

# Shop Manual

WHEEL LOADER

**WA270-8**

SERIAL NUMBERS 83001 and up

**KOMATSU**

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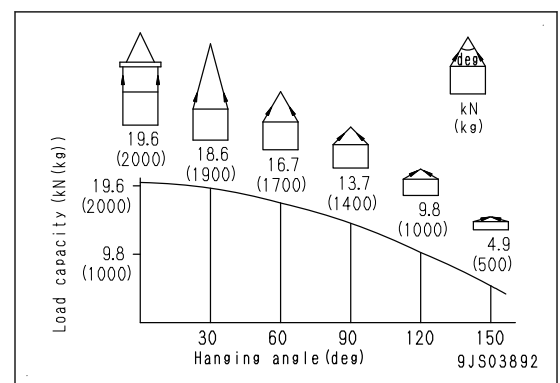
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## Precautions for Slings Work and When You Make Signals

- Only one appointed worker must make signals and co-workers must communicate with each other frequently. The appointed signaler must make specified signals clearly at a place where he is well seen from the operator's seat and where he can see the working condition easily. The signaler must always stand in front of the load and guide the operator safely.
  - ⚠ **Do not do the work while the lifted load is in the range where it possibly falls. It is not allowed to go in the range where the lifted load possibly falls.**
  - ⚠ **Do not move a load over a person.**
  - ⚠ **Never step on the load.**
  - ⚠ **Do not prevent the load from swinging or falling down by holding it simply with the hands.**
  - ⚠ **The sling workers and assistant workers other than the guide must move to a place where they are not caught between the load and materials or equipment on the ground or hit by the load even if the crane starts abruptly.**
- When you lift or fix the machine, see “Operation and Maintenance Manual” or “Field Assembly Instruction”.
  - ⚠ **Do not lift or fix the machine by the positions where the name plate is not attached.**
- When you lift the machine for the disassembly and assembly, follow the instructions on the Disassembly and Assembly.
- Check the slings before starting sling work.
- Keep putting on gloves during sling work. (Put on leather gloves, if available.)
- Measure the weight of the load by the eye and check its center of gravity.
- Use proper sling corresponding to the weight of the load and method of slinging. If too thick wire ropes are used to sling a light load, the load may slip and fall.
- Do not sling a load with 1 wire rope alone. If it is slung so, it may rotate and may slip out of the rope. Install 2 or more wire ropes symmetrically.
  - ⚠ **Slings with one rope may cause turning of the load during hoisting, untwisting of the rope, or slipping of the rope from its original slinging position on the load, which can result in a dangerous accident.**
- Hanging angle must be 60 ° or smaller as a rule.
- When slinging a heavy load (20kg or heavier), the hanging angle of the rope must be narrower than that of the hook.

### REMARK

When slinging a load with 2 or more ropes, the force subjected to each rope increases with the hanging angle. The figure below shows the variation of allowable load in kN {kg} when slinging is made with 2 ropes, each of which is allowed to sling up to 9.8 kN {1000 kgf} vertically, at various hanging angles. When the 2 ropes sling a load vertically, they can sling up to 2000 kg of total weight. This weight is reduced to 1000 kg when the 2 ropes make a hanging angle of 120 °. If the 2 ropes sling a 2000 kg load at a hanging angle of 150 °, each rope is subjected to a force as large as 39.2 kN {4000kgf} .

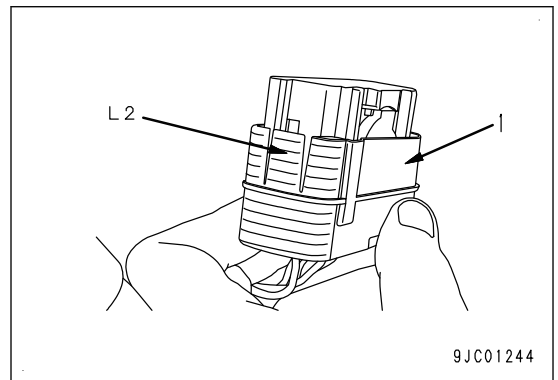
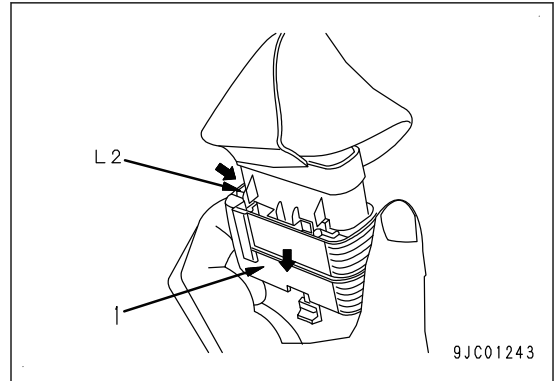


- When installing wire ropes to an angular load, apply pads to protect the wire ropes. If the load is slippery, apply proper material to prevent the wire rope from slipping.
- Use the specified eye bolts and fix wire ropes, chains, etc. to them with shackles, etc.

2. While pressing lock (L2), pull out connector (1).

**REMARK**

Lock (L2) is located behind connector (1) in the figure.

**How to Connect Slide Lock Type Connector (FRAMATOME-24)**

Insert it straight until it clicks.

Item	Unit	WA270-8
Total piston displacement	ℓ {cc}	6.69 {6690}
<b>Performance</b>		
Engine rated horsepower		
• Gross (SAE J1995) (*1)	kW {HP} / min <sup>-1</sup> {rpm}	115 {153}/2000{2000}
• ISO 14396		115 {153}/2000{2000}
• Net (ISO 9249/SAE J1349) (*2)		111 {149}/2000{2000}
Maximum torque (*2)	Nm {kgfm} / min <sup>-1</sup> {rpm}	679 {69.3}/1300{1300}
Maximum speed with no load	min <sup>-1</sup> {rpm}	2225 {2225}
Minimum speed with no load		825 {825}
Starting motor	-	24 V, 5.5 kW
Alternator	-	24 V, 90 A
Battery (*3)	-	12 V, 92 Ah x 2

\*1: Indicates the value of the bare engine (without cooling fan).

\*2: Indicates the value at the minimum cooling fan speed.

\*3: The battery capacity (Ah) is indicated in the 5-hour rate.

#### REMARK

The engine rated horsepower is indicated in the net value and gross value. Gross denotes the rated horsepower measured on the basic engine unit. Net denotes the value of an engine which is measured under the condition almost the same as that of the time when it would be installed on a machine.









- The rated horsepower (net) at the maximum cooling fan speed is the following value.  
101 kW/135 HP{2000 min<sup>-1</sup>/2000 rpm}

#### Power train

HST pump		
Type	-	Variable displacement swash plate piston type
Discharged volume	cm <sup>3</sup> /rev	0 to 110.4
HST motor 1		
Type	-	Variable displacement clinoaxis piston type
Discharged volume	cm <sup>3</sup> /rev	0 to 85.2
HST motor 2		
Type	-	Variable displacement clinoaxis piston type
Discharged volume	cm <sup>3</sup> /rev	32.5 to 85.2
Transfer		
Type	-	Counter-shaft double acting planetary type, helical gear constant-mesh type, switching between 2 power trains
Reduction gear system		
Type	-	Spiral bevel gear, splash oil lubrication
Differential		
Type	-	Straight bevel gear type, torque proportioning

### Inducement Strategy When Abnormality is Found in the EGR System by the Urea SCR System Devices (For European Union)

- The Inducement strategy is different if Inducement is triggered by abnormalities in EGR. It has 4 levels totally which is the same as that, but it has different display on the machine monitor, and engine power deration (torque lowering ratio is 25% or more) and alarm starts from "Warning".
- The table shows warning indications and engine power derations by each Inducement strategy status.

Status	Elapsed time (*1)	Machine monitor					Engine de-ration (*5)
		Message of SCR Infor-mation	Caution lamp (Action lev-el)	Tone of au-dible alert	Failure code for abnormali-ty (*2),( *3)	Failure code for Induce-ment strategy status (*4)	
1 Warning	5 hours	1: Please inspect and maintain SCR sys-tem.	Red  APP14416 Red  APP14414	Long inter-mittently	CA2271 CB2271	No indication	Torque: over 25%
2 Continuous Warning (Warning 2)	10 hours	2: Without treatment, engine power will be derated.	Red  APP14416 Yellow  APP14417 Red  APP14414	Triplet (*6) Short inter-mittently (*7)	CA2271 CB2271	AS00R2 (Warning 2 (SCR Device Abnormality))	Torque: over 25%
3 Low-Level Inducement (Induce-ment 1)	20 hours	3: Engine power is under dera-tion.	Red  APP14416 Red  APP14415 Red  APP14414	Long inter-mittently	CA2271 CB2271	AS00R3 (Inducement 1 (SCR De-vice Abnor-mality))	Torque: over 25%

## Neutral Safety Circuit

When the directional lever is set to “NEUTRAL (N)” position, a current flows from contact N of the directional lever to the coil of neutral safety relay (16).

### When the Starting Switch is Turned to “START” Position

1. When the starting switch (4) is turned to “START” position, a current flows from terminal C of the starting switch (4) to the starting motor safety relay (21) through the neutral safety relay (16) and the personal code relay (17) to start the engine.
2. When the directional lever is not in “NEUTRAL (N)” position, the neutral safety relay (16) does not operate and the engine does not start.
3. When the Gateway Function Controller (9) receives the engine cut-off command which is operated externally, the personal code relay (17) starts operating to shut down the circuit from the terminal C of starting switch (4) to the starting motor safety relay (21), thus the engine does not start.

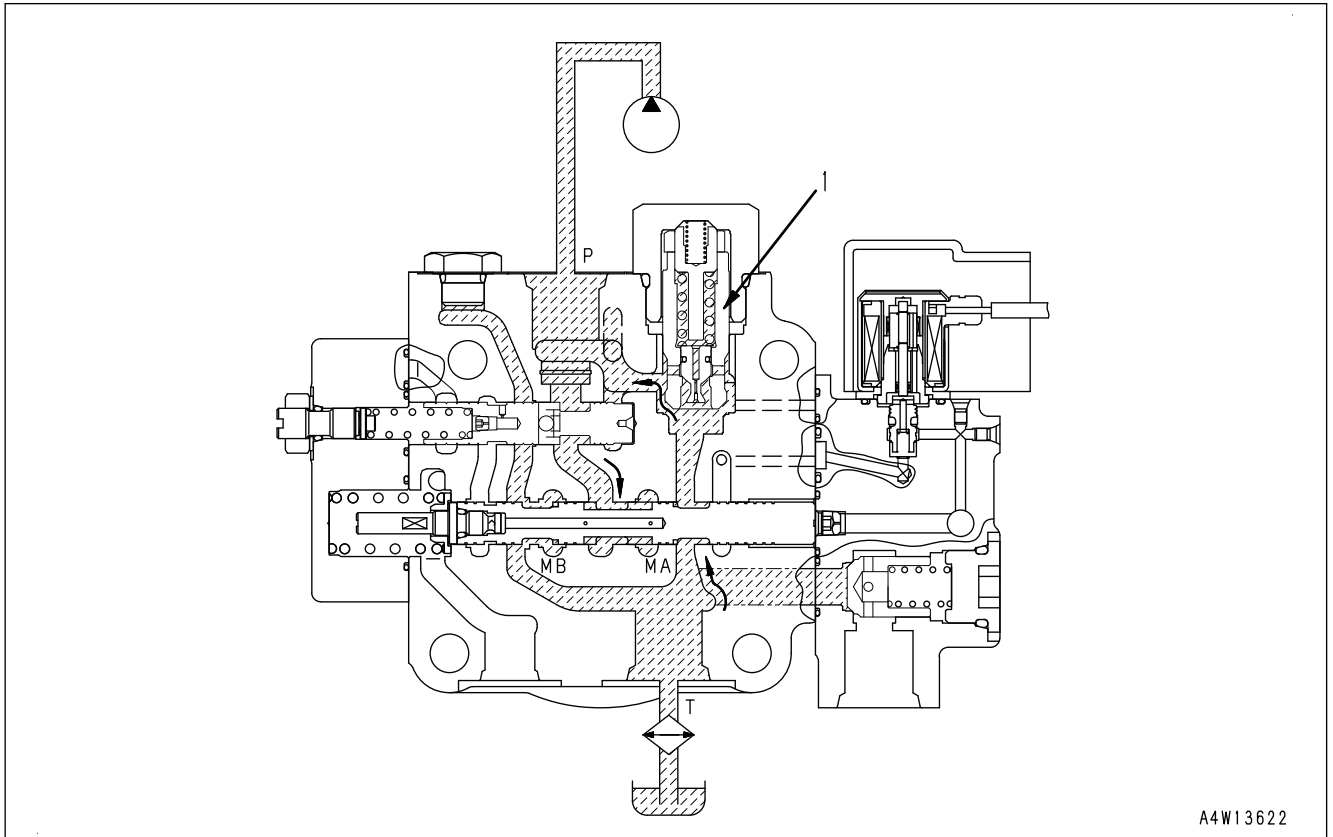
### When the Starting Switch is Turned to “OFF” Position

1. When the starting switch (4) is turned to “OFF” position, the ACC signal from the ACC terminal of the starting switch (4) to the engine controller (6) is shut off.
2. Even when the ACC signal is shut off, the power to the engine controller (6) is maintained by operating VIS holding relay (18) until the internal processing of the engine controller (6) is completed.
3. When the ACC signal is shut off, the engine speed is decreased to stop the engine. At the same time, alternator (22) stops generating power and the voltage from terminal R of alternator (22) is shut off. A current from the BR terminal of the starting switch (4) is also shut off, and the contacts of battery relay (3) are opened. Consequently, the power supplied to each circuit of the machine is shut off.

### When Engine Shutdown Secondary Switch is at “Stop Engine” Position

1. A current from the ACC terminal of the starting switch (4) to the engine controller (6) is forcibly shut off if the engine shutdown secondary switch (5) is turned to “ENGINE STOP” position.
2. Above induces the same state as the time when starting switch (4) is turned to “OFF” position, and the engine stops.

- When the cooling fan motor is stopped



1. When the engine stops, the pump input speed becomes 0 rpm.
2. The pressurized oil from the pump is not supplied to the port (P).
3. As the pressurized oil is not supplied to (MA) side of the motor, the motor speed decreases gradually to stop.
4. If the motor shaft is revolved by the force of inertia while the oil flow in the port (P) is reducing, the pressurized oil in port (T) on the outlet side is sent to the (MA) side to prevent cavitation by the suction safety valve (1).

**AMP-8P “RVM2”**

Pin No.	Signal name	Input and output signals
1	Rear view camera power supply output	Output
2	Rear view camera NTSC signal	Input
3	(*1)	-
4	(*1)	-
5	GND (rear view camera power supply)	-
6	(*1)	-
7	(*1)	-
8	GND (rear view camera shield)	-

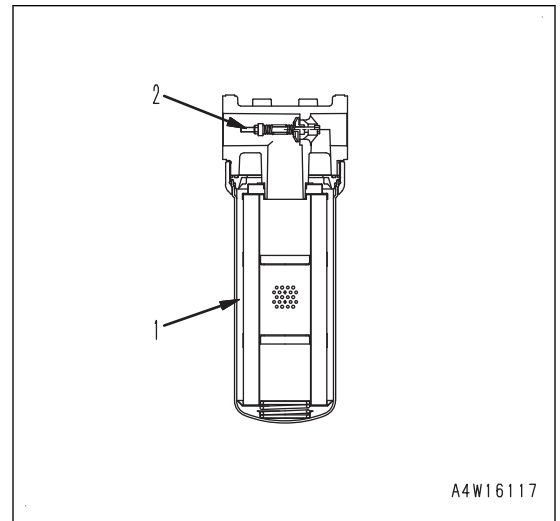
\*1: Never connect these pins. It may cause malfunction or failure.

## Hydraulic Oil Filter

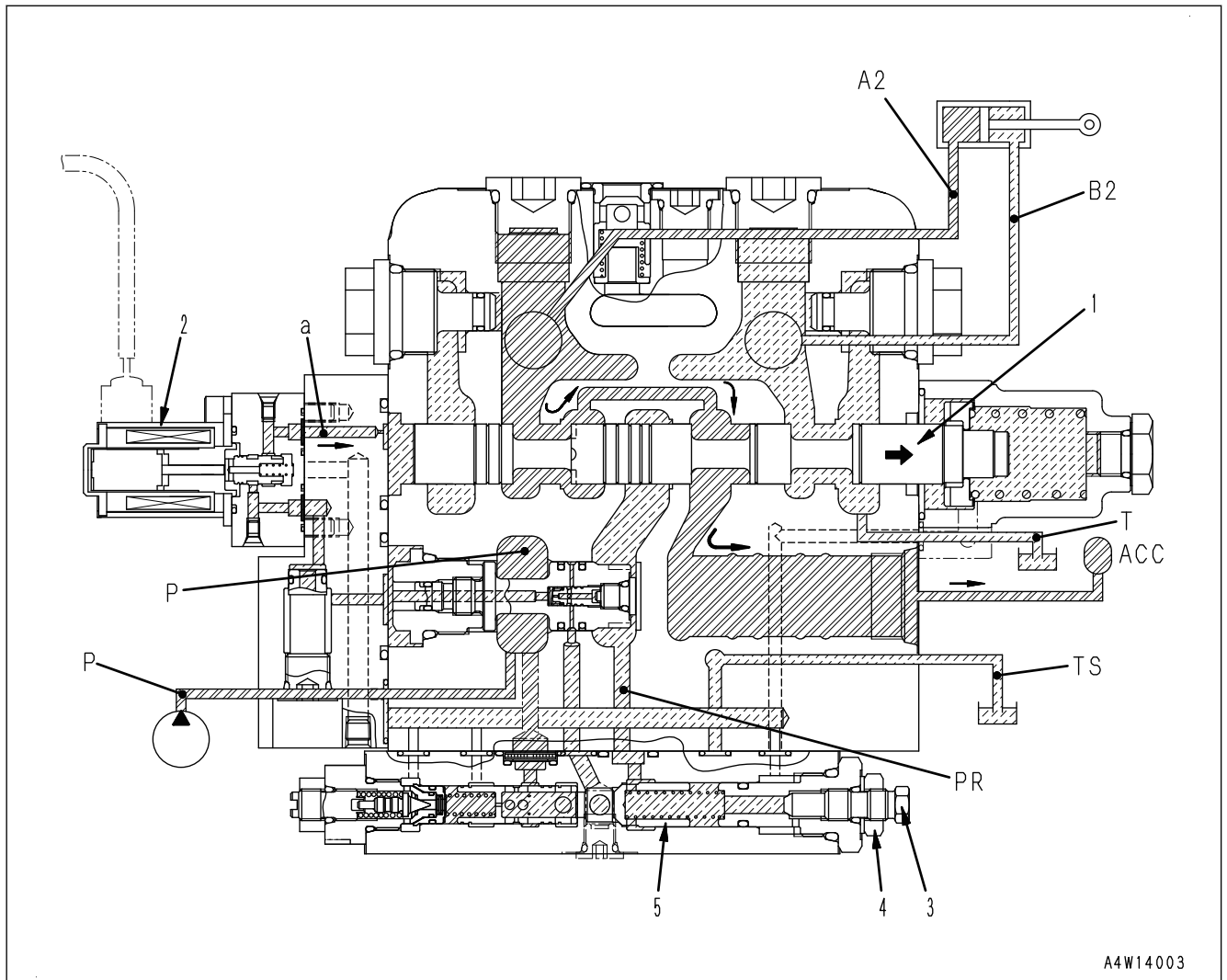
### Structure of Hydraulic Oil Filter

#### Sectional View

- 1: Filter cartridge
- 2: Bypass valve



## Operation of ECSS Control Valve of Control Valve



1. The signal enters the solenoid valve (2), and the pressure is applied to (a) when the travel speed exceeds 5 km/h.
2. The spool (1) moves to the right.
3. As the spool (1) moves, the line from (PR) to the accumulator (ACC) is closed, and the lines from (A2) to the accumulator (ACC) and from (B2) to (T) are opened. As a result, ECSS is enabled.
4. The signal is not sent to the solenoid valve (2), and the spool (1) is in neutral while travel speed is 5 km/h or less. The line from (PR) to the accumulator (ACC) is opened and the accumulator (ACC) is charged at this time.
5. The check valve (5) closes when accumulator (ACC) is charged up to the set pressure. The pressure in the accumulator (ACC) does not rise higher than that.

### Pressure Release Valve of Accumulator

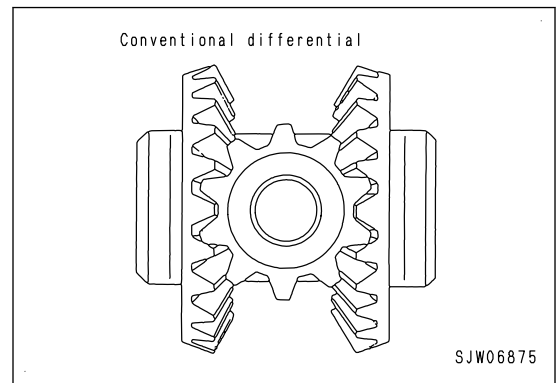
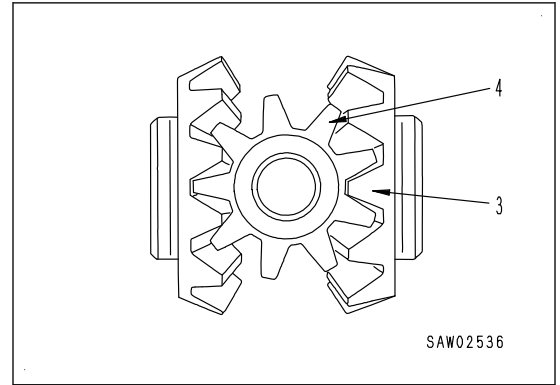
Loosen the nut (4) and plug (3) to open the circuits of (PR) and (TS) when the pressure in the accumulator (ACC) needs to be released for maintenance of the machine.

- The HST controller judges whether the machine is in the inertia travel by the accelerator pedal position and the signal from the engine speed sensor.

**REMARK**

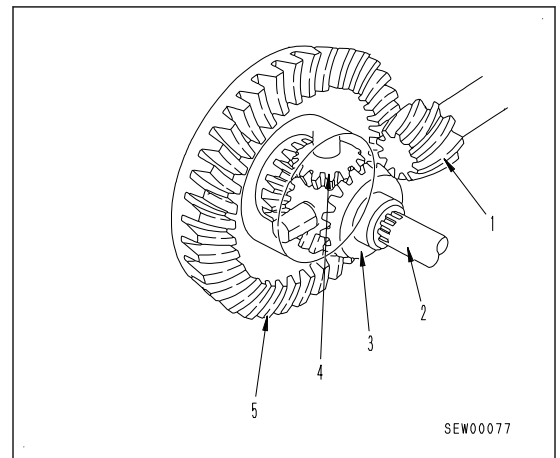
For the setup method of this function, see the "Operation and Maintenance Manual".

- The pinion (4) of this differential has an odd number of teeth. The meshing points of pinion (4) and side gears (3) change according to the difference of the road resistance. Consequently, the traction forces of the tires on both sides change.
- The torque proportioning differential lengthens the service life of the tire by 20 to 30 % and increases the working capacity at the same time.



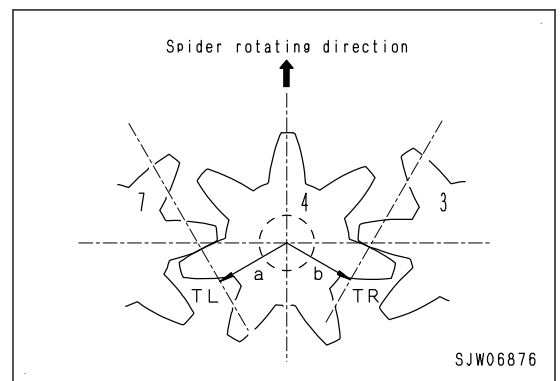
**Operation of Torque Proportioning Differential**

1. The power from the engine is sent through the HST pump, HST motor, transfer, and drive shaft to the front and rear axles.
2. Inside the axle, the power is sent through the bevel pinion (1) to the bevel gear (5), and changed in direction by 90° and reduced in speed, and then transmitted to the sun gear shaft (2) through the pinion (4) and the side gear (3).
3. The power of each sun gear is further reduced in speed by the final drives, and transmitted through the axle shafts to the wheels.



**Straight Travel (When the Road Resistances Under R.H. and L.H. Wheels are the Same)**

1. While the machine is traveling straight, R.H. and L.H. wheels rotate at the same speed.
2. When the road resistances under R.H. and L.H. wheels are the same, the distance (a) from the pinion (4) to the meshing point of left side gear (7) and the distance (b) to the meshing point of right side gear (3) are the same.
3. Accordingly, left traction force (TL) and right traction force (TR) are balanced.

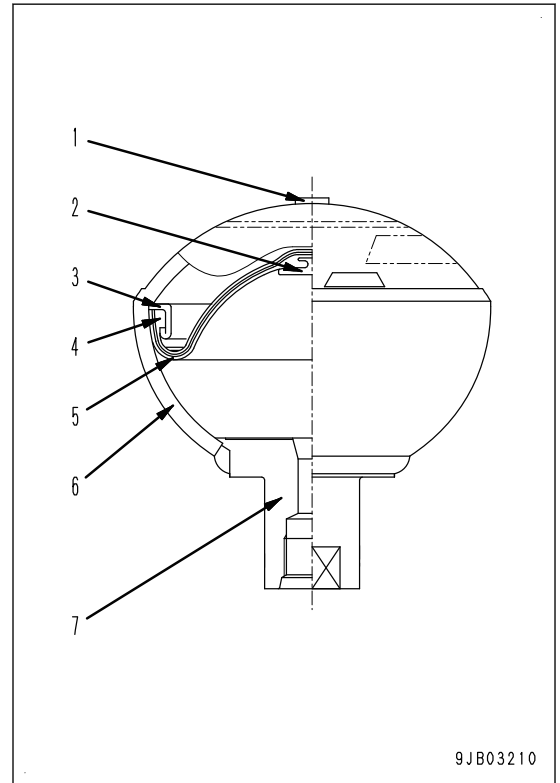


## Pilot Circuit Accumulator

### Structure of Pilot Circuit Accumulator

#### Sectional View

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



### Specifications of Pilot Circuit Accumulator

Gas used: Nitrogen gas

Volume of gas: 500 cc

Charged gas pressure: 1.18 MPa {12 kgf/cm<sup>2</sup>} (at 80 °C)

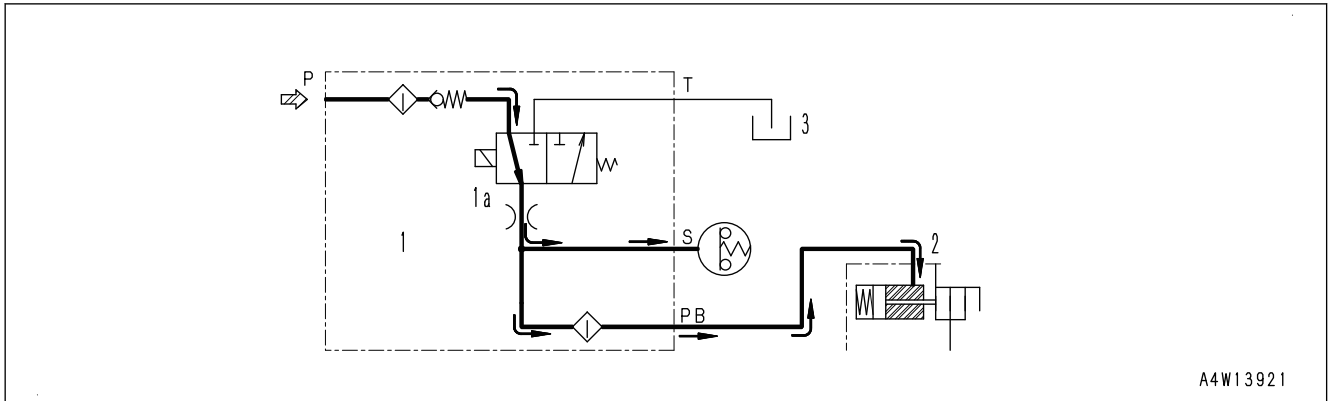
Max. using pressure: 3.92 MPa {40 kgf/cm<sup>2</sup>}

### Function of Pilot Circuit Accumulator

This accumulator is located between the charge valve and the work equipment PPC valve. Even if the engine is stopped while the work equipment is raised, the pilot oil pressure can be supplied to the work equipment control valve with the pressure of the compressed nitrogen gas in the accumulator to lower the work equipment by its own weight.

2. Accordingly, the spool (1a) is pushed to the left by the spring, and the port (P) is closed, then the oil from the parking brake cylinder (2) is sent from the port (PB) to the port (T) and drained into the hydraulic tank (3).
3. By this operation, the piston in the parking brake cylinder (2) is pushed back by the spring, and the plates and discs are pressed together in order to operate the parking brake.

### When Parking Brake is Released (When Solenoid is Energized)



1. When the parking brake switch is turned to "OFF" position, a current flows into the parking brake solenoid valve (1), thus the coil is "energized", and rightward thrust occurs in the plunger.
2. Accordingly, the spool (1a) is pushed to the right and the port (T) is closed, and the oil from the pump flows to the port (PB) through the port (P).
3. By this operation, the piston in the parking brake cylinder (2) compresses the spring, and the plates and discs are separated from each other in order to release the parking brake.

Abbreviation	Actual word spelled out	Purpose of use (major applicable machine (*1), or component/system)	Explanation
ICT	Information and Communication Technology	Communication and electronic control	A general term for the engineering and its socially applied technology of information processing and communication.
IMA	Inlet Metering Actuator	Engine	This is a valve that adjusts the fuel intake amount at the pump inlet in order to control the supply pump fuel discharged volume. (Same as IMV)
IMU	Inertial Measurement Unit	Engine	This is a device to detect the angle (or angular velocity) and acceleration of the 3 axes that control motions.
IMV	Inlet Metering Valve	Engine	This is a valve that adjusts the fuel intake amount at the pump inlet in order to control the supply pump combustion discharged volume. (Same as IMA)
KCCV	Komatsu Closed Crankcase Ventilation	Engine	This is a mechanism that burns the blowby gas again by separating oil from blowby gas and returning it to the intake side. It primarily consists of filters.
KCSF	Komatsu Catalyzed Soot Filter	Engine	This is a filter that captures soot in exhaust gas. It is built in to KDPF.
KDOC	Komatsu Diesel Oxidation Catalyst	Engine	This is a catalyst that is used for purifying exhaust gas. It is built in to KDPF or assembled with the muffler.
KDPF	Komatsu Diesel Particulate Filter	Engine	This is a component that is used to purify the exhaust gas. KDOC (catalyst) and KCSF (filter to capture soot) are built-in it. It is installed instead of the conventional muffler.
KTCS	Komatsu Traction Control System	Travel and brake (HM)	This is a function that performs braking with the optimum force and recovers the driving force of the wheels by actuating the inter-axle differential lock when the wheels runs idle while the machine travels on the soft ground.
LCD	Liquid Crystal Display	Machine monitor	This is an image display equipment such as a monitor in which the liquid crystal elements are assembled.
LED	Light Emitting Diode	Electronic parts	This is a semiconductor element that emits light when the voltage is applied in forward direction.
LIN	Local Interconnect Network	Communication and electronic control	This is one of communication standards that are used in the network on the machine.
LS	Load Sensing	Hydraulic system	This is a function that detects differential pressure of pump, and controls discharged volume corresponding to load.
LVDS	Low Voltage Differential Signaling	Communication and electronic control	This is one of communication standards that are used in the network on the machine.
MAF	Mass Air Flow	Engine	This indicates engine intake air flow. This is not used independently but is used as combined with sensor. Mass air flow sensor can be called as MAF sensor.

Abbreviation	Actual word spelled out	Purpose of use (major applicable machine (*1), or component/system)	Explanation
TOPS	Tip-Over Protective Structure	Cab and canopy	This is a protective structure that intended to protect the operator wearing seat belt from suffering injury which may be caused if the cab is crushed when the machine tips over. (Roll-over protective structure of hydraulic excavator)  This performance is standardized as ISO 12117.
TWV	2-Way Valve	Hydraulic system	This is a solenoid valve that switches over direction of flow.
VGT	Variable Geometry Turbocharger	Engine	This is a turbocharger on which the cross-section area of the exhaust passage is variable.
VHPC	Variable Horse Power Control	Engine control	This is a function that finely controls the maximum output of the machine so that high work efficiency and low fuel consumption rate are both achieved.

\*1: Code for applicable machine model

D: Bulldozer

HD: Dump truck

HM: Articulate dump truck

PC: Hydraulic excavator

WA: Wheel loader

## List of Abbreviations Used in the Circuit Diagrams

Abbreviation	Actual word spelled out
A/C	Air Conditioner
A/D	Analogue-to-Digital
A/M	Air Mix Damper
ACC	Accessory
ADD	Additional
AUX	Auxiliary
BR	Battery Relay
CW	Clockwise
CCW	Counter Clockwise
ECU	Electronic Control Unit
ECM	Electronic Control Module
ENG	Engine
EXGND	External Ground
F.G.	Frame Ground
GND	Ground
IMA	Inlet Metering Actuator
NC	No Connection

**REMARK**

- Normally, the blow-by pressure should be measured while the engine is operated at the rated output. In the field, however, an approximate value can be obtained by full stalling.
- If the rated output operation or full stall operation cannot be performed, measure the pressure during the operation at high idle. If the pressure is measured while running the engine at high idle, approximately 80 % of the standard value can be obtained as the measured value.
- Blowby pressure varies greatly with the condition of the engine. If the value by the test is considered unusual, perform inspection for phenomena such as excessive oil consumption, bad color of exhaust gas, early oil deterioration, early oil contamination, etc., which are related to blowby problems.

