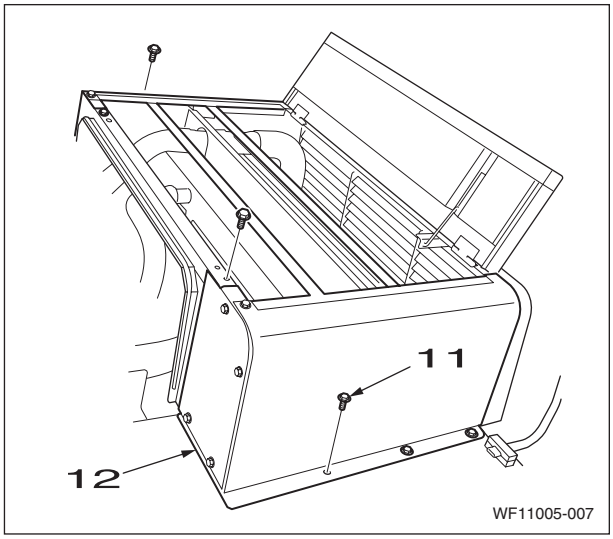


[3] Loosen the hose bands (5), and then remove the hose (6).

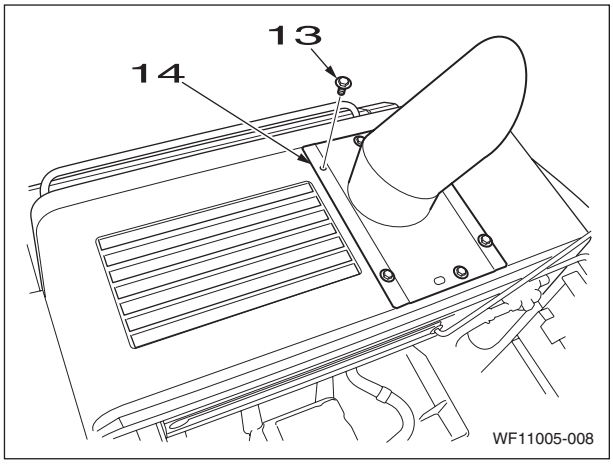
- Use caps to cover the turbo charger and the hose to prevent any entry of water, dust or dirt.



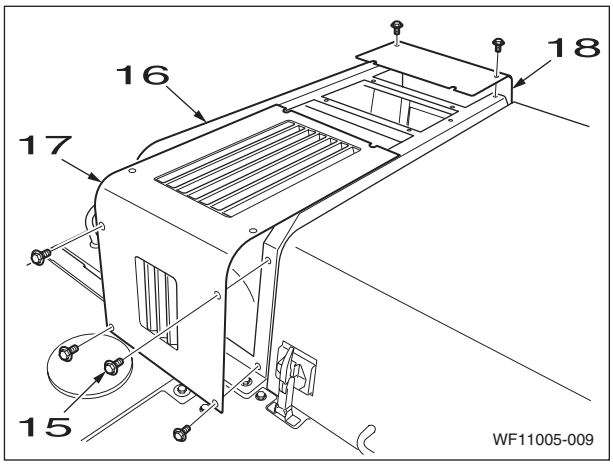
[6] Use a wrench to remove the bolts (11) and washers, then remove the engine hood (left) (12).



[7] Use a wrench to remove the bolts (13) and washers, then remove the pipe tail (14).



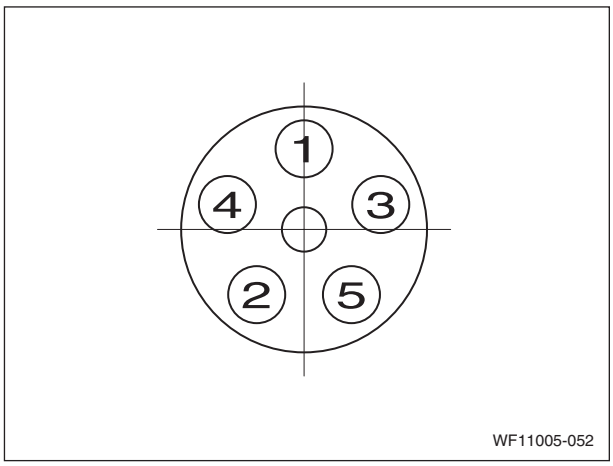
[8] Use a wrench to remove the bolts (15), then remove the engine hood (right) (16) covers (17) (18).



2 Installation of supply pump

[1] Attach the gear to the gear assembly shaft.

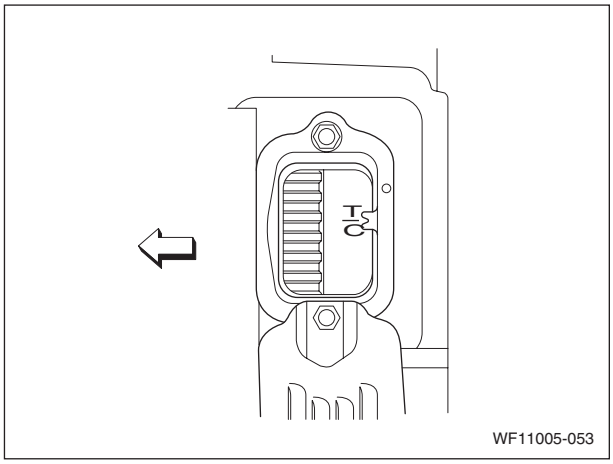
- Apply molybdenum disulfide to the bolt thread sections and seating surfaces, then tighten them to the specified torque in the order shown in the figure. Tightening torque: 39 Nm.



WF11005-052

[2] Turn the crankshaft forward and align flywheel mark line with the timing pointer so that the 1st cylinder comes to its compression top dead center.

- Check that there is clearance at the suction and exhaust valves of the 1st cylinder.



WF11005-053

[3] nstall the pointer (2) on the gear assembly (1).

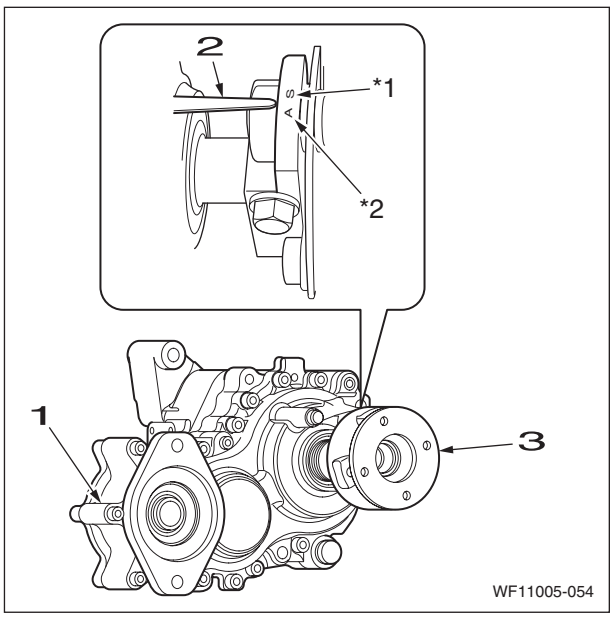
[4] Set the O-ring on the gear case installation section.

[5] Attach the coupling (3) aligning with the gear assembly shaft.

- Set the coupling aligning the pointer and the coupling stamp "A" (*2). After the coupling has been set, the coupling "S" (*1) mark position and the pointer tip are aligned.

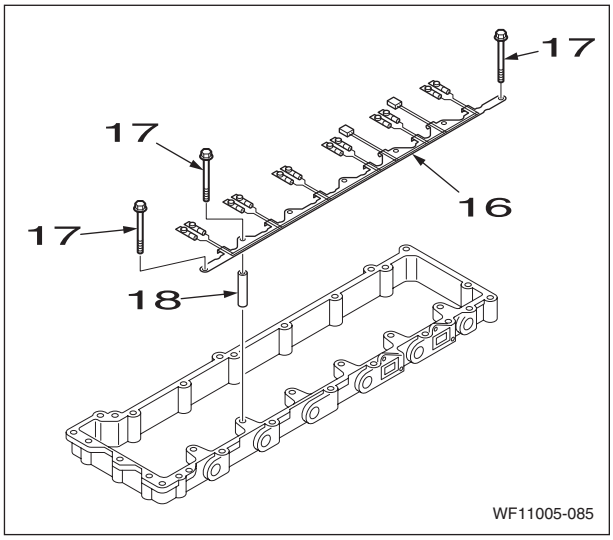
[6] Turn the shaft slightly and mesh with the gear, then insert completely until it fits fast in the gear case.

- Check that the pointer and coupling stamp "S" (*1) are aligned. If they are not aligned, the gear teeth are out of place, so redo.

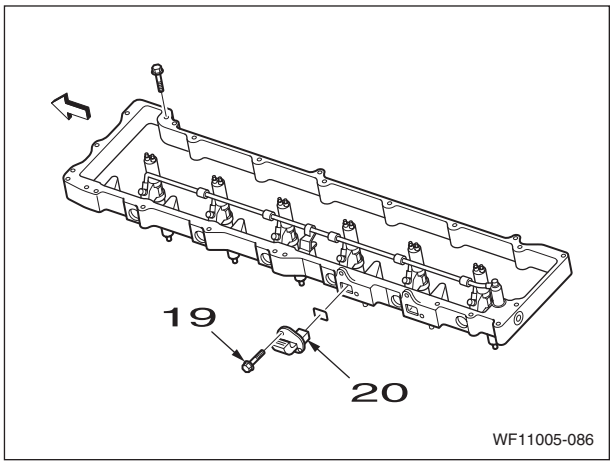


WF11005-054

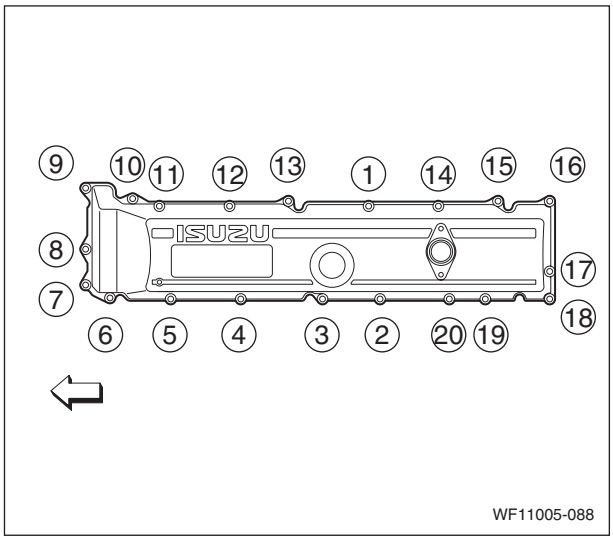
[5] Install the injector harness (16) and the spacer (18) with the bolts (17).
Tightening torque: 22 Nm

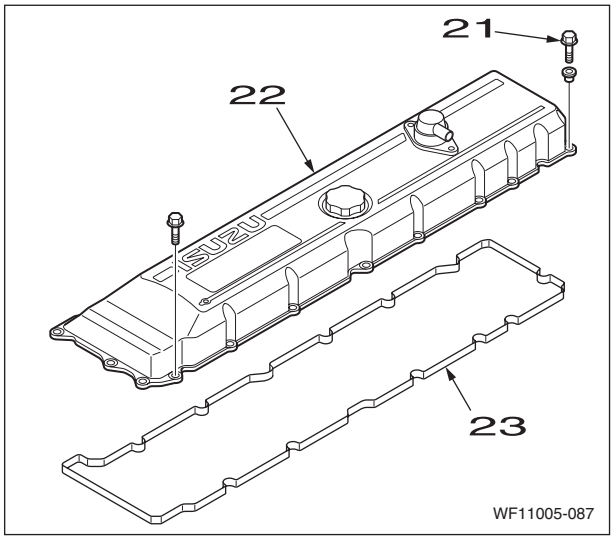


[6] Install the connector (20) with the bolt (19).

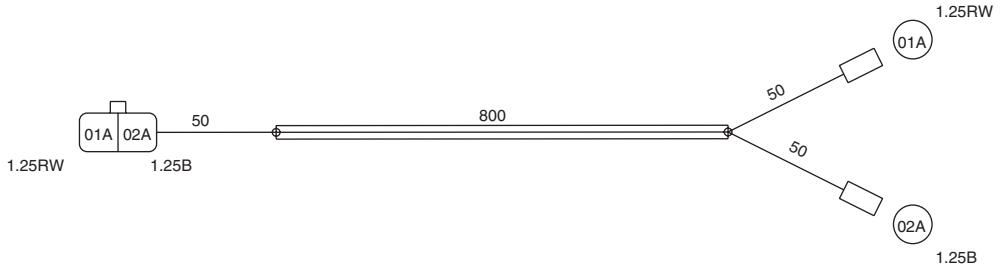


[7] Install the head gasket (23) on the cylinder head cover (22) and tighten them with each of the bolts (21).
Tighten them in the order shown in the figure.
Specified torque: 18 Nm



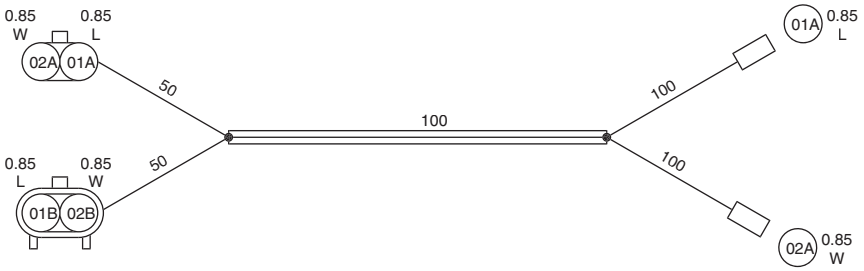


30)For fan motor reverse valve (2P) - CX460 to CX800



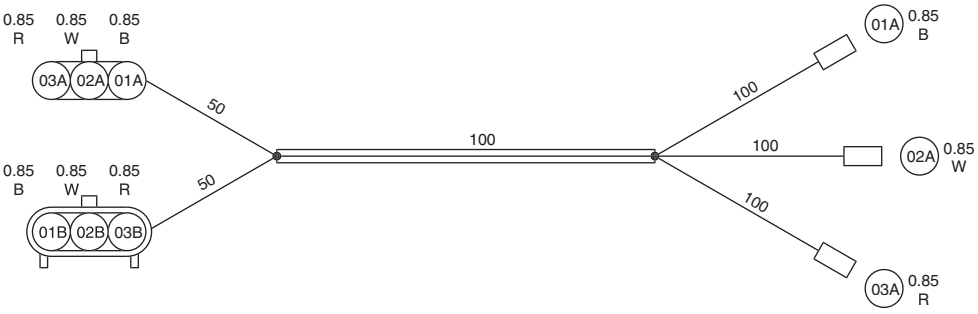
KHP11050

31)For Solenoid valve and fuel sensor (2P)



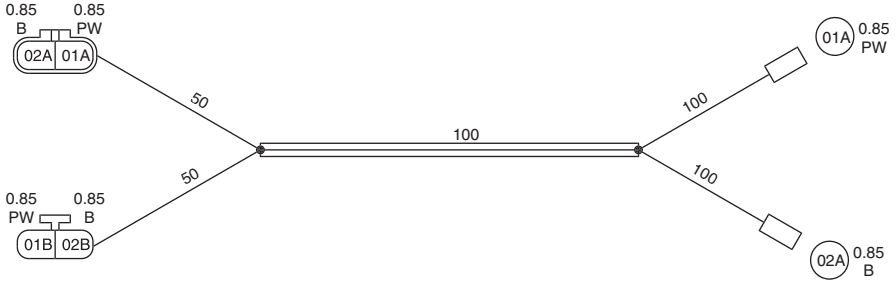
KHP13650

32)For angle sensor (3P)



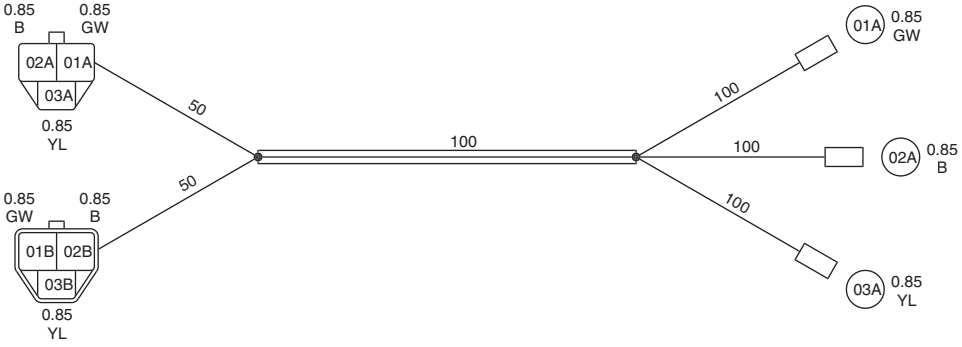
KHP13660

33)For fuel feed pump (2P)



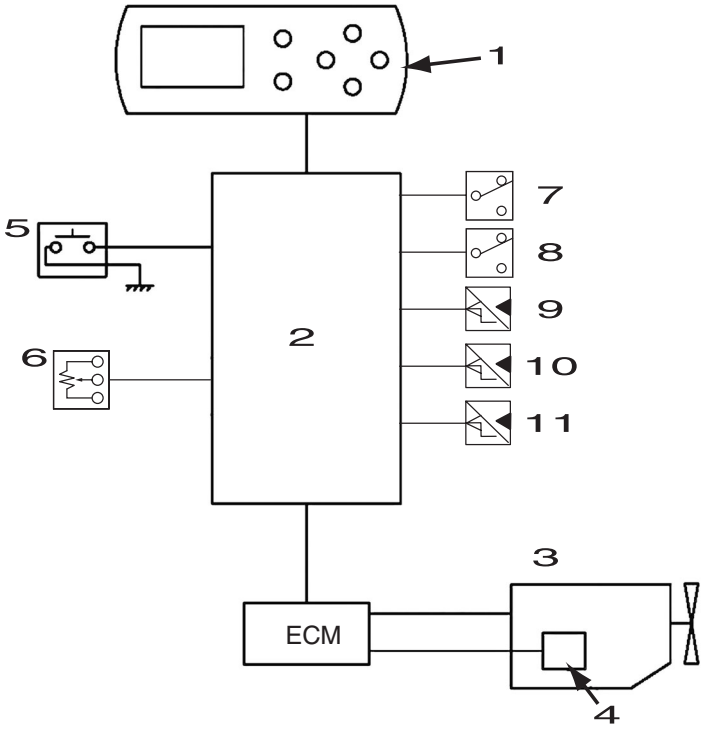
KHP13670

34)For fuel pump harness (3P)



KHP13680

2. Idling Control (auto / one-touch)



RE06009-002

1	Monitor display	**5**	One-touch idle switch	**9**	Pressure sensor (upper)
2	Computer A	**6**	Throttle volume	**10**	Pressure sensor (swing)
3	Engine	**7**	1st option pressure switch	**11**	Pressure sensor (travel)
4	Coolant temperature sensor	**8**	2nd option pressure switch	**ECM**	Engine Control Module

Operation explanation:

a) Auto / one-touch switchover function

The operator can switch between one-touch and auto by pressing the auto idle switch on the monitor in the figure below.

When auto idle is ON, the LED at the side of the switch lights up.

b) Auto idle control (A)

1. When auto idle is set, if the lever is left continuously unoperated for 5 seconds, the engine speed automatically becomes the auto idle speed (1200 min^{-1}).

This five-second setting for auto idle operation is the default setting value. This setting can be changed to from 1 to 30 seconds with service support operations.

2. When the lever is operated, the engine speed is automatically returned to the engine speed set for the throttle volume.

3. Even with auto idle set, it is possible to move to auto idle or return from auto idle by pressing the knob switch (one-touch idle switch) on the right operation lever.

c) One-touch idle control

When auto idle is not set, regardless of lever operation, it is possible to move to auto idle or return from auto idle by pressing the knob switch (one-touch idle switch) on the right operation lever.

The idling speed for one-touch idle control is 900 min^{-1}.

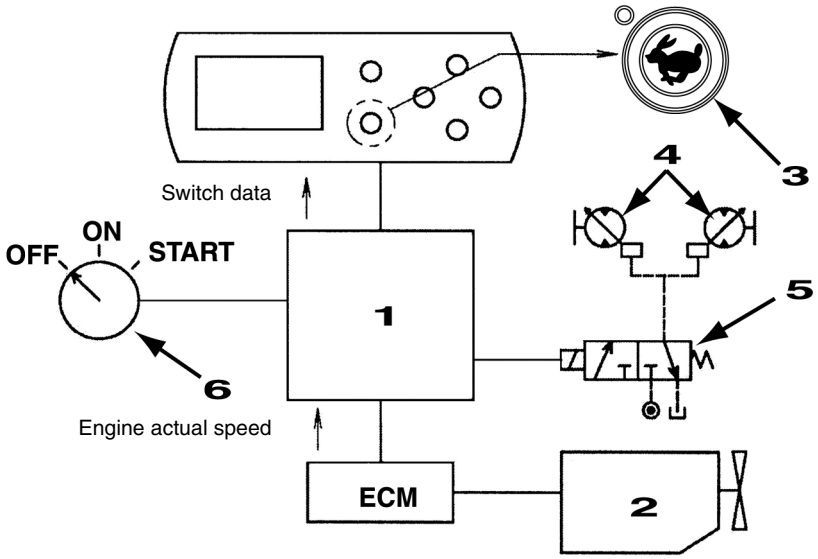
Travel

1. Travel Speed Switchover

The travel motor tilting angle is changed by switching the travel speed between low speed and high speed with the switch.

However, in high-speed mode, if the drive pressure becomes high due to the functioning of the travel motor itself, the tilting angle is automatically switched to low speed.

After that, when the drive pressure becomes low, the slope automatically returns to high speed.



1	Computer A	**4**	Travel motor
2	Engine	**5**	Travel high-speed solenoid
3	Travel high-speed select switch	**6**	Key switch

a) Operation

1. When the key is ON, the speed becomes low speed. The previous travel mode is reset.
(If the service support operation is changed, it is possible to hold the previous data).

2. Each time the travel high-speed switch is pressed, the speed is switched between low speed and high speed. During high speed, the LED at the top left of the switch lights up.

3. While the engine is stopped with the key ON, if the travel high-speed switch is pressed, the solenoid does not operate. The LED lights up.
(To prevent the battery being run down).

4. In high-speed mode, the tilting angle is automatically switched between low speed and high speed by the travel motor drive pressure.
However, the electrical control remains at high speed, the high-speed LED remains lit, and the solenoid remains ON.

2. Working Light

Basic operation

a) When turning the key to ON, always start with the working light OFF (Previous data reset).

b) Each time the working light switch is pressed, the working light is switched between ON and OFF (Momentary). When this light is ON, the LED indicator lights up.

c) Communication with computer A

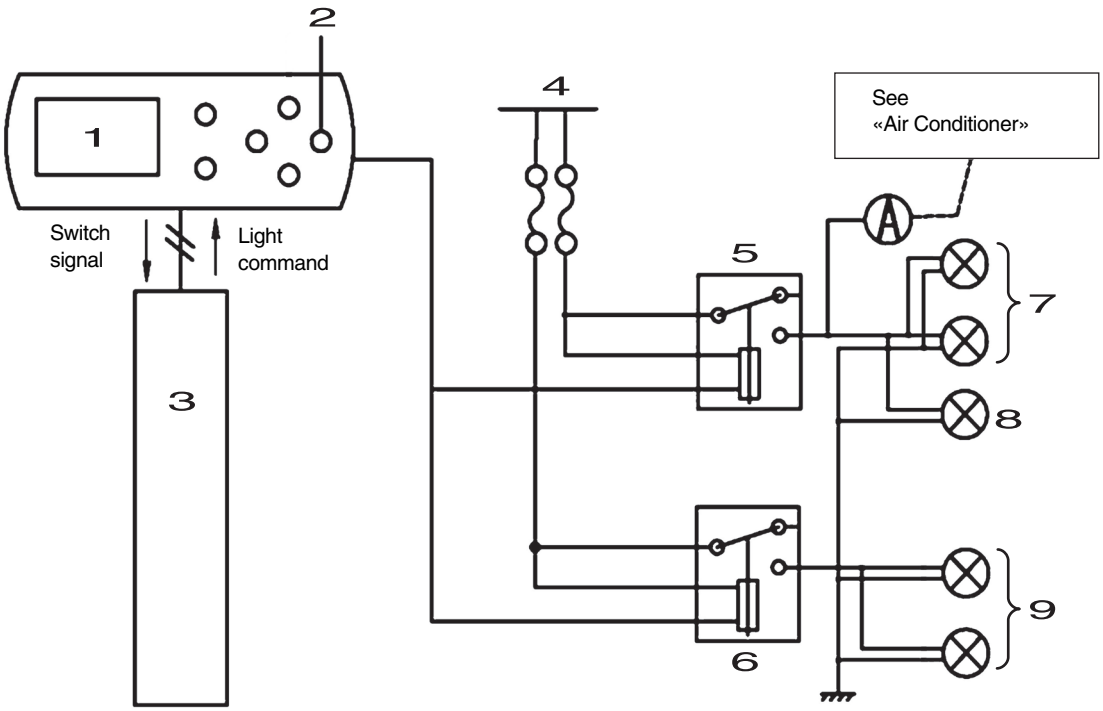
When the working light switch is pressed, the signal is first sent to the computer A and processed. Then, the light command is sent to the monitor and the monitor drives the relay.

d) Trouble mode

If there is an abnormality occurs in UART communication, the monitor goes into trouble mode.

In trouble mode, the monitor carries out the operation in **b)** on its own rather than commands from the computer A.

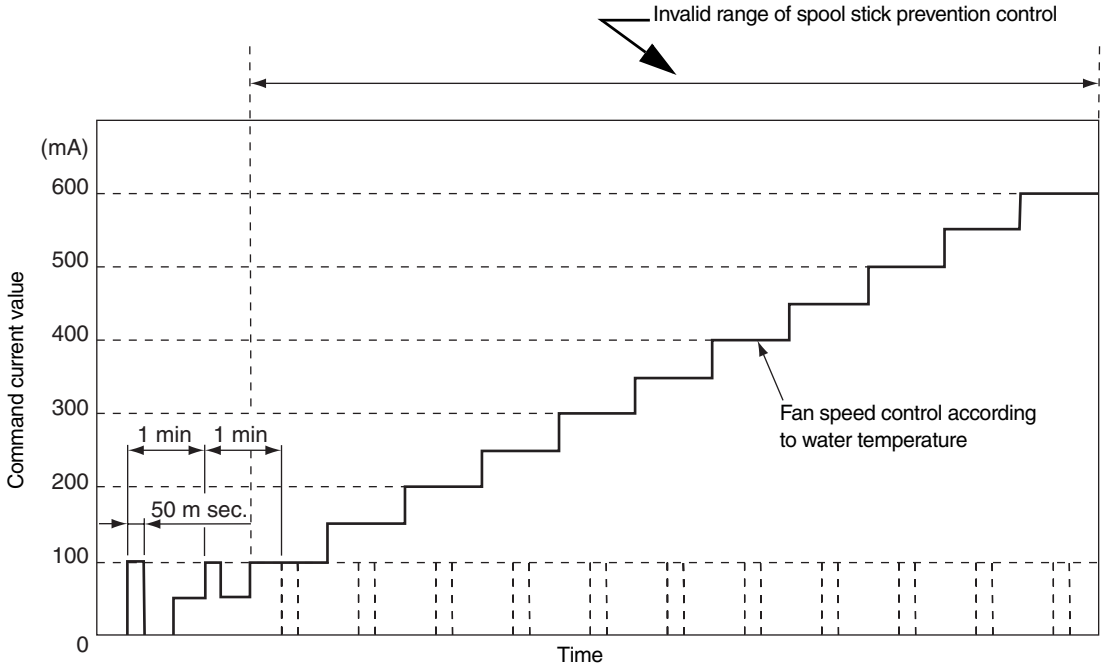
When the communication error is recovered from, trouble mode is exited and the monitor returns to normal mode.



WE06010-008

1	Monitor panel	**6**	Working light relay (cab)
2	Working light switch (with LED indicator)	**7**	Working light (boom)
3	Computer A	**8**	Working light (tool etc.)
4	Key switch	**9**	Working light (cab top)
5	Working light relay (upper)		

b) Time chart



700-1-04-01-21bd

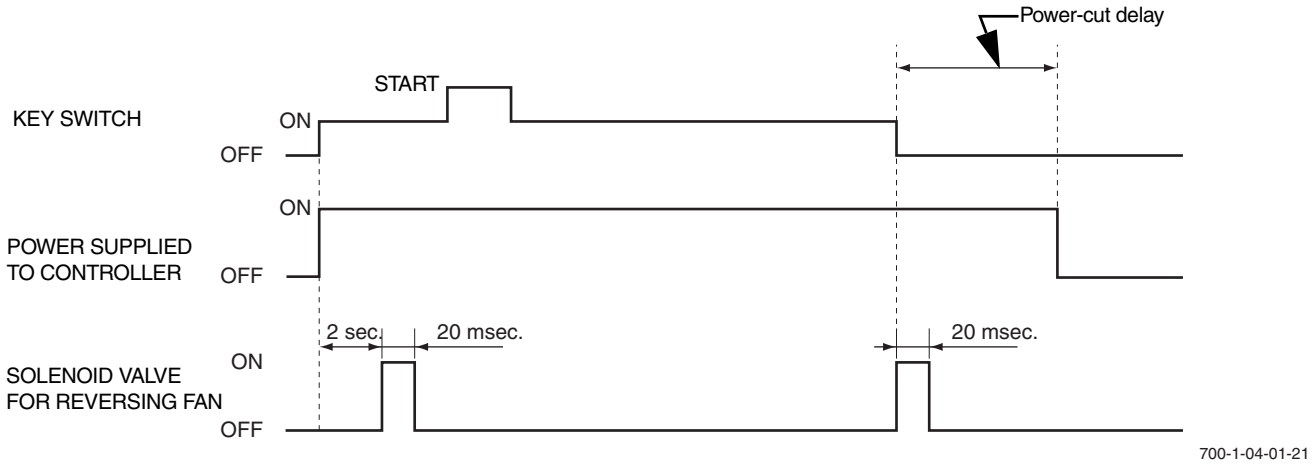
Solenoid valve for reversing fan Spool stick prevention control

a) Outline

Engine key ON/OFF mode

1. When the key switch is turned ON and 2 seconds have passed, spool stick prevention signal is delivered from «PNP out 5» in the computer A for a certain period of time (20msec.).
2. When the engine is started within 2 seconds after the key switch has been turned ON, the spool stick prevention signal stated above will not be delivered.
3. Similarly, after the key switch has been turned OFF too, the spool stick prevention signal is delivered from «PNP out 5» in the computer A for a certain period of time (20msec.).

b) Time chart

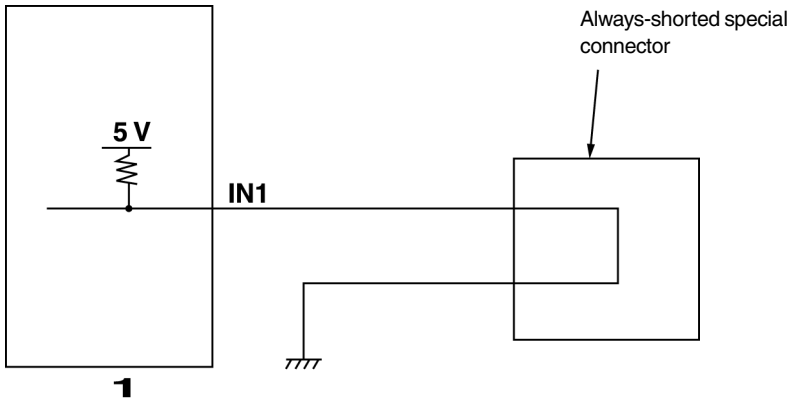


700-1-04-01-21

e) Solution for machines with no breaker setting

Machines with no breaker setting in accordance with **c)** (= machines with no return filter clog pressure switch)

Even with these machines, filter clogs would be detected. In order to prevent this, a special connector is set that is always shorted.



1	Computer A

f) Disconnection detection

When the key is ON, if IN1 was OFF before the engine was started, the situation is judged to be a disconnection abnormality.

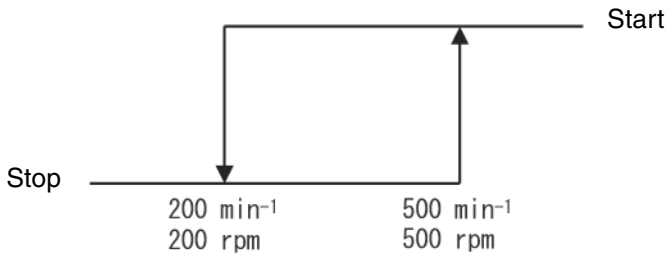
5. Engine Start/Stop Judgment

Engine start and stop is judged based on the engine speed sent from the ECM with CAN communication.

Judgment values

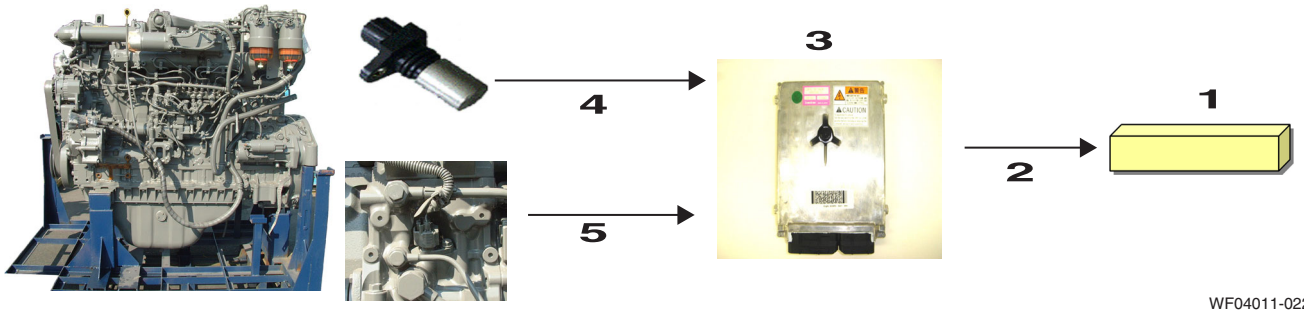
Start: 500 min^{-1}

Stop: 200 min^{-1}



RST-06-04-001v01

Configuration diagram



WF04011-022

1. Computer A
2. Engine speed
3. ECM
4. CKP sensor signal
5. CMP sensor signal

2. Displays the time at which the trouble under the cursor first occurred

1st	0010	hr

...Occurred first at 10 hours

3. Displays the time at which the trouble under the cursor last occurred

Last	0901	hr

...Occurred last at 901 hours

4. Diagnostic trouble code

The troubles are sorted with the last one to occur at the top of the list.

The diagnostic trouble code under the cursor is displayed in (1) - (3).

DTC1	7002
DTC2	0238
DTC3	----
DTC4	----

...7002 (faulty N1 pressure sensor)

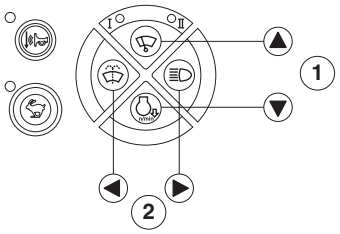
...0238 (Boost pressure sensor abnormally high voltage)

For details on diagnostic triuble code, see the Main Unit Diagnostic Trouble Code List.

Maximum display count

4 codes per page X 16 pages = 64 diagnostic trouble codes are displayed. From the 65th code onward, the oldest code is erased. However, even though these codes are not displayed, the data is retained.

B) Operation



1) Cursor up/down:
Up operation ... wiper switch
Down operation ... auto idle switch

2) Page forward / back:
Forward operation ... light switch
Back operation ... washer switch

C) Reset

If the washer switch and the light switch are held down for 10 seconds, the trouble log is reset.

2. The flow setting for the selected mode is selected by pressing the wiper switch or auto idle select switch. The flow setting can be set to 10 levels from Level 1 to Level 10.

CAUTION: *The set flow is the flow value when SP mode is selected.*
Be careful. If run with the engine speed reduced, the actual flow is not the flow displayed.

