HITACHI

Training Text

EX1200-5

PERFORMANCE CHECK
TROUBLESHOOTING

Technical Training Center

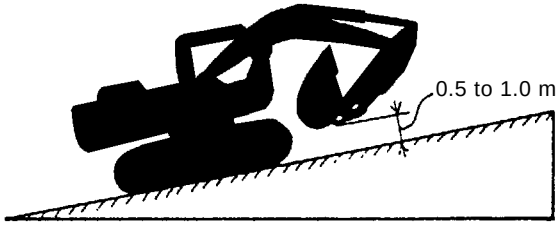
TRAVEL PARKING FUNCTION

Summary:
To measure the parking brake function on a specified slope.

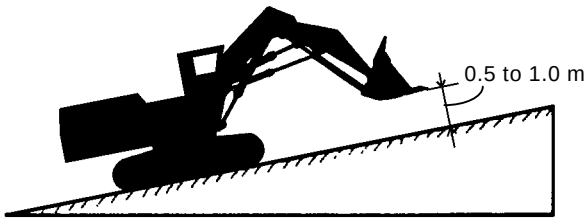
Preparation:
1. The surface of the test slope shall be even with a gradient of 20 % (11.31).
2. Hold the bucket 0.5 to 1.0 m (20 to 39 in) above the ground with the arm and bucket fully rolled in.
3. Maintain the hydraulic oil temperature at 50±5 °C (122±9 °F).

Measurement:
1. Climb the slope and place the travel levers in neutral.
2. Stop the engine.
3. After the machine stops, put alignment marks on a track link or shoe, and the track side frame.
4. After 5 minutes, measure the distance between the marks on the track link or shoe and the track side frame.

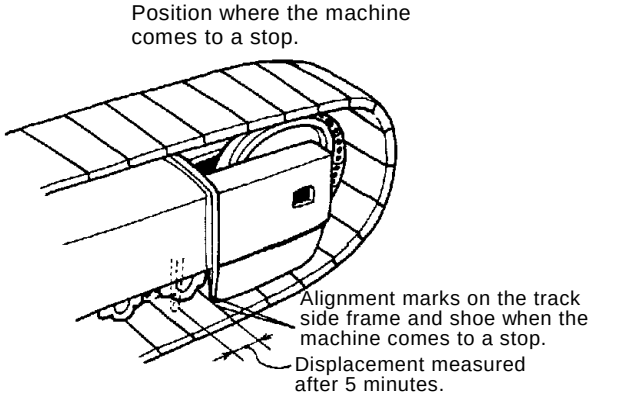
Evaluation:
Refer to T4-5 Operational Performance Standard.



T142-05-03-002



T118-04-03-001



T105-06-03-006

CYLINDER DRIFT

Summary:

1. While holding the soil weight of or a specified weight in the bucket, the dig function drift is measured to check for internal oil leaks in the control valve, boom, arm, and bucket cylinders.
2. After replacing the hydraulic cylinders, slowly operate each cylinder for approx. 10 minutes to bleed air from the hydraulic circuit before starting the test.

Preparation:

1. Load bucket fully. In lieu of loading the bucket, weight (W) of the following specification can be used.
   Backhoe: W=6000 kg (13200 lb)(Up to Serial No. 2122)
   W=6600 kg (14500 lb)(Serial No. 2123 and later)
   Loading Shovel: W=9450 kg (20800 lb)
2. Position the front attachment as described in the following.
   Backhoe:
   With the arm cylinder with rod approx.50 mm (2 in) extended from the fully retracted position, and bucket cylinder with the rod approx. 50 mm (2 in) retracted from the fully extended, position the arm top pin height flush with the boom foot pin height.
   Loading shovel:
   With the arm cylinder with the rod approx. 50 mm (2 in) retracted from the fully extended position, and bucket cylinder with the approx. 50 mm (2 in) retracted from the fully extended, position the arm top pin height flush with the boom foot pin height.
3. Maintain the hydraulic oil temperature at 50±5 °C (122±9 °F).

Measurement:

1. Stop the engine.
2. After five minutes have passed, measure the retractions of the boom, arm, and bucket cylinders as illustrated
3. Repeat step (2) three times and calculate the average values.