For standard values, see Standard Value Table, "Standard Value Table for Engine".

After finishing the test, remove the testing tools and restore the machine.



Clamp:

$4.4 \pm 0.49 \text{ Nm}$  { $0.45 \pm 0.05 \text{ kgfm}$ }

Test State	Content	Details	Required action
1	DEF pump pressure is being increased.	System is moving to "Test State" "10"	Wait until "Test State" changes to "10".
10	Being tested	It is on the following state depending on the contents. <ul style="list-style-type: none"> <li>• Being pressure-fed by DEF pump</li> <li>• DEF is being injected.</li> <li>• The operation of energization cycle at a fixed time after specific time passes.</li> <li>• "SCR Denitration Efficiency Test" is being performed</li> <li>• "Ash in Soot Accumulation Correction" is being performed</li> </ul>	<ul style="list-style-type: none"> <li>• Check the items to be performed during the test.</li> <li>• In case of "SCR Denitration Efficiency Test" or "Ash in Soot Accumulation Correction", wait until test is finished.</li> </ul>
5	Pressure drop of DEF pump is detected (failure code [CA3574] is displayed)	Pressure drops (only when DEF pump is pressure-fed) while the display of "Test State" is "10".	Perform the troubleshooting for the failure code [CA3574]. For details, see "40 Troubleshooting".
20	Test has been finished.	<ul style="list-style-type: none"> <li>• DEF is being purged.</li> <li>• Heater energizing has been completed.</li> </ul>	<ul style="list-style-type: none"> <li>• If "Turn key OFF" is displayed, turn the starting switch to OFF position and shut down the engine controller. (*1)</li> <li>• If "STOP" is displayed, press the corresponding switch to return the test to initial state.</li> </ul> <p>Other than the above, the state automatically returns to initial state.</p>
11	Purging (energizing temporarily stops) or test cannot be performed.	<ul style="list-style-type: none"> <li>• DEF is being purged.</li> <li>• A particular error message is displayed.</li> </ul>	<ul style="list-style-type: none"> <li>• Turn the starting switch to OFF position once, and perform the test again after shutting down the engine controller.</li> <li>• If a specific error message is displayed, see "40 Troubleshooting" and perform troubleshooting for the failure code.</li> </ul>
12	DEF tank or DEF pump is at high temperature (energizing temporarily stops)	DEF tank temperature exceeds 70 °C or DEF pump temperature exceeds upper limit.	Wait for DEF tank temperature or DEF pump temperature to be lowered. After the display of "Test State" changes to "10", the test restarts automatically.
14	SCR temperature is out of specified range	SCR temperature is 450 °C or above or 250 °C or below (temperature range is set by each test level)	The test state is displayed when step is switched during "SCR Denitration Efficiency Test". Wait for several minutes. After "Test State" becomes "10", test restarts automatically.
15	Mass air flow is out of specified range	Mass air flow is above 0.40 kg/sec or below 0.03 kg/sec.	Under the condition described on the left, "SCR Denitration Efficiency Test" does not finish successfully. Perform the troubleshooting for the failure code. See "40 Troubleshooting".

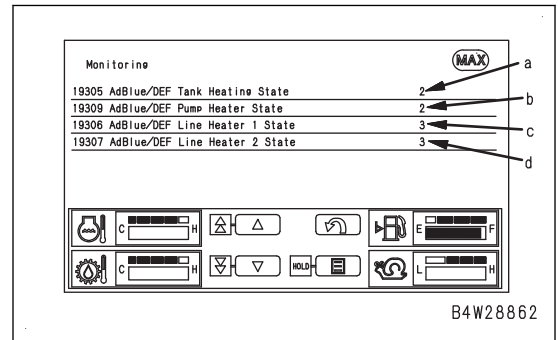
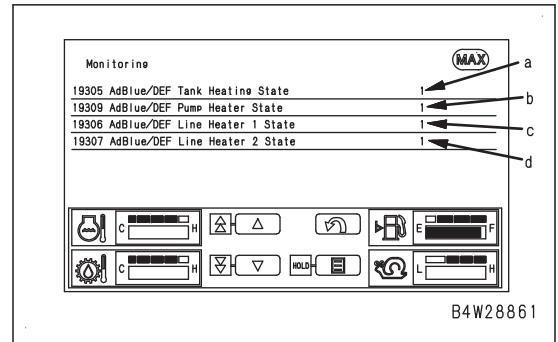
- 2) Check the monitoring information of (a) to (d).  
Details of the monitoring information are as follows.

1: Thawing is in process.

2: Thermal insulation is in process.

3: OFF

- When one or more of the status of the monitoring information (a) to (d) is "1":  
DEF is frozen. Thawing is in process. Keep the engine speed at low idle and wait until all the states of (a) to (d) of the monitoring information become "2" or "3". And then, go to Step 3.
- When the monitoring information of (a) to (d) are "2" or "3":  
DEF is not frozen. Go to Step 3.



3. Show the Abnormality Record screen. For details, see "METHOD FOR CONFIRMING ABNORMALITY RECORD (MECHANICAL SYSTEMS)" and "METHOD FOR CONFIRMING ABNORMALITY RECORD (ELECTRICAL SYSTEMS)".
4. Make sure that the failure code (other than [CA1682], [CA3574], and [CA3596]) with the action level is not shown.

#### NOTICE

**If the failure code (other than [CA1682], [CA3574], and [CA3596]) is shown, see TROUBLESHOOTING to do the troubleshooting.**

#### REMARK

The failure codes [CA1682], [CA3574], and [CA3596] can be shown when foreign materials in the tank are caught to the DEF pump.

CA1682: DEF Pump Priming Error

CA3574: DEF Pump Pressure Too Low Error

CA3596: DEF Pump Pressure Unstable Error

5. Stop the engine.

**⚠ Parts and oil are still very hot immediately after the engine is stopped. It can cause burn injury. Wait for the temperature to go down, and then start the work.**

6. Check the stored condition and procedure to add DEF.

- 1) Make sure that the pump or container with corrosion resistance is used to add DEF.
- 2) Before you add DEF, be sure to clean around the filler port.

#### REMARK

For details, see the Service news "AT16201".

7. Clean the surface of DEF pump, around the DEF tank filler port, and inside of the DEF tank cap.

#### REMARK

- Use water and brush to clean the surface of DEF pump, around the DEF tank filler port, and inside of the DEF tank cap. Fully clean up the dirt.
- If they are not cleaned fully, foreign material can go into them when you replace the DEF filler port filter or when you clean the DEF pump.

## Examine Wear Volume of Parking Brake Disc

### Tools to Examine Parking Brake Disc Wear

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

**⚠** Place the machine on a level ground, lower the work equipment to the ground, set the parking brake switch in PARKING (P) position and work equipment lock switch in LOCK position, and stop the engine.

**⚠** Chock the tires to prevent the machine from moving.

#### REMARK

If the parking brake does not work, test the parking brake disc wear amount according to the following procedure.

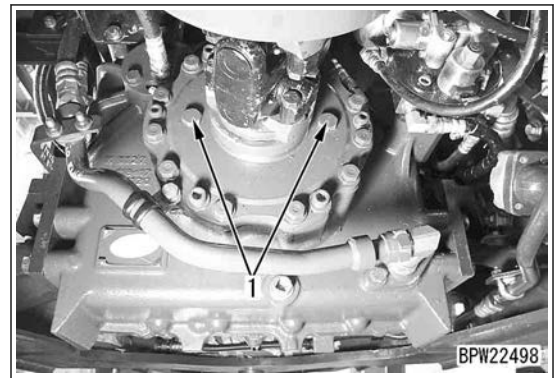
For testing of the parking brake disc wear amount to perform troubleshooting or others, refer to this section.

### How to Examine Wear Quantity of Parking Brake Disc

1. Remove either of the plugs (1).

#### REMARK

Place the oil container B. The oil pours out of the hole after removing the plug (1).



2. Measure depth (a) from the end surface of cage (2) to piston (3) with vernier calipers A.

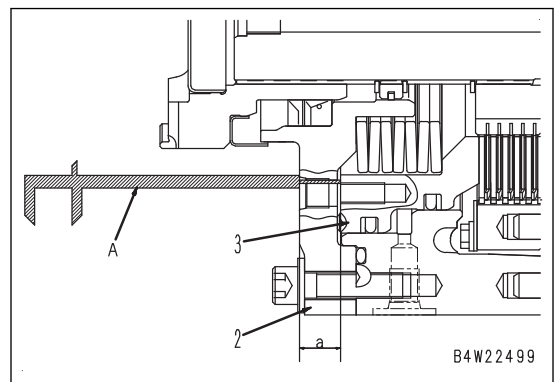
Standard depth (a): 24.6 mm or less

3. If the depth (a) exceeds the standard value, remove the parking brake disc (4) and the plate, and measure the disc thickness. see Disassembly and Assembly, "Remove and Install Transfer Assembly".

#### REMARK

If the parking brake disc and the plate are less than the standard value, replace them.

For the standard value, see MAINTENANCE STANDARD, "MAINTENANCE STANDARD OF PARKING BRAKE".



After testing, add the oil to the specified level through the oil filler port of the transfer case. Run the engine to circulate the oil through the system. Then, check the oil level again.

 Plug (1):

19.6 to 24.5 Nm {2.0 to 2.5 kgfm}

## Electrical System

### Set and Adjust Each Equipment

Use the machine monitor to set or adjust as appropriate when replacement, disassembly, or additional installation of components shown in the table below is performed.

#### REMARK

To perform the works listed in “Required setting/adjustment”, start from the work at the top of the list.

Details of work	Required setting/adjustment	Reference page	
Replacement of the monitor controller	Machine Model Selection	METHOD FOR SETTING WITH DEFAULT SETTING MENU (MACHINE MODEL SELECT)	
	Set up the service meter and the odometer	See “Service News”.	
	Option Selection	METHOD FOR SETTING WITH DEFAULT SETTING MENU (OPTION SELECTION)	
	1st Minimum Speed / Creep Adjustment	METHOD FOR ADJUSTING WITH ADJUSTMENT MENU (1ST MINIMUM SPEED AND CREEP ADJUSTMENT)	
	HST Pump Block Curve Adjustment	METHOD FOR ADJUSTING WITH ADJUSTMENT MENU (HST PUMP BLOCK CURVE ADJUSTMENT)	
	Adjustment of HST controller boom angle		METHOD FOR ADJUSTING WITH ADJUSTMENT MENU (BOOM ANGLE SENSOR (RAISE))
			METHOD FOR ADJUSTING WITH ADJUSTMENT MENU (BOOM ANGLE SENSOR (LOWER))
	Adjustment of PZ Auto Tilt-in Current Compensation	METHOD FOR ADJUSTING WITH ADJUSTMENT MENU (PZ AUTO TILT-IN EPC SOLENOID CURRENT COMPENSATION)	
	Adjustment of Fan Maximum Speed EPC Current	METHOD FOR ADJUSTING WITH ADJUSTMENT MENU (FAN MAXIMUM SPEED EPC SOLENOID CURRENT)	
Adjustment of Fan Minimum Speed EPC Current	METHOD FOR ADJUSTING WITH ADJUSTMENT MENU (FAN MINIMUM SPEED EPC SOLENOID CURRENT)		
Replacement of HST controller	Machine Model Selection	METHOD FOR SETTING WITH DEFAULT SETTING MENU (MACHINE MODEL SELECT)	
	Option Selection	METHOD FOR SETTING WITH DEFAULT SETTING MENU	
Replacement of Boom Angle Sensor	Adjustment of HST controller boom angle	METHOD FOR ADJUSTING WITH ADJUSTMENT MENU (BOOM ANGLE SENSOR (RAISE))	
		METHOD FOR ADJUSTING WITH ADJUSTMENT MENU (BOOM ANGLE SENSOR (LOWER))	

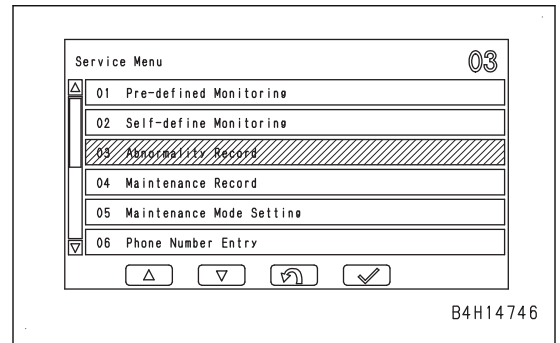
## Abnormality Record Menu

### How to See Abnormality Record (Mechanical Systems)

- The machine monitor logs the failures that occurred in the past and is occurring currently. It classifies them into the mechanical system abnormality and electrical system abnormality.
  - To check “Mechanical Sys Abnormality Record”, perform the following procedures.
  - For the failure code list, see “Failure Code Table” for troubleshooting.
1. Select “Abnormality Record” on “Service Menu” screen.

**REMARK**

For selecting method, see “How to Operate Service Mode” in “SERVICE MODE”.



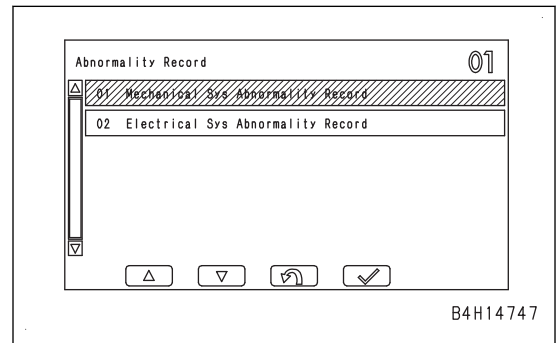
2. After the “Abnormality Record” screen is displayed, use a switch on the switch panel to select “Mechanical Sys Abnormality Record”.

UP switch (10): Moves the selection up by one item

DOWN switch (11): Moves the selection down by one item

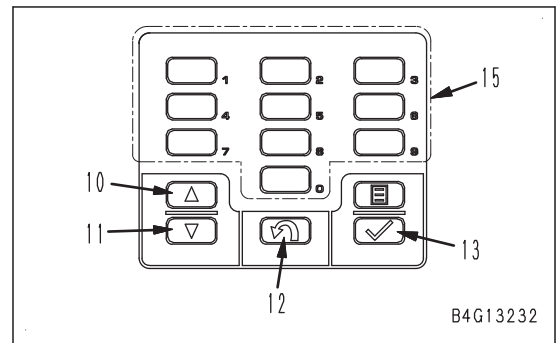
RETURN switch (12): Returns the screen to “Service Menu” screen

ENTER switch (13): Validates the selection



**REMARK**

Input a code (2-digit) by using the numeral (15) input switch to directly select the item, and then press ENTER switch (13) to enter the selection.



- After the “Diagnostic Tests” screen is displayed, use a switch on the switch panel to select “Engine Controller Active Fault Clear”.

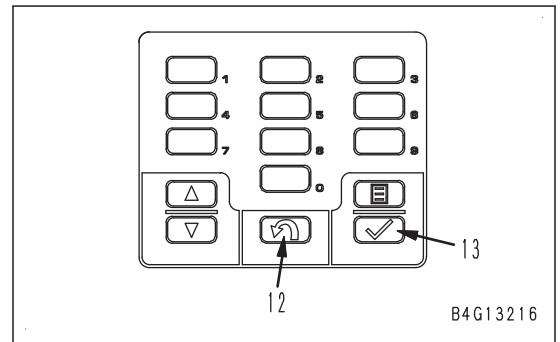
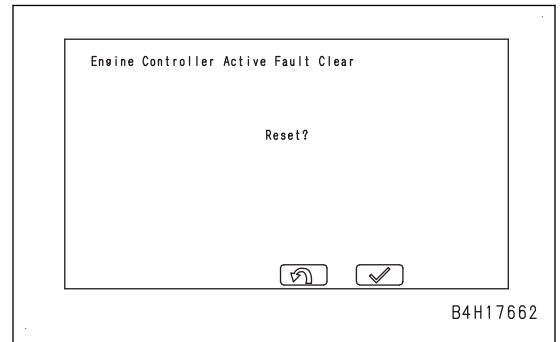
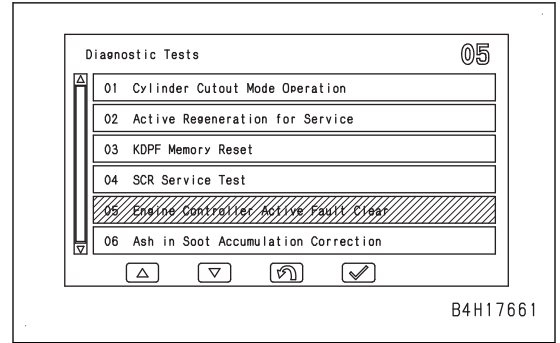
**REMARK**

For selecting method, see “How to Operate Service Mode” in “SERVICE MODE”.

- After the “Engine Controller Active Fault Clear” screen is displayed, use a switch on the switch panel to select the item to be executed.

RETURN switch (12): Returns the screen to “Diagnostic Tests” screen

ENTER switch (13): Clears the failure code



**Testing Menu (Ash in Soot Accumulation Correction)**

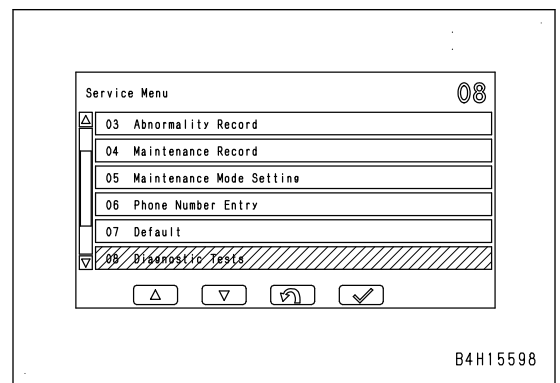
Default menu is used to check or change default values of the machine monitor and machine.

You can correct the ash accumulation quantity in the soot accumulation according to the procedures in this section.

- Perform “KDPF Cleaning”, and then perform “KDPF Change”. See “Testing Menu (KDPF Memory Reset)”.
- Turn the starting switch to OFF position.
- Check the system operating lamp is not lit, and turn the starting switch to ON position.
- Select “Diagnostic Tests” on “Service Menu” screen.

**REMARK**

For selecting method, see “How to Operate Service Mode” in “SERVICE MODE”.



### Adjustment Menu (Clutch Engage Time)

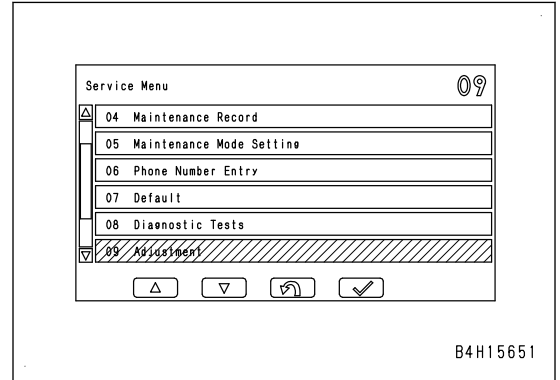
This function reduces a shock of the machine because the controller outputs variable current to the transfer clutch and the EPC valve clutch, during deceleration from 3rd or 4th speed range.

Adjustment menu is used to check the various settings of the machine or to adjust the value.

1. From "Service Menu" screen, select "Adjustment".

**REMARK**

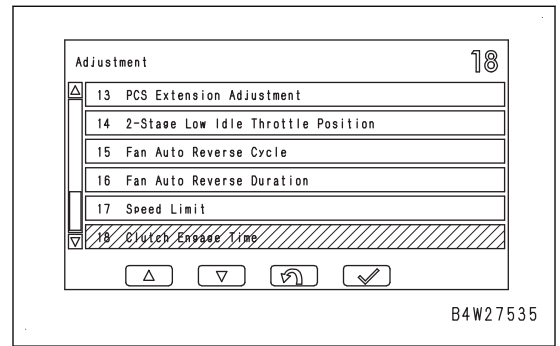
For selecting method, see "How to Operate Service Mode" in "SERVICE MODE".



2. When "Adjustment" screen is displayed, use a switch on the switch panel to select "Clutch Engage Time".

**REMARK**

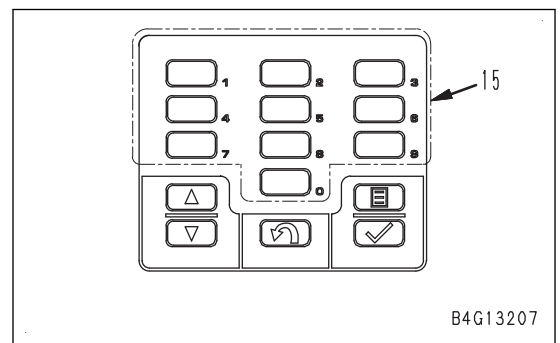
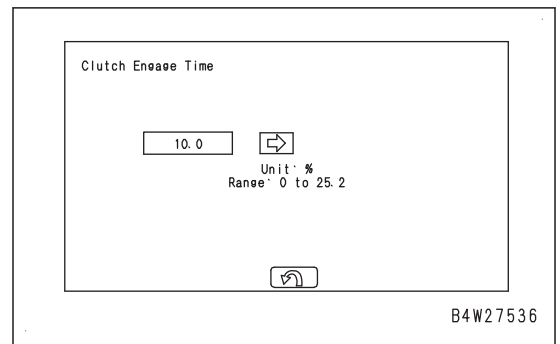
For selecting method, see "How to Operate Service Mode" in "SERVICE MODE".



3. When "Clutch Engage Time" screen is displayed, press numeral input switch (15) of switch panel, and display "Numeric Input of New Value" screen.

**REMARK**

When any of numeral input switches 0 to 9 is pressed, "Numeric Input of New Value" screen is displayed.



## Change Lubrication Time and Lubrication Interval

- ⚠ Place the machine on a level ground, and lower the work equipment to the ground.
- ⚠ Set the parking brake switch in PARKING (P) position and work equipment lock switch in LOCK position, and then stop the engine.
- ⚠ Chock the tires to prevent the machine from moving.

For information about the lubrication time and lubrication interval time change, refer to this section.

### Parameter List

Display	Symbol	Explanation
<b>000</b> B4W24925	000	"000" flashes.
<b>t PA</b> 9JD17889	t = TIMER PA = PAUSE	The control unit operates as a time controlled contact maker (TIMER) and is in the PAUSE state
<b>c PA</b> 9JD17890	c = COUNTER PA = PAUSE	Not used. This mode causes a malfunction.
<b>t CO</b> 9JD17891	t = TIMER CO = CONTACT	The control unit operates as a time controlled contact maker (TIMER) and is in the pump running time (CONTACT)
<b>c CO</b> 9JD17892	c = COUNTER CO = CONTACT	Not used. This mode causes a malfunction.
<b>COP</b> 9JD17893	C = CYCLE O = OFF P = PRESSURE	Display of beginning of menu "Configurations"
<b>OFF</b> 9JD17894	Mounting OFF	Disabling monitoring function PS (progressive system) and CS (cycle switch)
<b>CS</b> 9JD17895	C = CYCLE S = SWITCH	Cycle switch monitoring is activated
<b>FLL</b> 9JD17896	F = FAULT L = LOW L = LEVEL	Grease in the grease tank has reached the minimum level.
<b>FCS</b> 9JD17897	F = FAULT C = CYCLE S = SWITCH	No signal from cycle switch during pump running time.

## Troubleshooting Points for Urea SCR System

### Shutdown of Engine Controller

The followings are troubleshooting related cautions and changes for the newly installed Urea SCR system for the Tier4 Final specification.

- When the starting switch is turned to the OFF position, the engine controller starts the shutdown processing. After the shutdown processing is completed, the action of turning off the engine controller's power is referred to as "Engine controller shut down".
- On machines with the Urea SCR system, the engine controller's shutdown process now includes purging of DEF from devices or hoses to the tank. This increases average shutdown time from 2 minutes in former models to maximum 7 minutes in Tier4 Final Specification models. (Described as 2 to 6 minutes in the description of "Troubleshooting by failure code").
- If the starting switch is turned OFF and ON before the engine controller is shut down, the information in the engine controller which should be updated will not be updated, and the troubleshooting of the device may not function properly. If this happens, it becomes necessary to shut down the engine controller. Completion of engine controller shut down can be confirmed when the system operating lamp goes out.

### "Loaded Diagnostics Operation to Clear Failure Code" and "Loaded Diagnostics Operation to Confirm Failure Correction" in the Troubleshooting

**⚠** Since the aftertreatment devices and their temperature sensor, pressure sensor, NOx sensor, ammonia sensor, DEF injector, etc. are heated to a high temperature after "Loaded Diagnostics Operation To Confirm Failure Correction" or "Loaded Diagnostics Operation To Clear Failure Code", take care not to get burned. Perform troubleshooting or repair after letting the devices cool down.

#### NOTICE

The operations for "Operation for judging the repair result" and "Machine operation for clearing the failure code" to apply a load to the engine are special operations to be performed only in a procedure for troubleshooting.

Perform stall operation, etc. to implement normal check according to the procedure described in TESTING AND ADJUSTING.

#### NOTICE

Check the fuel and DEF level before the operation for "Operation for judging the repair result" or "Machine operation for clearing the failure code".

For checking the fuel and DEF level, see Testing and Adjusting, "Set and Operate Machine Monitor", "SERVICE MODE", "METHOD FOR OPERATING TESTING MENU (SCR SERVICE TEST)".

#### 1. Tips

- The engine controller monitors the operation of engine related components (including aftertreatment devices), and displays a failure code on the monitor when an abnormality is detected, and clears the failure code after the failure is corrected. The monitored items include: sensors, actuators, electric wiring, catalyzer, etc.
- The engine controller clears the failure code when it performs troubleshooting and the failure is corrected. However, the failure code may be cleared when the engine controller is shut down even if the failure still exists. It may be necessary to apply load to the engine to activate the troubleshooting. Open circuits and short circuits can be diagnosed by turning the starting switch to ON position after completing the repair. The engine controller determines if the failure, and displays a failure code on the monitor when an abnormality is detected.
- However, the engine controller may not activate troubleshooting of the aftertreatment devices or other functions if the exhaust gas temperature or flow rate is below the specified value. "Loaded Diagnostics Operation To Confirm Failure Correction" or "Loaded Diagnostics Operation To Clear Failure Code" should always be performed after the repair. These operations mean to run the engine, and rev up or load the engine to meet the conditions for activating troubleshooting.

#### 2. Loaded Diagnostics Operation To Confirm Failure Correction

- This operation is performed to confirm if a failure is corrected when the failure code is already cleared (described later) or has been cleared before the failure was corrected.

## Examine Oil Level in Rear Axle Case

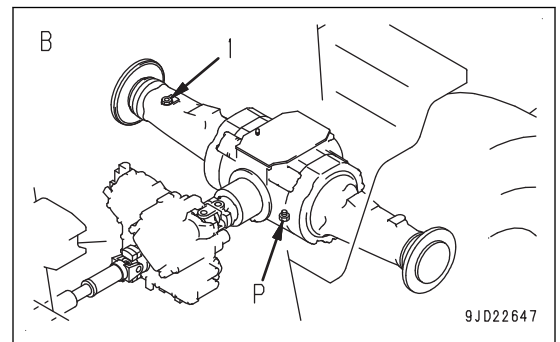
- ⚠ When checking the oil level, apply the parking brake and secure the front and rear frames with the frame lock bar.
- ⚠ Immediately after the engine is stopped, its parts and oil are still very hot and may cause burn injury. Wait for the temperature to go down, and then start the work.
- ⚠ When removing the plug, the oil may spout out. Turn it slowly to release the internal pressure, then remove it.

Perform the check when ooze of oil is recognized on the axle case.

Perform the check with machine on the level ground.

B: Rear axle case

1. Stop the engine and remove the plug (1).
2. Wipe off the oil of the dipstick (G) attached to the plug (1) with a cloth.



3. Set the dipstick (G) as shown in the figure.
  - (2): Axle
  - (3): Spot facing
4. Oil level is appropriate if it is between 2 grooves (H) and (L) of the dipstick.


### REMARK

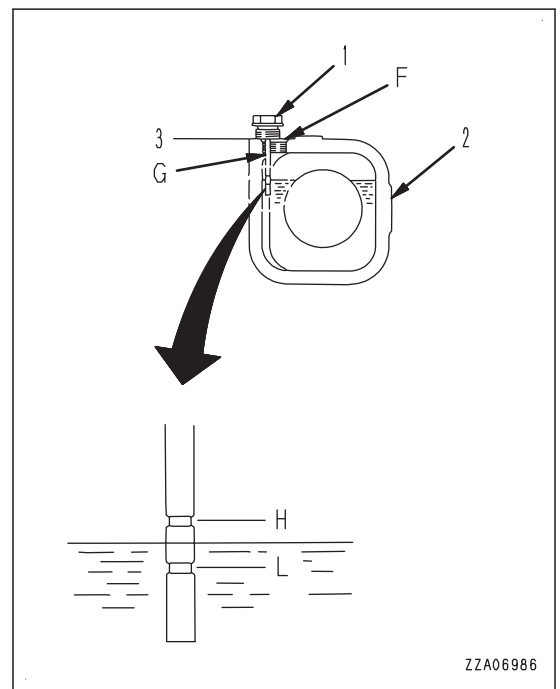
If the oil level is below lower mark (L), add axle oil through the oil filler port (F).

### REMARK

For the axle with limited slip differential, lubricating oil amount may be different, so take care. Always use the specified lubricating oil

5. If the oil level is above upper mark (H), drain the excess oil through the drain plug (P), and then check the oil level again.
6. When oil level is appropriate, Install the plug (1).

 Tightening torque:  
93 to 123 Nm {9.5 to 12.5 kgfm}



## Bleed Air from Fuel System

For the bleeding air from the fuel system, see "30 Testing and Adjusting", "BLEED AIR FROM FUEL SYSTEM".

## Bleed Air from Hydraulic System

For bleeding air from the hydraulic system, see Testing and Adjusting, "Bleed Air from Steering Cylinder Circuit", "BLEED AIR FROM BRAKE CIRCUIT", "BLEED AIR FROM WORK EQUIPMENT CIRCUIT", "BLEED AIR FROM COOLING FAN CIRCUIT".

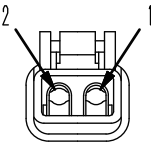
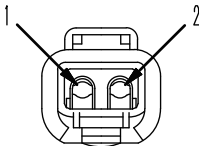
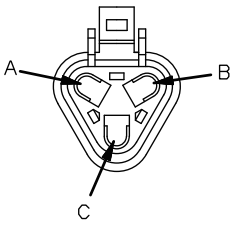
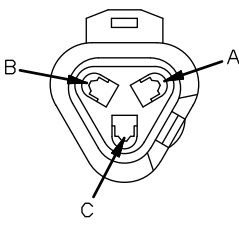
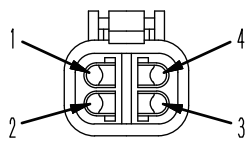
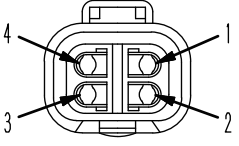
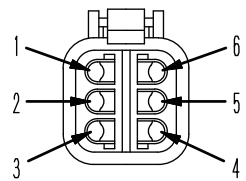
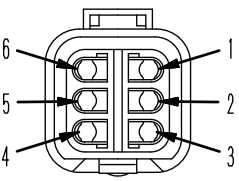


**Connector List and Layout (Machine with Gateway Function Controller) (Applicable Machine: 86600 and Up)**

**40 Troubleshooting**

Connector No.	Connector type	Number of pins	Location	Address
L18	DT	2	Intermediate connector	W-1
L18A	YAZAKI	2	12 V socket	V-6
L18B	YAZAKI	2	12 V socket	V-7
L21	S	10	Wiper switch	N-7
L31	KES0	6	Wiper timer	Q-9
L32	KES0	6	Wiper timer	X-8
L35	DT	2	Boom FLOAT	N-6
L36	DT	2	Boom RAISE detent	N-6
L37	DT	2	Bucket detent	M-5
L38	X	2	Optional power supply +24V (continuous power supply)	V-3
L39	X	2	Optional power supply +24V	V-2
L40	DT	3	Intermediate connector	M-9
L41	YAZAKI	10	Quick coupler switch	M-9
L44	DT	6	Intermediate connector (load meter printer wiring harness)	X-1
L45	DT	6	Auto-greasing (if equipped)	T-1
L54	DT	3	Travel speed control dial	P-7
L55	DT	2	Air suspension seat	S-1
L57	M	6	Front wiper motor	N-9
L62	DT	4	Intermediate connector	P-7
L64	SWP	6	Traction control switch	P-8
L67	SWP	6	Intermediate connector	R-9
L70	DT	6	Intermediate connector	O-7
L71	DT	4	Brake valve	Q-1
L72	YAZAKI	2	Resistance for emergency travel	S-1
L73	DT	6	Specification selection	N-6
L80	Terminal	1	Ground cable	M-4
L81	Terminal	1	Ground (rearview monitor)	P-8
L82	Terminal	1	Ground (rearview monitor)	P-7
L85	AMP	81	Gateway function controller	Y-6
L86	DT	12	ICT service connector	X-1
L87	DT	12	3rd party component connector	U-8
L88	DT	12	Extension sensor connector	N-1
L100	Terminal	1	Ground cable	T-1
L102	Relay	5	VIS power supply hold	X-7
L105	Relay	5	Parking brake	X-7
L106	Relay	5	Neutral safety	W-9

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

No. of pins	DT Series connector		
	Body (plug)	Body (receptacle)	Testing connection use special tool Part No.
2	 <p style="text-align: center;">BWP05037</p>	 <p style="text-align: center;">BWP05038</p>	<p>799-601-9020 (T-adapter) 799-601-9890 (T-adapter)</p>
	<p>Part No. :08192-12200 (normal type) 08192-22200 (fine wire type)</p>	<p>Part No. :08192-12100 (normal type) 08192-22100 (fine wire type)</p>	
3	 <p style="text-align: center;">BWP05039</p>	 <p style="text-align: center;">BWP05040</p>	<p>799-601-9030 (T-adapter) 799-601-9890 (T-adapter)</p>
	<p>Part No. :08192-1A200 (normal type) 08192-2A200 (fine wire type)</p>	<p>Part No. :08192-13100 (normal type) 08192-23100 (fine wire type)</p>	
4	 <p style="text-align: center;">BWP05041</p>	 <p style="text-align: center;">BWP05042</p>	<p>799-601-9040 (T-adapter) 799-601-9890 (T-adapter)</p>
	<p>Part No. :08192-14200 (normal type) 08192-24200 (fine wire type)</p>	<p>Part No. :08192-14100 (normal type) 08192-24100 (fine wire type)</p>	
6	 <p style="text-align: center;">BWP05043</p>	 <p style="text-align: center;">BWP05044</p>	<p>799-601-9050 (T-adapter)</p>
	<p>Part No. :08192-16200 (normal type) 08192-26200 (fine wire type)</p>	<p>Part No. :08192-16100 (normal type) 08192-26100 (fine wire type)</p>	

B4D18410

## Prepare Troubleshoot Machine Monitor

- Machine monitor consists of multiple independent units which transmit/receive data to/from monitor controller through LIN communication.
- Connectors in Table 1 are used to each unit related to machine monitor.
- You need to create your own harness checker for troubleshooting for LCD unit of machine monitor. See "Procedure to Make Harness Checker on Machine Monitor LCD Unit" for method for creating the harness checker on machine monitor LCD unit.