	Unit	
1 pump flow (flow Level 1)	L / min	285
1 pump flow (flow Level 2)	L / min	262
1 pump flow (flow Level 3)	L / min	233
1 pump flow (flow Level 4)	L / min	205
1 pump flow (flow Level 5)	L / min	176
1 pump flow (flow Level 6)	L / min	148
1 pump flow (flow Level 7)	L / min	119
1 pump flow (flow Level 8)	L / min	91
1 pump flow (flow Level 9)	L / min	62
1 pump flow (flow Level 10)	L / min	49
2 pumps flow (flow Level 1)	L / min	571
2 pumps flow (flow Level 2)	L / min	547
2 pumps flow (flow Level 3)	L / min	519
2 pumps flow (flow Level 4)	L / min	490
2 pumps flow (flow Level 5)	L / min	462
2 pumps flow (flow Level 6)	L / min	433
2 pumps flow (flow Level 7)	L / min	405
2 pumps flow (flow Level 8)	L / min	376
2 pumps flow (flow Level 9)	L / min	348
2 pumps flow (flow Level 10)	L / min	335

3. There is no need to do anything to finalize the setting. End by leaving this screen or switching OFF the key.

The factory settings for each mode are as follows.

There are no 4 or 5 settings for the breaker or crusher. Just a hyphen is displayed for these settings.

Mode	Flow display
Breaker circuit 1 / Crusher 1	Level 3 flow
Breaker circuit 2 / Crusher 2	Level 5 flow
Breaker circuit 3 / Crusher 3	Level 7 flow
Breaker circuit 4 / Crusher 4	(Not used)
Breaker circuit 5 / Crusher 5	

Trouble location	Trouble mode	Diagnostic trouble code		Judgment timing	Prerequisites	Occurrence judgment	Recovery judgment
		DTC	Dis-play			Conditions	Conditions
Sensor; Angle (Offset)	Ground short/ disconnection	7062	O	Immediately after key switched ON	Liftcrane or interference prevention selected	Voltage ≤ 0.2 V	0.2 V < Voltage < 4.8 V
	Power supply short					Voltage ≥ 4.8 V	
Pressure switch return filter clog	Disconnection	7063	O	From immediately after key switched ON until engine starts	None	Pressure switch = OFF	Pressure switch = ON

For items for which X is displayed, the “ELEC. PROBLEM” message is not displayed. Also, there is no DTC display on the user screen.
However, the DTC is recorded on the service (DIAG) screen.

2. EPF (engine protection feature)

This feature controls the engine speed or stopping when the coolant temperature rises, the boost temperature rises, or the oil pressure drops.

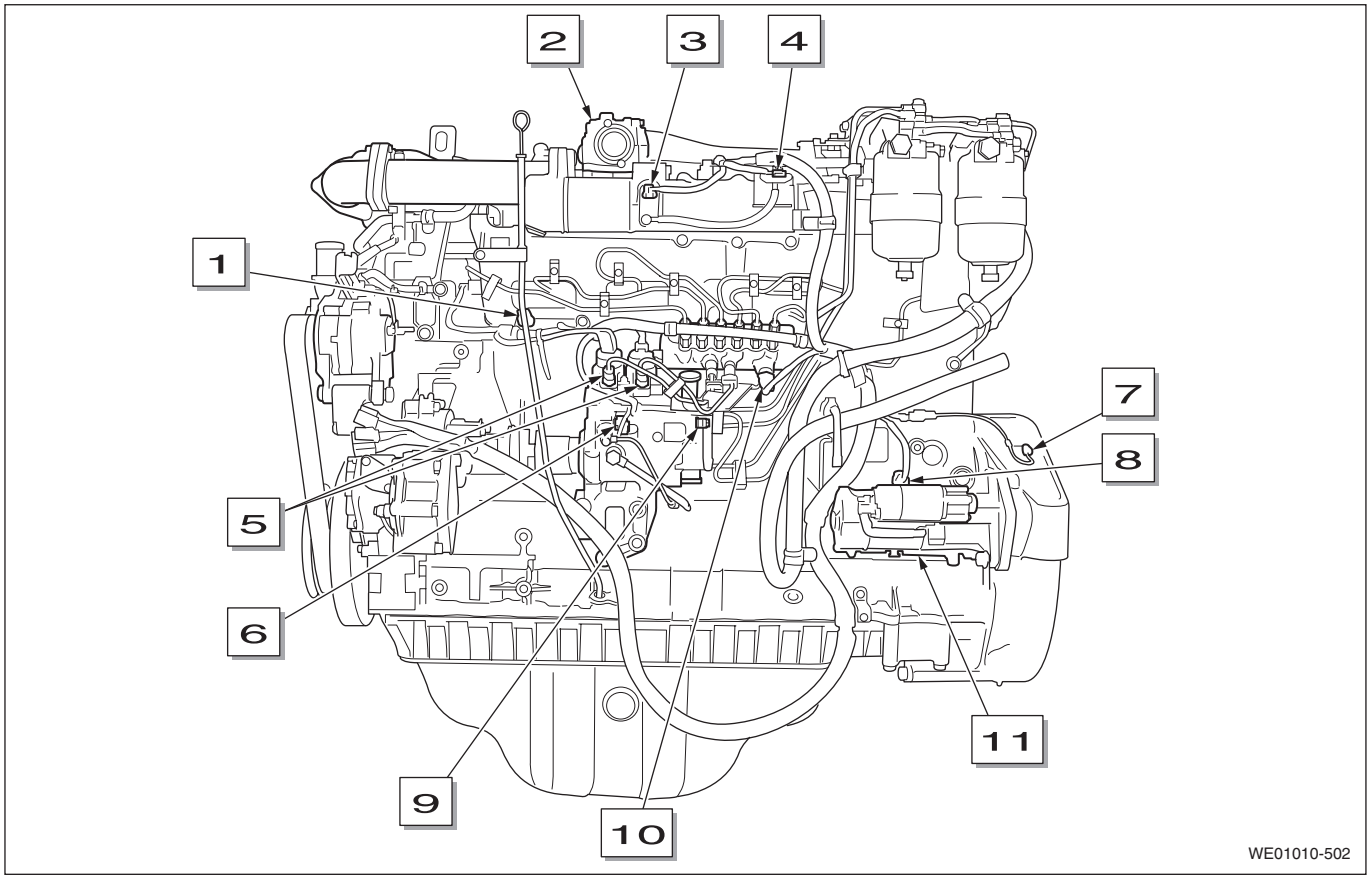
Trouble state:

Recovered = State in which trouble recovered from during the key ON cycle

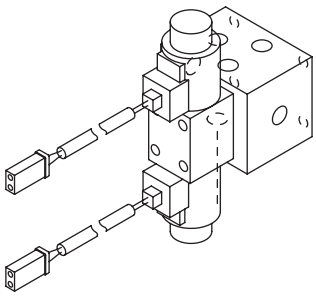
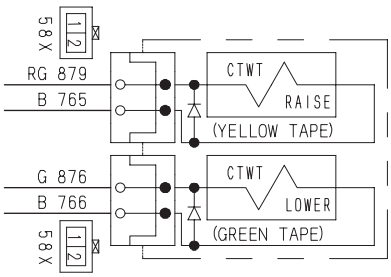
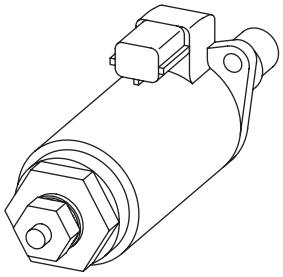
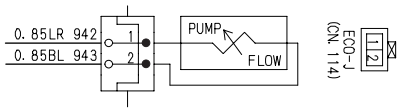
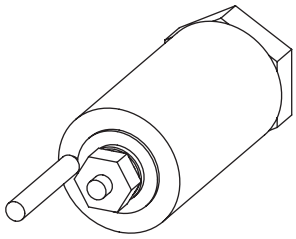
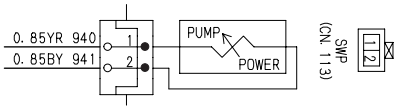
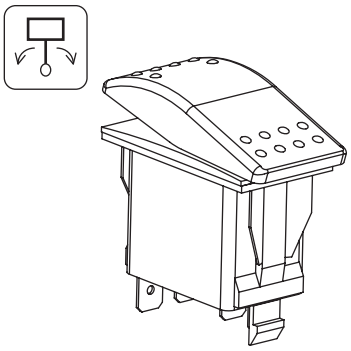
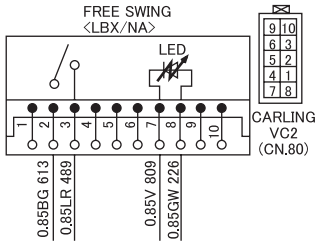
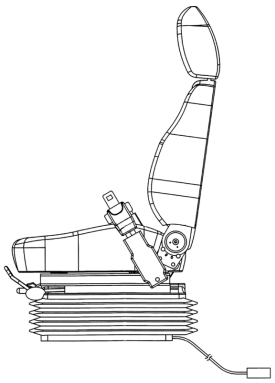
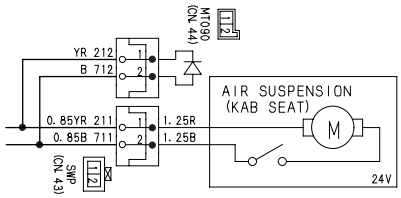
Ongoing = State in which the key was switched OFF, then ON again with the previous trouble underway (or continuing)

		Degree of speed restriction	Explanation
Coolant temperature over 105°C (221°F)	Trouble underway	0: None	-
	Recovered	0: None	-
	Ongoing	0: None	-
Coolant temperature over 110°C (230°F)	Trouble underway	2: Low idle	The engine goes to low idle at a coolant temperature of 110°C (230°F) or higher.
	Recovered	0: None	When the coolant temperature falls to 105°C (221°F) or less, the system recovers and controls returns to normal.
	Ongoing	2: Low idle	When the key is switched ON again and the engine starts, for the time (1 minute) until judgment starts, the engine speed is restricted to low idle.After that, the status moves to trouble underway or recovered based on the judgment results.
Coolant temperature over 120°C (248°F)	Trouble underway	4: Stop (restart possible)	The engine stops at a coolant temperature of 120°C (248°F) or higher. The engine cannot be restarted until the key is turned to ON again or the coolant temperature falls to 120°C (248°F) or less.
	Recovered	0: None	When the coolant temperature falls to 120°C (248°F) or less, the restriction due to the coolant temperature being over 120°C (248°F)goes to 0 (Normal control). However, if the restriction due to the coolant temperature being over 110°C (230°F) is not 0, that restriction is applied.
	Ongoing	2: Low idle	When the key is switched ON again and the engine starts, for the time (1 minute) until judgment starts, the engine speed is restricted to low idle.After that, the status moves to trouble underway or recovered based on the judgment results.
Boost temperature over 80°C (176°F)	Trouble underway	2: Low idle	The engine goes to low idle at a boost temperature of 80°C (176°F) or higher.
	Recovered	0: None	When the boost temperature falls below 70°C (158°F) or less, the system recovers and controls returns to normal.
	Ongoing	2: Low idle	When the key is switched ON again and the engine starts, for the time (1 minute) until judgment starts, the engine speed is restricted to low idle. After that, the status moves to trouble underway or recovered based on the judgment results.
Boost temperature over 90°C (194°F)	Trouble underway	4: Stop (restart possible)	Engine stop.The engine cannot be restarted until either the key is switched ON again or the boost temperature recovers to the normal level.
	Recovered	0: None	When the boost temperature falls to 90°C (194°F) or below, the restriction due to the boost temperature being over 90°C (194°F) goes to 0 (Normal control). However, if the restriction due to the boost temperature being over 80°C (176°F) is not 0, that restriction is applied.
	Ongoing	2: Low idle	When the key is switched ON again and the engine starts, for the time (1 minute) until judgment starts, the engine speed is restricted to low idle.After that, the status moves to trouble underway or recovered based on the judgment results.
Engine oil pressure drop	Trouble underway	4: Stop (restart possible)	Engine stop. The engine cannot be restarted until the key is switched ON again. Recovery cannot be judged until the engine is restarted, so the system does not move from trouble underway to be recovered.
	Recovered	0: None	The engine oil pressure recovers to 40 kPa (5.8 PSI) or higher and controls returns to normal.
	Ongoing	2: Low idle	When the key is switched ON again and the engine starts, for the time (30 s) until judgment starts, the engine speed is restricted to low idle. After that, the status moves to trouble underway or recovered based on the judgment.

Engine Section Layout Diagram

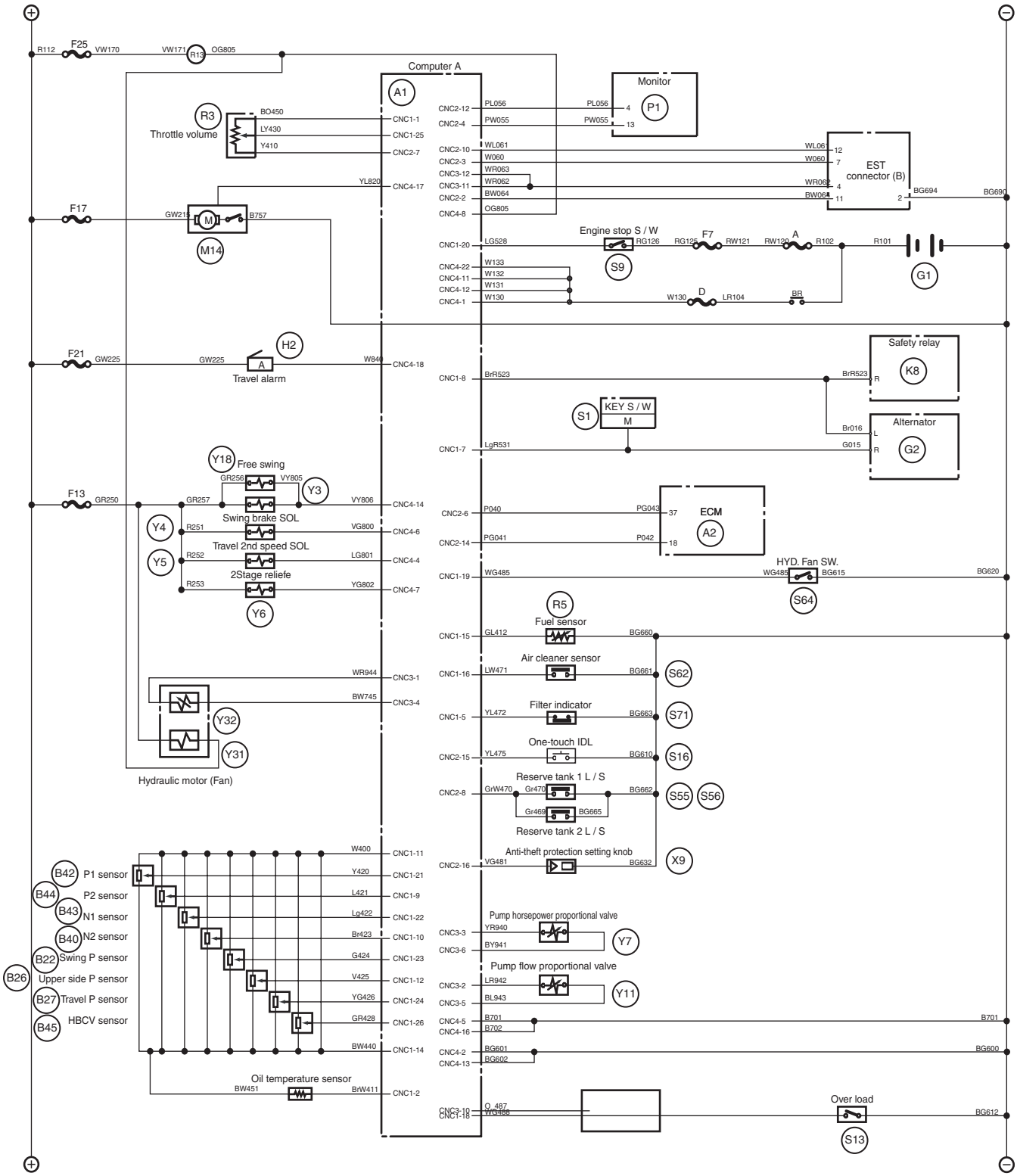


1	Engine coolant temperature sensor	7	Crank position sensor
2	EGR valve	8	Engine hydraulic pressure sensor
3	Boost temperature sensor	9	Fuel temperature sensor
4	Boost pressure sensor	10	Common rail pressure sensor
5	Pressure control valve	11	Starter motor
6	G sensor		

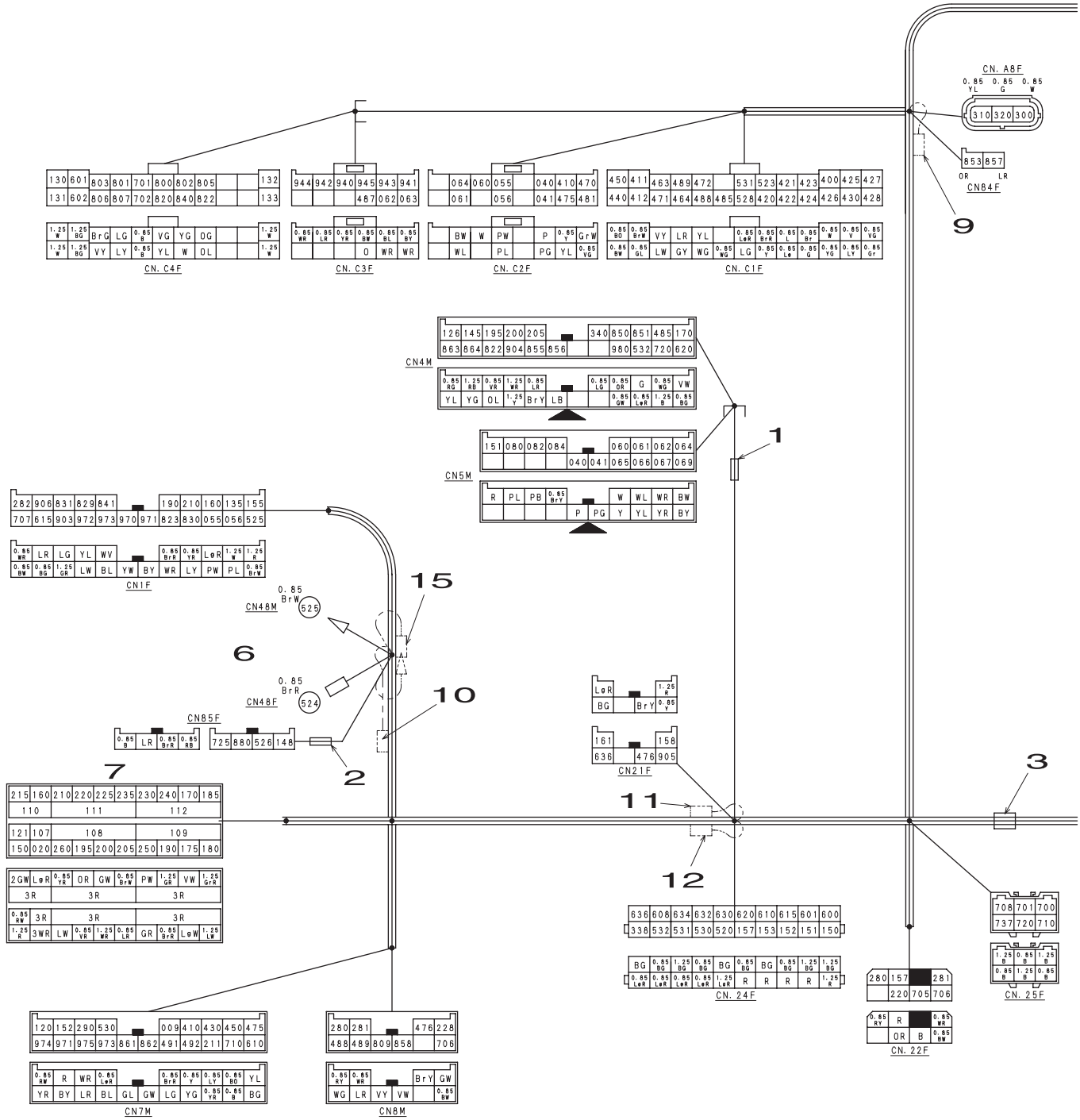
Name	No.	Shape	Circuit	Remarks
Counterweight removal solenoid	Y12 Y13 Y14 Y15	 WE01010-008	 WE01010-106	
P1 flow control proportional valve	Y11			
Horsepower control proportional valve	Y7			
Free swing switch	S22			North America Only
CAB seat air suspension connector	X6			

Bloc Diagram

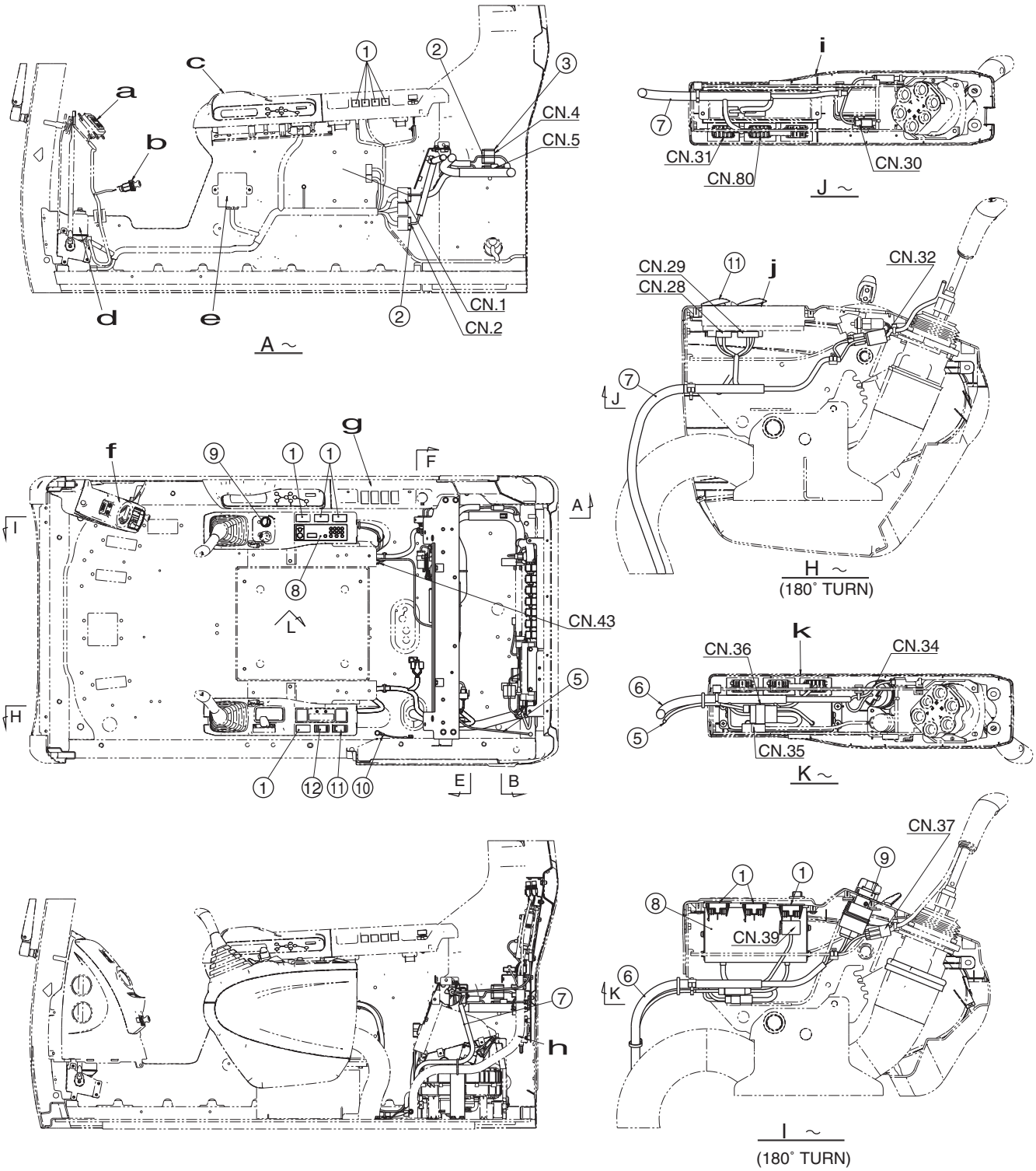
1) Computer A



WE03011-002



KHR18801-E00



KHR16040-E09

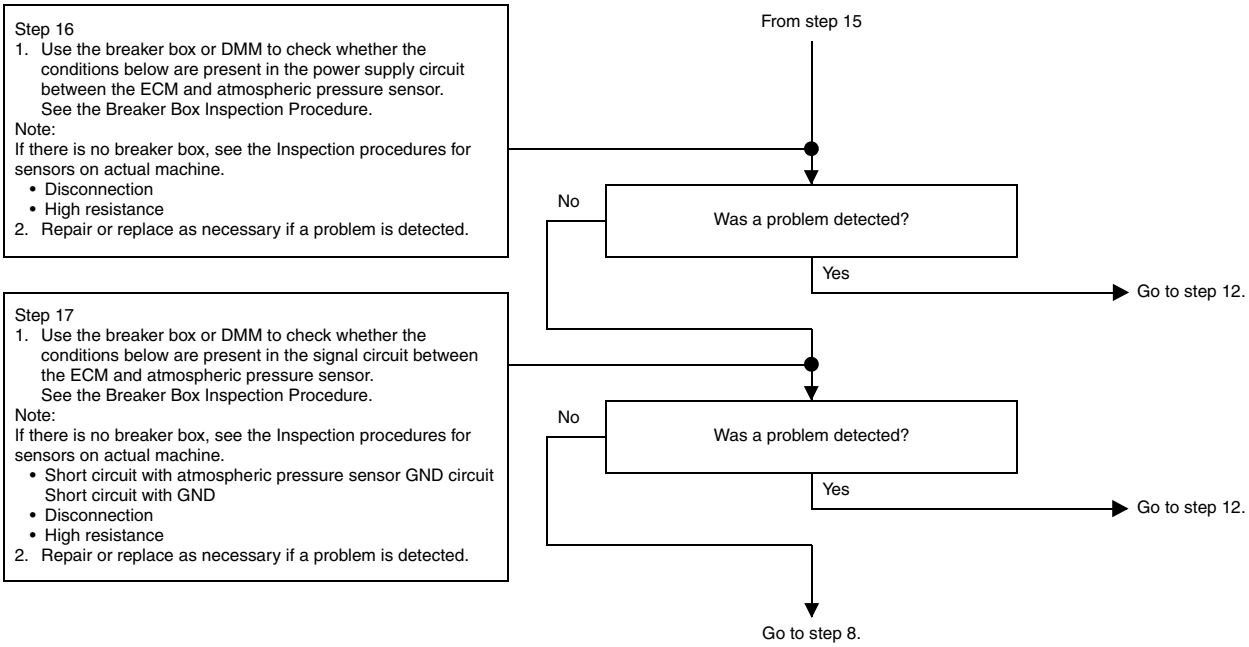
Diagnostic aid

If an intermittent problem is suspected, the cause may be one of the following.

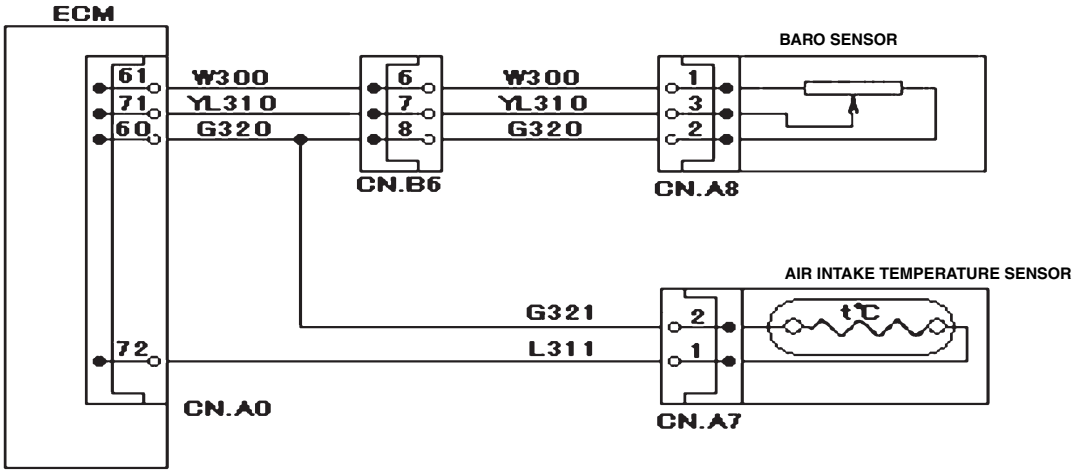
- Harness connector connection problem
- Harness routing problem
- Breakage in harness covering due to friction
- Wire disconnection within harness covering

In order to detect these causes, the following inspection is necessary.

- Harness connector and ECM connector connection problem
  - Terminal has come out from connector
  - Connection between non-matching terminals
  - Damage to connector lock
  - Terminal and wire connection problem
- Harness damage
  - Inspect the external appearance to check for any harness damage.
  - While moving the connector or harness related to a sensor, confirm the display of the related item in the scan tool data display. The display change shows the trouble location.



Block diagram



TSHK0029

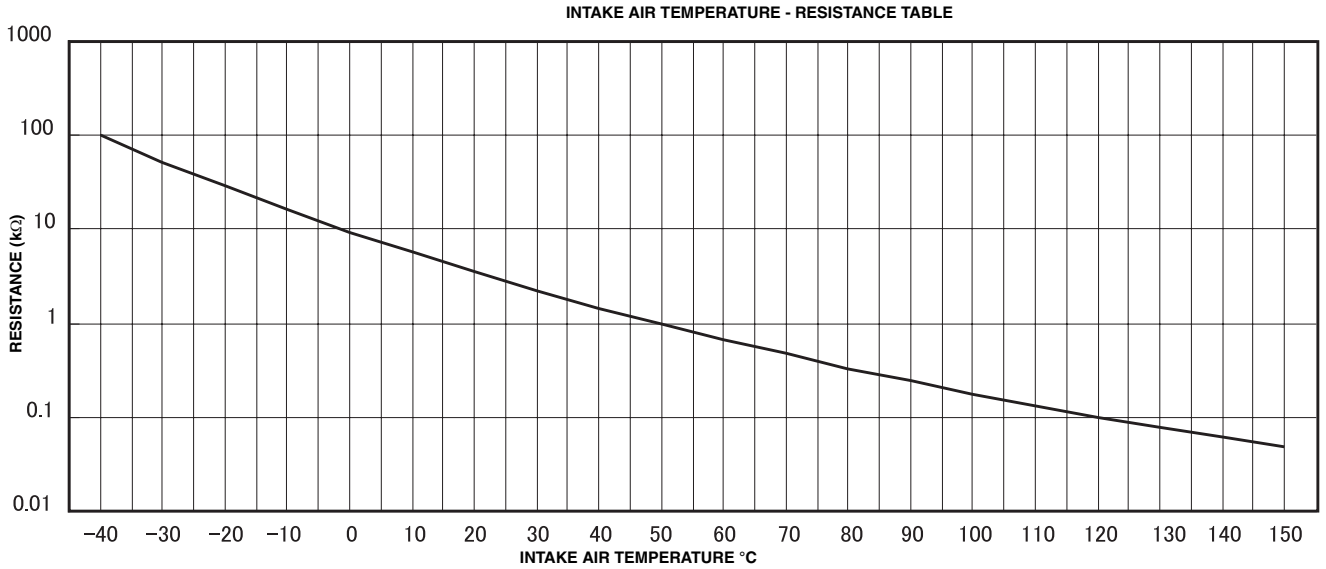
Preconditions when DTC is set

- Key switch input voltage is 16 V or higher.
- DTC: 1630, 1632 are not detected.

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, 17	Short circuit with power supply circuit	Voltage value measurement	• Remove the sensor connector. • Key switch “ON”	72-GND	0 V	18 V or higher
7, 18	Disconnection/ high resistance	Resistance measurement	• Remove the sensor connector. • Key switch “OFF”	72-Sensor connector signal terminal	100 M Ω or lower	10 M Ω or higher
8, 19	Disconnection/ high resistance	Resistance measurement	• Remove the sensor connector. • Key switch “OFF”	60-Sensor connector signal terminal	100 Ω or lower	10 M Ω or higher



Diagnostic aid

- Check that the temperature of the FT sensor and IAT (intake air temperature) sensor are close in value before starting when the engine is cool.

If an intermittent problem is suspected, the cause may be one of the following.

- Harness connector connection problem
- Harness routing problem
- Breakage in harness covering due to friction
- Wire disconnection within harness covering

In order to detect these causes, the following inspection is necessary.

- Harness connector and ECM connector connection problem
  - Terminal has come out from connector
  - Connection between non-matching terminals
  - Damage to connector lock
  - Terminal and wire connection problem
- Harness damage
  - Inspect the external appearance to check for any harness damage.
  - While moving the connector or harness related to a sensor, confirm the display of the related item in the scan tool data display. The display change shows the trouble location.

Breaker box inspection procedure

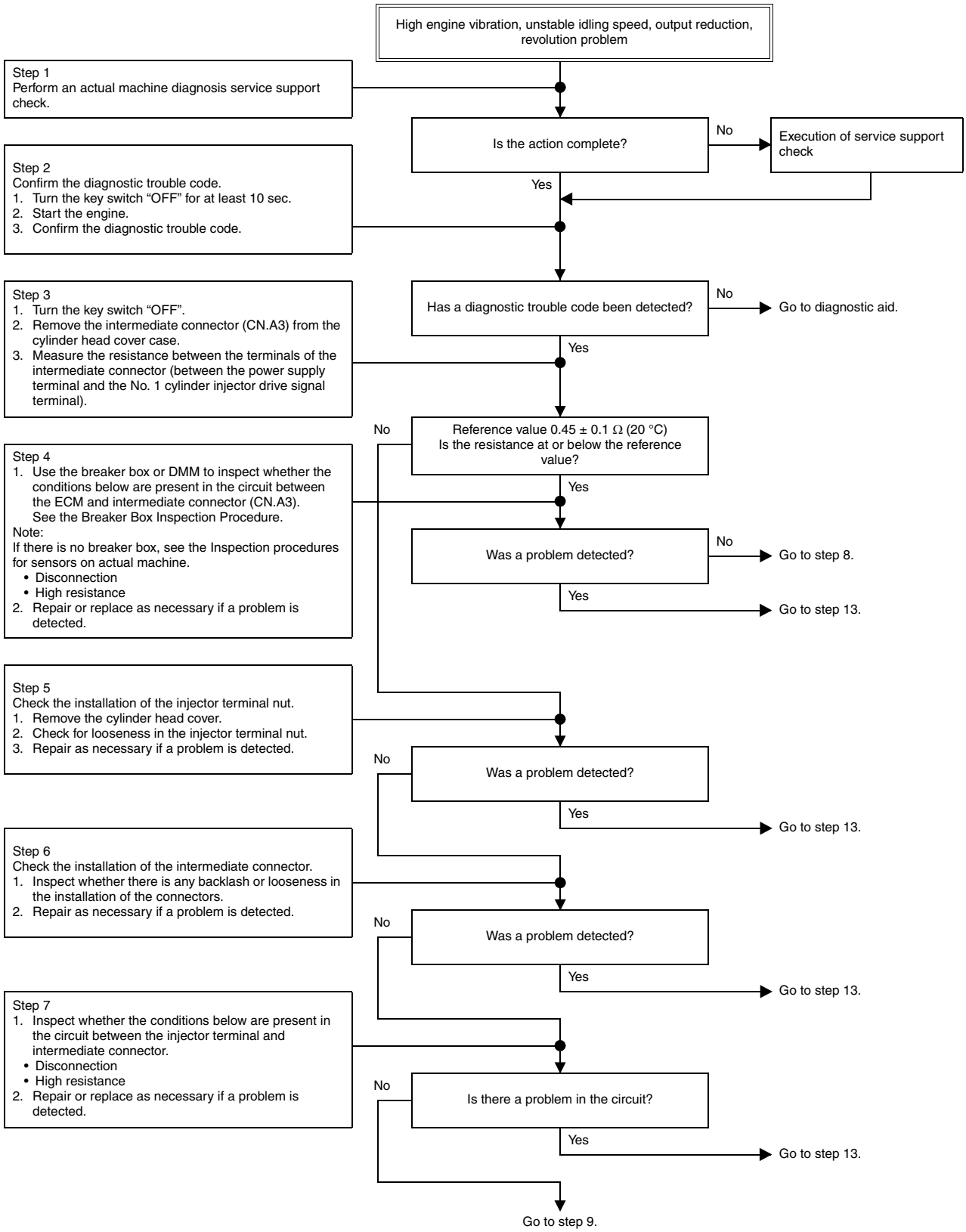
For steps in which breaker box usage is indicated, perform inspection with the following procedure.
Return to diagnosis step after inspection.