**Table 1. Details of Connectors Related to Machine Monitor**

	Unit name	Connector name	Number of pins	Model number	Manufacturer	Connector type, etc	Tool	Remarks
Machine monitor	LCD unit	MDM1	8	MX40008U-Q1	JAE		-	
	LED unit	MDM2	6	175954/-1	AMP	070 Connector	T-adapter	
	Meter unit	MDM3	8	175955/-1	AMP	070 Connector	T-adapter	
-	Monitor controller	MCM1 A	81	TY-CO-1241434	AMP	Same as the pump controller of PC	Box type socket	This is not T-adapter. Working pressure cannot be measured.
-		MCM1 B	40					
-	Monitor controller	MCM2	8	MX40008NQ1	JAE		Harness checker	See, "PROCEDURES FOR CREATING HARNESS CHECKER ON MACHINE MONITOR LCD UNIT".
-	Switch panel	MOM1	6	175954/-1	AMP	070 Connector	T-adapter	
-	Rearview monitor	RVM1	12	175957/-1	AMP	070 Connector	T-adapter	
-		RVM2	8	175955/-1	AMP	070 Connector	T-adapter	

**Failure Code [2G42ZG]**

Action level	Failure code	Failure	Accumulator Oil Pressure Low (Front) (Monitor controller system)
L03	2G42ZG		
Detail of failure	Front brake accumulator oil pressure switch circuit is open (below the specified pressure) when 30 seconds passed after engine is started, or the circuit becomes open after front brake accumulator oil pressure switch circuit is closed (indicates specified pressure) once.		
Action of controller	<ul style="list-style-type: none"> <li>Makes centralized warning lamp light up and alarm buzzer sound.</li> <li>If cause of failure disappears, machine becomes normal by itself.</li> </ul>		
Phenomenon on machine	<ul style="list-style-type: none"> <li>Front brake accumulator pressure drops.</li> <li>Brake may not work.</li> </ul>		
Related information	<ul style="list-style-type: none"> <li>Input state (ON/OFF) from brake pressure switch can be checked with monitoring function. (Code: 04510)</li> <li>After completion of repair, check if the failure code is cleared by the following procedure. Procedure: Turn the starting switch to ON position.</li> </ul>		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Low oil pressure of front brake accumulator	Check the front brake accumulator oil pressure. (See TESTING AND ADJUSTING.)		
2	Defective front brake oil pressure switch	1. Turn the starting switch to OFF position. 2. Disconnect the connector T13, and connect the T-adapter to male side.		
		Resistance	Between T13 (male) (1) and (2)	Front brake accumulator oil pressure: Pressure is normal. 5.88 MPa and above {60 kgf/cm <sup>2</sup> and above} Max. 1 Ω
				Front brake accumulator oil pressure: Pressure is low. 3.92 MPa and below {40 kgf/cm <sup>2</sup> and below} Min. 1 MΩ
3	Open circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connectors MCM1A and T13, and connect the T-adapter to each female side.		
		Resistance	Between MCM1A (female) (73) and T13 (female) (1)	Max. 1 Ω
			Between T13 (female) (2) and ground	Max. 1 Ω
4	Defective monitor controller	If no failure is found by above checks, monitor controller is defective. (Since this is an internal defect, troubleshooting cannot be performed).		

## Failure Code [AB00KE]

Action level	Failure code	Failure	Charge Voltage Low (Machine monitor system)
L03	AB00KE		
Detail of failure	Generation signal is not input from alternator while engine is running.		
Action of machine monitor	Makes centralized warning lamp light up and alarm buzzer sound.		
Phenomenon on machine	If machine is used as it is, power supply voltage can drop too low for machine to drive.		
Related information	Battery charge voltage can be checked with monitoring function. (Code: 04306)		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective alternator	1. Turn the starting switch to OFF position. 2. Disconnect wiring harness from alternator terminal R. 3. Start the engine.  <b>REMARK</b> If battery is deteriorated or it is used in cold district, voltage may stay low for a while after engine has started.		
		Voltage	Between alternator terminals R and E	24 to 30 V
2	Open circuit in wiring harness (wire breakage or defective contact)	1. Turn the starting switch to OFF position. 2. Disconnect connector MCM1 A, and connect T-adapter to female side. 3. Start the engine.  <b>REMARK</b> If battery is deteriorated or it is used in cold district, voltage may stay low for a while after engine has started.		
		Voltage	Between MCM1 A (female) (6) and ground	24 to 30 V
		Resistance	Between MCM1 A (female) (6) and alternator R terminal	Max. 1 Ω
3	Defective monitor controller	1. Turn the starting switch to OFF position. 2. Insert T-adapter into connector MCM1 A. 3. Start the engine.		
		Voltage	Between MCM1 A (6) and ground	20 to 30 V
		If battery is deteriorated or it is used in cold district, voltage may stay low for a while after engine has started.		

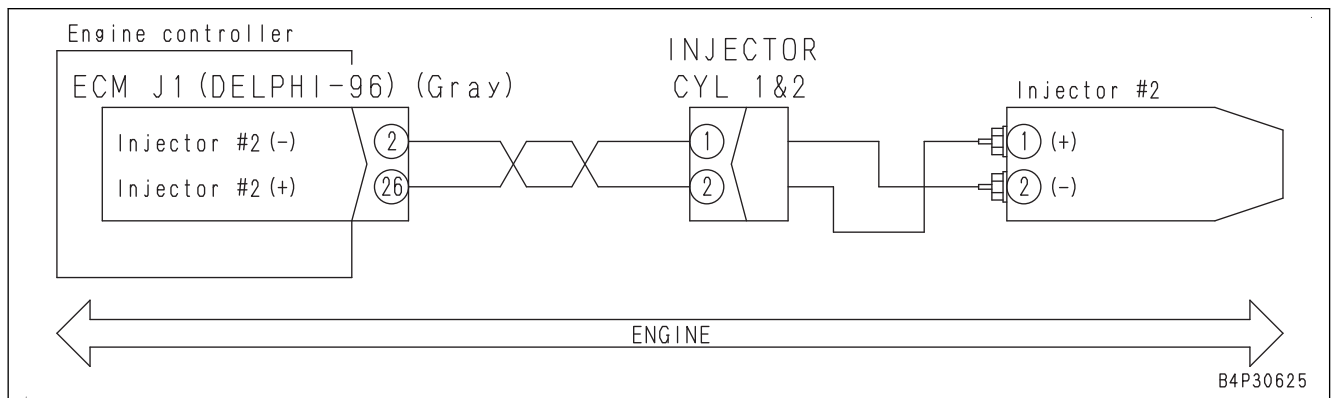
**Failure Code [CA145]**

Action level	Failure code	Failure	Coolant Temperature Sensor Low Error (Engine controller system)
L01	CA145		
Details of failure	Low voltage occurs in signal circuit of engine coolant temperature sensor.		
Action of controller	Sets coolant temperature to fixed value for operation.		
Phenomenon on machine	<ul style="list-style-type: none"> <li>• Engine startability becomes poor in low temperature.</li> <li>• Overheat prevention function does not operate.</li> </ul>		
Related information	<ul style="list-style-type: none"> <li>• Signal voltage from engine coolant temperature sensor can be checked by monitoring function. (Code: 04105 (V))</li> <li>• Temperature in engine oil coolant sensor can be checked by monitoring function. (Code: 04107 (°C))</li> <li>• After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position.</li> <li>• When temperature sensor connector is removed, failure code for High Error [CA144] is displayed instead of this failure code.</li> </ul> <p><b>⚠ Do not work at high coolant temperature, when testing and replacing coolant temperature sensor.</b></p>		

No.	Cause	Procedure, measuring location, criteria and remarks			
1	Defective wiring harness connector	1. See descriptions of wiring harness and connectors in “c: Electrical equipment” in “CHECKS BEFORE TROUBLESHOOTING” of “RELATED INFORMATION ON TROUBLESHOOTING”, and check it. 2. Turn starting switch to ON position.			
		If this failure code is cleared, wiring harness connector is defective.			
2	Defective coolant temperature sensor	1. Turn starting switch to OFF position. 2. Disconnect connector COOLANT TEMP and connect socket to male side.			
		<b>REMARK</b>			
		Regard coolant temperature sensor as normal if its resistance is 700 Ω to 37 kΩ when coolant temperature is min. 0 °C.			
		Resistance	Between COOLANT TEMP (male) (A) and (B) Coolant temperature characteristics	0 °C	30 to 37 kΩ
				25 °C	9.3 to 10.7 kΩ
				50 °C	3.2 to 3.8 kΩ
80 °C	1.0 to 1.3 kΩ				
95 °C	700 to 800 Ω				
	Between COOLANT TEMP (male) (B) and ground	All coolant temperature range	Min. 100 kΩ		

No.	Cause	Procedure, measuring location, criteria and remarks		
5	Ground fault in wiring harness (contact with ground circuit)	If failure code is still displayed after above checks on cause 3, this check is not required. 1. Turn starting switch to OFF position. 2. Disconnect connectors ECM J1 and INJECTOR CYL 1 & 2, and connect T-adaptor to either female side.		
		Resistance	Between ground and ECM J1 (female) (26) or INJECTOR CYL 1 & 2 (female) (1)	Min. 100 kΩ
			Between ground and ECM J1 (female) (2) or INJECTOR CYL 1 & 2 (female) (2)	Min. 100 kΩ
6	Short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connectors ECM J1 and INJECTOR CYL 1 & 2, and connect T-adaptor to female side of ECM J1.		
		Continuity	Between ECM J1 (female) (26) and each pin other than pin (26)	No continuity (no sound is heard)
			Between ECM J1 (female) (2) and each pin other than pin (2)	No continuity (no sound is heard)
7	Hot short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Insert T-adaptor to connector ECM J1. 3. Turn starting switch to ON position.		
		Voltage	Between ECM J1 (26) and ground	Max. 6 V
		If measured voltage is abnormal, disconnect connector INJECTOR CYL 1 & 2 and measure the voltage at the same point again. If the abnormality persists, a positive (+) line is defective. If the voltage is restored back to a normal range, a negative (-) line is defective.		
8	Defective another cylinder's injector or wiring harness	When failure code for abnormality in multiple injectors is displayed, perform troubleshooting these first.		
9	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

**Circuit Diagram of Injector #2**



**Failure Code [CA515]**

Action level	Failure code	Failure	Common Rail Pressure Sensor Supply Voltage High Error (Engine controller system)
L03	CA515		
Detail of failure	High voltage occurs in power supply (5 V) of common rail pressure sensor.		
Action of controller	<ul style="list-style-type: none"> <li>• Engine power deration.</li> <li>• Restricts common rail pressure.</li> </ul>		
Phenomenon on machine	Engine power deration.		
Related information	<ul style="list-style-type: none"> <li>• After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn the starting switch to ON position.</li> <li>• Because female connector alone is provided in “Socket” for troubleshooting for this sensor, check for open circuit in wiring harness and voltage check cannot be performed (T-adaptor is not provided).</li> </ul>		

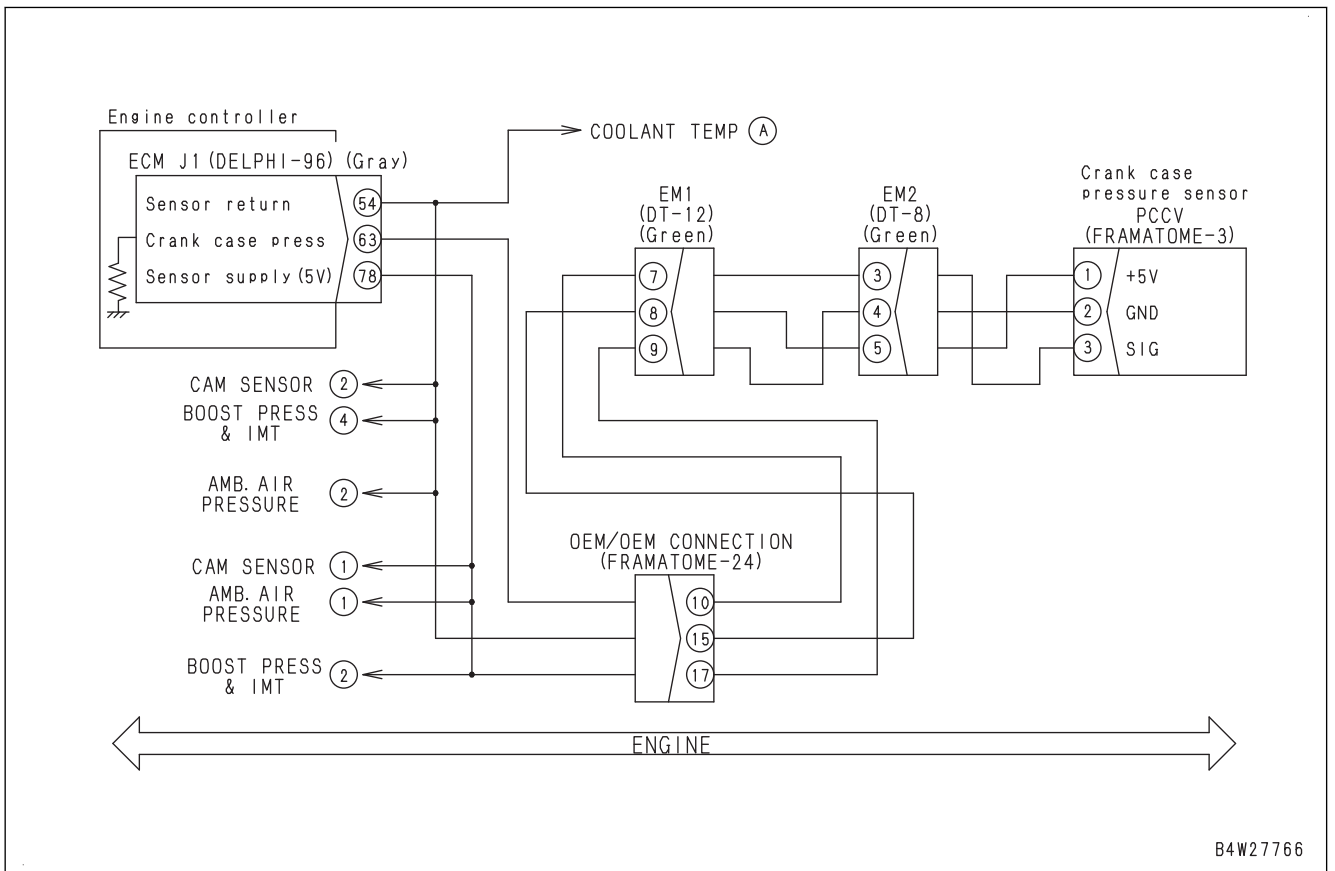
No.	Cause	Procedure, measuring location, criteria and remarks	
1	Defective wiring harness connector	<ol style="list-style-type: none"> <li>1. See descriptions of wiring harness and connectors in “Electrical equipment” in “CHECKS BEFORE TROUBLESHOOTING” of “RELATED INFORMATION ON TROUBLESHOOTING”, and check it.</li> <li>2. Turn starting switch to ON position.</li> </ol>	
		If this failure code is cleared, harness connector is defective.	
2	Defective common rail pressure sensor (internal defect)	<ol style="list-style-type: none"> <li>1. Turn starting switch to OFF position.</li> <li>2. Disconnect connector FUEL RAIL PRESS.</li> <li>3. Turn starting switch to ON position.</li> </ol>	
		If this failure code is cleared any more, sensor is defective. <b>REMARK</b> Other failure codes are displayed at the same time. This happens because the connector is disconnected. So ignore other codes than this failure code.	
3	Defective wiring harness	<ol style="list-style-type: none"> <li>1. Turn starting switch to OFF position.</li> <li>2. Disconnect connector ECM J1.</li> <li>3. Turn starting switch to ON position.</li> </ol>	
		If this failure code is cleared, wiring harness system may be defective. perform following diagnosis. <b>REMARK</b> Many other failure codes appear at same time because of disconnected connector. Ignore failure codes other than this.	
4	Hot short circuit in wiring harness	If failure code is still displayed after above checks on cause 3, this check is not required. <ol style="list-style-type: none"> <li>1. Starting switch: OFF</li> <li>2. Disconnect connector FUEL RAIL PRESS.</li> <li>3. Insert T-adaptor into connector ECM J1.</li> <li>4. Starting switch: ON</li> </ol>	
		Voltage	Between ECM J1 (82) and (58)

**Failure Code [CA1682]**

Action level	Failure code	Failure	DEF Pump Priming Error (Engine controller system)
L01	CA1682		
Detail of failure	The pressure cannot be raised for preparation of DEF injection due to damage, clogging, etc. of the DEF pump or hose.		
Action of controller	<ul style="list-style-type: none"> <li>• DEF pump stop</li> <li>• Advances to Inducement strategy.</li> </ul>		
Phenomenon on machine	<ul style="list-style-type: none"> <li>• NOx emission increases because DEF injection is disabled.</li> <li>• Engine power deration according to inducement strategy.</li> </ul>		
Related information	<ul style="list-style-type: none"> <li>• The engine controller does not display this failure code during thawing control of the DEF supply system (DEF injection is disabled, which disables judgment).</li> <li>• Make sure that the value of the following 4 states are other than 1 (thawing) 3 minutes after the engine is started. (It is not possible to troubleshoot this failure until thawing control is completed.)</li> <li>• The state of each heater is 1: Thawing, 2: Warming, or 0: OFF. Enter the following numbers directly and confirm the values on the monitoring code screen. 19305 DEF Tank Heating State 19306 DEF suction and purge line heater state 19307 DEF pressure line heater state 19308 DEF pump heater state</li> <li>• This failure code is cleared on the DEF pump “Pre-defined Monitoring” screen if the DEF pump pressure rises to around 900 kPa.</li> <li>• The associated values can be confirmed on the following screen. (The values can also be confirmed on the monitoring code screen by entering the numbers directly.)</li> <li>• The “Pre-defined Monitoring” screen. (The following numbers are the monitoring codes) DEF pump diagnosis 19304 DEF pump state 19108 DEF Pump Pressure 19136 DEF Pump Temperature 19109 DEF Pump Pressure Sensor Voltage 19120 DEF Injection Quantity</li> </ul> <p><b>NOTICE</b> This failure code requires “Loaded Diagnostics Operation To Clear Failure Code”. After investigating the cause of the problem and completing the repair, perform “Loaded Diagnostics Operation To Clear Failure Code” to make sure the failure code is cleared. (This failure code is not cleared by only turning ON the starting switch again.)</p>		

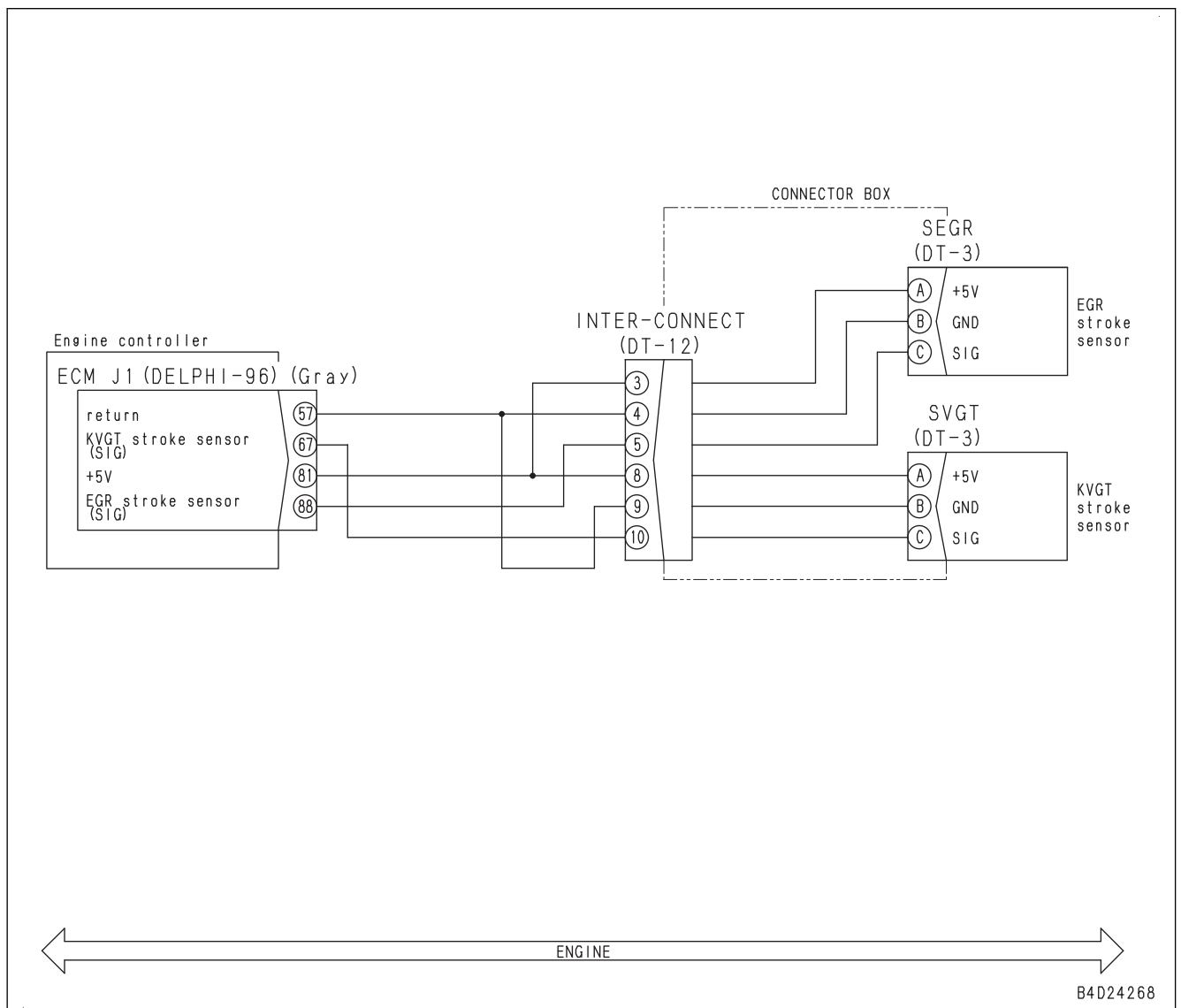
No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective wiring harness connector	1. See descriptions of wiring harness and connectors in “Electrical equipment” in “CHECKS BEFORE TROUBLESHOOTING” of “RELATED INFORMATION ON TROUBLESHOOTING”, and check them.
		2. Turn the starting switch to ON position.
		If this failure code is not displayed, the wiring harness connector is defective.
2	Defective DEF pump system	If failure code [CA3558] or [CA3559] or [CA3571] or [CA3572] is displayed on the abnormality record screen, perform troubleshooting these first.

### Circuit Diagram of Crankcase Pressure Sensor



No.	Cause	Procedure, measuring location, criteria and remarks		
8	Short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connectors ECM J1 and INTER-CONNECT, and connect T-adapter to either female side.		
		Resistance	Between ECM J1 (female) (88) and (57), or between INTER-CONNECT (female) (5) and (4)	Min. 100 kΩ
9	Defective EGR valve lift sensor	If no failure is found in causes 1 through 8 but found in cause 9, the sensor is defective. 1. Turn starting switch to OFF position. 2. Insert T-adapter into connector ECM J1 or SEGR. 3. Turn starting switch to ON position.		
		Voltage	Between ECM J1 (88) and (57), or between SEGR (C) and (B)	1.0 to 4.0 V
10	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

**Circuit Diagram of EGR Valve Lift Sensor**



No.	Cause	Procedure, measuring location, criteria and remarks													
2	Defective smart sensor power supply relay system	<p>If failure code [CA1776] or [CA1777] is displayed, perform troubleshooting for [CA1776] or [CA1777] first.</p> <ol style="list-style-type: none"> <li>1. Turn starting switch to OFF position.</li> <li>2. Check that system operating lamp does not light up, and then turn battery disconnect switch to OFF position.</li> <li>3. Disconnect relay connector SSR, and connect T-adaptor to female side.</li> <li>4. Turn the battery disconnect switch to ON position.</li> <li>5. Turn starting switch to ON position.</li> <li>6. Perform troubleshooting for failure code [CA1776] if a failure is found.</li> </ol> <table border="1" data-bbox="528 633 1474 678"> <tr> <td data-bbox="528 633 683 678">Voltage</td> <td data-bbox="683 633 1321 678">Between SSR (female) (5) and (4)</td> <td data-bbox="1321 633 1474 678">Min. 22 V</td> </tr> </table>	Voltage	Between SSR (female) (5) and (4)	Min. 22 V										
Voltage	Between SSR (female) (5) and (4)	Min. 22 V													
3	Defective sensor power supply relay	<ol style="list-style-type: none"> <li>1. Turn starting switch to OFF position.</li> <li>2. Check that system operating lamp does not light up, and then turn battery disconnect switch to OFF position.</li> <li>3. Disconnect connectors TDPF, NOX1, NH3, SCRT, NOX2, and UREA.</li> <li>4. Insert T-adaptor into connector SSR.</li> <li>5. Turn the battery disconnect switch to ON position.</li> <li>6. Turn starting switch to ON position.</li> </ol> <table border="1" data-bbox="528 969 1474 1249"> <tr> <td data-bbox="528 969 683 1249" rowspan="6">Voltage</td> <td data-bbox="683 969 1321 1014">Between SSR (6) and (4)</td> <td data-bbox="1321 969 1474 1014">Min. 22 V</td> </tr> <tr> <td data-bbox="683 1014 1321 1059">Between SSR (7) and (4)</td> <td data-bbox="1321 1014 1474 1059">Min. 22 V</td> </tr> <tr> <td data-bbox="683 1059 1321 1104">Between SSR (8) and (4)</td> <td data-bbox="1321 1059 1474 1104">Min. 22 V</td> </tr> <tr> <td data-bbox="683 1104 1321 1149">Between SSR (9) and (4)</td> <td data-bbox="1321 1104 1474 1149">Min. 22 V</td> </tr> <tr> <td data-bbox="683 1149 1321 1193">Between SSR (11) and (4)</td> <td data-bbox="1321 1149 1474 1193">Min. 22 V</td> </tr> <tr> <td data-bbox="683 1193 1321 1238">Between SSR (12) and (4)</td> <td data-bbox="1321 1193 1474 1238">Min. 22 V</td> </tr> </table>	Voltage	Between SSR (6) and (4)	Min. 22 V	Between SSR (7) and (4)	Min. 22 V	Between SSR (8) and (4)	Min. 22 V	Between SSR (9) and (4)	Min. 22 V	Between SSR (11) and (4)	Min. 22 V	Between SSR (12) and (4)	Min. 22 V
Voltage	Between SSR (6) and (4)	Min. 22 V													
	Between SSR (7) and (4)	Min. 22 V													
	Between SSR (8) and (4)	Min. 22 V													
	Between SSR (9) and (4)	Min. 22 V													
	Between SSR (11) and (4)	Min. 22 V													
	Between SSR (12) and (4)	Min. 22 V													
4	Defective turbocharger outlet NOx sensor	<p>If all 6 failure codes of [CA2771], [CA3232], [CA3868], [CA3911], [CA4151], and [CA4152] are displayed</p> <ol style="list-style-type: none"> <li>1. Turn starting switch to OFF position.</li> <li>2. Disconnect turbocharger outlet NOx sensor (NOX1).</li> <li>3. Turn starting switch to ON position.</li> </ol> <p>Displaying less than 6 failure codes indicates the disconnected sensor is defective.</p>													
5	Defective SCR outlet NOx sensor	<p>If all 6 failure codes of [CA2771], [CA3232], [CA3868], [CA3911], [CA4151], and [CA4152] are displayed</p> <ol style="list-style-type: none"> <li>1. Turn starting switch to OFF position.</li> <li>2. Disconnect SCR outlet NOx sensor (NOX2).</li> <li>3. Turn starting switch to ON position.</li> </ol> <p>Displaying less than 6 failure codes indicates the disconnected sensor is defective.</p>													
6	Defective SCR temperature sensor	<p>If all 6 failure codes of [CA2771], [CA3232], [CA3868], [CA3911], [CA4151], and [CA4152] are displayed</p> <ol style="list-style-type: none"> <li>1. Turn starting switch to OFF position.</li> <li>2. Disconnect SCR temperature sensor (SCRT).</li> <li>3. Turn starting switch to ON position.</li> </ol> <p>Displaying less than 6 failure codes indicates the disconnected sensor is defective.</p>													

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective SCR temperature sensor (internal open or short circuit to ground)	If failure code [CA3142] or [CA3143] is displayed, perform troubleshooting for [CA3142] or [CA3143].
2	Defective KDPF system (Abnormal exhaust gas temperature to SCR)	<ol style="list-style-type: none"> <li>1. If failure code [CA3251] is displayed, perform troubleshooting for [CA3251].</li> <li>2. If failure code [CA3253], [CA3254], or [CA3311] is displayed, perform troubleshooting for [CA3253], [CA3254], or [CA3311].</li> <li>3. If failure code [CA3255], [CA3256], or [CA3312] is displayed, perform troubleshooting for [CA3255], [CA3256], or [CA3312].</li> </ol>
3	Defective SCR temperature sensor (installation error)	See "DISASSEMBLY AND ASSEMBLY", "REMOVE AND INSTALL SCR ASSEMBLY" and fix installation error, if any.
4	Improper DEF quality	<ol style="list-style-type: none"> <li>1. Turn starting switch to ON position.</li> <li>2. If failure code [CA4277] is displayed or failure code [CA4277] is logged on the abnormality record screen, perform troubleshooting these first.</li> <li>3. Check the "DEF concentration" on the troubleshooting assistance screen (normal value: 29 to 36 %).</li> <li>4. If a failure is found by above checks, it may be contaminated. Replace the DEF in the tank.</li> <li>5. Replace the DEF injector.</li> <li>6. Perform "Loaded Diagnostics Operation To Confirm Failure Correction".</li> </ol>
5	Defective SCR temperature sensor (internal defect)	<ol style="list-style-type: none"> <li>1. If the failure code persists after the above checks, replace the SCR temperature sensor.</li> <li>2. Perform "Loaded Diagnostics Operation To Confirm Failure Correction".</li> </ol>
		If the failure code is cleared, the SCR temperature sensor may be defective.
6	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)

## Loaded Diagnostics Operation to Confirm Failure Correction

### REMARK

If this failure code is displayed during "Loaded Diagnostics Operation To Confirm Failure Correction", return to troubleshooting.

Check if the repair has been completed with the following procedure:

1. Turn the starting switch to OFF position, and shut down the engine controller.
2. Turn the starting switch to the ON position, and check the failure code is cleared. If this failure code is displayed, return to troubleshooting.
3. Start the engine.
4. Run the engine at low idle speed for 10 minutes.
5. Run the engine at high idle speed for 10 minutes.
6. If this failure code is cleared, repair is completed.

No.	Cause	Procedure, measuring location, criteria and remarks
2	Defective intake air system	Check intake air system hoses, clamps, and tubes for damage and loosening. Repair as necessary.
3	Defective injector	Perform cylinder cutout mode operation to identify disabled cylinder (see "30 Testing and Adjusting", "HANDLING CYLINDER CUTOUT MODE OPERATION").
4	Oil leakage to turbocharger exhaust connector	<ol style="list-style-type: none"> <li>1. Remove turbocharger exhaust connector.</li> <li>2. Check inside of turbocharger exhaust connector for adhesion of oil and fuel.</li> </ol> <p><b>NOTICE</b></p> <ul style="list-style-type: none"> <li>• If oil or fuel is found, visually check for oil leaks from EGR valve and turbocharger. Repair abnormality, if any.</li> <li>• Wipe off oil or fuel sticking to piping.</li> </ul>
5	Oil leakage into exhaust connector or duct to KDPF	<p>Check the exhaust system between the turbocharger and KDPF to check for oil or fuel flow into KDPF.</p> <ul style="list-style-type: none"> <li>• Wipe stained oil or fuel off clean, if any.</li> <li>• If there is a trace of oil or fuel flowing into KDPF, check for KDPF and clean or replace it as necessary.</li> </ul>
6	KDPF outlet temperature sensor installation error	<p>For details, see "50 Disassembly and Assembly", "REMOVE AND INSTALL KDPF ASSEMBLY" and "DISASSEMBLE AND ASSEMBLE OF KDPF ASSEMBLY". Repair as necessary.</p> <p>For details, see "Remove and Install KDPF Assembly", and "DISASSEMBLE AND ASSEMBLE OF KDPF ASSEMBLY" in Chapter 50 DISASSEMBLY AND ASSEMBLY. Repair as necessary.</p>
7	Defective KDPF temperature sensor	If the failure code is not cleared after performing above-mentioned troubleshooting, replace KDPF temperature sensor.
8	Defective engine controller	If this failure code is kept displayed, or is displayed again after above checks are performed, engine controller is defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly.)

### Loaded Diagnostics Operation to Confirm Failure Correction

Check if the repair has been completed with the following procedure:

(Make sure this failure code is not displayed after this procedure.)

1. Turn the starting switch from OFF to ON.

**NOTICE**

**The failure code is cleared once when starting switch is turned from OFF position to ON position. Check that cleared failure code is not displayed again when engine runs at low idle speed.**

2. Start the engine and run it at low idle speed for 2 minutes.

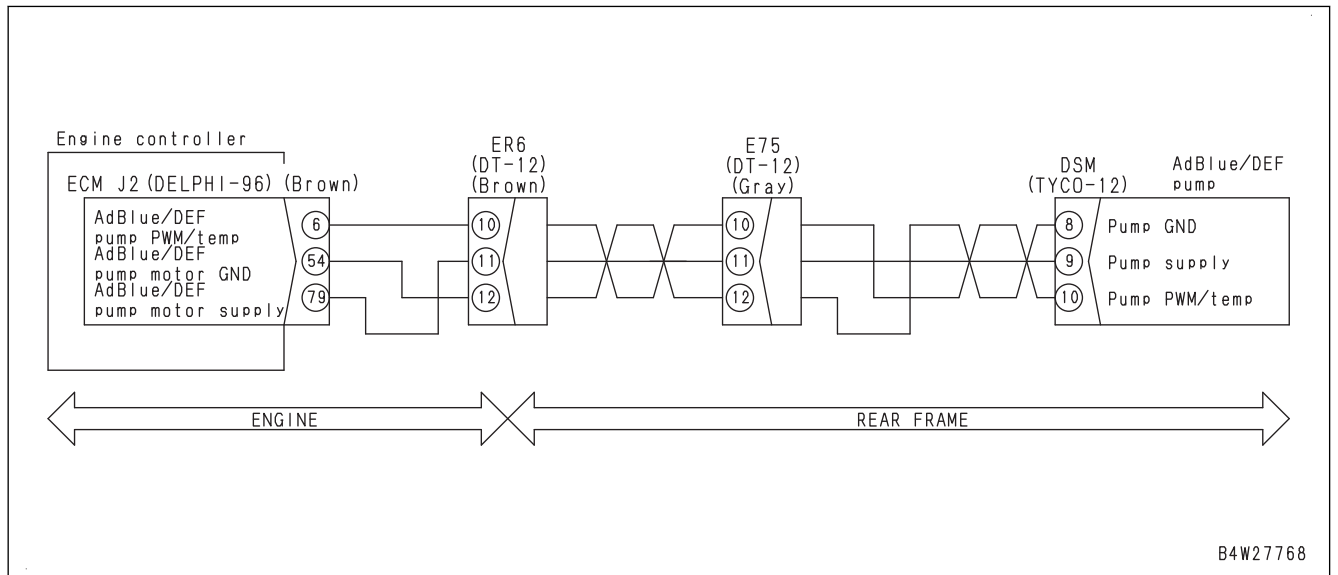
**NOTICE**

**If this failure code is displayed when starting switch is turned to ON position but engine is not started, perform troubleshooting for following failure codes as well after finishing troubleshooting and repair for this code.**

- [CA3319] KDPF Outlet Temperature Sensor Low Error
- [CA3321] KDPF Outlet Temperature Sensor High Error

No.	Cause	Procedure, measuring location, criteria and remarks
5	Defective DEF pump	If failure code is still displayed after above checks, DEF pump may be defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly.)
6	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)

**Circuit Diagram of DEF Pump**



**Failure Code [CA3583]**

Action level	Failure code	Failure	SCR Outlet NOx Sensor Heater Warming up Error (Engine controller system)
L01	CA3583		
Detail of failure	There is an abnormality in the heater part of the SCR outlet NOx sensor. (It is not heated or the temperature cannot be kept)		
Action of controller	<ul style="list-style-type: none"> <li>• Drive at the default NOx emission value (0 ppm)</li> <li>• Advances to Inducement strategy. (EU Specification)</li> </ul>		
Phenomenon on machine	<ul style="list-style-type: none"> <li>• NOx emission may increase or ammonia may be exhausted because DEF injection works inappropriately.</li> <li>• Engine power deration according to inducement strategy. (EU Specification)</li> </ul>		
Related information	<p><b>⚠ The KDPF, sensor fitting piping, and sensor probe become hot (Min. 500 °C). Be careful not to get burned.</b></p> <p><b>⚠ The SCR assembly, sensor fitting piping, and sensor probe become hot (Min. 400 °C). Be careful not to get burned.</b></p> <p><b>⚠ Be careful not to get burned by the sensor probe as it is heated by itself even if the ambient temperature is not high.</b></p> <ul style="list-style-type: none"> <li>• The SCR outlet NOx sensor operates when 19302 SCR outlet temperature is 150 °C or more (19210 SCR outlet NOx sensor measurement state is "1").</li> <li>• The SCR outlet NOx sensor is a smart sensor which performs CAN communication with the engine controller together with the other sensors.</li> <li>• The SCR outlet NOx sensor does not operate when SCR outlet temperature is 150 °C or lower, and correct value is not displayed.</li> <li>• The Pre-defined Monitoring screen uses the engine operation state diagnosis, SCR catalyst, NOx sensor, and ammonia sensor diagnosis.</li> <li>• Engine operation state diagnosis                     <ul style="list-style-type: none"> <li>01002 Engine speed</li> <li>19200 Exhaust gas flow rate</li> <li>47300 KDOC Inlet Temperature</li> <li>19300 SCR Temperature</li> <li>19302 SCR Outlet Temperature</li> </ul> </li> <li>• SCR catalyst, NOx sensor, ammonia sensor diagnosis.                     <ul style="list-style-type: none"> <li>19203 Turbo Outlet NOx Sensor State</li> <li>19210 SCR Outlet NOx Sensor State</li> <li>19202 Turbo Outlet Concentration Corrected</li> <li>19209 SCR Outlet NOx Corrected</li> <li>19205 Ammonia Concentration Corrected</li> <li>19120 DEF Injection Quantity</li> </ul> </li> </ul> <p><b>NOTICE</b></p> <p><b>For this failure code, after investigating the cause of the problem and completing the repair, perform "Loaded Diagnostics Operation To Confirm Failure Correction" to make sure the failure code is cleared. (This failure code is not cleared by only turning ON the starting switch.)</b></p>		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective CAN communication system	If failure code [CA2771] is displayed, perform troubleshooting for [CA2771] first.

No.	Cause	Procedure, measuring location, criteria and remarks
2	Low DEF concentration (entrained water, etc.)	<ol style="list-style-type: none"> <li>1. Check that the "DEF concentration" displayed on the Pre-defined Monitoring screen is in the normal range (29 to 36 %).</li> <li>2. If the "DEF concentration" is normal, perform "Loaded Diagnostics Operation To Clear Failure Code".</li> <li>3. If the "DEF concentration" falls outside of this range, use a portable concentration meter to recheck the concentration. If the concentration still falls outside of the range of 31.5 to 33.5 %, drain all of the DEF from the tank and refill with fresh DEF.</li> <li>4. If the "DEF concentration" is in 29 to 36 % after the work finished, perform "Loaded Diagnostics Operation To Clear Failure Code".</li> <li>5. If the portable concentration meter reading is in the range of 31.5 to 33.5 %, proceed to the next troubleshooting.</li> </ol>
3	Contaminated DEF	<ol style="list-style-type: none"> <li>1. Drain more than 1 ℓ of DEF to check that it is not contaminated with foreign material, etc.</li> <li>2. If the drained DEF is contaminated, drain all of the DEF and refill with fresh DEF.</li> <li>3. If it is heavily contaminated with sand, dirt, etc., clean the DEF tank.</li> <li>4. If the "DEF concentration" is in 29 to 36 % after the work finished, perform "Loaded Diagnostics Operation To Clear Failure Code".</li> <li>5. If the "DEF concentration" is out of the normal range, proceed to the next troubleshooting.</li> </ol>
4	Foreign matter adhered to the sensing part of the DEF tank sensor	<ol style="list-style-type: none"> <li>1. Remove the DEF level sensor so that you can reach the DEF concentration detection part (end of sensor).</li> <li>2. Clean up the DEF concentration detection part with dry and clean cloth, and install the DEF level sensor.</li> <li>3. If DEF concentration is within the range from 29 to 36 % on "Pre-defined Monitoring" screen, perform "Loaded Diagnostics Operation to Clear Failure Code" to complete the repair work.</li> <li>4. If DEF concentration is out of the normal range, proceed to the next troubleshooting.</li> </ol> <p><b>REMARK</b></p> <ul style="list-style-type: none"> <li>• If the new DEF has not been added as described in Cause "Contaminated DEF", and if it takes time to remove the sensor, drain the total amount of DEF, refill with new DEF again, and check the sensor output.</li> <li>• For details of removing DEF tank sensor, see Disassemble and Assembly, "Remove and Install DEF Tank Sensor Flange Assembly".</li> </ul>
5	Defective DEF tank sensor (internal defect)	<ol style="list-style-type: none"> <li>1. Replace the DEF tank sensor.</li> <li>2. If the "DEF concentration" displayed on the Pre-defined Monitoring screen falls in the range of 29 to 36%, perform "Loaded Diagnostics Operation To Clear Failure Code" topics to complete the repair.</li> <li>3. If the "DEF concentration" falls outside of this range, proceed to the next troubleshooting.</li> </ol>
6	Defective engine controller	<ol style="list-style-type: none"> <li>1. Replace the engine controller.</li> <li>2. If "DEF concentration" ranges from 29 to 36 % on the Troubleshooting Pre-defined Monitoring screen, perform "Loaded Diagnostics Operation To Clear Failure Code" and repair is completed.</li> </ol>

**Failure Code [CA4155]**

Action level	Failure code	Failure	DEF Pump Heater Relay Voltage High Error (Engine controller system)
L01	CA4155		
Detail of failure	A high voltage error is detected in DEF pump heater relay circuit.		
Action of controller	Advances to Inducement strategy.		
Phenomenon on machine	<ul style="list-style-type: none"> <li>• Engine output is reduced based on inducement strategy.</li> <li>• DEF thawing defective.</li> <li>• NOx emission increases because DEF injection is disabled at low temperature.</li> </ul>		
Related information	<ul style="list-style-type: none"> <li>• DEF pump heater relay is driven at DEF supply system thawing/thermal insulation or an DEF pump heater relay test.</li> <li>• DEF pump heater relay is integrated in the DEF heater relay.</li> <li>• Troubleshooting of this failure code covers circuits from engine controller through DEF heater relay to ground.</li> <li>• This failure code is detected only when the DEF pump heater relay is turned OFF.</li> <li>• This failure code is displayed if the connector is removed.</li> <li>• After repairing, check if the failure code is cleared by the following procedure. Procedure: Turn starting switch to ON position.</li> </ul>		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective wiring harness connector	<ol style="list-style-type: none"> <li>1. See descriptions of wiring harness and connectors in “Electrical equipment” in “CHECKS BEFORE TROUBLESHOOTING” of “RELATED INFORMATION ON TROUBLESHOOTING”, and check it.</li> <li>2. See “service modes” of “setting and operating machine monitor”, “operating method of testing menu (SCR service test)” to perform an “DEF pump heater relay test”.</li> </ol>		
		If this failure code is cleared, wiring harness connector is defective.		
2	Open circuit in wiring harness (wire breakage or defective contact of connector)	<ol style="list-style-type: none"> <li>1. Turn starting switch to OFF position.</li> <li>2. Disconnect connectors ECM J2, UHR1 and DSM, and connect T-adapters to each female side.</li> </ol>		
		Resistance	Between UHR1 (female) (12) and ground	Max. 10 Ω
			Between ECM J2 (female) (83) and UHR1 (female) (3)	Max. 10 Ω
3	Hot short circuit in wiring harness	<ol style="list-style-type: none"> <li>1. Turn starting switch to OFF position.</li> <li>2. Disconnect connector UHR1, and connect T-adapter to female side.</li> <li>3. Turn starting switch to ON position.</li> </ol>		
		Voltage	Between UHR1 (female) (3) and (12)	Max. 4.5 V
4	Defective DEF heater relay	<ol style="list-style-type: none"> <li>1. Turn starting switch to OFF position.</li> <li>2. Check that system operating lamp does not light up, and then turn the battery disconnect switch OFF.</li> <li>3. Disconnect connector UHR1 and UHR2, and replace DEF heater relay.</li> <li>4. Turn the battery disconnect switch ON.</li> <li>5. Turn starting switch to ON position.</li> </ol>		
		If this failure code is cleared, the original DEF heater relay is defective.		

No.	Cause	Procedure, measuring location, criteria and remarks		
2	Defective sensor power supply relay	<ol style="list-style-type: none"> <li>1. Turn starting switch to OFF position.</li> <li>2. Check that system operating lamp does not light up, and then turn battery disconnect switch to OFF position.</li> <li>3. Insert T-adapter into connector SSR.</li> <li>4. Disconnect connector TDPF.</li> <li>5. Turn battery disconnect switch to ON position.</li> <li>6. Turn starting switch to ON position.</li> </ol>		
		Voltage	Between SSR (8) and (4)	Min. 22 V
3	Open circuit in wiring harness	<ol style="list-style-type: none"> <li>1. Turn starting switch to OFF position.</li> <li>2. Disconnect connector TDPF, and connect T-adapter to female side.</li> <li>3. Turn starting switch to ON position.</li> </ol>		
		Voltage	Between TDPF (female) (4) and (1)	Min. 22 V
4	Defective KDPF temperature sensor (defective internal circuit)	If failure code is still displayed after above checks, KDPF temperature sensor may be defective. (In case of an internal defect, troubleshooting is impossible as an assembly. Replace whole assembly.)		
5	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		
6	Defective wiring harness	If there is no abnormality in above diagnosis, defective contact of harness is a possibility (Replace harness).		

**Failure Code [CA5115]**

Action level	Failure code	Failure	DEF Line Heater 1 Voltage Low Error (Engine controller system)
L01	CA5115		
Detail of failure	A low voltage error occurs in DEF line heater 1 ( low-temperature pressure, intake and return side) signal circuit.		
Action of controller	None in particular		
Phenomenon on machine	<ul style="list-style-type: none"> <li>DEF line stops thawing.</li> <li>NOx emission increases because DEF injection is disabled at low temperature.</li> </ul>		
Related information	<ul style="list-style-type: none"> <li>DEF line heater 1 is driven at DEF supply system thawing/thermal insulation or “DEF line heater relay 1 test”.</li> <li>DEF line heater 1 is driven by DEF line heater relay 1 inside DEF heater relay.</li> <li>This failure code is detected only when the DEF line heater 1 is turned ON.</li> <li>After repairing, check if the failure code is cleared by the following procedure. Procedure: Start the engine in low temperature (ambient temperature of 5 °C or below) or see “Service Mode” of “setting and operating machine monitor”, and “explanation of operating method of testing menu (SCR service test)” to perform “DEF line heater relay 1 test”.</li> </ul>		

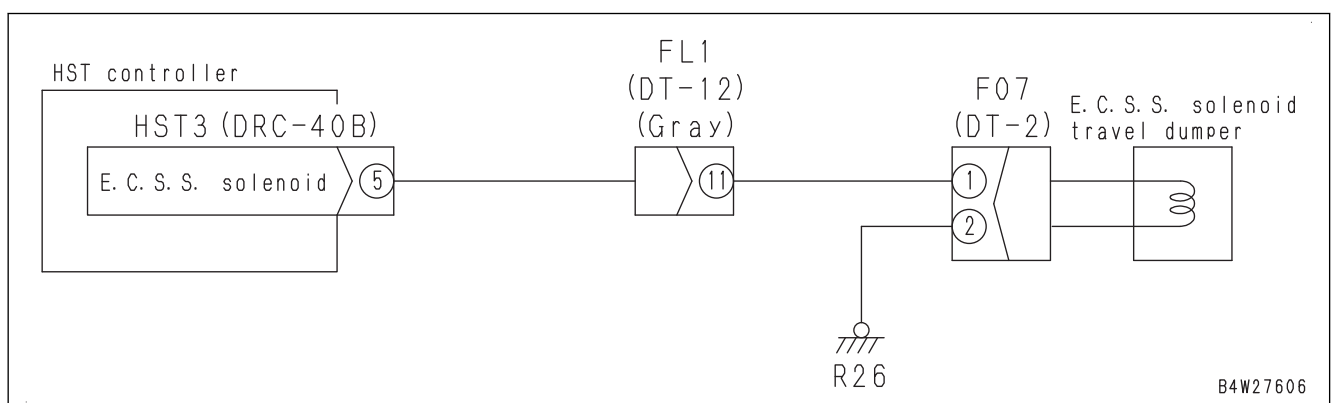
No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective wiring harness connector	<ol style="list-style-type: none"> <li>See descriptions of wiring harness and connectors in “Electrical equipment” in “CHECKS BEFORE TROUBLESHOOTING” of “RELATED INFORMATION ON TROUBLESHOOTING”, and check them.</li> <li>Start the engine in low temperature (ambient temperature of 5 °C or lower) or perform “DEF Line Heater Relay 1 Test”. For details, see SET AND OPERATE MACHINE MONITOR, “SERVICE MODE” and “METHOD FOR SETTING WITH TESTING MENU (SCR SERVICE TEST)”.</li> </ol>		
		If this failure code is cleared, the wiring harness connector is defective.		
2	Open circuit in wiring harness	<ol style="list-style-type: none"> <li>Turn the starting switch to OFF position.</li> <li>Disconnect the connectors ECM J2,UHR1,UHA and UHB, and connect the T-adaptor to each female side.</li> </ol>		
		Resistance	Between ECM J2 (female) (39) and UHR1 (female) (8)	Max. 10 Ω
			Between UHR1 (female) (12) and ground	Max. 10 Ω
			Between UHB (female) (1) and UHR1 (female) (5)	Max. 10 Ω
			Between UHB (female) (2) and ground	Max. 10 Ω
			Between UHA (female) (1) and UHR1 (female) (6)	Max. 10 Ω
Between UHA (female) (2) and ground	Max. 10 Ω			
3	Ground fault in wiring harness	<ol style="list-style-type: none"> <li>Turn the starting switch to OFF position.</li> <li>Disconnect the connectors ECM J2,UHR1,UHA and UHB, and connect the T-adaptor to either female side.</li> </ol>		
		Resistance	Between ground and ECM J2 (female) (39) or UHR1 (female) (8)	Min. 100 kΩ
			Between ground and UHR1 (female) (6) or UHA (female) (1)	Min. 100 kΩ
			Between ground and UHR1 (female) (5) or UHB (female) (1)	Min. 100 kΩ

**Failure Code [D192KB]**

Action level	Failure code	Failure	ECSS Solenoid Ground Fault (HST controller system)
L01	D192KB		
Detail of failure	Due to ground fault in ECSS (Electronically Controlled Suspension System) solenoid system, abnormal current flows when controller drives ECSS solenoid.		
Action of controller	<ul style="list-style-type: none"> <li>Stops driving ECSS (Electronically Controlled Suspension System) solenoid.</li> <li>Even if cause of failure is eliminated, machine does not become normal until starting switch is turned to OFF position.</li> </ul>		
Phenomenon on machine	<ul style="list-style-type: none"> <li>ECSS (Electronically Controlled Suspension System) does not operate.</li> <li>Wiring harness or controller may be burnt out.</li> </ul>		
Related information	<ul style="list-style-type: none"> <li>Output state (ON/OFF) to ECSS (Electronically Controlled Suspension System) solenoid can be checked with monitoring function. (Code: 03713)</li> <li>After completion of repair, check that the failure code is cleared by the following procedure. Procedure: Turn the starting switch to ON position, and turn on the ECSS switch, and drive with any speed range other than 1st.</li> </ul>		

No.	Cause	Procedure, measuring location, criteria and remarks			
1	Defective ECSS solenoid	1. Turn the starting switch to OFF position.			
		2. Disconnect the connector F07, and connect the T-adapter to male side.			
		Resistance	<table border="1"> <tr> <td>Between F07 (male) (1) and (2)</td> <td>35 to 45 Ω</td> </tr> <tr> <td>Between F07 (male) (1) and ground</td> <td>Min. 1 MΩ</td> </tr> </table>	Between F07 (male) (1) and (2)	35 to 45 Ω
Between F07 (male) (1) and (2)	35 to 45 Ω				
Between F07 (male) (1) and ground	Min. 1 MΩ				
2	Ground fault in wiring harness	1. Turn the starting switch to OFF position.			
		2. Disconnect the connectors HST3 and F07, and connect the T-adapter to either female side.			
		Resistance	<table border="1"> <tr> <td>Between ground and either HST3 (female) (5) or F07 (female) (1)</td> <td>Min. 1 MΩ</td> </tr> </table>	Between ground and either HST3 (female) (5) or F07 (female) (1)	Min. 1 MΩ
Between ground and either HST3 (female) (5) or F07 (female) (1)	Min. 1 MΩ				
3	Defective HST controller	If no failure is found by preceding checks, HST controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)			

**Circuit Diagram Related to ECSS Solenoid**



No.	Cause	Procedure, measuring location, criteria and remarks		
3	Defective CAN2 terminating resistor	1. Turn the starting switch to OFF position. 2. Disconnect the connectors MDM3 and CAN1, and connect the T-adapter to each male side.		
		Resistance	Between MDM3 (male) (7) and (8)	120±12 Ω
			Between CAN1 (male) (A) and (B)	120±12 Ω
4	Open circuit in wiring harness (CAN2 communication line)	1. Turn the starting switch to OFF position. 2. Check that system operating lamp is not lit, and then turn the battery disconnect switch to OFF position. 3. Disconnect the connectors L80A and MCM1 B, and connect the T-adapter to each female side.		
		Resistance	Between L80A (female) (10) and MCM1 (female) (97)	Max. 1 Ω
			Between L80A (female) (11) and MCM1 (female) (89)	Max. 1 Ω
5	Ground fault in wiring harness (CAN2 communication line)	1. Turn the starting switch to OFF position. 2. Check that system operating lamp is not lit, and then turn the battery disconnect switch to OFF position. 3. Disconnect the connectors L80A, MCM1 B, MDM3, IDK, AL1, SV, HST2, CAN1, and ECM J2, and connect the T-adapter to female side of L80A, and MCM1 B.		
		Resistance	Between ground and either L80A (female) (10) or MCM1 B (female) (97)	Min. 1 MΩ
			Between ground and either L80A (female) (11) or MCM1 B (female) (89)	Min. 1 MΩ
6	Hot short circuit in wiring harness (CAN2 communication line)	1. Turn the starting switch to OFF position. 2. Check that system operating lamp is not lit, and then turn the battery disconnect switch to OFF position. 3. Insert the T-adapter into connector CAN1. 4. Turn the battery disconnect switch to ON position. 5. Turn the starting switch to ON position.		
		<b>REMARK</b> Voltage of CANH and CANL is 2.5±1 V including during communication, so regard wiring harness as normal if measured voltage is 1 to 4 V.		
		Voltage	Between CAN1 (A) and ground	1 to 4 V
Between CAN1 (B) and ground	1 to 4 V			
7	Defective KOMTRAX terminal	If no failure is found by preceding checks, KOMTRAX terminal is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		
8	Defective monitor controller	If no failure is found by above checks, monitor controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

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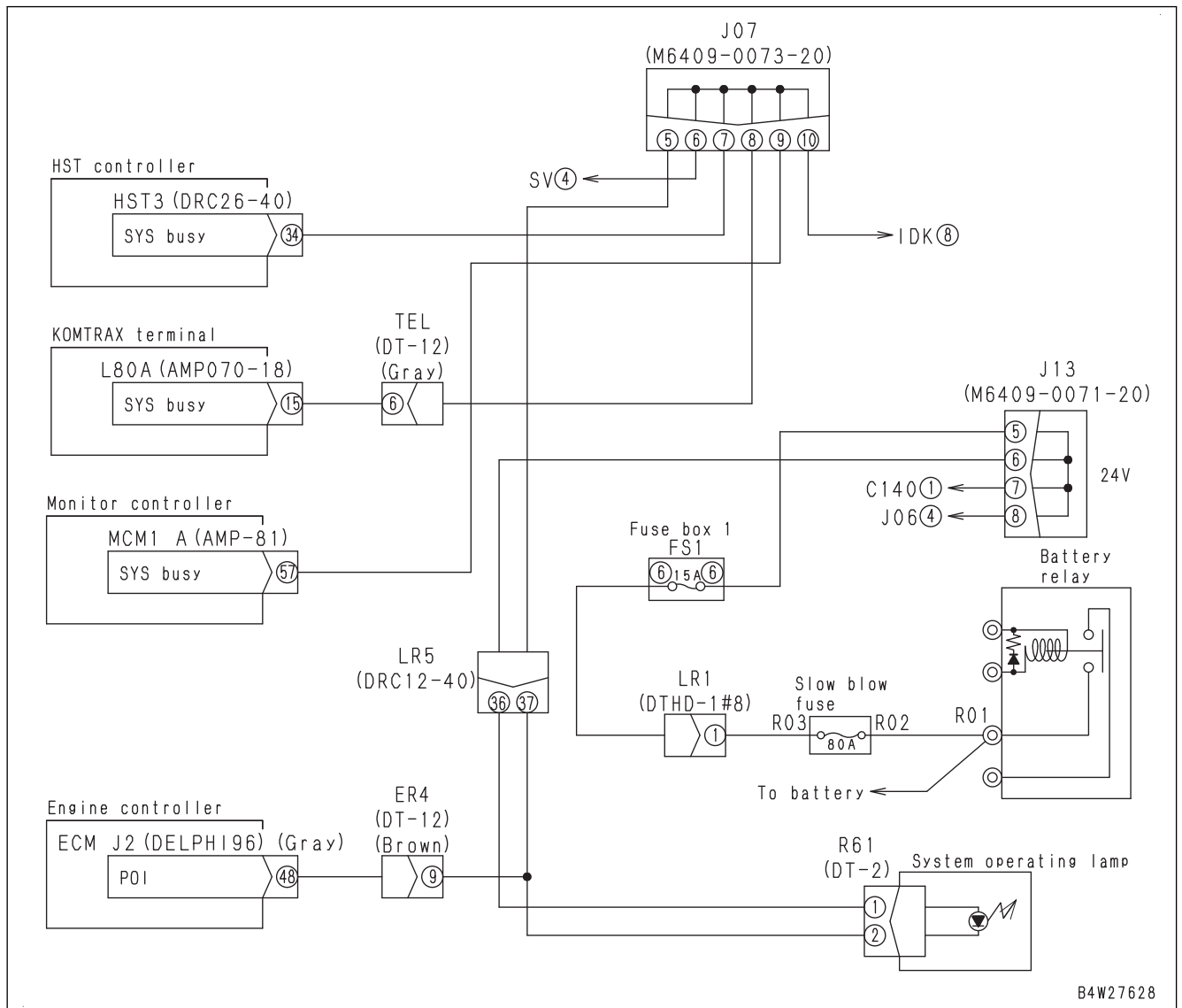
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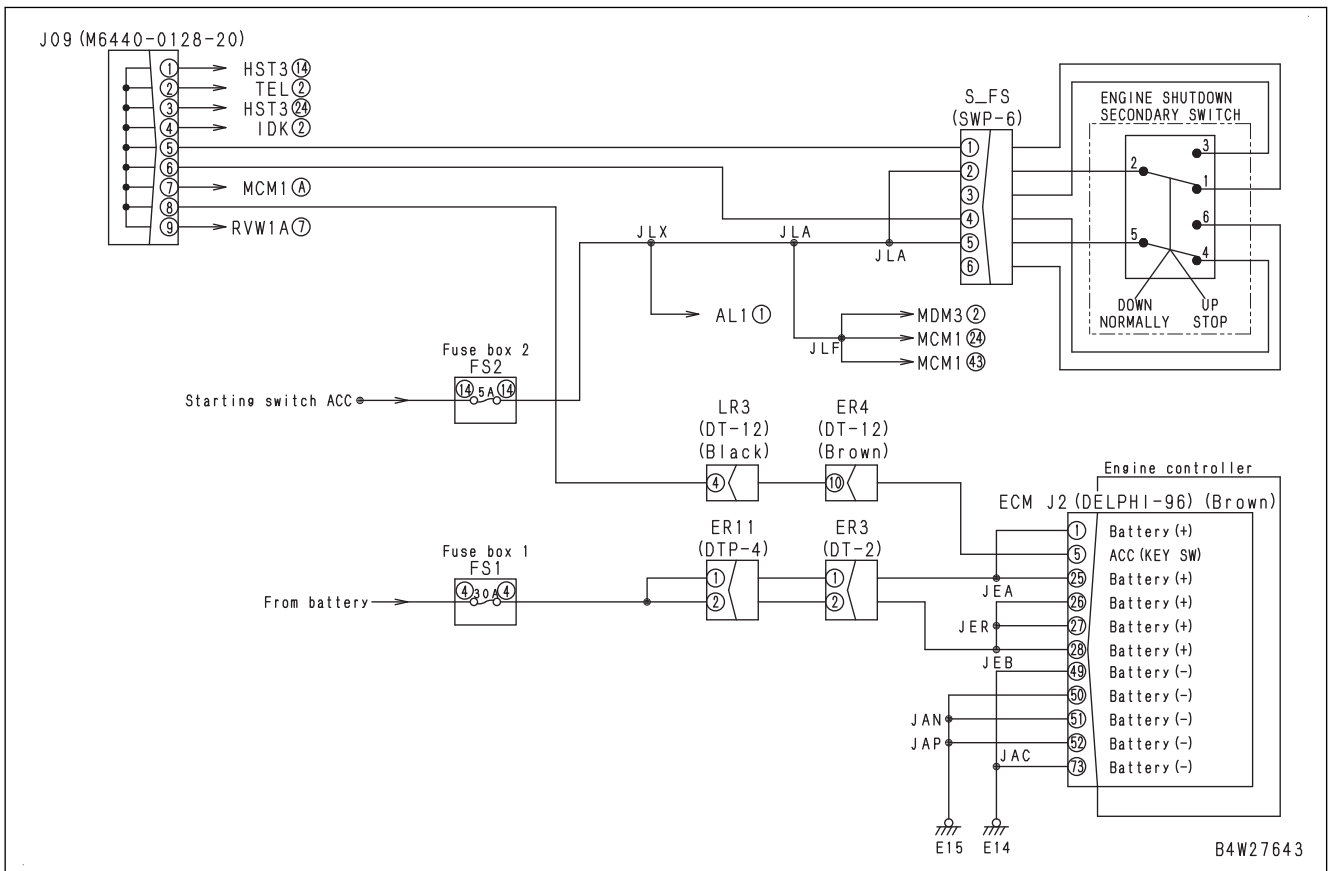
No.	Cause	Procedure, measuring location, criteria and remarks		
3	Defective monitor controller ACC signal circuit	1. Turn the starting switch to OFF position. 2. Check that system operating lamp is not lit, and then turn the battery disconnect switch to OFF position. 3. Disconnect the connector MCM1 A, and connect the T-adapter to female side. 4. Turn the battery disconnect switch to ON position. 5. Turn the starting switch to ON position. <b>REMARK</b> If there is no failure, troubleshooting for No. 4 is not required.		
		Voltage	Between MCM1 A (female) (24) and (2)	20 to 30 V
			Between MCM1 A (female) (31) and (2)	20 to 30 V
			Between MCM1 A (female) (43) and (2)	20 to 30 V
			Between MCM1 A (female) (24) and (3)	20 to 30 V
4	Open circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Check that system operating lamp is not lit, and then turn the battery disconnect switch to OFF position. 3. Remove the fuse No.14 in the fuse box FS2. 4. Disconnect the connector MCM1 A, and connect the T-adapter to female side.		
		Resistance	Between MCM1 A (female) (24) and FS2-14	Max. 1 Ω
			Between MCM1 A (female) (31) and FS2-14	Max. 1 Ω
			Between MCM1 A (female) (43) and FS2-14	Max. 1 Ω
			Between MCM1 A (female) (2) and ground	Max. 1 Ω
Between MCM1 A (female) (3) and ground	Max. 1 Ω			
5	Defective CAN2 terminating resistor	1. Turn the starting switch to OFF position. 2. Disconnect the connectors MDM3 and CAN1, and connect the T-adapter to each male side.		
		Resistance	Between MDM3 (male) (7) and (8)	120±12 Ω
			Between CAN1 (male) (A) and (B)	120±12 Ω
6	Open circuit in wiring harness (CAN2 communication line)	1. Turn the starting switch to OFF position. 2. Check that system operating lamp is not lit, and then turn the battery disconnect switch to OFF position. 3. Disconnect the connectors MCM1 B and CAN1, and connect the T-adapter to each female side.		
		Resistance	Between MCM1 B (female) (97) and CAN1 (female) (A)	Max. 1 Ω
			Between MCM1 B (female) (89) and CAN1 (female) (B)	Max. 1 Ω