Step	Inspection item	Inspection method	Measurement condition	Measurement terminal No.	Normal value	Abnormal value
6, 15	Short circuit with GND circuit/GND	Resistance measure-ment	• Remove the sensor connector. • Key switch “OFF”	83-109 83-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.

DTC: 0201
No. 1 Cylinder Injector Drive System Disconnection

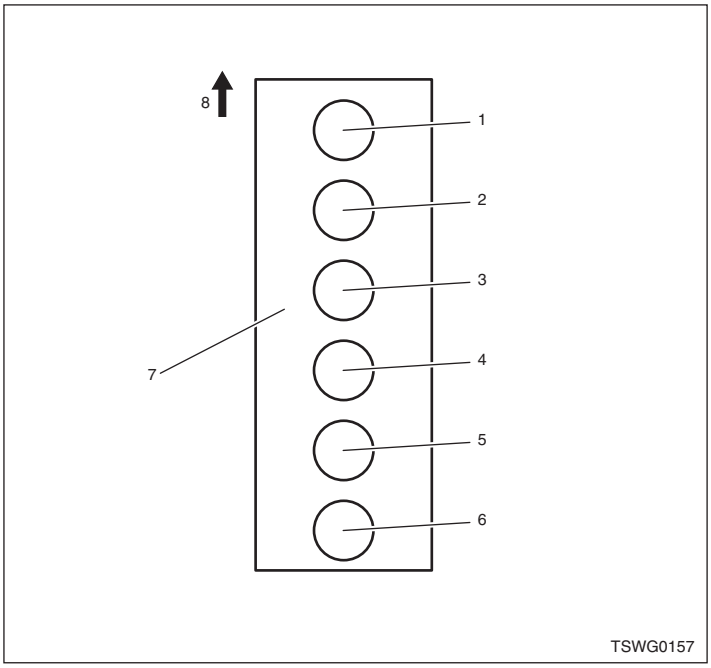


Breaker box inspection procedure

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 measure-ment	• Remove the intermedi-ate connector. • Key switch “OFF”	117-Intermediate connector terminal (CN.A3 No. 8)	100 Ω or lower	10 M Ω or higher

Cylinder No. and injection sequence



Name

1. 1st cylinder
2. 2nd cylinder
3. 3rd cylinder
4. 4th cylinder
5. 5th cylinder
6. 6th cylinder
7. Cylinder block
8. Engine front side

Injection sequence: 1 → 5 → 3 → 6 → 2 → 4

Preconditions when DTC is set

- Main relay power supply voltage is 16 V or higher.
- At least 70 min^{-1}
- DTC: 0206, 0612, 1262 are not detected.

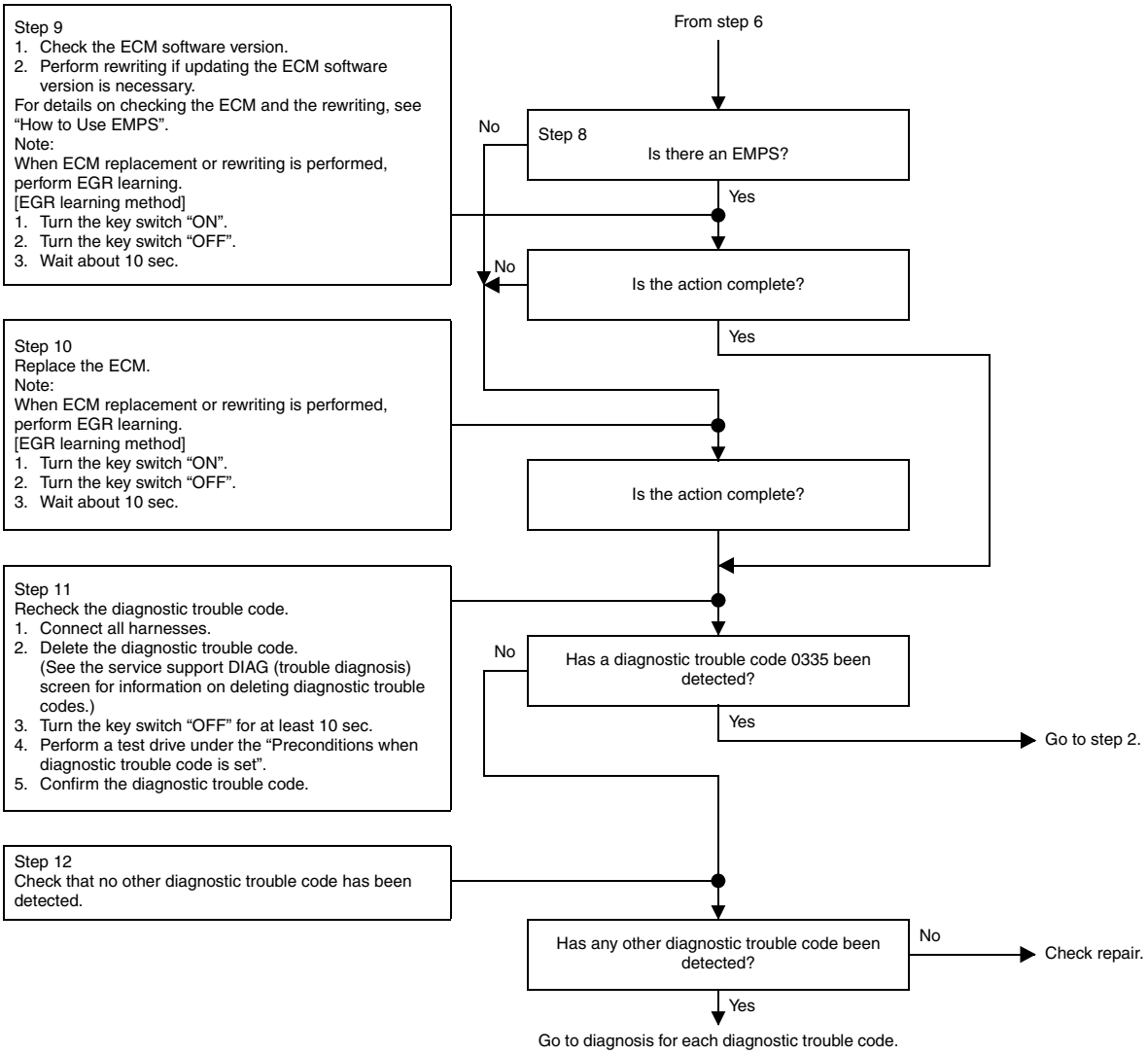
Diagnostic aid

If an intermittent problem is suspected, the cause may be one of the following.

- Harness connector connection problem
- Harness routing problem
- Breakage in harness covering due to friction
- Wire disconnection within harness covering

In order to detect these causes, the following inspection is necessary.

- Harness connector and ECM connector connection problem
  - Terminal has come out from connector
  - Connection between non-matching terminals
  - Damage to connector lock
  - Terminal and wire connection problem
- Harness damage
  - Inspect the external appearance to check for any harness damage.
  - While moving the connector or harness related to a sensor, confirm the display of the related item in the scan tool data display. The display change shows the trouble location.


From step 6
Step 8
Is there an EMPS?
No
Yes
Is the action complete?
No
Yes
Is the action complete?
Has a diagnostic trouble code 0335 been detected?
No
Yes
Go to step 2.
Has any other diagnostic trouble code been detected?
No
Check repair.
Yes
Go to diagnosis for each diagnostic trouble code.
Step 9
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 10
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 11
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 12
Check that no other diagnostic trouble code has been detected.

Breaker box inspection procedure

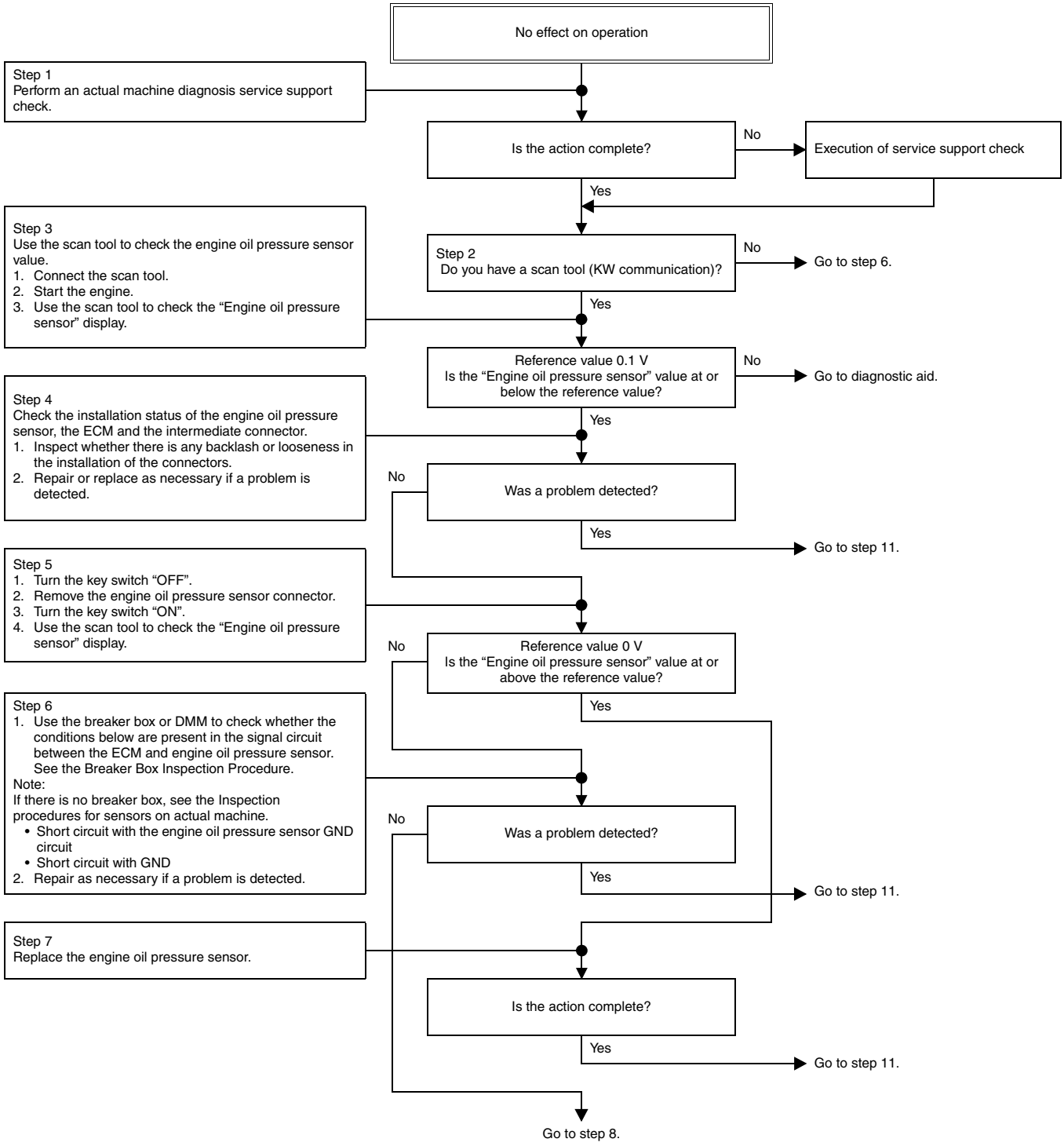
For steps in which breaker box usage is indicated, perform inspection with the following procedure.
Return to diagnosis step after inspection.

Step	Inspection item	Inspection method	Measurement condition	Measurement terminal No.	Normal value	Abnormal value
7	Short circuit with other signal circuit	Voltage value measurement	• Remove the sensor connector. • Key switch “ON”	98-GND	5 V Voltage will be pulled up when disconnecting the connector. Therefore, it always will be 5 V.	4 V or less

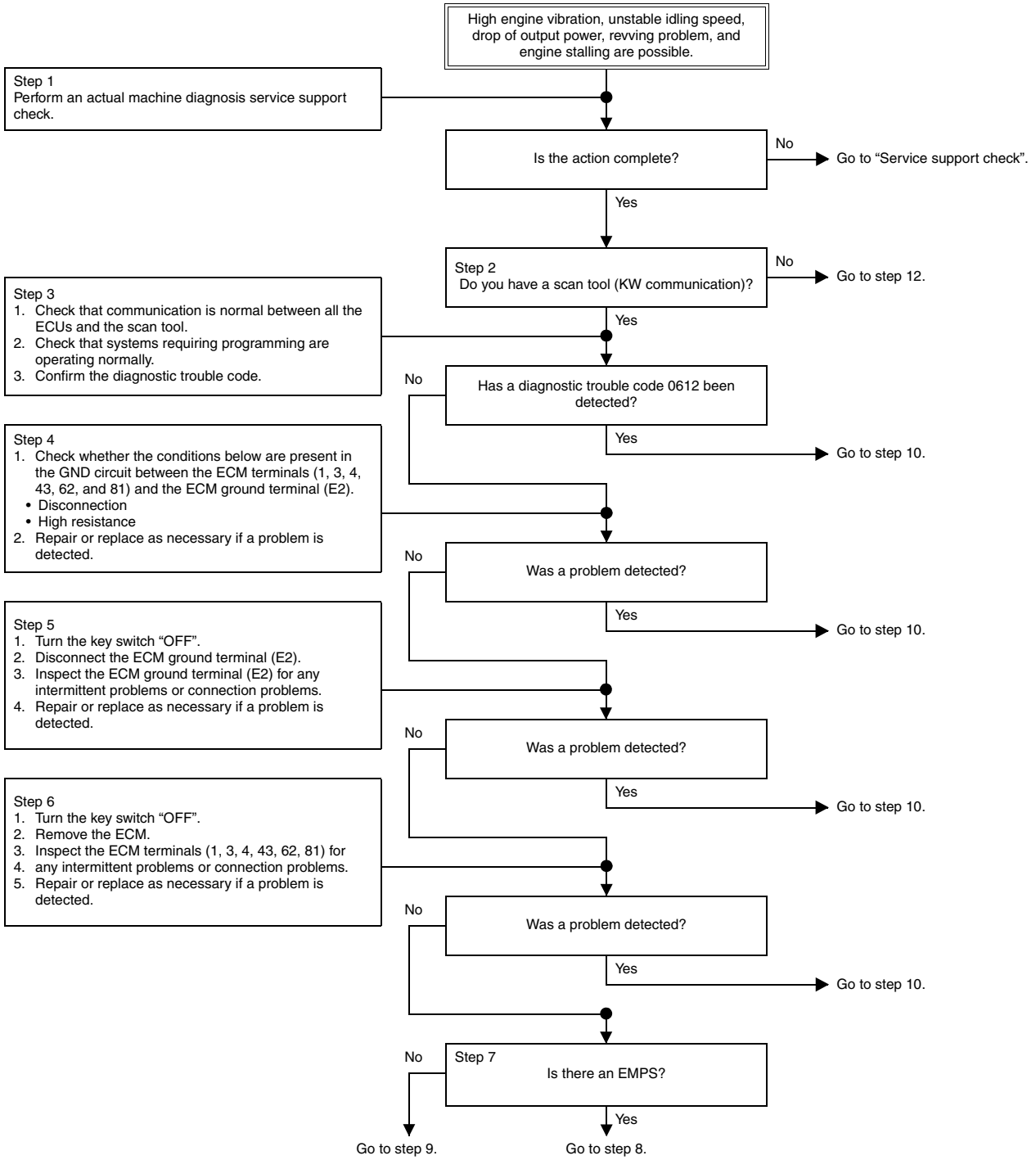
Inspection procedures for sensors on actual machine

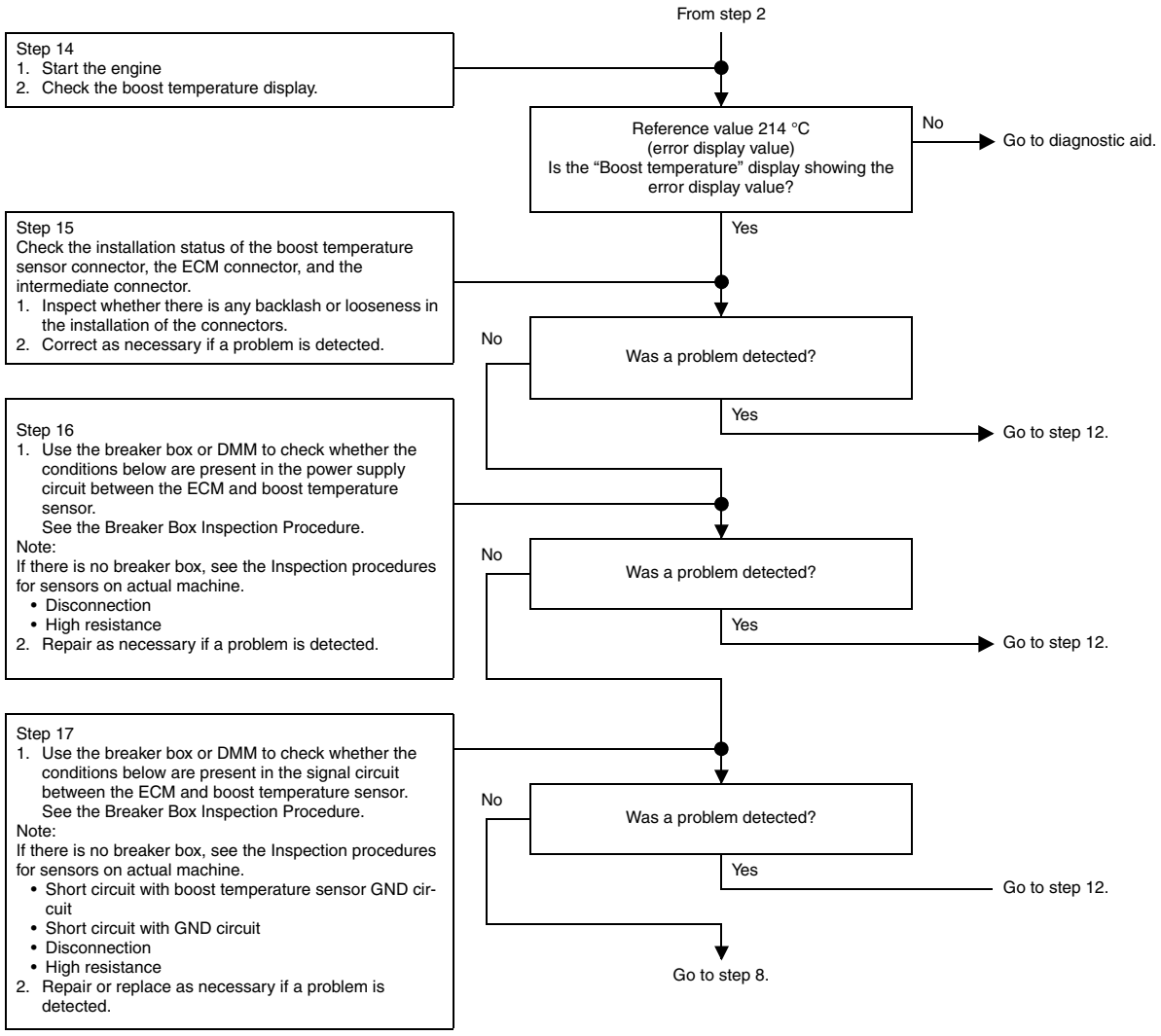
1. Disconnect the intermediate connectors and perform sensor inspection from the engine harness connector.
2. Disconnect the connector from the sensor and short circuit the sensor connector wiring.
3. Inspect the harness disconnection from the intermediate connector.
   - If there is an abnormality in 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.

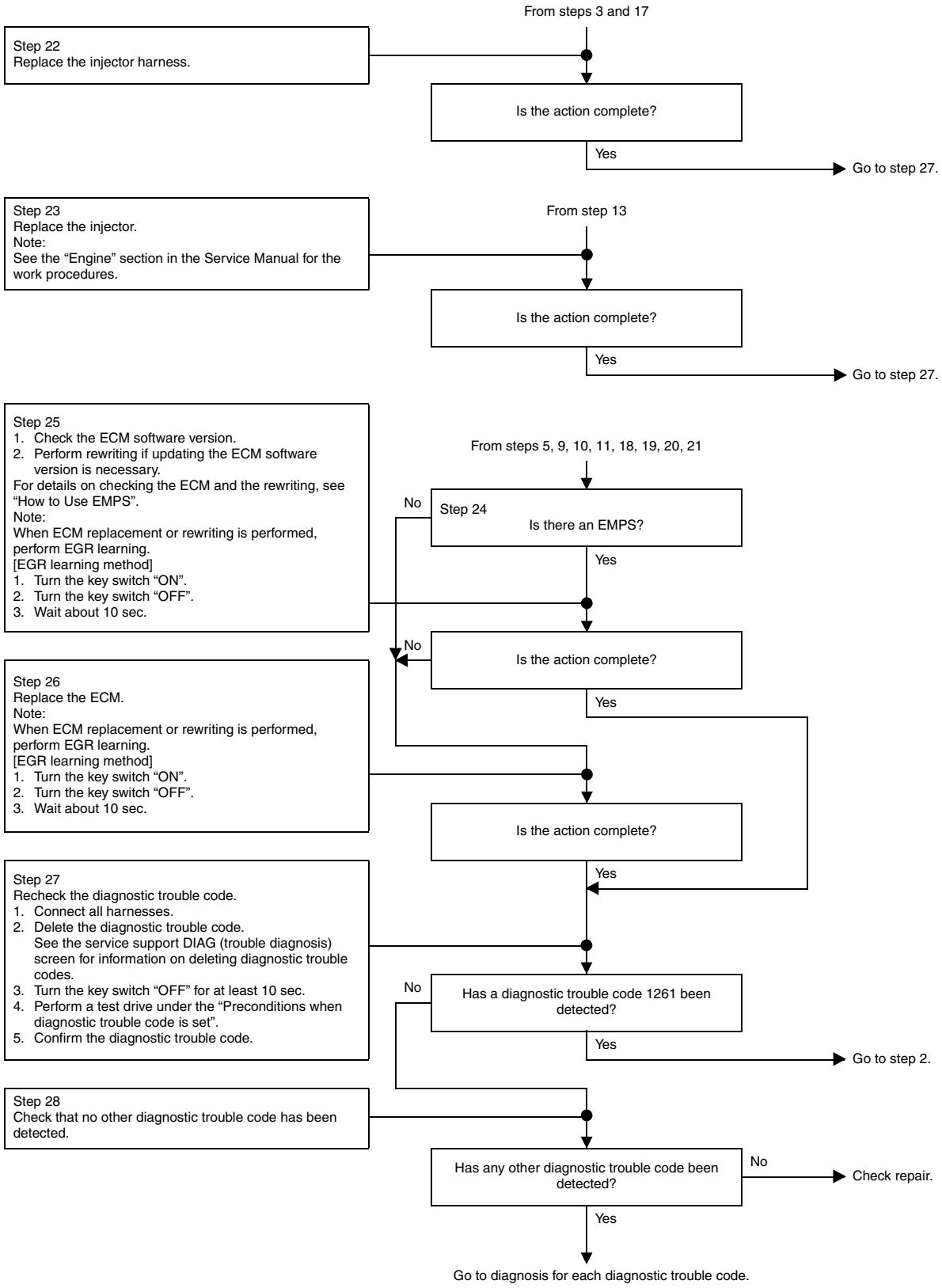
DTC: 0522
Engine Oil Pressure Sensor Abnormality (abnormally low voltage)

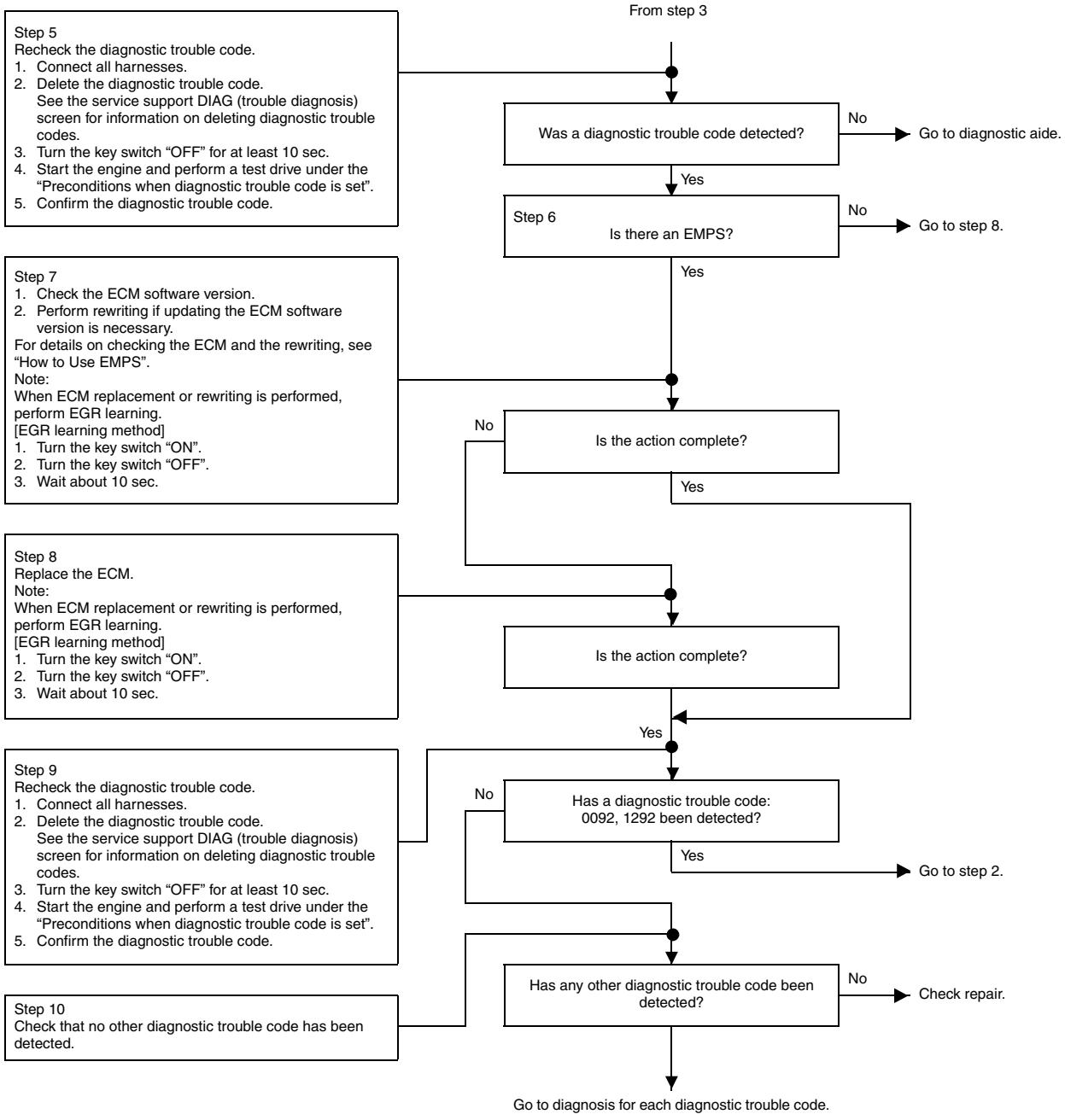


DTC: 0612
Charge Circuit Abnormality (bank 2)

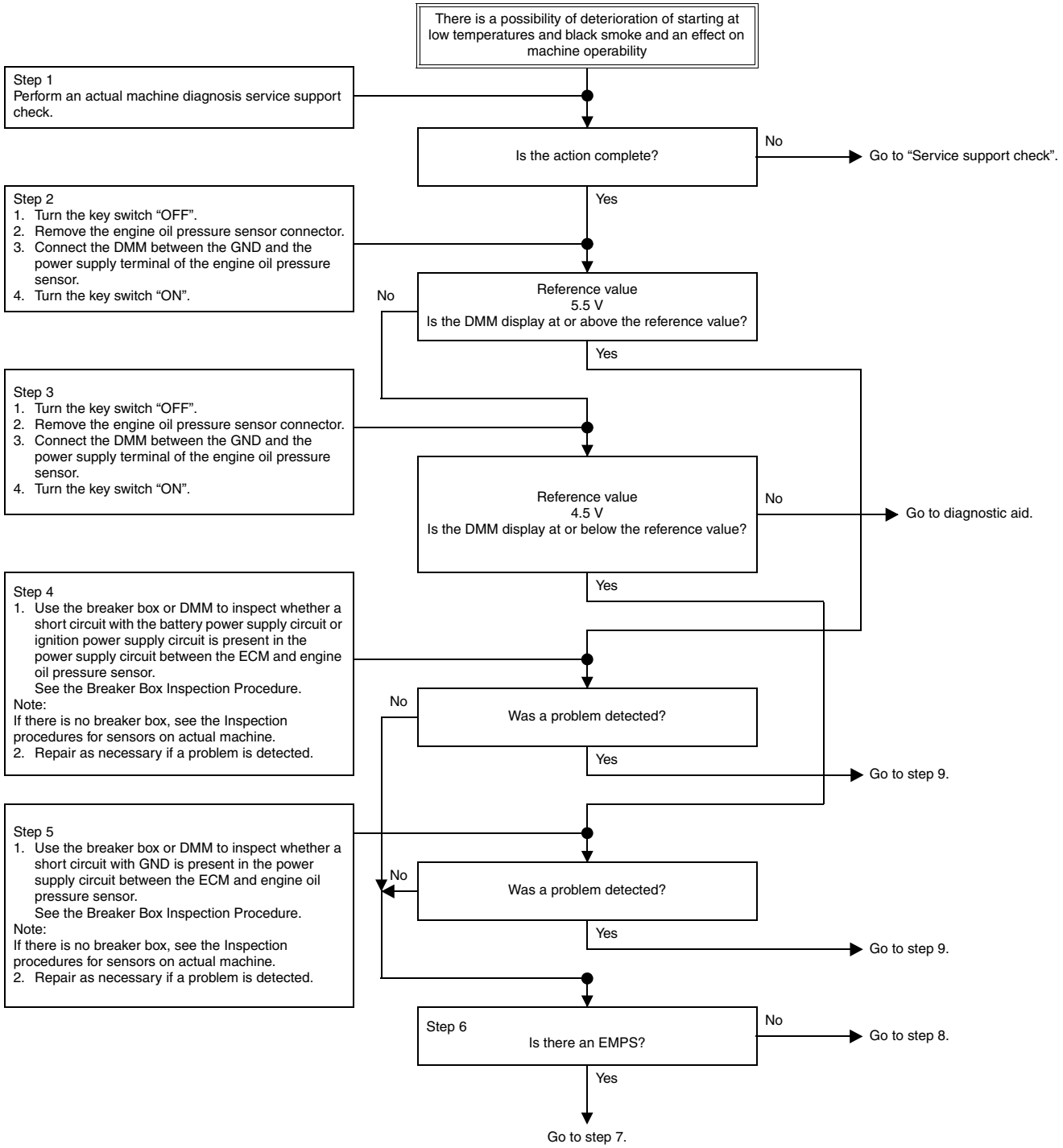


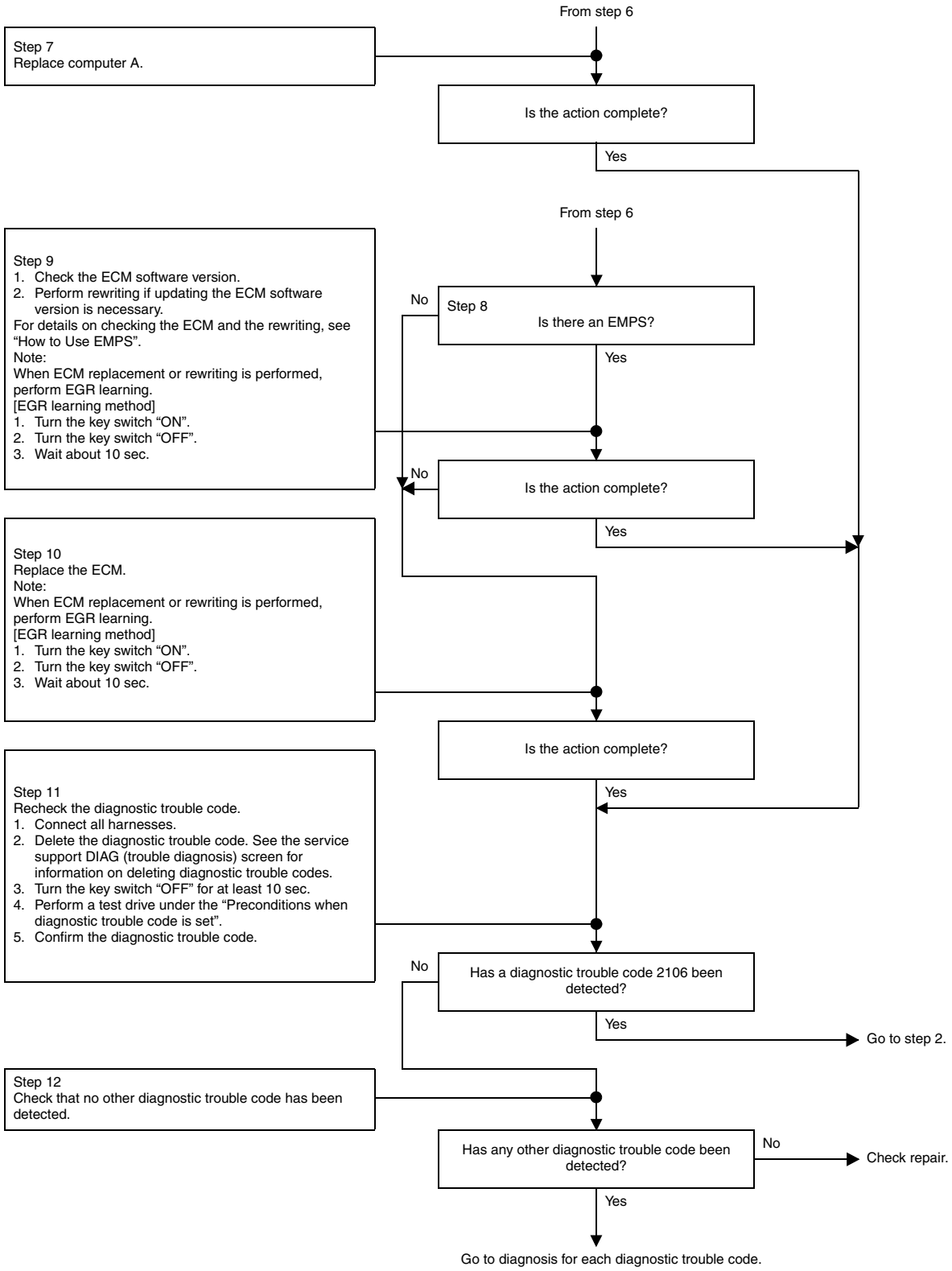

From step 2
Step 14
1. Start the engine
2. Check the boost temperature display.
Reference value 214 °C
(error display value)
Is the “Boost temperature” display showing the error display value?
No
Go to diagnostic aid.
Yes
Step 15
Check the installation status of the boost temperature sensor connector, the ECM connector, and the intermediate connector.
1. Inspect whether there is any backlash or looseness in the installation of the connectors.
2. Correct as necessary if a problem is detected.
No
Was a problem detected?
Yes
Go to step 12.
Step 16
1. Use the breaker box or DMM to check whether the conditions below are present in the power supply circuit between the ECM and boost temperature sensor.
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
2. Repair as necessary if a problem is detected.
No
Was a problem detected?
Yes
Go to step 12.
Step 17
1. Use the breaker box or DMM to check whether the conditions below are present in the signal circuit between the ECM and boost temperature sensor.
See the Breaker Box Inspection Procedure.
Note:
If there is no breaker box, see the Inspection procedures for sensors on actual machine.
• Short circuit with boost temperature sensor GND circuit
• Short circuit with GND circuit
• Disconnection
• High resistance
2. Repair or replace as necessary if a problem is detected.
No
Was a problem detected?
Yes
Go to step 12.
Go to step 8.