No.	Cause	Procedure, measuring location, criteria and remarks	
3	Ground fault in wiring harness	1. Turn the starting switch to OFF position. 2. Check that system operating lamp is not lit, and then turn the battery disconnect switch to OFF position. 3. Disconnect connectors R61 and C140, and connect T-adaptor to female side of R61. 4. Remove the fuse No.6 in the fuse box FS1.	
		<table border="1"> <tr> <td>Resistance</td> <td>Between ground and either R61 (female) (1) or FS1-6</td> <td>Min. 1 MΩ</td> </tr> </table>	Resistance
Resistance	Between ground and either R61 (female) (1) or FS1-6	Min. 1 MΩ	
4	Defective HST controller	If no failure is found by preceding checks, HST controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)	

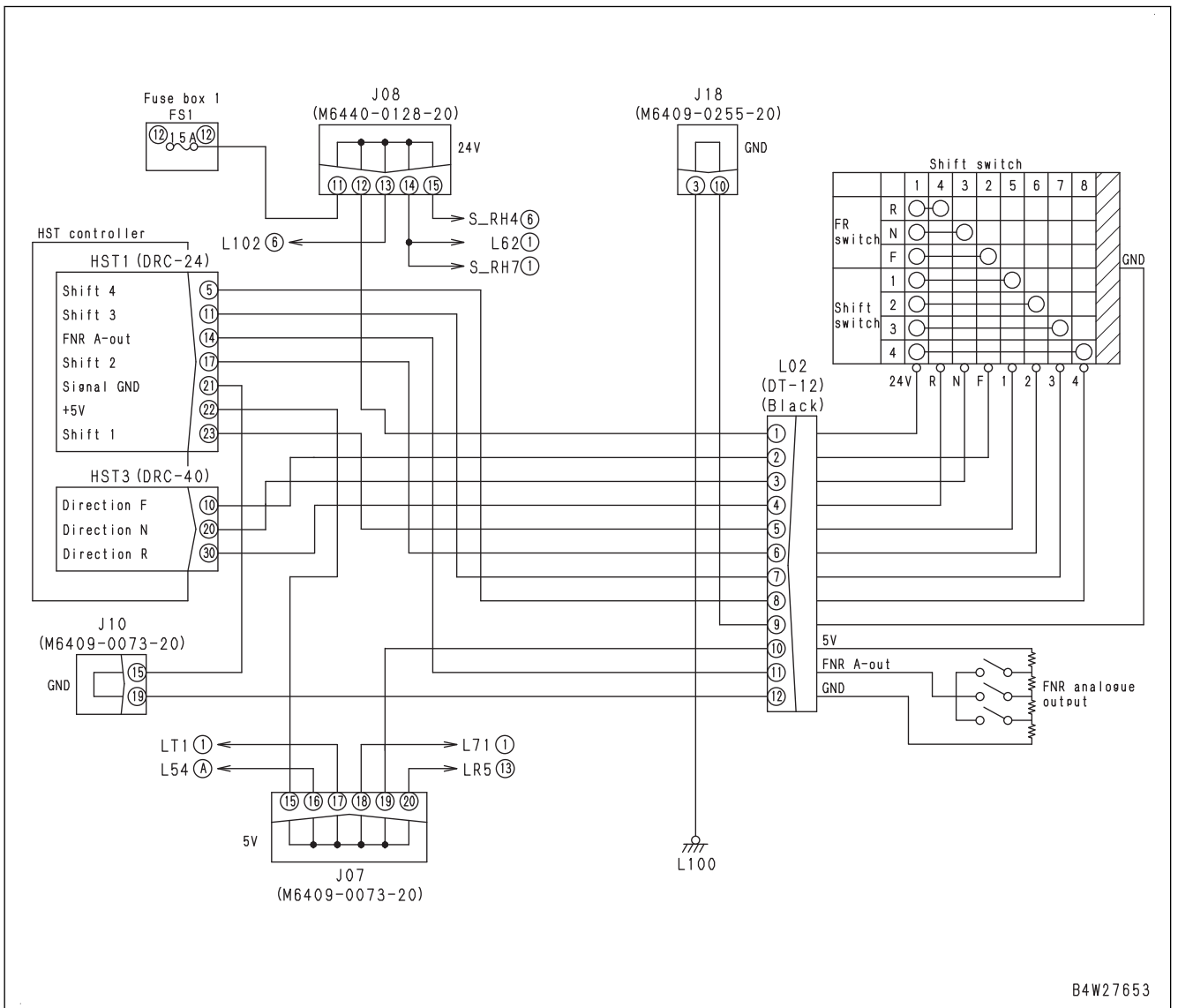
**Circuit Diagram Related to System Operating Lamp**



**Circuit Diagram Related to Machine Monitor Power Supply**

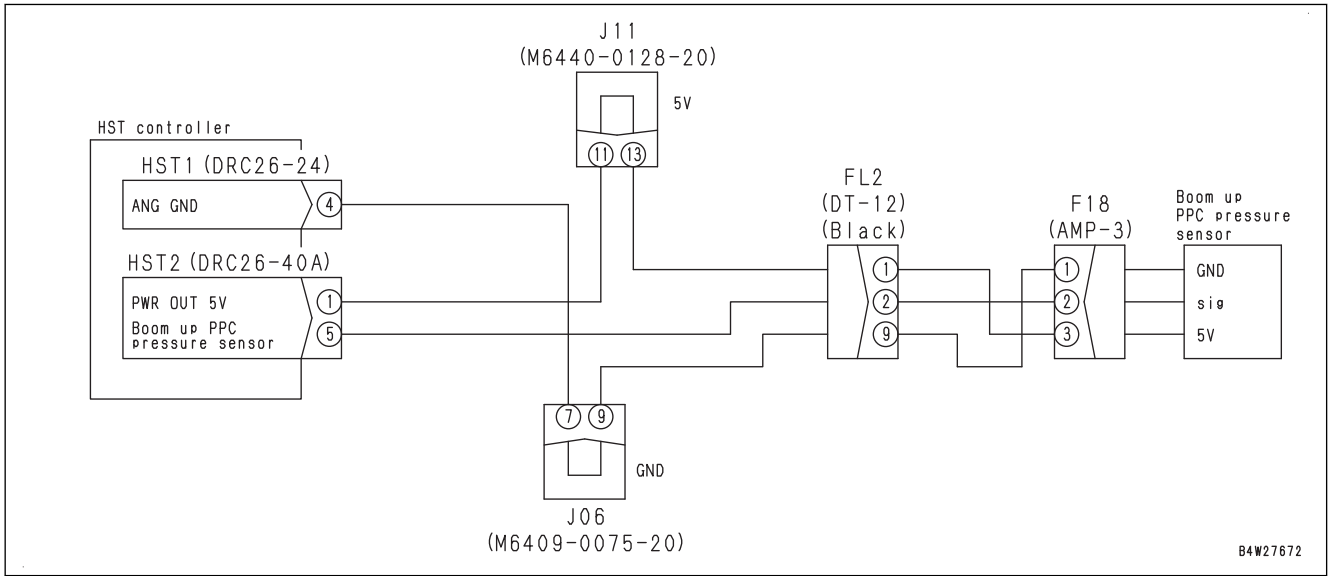


Circuit Diagram Related to Directional Lever



B4W27653

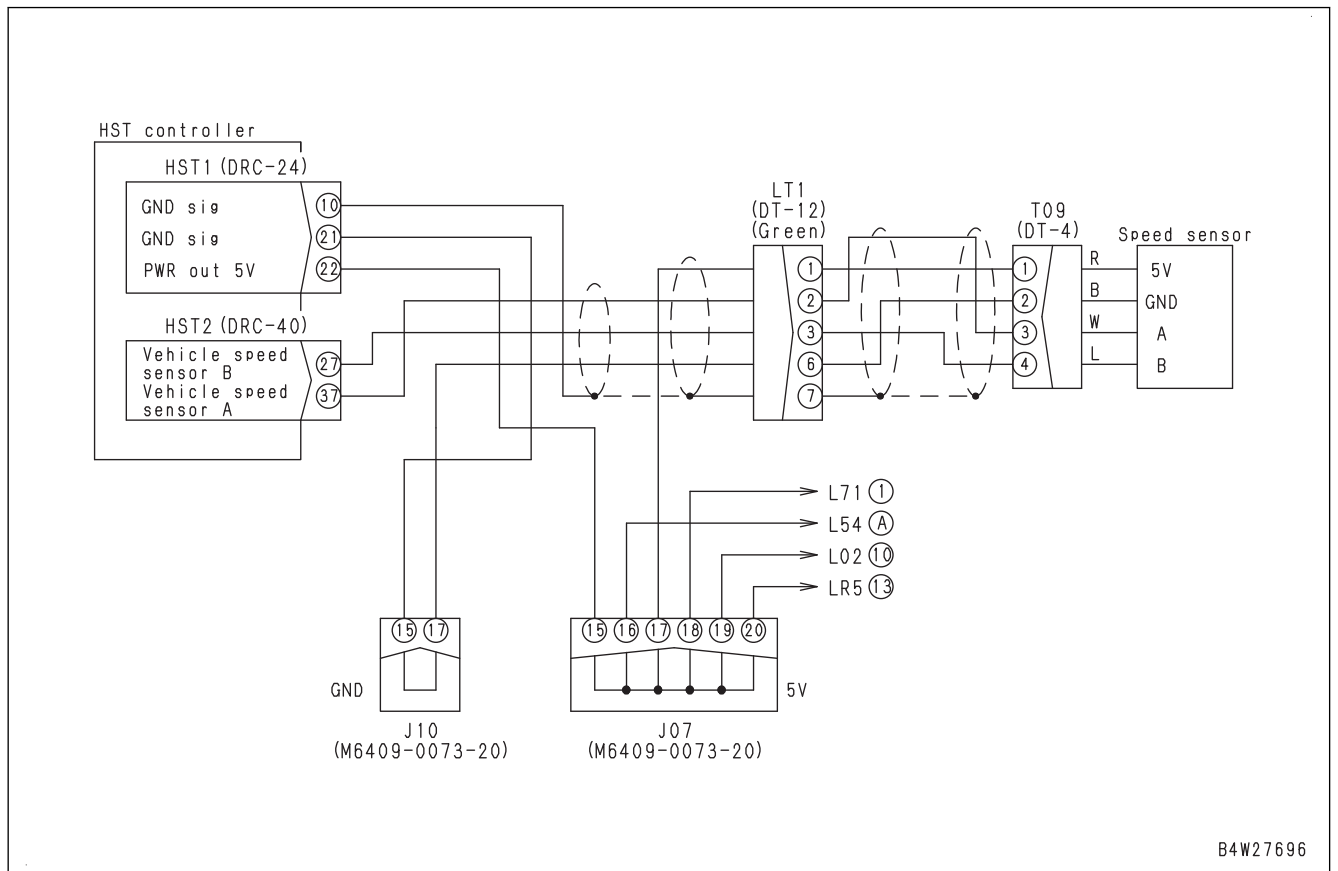
### Circuit Diagram of Boom RAISE PPC Pressure Sensor



No.	Cause	Procedure, measuring location, criteria and remarks			
5	Defective 3rd valve (PCS) potentiometer signal line	1. Turn the starting switch to OFF position. 2. Insert T-adaptor into connectors HST1 and HST2. 3. Set the work equipment lock switch to LOCK position. 4. Turn starting switch to ON position. 5. Operate 3rd valve (PCS) to perform troubleshooting. <b>REMARK</b> If there is any failure, it may be defective contact. Check it again.			
		Voltage	Between HST2 (1) and HST1 (4)	3rd valve (PCS) lever: Always	4.8 to 5.2 V
			Between HST1 (19) and (4)	3rd valve (PCS) lever: NEUTRAL	2.38 to 2.62 V
			Between HST1 (19) and (4)	3rd valve (PCS) lever: Extend operation to stroke end	3.90 to 4.40 V
			Between HST1 (19) and (4)	3rd valve (PCS) lever: Retract operation to stroke end	0.60 to 1.10 V
			Between HST1 (13) and (4)	3rd valve (PCS) lever: NEUTRAL	2.38 to 2.62 V
			Between HST1 (13) and (4)	3rd valve (PCS) lever: Extend operation to stroke end	0.60 to 1.10 V
Between HST1 (13) and (4)	3rd valve (PCS) lever: Retract operation to stroke end	3.90 to 4.40 V			
6	Defective HST controller	If no failure is found by preceding checks, HST controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)			

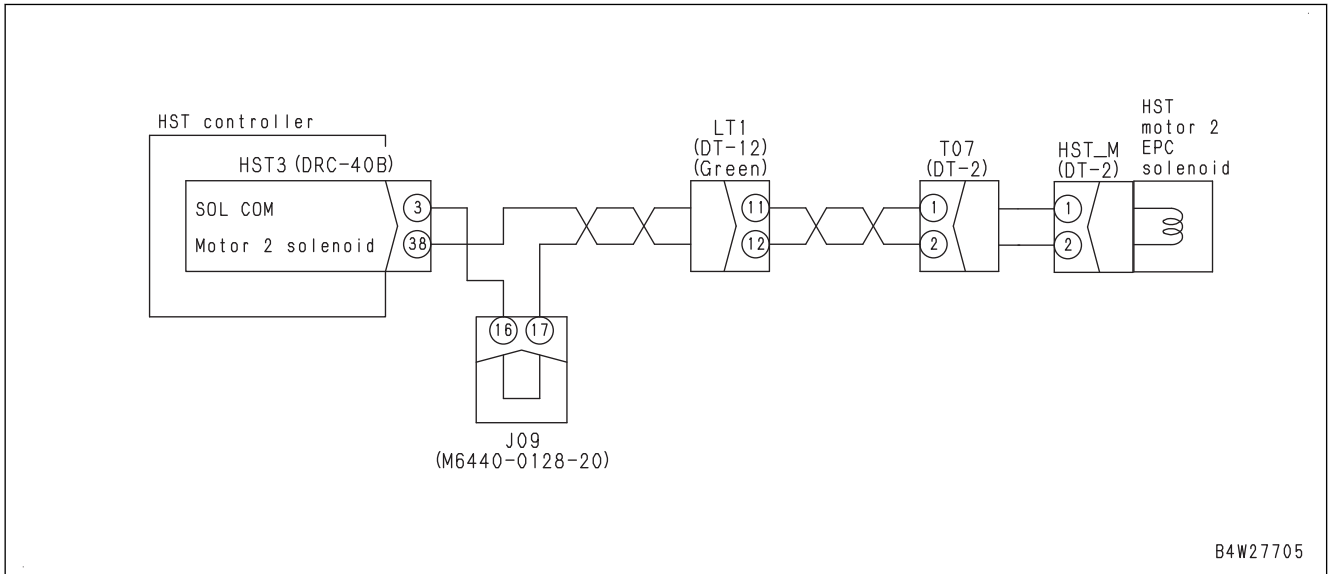
No.	Cause	Procedure, measuring location, criteria and remarks
5	Defective travel speed sensor	<ol style="list-style-type: none"> <li>1. Turn the starting switch to OFF position.</li> <li>2. Disconnect the connector T09, and replace the sensor with an another one of same type.</li> <li>3. Turn the starting switch to ON position.</li> <li>4. Start the engine and drive the machine at 5 km/h and above.</li> </ol> <p>If this failure code is cleared, original sensor is defective.</p>
6	Defective HST controller	If no failure is found by preceding checks, HST controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)

**Circuit Diagram Related to Travel Speed Sensor**



B4W27696

### Circuit Diagram Related to Motor 2 Solenoid

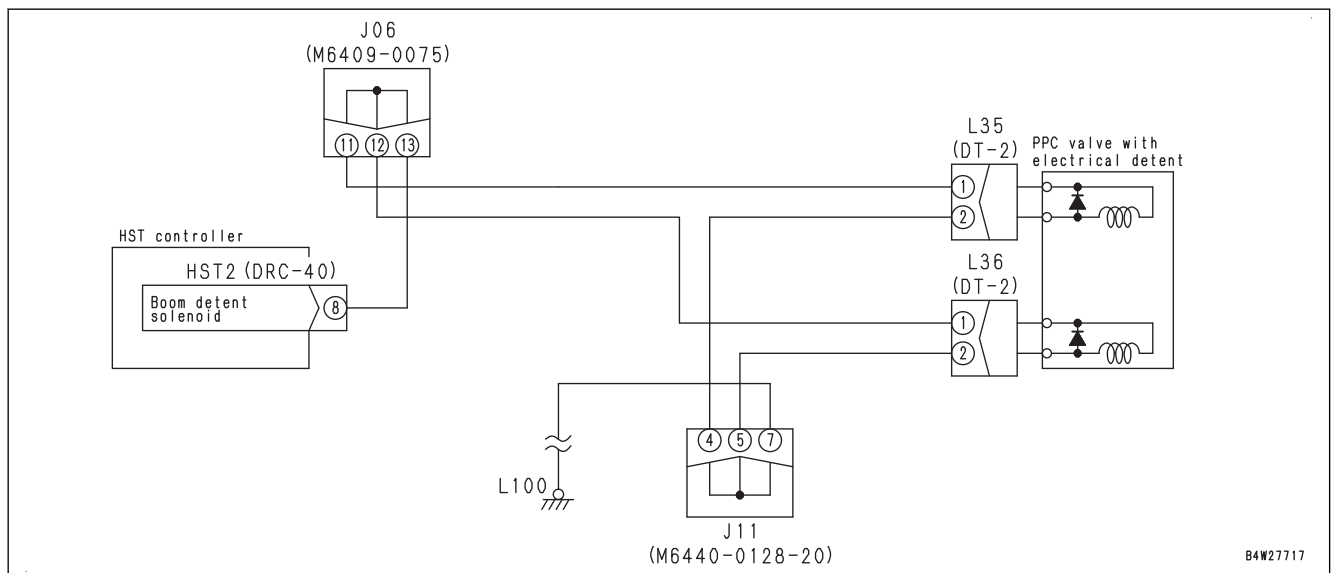


**Failure Code [DWN6KY]**

Action level	Failure code	Failure	Magnet Detent Solenoid Hot Short Circuit (Boom) (HST controller system)
L01	DWN6KY		
Detail of failure	Due to hot short circuit in output signal circuit to boom magnet detent solenoid, abnormal current flows when controller stops driving boom magnet detent solenoid.		
Action of controller	<ul style="list-style-type: none"> <li>Stops driving boom magnet detent solenoid.</li> <li>Even if cause of failure is eliminated, machine does not become normal until starting switch is turned to OFF position.</li> </ul>		
Phenomenon on machine	<ul style="list-style-type: none"> <li>When boom detent is operated, detent is not automatically released (it can be released manually).</li> <li>When boom detent is not operated, boom lever does not return to NEUTRAL position smoothly due to drawing force of magnet (lever operability is degraded).</li> <li>Boom kick-out does not work.</li> </ul>		
Related information	<ul style="list-style-type: none"> <li>Output state (ON/OFF) to boom magnet detent solenoid can be checked with monitoring function. (Code: 03714)</li> <li>After completion of repair, check that the failure code is cleared by the following procedure. Procedure: Start the engine.</li> </ul>		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Hot short circuit in wiring harness	<ol style="list-style-type: none"> <li>Turn the starting switch to OFF position.</li> <li>Disconnect the connectors L35 and L36, and connect the T-adaptor to each female side.</li> <li>Start the engine.</li> <li>Set the work equipment lock switch to UNLOCK position.</li> <li>Operate the boom lever to perform troubleshooting.</li> </ol>		
		Voltage	Between L35 (1) and (2) or between L36 (female) (1) and (2)	Boom lever: NEUTRAL
2	Defective HST controller	If no failure is found by preceding checks, HST controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

**Circuit Diagram Related to Magnet Detent Solenoid**



**Failure Code [DXHJKA]**

Action level	Failure code	Failure	3rd Valve Extend EPC Solenoid Open Circuit (HST controller system)
L03	DXHJKA		
Detail of failure	Due to open circuit in output signal circuit to 3rd valve (PCS) extend EPC solenoid, no current flows when controller drives 3rd valve (PCS) extend EPC solenoid.		
Action of controller	<ul style="list-style-type: none"> <li>The output from controller continues.</li> <li>Makes centralized warning lamp light up and alarm buzzer sound.</li> <li>Even if cause of failure is eliminated, machine does not become normal until starting switch is turned to OFF position.</li> </ul>		
Phenomenon on machine	3rd valve (PCS) cylinder neither extends nor retracts.		
Related information	<ul style="list-style-type: none"> <li>This failure code is not displayed on a machine that is not equipped with 3rd valve (PCS).</li> <li>If this failure code is displayed on the machine that is not equipped with 3rd valve, select "None" for 3rd valve (PCS) lever setting on option setting screen of machine monitor.</li> <li>Output current value to 3rd valve (PCS) extend EPC solenoid can be checked with monitoring function. (Code: 41923)</li> <li>This failure code is displayed only for the machine equipped with 3rd valve (PCS).</li> <li>After completion of repair, check that the failure code is cleared by the following procedure. Procedure: Start the engine, and perform 3rd valve (PCS) extend operation.</li> </ul>		

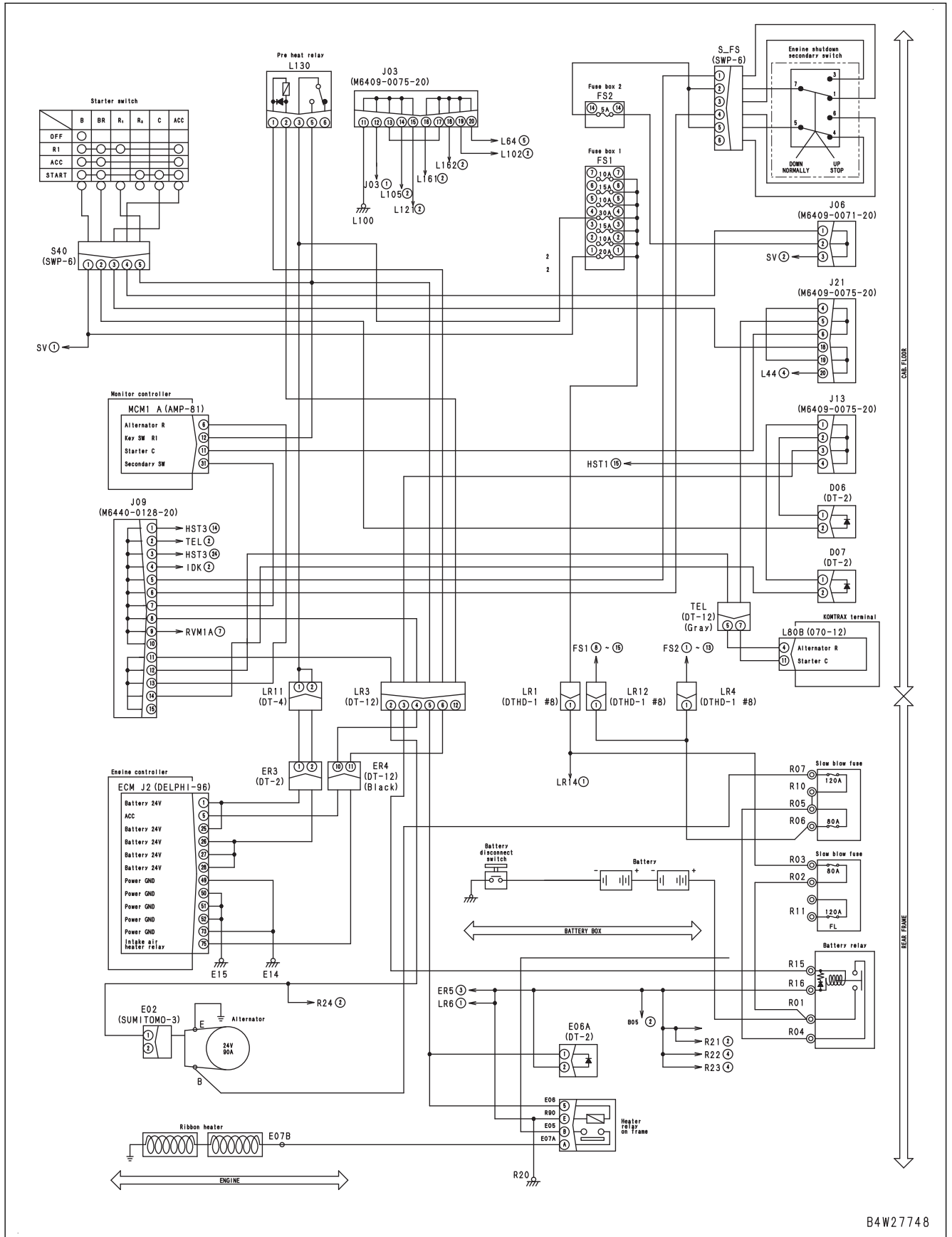
No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective solenoid of 3rd valve (PCS) extend EPC	1. Turn the starting switch to OFF position.		
		2. Disconnect the connector F24, and connect the T-adapter to male side		
		Resistance	Between F24 (male) (1) and (2) Between F24 (male) (1) and ground	5 to 15 Ω Min. 1 MΩ
2	Defective circuit related to 3rd valve (PCS) extend EPC solenoid	1. Turn the starting switch to OFF position.		
		2. Disconnect the connector F24, and connect the T-adapter to female side.		
3	Open circuit in wiring harness	3. Turn the starting switch to ON position.		
		Voltage	Between F24 (female) (1) and (2)	1 to 4.5 V
		Resistance	Between HST3 (female) (16) and F24 (female) (1)	Max. 1 Ω
Between HST3 (female) (23) and F24 (female) (2)	Max. 1 Ω			
4	Defective HST controller	If no failure is found by preceding checks, HST controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

**Failure Code [F31CKB]**

Detail of failure	Because the voltage of the 12V sensor power supply output line from the gateway function controller is 8V or less while the command is ON, a short circuit is found.
Action level	-
Action of controller	<ul style="list-style-type: none"> <li>12V sensor power supply output is turned OFF.</li> <li>Even if the cause of the abnormality is removed, the machine will not go back to the correct condition until the starting switch is turned to the OFF position one time.</li> </ul>
Phenomenon on machine	KOMTRAX system does not operate correctly.
Related information	

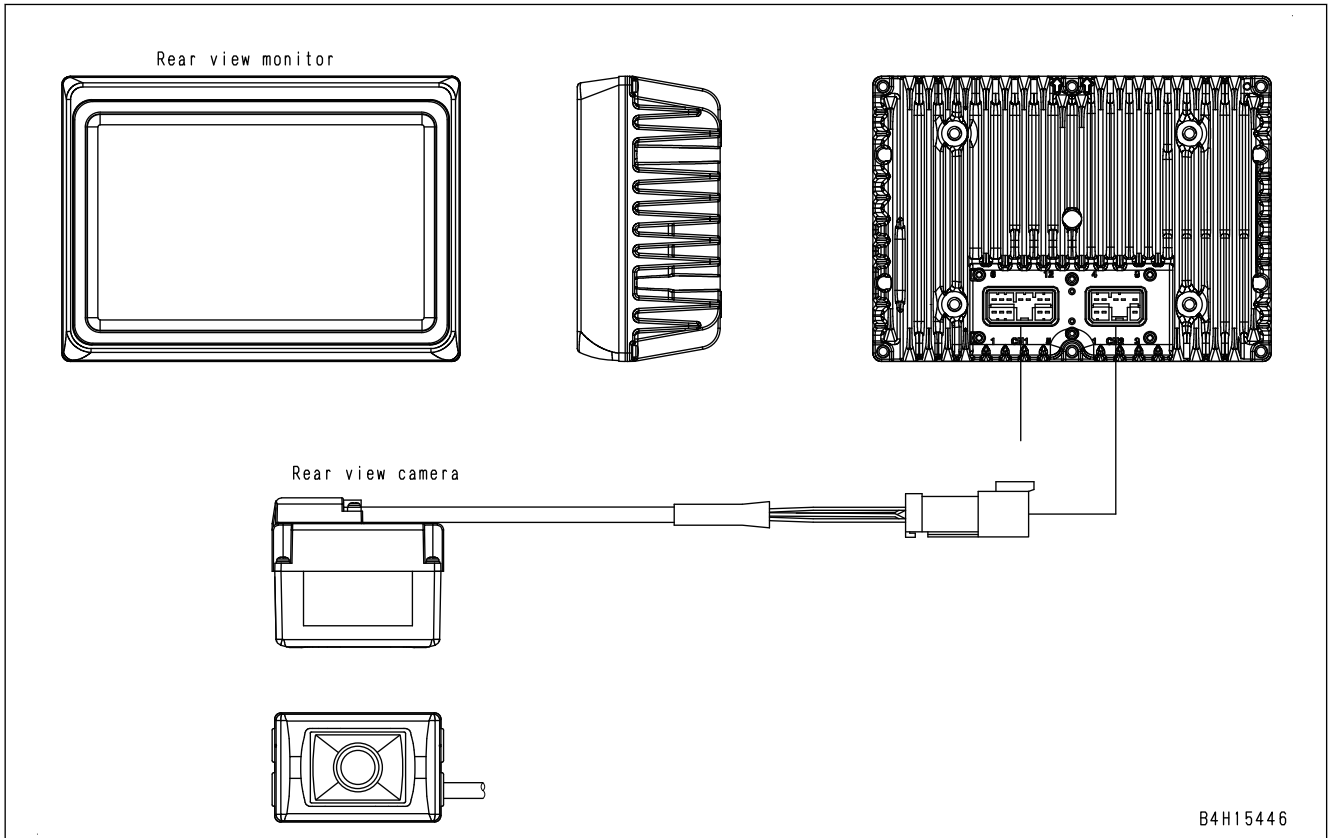
No.	Check item	Procedure of troubleshooting			Judgment and remedy	
1	Wiring harness and connector	1. Do the check in accordance with the descriptions of wiring harnesses and connectors in RELATED INFORMATION FOR TROUBLESHOOTING, CHECKS BEFORE TROUBLESHOOTING, ELECTRICAL EQUIPMENT. 2. Are the wiring harnesses and connectors in the correct state?			YES	<ul style="list-style-type: none"> <li>The wiring harnesses and connectors are in the correct state.</li> <li>Go to the next check item.</li> </ul>
					NO	<ul style="list-style-type: none"> <li>A wiring harness or a connector is defective.</li> <li>Repair or replace the defective wiring harness or connector.</li> <li>Go to "Confirmation of repair".</li> </ul>
2	Ground fault in wiring harness	1. Turn the starting switch to the OFF position. 2. Disconnect the connectors L85 and L88. Connect a T-adapter to one of the female side of L85 or the male side of L88. 3. Measure the resistance. 4. Does the troubleshooting result agree with the standard value?			YES	<ul style="list-style-type: none"> <li>The wiring harness does not have a ground fault.</li> <li>Go to the next check item.</li> </ul>
					Item	Measurement position, condition
		Resistance	Between ground and one of L85 (female) (38) or L88 (male) (4)	Min. 1MΩ		

Circuit Diagram of Engine Preheating



B4W27748

### Wiring Harness of Rearview Monitor



No.	Cause	Procedure, measuring location, criteria and remarks			
5	Defective diode (internal open circuit or short circuit)	1. Turn the starting switch to OFF position. 2. Disconnect connector T15A, and connect T-adapter to diode.  <b>REMARK</b> Measure it with diode range of multimeter.			
		Continuity	Between T15A (male) (1) (+) and (2) (-)	No continuity	
			Between T15A (male) (2) (+) and (1) (-)	Continuity	
6	Defective parking brake switch	1. Turn the starting switch to OFF position. 2. Disconnect connector S_FA, and connect T-adapter to male side. 3. Start the engine.			
		Resistance	Between S_FA (male) (3) and (4)	Parking brake switch: RELEASE	Max. 1 Ω
			Parking brake switch: PARKING	Min. 1 MΩ	
			Between S_FA (male) (5) and (6)	Parking brake switch: RELEASE	Min. 1 MΩ
Parking brake switch: PARKING	Max. 1 Ω				
7	Open circuit, ground fault, or hot short circuit in wiring harness	<ul style="list-style-type: none"> <li>• Parking brake control switch line</li> </ul> 1. Turn the starting switch to OFF position. 2. Insert T-adapter into connectors HST1 and HST3. 3. Turn the starting switch to ON position.			
		Voltage	Between HST1 (24) and HST3(31)	Parking brake switch: RELEASE	20 to 30 V
			Parking brake switch: PARKING	Max. 3 V	
8	Open circuit, ground fault, or hot short circuit in wiring harness	<ul style="list-style-type: none"> <li>• Parking brake solenoid line</li> </ul> 1. Turn the starting switch to OFF position. 2. Disconnect connector T15, and connect T-adapter to female side. 3. Turn the starting switch to ON position.			
		Voltage	Between T15 (female) (1) and (2)	Parking brake switch: RELEASE	20 to 30 V
			Parking brake switch: PARKING	Max. 4.5 V	
9	Ground fault in wiring harness (contact with ground circuit)	1. Turn the starting switch to OFF position. 2. Disconnect connectors HST1, L105, and S_FA, and connect T-adapter to any female side. 3. Remove fuse No.8 in fuse box FS2.			
		Resistance	Between ground and HST1 (female) (24) or S_FA (female) (3)	Min. 1 MΩ	
			Between S_FA (female) (4) and ground	Min. 1 MΩ	
Between S_FA (female) (6) and ground	Min. 1 MΩ				

No.	Cause	Procedure, measuring location, criteria and remarks		
6	Open circuit in wiring harness (wire breakage or defective contact of connector)	If no failure is found in power supply line, this check is not required. Primary side of headlamp R.H. relay L119 1. Turn the starting switch to OFF position. 2. Remove fuse No.9 in fuse box FS1. 3. Set lamp switch to HEAD position (move pin 2 of relay to GND).  <b>REMARK</b> Coil resistance of relay L119		
		Resistance	Between FS1-9 and ground	200 to 400 Ω
		If no failure is found in power supply line, this check is not required. Secondary side output of headlamp R.H. relay L119 1. Turn the starting switch to OFF position. 2. Disconnect connector L119, and connect T-adaptor to female side.  <b>REMARK</b> Lamp resistance		
		Resistance	Between L119 (female) (5) and ground	Approx 8 Ω
7	Ground fault in wiring harness (contact with ground circuit)	1. Turn the starting switch to OFF position. 2. Remove fuses No.8 and 9 in fuse box FS1. 3. Disconnect connectors L04, L119, L120, and HEAD (right and left), and connect T-adaptor to any female side.		
			Between L04 (female) (3) and ground	Min. 1 MΩ
			Between L04 (female) (6) and ground	Min. 1 MΩ
			Between L04 (female) (7) and ground	Min. 1 MΩ
		Resistance	Between L.H. HEAD (female) (B) and ground	Min. 1 MΩ
			Between R.H. HEAD (female) (B) and ground	Min. 1 MΩ
			Between ground and L120(female) (1) or (3)	Min. 1 MΩ
8	Hot short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Remove fuses No.14 and 15 in fuse box FS8. 3. Disconnect connectors HEAD (right and left), and connect T-adaptor to each female side. 4. Turn the starting switch to ON position.  <b>REMARK</b> Turn off headlamp switch.		
		Voltage	Between L.H. HEAD (female) (B) and ground	Max. 1 V
			Between R.H. HEAD (female) (B) and ground	Max. 1 V

### E-57 Hazard Lamp Does Not Come On or Go Out (For European Union)

Failure	Hazard lamp does not light up or does not go out.
Related information	<ul style="list-style-type: none"> <li>When clearance lamps or tail lamps do not light up, perform troubleshooting for “Clearance lamp and tail lamp do not light up or do not go out.” in E mode first.</li> <li>Switch or lamp of hazard lamp is defective.</li> <li>This case assumes that clearance lamp flashes normally.</li> <li>If hazard lamp does not go out, remove hazard/turn relay. If hazard lamp then go out, hazard/turn relay is defective.</li> </ul>

No.	Cause	Procedure, measuring location, criteria and remarks			
1	Defective fuse	If fuse No.2 in fuse box FS1 is burnt out, circuit probably has ground fault. Perform troubleshooting for ground fault (contact to ground circuit) of wiring harness first.			
2	Defective slow-blow fuse	If slow-blow fuse 80 A (terminal R03 side) is burnt out, circuit may have ground fault, etc. (See check on cause of wiring harness ground fault.)			
3	Defective hazard lamp relay	<ol style="list-style-type: none"> <li>Turn the starting switch to OFF position.</li> <li>Replace hazard lamp relay L125 with another relay, for example, horn relay L125.</li> <li>Turn the starting switch to ON position.</li> <li>Turn the hazard lamp switch ON/OFF.</li> </ol>			
		If hazard lamps then operate normally, original hazard lamp relay L125 is defective.			
4	Defective hazard/turn relay	<ol style="list-style-type: none"> <li>Turn the starting switch to OFF position.</li> <li>Replace hazard/turn relay L124.</li> <li>Turn the starting switch to ON position.</li> <li>Turn the hazard lamp switch ON/OFF.</li> </ol>			
		If hazard lamps then operate normally, original hazard/turn relay L124 is defective.			
5	Defective hazard lamp switch (internal open or short circuit)	<ol style="list-style-type: none"> <li>Starting switch: OFF</li> <li>Disconnect connector S_FB, and connect T-adaptor to male side</li> <li>Turn the hazard lamp switch ON/OFF.</li> </ol>			
		Resistance	Between S_FS (male) (5) and (6)	Turn the hazard lamp switch ON.	Max. 1 Ω
				Turn the hazard lamp switch ON.	Min. 1 MΩ
	Between ground and each of S_FB (male) (5) and (6)	Continuous	Min. 1 MΩ		

## Troubleshooting for Hydraulic and Mechanical Systems (H Mode)

### Information Shown in Troubleshooting Table (H-Mode)

The following information is summarized in the troubleshooting table. Before performing troubleshooting, understand that information fully.

Failure	Failure symptom that appears on machine	
Related information	Information on occurred failure or troubleshooting	
No.	Cause	Procedure, measuring location, criteria, and remarks
1	Probable cause of failure (Each number is serial number, not priority sequence.)	<Contents of description> <ul style="list-style-type: none"> <li>• Criteria to determine probable causes</li> <li>• Remarks for determination of probable cause</li> </ul>
2		
3		
4		
5		

### H-13 Wheel Brakes are Not Released or Drag

Failure	Wheel brakes are not released or they drag.
Related information	<p><b>⚠ Be sure to release the remaining pressure in the brake accumulator circuit. For details, see Testing and Adjusting, “Release Remained Pressure in Brake Accumulator Circuit”.</b></p> <p><b>⚠ Pressure may not be released even if releasing pressure from the brake accumulator circuit is performed. Take care.</b></p> <ul style="list-style-type: none"> <li>• Check that brake pedal returns completely.</li> <li>• Check that parking brake is released completely.</li> <li>• If any failure code is displayed, perform troubleshooting for that failure code first. ([D1E6KY])</li> </ul>

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective brake valve	Be ready with engine stopped, then perform troubleshooting with engine at high idle.		
		Brake valve actuating pressure	When brake pedal is released	0 MPa {0 kgf/cm <sup>2</sup> }
			When brake pedal is depressed	Min. 3.8 MPa {Min. 38.8 kgf/cm <sup>2</sup> }
		<ul style="list-style-type: none"> <li>• If brake oil pressure is high while brake pedal is released, seizure of brake valve spool is suspected.</li> <li>• Discharge the oil from air bleeder while brake pedal is released. Check if circuit pressure lowers and brake is released.</li> </ul>		
2	Defective wheel brake	<ul style="list-style-type: none"> <li>• Jack up 4 wheels and place the axle on the table (with engine stopped)</li> <li>• Release the parking brake, and rotate the tire to check if there is any tire which is hard to rotate.</li> </ul>		
3	Defective slack adjuster	When air bleeder is loosened in order to release the brake pedal, if oil flows out and brake is released, slack adjuster may be defective.		

## Troubleshooting of Engine (S-Mode)

### Information Shown in Troubleshooting Table (S-Mode)

The following information is summarized in the troubleshooting table. Before performing troubleshooting, understand that information fully.

Failure	Failure symptom that appears on engine		
Related information	Information on occurred failure or troubleshooting		
	Cause	Point to check, remarks	Remedy
1	<b>Probable cause of failure</b> <b>(Each number is serial number, not priority sequence.)</b>	<b>&lt;Contents of description&gt;</b> <ul style="list-style-type: none"> <li>• <b>Contents of check to determine probable causes</b></li> <li>• <b>Remarks for determination of probable cause</b></li> </ul>	<ul style="list-style-type: none"> <li>• Actions to eliminate probable cause of failure</li> </ul>
2			
3			
4			
5			

### Troubleshooting for FCS

In case FCS is displayed, change the pump system monitoring as shown.

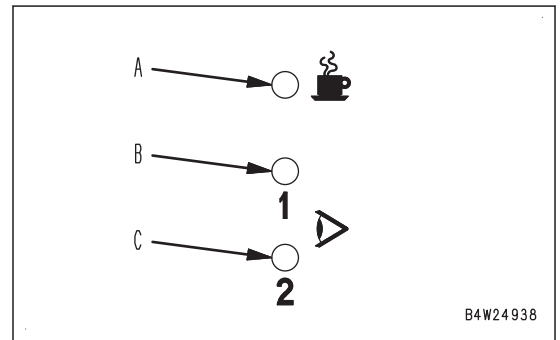
**REMARK**









LED display

(A): Pause time

(B): Monitoring of system function by means of an external cycle switch

(C): Without function



Step	Key	Display
1	 B4W24929 Press for more than 2s	<b>000</b> B4W24925 Display flashes (Code 000, factory setting)
2	 B4W24929 Press briefly (confirm code)	<b>⌚ P A</b> 9JD17889 Automatically indicates first parameter Example: "pause in timer operation" LED (A) flashes
3	 B4W24927 Operate keys until	<b>[ C O P ]</b> 9JD17893 Monitoring menu is displayed LED (B) and (C) flashes
4	 B4W24929 Press briefly	<b>OFF</b> 9JD17894 Monitoring deactivated (factory setting)
5	 B4W24928 Press appropriate key until  B4W24927	<b>[ C S ]</b> 9JD17895 Monitoring with cycle switch is active LED (B) flashes or <b>P S</b> B4W24926 Is not permissible for progressive systems!
6	 B4W24929 Press briefly	Confirm new settings
7	 B4W24929 Press for more than 2s	New settings are written to the memory, and the LED indicators extinguish

**Tools for Removal and Installation of the Air Conditioner Compressor Assembly**

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	Commercially available	Wrench	•	1			Removal and installation of the air conditioner compressor assembly

**Tools for Removal and Installation of HST Pump Assembly**

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	Commercially available	Oil container	•	1			Removal and installation of the HST pump assembly
B	Commercially available	Lifting tool	•	2			
C	Commercially available	Webbing sling	•	1			
D	793T-315-1150	Stopper	■	1	N	○	Removal and installation of boss

**Tools for Removal and Installation of HST Motor 1 Assembly**

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	Commercially available	Oil container	•	1			Drain of hydraulic oil
B	Commercially available	Transmission jack	•	1			Removal and installation of HST motor 1 assembly
C	Commercially available	Block	•	1			

**Tools for Removal and Installation of HST Motor 2 Assembly**

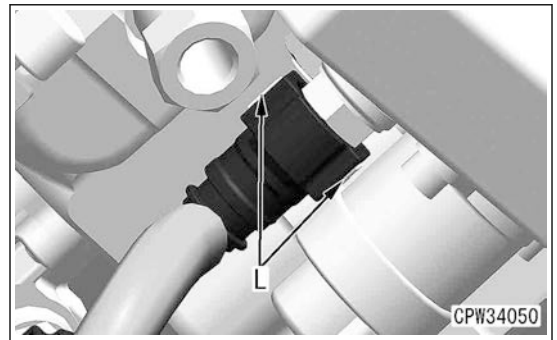
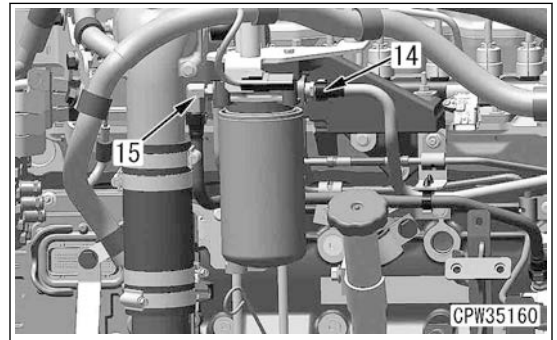
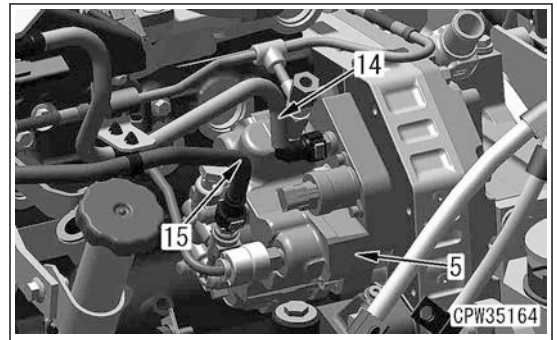
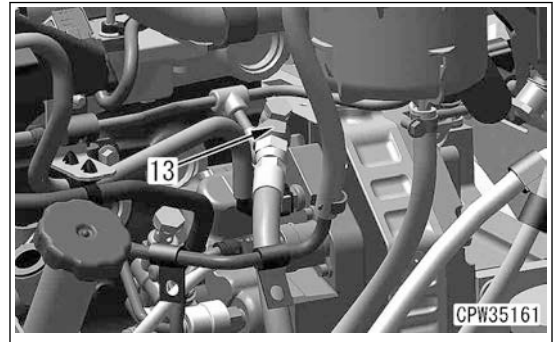
Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	Commercially available	Oil container	•	1			Drain of hydraulic oil
B	Commercially available	Webbing sling	•	1			Removal and installation of fender
C	Commercially available	Eyebolt	•	2			Removal and installation of DEF tank assembly
D	Commercially available	Lifting tool	•	1			

**Fuel filter**

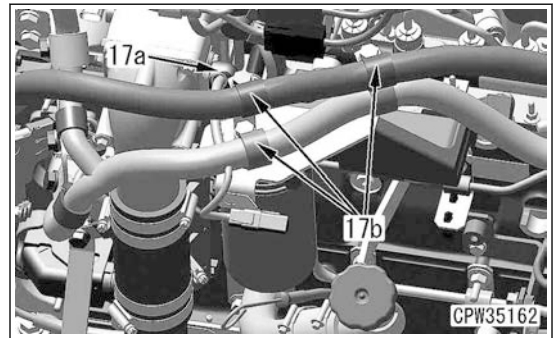
9. Disconnect the fuel return hose (13) from the supply pump (5).
10. Remove the fuel filter hoses (14) and (15).

**REMARK**

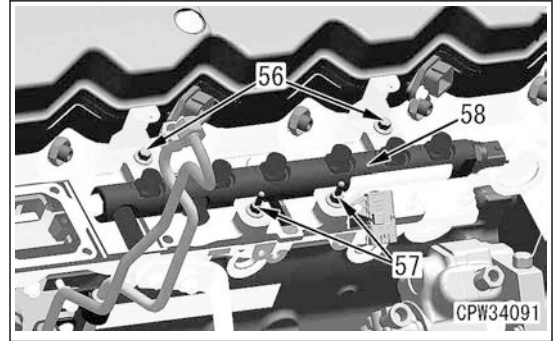
- Remove the mud from the hose connecting portion in advance. (To prevent the lock (L) from sticking)
- Pull out the hose while pressing the lock (L) of the hose connecting portion from both sides.



11. Remove the clamps (17b) (3 places).
12. Remove the rubber cap (17a).

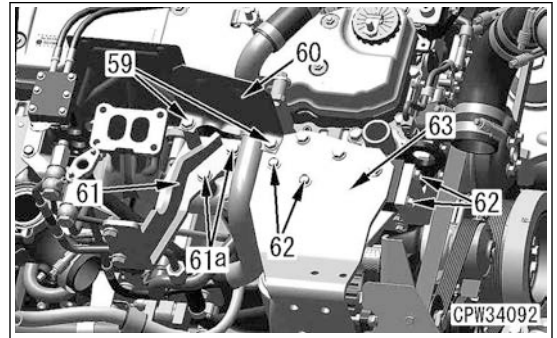


42. Remove the bolts (56) (2 pieces) and screws (57) (2 pieces), and remove the common rail (58).

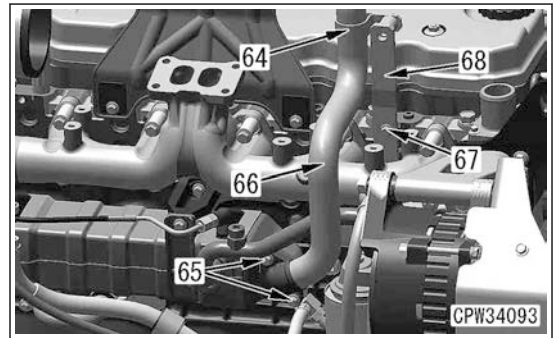


### VGT assembly

43. Remove VGT assembly. See "Remove and Install VGT Assembly".
44. Remove the bolts (59) (2 pieces), and remove the heat insulation plate (60).
45. Remove the bolts (61a) (2 pieces), and remove the bracket (61).
46. Remove the bolts (62) (4 pieces), and remove the bracket (63).

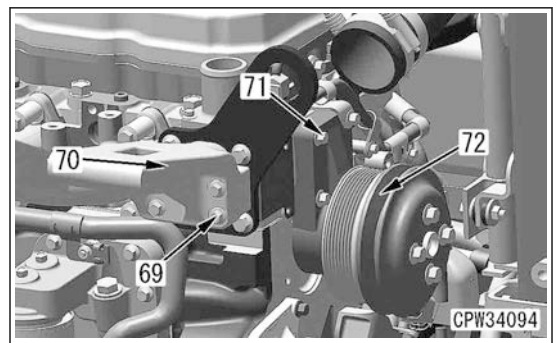


47. Remove the clamp (64).
48. Remove the bolts (65) (2 pieces), and remove the tube (66).
49. Remove the bolts (67) (2 pieces), and remove the bracket (68).



### Alternator assembly

50. Remove the alternator assembly. See "Remove and Install Alternator Assembly".
51. Remove the bolts (69) (4 pieces), and remove the bracket (70).
52. Remove the bolts (71) (4 pieces), and remove the accessory pulley and bracket assembly (72).



### EGR cooler assembly

53. Remove EGR cooler assembly. See "Remove and Install EGR Cooler Assembly".

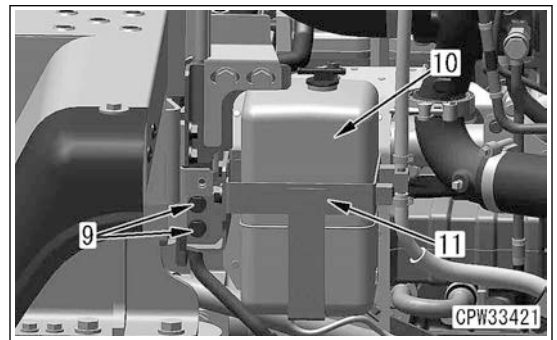
4. Disconnect the connector B05 (6).



5. Remove the clamp (7).

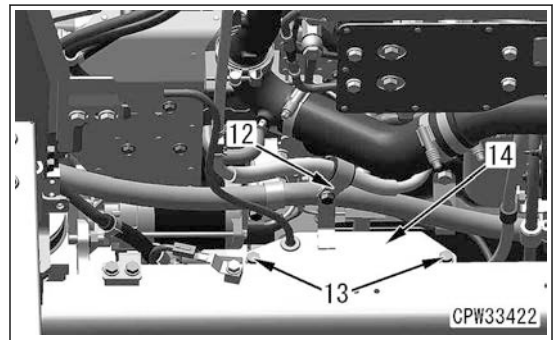


6. Remove the bolts (9) (2 pieces), and remove the reservoir tank (10) together with the bracket (11).



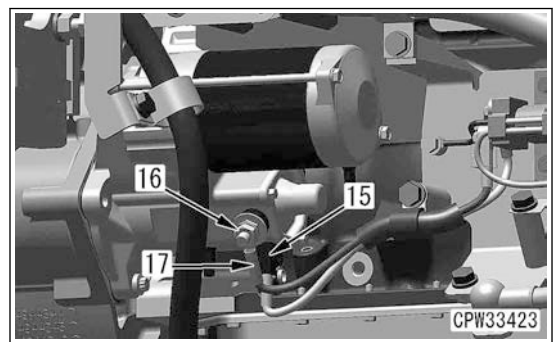
7. Remove the clamp (12).

8. Remove the bolts (13) (2 pieces), and remove the bracket (14).




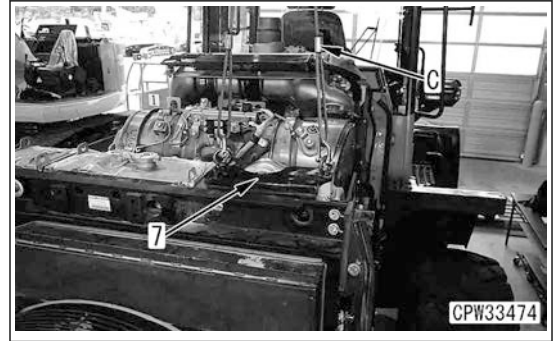
9. Disconnect the terminal C (15).

10. Remove the nut (16), and disconnect the terminal B (17).



7. By using the lifting tool (C), sling the hydraulic oil cooler assembly (7), and remove it.


 Hydraulic oil cooler assembly (7):  
14.6 kg

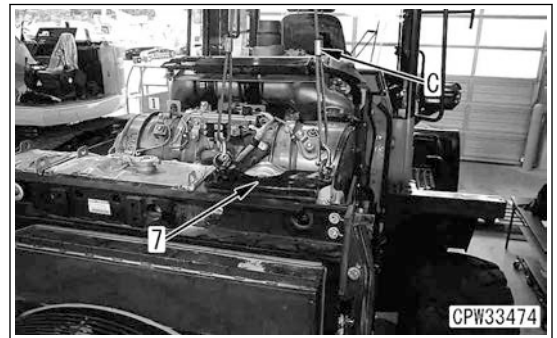


## How to Install Hydraulic Oil Cooler Assembly

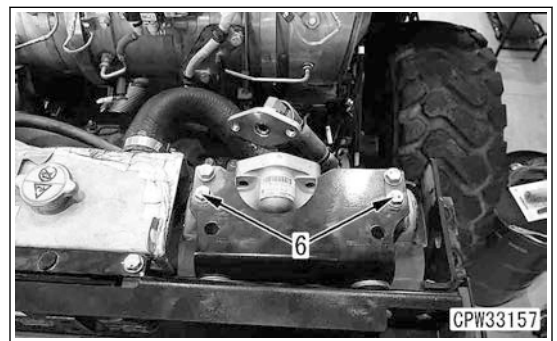
### Hydraulic oil cooler assembly

1. By using the lifting tool (C), sling the hydraulic oil cooler assembly (7), and set it to the installing position.

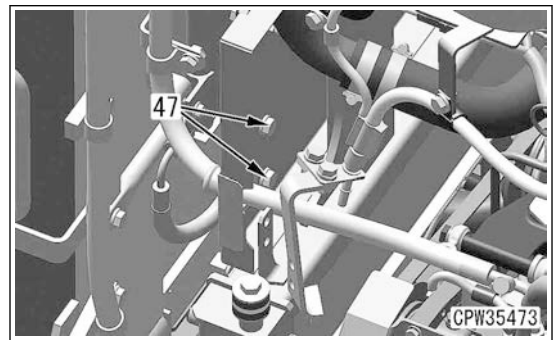
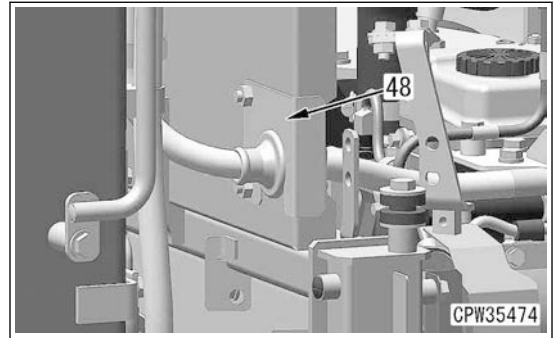
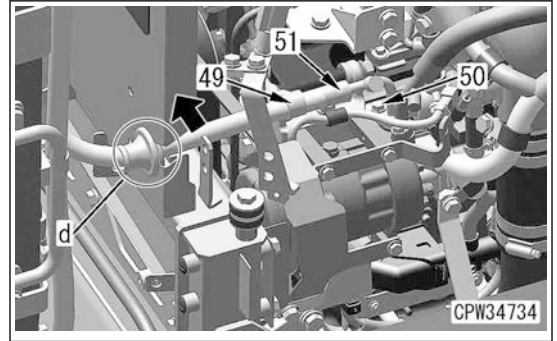
 Hydraulic oil cooler assembly (7):  
14.6 kg



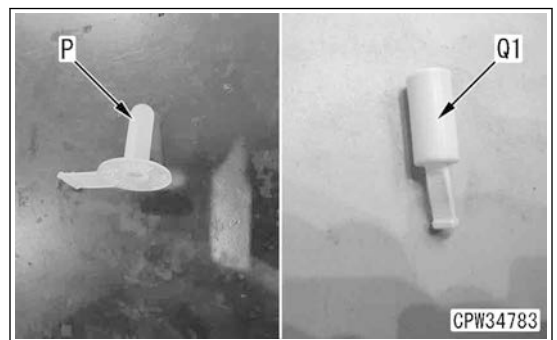
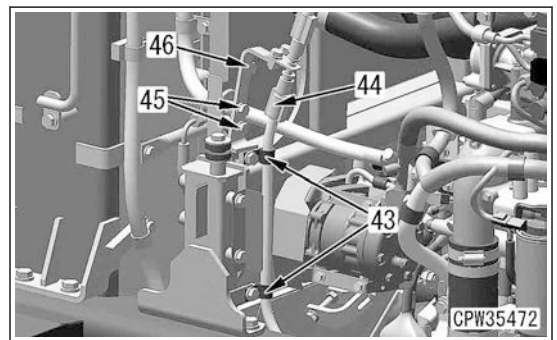
2. Remove the eyebolts (B), and remove the bolts (6) (2 pieces).



80. Return the air conditioner hose (51) to the installing position (d).
81. Connect the air conditioner hose (51), and install the bolt (50).
82. Install the clamp (49).
83. Install the cover (48) with the bolts (47) (2 pieces).



84. Install the bracket (46) with the bolts (45) (2 pieces).




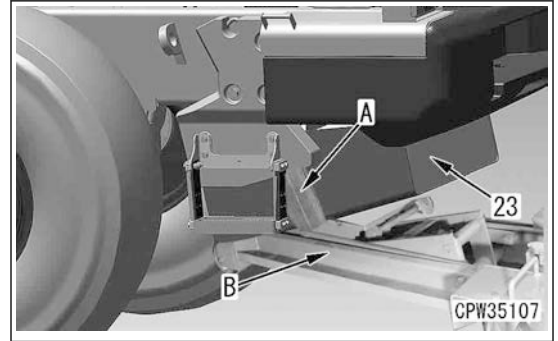
85. Remove the plug (for 3/8 inch of hose diameter) (P) on DEF hose side and cap (green) (Q1) on the nipple side, and connect DEF hose (44).

18. By using the lifting tool (A) and jack (B), lower the fuel tank assembly (23) slowly, and pull it out backward.

**REMARK**

The bottom of the fuel tank assembly (23) is tilted. Stabilize the fuel tank assembly (23) by using blocks etc. between the jack (B) and fuel tank assembly (23).


 Fuel tank assembly (23) :  
105 kg

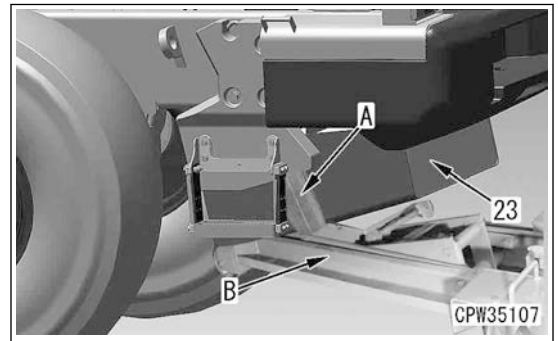
**How to Install Fuel Tank Assembly****Fuel tank assembly**

1. By using the lifting tool (A) and jack (B), move the fuel tank assembly (23) to the area directly under the installing position.

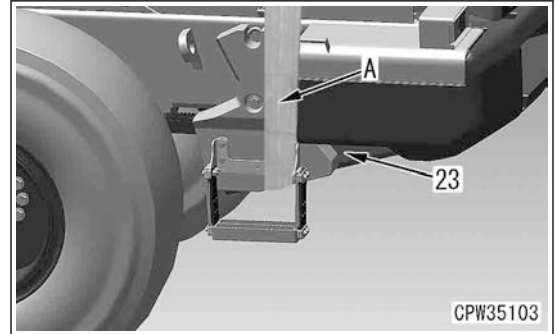
**REMARK**

The bottom of the fuel tank assembly (23) is tilted. Stabilize the fuel tank assembly (23) by using blocks etc. between the jack (B) and fuel tank assembly (23).


 Fuel tank assembly (23) :  
105 kg

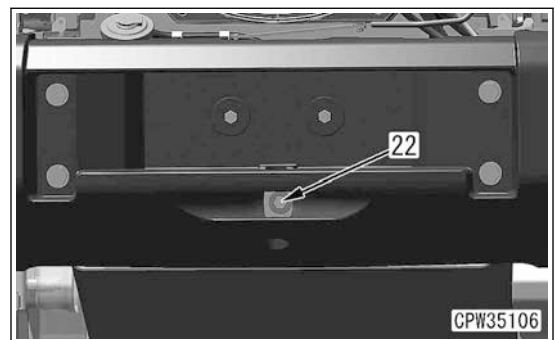


2. By using the lifting tool (A) and jack (B), lift the fuel tank assembly (23) slowly, and set it to the installing position.
3. By using the lifting tool (A), sling the fuel tank assembly (23), and hold it.

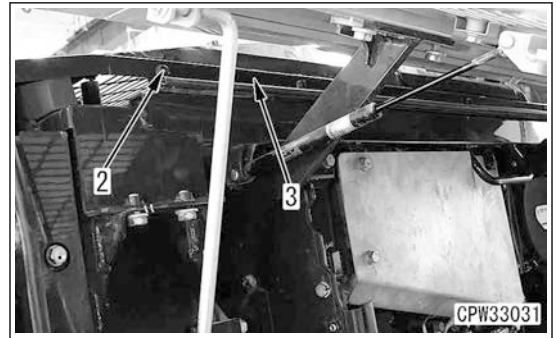


4. Install the bolt (22) (1 piece at the rear).

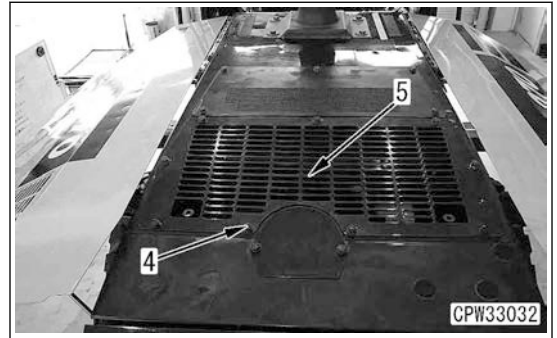
 Bolt (22):  
235 to 285 Nm {23.5 to 29.5 kgfm}



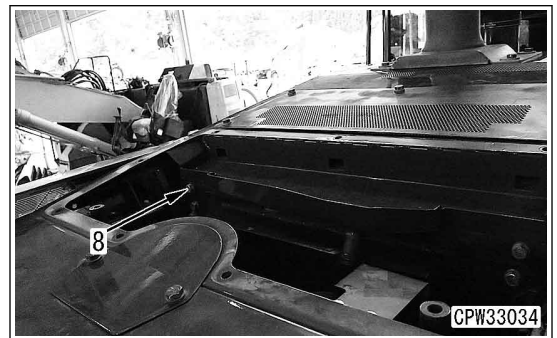
2. Remove the bolts (2) (4 pieces each on the right and left sides), and remove the brackets (3) (right and left).



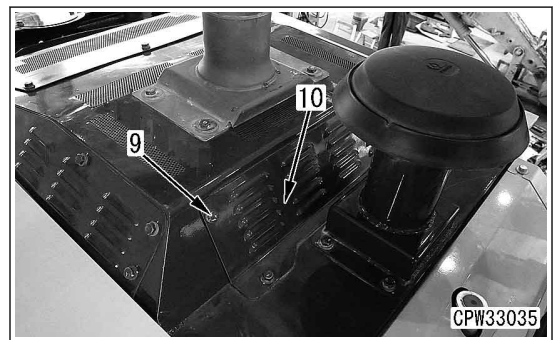
3. Remove the bolts (4) (9 pieces), and remove the cover (5).



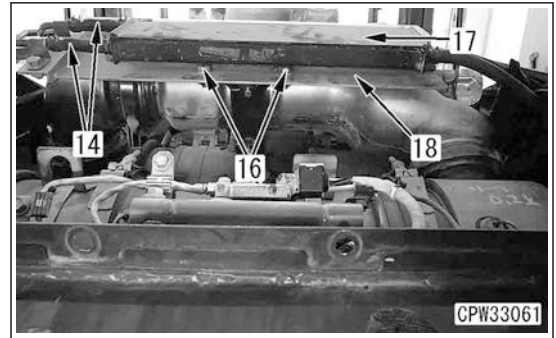
4. Remove the bolts (8) (4 pieces).



5. Remove the bolts (9) (4 pieces), and remove the cover (10).



11. Remove the bolts (16) (2 pieces), and move the tank (17) and coolant hose (14) together with the bracket (18) aside so that they do not hinder the work.