From steps 3 and 17
Step 22
Replace the injector harness.
Is the action complete?
Yes
Go to step 27.
From step 13
Step 23
Replace the injector.
Note:
See the “Engine” section in the Service Manual for the work procedures.
Is the action complete?
Yes
Go to step 27.
From steps 5, 9, 10, 11, 18, 19, 20, 21
Step 25
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.
No
Step 24
Is there an EMPS?
Yes
No
Is the action complete?
Yes
Step 26
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.
Is the action complete?
Yes
Step 27
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.
No
Has a diagnostic trouble code 1261 been detected?
Yes
Go to step 2.
Step 28
Check that no other diagnostic trouble code has been detected.
Has any other diagnostic trouble code been detected?
No
Check repair.
Yes
Go to diagnosis for each diagnostic trouble code.


From step 3
Step 5
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. Start the engine and perform a test drive under the “Preconditions when diagnostic trouble code is set”.
5. Confirm the diagnostic trouble code.
Was a diagnostic trouble code detected?
No
Go to diagnostic aide.
Yes
Step 6
Is there an EMPS?
No
Go to step 8.
Yes
Step 7
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.
No
Is the action complete?
Yes
Step 8
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.
Is the action complete?
Yes
Step 9
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. Start the engine and perform a test drive under the “Preconditions when diagnostic trouble code is set”.
5. Confirm the diagnostic trouble code.
No
Has a diagnostic trouble code: 0092, 1292 been detected?
Yes
Go to step 2.
Step 10
Check that no other diagnostic trouble code has been detected.
Has any other diagnostic trouble code been detected?
No
Check repair.
Go to diagnosis for each diagnostic trouble code.

DTC: 1633
5 V Power Supply 3 Voltage Abnormality (engine oil pressure power supply)




From step 6
Step 7
Replace computer A.
Is the action complete?
Yes
From step 6
Step 9
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.
No
Step 8
Is there an EMPS?
Yes
No
Is the action complete?
Yes
Step 10
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.
Is the action complete?
Yes
Step 11
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.
No
Has a diagnostic trouble code 2106 been detected?
Yes
Go to step 2.
Step 12
Check that no other diagnostic trouble code has been detected.
Has any other diagnostic trouble code been detected?
No
Check repair.
Yes
Go to diagnosis for each diagnostic trouble code.

A

Inspect the overload pressure sensor.

Turn the key switch OFF and disconnect CN.123.

Measure the resistance between terminals 1 and 3 of the CN.123 overload pressure sensor side.
About 10 kΩ

No

Cause and solution
Overload pressure sensor defect
Replacement

Yes

Inspect for shorts to ground and disconnections.

Inspect the conductance between the ground and terminal 1 of the CN.123 harness side.
Inspect the conductance between the ground and terminal 2 of the CN.123 harness side.

Conductance

No

Inspect the conductance between the ground and terminal 3 of the CN.123 harness side.
Conductance

No

Cause and solution
BW440 or BW448 harness defect (disconnection)
Repair or replace

Yes

Key switch ON

Yes

Cause and solution
W400, W408 or Gr428 harness defect (short)
Replacement

Measure the voltage between the ground and terminal 1 of the CN.123 harness side.
About 5 V

No

Cause and solution
W440 or W408 harness defect (disconnection)
Repair or replace

Yes

Measure the voltage between the ground and terminal 2 of the CN.123 harness side.
0.25 V or higher

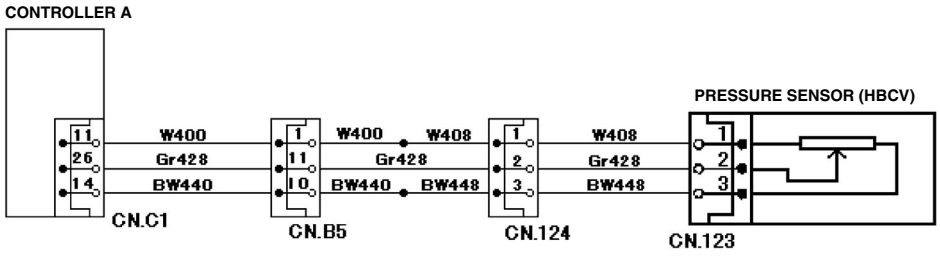
No

Cause and solution
Gr428 harness defect (disconnection)
Repair or replace

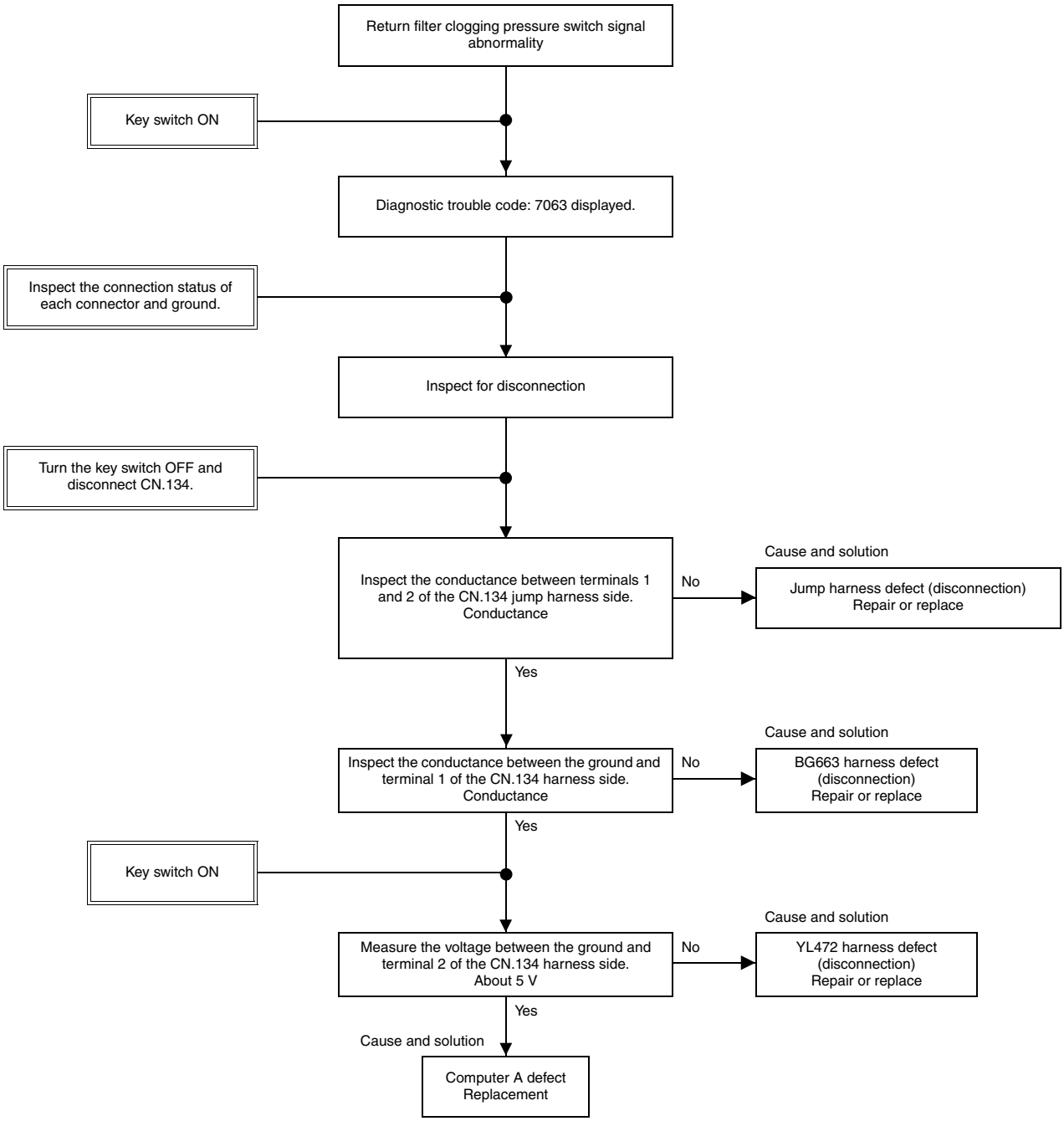
Yes

Cause and solution
Computer A defect
Replacement

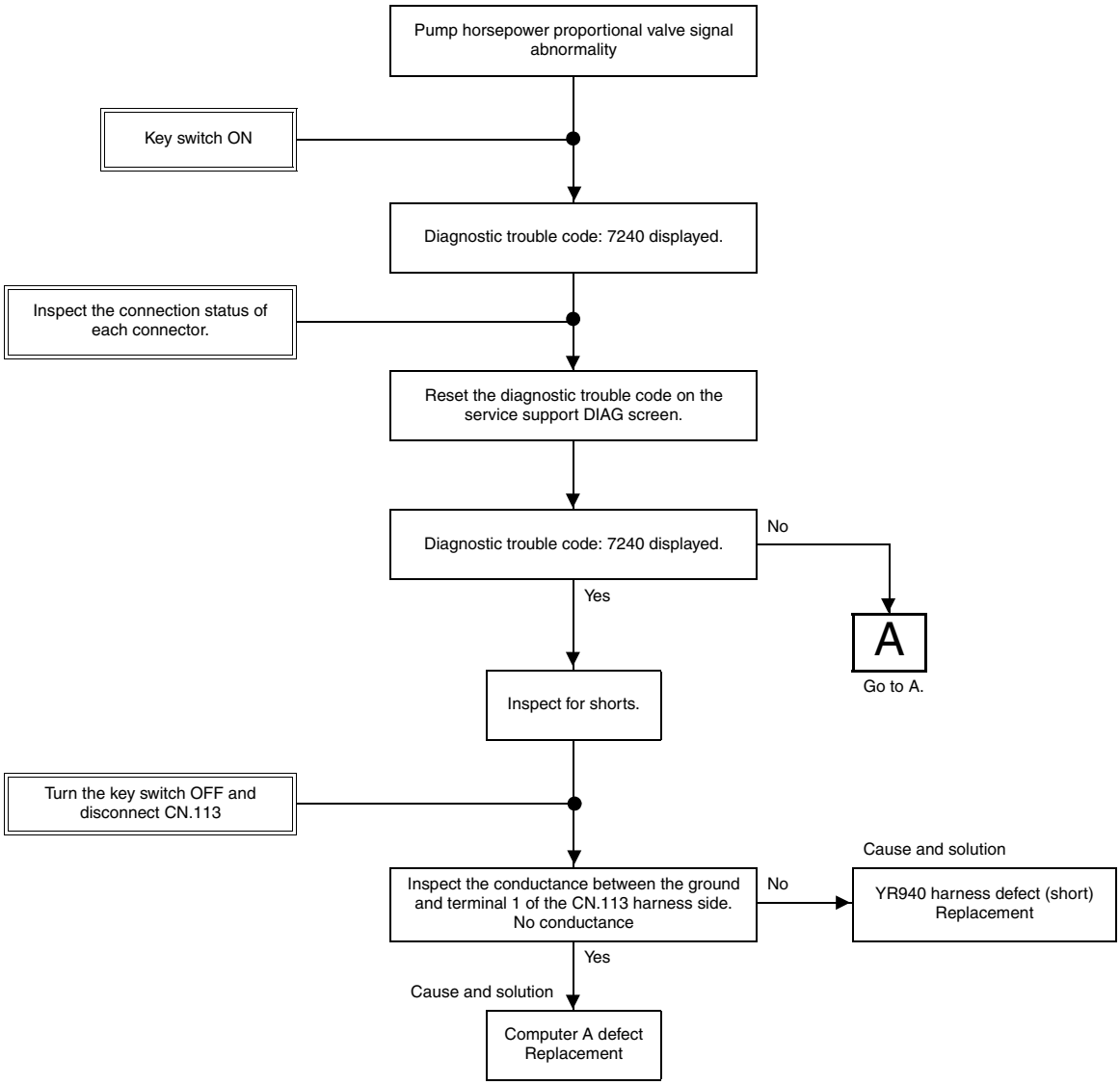
Block diagram



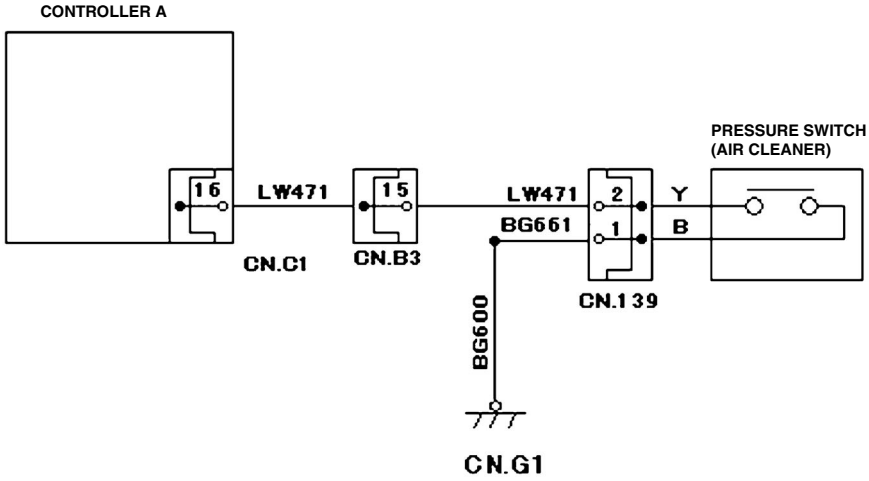
(Other than breaker specifications)



DTC: 7240
Pump Horsepower Proportional Valve Signal Abnormality



Block diagram

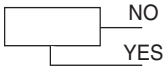


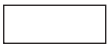
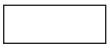
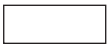
Reading Flow Charts

Diagnostic Trouble Code Number and Problem

The diagnostic trouble code number and problem are listed above the flow chart.

How to proceed

- Continue with either the YES or NO branch for the inspection and measurement result in 

and go to the next  .
-  contains inspection and measurement methods and values. If there is agreement with the values and question in  , then the result is YES. The result is NO if there is no agreement.

Electrical wiring colors

See the table below for electrical wiring colors in measurement locations when doing troubleshooting.

Electrical wiring color distinctions

Symbol	B	W	Br	P	V	G	O
Color	Black	White	Brown	Pink	Violet	Green	Orange
Symbol	R	Y	Lg	Sb	L	Gr	
Color	Red	Yellow	Light green	Sky blue	Blue	Gray	

“ab” indicates there is a color “b” stripe on the electrical wire color “a” base.
Ex.) BR: Red stripe on black base color.

Engine control system questionnaire

Company of inspector _____

Name of inspector _____

User	**User's name**	**Machine application**
	Address:	
Machine	**Date of diagnosis: _____Year _____ Month _____Day**	**Date of delivery: _____Year _____ Month _____Day**
	Operating period: Present _____hours (When trouble occurs _____ hours)	**Date of trouble occurrence:_____Year _____ Month _____Day**
	Machine model	**Machine serial No.**
Engine	**Engine model**	**Engine serial No.**

Trouble symptom	o Engine does not start	o Engine does not crank		o No first combustion	o Incomplete combustion
	o Difficult starting of engine	o Engine cranks slowly: Take more than _____ sec.		o Others (_____)	
	o Unstable idling	o Abnormal idling	o High (_____ rpm)	o Low (_____ rpm)	
		o Rough idle (out of specified speed for full warm-up)		o Others (_____)	
	o Low machine operationally	o Surging	o Knocking	o Low output	o Others
	o Abnormal smoke	o Much black smoke	o Much white smoke	o Much bluish smoke	o Others
	o Noise	o Engine vibration sound (_____ Circumference)		o Noise in engine (_____ Circumference)	
	o Engine stalls	o Immediately after starting	o When accelerator is released		o When A/C is operated
		o When operating at full load	o At certain operation mode	o Others (_____)	
	o Vibration at idling	o Vertical vibration	o Horizontal vibration	o Others (_____)	

Trouble Condition	**Frequency of trouble**	o Always	o Sometimes (How many times _____Date/Month)		o Once
		o Others (_____)			
	Weather	o Fine	o Cloudiness	o Rain	o Snow
		o After lightening	o Others (_____)		
	Ambient temperature	o 30 °C or more	o Around 20-30 °C	o Around 10-20 °C	o 0 °C or less (_____ °C)
	Season	o Spring	o Summer	o Autumn	o Winter
	Location	o Outdoor	o Indoor	o General road	o Rough road
		o Expressway	o Slope (Grade _____°)	o Height (___m above sea level)	o In mountain
		o On the sea	o Harbor	o Construction field (Type _____)	
		o Roadworks field (Type _____)		o Others (_____)	
	Engine temperature	o Cold	o During warm-up	o After warm-up	o Others (_____)
	Engine coolant/oil temp.	o Engine coolant temperature (_____ °C)		o Engine oil temperature (_____ °C)	
	Operating condition	o When starting	o After starting (_____min.)	o Idling	o Racing
		o During operation	o Constant speed	o When engine speed rises	o When engine speed lowers
		o A/C switch ON	o A/C switch OFF	o Others (_____)	
	Condition when trouble occurs	o After engine oil is replaced	o After oil filter is replaced	o After replenishment of fuel	o After sediment is drained
		o After operating on slope	o After out of gas	o After washing with HP	o Others (_____)
	Oil used	Maker (_____)	Manufacturer (_____)	Grade (_____)	Viscosity (_____)
	Fuel type	o Diesel fuel	o Diesel fuel No. 1	o Diesel fuel special No.1	o Diesel fuel No. 2
		o Diesel fuel special No.3	o Kerosene	o A heavy oil	o Others (_____)

Error Codes	**State of diagnostic lamp**		o ON	o Sometimes comes on	o Not come on	
	Error codes	**Current code**	o _____	o _____	o _____	o _____
			o _____	o _____	o _____	o _____
		Past code	o _____	o _____	o _____	o _____
			o _____	o _____	o _____	o _____
	Past error history		Date of error occurrence: _____ Year _____Month _____Day/ Description: (_____) Action to be taken: (_____)			
			Date of error occurrence: _____ Year _____Month _____Day/ Description: (_____) Action to be taken: (_____)			

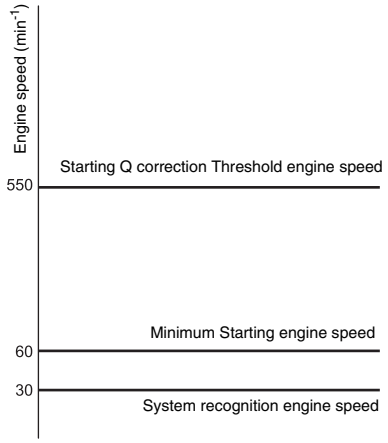
Others

Fuel injection correction

The ECM calculates the basic injection quantity from signals from the boost pressure sensor, CKP sensor, and G sensor. It uses conditions such as the common rail pressure and engine coolant temperature at the time to control the PCV opening and closing interval and the injector electrified time and it makes corrections for the optimum injection timing and injection quantities.

Starting Q correction

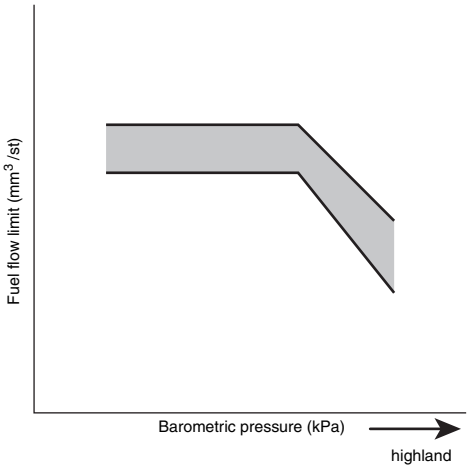
The ECM corrects the starting Q during engine starting when the engine rotation is below the starting Q threshold.
Also, the ECM does not recognize engine rotation during rotation that is at or below the system recognition level, so it cannot correct starting Q or start the engine at this time.



TSWG0175

High altitude correction

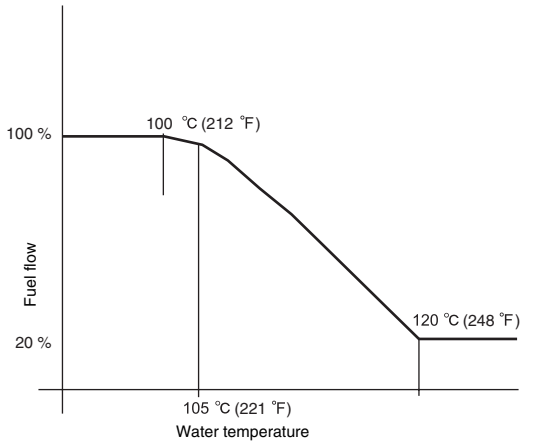
The ECM calculates the current altitude from the atmospheric pressure sensor signals.
Corrections to achieve the optimum fuel flow are made from the altitude conditions at this time.



TSWG0173

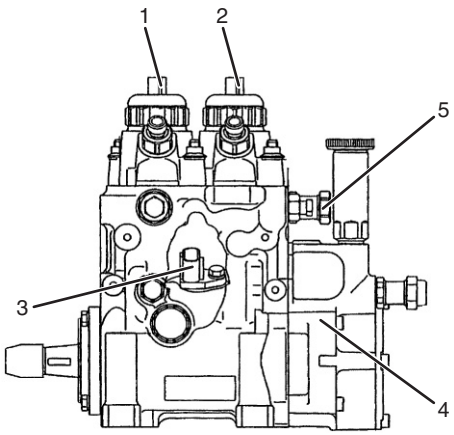
Control for overheating

The ECM, in order to protect the engine, will start control of the fuel flow if the engine coolant temperature exceeds 100 °C. If the engine coolant temperature rises further, the fuel flow is further restricted. Near 120 °C, the fuel flow will be restricted to a constant level.
A warning will also be emitted from the system **by computer A** from 105 °C. Along with the warning, the fuel flow will be gradually restricted, and the engine will be stopped even if the temperature rises.



TSWG0169

Supply pump



TSWG0009

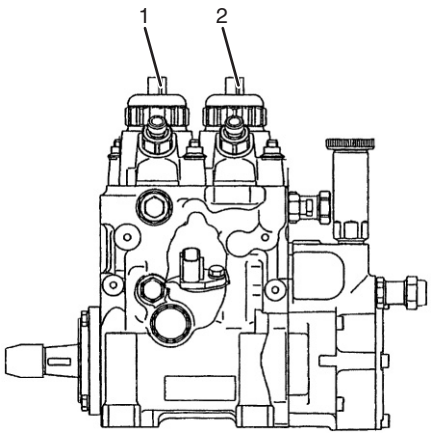
Name

1. PCV #1
2. PCV #2
3. G sensor
4. Feed pump
5. Fuel temperature sensor

The supply pump uses the force of the engine rotation to raise the fuel pressure and pressure feed fuel to the common rail. Also, the PCV (suction control valve), fuel temperature (FT) sensor, and feed pump are installed on the supply pump.

Note:
See the “Engine” section in the Service Manual for the work procedures.

PCV (Pressure control valve)



TSWG0010

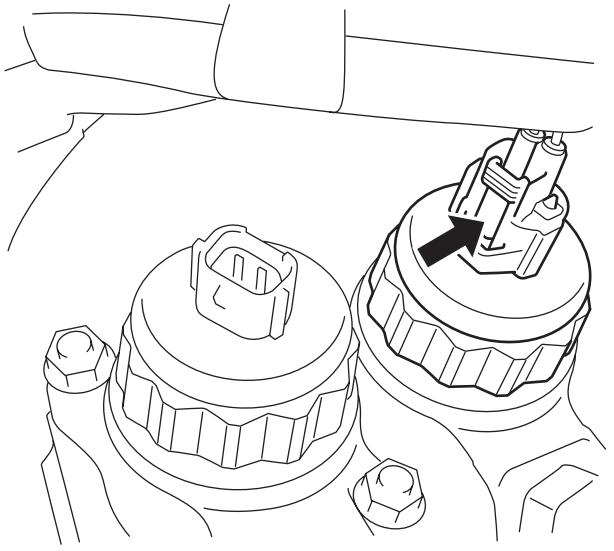
Name

1. PCV #1
2. PCV #2

The PCV (suction control valve) is installed on the supply pump and controls the fuel pressure feed (discharge volume) to the common rail. The engine control module (ECM) controls the electrified time to the PCV and controls the fuel discharge volume.

Removal

- Do not replace the PCV.
- If there is a problem, replace the entire supply pump assembly.



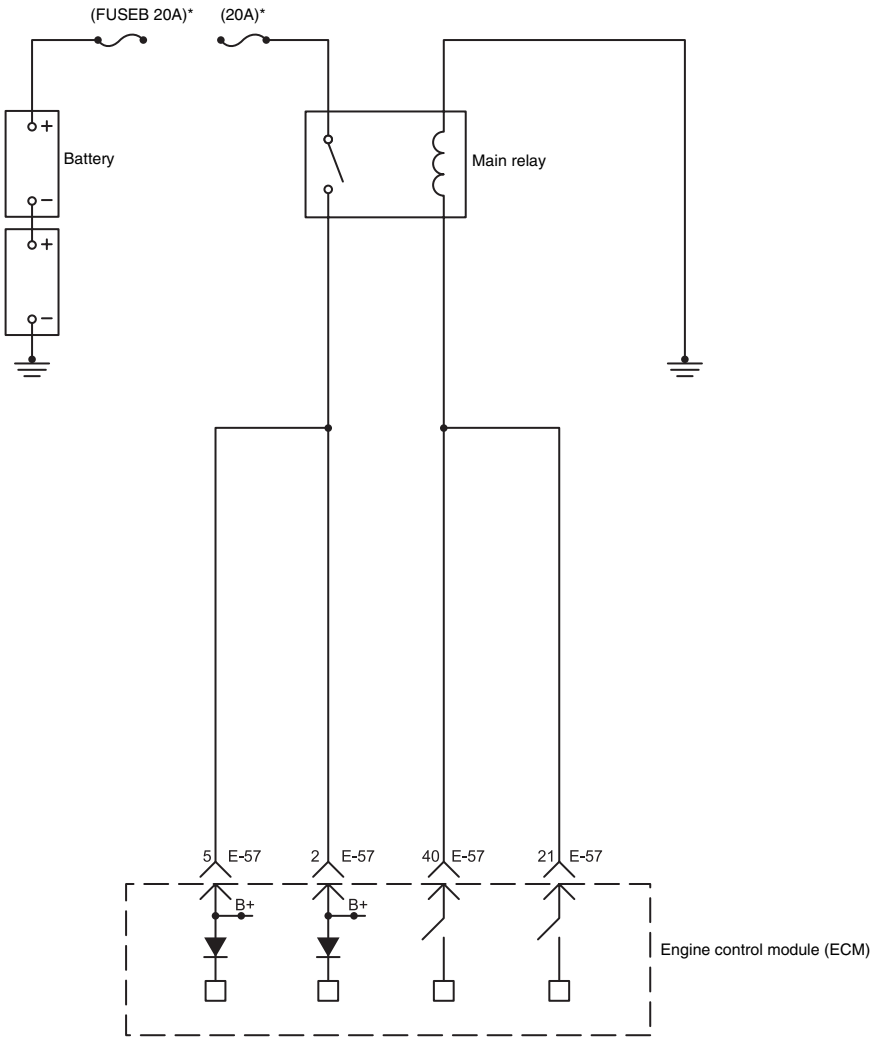
TSWG0194

Circuit Diagram

For how to read the wiring diagram, see “Wiring diagrams”.

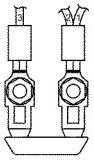
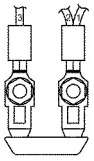
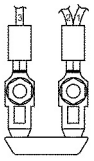
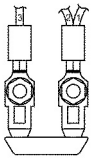
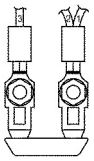
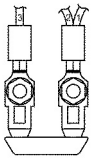
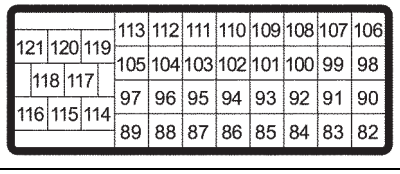
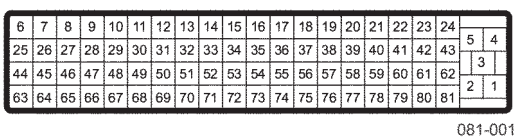
Main relay circuit

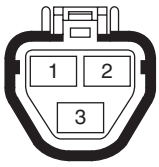
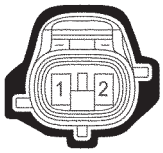
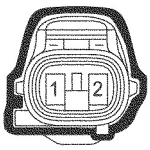
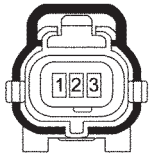
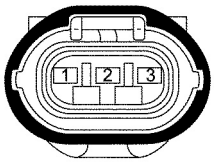
(*: Specifications (fuse current value etc.) vary depending on each machine. Refer to the machine’s manual.)



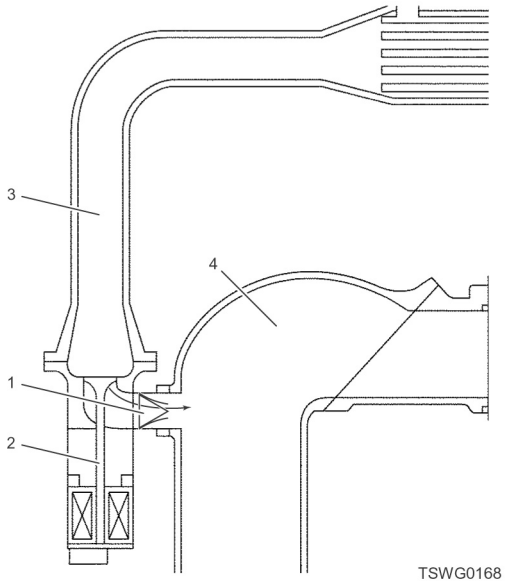
TSWG0027

Connector List

	Connector Face
E-27	 003-128
	#1 injector (silver)
E-29	 003-128
	#2 injector (silver)
E-31	 003-128
	#3 injector (silver)
E-33	 003-128
	#4 injector (silver)
E-35	 003-128
	#5 injector (silver)
E-37	 003-128
	#6 injector (silver)
E-56	 040-004
	Main unit harness side (female terminal) (black)
E-57	 081-001
	Main unit harness side (female terminal) (black)

	Connector Face
E-75	 003-501
	Engine harness side (male terminal) (black)
E-76	 003-501
	Engine harness side (male terminal) (black)
E-80	 003-501
	Engine harness side (male terminal) (black)
E-90	 003-500
	Engine harness side (male terminal) (light gray)
E-93	 002-232
	Engine harness side (male terminal) (green)
E-98	 002-233
	Engine harness side (male terminal) (dark gray)
E-112	 003-067
	Engine harness side (male terminal) (black)
E-113	 003-097
	Engine harness side (male terminal) (black)

Reed valve check



Name

1. Reed valve
2. EGR valve
3. Exhaust side
4. Intake side

If the reed valve is broken, bypass of intake air deteriorates air-fuel ratio (A / F), resulting in output lowering.
Check the reed valve for deformation or breakage.

Checking the Exhaust System

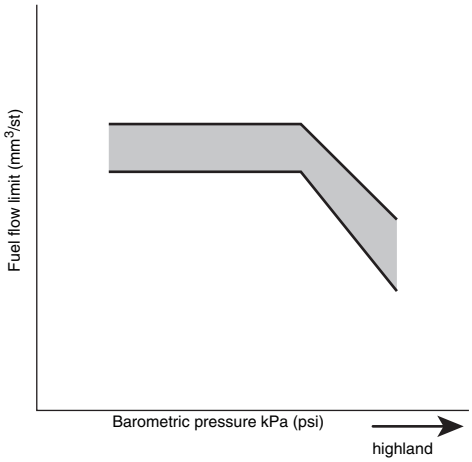
Exhaust system

The exhaust system consists of an exhaust pipe and tail pipe.

Step	Action	Value	Yes	No
1	Check the exhaust pipe and tail pipe for crushing, damage, and exhaust leaking. Was a problem detected?	-	Go to step 2.	Go to step 3.
2	Repair or replace the exhaust pipe or tail pipe. Is the action complete?	-	Go to step 3.	-
3	Repair the main unit. Is the action complete?	-	Check repair.	-

High altitude correction

The ECM calculates the current altitude from the atmospheric pressure sensor signals.
The PCV opening and closing interval and the injector electrified time are controlled according to the high altitude conditions at this time, and correction is made to achieve the optimum fuel flow.



TSWG0173

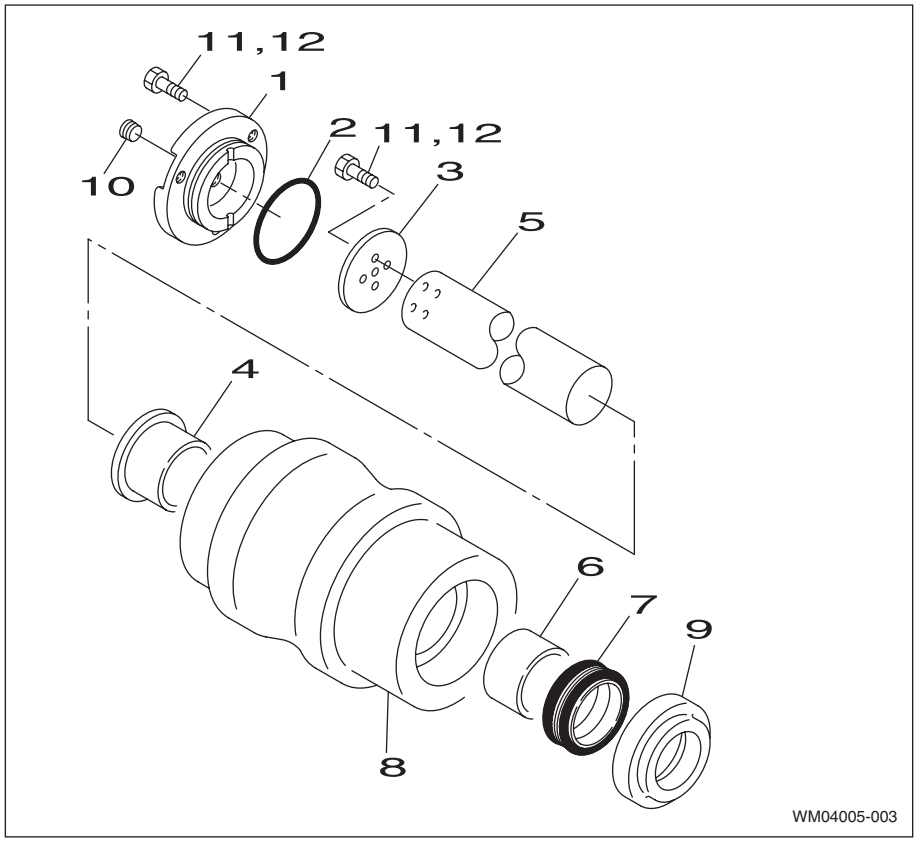
Step	Action	Value	Yes	No
1	Perform “Trouble Diagnosis by Service Support” Is the action complete?	-	Go to step 2.	
2	1. Check whether the engine coolant temperature has exceeded 108 °C. 2. Inspect the overheating causes and perform repair. 3. Lower the engine coolant temperature and check whether the output deficiency has been improved. Is the action complete?	-	Go to step 20.	Go to step 3.
3	Checking the operation environment During operation at high altitudes, the fuel flow may be restricted through correction. Is operation being done at a high altitude?	-	Contact the main unit manufacturer and confirm the handling method.	Go to step 4.
4	Check that there is no excessive load on the main unit side. Perform repair or replacement for any locations where problems are found. **Note:** **For information about inspection and repair, see the Service Text.** Is the action complete?	-	Go to step 5.	
5	Check the fuel. 1. Replace fuel within the fuel tank and line. 2. Start the engine and operate the main unit and check whether symptoms occur. Have the engine symptoms normalized?	-	Go to step 20	Go to step 6.
6	Perform fuel air bleeding and check whether the symptoms occur again. **Note:** **See the “Fuel system air bleeding” for the work procedures.** Have the engine symptoms normalized?	-	Go to step 20.	Go to step 7.
7	Perform checking of the fuel system. Is the action complete?	-	Go to step 8.	Go to “Checking the Fuel System”.
8	Perform checking of the intake air system. Is the action complete?	-	Go to step 9.	Go to “Checking the Intake Air System”.
9	Perform checking of the exhaust system. Is the action complete?	-	Go to step 10.	Go to “Checking the Exhaust System”.

Data display item	Unit	Idling reference value (varies according to main unit conditions)
Starter switch (ON)	ON/OFF	ON
Starter switch (ST)	ON/OFF	Auto
Idle manual switch	ON/OFF	Auto
Idle up switch	ON/OFF	OFF
Idle down switch	ON/OFF	OFF (ON immediately after key switch ON.)
Glow relay	ON/OFF	OFF (ON immediately after key switched ON)
Glow lamp	ON/OFF	OFF
Diagnostic switch	ON/OFF	-
Q-adjust resistance data 1		Varies according to main unit conditions
Q-adjust resistance data 2		Varies according to main unit conditions
Q-adjust resistance data 3		Varies according to main unit conditions

ASSEMBLY AND DISASSEMBLY OF UPPER ROLLER

Caution:	To ensure safe operations, wear protective devices before beginning work and follow all precautions. When removing devices or positioning devices at the time of installation, use a removal jig and a hammer or steel rod. Follow the precautions below when suspending the load. • The crane must be operated by a qualified operator. • Do not stand or pass under the suspended load. • Check the weight of the roller to determine whether it can be carried by hand or whether a crane must be used. Fix the roller to a level surface so it does not roll. Be sure to repair any parts damaged during disassembly, and prepare replacement parts in advance. If any parts are significantly rusted or dirty, clean them before disassembling. Any foreign matter entering the equipment during assembly can create a malfunction. Therefore, after thoroughly cleaning the equipment with cleaning oil, air blow the equipment, and assemble in a clean location. When assembling touching parts, be sure to coat them with new hydraulic oil. As a rule, replace all O-rings and other seal parts with new parts. General cautions Be careful not to drop precision parts or let bump them with other parts during work. Do not forcefully open or hit parts in an effort to speed up operations. Pay careful attention and proceed with caution so as not to damage any parts, create any oil leaks, or compromise the efficiency of the equipment. Disassembled parts can easily rust or collect dust. Therefore, immediately after disassembling parts, take precautions to prevent the parts from rusting or collecting dust.

1 Configuration diagram



1 COVER
2 O-RING
3 THRUST PLATE
4 BUSHING
5 SHAFT
6 BUSHING
7 FLOATING SEAL
8 UPPER ROLLER
9 COLLAR
10 PLUG
11 HEXAGON BOLT
12 LOCTITE 262

5 Assembly procedure

[1] Place parts in a rough cleaning container filled with kerosene to clean off any adhered matter that can form sharp points and cause scratches.

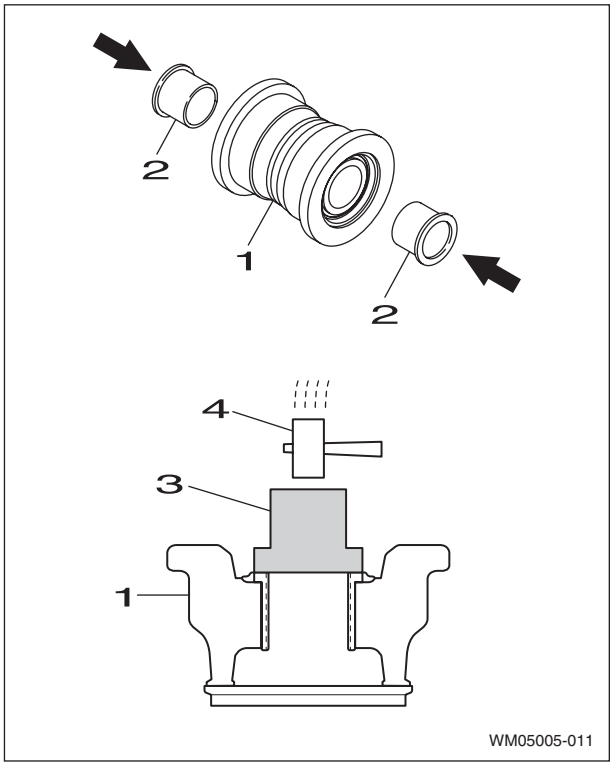
- Immerse in kerosene until dust, grease, and other adhered matter comes off and floats to the surface.

[2] Place parts in a finish cleaning container filled with kerosene and clean while gently moving the parts. After cleaning, wipe away the kerosene with a clean rag.

- Place the parts in a location free of dust and moisture and use compressed air to dry the parts. After drying, coat parts with engine oil.

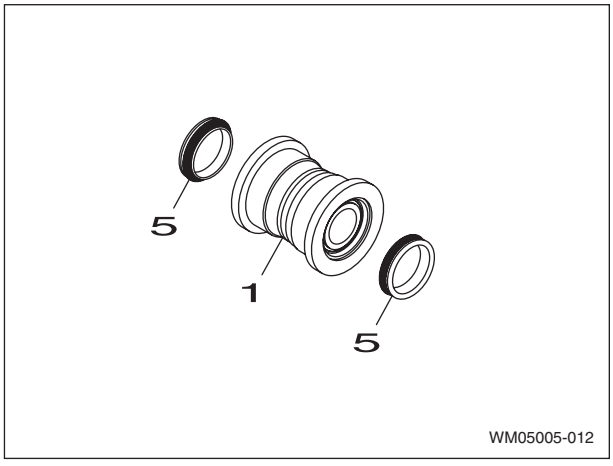
[3] Use the jig (B) (3) and hammer (4) to install the bushings (2) in the lower roller (1).

- Use new bushings.

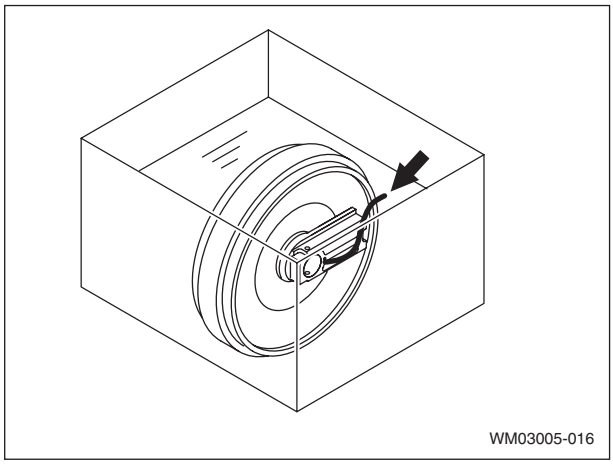


[4] Install the floating seals (5) to the lower roller (1).

- Use new floating seals.



[9] Use compressed air to check for leaks in the assembly parts.
Compressed air pressure: 0.2 MPa.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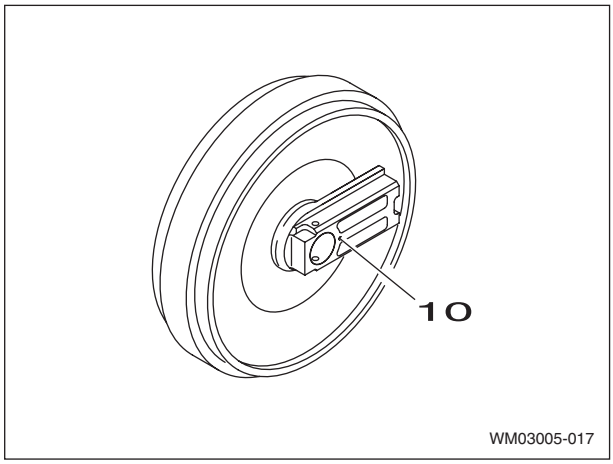
[10]Fill oil (about 780 cc) from the plug hole (10).

- The roller main unit can be very unstable, so give consideration to securing it.



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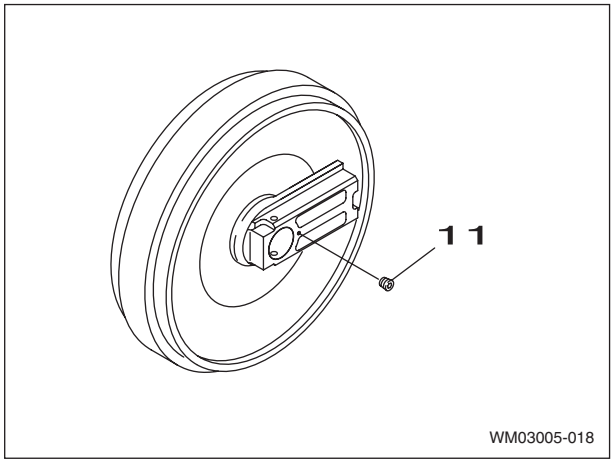
[11]Install the plug (11).

- Clean the assembly parts and dry with compressed air.
- To reuse a plug, wrap it with seal tape.



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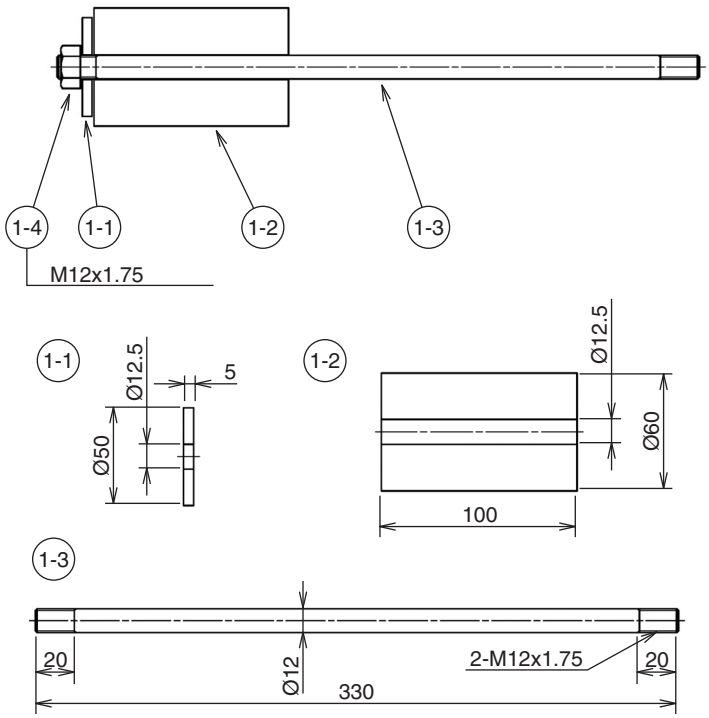
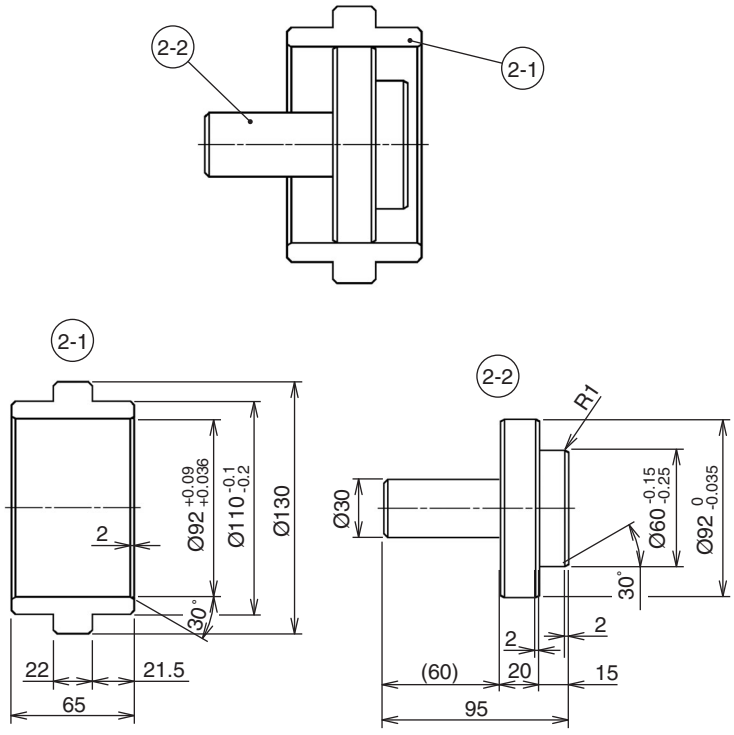
DISASSEMBLY AND ASSEMBLY OF TRAVEL MOTOR

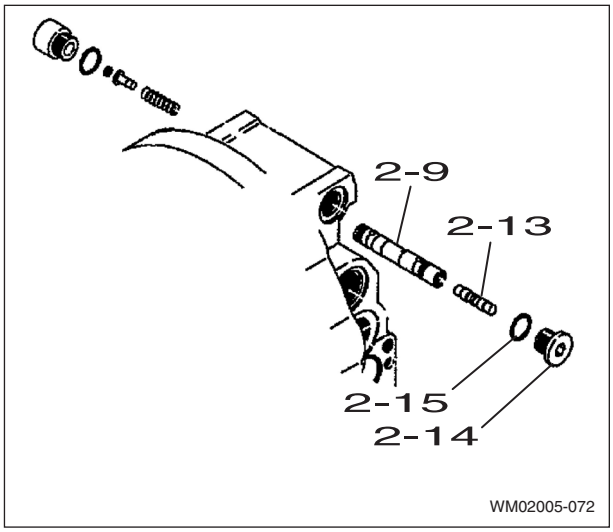
1 Tools for Assembly and Disassembly

NOTE: *The tools listed below are to be made locally.*

Tool name	Shape
Brake piston disassembly jig	
Oil seal press-fit jig	

Applicable part	Inpection and measurement location	permissible limit value	Repair, solution procedure
Piston assembly (11)	Shoe sliding surface	1.6 a degree of roughness Or the surface is rough and there is scratching at least 0.02 mm deep.	Lap the shoe sliding surface (#1000). If the scratching cannot be removed, replace using the case kit.
	Piston outer diameter	1.2 a degree of roughness Or the surface is rough and there is scratching at least 0.02 mm deep.	Replace using the case kit.
	Piston outer diameter and case (1) inner diameter	Gap 0.030 mm	
	Shoe ball backlash	0.7 mm of backlash	
Spool assembly (2-2)	Spool outer diameter	0.8 a degree of roughness There is scratching at least 0.02 mm deep or the surface is rough.	Replace using the base plate kit.
	Spool outer diameter and base plate inner diameter	Gap 0.050 mm	
Base plate (2-1)	Spool assembly (2-2) mounting hole	0.8 a degree of roughness There is scratching at least 0.02 mm deep. Or the surface is rough.	Replace using the base plate kit.
	Base plate inner diameter and spool outer diameter	Gap 0.050 mm	
	Orifice (2-11) mounting hole	0.8 a degree of roughness There is scratching at least 0.02 mm deep. Or the surface is rough.	
	Base plate inner diameter and valve assembly outer diameter	Gap 0.040 mm	
	Relief valve assembly free piston sliding and seat sections	There is scratching at least 0.02 mm deep. Or the surface is rough.	
Valve assembly (2-9)	Spool outer diameter	0.8 a degree of roughness There is scratching at least 0.02 mm deep. Or the surface is rough.	Replace using the base plate kit.
	Spool outer diameter and base plate inner diameter	Gap 0.040 mm	
Free piston (2-7-10)	Sliding section against the base plate and seat section	There is scratching at least 0.02 mm deep. Or the surface is rough.	Replace using the relief valve assembly.
Housing (2-7-2)	Sliding section (outer diameter)	There is scratching at least 0.02 mm deep. Or the surface is rough.	
Spring (2-4)	Appearance dimensions	Free length 65 mm	Replace the spring.
	Appearance	There is deformation and scratching on the coil surface.	
Spring (2-13)	Appearance dimensions	Free length, see the list at the end of this document	Replace the spring.
	Appearance	There is deformation and scratching on the coil surface.	
Spring (2-20)	Appearance dimensions	Free length 42 mm	Replace the spring.
	Appearance	There is deformation and scratching on the coil surface.	
Spring (12)	Appearance dimensions	Free length 49.7 mm	Replace the spring.
	Appearance	There is deformation and scratching on the coil surface.	
Spring (11)	Appearance dimensions	Free length 41.8 mm	Replace the spring.
	Appearance	There is deformation and scratching on the coil surface.	
Spring (26)	Appearance dimensions	Free length 40.3 mm	Replace the spring.
	Appearance	There is deformation and scratching on the coil surface.	
Each O-ring and oil seal		During disassembly	Replace each O-ring and oil seal.

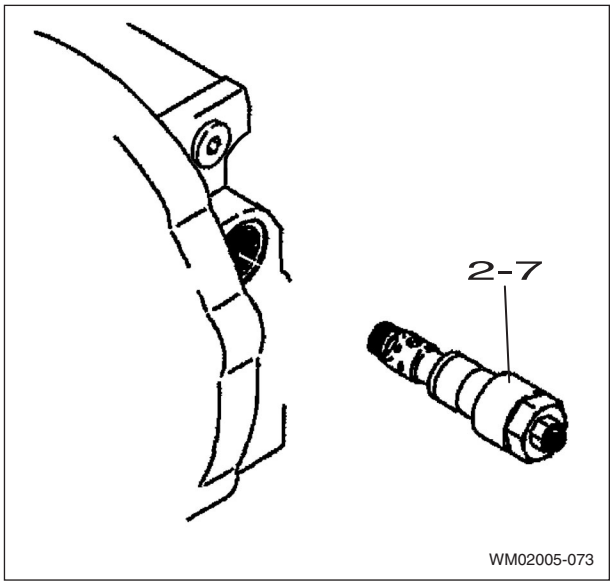
n) Valve assembly (2-9) attachment.
Attach the spring (2-13) to the valve assembly (2-9), then attach the assembly to the base plate (2-1). After attaching the valve assembly (2-9), check that the O-ring (2-15) is mounted on the plug (2-14), then tighten the plug (2-14) to the base plate (2-1) to the specified torque.
Next, check that the O-rings (2-15) are mounted to the plug (2-17), attach the spring guide (2-16) and washer (2-18), then tighten the plug (2-17) to the base plate (2-1) to the specified torque.



Caution:

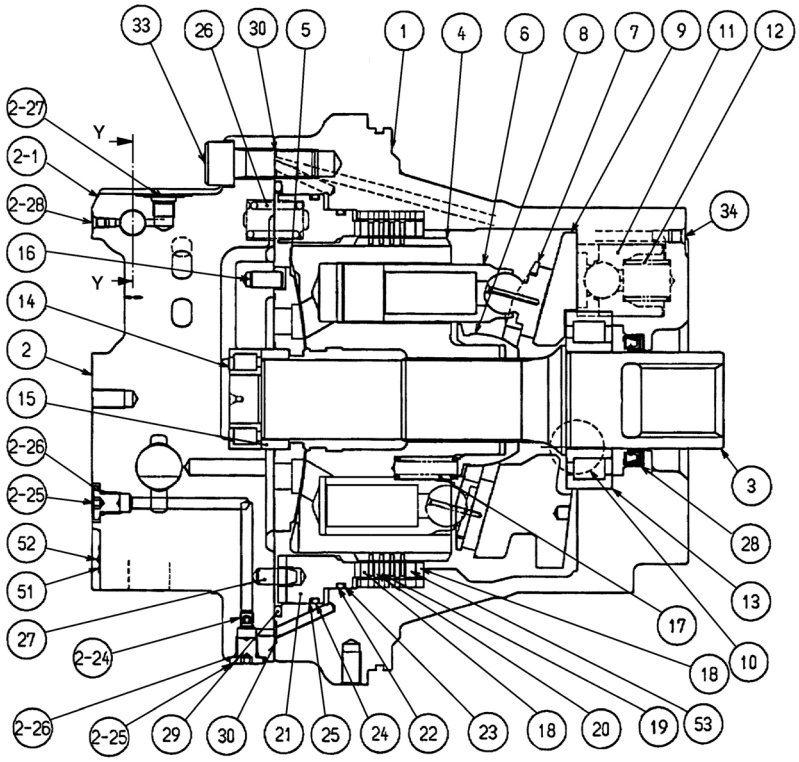
- Attach the valve assembly (2-9) to the base plate (2-1) so that the base plate (2-1) line port side is on the side nearest to the installer and the valve assembly (2-9) spring (2-13) mounting side is on the right. Attaching in the opposite direction may cause problems such as switching errors.
- Attach the valve assembly (2-9) after applying hydraulic oil to the outer circumference.
- After attaching the valve assembly (2-9), check that it moves smoothly.

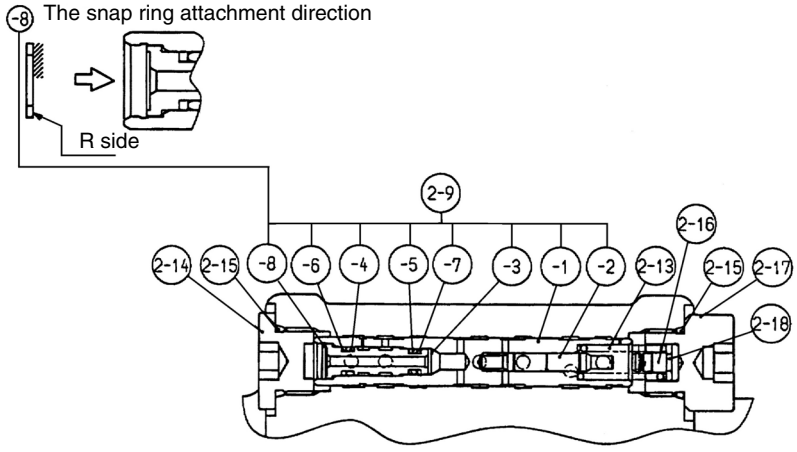
o) Relief valve assembly (2-7) attachment.
Check that the poppet (2-7-3) is mounted on the end of the relief valve assemblies (2-7), then attach the relief valve assemblies (2-7) to the base plate (2-1) and tighten to the specified torque.



Caution:

- Replace the O-ring (2-7-12) with a new one before attaching the relief valve assemblies.
- Check that the O-ring (2-7-12) and backup rings (2-7-16) are mounted on the poppet seat (2-7-1).
- Apply grease to the O-ring (2-7-12) and backup rings (2-7-16) before attaching.





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3 Tightening torque

Code	Screw side	Tightening torque Nm	Code	Screw side	Tightening torque Nm
2-2-4	G3/8	39.2 ± 2.0	2-21	G1	412 ± 20
2-6-2, 2-11	M5	2.45 ± 0.49	2-23, 2-24	M8	9.8 ± 1.0
2-6-3	G1/8	15.7 ± 1.0	2-25	G1/4	36.8 ± 2.5
2-6-6	M12	107.9 ± 4.9	2-28	M6	14.7
2-7	1" 5/16-12UN	412 ± 20	31	G3/4	157 ± 8.0
2-7-9	M12	39.2 ± 4.9	33	M18	439 ± 22
2-14, 2-17	G1/2	63.7 ± 4.9	34	M8	32.3

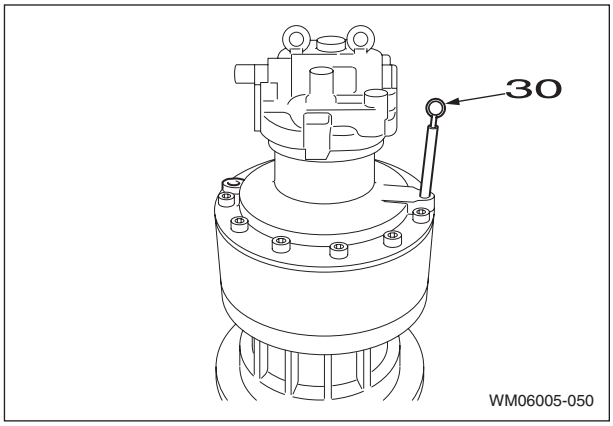
ASSEMBLY AND DISASSEMBLY OF SWING REDUCTION GEAR

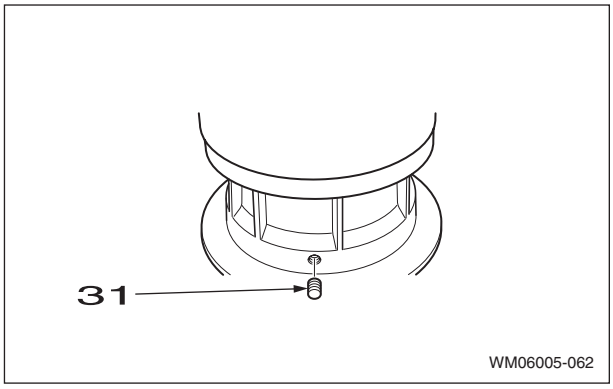
Caution:	Read and understand the contents of this Maintenance Manual before performing disassembly, reassembly, inspection, repair, or other such work of this product. Handle this product according to the separate "Usage Cautions". When removing this product from the equipment it is mounted on, stop that equipment system and wait for the surface temperature of this product to fall to about 40°C or below before removing it. Working on this product while it is still hot can cause burns. Additionally, always bleed out the pressure before removing any line from this product. Removing a pressurized line can result in oil spraying out and causing burns and oil leaking. Use the specialty tools and measurement instruments for disassembly, reassembly, inspection, and repair, etc. of this product. Using an inappropriate tool may result in injury or product damage. Be careful of parts falling when performing disassembly, reassembly, inspection or repair, etc. of this product. This may result in injury or parts damage. Do not directly touch with bare hands the machined edges or threaded sections of parts during disassembly, reassembly, inspection, or repair etc. of this product. This may result in injury. Check performance after reassembly. Do not resume use unless performance is fully recovered. Using this product at a sub-par performance level may result in product damage. The cautions (mark !) listed in this Maintenance Manual do not cover all possible dangers. Always think of safety first during disassembly, inspection, reassembly, repair, or other such work.

1 Disassembly

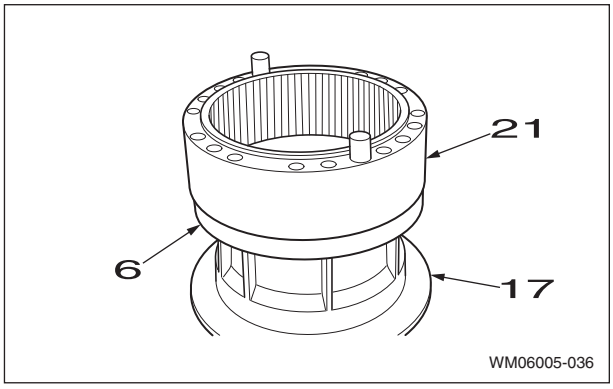
1 Disassembly of swing reduction gear

[1] Remove the oil gauge (30) and plug (31), and then drain the gear oil.



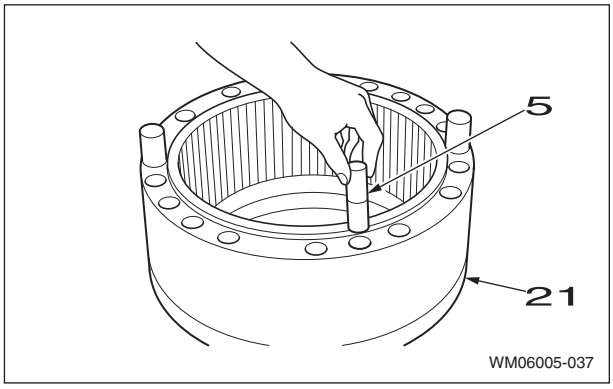


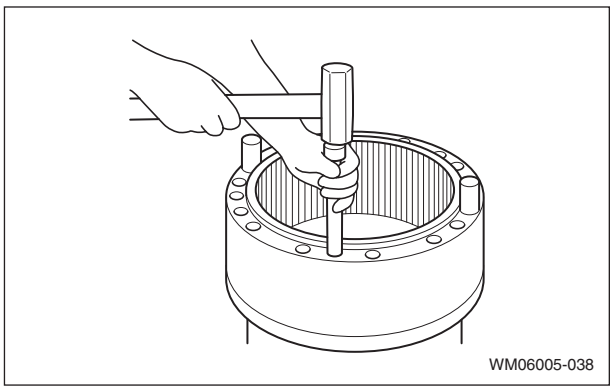
[8] Install while paying attention to the installation direction and orientation of the ring gear (21), and tighten the jig bolts (M20x200 full threaded bolts) and spacers (outer diameter: Ø27.2, inner diameter: Ø21, height: 20 pipe) at each of the 2 locations.



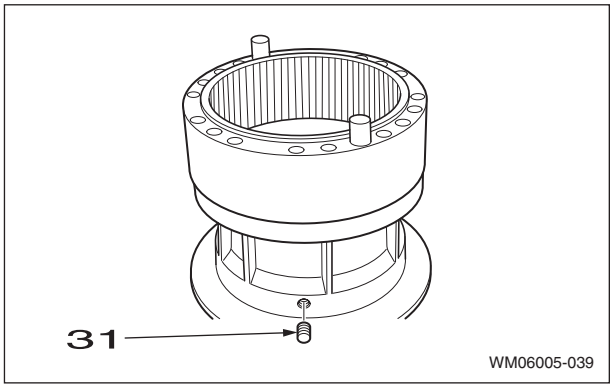
[9] Use a jig to hammer the knock pins (5) from the 4 knock pin holes on the ring gear (21).

- Be careful to hammer the knock pins into the correct knock pin holes so as not to damage the screws.

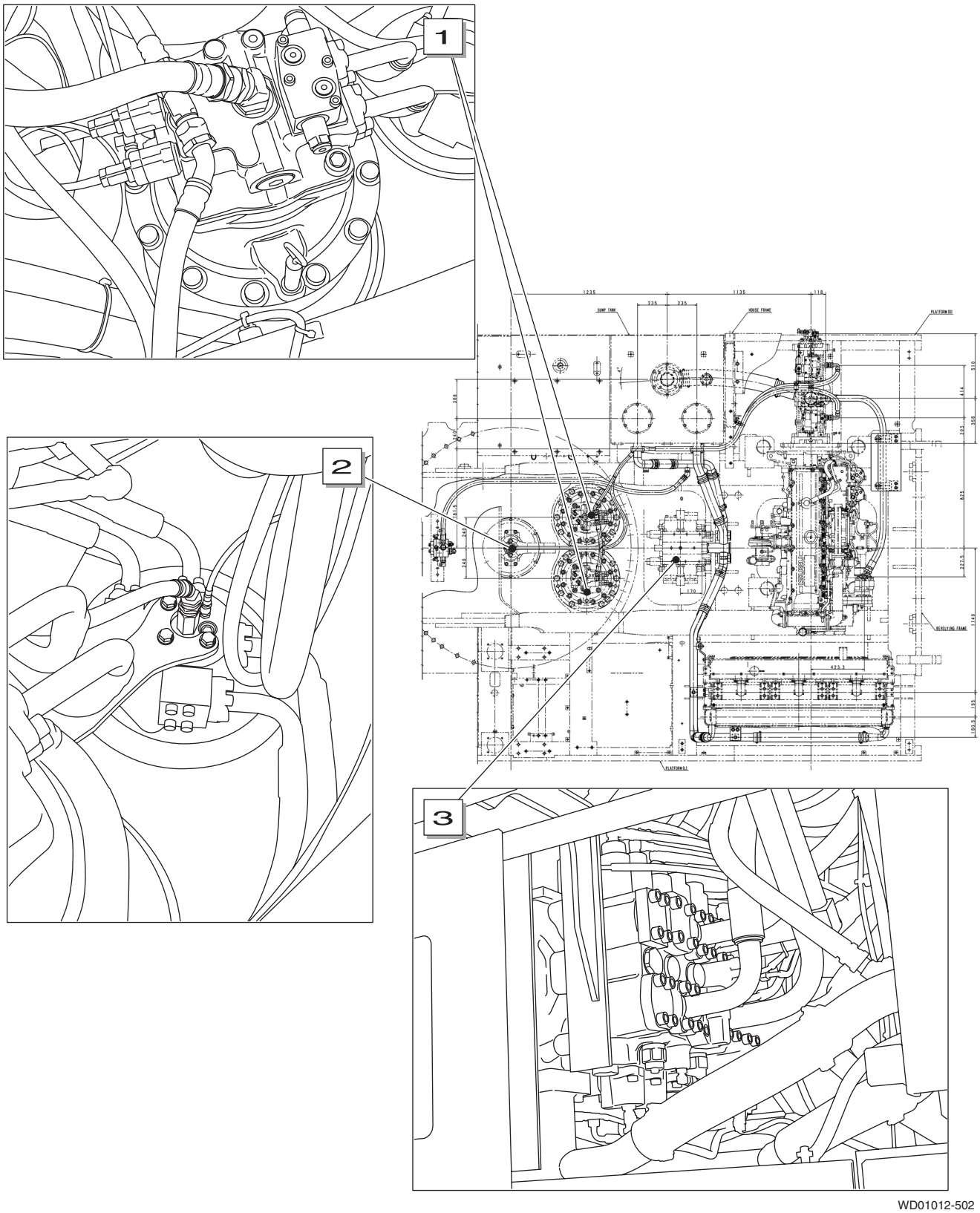




[10]Screw the plug (31) into the drain port on the gear case (17) side.