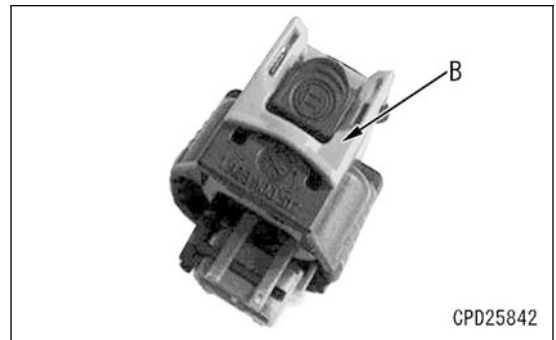
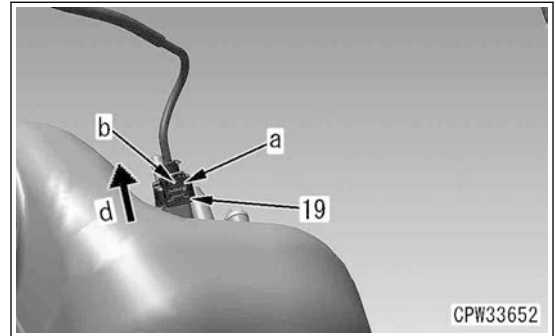


12. Disconnect the connector UDM (19) according to the following procedure.

**NOTICE**

- Disconnect DEF hose (15), and then disconnect DEF wiring connector UDM (19). (In order to prevent DEF from sticking to the DEF wiring connector)
- After disconnecting DEF wiring connector UDM (19), install DEF injector electrical connector cover (B) to DEF injector electrical connector side. (In order to prevent entry of the foreign materials)

- 1) Slide the red lever (a) in the direction of unlock position (d) until click sound is heard.
- 2) While pressing the knob (b) with your fingers, disconnect DEF wiring connector UDM (8).

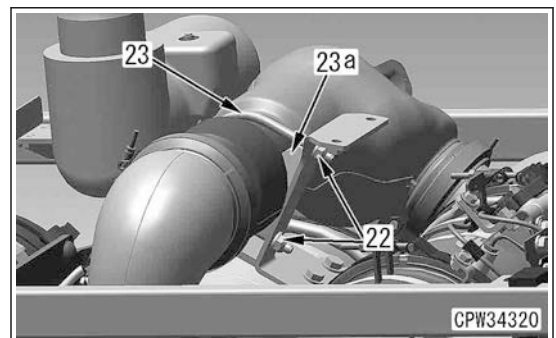


**DEF mixing tube**

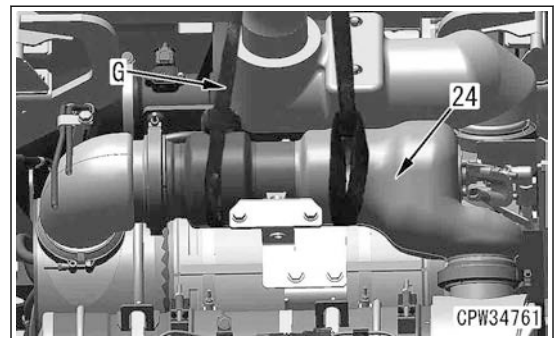
13. Remove the nuts (22) (2 pieces), and remove U-bolt (23).

**REMARK**

When removing them, take care not to drop the sheet (23a).



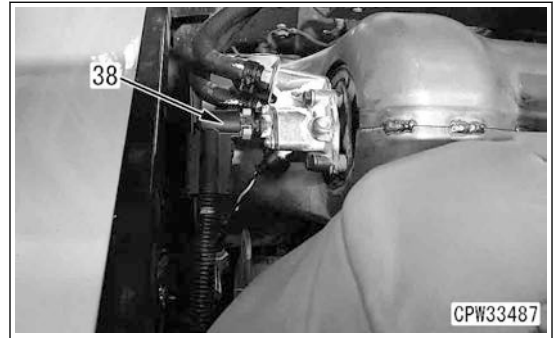
14. By using the webbing sling (G), sling DEF mixing tube (24), and hold it.



15. Connect the connector EM2 (48).

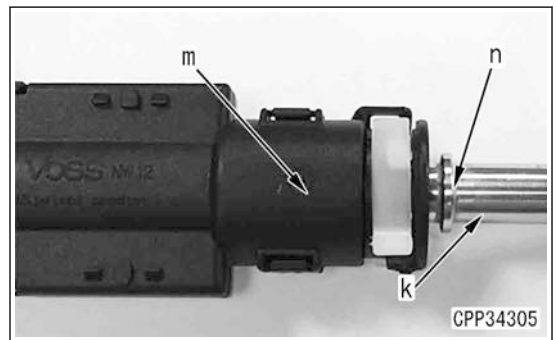
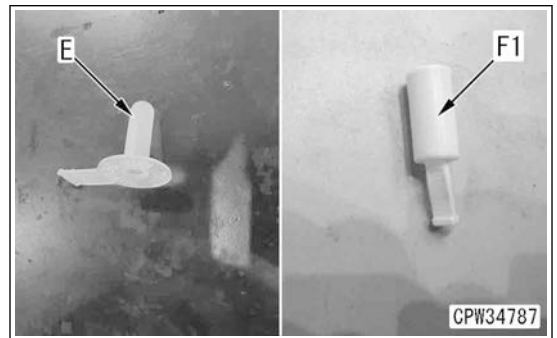


16. Connect DEF hose (38).



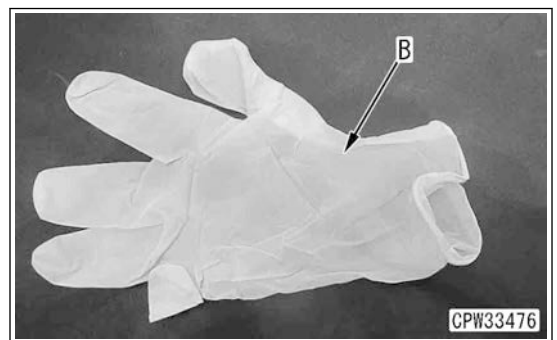
#### REMARK

- Remove the plug (for 5/16 inch hose diameter) (E) and cap (yellow) (F1) on DEF side before connecting DEF hose (38).
- Insert the connector (m) of DEF hose (38) into the pin (k) on the injector and joint side until click sound is heard to install it.
- When the convex part (n) of the pin (k) passes the convex part inside of the clip, lock it by using the clip.



#### NOTICE

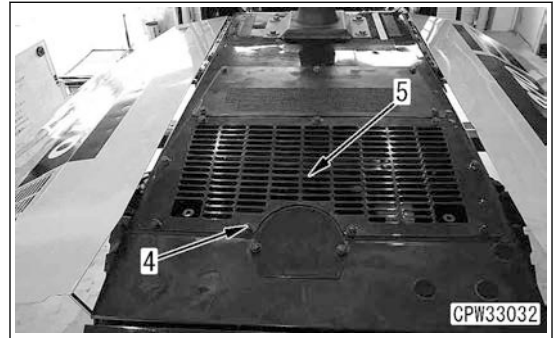
When handling DEF, be sure to wear the vinyl gloves (B).



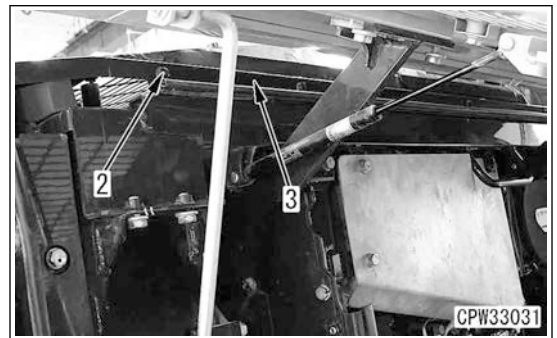
23. Install the bolts (8) (4 pieces).



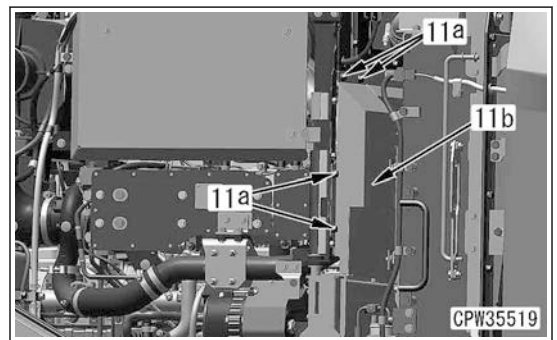
24. Install the cover (5) with the bolts (4) (9 pieces).



25. Install the brackets (3) (right and left) with the bolts (2) (4 pieces each on the right and left sides).



26. Install the bracket (11b) with the bolts (11a) (4 pieces).



### Refilling with coolant

27. Refill the radiator with coolant to the specified level through the coolant filler port. Run the engine to circulate the coolant, and then check the coolant level again.



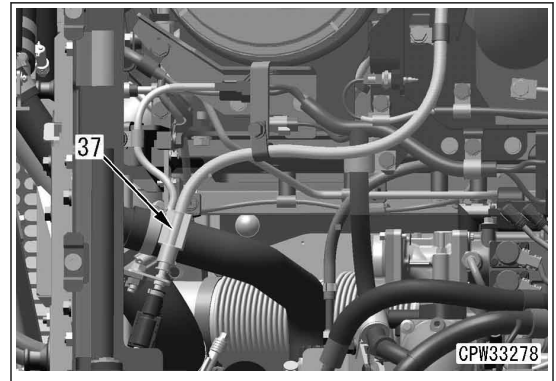
Radiator:

31.8 ℓ

#### REMARK

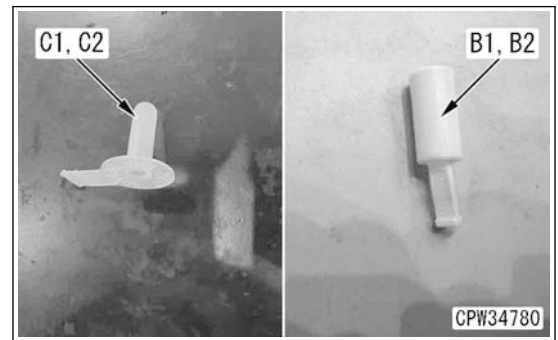
If the coolant level is lower when checking the level again, refill with coolant.

7. Remove DEF hose (37) between joint and DEF injector according to the following procedure.

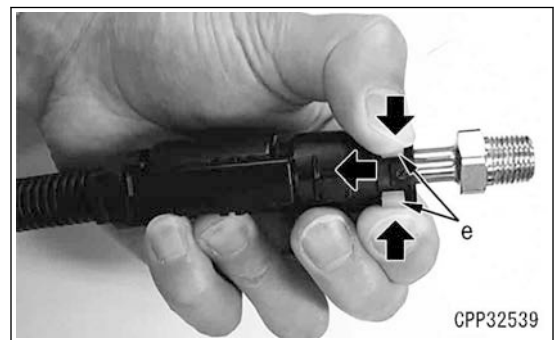


#### NOTICE

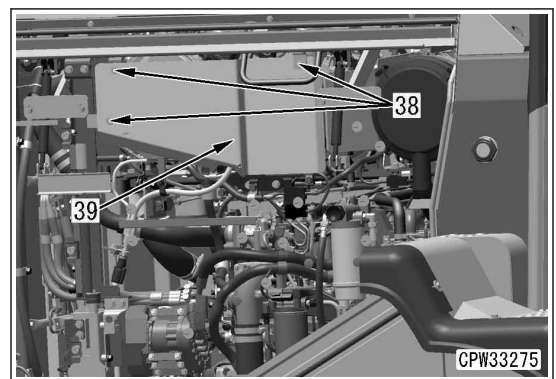
- Before disconnecting DEF hose (37), wash the connecting portions with distilled water to remove the sticking materials.
- After disconnecting DEF hose (37) (joint side), install the plug (for 3/8 inch hose diameter) (C1) to the hose, and install the cap (green) (B1) to the nipple to prevent leakage and entering of foreign materials.
- After disconnecting DEF hose (37) (injector side), install the plug (for 5/16 inch hose diameter) (C2) to the hose, and install the cap (yellow) (B2) to the nipple to prevent leakage and entering of foreign materials.
- Cover the connecting portion with a clean plastic sheet, etc. to prevent entering of dusts or sticking of DEF.



By pinching the protruding portions (e) of the clip with your fingers, the lock is unlocked. While they are kept pinched, disconnect DEF hose (37).




- 1) Remove the bolts (38) (3 pieces), and remove the thermal guard (39).

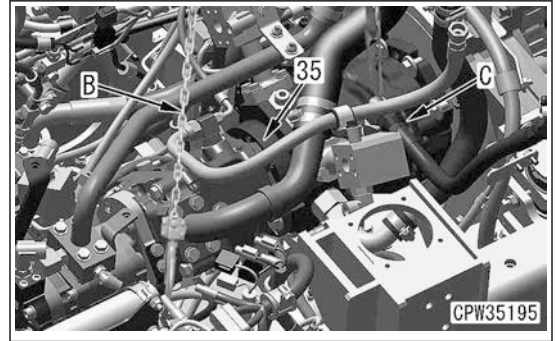


42. Sling HST pump assembly (35), and remove it.

**REMARK**

- Check that all the wires and pipes are disconnected before removing.
- Disconnect HST pump assembly (35) from the damper, move the assembly to the machine front until the boss (gear) comes out, and then remove it.

 HST pump assembly (35):  
220 kg

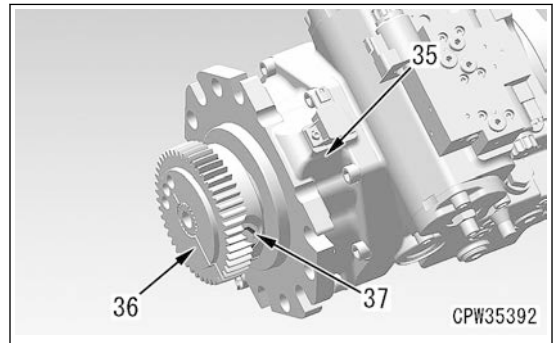



**How to Install HST Pump Assembly**

**HST pump assembly**

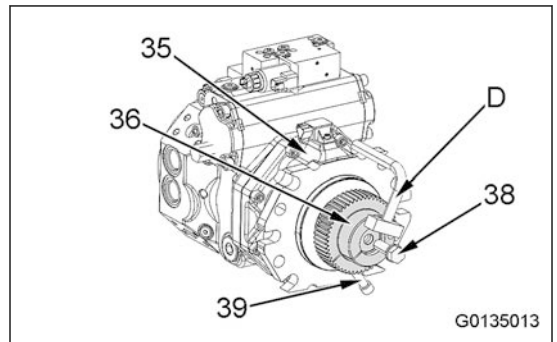
1. If the boss (36) was removed from HST pump assembly (35), install the boss (36) according to the following procedure.

- Applicable machine: 83001 to 85038
- 1) Install the boss (36) until it is at the same height as the axial end surface of HST pump assembly (35).  
Step between the boss (36) and axial end surface of HST pump assembly (35): 0.5 mm or less





2) Tighten the bolt (37).  
 Bolt (37):  $86 \pm 5 \text{ Nm} \{8.8 \pm 0.5 \text{ kgm}\}$



- Applicable machine: 85039 or later models
- 1) Use the tool D to tighten the boss (36) with the bolt (38).




**REMARK**

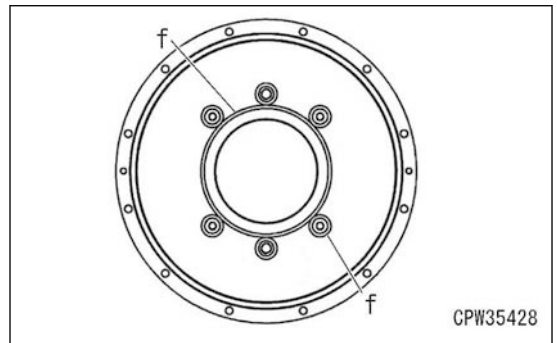
To protect the end surface of the HST pump assembly (35), put an iron plate on the contact surface with the tool.

 Threaded part of bolt (38): Liquid adhesive (LT-2)  
 Bolt (38):  $265 \text{ Nm} \{27 \text{ kgfm}\}$

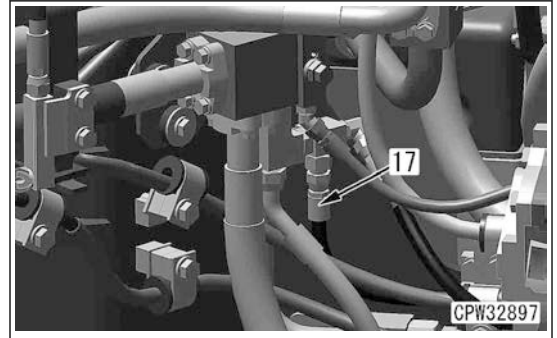
2) Tighten the boss (36) with the bolt (39).  
 Threaded part of bolt (39): Rust-proof oil (KP-9)  
 Bolt (39):  $86 \pm 5 \text{ Nm} \{8.8 \pm 0.5 \text{ kgfm}\}$

2. Apply the liquid gasket to the mounting face (f) of HST pump assembly (35).

 Pump mating face (f):  
Liquid gasket (LG-6)



16. Disconnect the hose (17).



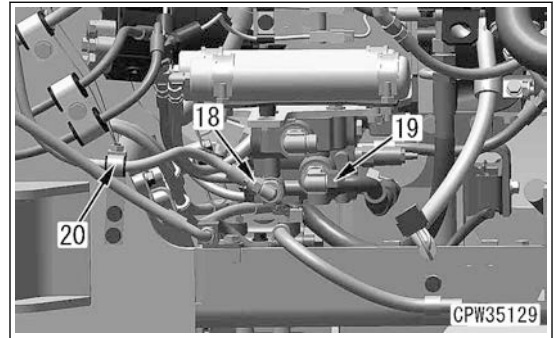
17. Disconnect the hose (18).

18. Disconnect the hose (19).

**REMARK**

- Place an oil container under the hose end.
- Plug the disconnected hoses and the mounting locations to prevent oil from flowing out and dust from entering.

19. Remove the clamp (20).

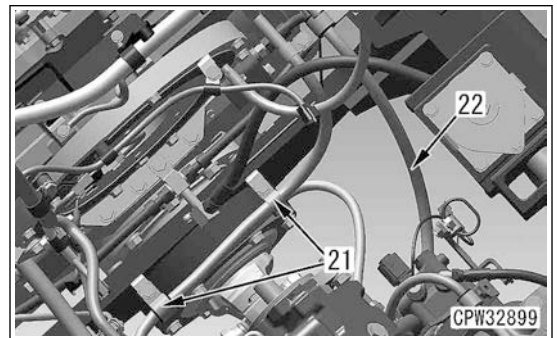


20. Remove the clamps (21) (2 places).

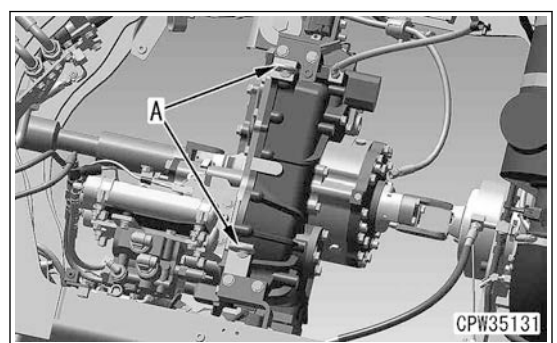
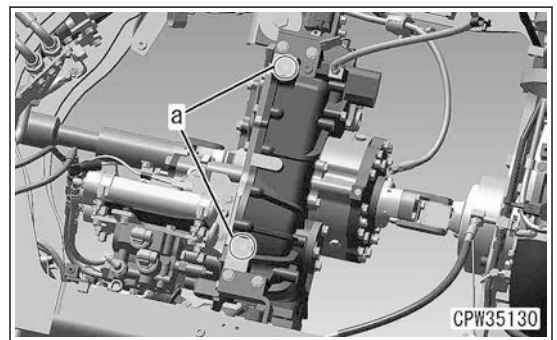
21. Disconnect the hose (22).

**REMARK**

- Place an oil container under the hose end.
- Plug the disconnected hoses and the mounting locations to prevent oil from flowing out and dust from entering.



22. Install the eyebolt (A) to the slinging position (a).

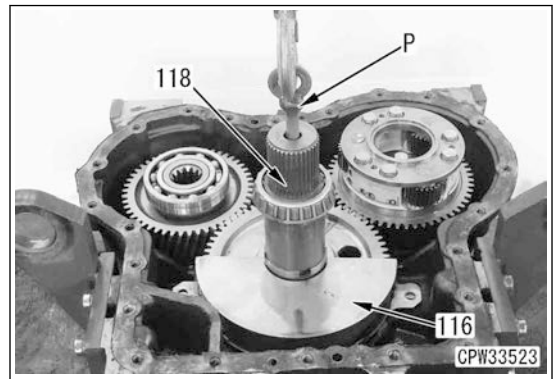


**Installing the output shaft and gear assembly**


33. By using the eyebolt (P), sling the output shaft and gear assembly (118), attach the baffle (116) to the gear, and then install the assembly to the rear case.


**REMARK**

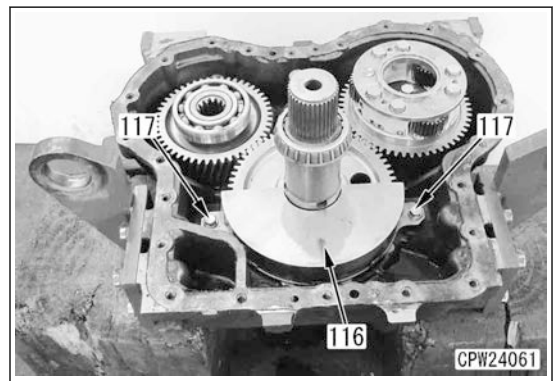
Be careful not to allow the shaft spline to damage the outer race press fitted into the rear case.



34. Tighten the bolts (117) (2 pieces) of the baffle (116).

 Threaded portion of the bolt (117):  
Liquid adhesive (LT-2)

 Bolt (117):  
59 to 74 Nm {6 to 7.5 kgfm}




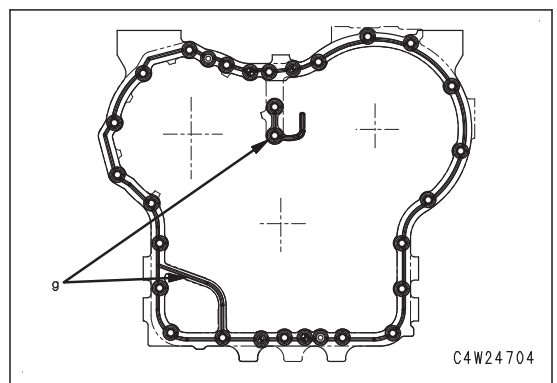
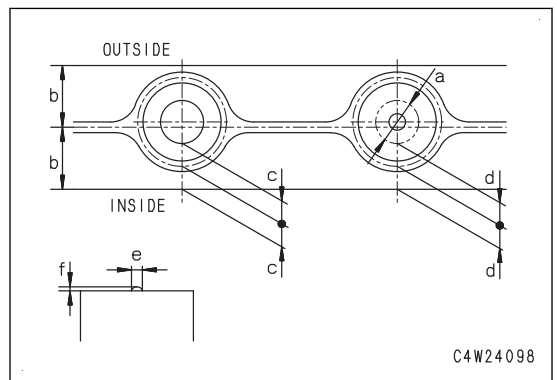
**Installing the front case**

35. Apply liquid gasket to the positions shown in the drawing on the rear case flange surface according to the following procedure.

**REMARK**

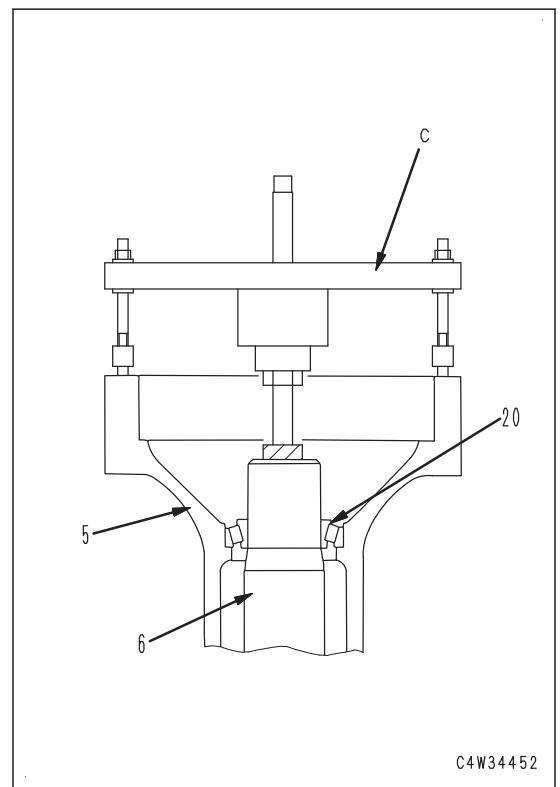
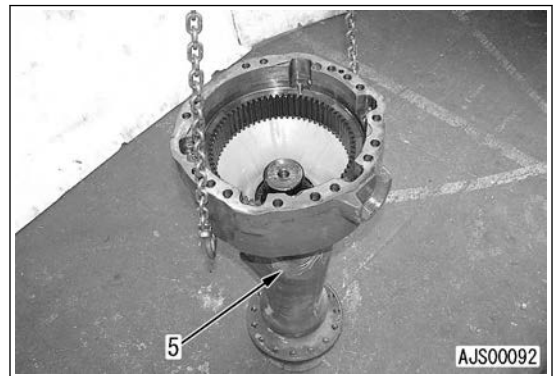
- Use the front case and rear case as a set part.
- Check the marks on the top surface of the case are the same.
- Apply liquid gasket also to the part (a) (forcing screw contact part) according the same dimension as the bolt hole.
- Apply liquid gasket so that the dimension (b) and dimension (c) are the same.
- Apply liquid gasket so that the value (cross-sectional area) obtained by multiplying the dimension (e) by dimension (f) is 0.2 to 0.5 cm<sup>2</sup>.
- Be sure to apply liquid gasket also to the position (g) shown in the drawing.

 Rear case flange surface:  
Liquid gasket (LG-8)



**Axle shaft**

15. Sling the axle housing assembly (5) approximately 20 mm.
16. Set the axle housing (5) to prevent it from falling over.
17. By using the tool (C), pull up the axle housing (5), and separate the axle shaft (6) from the bearing (20).



37. Apply axle oil to the bearing, and install the shim (87), and right and left bearing carriers (44) with the bolt (G).

**REMARK**

- Install shims of the same quantity and thickness as checked during the disassembly to the right and left bearing carriers.
- Tighten the mounting bolt while rotating the bevel gear.
- Rotate the bearing several turns to smooth axle oil on it.



Bearing:

Axle oil (AXO80)



Bearing carrier (44) mounting bolt:

98 to 123 Nm {10.0 to 12.5 kgfm}

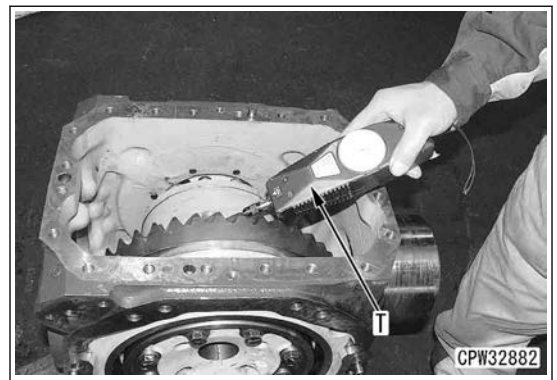
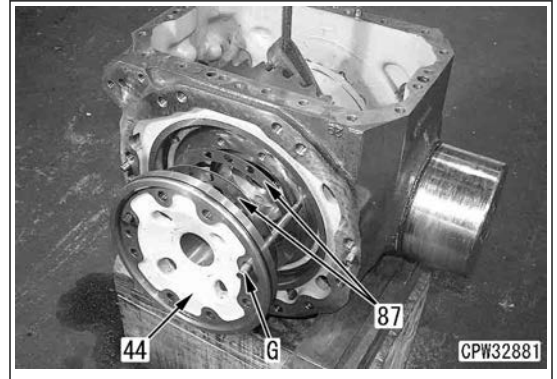
38. Measure the starting torque of the bevel gear in the tangential direction by using the push-pull scale (T).

**REMARK**

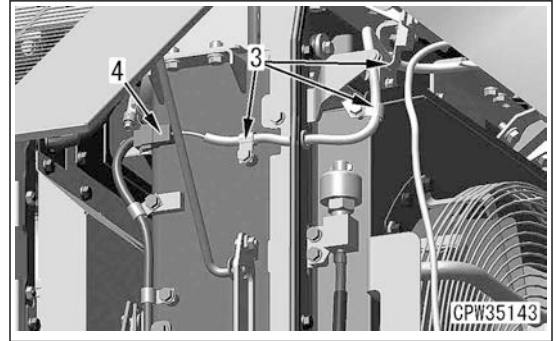
- If the starting torque is out of the standard value range, adjust it by increasing or decreasing the shim thickness.
- After adjustment, set the shim thickness within the range from 0.5 to 1.35 mm on one side.

Starting torque: 8.8 to 20.6 N {0.9 to 2.1 kg}

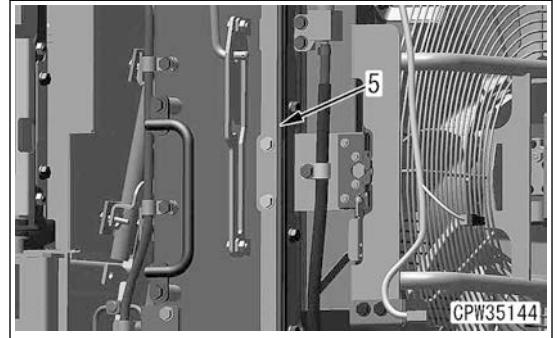
Available shims: 0.05, 0.2, 0.3, 0.8 mm



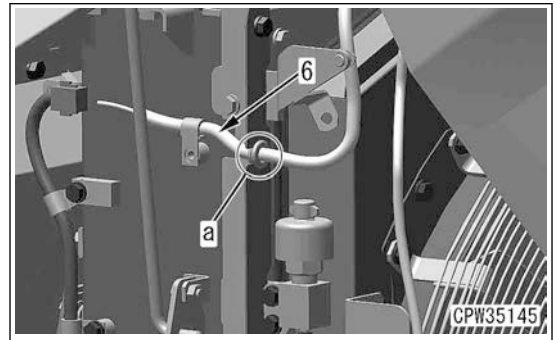
3. Remove the clamps (3) (3 places), and disconnect the connector GR1 (4).



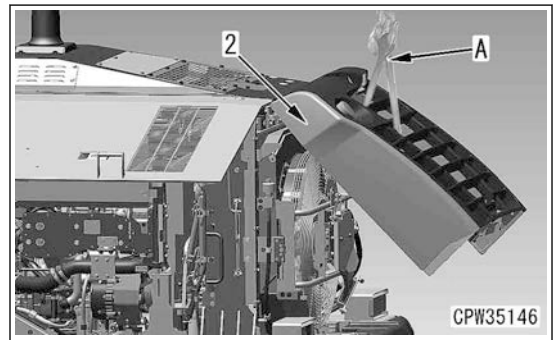
4. Remove the rubber cover (5).



5. Disconnect the wiring harnesses (6) from the part (a).



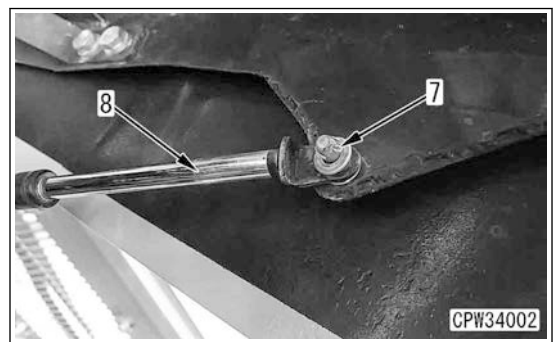
6. By using the lifting tool (A), sling the grille assembly (2), and hold it.



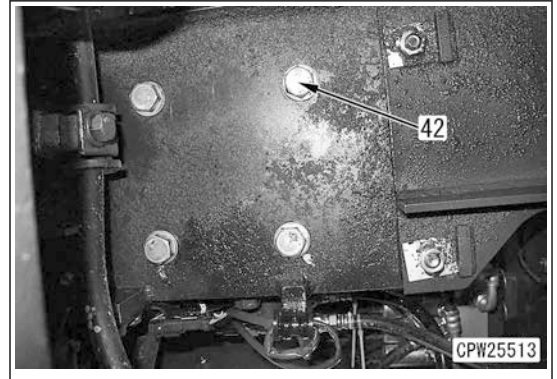
7. Remove the cotter pin (7), and disconnect the gas cylinder (8). (Right and left)

**REMARK**

Sling the gas cylinder (8) on the machine side.

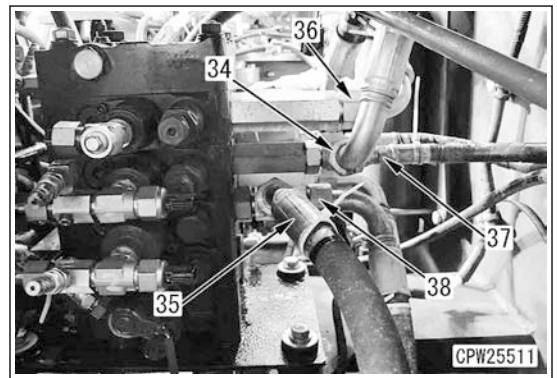
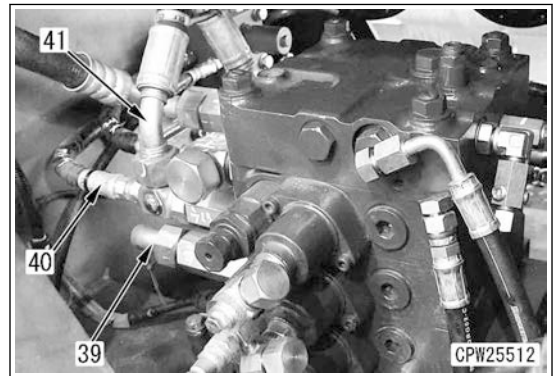


6. Install the bolts (42) (4 pieces) at the bottom of the control valve assembly.



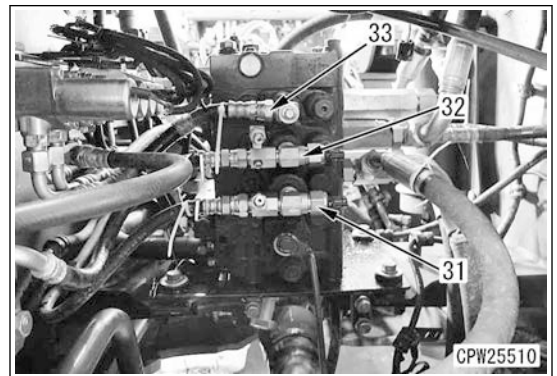
7. Connect the following hoses to the left side of the control valve assembly.