Swing body center section



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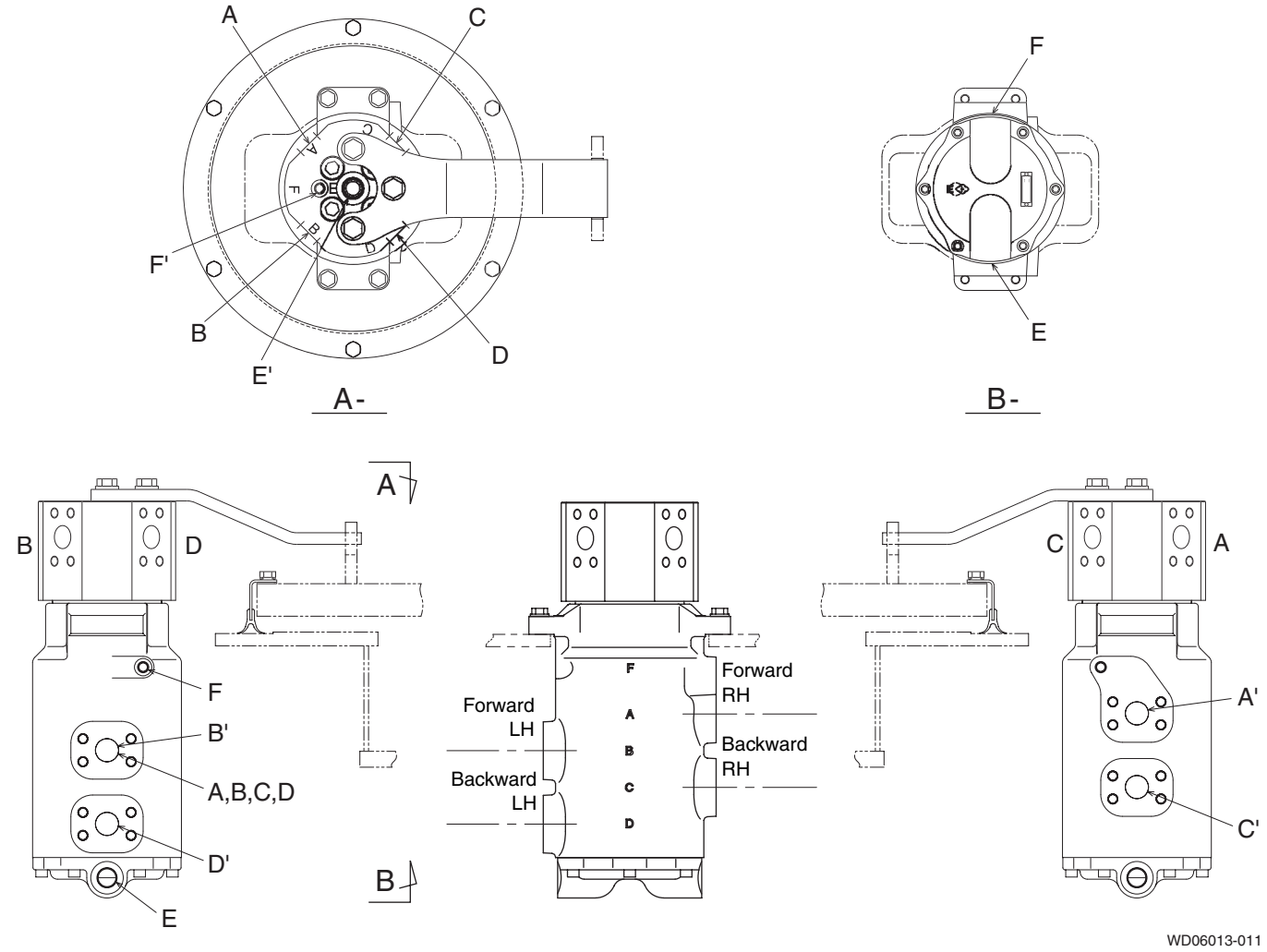
1	Swing motor
2	Center joint
3	Control valve

Center joint

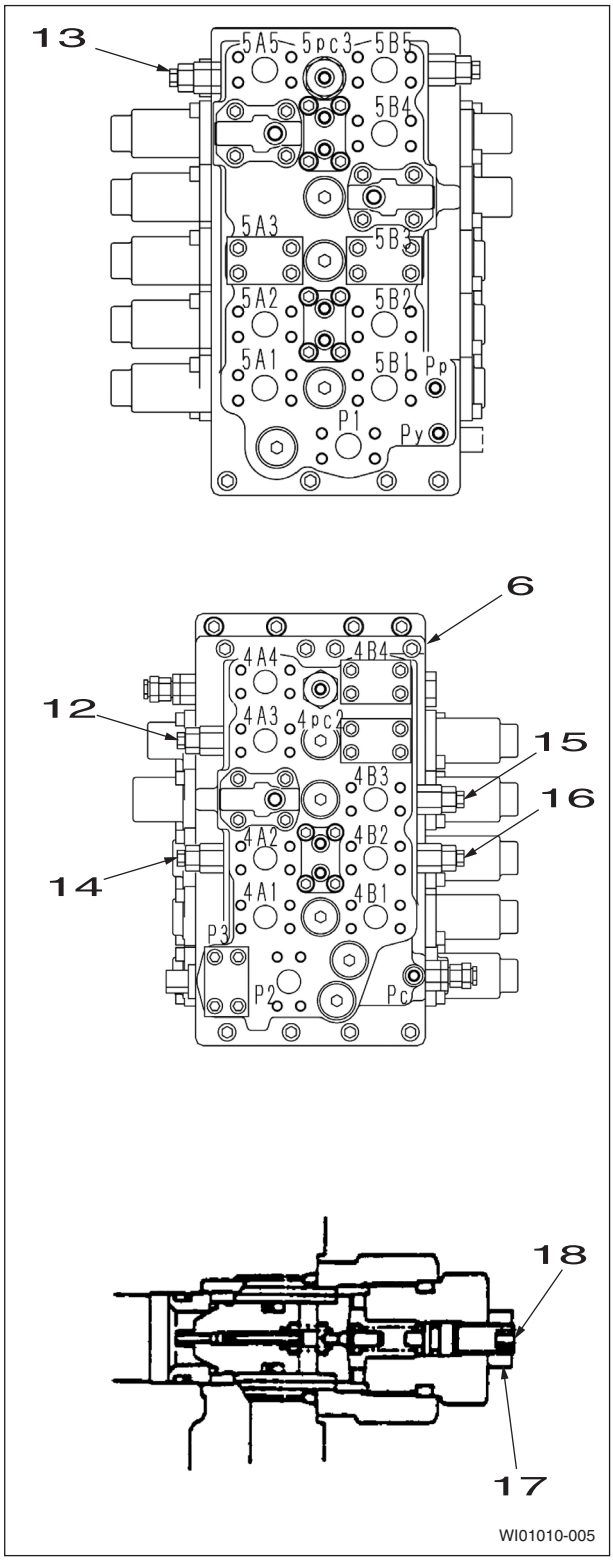


Port	Description	Location
A, A'	Main port	1 1/4 split flange
B, B'	Main port	1 1/4 split flange
C, C'	Main port	1 1/4 split flange
D, D'	Main port	1 1/4 split flange
E’	Drain port	G3/4
F’	Pilot port	G1/4
E	Drain port	2 - G3/4
F	Pilot port	2 - G1/4

Overload relief pressure adjustment

Engine speed	1870 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: 27.5 MPa 3989 Psi
	Others: 36.3 MPa 5265 Psi
Pressure per rotation of adjusting screw	Boom down 27.5 MPa / rotation 3989 Psi / rotation
	Others: 36.3 MPa 5265 Psi

6	Control valve
12	Boom-up
14	Bucket-open
15	Boom down
16	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 38.7 MPa (5613 Psi).

NOTE: *For boom down (15), 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

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

Example: Arm-out (13) overload relief adjustment

A Loosen the lock nut (17) and adjust by the turning the adjusting screw (18).

- 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 (17).

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

Section

8002

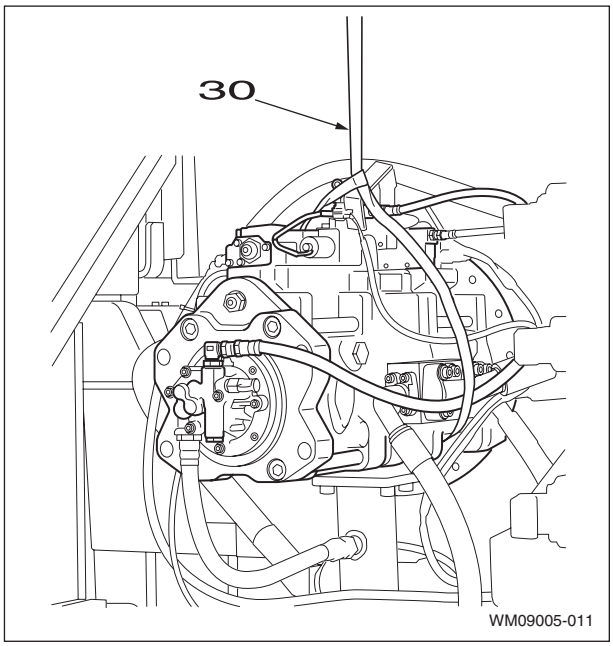
REMOVAL AND INSTALLATION OF THE HYDRAULIC RESERVOIR

Printed in France
February 2009

CNH

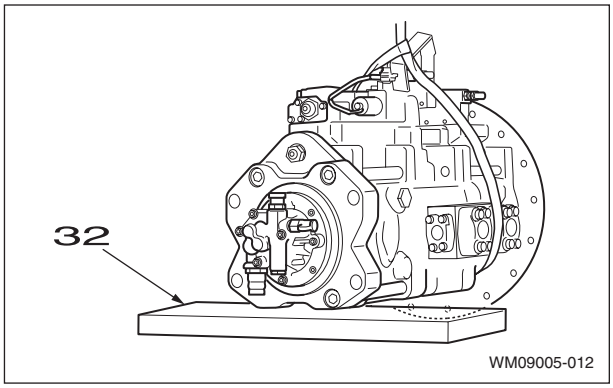
Lep SM700B8002-0EN

[12]Use a liftcrane and the nylon sling (30) to pull the pump out from the shaft and lift the pump.



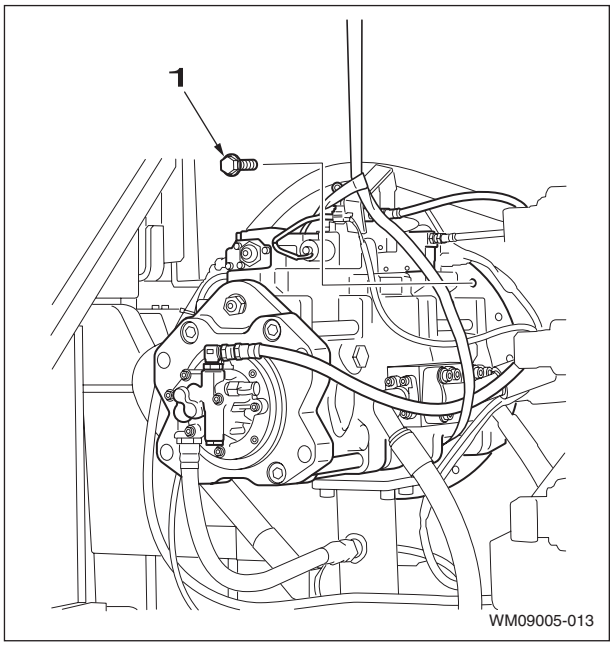
[13]Thoroughly check that the location is safe before lowering the pump on wood planks (32).

- Thoroughly secure the pump so that it does not fall over.



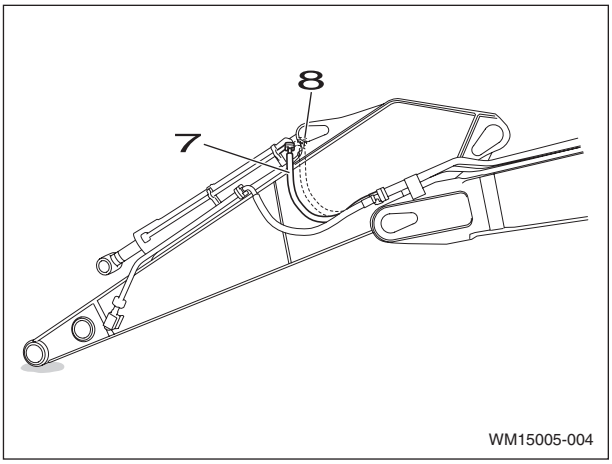
2 Installation of hydraulic pump

Perform the reverse of the removal procedure**.**
The tightening torque for the pump installation bolt (1) is 88 - 108 Nm.
Fill the pump case with hydraulic oil from the drain port so that no air remains in the pump case.
Additionally, when there is a 2nd option gear pump, bleed off air from the air bleed port.



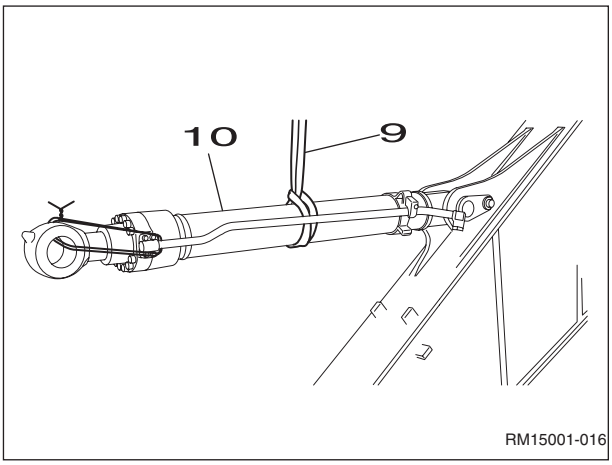
[9] Use a hexagon wrench to remove each group of 4 hexagon socket head bolts, and then remove the hoses (7) and (8).

- Use caps and plugs to cover the hoses and lines to prevent any entry of water, dust or dirt.
- Clean the hoses and line by spraying them with a parts cleaner to prevent scratches and prevent dirt from accumulating on the connectors.

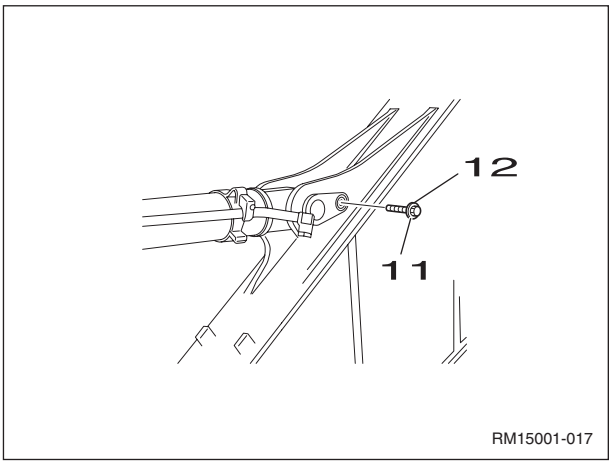


[10]Use a crane and nylon sling (9) to secure the bucket cylinder (10).

- Wrap the nylon sling to the inside of the line so that it is not crushed.



[11]Use a wrench to remove the bolt (11) and washer (12).

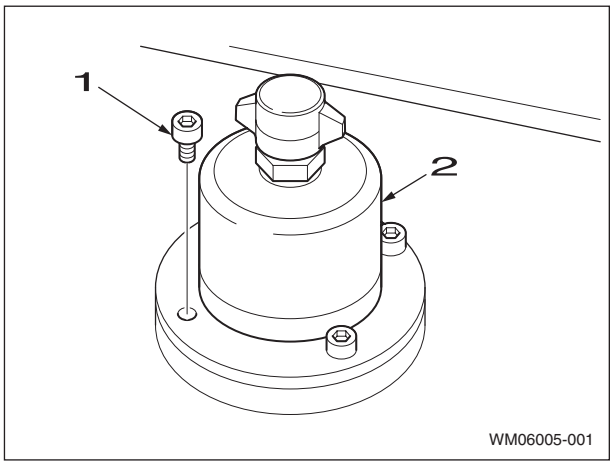


REMOVAL AND INSTALLATION OF CENTER JOINT

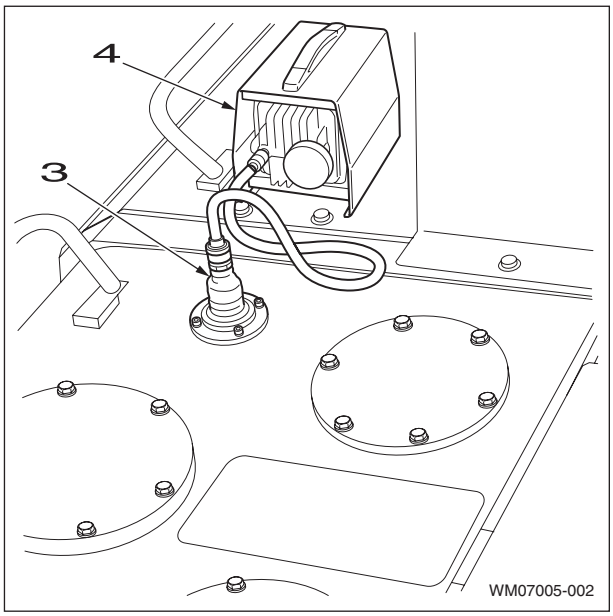
Caution:	Be sure to stop the engine before beginning work. Be sure to inspect the wire rope and other lifting equipment before beginning work. Do not stand or pass under the suspended load.

1 Removal of center joint

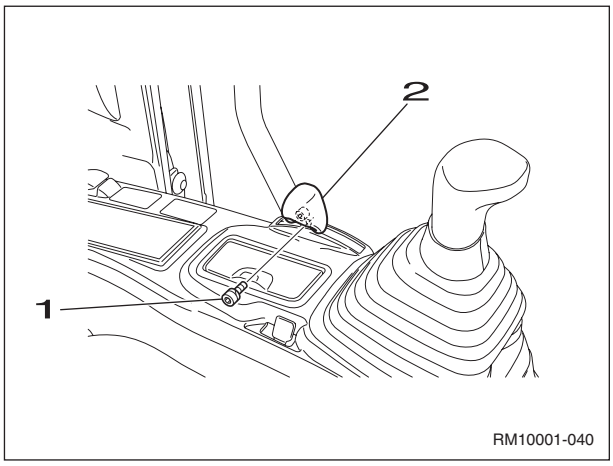
[1] Use a hexagon wrench (5 mm) to remove the 4 bolts (1), and then remove the air breather (2) on the hydraulic oil tank.



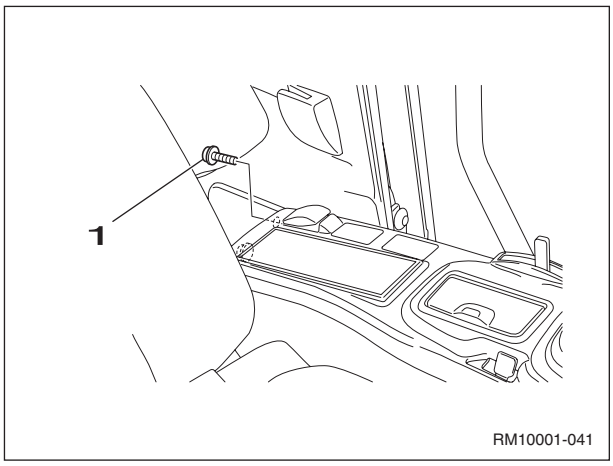
[2] Attach the specialty adapter (3) to the area where the air breather was removed, and set the vacuum pump (4).
Create negative pressure in the hydraulic oil tank using the vacuum pump.



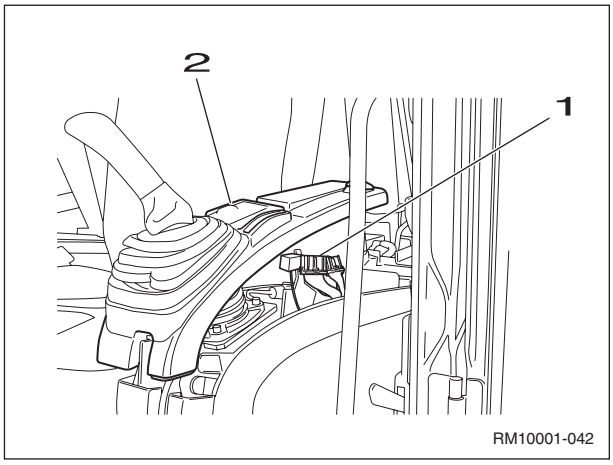
[3] Disassemble the retaining screws (1) and remove the grip (2) of the gate lock lever.



[4] Disassemble the retaining screws (1) of the console top cover.



[5] Remove 3 connectors (1) and remove the console top cover (2).



Section

8010

DISASSEMBLY AND ASSEMBLY OF THE MAIN HYDRAULIC PUMP

CNH

Lep SM700B8010-0EN

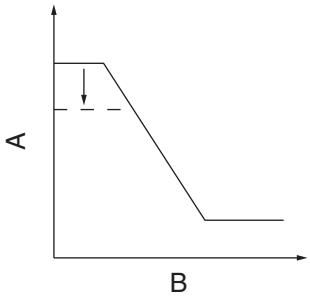
EXPLANATION OF REGULATOR OPERATION

1 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 "Regulator adjustment amount list".)

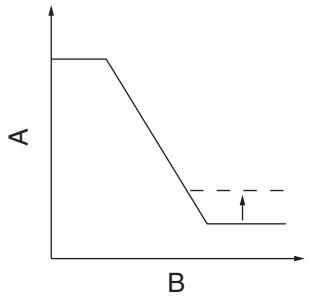
1 Maximum flow adjustment

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 Pi.



2 Minimum flow adjustment

Loosen the hexagon nut (806) and tighten (or loosen) the hexagon socket head locking screw (953) to adjust 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 Pi.

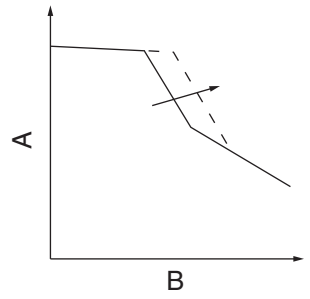


3 Input horsepower adjustment

This regulator uses the simultaneous full-horsepower method. Therefore, when changing the horsepower setting, adjust the adjusting screw of both the front and rear pumps to the same amount.
The pressure change value resulting from adjustment is the value when pressure boost is simultaneously performed with both pumps.

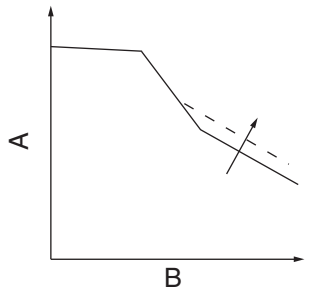
[1] Outer spring adjustment.

Loosen the hexagon nut (630) and tighten (or loosen) the adjusting screw (C) (628) to adjust the outer spring. As the adjusting screw is tightened, the control diagram shifts to the right as in the diagram on the right and the input horsepower increases. When the adjusting screw (C) is rotated N times, the inner spring (626) setting also changes. Therefore, return the adjusting ring (C) (627) by rotating it N x A times in the opposite direction.
A : Discharge flow amount Q.
B : Discharge pressure (P1+P2).

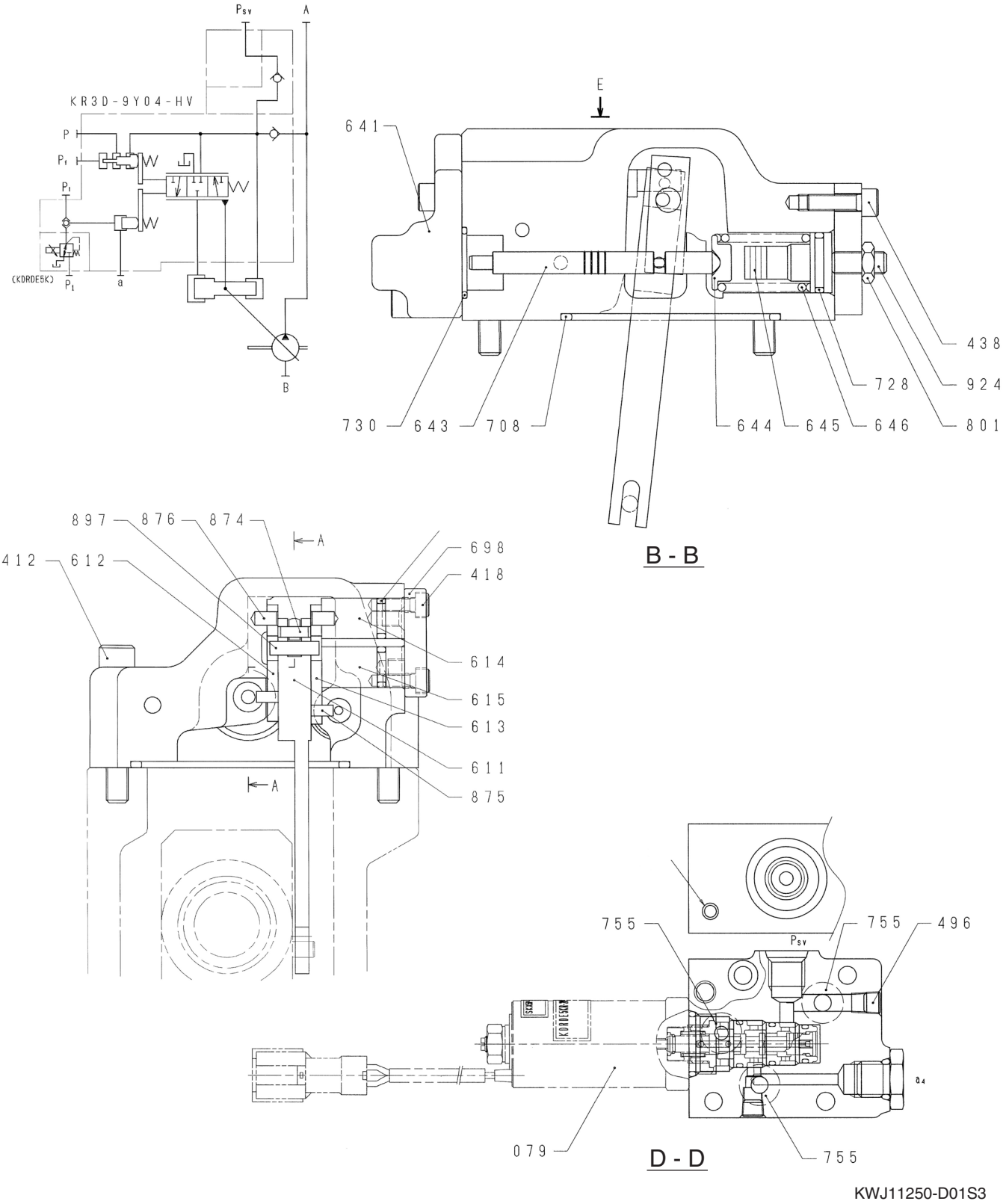


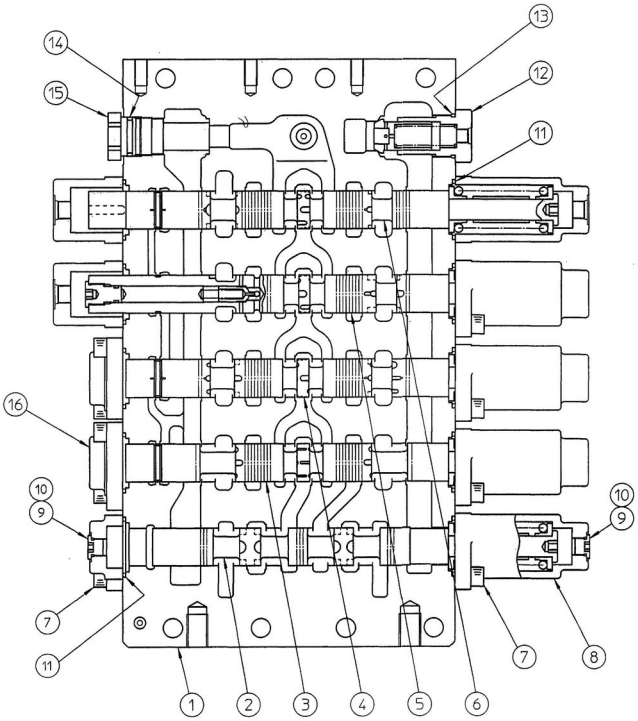
[2] Inner spring adjustment.

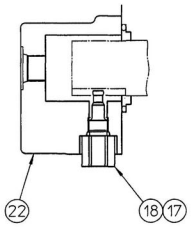
Loosen the hexagon nut (802) and tighten (or loosen) the adjusting ring (C) (627) to adjust the inner springs. As the adjusting ring (C) (627) is tightened, the flow amount increases as shown in the diagram on the right and the input horsepower increases.
A : Discharge flow amount Q.
B : Discharge pressure (P1+P2).

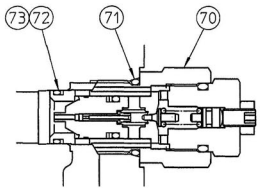


2 Rear-side regulator assembly cross-section diagram (KR3G-9X04-HV)

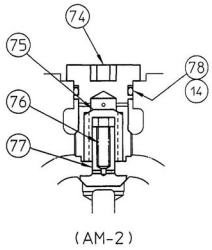


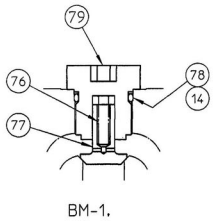


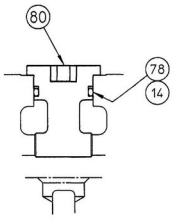




Over load relief valve (BM, BKT)







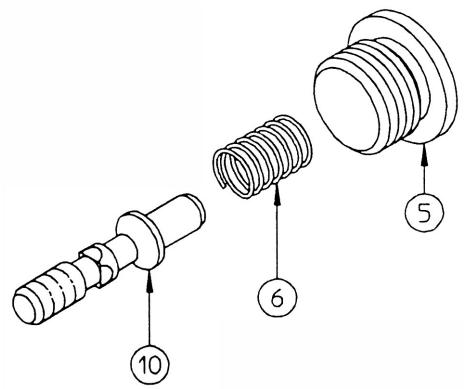
Travel

KWJ11800-D00S1

[2] Cover section.

1) Remove the cap (5), and remove the spring (6) and poppet (10).
Cap
Hexagon socket diameter: 10
Tightening torque: 49 Nm.

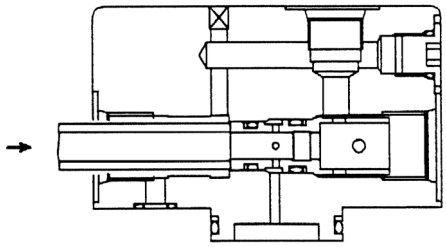
- For parts that have been in operation for a long time, the poppet (10) may not be able to be removed from the edge of the sleeve (9) seat surface. Do not force disassembly of parts.

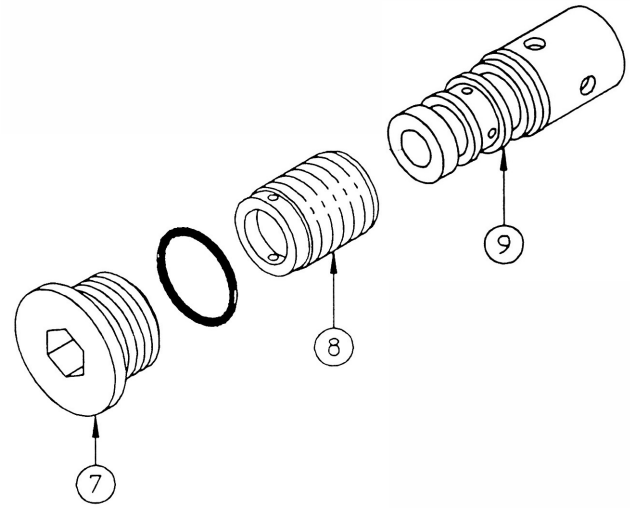


2) Remove the cap (7) and remove the piston (8).

- Cap
Hexagon socket diameter: 10
Tightening torque: 49 Nm.

3) Use a pipe with an inner diameter of Ø10 and an outer diameter of Ø14 and lightly tap out the sleeve (9) from the left side.





8012

Section

8012

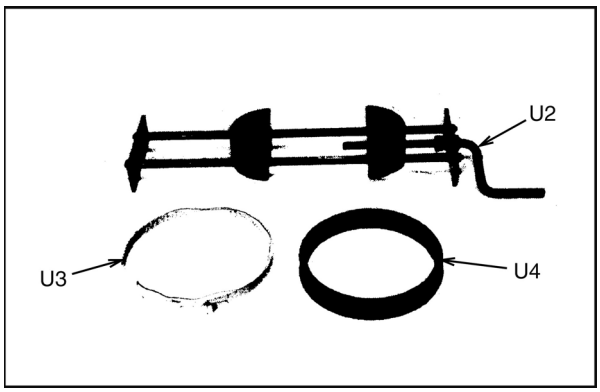
ASSEMBLY AND DISASSEMBLY OF THE ATTACHMENT CYLINDERS

Printed in France
February 2009

CNH

Lep SM700B8012-0EN

[2] Piston ring expander



Component parts

Tool	Part name	Part No.	Qty.	Remarks
U2	Expander	380200122	1	
U3	Clamp	380200123	1	Piston outer diameter Ø120 - Ø135
		380200124	1	Piston outer diameter Ø100 - Ø115
U4	Ring (rubber band)	380200125	1	Piston outer diameter Ø120 - Ø135
		380200126	1	Piston outer diameter Ø100 - Ø115

Characteristics

A teflon ring is used on the piston of the hydraulic cylinder, but this cannot be installed as is.

By simply rotating the handle, the ring expander can be used to expand the ring smoothly and easily for mounting on the piston without creating any damage.

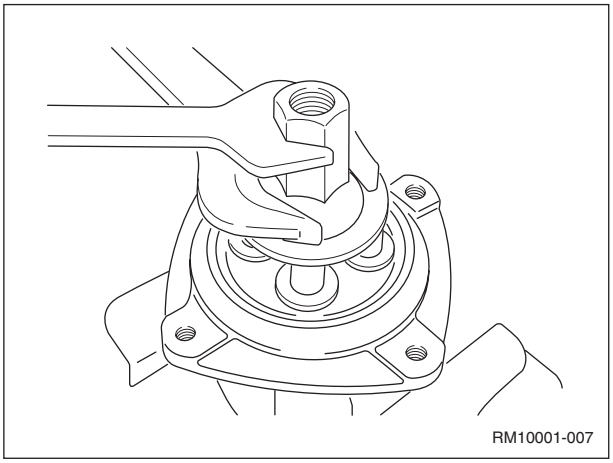
With the use of a compression ring, the teflon ring to be installed on the piston can be mounted exactly at the specified position.

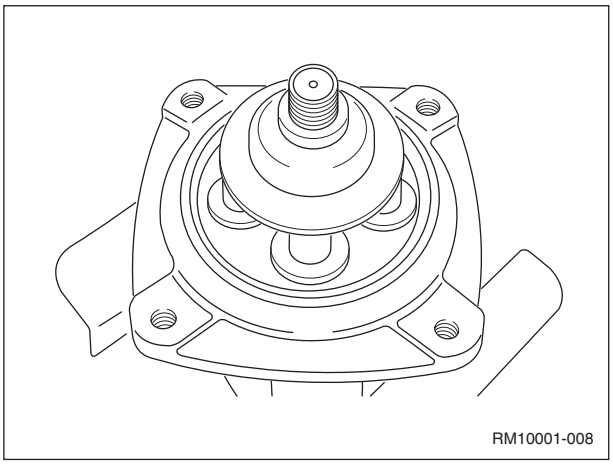
[3] Bushing tool kit

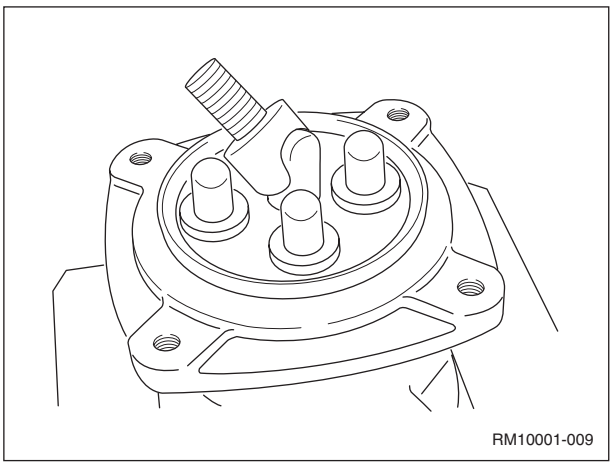
Part No.: 380200127

Application: Each bushing tool can be installed to the grip by bolts and be used as striking tool when press fitting the wrapping bearing on the attachment cylinder.

[4] Use a wrench on the bolt width of the adjusting nut (312) and disk (302) to loosen them, and remove the adjusting nut and disk.


RM10001-007


RM10001-008


RM10001-009

ASSEMBLY/DISASSEMBLY OF TRAVEL REMOTE CONTROL VALVE

When disassembling the valve, read the disassembly procedures thoroughly before following the sequence below. The numbers in the parentheses after the part names indicate codes in "Attached diagram 1. Remote control valve assembly cross-section diagram".

1 Maintenance Procedures

1 Disassembly procedures

1 Preparations

[1] Prepare a sufficiently spacious, solid and stable work platform so that parts will not fall or move during work.

[2] Prepare the tools and materials.

2 General work precautions

[1] Each part has been manufactured with a high degree of precision, so be careful not to let parts bump each other or fall when handling them.

[2] If parts are struck or pulled with excessive force during work because they are tight, this may cause burrs or damage which may then cause reductions in performance or oil leaking due to faulty assembly. Perform work carefully and thoroughly.

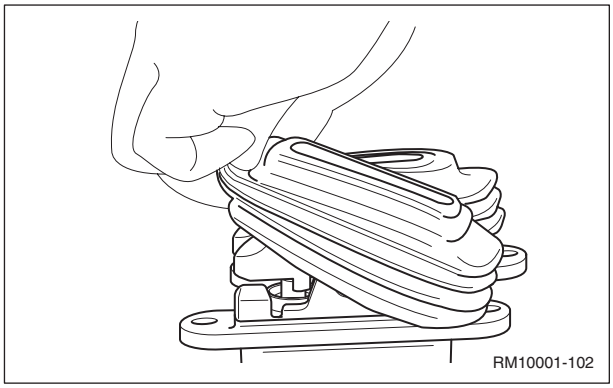
[3] Rust may form on parts due to moisture or debris if the valve is left disassembled or if work is abandoned in the middle of disassembly. If work must be halted, be careful about preventing rust from forming and dust settling on parts.

3 Disassembly procedure

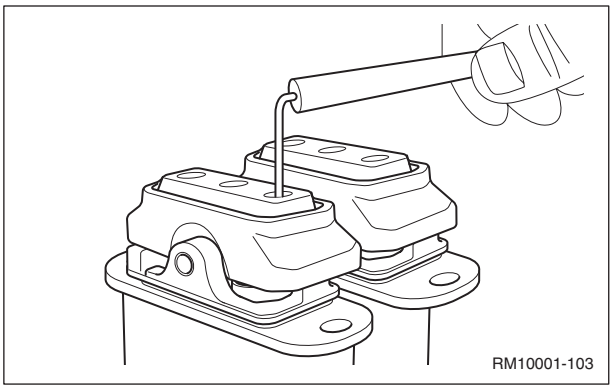
[1] Clean the remote control valve with white kerosene.

- Place plugs in each port.

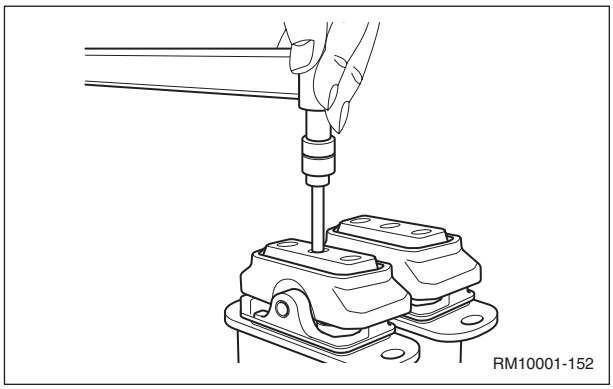
[2] Use shock plate to secure the remote control valve in a vise.
Remove the bellows (501) from the covers (201) and remove the covers by pulling upwards.


RM10001-102

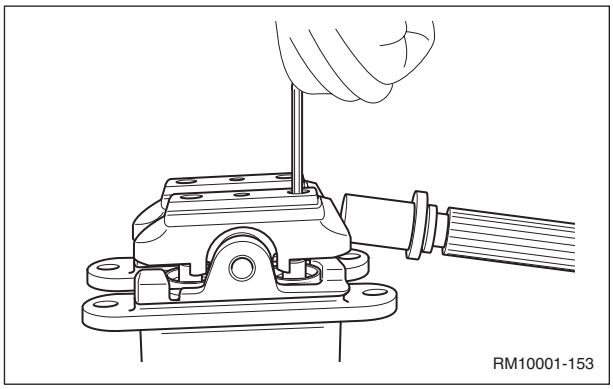
[3] Use a hexagon wrench on the hexagon socket head locking screws (423) to loosen them.
Be careful, as application of Loctite #241 makes the loosening torque high.


RM10001-103

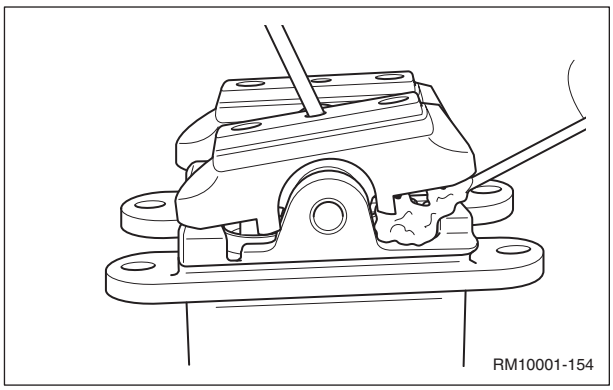
[24]Tighten the hexagon socket head locking screws (423) to the specified torque.
Tightening torque: 6.9±1 Nm


RM10001-152

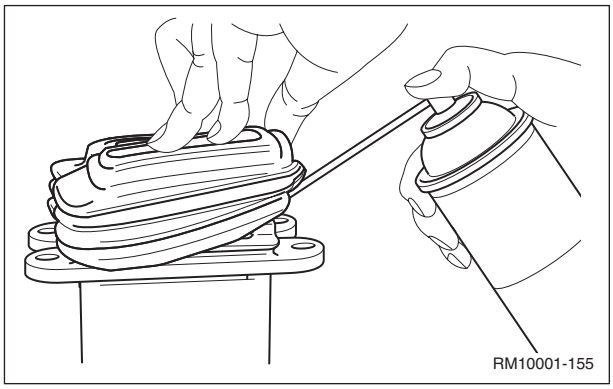
[25]Adjust the height of the locking screws (471) so that the top surface of the cams (420) and the bottom surface of the covers (201) are parallel, and tighten the lock nuts (472) to the specified torque after rotating the cams left and right to check if there is any neutral backlash.
Tightening torque: 33.3±3.4 Nm.
Even if the push rods (214) are pressed in too much by the locking screws, backlash during neutral will occur. Use caution as this may cause the sudden movement when starting the engine.


RM10001-153

[26]Tilt the cams (420) and fill the grease cups (203) of the plugs (202) with grease while applying grease to the top of the push rods (214).
For grease application and filling, use a flat object made of soft material so as to not scratch the push rod or plug surfaces.


RM10001-154

[27]After mounting the top end of the bellows (501) on the cams (420), mount the bottom end into the grooves on the covers (201).
Before mounting the bottom end of the bellows into the grooves of the covers, spray anti-rust oil on the parts within the bellows.


RM10001-155

Code	Part name	Code	Part name
1	Body	13	Spring
2	Spool	14	Plug
3	Spring	15	O-ring
4	Plug	16	Steel ball
5	O-ring	17	Seat
6	Cap screw	18	O-ring
7	O-ring	19	Plug
8	Plug	20	O-ring
9	Check plunger	21	Name plate
10	Check plunger	22	Drive screw
11	Check plunger	23	Plug
12	Check plunger	24	Plug

ASSEMBLY AND DISASSEMBLY OF SWING MOTOR

1 Causes of Trouble and Solutions

1 General cautions.

This list consists of actions to be taken when an abnormality is sensed during use of the hydraulic motor. General cautions are listed below.

1) Think before attempting to fix a problem.
Determine the nature of the abnormality before beginning work and think whether this same kind of problem has occurred before.
Also, reconfirm whether the motor is the source of the problem.

2) Be careful about dust and dirt.
The cause of wear is very often dust and dirt. So be careful that dust and dirt do not get into parts during disassembly.

3) Parts handling
Parts are manufactured with a high degree of precision, so be careful not to scratch them during handling.

4) Do not damage O-rings or gasket surfaces while performing work. Also, it is recommended that O-rings are replaced for new ones during disassembly.

2 Investigating abnormalities in the motor main unit

It is very difficult to search for the source of troubles in the hydraulic circuits. Inspect the following items and thoroughly investigate whether the motor is the source of troubles.

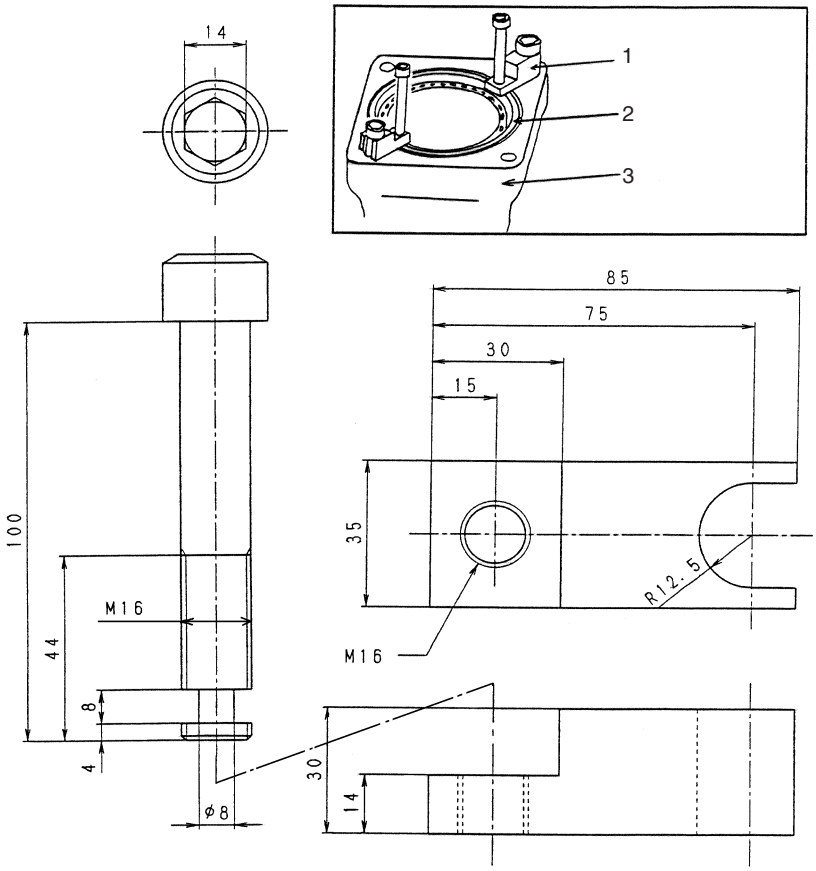
1) Inspecting oil within the casing
Remove the drain plug and inspect the hydraulic oil within the casing. If a large amount of metal particles come out at the same time as oil, it is very likely that there is damage with parts within the motor.

2) Existence of abnormal noise
Check whether abnormal noise is coming from the motor main unit.

3) Measure pressure for each part.
Do not perform disassembly inspection carelessly. Measure pressure for each part and look for abnormalities in each area.

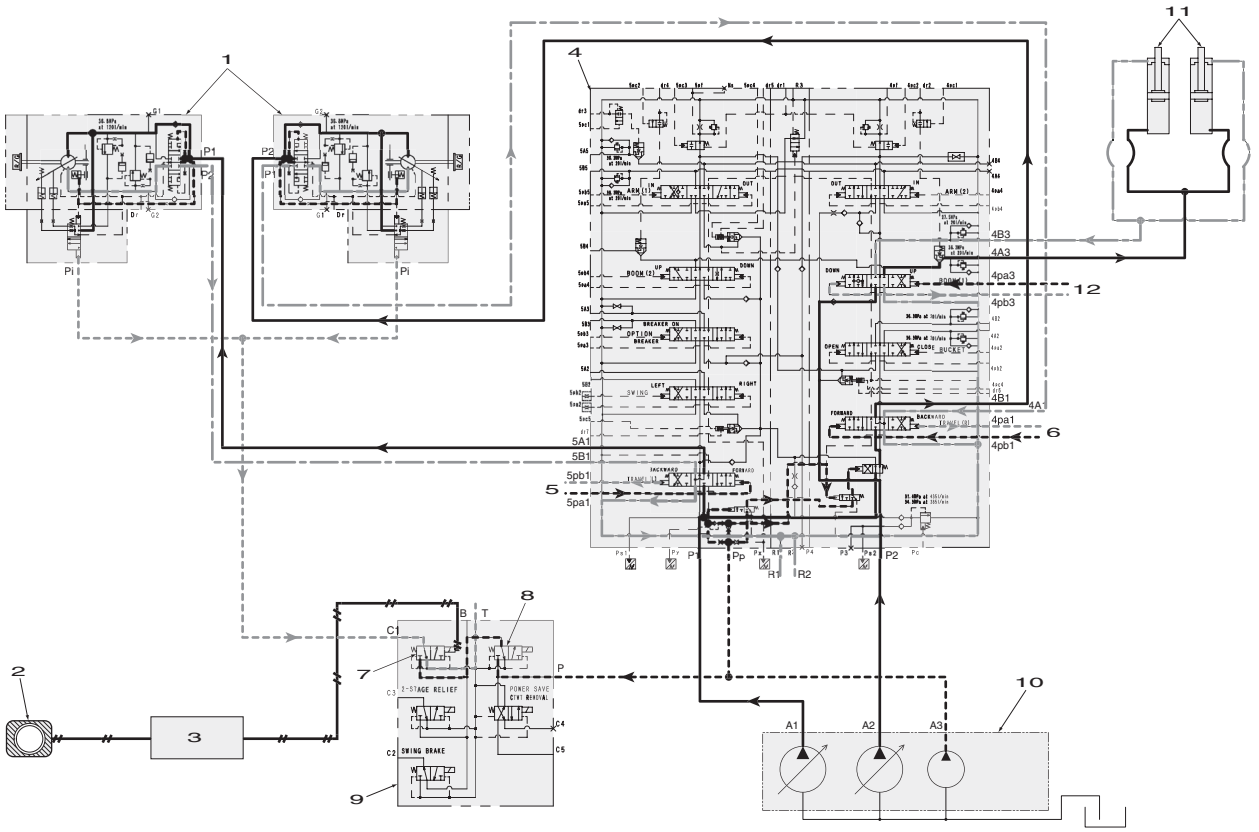
5 Jig

1 Brake piston removal jig



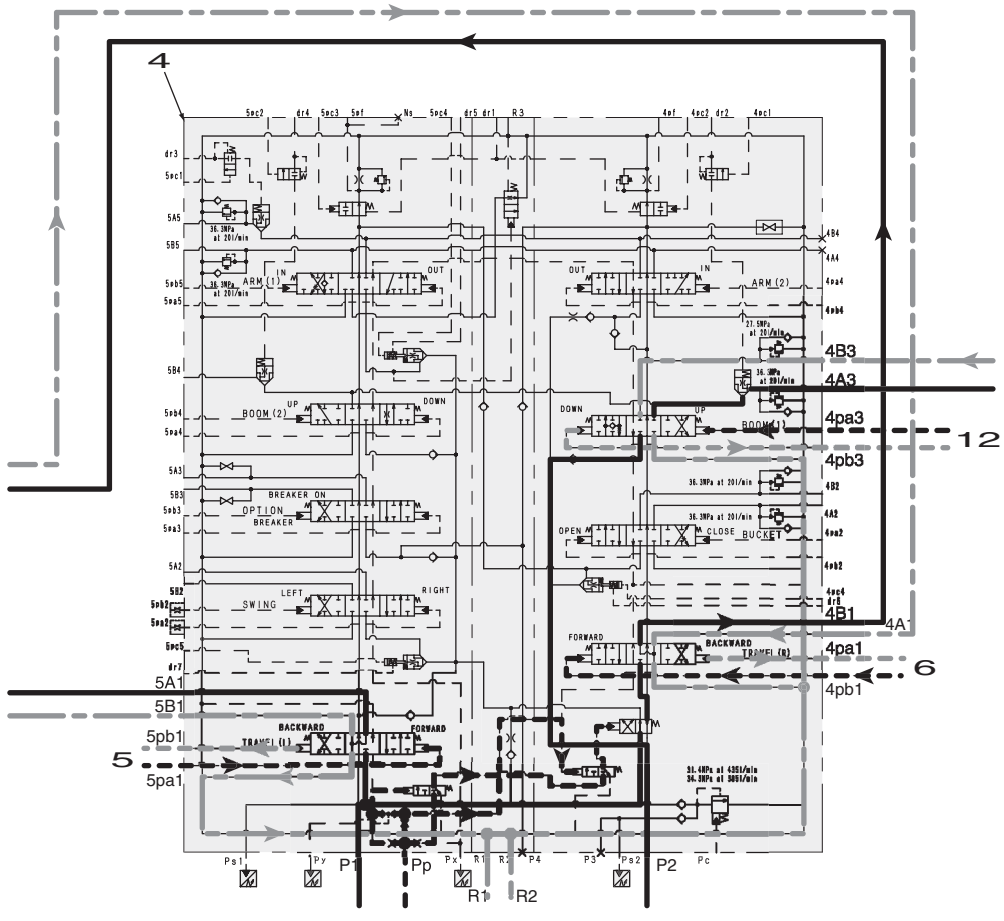
1) Brake piston removal jig
2) Brake piston
3) Casing

Overall View



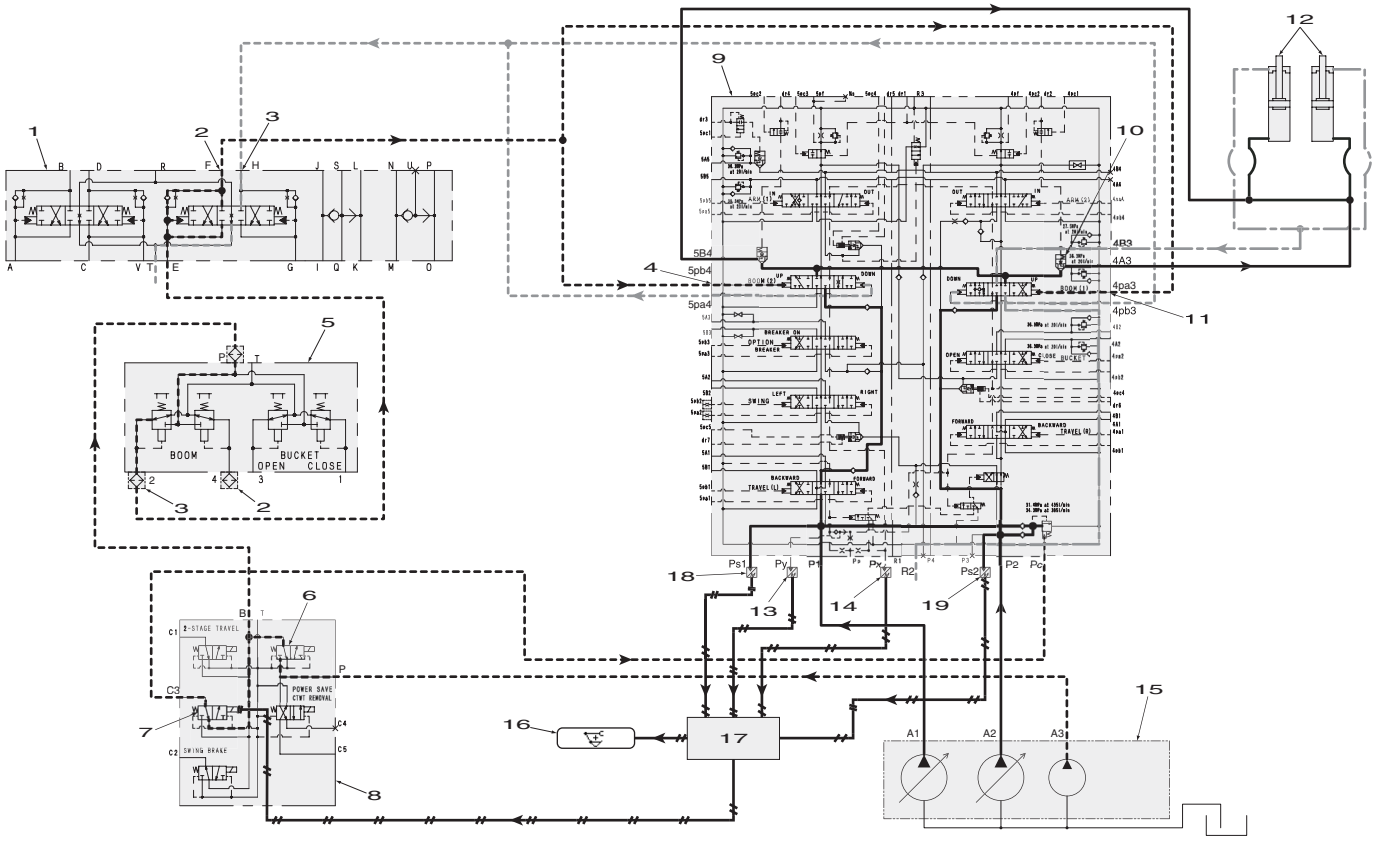
WD04011-003a

Enlarged View



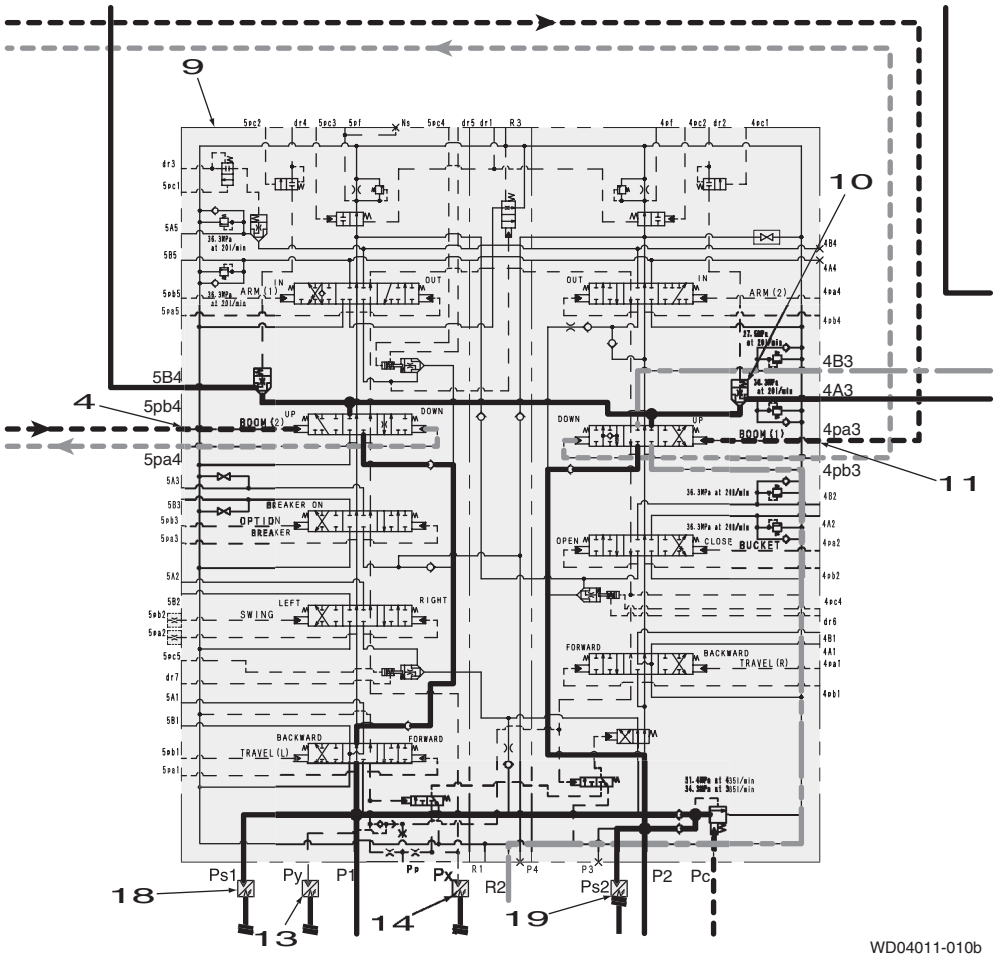
WD04011-003b

Overall View (without safety valve)



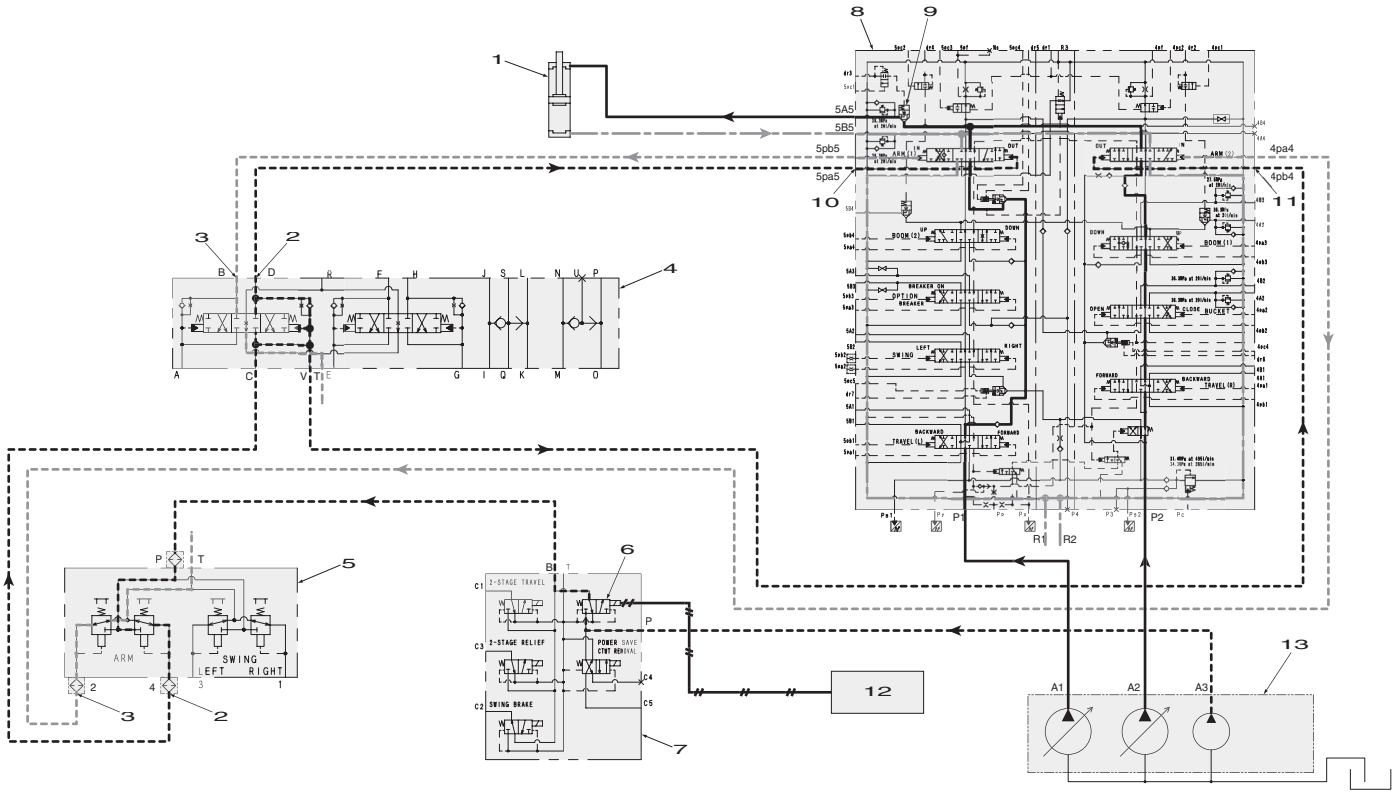
WD04011-010a

Enlarged View (without safety valve)



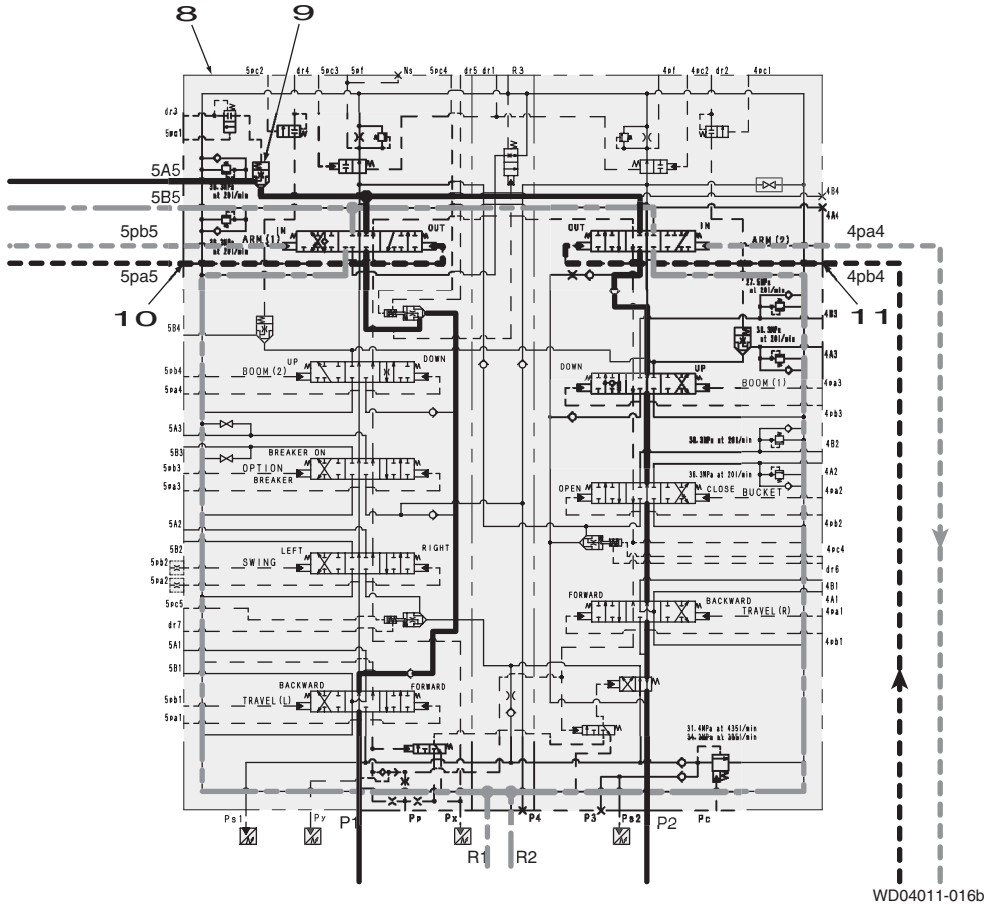
WD04011-010b

Overall View (without safety valve)



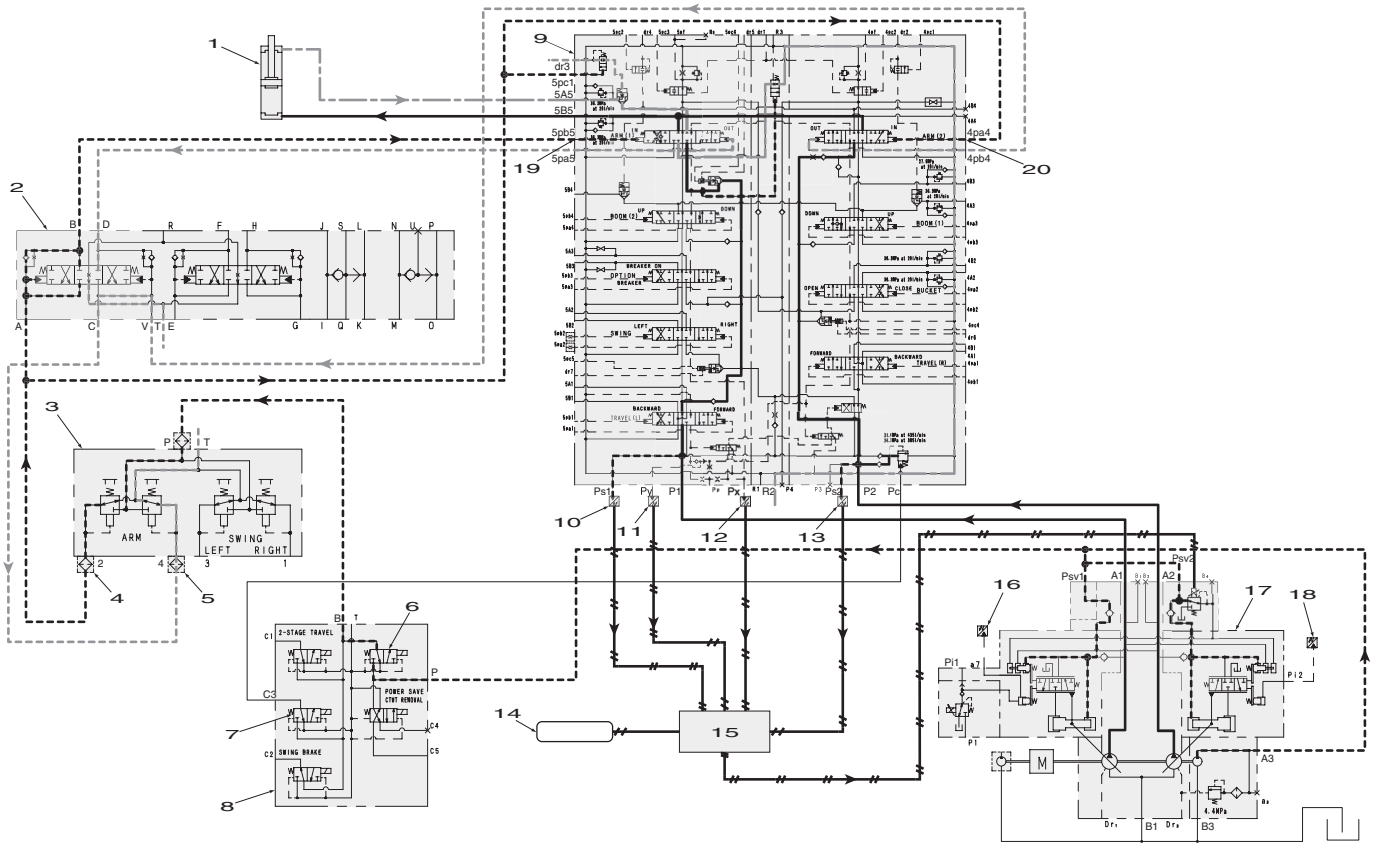
WD04011-016a

Enlarged View (without safety valve)