- Hose (41): B3 port
- Hose (40): B3 port
- Hose (39): B2 port
- Hose (38): A2 port
- Hose (37): A3 port
- Hose (36): A4 port
- Hose (35): A2 port
- Hose (34): A3 port




8. Connect the following hoses to the front of the control valve assembly.

- Hose (33): PA4 port
- Hose (32): PA3 port
- Hose (31): PA2 port



- When one or both of the piston rod and piston assembly (13) are new, assemble the piston assembly (13) according to the following procedure.

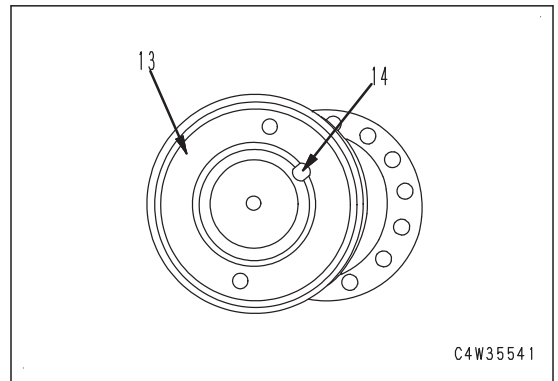
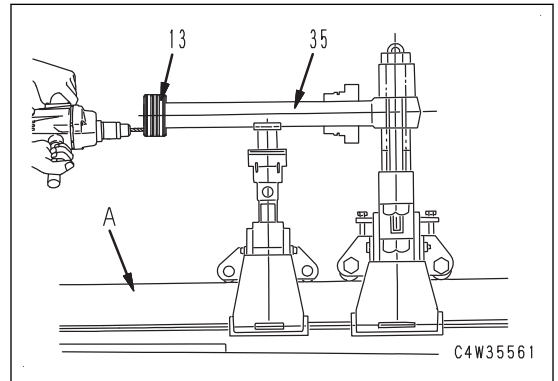
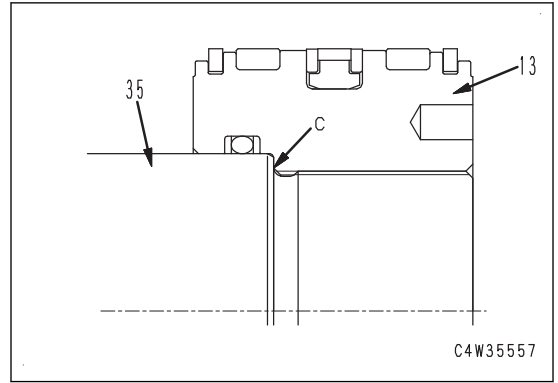
- 1) Screw in the piston assembly (13) until it reaches the end surface (c) of the piston rod (35), and tighten it to the specified torque by using the wrench assembly (for lift cylinder and bucket cylinder) (E).

 Piston assembly (13):  
294±29.4 Nm {30±3.0 kgfm}

- 2) Drill a threaded hole (1 place) for tightening the lock screw (14).

**REMARK**


- Set the piston rod (35) on the repair stand (A).
- Take care to drill it horizontally at V-groove of the threaded portion of the piston assembly (13) and piston rod (35) by using a drill.




**Screw Hole Machining Dimension**

Tap-hole drilling diameter	Depth for drilling tap hole	Tap to use	Tapping depth
10.3 mm	27 mm	12 x 1.75 mm	20 mm

- 3) After making the hole, remove all dirt and clean the hole thoroughly.
- 4) Tighten the screw (14) to the piston assembly (13).

 Threaded portion of screw (14):  
Liquid adhesive (LT-2)


 Screw (14):  
58.9 to 73.6 Nm {6.0 to 7.5 kgfm}


- 5) Punch 4 places of the threaded portion (b) of the screw (14) by using a punch.


- Connect the air conditioner refrigerant tubes (45) (2 pieces) and heater hoses (44) (2 pieces).


**REMARK**


- When installing the hoses for the air conditioner circuit, be careful to prevent any dirt, dust and water from entering the hoses.
- When installing the air conditioner hoses, check that O-rings (70) are fitted to each of the fittings.
- Check that O-rings (70) are not damaged or deteriorated.
- When connecting the refrigerant pipes, apply compressor oil for new refrigerant (R134a) (SANDEN: SP-20PAG oil) to O-ring (70).

 Screw size (M16 x 1.5) (width across flats: 19):  
12 to 15 Nm {1.2 to 1.5 kgfm}

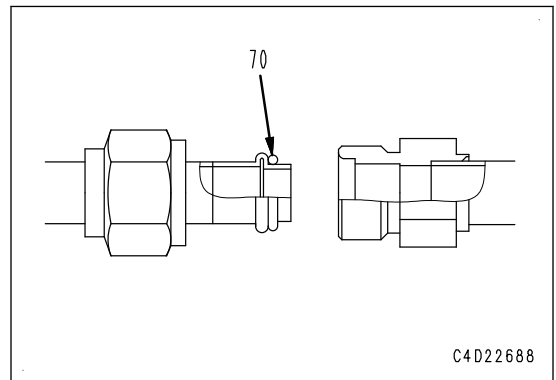
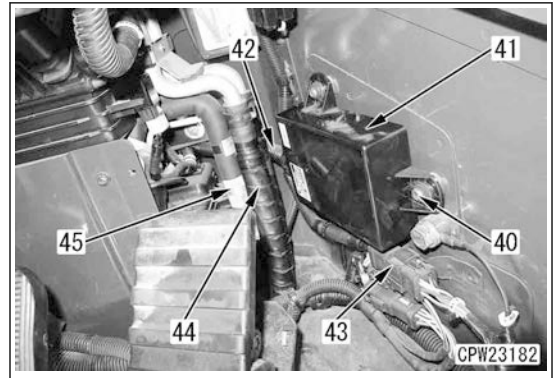
 Screw size (M22 x 1.5) (width across flats: 24):  
20 to 25 Nm {2.0 to 2.6 kgfm}

 Screw size (M24 x 1.5) (width across flats: 27):  
30 to 35 Nm {3.0 to 3.5 kgfm}

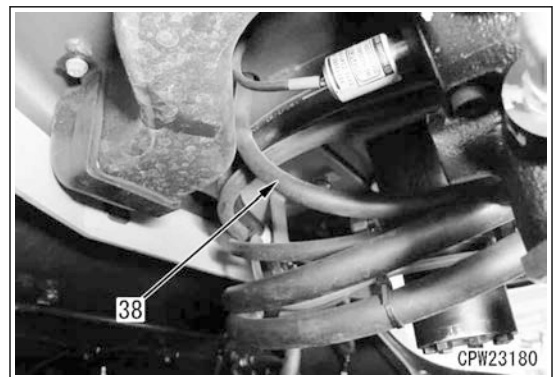
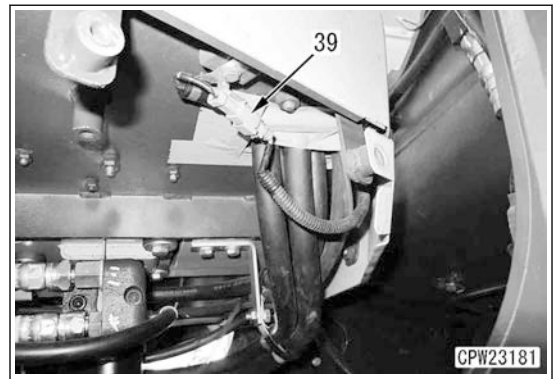
 Bolt (M6 x 1.0) (width across flats: 10):  
8 to 12 Nm {0.8 to 1.2 kgfm}

 Bolt (M8 x 1.25) (width across flats: 10):  
20 to 25 Nm {2.0 to 2.6 kgfm}

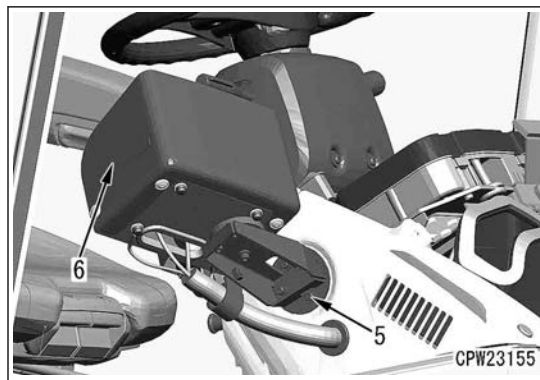
- Connect the connector AL1 (43).
- Connect the connector (42), and install the air conditioner controller (41) with the hexagonal socket head bolts (4 mm) (40) (3 pieces).
- Connect the connector (39) to the lower right of the operator's cab.



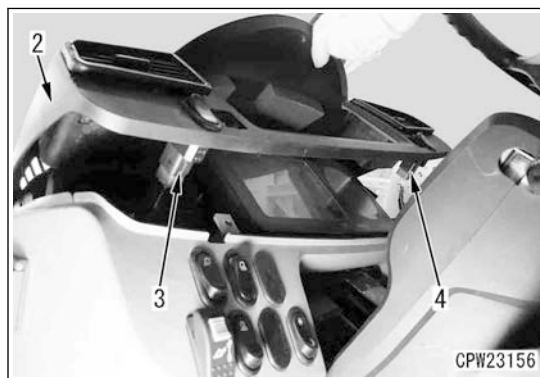
- Connect the air conditioner drain hose (38) on the lower left of the operator's cab.



10. Install the rearview monitor (6) with the hexagonal socket head bolts (4 mm) (5) (4 pieces).



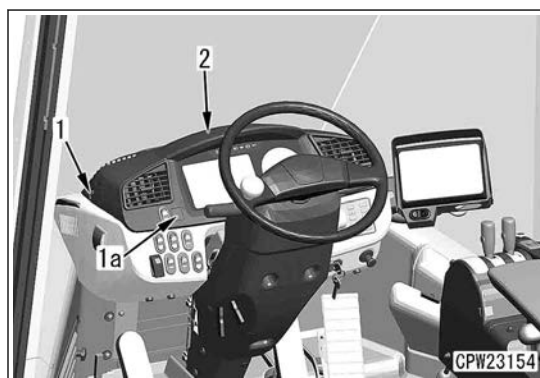
11. Connect the connectors S-FA (4) and S-FB (3) to the back side of the cover (2).



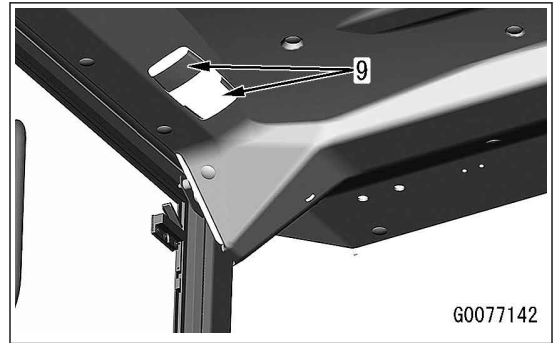
12. Install the cover (2) with the hexagonal socket head bolts (4 mm) (1) (2 pieces on the front side) and (1a) (2 pieces on the rear side).

**REMARK**

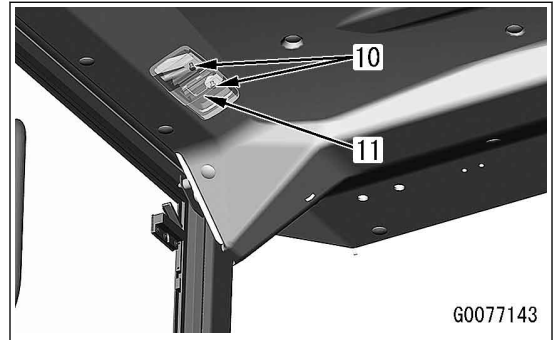
Caps are provided with the hexagonal socket head bolts (1a) (2 pieces).



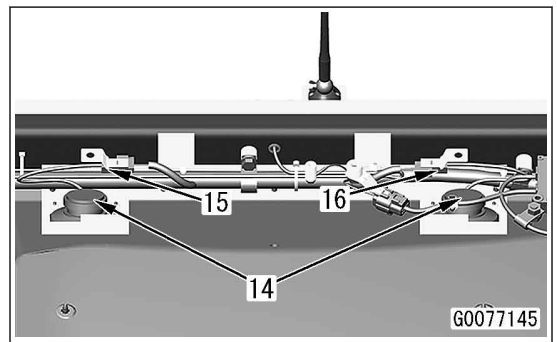
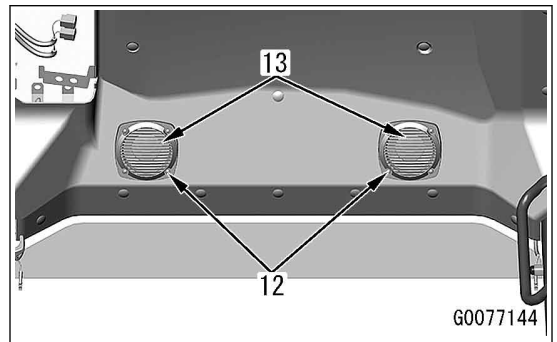
5. Remove the cover (9) (2 pieces).



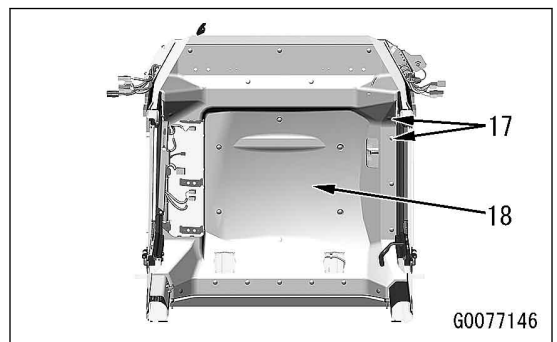
6. Remove the bolts (10) (2 pieces), and remove the room lamp (11).



7. Remove the bolts (12) (8 pieces).  
 8. Remove the cover (13), speaker (14) as one unit. Disconnect the connector C02 (15), connector C03 (16).



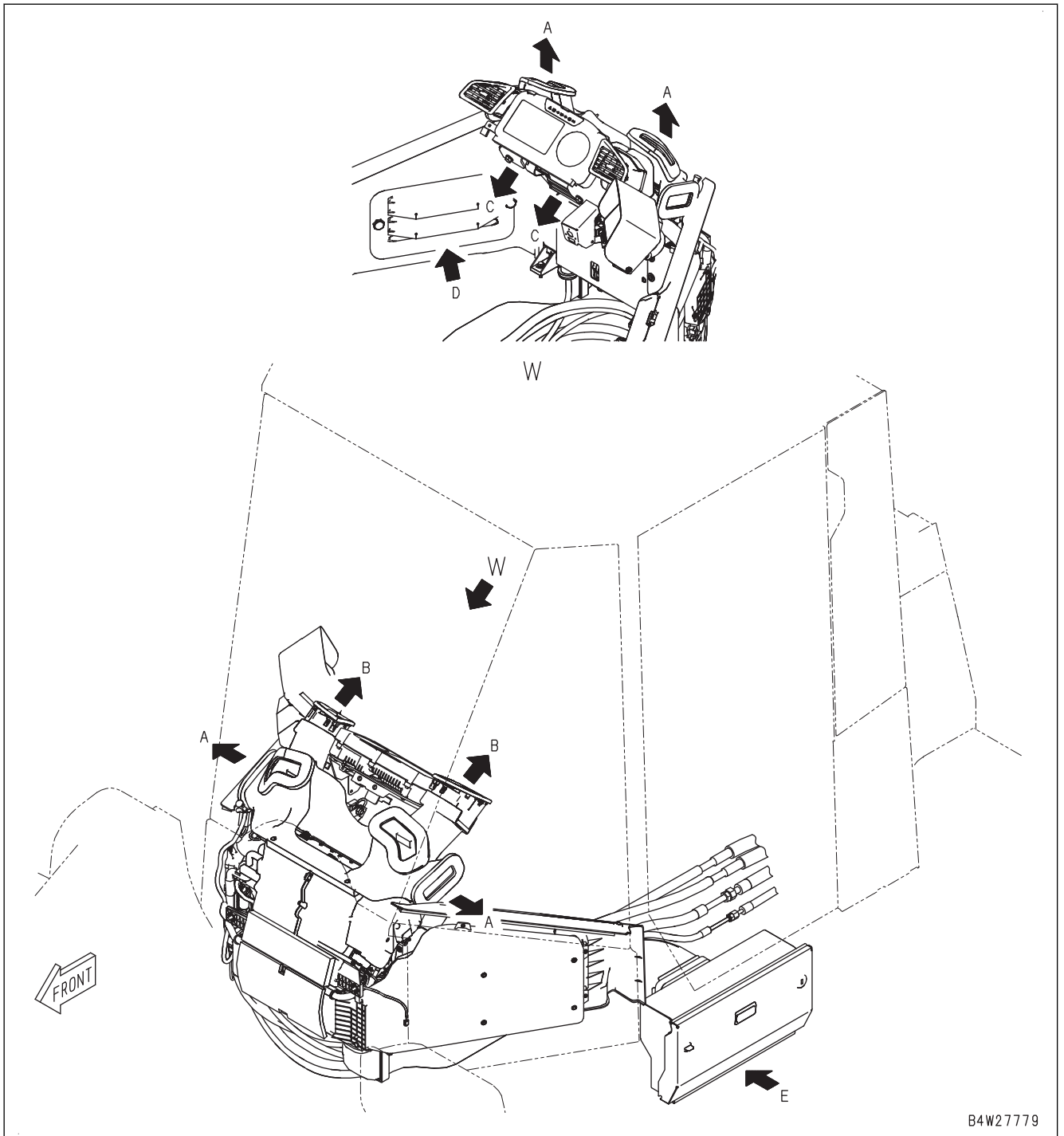
9. Remove the clips (17) (23 pieces), and remove the cover (18).



Unit: mm

No.	Item	Judgment criteria				Remedy
		Standard dimensions	Tolerance		Repair limit	
1	Thickness of plate	1.6	±0.02		1.5	Replace
		3			2.9	
		3.2				
2	Thickness of disc	3.2	±0.07		3.1	
3	Thickness of washer	2	±0.05		1.8	
		2.1				
4	Clearance between disc and plate (clearance in total of the both sides)	0.2 to 0.75 (when pushed with 70 kg)				
5	End play of side gear in axial direction (on one side)	0.13 to 0.36				
6	Backlash between case and plate	0 to 0.6				
7	Backlash between side gear and disc	0.13 to 0.36				
8	Clearance between spider and differential pinion	Standard dimensions	Tolerance		Standard clearance	Allowable clearance
			Shaft	Hole		
		25.4	-0.11 -0.16	+0.05 0	0.11 to 0.21	-

No.	Item	Judgment criteria		Remedy
1	Tightening torque of the nut	Procedure	Specified torque	Re-tighten
		1st stage	58.8 to 68.6 Nm {6 to 7 kgfm}	
		2nd stage	78.5 to 88.3 Nm {8 to 9 kgfm}	
		3rd stage	98.1 to 113 Nm {10 to 11.5 kgfm}	



A: Front window glass defroster vents

B: Face vents

C: Foot vents

1. Compressor

2: Capacitor

3: Receiver drier

4: Hot water piping

5: Hot water return piping

6: Refrigerant piping

7: Dual pressure switch

D: Recirculation air inlet

E: Fresh air inlet

8: Sight glass

9: Air conditioner controller

10: Air conditioner unit

11: Recirculation air filter

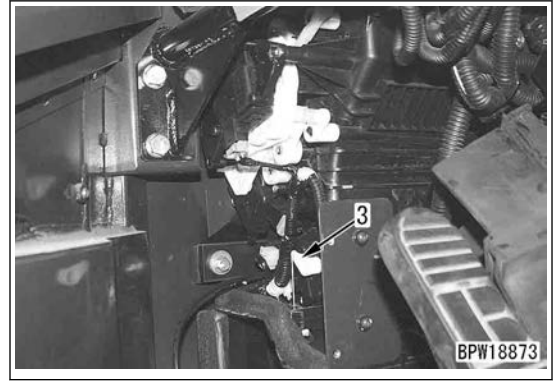
12: Fresh air filter

13: Machine monitor

14: Sunlight sensor

6. Operate the FRESH/RECIRC air selector switch to check whether FRESH/RECIRC air changeover damper (4) opens and closes or not.

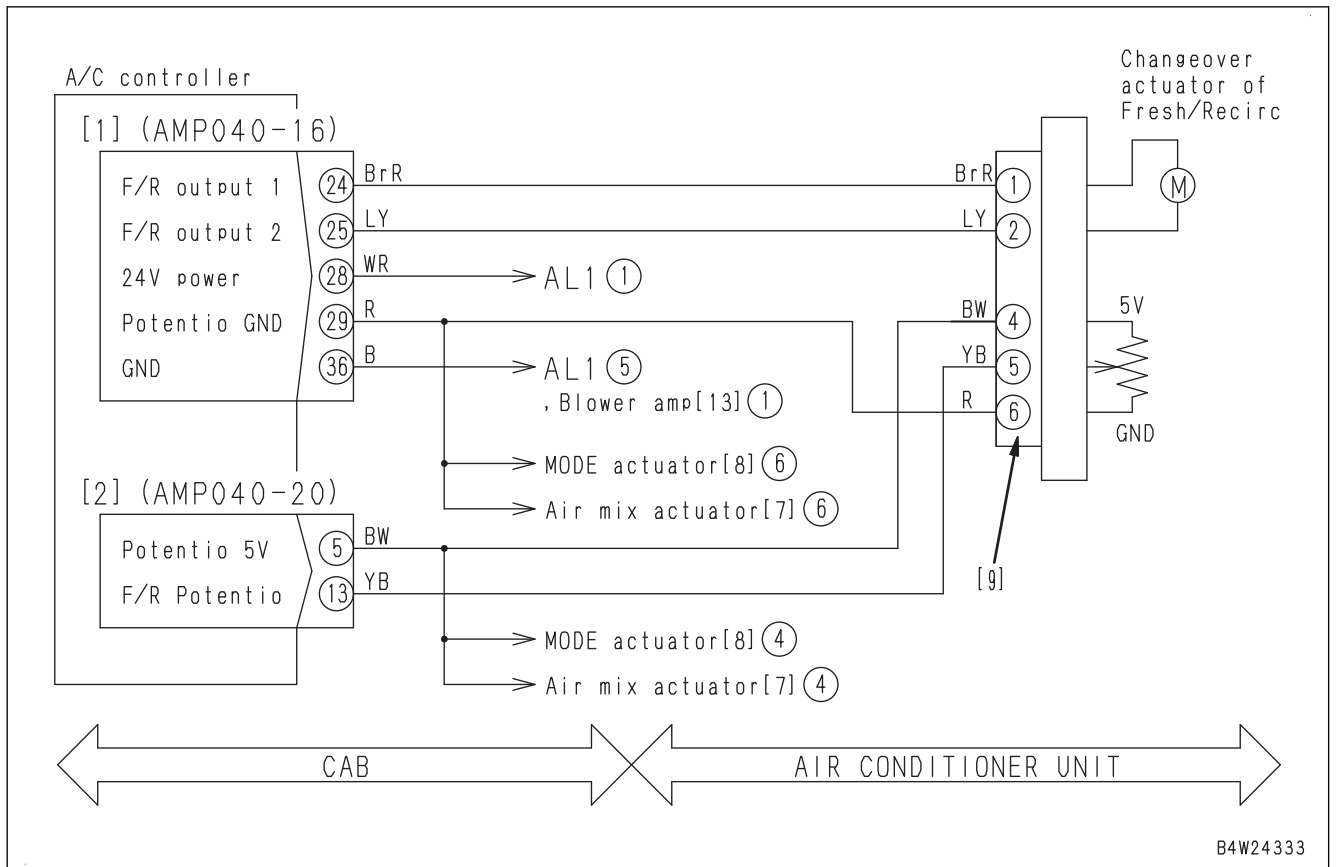
In case of FRESH air, lever (3) becomes as follows.



After completion of test, turn the starting switch to OFF position.

No.	Cause	Procedure, measuring location, criteria and remarks
4	Defective air conditioner wiring harness	Perform when the result of check on cause 2 is normal and the result of check on cause 3 is abnormal. Check by referring to circuit diagram.
5	Defective air conditioner controller	When test result for cause 2 is normal and that for cause 3 is abnormal and that for cause 4 is normal, air conditioner controller is defective.
6	Defective switch panel (defective switch)	1. Turn the starting switch to OFF position. 2. Display the air conditioner operation screen on the machine monitor.
		Press the FRESH/RECIRC air selector switch. Display is switched from the recirculation air inlet to the fresh air inlet.

### Circuit Diagram of FRESH/RECIRC Air Changeover

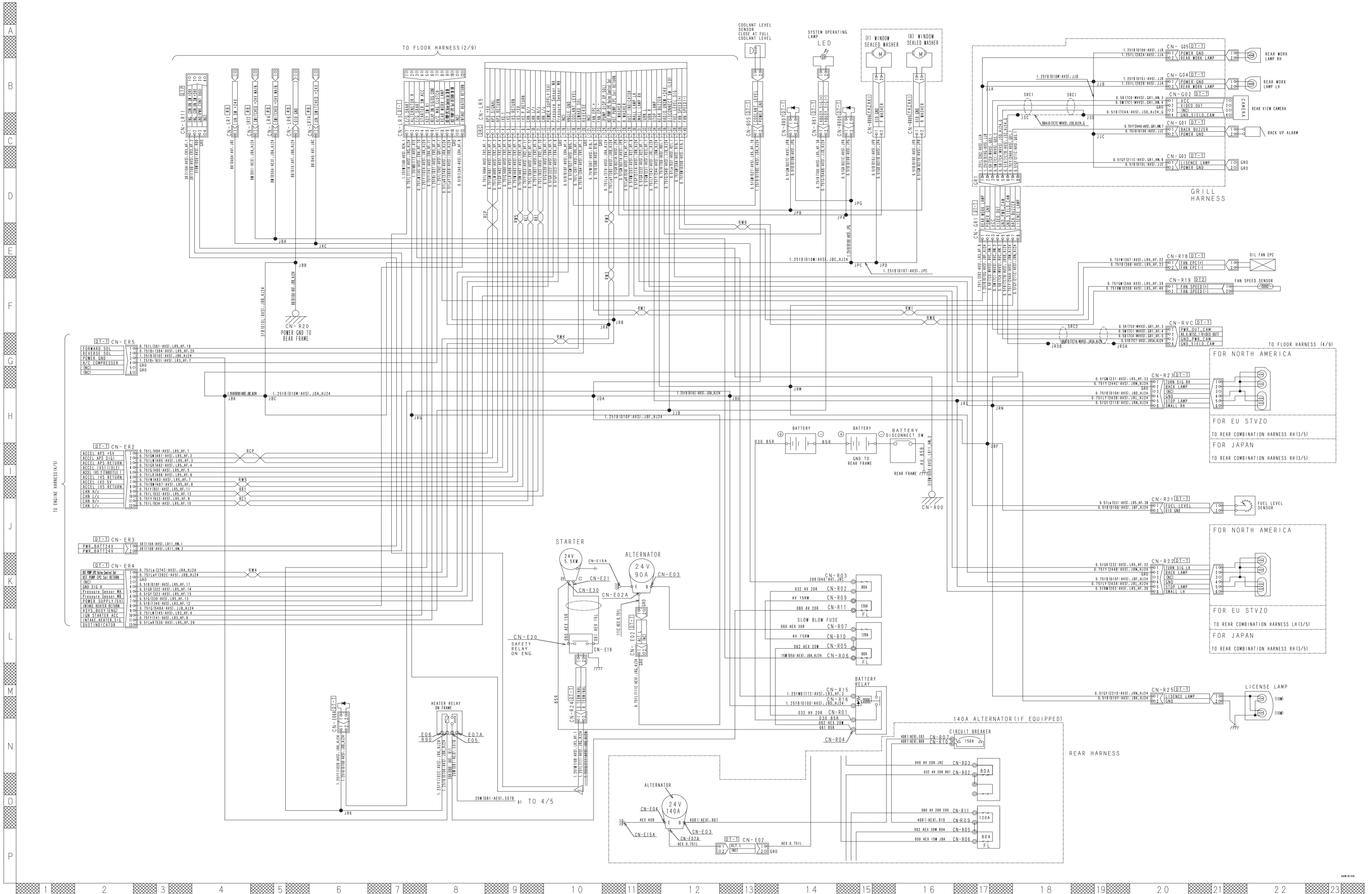


# Electrical Circuit Diagram of Machine (Machine with KOMTRAX Terminal) (2/7)

WA270-8

## REMARK

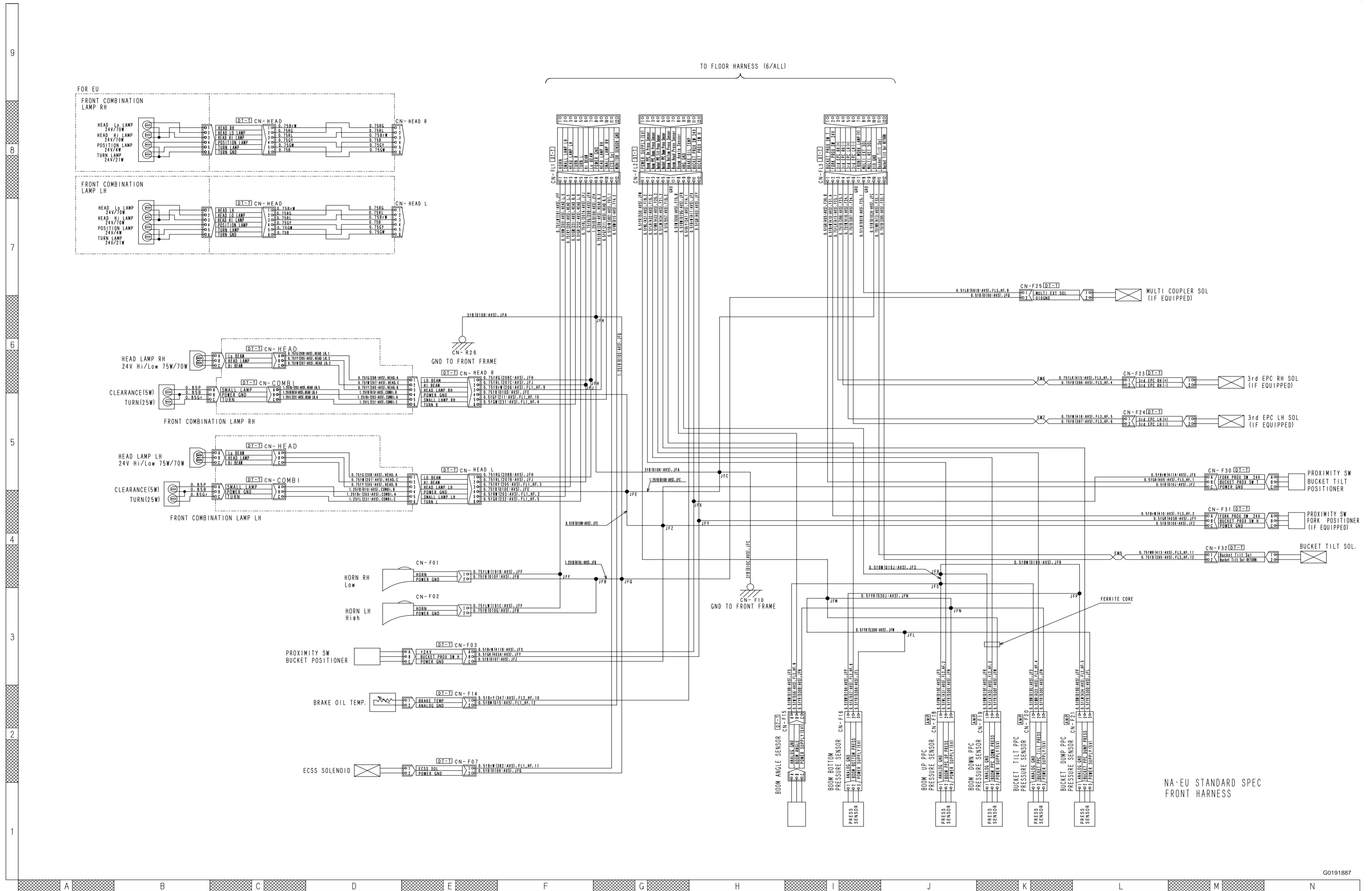
This figure covers the equipment and devices that are unavailable as optional items in some areas.



# Electrical Circuit Diagram of Machine (Machine with Gateway Function Controller and Collision Detection System) (Applicable Machine: 86600 and Up) (1/8)

## REMARK

This figure covers the equipment and devices that are unavailable as optional items in some areas.



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FRONT HARNESS

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