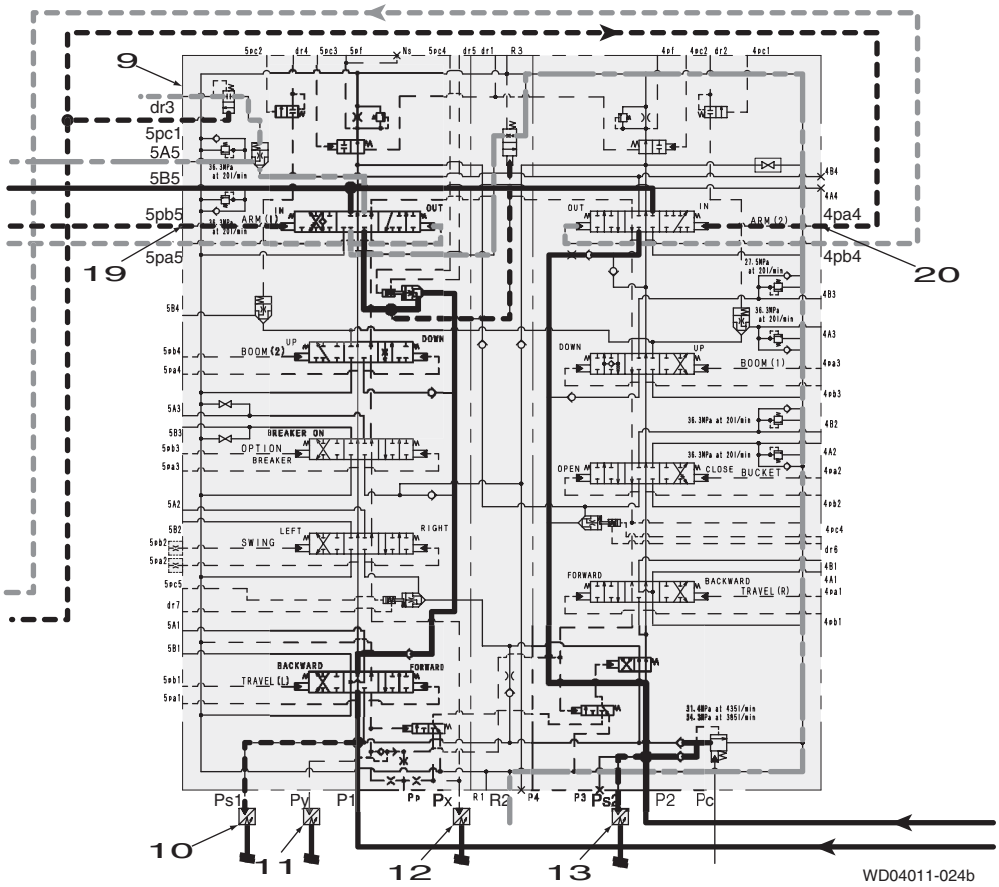
WD04011-016b

Overall View



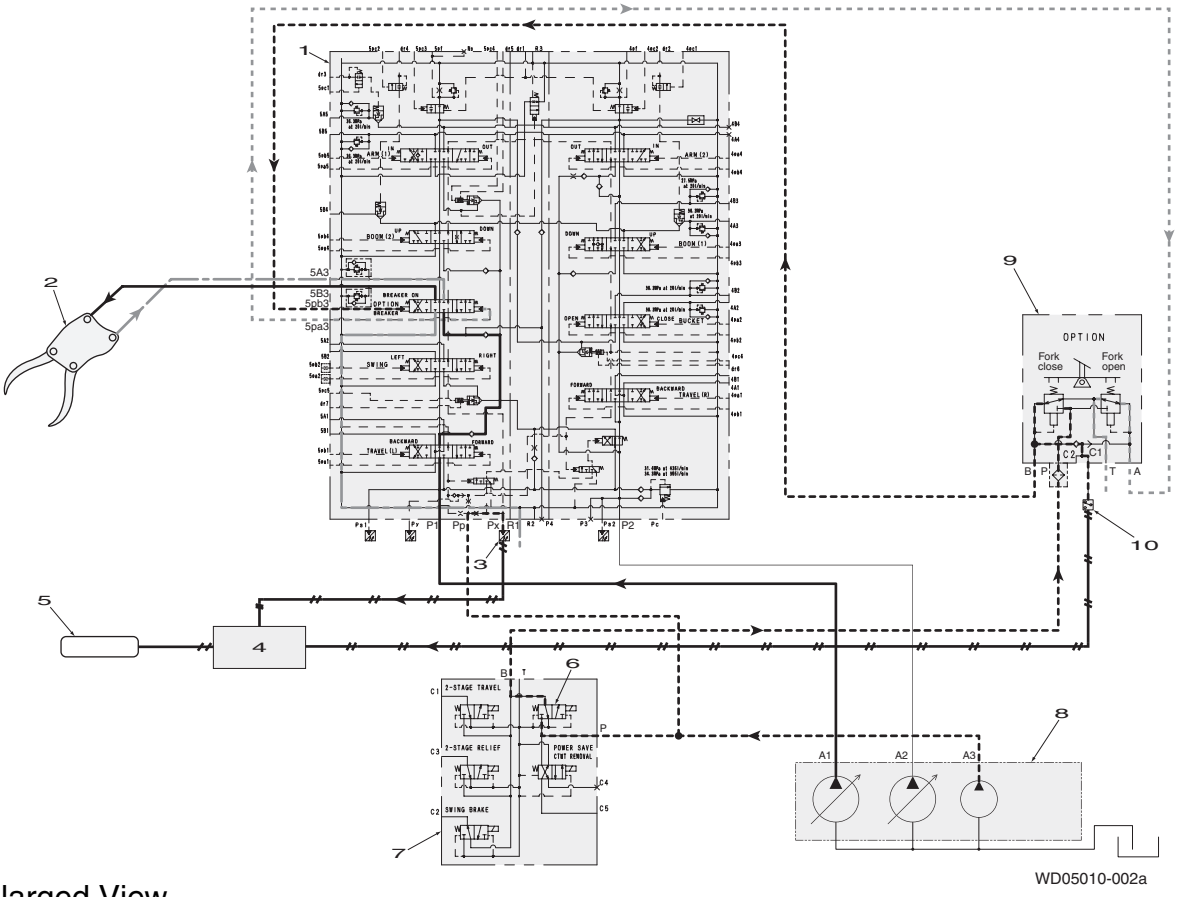
WD04011-024a

Enlarged View

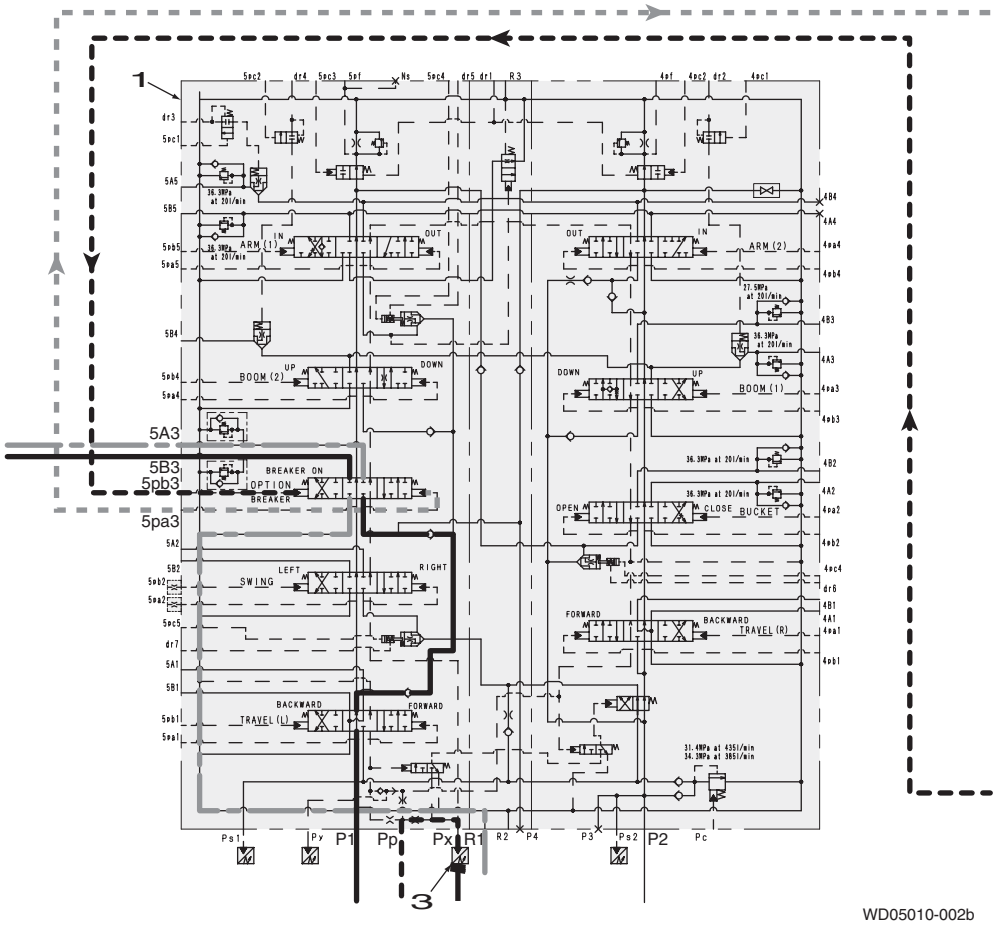


WD04011-024b

Overall View



Enlarged View



2. Regulator

1) Regulator handling

1] Summary

The regulator KR3*-9N** for the Kawasaki K3V series of in-line axial piston pumps is composed of the following control mechanisms.

1- Horsepower control

The pump tilting angle (discharge flow) is automatically decreased and the input torque is controlled to or below a constant value according to the rise in the self pump discharge pressure P1 and the counterpart pump discharge pressure P2. (Input horsepower is constant when the speed is constant.)

When a tandem-type double pump is used, the simultaneous full-horsepower method, which operates with the sum of the load pressure of the 2 pumps, is used. Therefore, when horsepower is controlled, overload of the power source is automatically prevented no matter the amount of the load of the 2 pumps.

2- Power shift control

As the command current value of the electromagnetic proportional pressure reducing valve attached to the regulator is changed, the horsepower setting value shifts.

There is one electromagnetic proportional pressure reducing valve, but secondary pressure Pf (power shift pressure) passes through the internal pump path and is guided to the horsepower control section of the regulator of each pump, and the horsepower setting value for each pump shifts to the same value.This mechanism enables the operator to arbitrarily change the pump output power to achieve optimal power according to the operating status.

3- Flow control

Changing the pilot pressure Pi enables arbitrary control of the pump tilting angle (discharge flow).

This regulator uses a negative flow control (negative control) method in which discharge flow Q decreases as pilot pressure Pi increases.This mechanism can be used to direct the pilot pressure according to the required flow, thereby enabling the pump to discharge only the required flow and avoid needless consumption of power.

This regulator uses the 3 control mechanisms described above, but when combining each of the controls, low tilting (low flow) commands are given priority due to later mechanical additions.

MOTOR

1. Travel Motor

1) Operation principles

1] Hydraulic motor

See the (2) Structural diagram

9 pistons are installed in the cylinder block.

Also, a valve plate with 2 spherical, half crescent-shaped ports B and C (high, low pressure switchover distribution valves) is connected to the end surface of the cylinder block.

Torque occurrence principles

If high-pressure oil (pressure P) is led to the B port, the sloped surface will be pushed by the force of each individual piston (F = P x A, A: piston cross-section area), the pistons will receive the resulting reaction force from the sloped surface, and this reaction force will be divided into separate rotation direction components.Rotational force will be produced in the cylinder block by the sum total of the rotation direction forces of the high-pressure side pistons and torque will be transmitted to the shaft through the spline to create rotation.

In contrast, if high-pressure oil is led to the C port, rotation in the opposite direction of that above will be produced.

The output torque and rotation speed is given by the following equation.

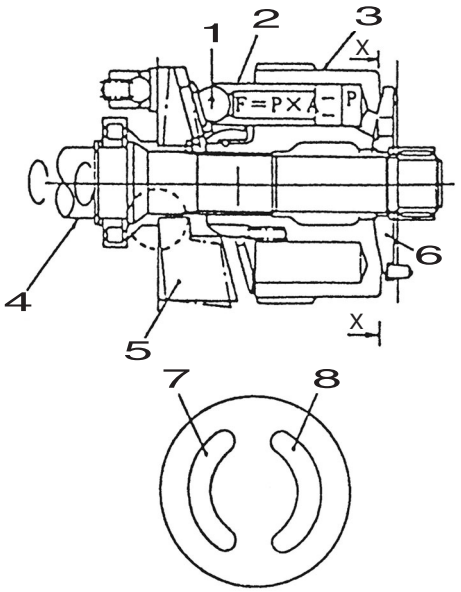
Output Torque

$$T = \frac{PxDx\eta m}{2x\pi} \ [Nm]$$

Revolution Speed (N)

$$N = \frac{Qx1000x\eta v}{Dxi} \ [min^{-1}]$$

D: Displacement volume (cm^3/rev)
P: Effective drive pressure (Mpa)
Q: Flow-in rate (L/min)
ηm: Machine efficiency (%x10^{-2})
ηv: Volume efficiency (%x10^{-2})
i: Deceleration ratio



WD02010-006

Distributing valve section X-X

Figure 1: Travel motor structural diagram

1	Radial factor FR	5	Swash plate
2	Piston	6	Valve plate
3	Cylinder block	7	B port
4	Shaft	8	C port

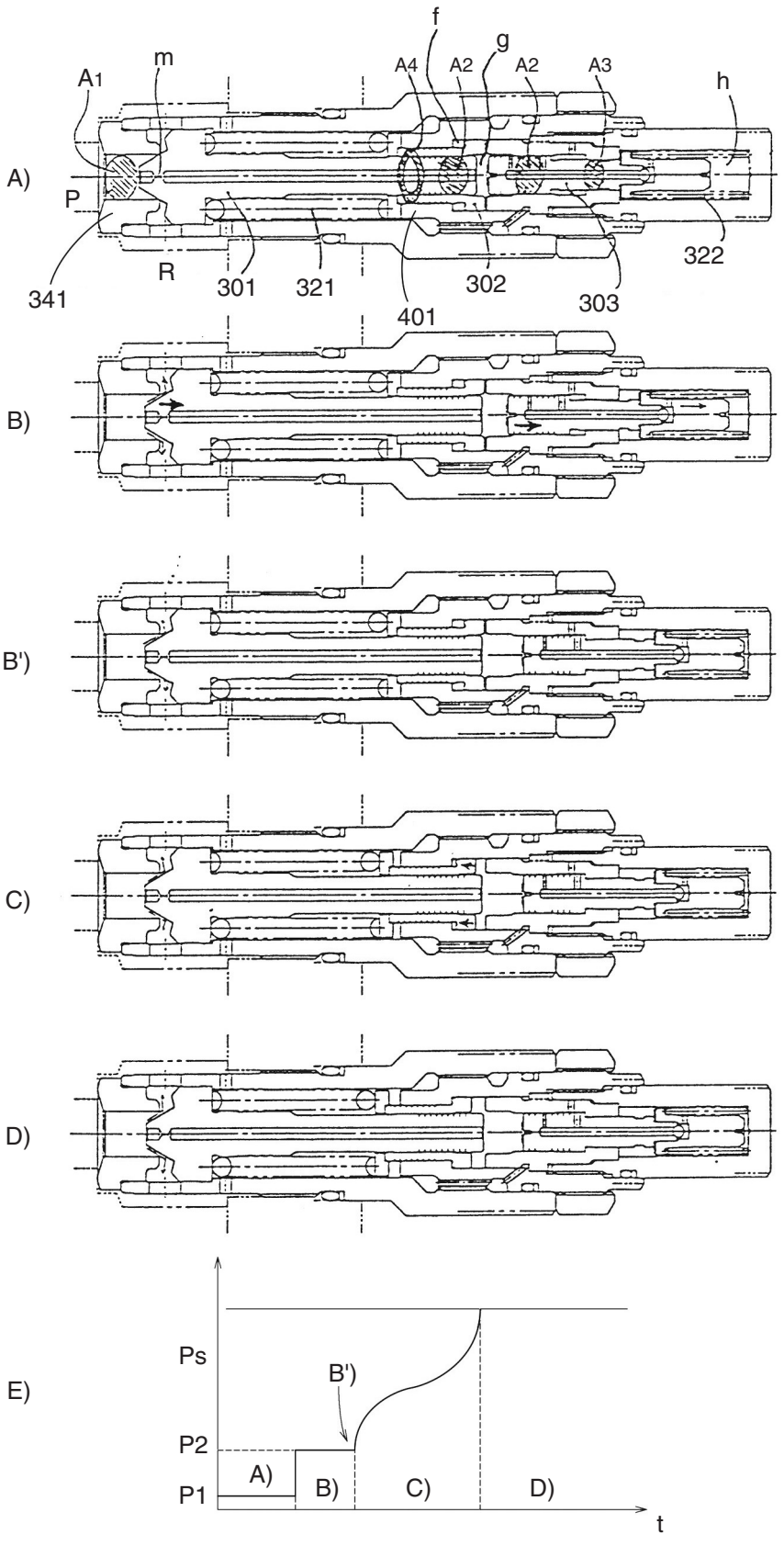
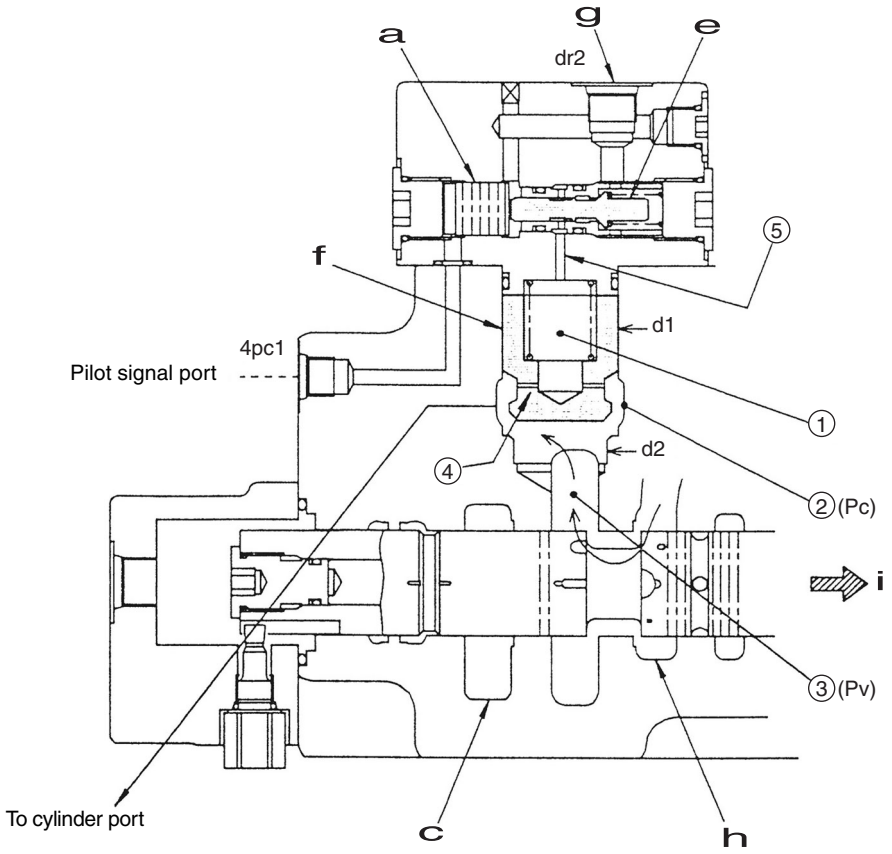


Fig. 2: Relief valve operation diagram

2)When plunger is neutral (4pc1 pilot signal: OFF)

1.Boom up [Pv > PC] (4pc1 pilot signal: OFF)

The plunger moves to the right and the high-pressure feed path oil enters chamber (3). Chamber (1) is connected to chamber (2) via orifice (4), so the pressure becomes Pc. Poppet C (f) is opened by pressure Pv, and the high-pressure feed path (h) oil is fed to the cylinder head side.



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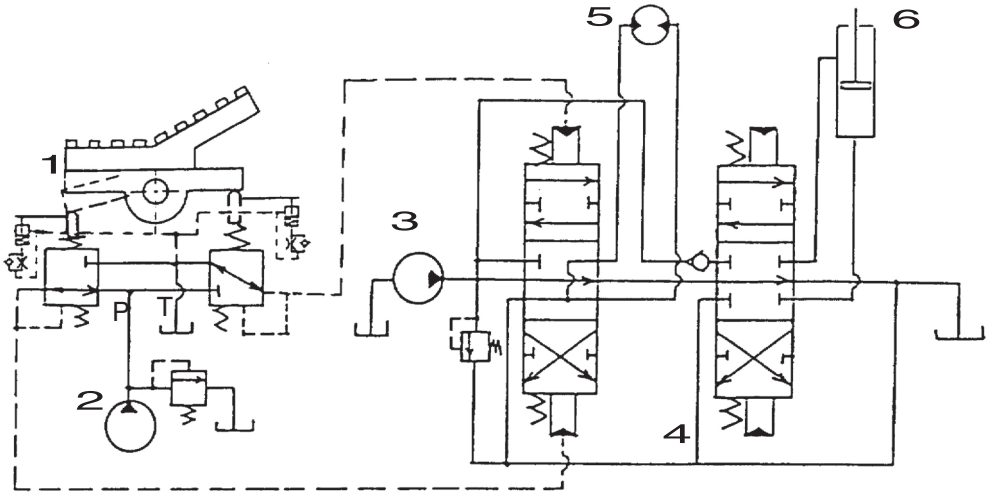
a	Piston A
c	Tank passage
e	Poppet B
g	Drain port
i	Boom 1 PL

4. Travel Pilot Valve (remote control valve)

1) Operation

The remote control valve with built-in damper (below, remote control valve with damper) is a remote control valve that incorporates into the remote control valve main unit a damping function for preventing the man-machine system hunting (lever hunting) phenomenon.

Operation of the remote control valve with damper is divided into 4.-(1)-1) Pressure reduction valve section and 4.-(1)-2) Operation section damping mechanism section. The explanations in these 2 sections are based on the hydraulic pressure circuit diagram, assembly section diagram, and damping operation explanation diagram below. The figure below is a typical usage example for the remote control valve.



RST-04-02-001w

Hydraulic circuit diagram

1	Remote control valve	4	Control valve
2	Pilot pump	5	Hydraulic motor
3	Main pump	6	Hydraulic cylinder

1] Pressure reduction valve section

1- For the neutral state

The spool (301) is pushed up by the return spring (335) via the spring seating (311) and washer 1 (215) and is in the neutral position shown in the assembly section diagram.

Therefore, since the output port is connected only to the port T by the spool switching function, the pressure at output ports 1 and 2 is the same as the pressure at the port T.

2- When the remote control valve operation section is tilted from the neutral state

In the assembly section diagram, when the cam (420) is rotated clockwise, the port 1 side push rod (214) is pushed down, the spool moves down via washer 1, the spring seating, the secondary pressure setting spring (324), washer 2 (217), and washer 3 (313), the port P and port 1 are connected, and the oil fed from the pilot pump flows to port 1 and generates pressure.

When the port 1 pressure rises to the pressure equivalent to the secondary pressure setting spring force that has been set by tilting the operation section, the hydraulic pressure on the spool and the spring force come into balance and the port 1 output pressure is held constant. The port 2 spool holds the neutral state and the oil from the control valve is discharged via the port T.

Some specifications are of the type that near the maximum angle of the operation section, a push rod directly touches the spool top section and forcibly pushes in the spool to connect the port P and the output port so that they have the same pressure.

3) Variable flow control valve

Function

Only the necessary volume of pump discharge flow is fed to the motor and the excess amount returns to the tank.

- As shown in diagram 1, the motor rotation is boosted in proportion to the intake flow volume Q.

At intake flow volume Q1, rotation is at min-1.

In order for the fan motor to fulfill its function of reducing noise and reducing loss, fan rotation must be controlled at a required constant rotation rate regardless of the intake flow volume.

The flow control valve is built in to fulfill the function stated above.

(Even if intake flow volume increases from Q0 to Q1, motor rotation is held constant at A to C min-1.)

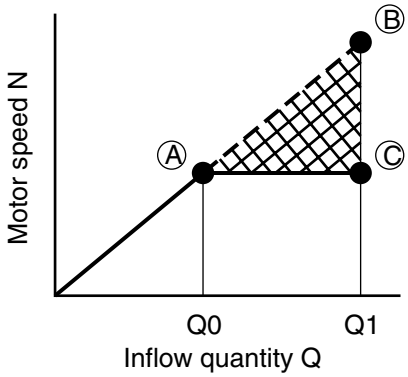


Fig. 1

WD02010-056

Operation

Basic flow control operation consists of guiding the upstream pressure metered on the A side of the flow control spool and the downstream pressure metered on the B side and having the pressure difference of the metered section in relation to the intake flow volume act on the flow control spring (g).

If the intake flow volume reaches or exceeds Q0 in Fig. 1, the pressure difference across the flow control spool will become greater than the flow control spring (g) installation section load. The flow control spool opening P → T will open, the excess flow of the ▨ section will be disposed of through the flow control valve (c), and the motor rotation will be held at a constant rotation from A → C.

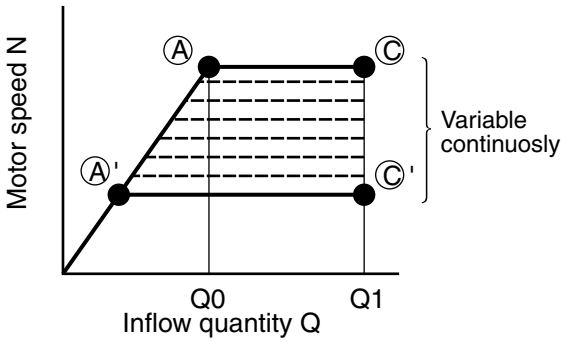


Fig. 1

WD02010-057

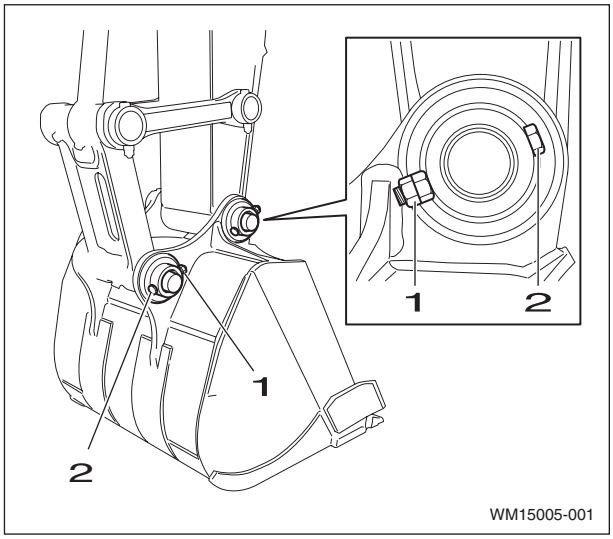
REMOVAL AND INSTALLATION OF BUCKET

Caution:	Stop the machine on a level location with good footing. Be sure to stop the engine before beginning work. When working together with others, always be sure to exchange signals and pay adequate attention to safety. Always wear protective devices (protective eye wear and safety shoes, ect.) when working with a hammer.

1 Removal of bucket

[1] Place the back of the bucket parallel to the ground.

[2] Use a wrench to remove the 2 nuts (1), and then remove the bucket side and arm side bolts (2).

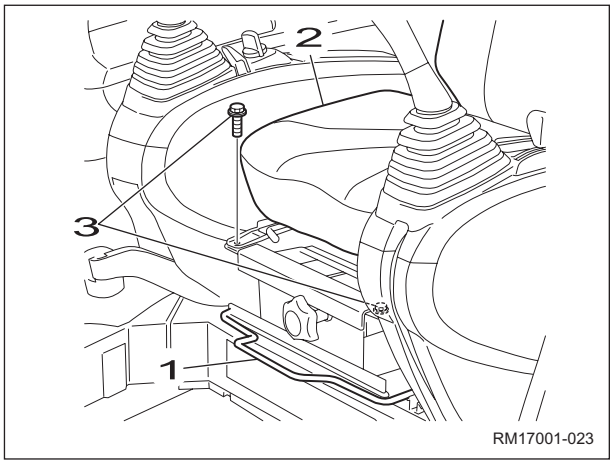


REMOVAL AND INSTALLATION OF OPERATOR'S SEAT

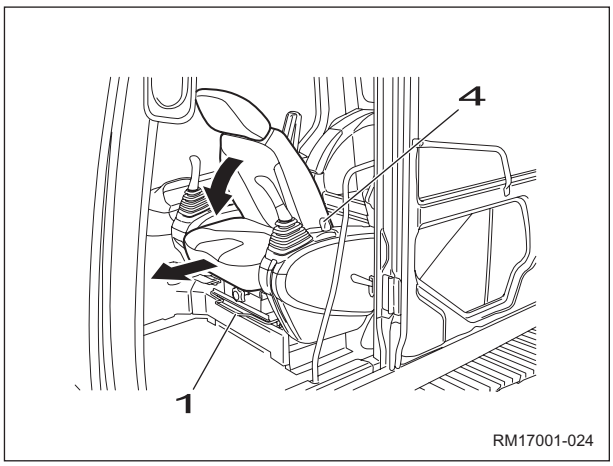
1 Removal of operator's seat

[1] Pull the slide lever (1) to slide the seat (2) to the rear.

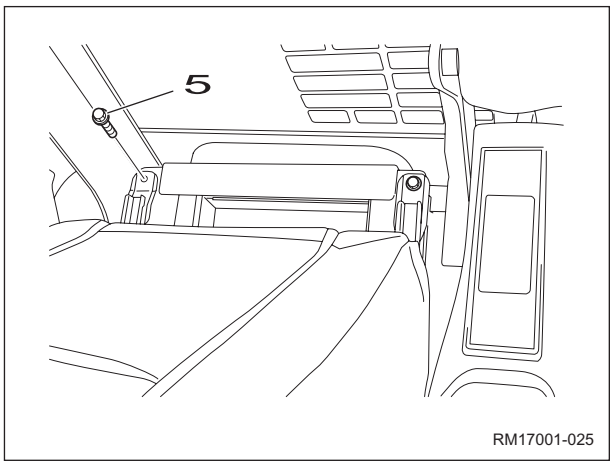
[2] Use a wrench (13 mm) to remove the 2 bolts (3) from the front of the seat.



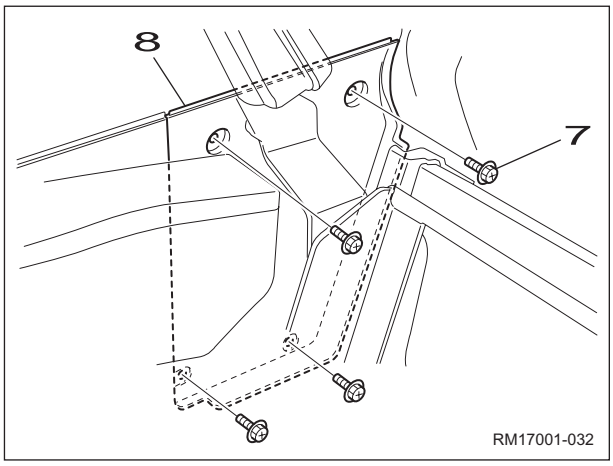
[3] Pull the slide lever (1) to slide the seat forward, and then pull the reclining lever (4) to fold the seat back forward.



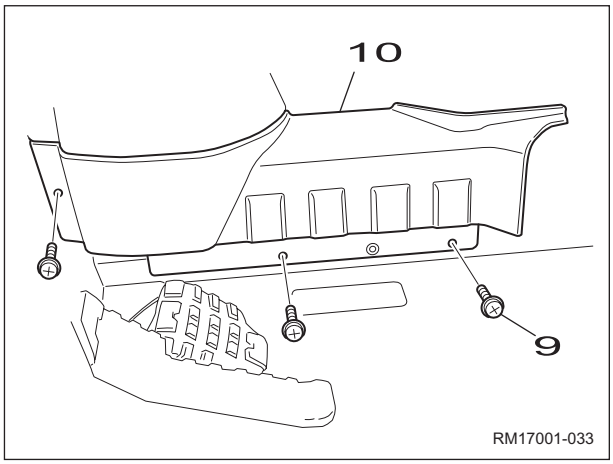
[4] Use a wrench (13 mm) to remove the 2 bolts (5) from the rear of the seat.



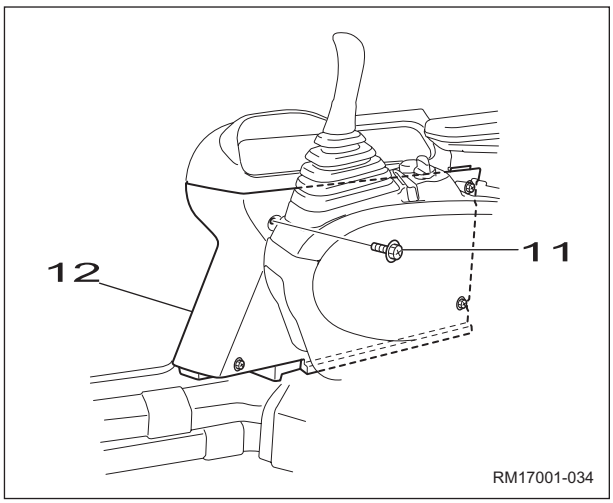
[4] Use the Phillips screwdriver or box wrench (10 mm) to remove the 4 bolts (7), and then remove the side rear B trim (8).



[5] Use a wrench (10 mm) to remove the 3 bolts (9), and then remove the side lower trim (10).

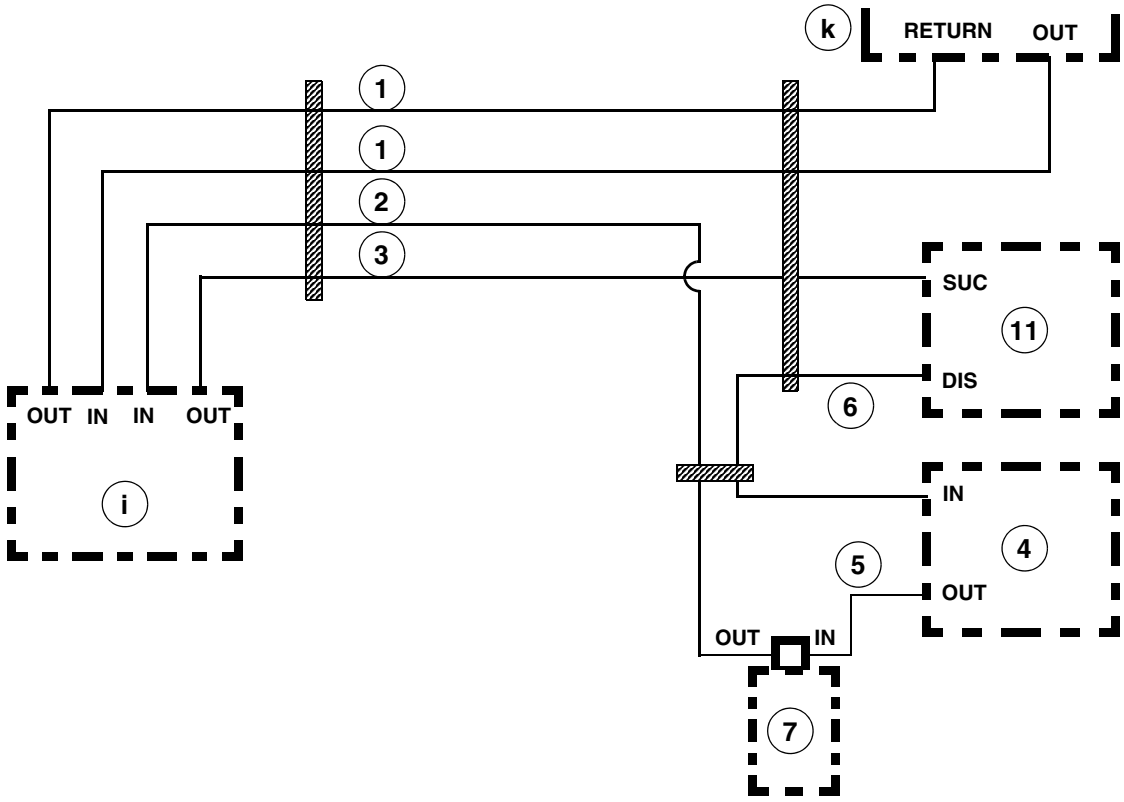


[6] Use the Phillips screwdriver or box wrench (10 mm) to remove the 4 bolts (11), and then remove the side rear A trim (12).



AIR CONDITIONNER OVERALL DIAGRAM

Hose connection - CX700B



Hose connection (refer to the following pages)

Item	Description	Qty
1	Rubber hose	2
2	Cooler hose (LIQUID2)	1
3	Cooler hose (SUCTION)	1
4	Air conditioner condenser	1
5	Cooler hose (LIQUID1)	1
6	Cooler hose (DISCHARGE)	1
7	Dryer receiver	1
8	Belt	1
9	Slide shaft	1
10	Tension pulley (with cover)	1
11	Air conditioner compressor	1
12	Compressor bracket	1

Item	Description
a	Platform (left)
b	House
c	Discharge hose
d	Suction hose
e	Swing frame
f	From air conditioner unit to engine
g	From engine to air conditioner unit
h	Engine support
i	Air conditioner unit
j	Floor
k	Engine

3) Manual control

a) When operation of the blow mode select switch is recognized, the motor actuators are driven to attain the output shaft angle below and the display is switched too. Each time operation of the switch is recognized, the display switches MODE1 => MODE2 => MODE3 => MODE4 => MODE1 => ... However, if this switch is pressed during auto control, auto control is ended and the diffuser is fixed at its current position.

b) MODE5 in the table below only occurs when operation of the DEF select switch is recognized. After that, when operation of the blow mode select switch is recognized, the blow mode becomes the one that was in effect just before operation of the DEF switch was recognized.

Blow mode and display and motor actuator angle					
Blow mode	**MODE 1**	**MODE 2**	**MODE 3**	**MODE 4**	**MODE 5**
Blow mode motor actuator degree of opening	**90°**	**65.5°**	**46.5°**	**26.6°**	**0°**
Panel display	FACE 	VENT 	B/L 	FOOT 	DEF 

4) Mode unit hysteresis correction operation (motor actuator one-direction stop)

After the actuator moves to the target degree of opening (a), it returns to the specified position. However, if (a) is less than 0°C, the actuator is treated as having reached the target degree of opening (a) when it reaches 0°C, then it moves to the specified position.

(A stop in the VENT or FACE direction is used as the standard.)

5) Operation start / stop judgment

a) The operating motor actuator stops when the current position comes within the target position.

b) The stopped motor actuator operates when the current position goes beyond the target position.

6) Blow mode control priority order

The priority order for auto control and manual control is as follows.

Control priority order

Priority order	Control
1	Manual control
2	Auto control

3. Refresh / Recirculate Switch Motor Actuator Control

1) Recirculate mode

In refresh mode, when it is recognized that the refresh / recirculate switch on the operation panel has been closed, the system goes into recirculate mode. At this time, the display switches to recirculate and the refresh / recirculate switch motor actuator operates to the recirculate angle.

2) Refresh mode

In recirculate mode, when it is recognized that the recirculate / refresh select switch on the operation panel has been closed, the system goes into refresh mode. At this time, the display switches to refresh and the refresh / recirculate switch motor actuator operates to the refresh angle.

3) Operation stop judgment

When one of the limiters is detected, operation stops.

Refresh / recirculate mode and refresh / recirculate display and motor actuator angle		
Refresh / recirculate mode	Recirculate	Refresh
Refresh / recirculate motor actuator degree of opening	0 °	90 °
Panel display