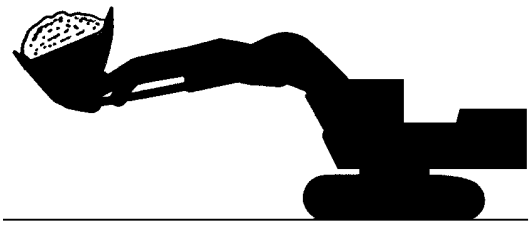
Evaluation:

Refer to T4-5 Operational Performance Standard.

Solution:

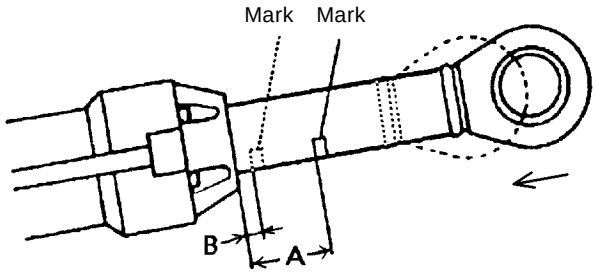
Refer to T5-4 Troubleshooting B.

T145-05-03-020



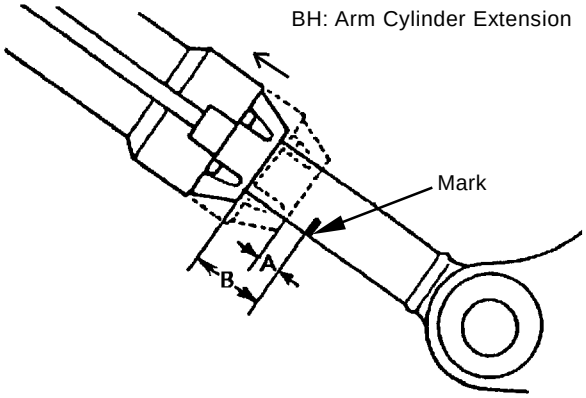
T145-05-03-021

BH: Boom and Bucket Cylinders Retraction
LD: Boom, Arm and Bucket Cylinders Retraction



T110-06-03-002

BH: Arm Cylinder Extension



T110-06-03-001

NOTE: BH: Backhoe
LD: Loading Shovel

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MAIN PUMP FLOW RATE MEASUREMENT

- P-Q Control (Torque Control)

Summary:

Main pump performance is checked by measuring the pump flow rate with a hydraulic tester installed at the main pump delivery line. Measure the flow rate by using the built-in diagnosing system and a pressure gauge.

Preparation:

IMPORTANT: The method described here is a simplified method, so that the flow rate is reduced by approx. 5% compared to the actual measurement (ex. bench test). If the actual measurement is required, connect the return circuit to the hydraulic oil tank instead of the control valve.

CAUTION: Do not quickly loosen the cap on the hydraulic oil tank. The cap may fly off due to internal pressure. Always turn the cap slowly to release any remaining pressure before removing it.

1. Stop the engine. Slowly loosen the cap to release air from the hydraulic oil tank. Connect the vacuum pump to the oil filler port.

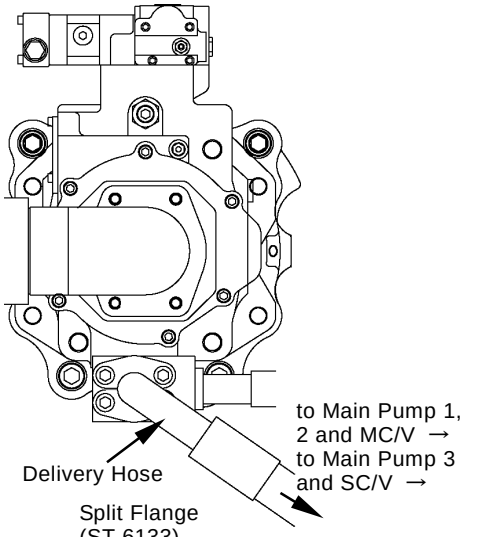
NOTE: Keep operating the vacuum pump while connecting the measurement piping.

2. Remove the delivery hose from the main pump to be measured, then install flange (ST 6123) on the removed hose using split flange (ST 6133) and bolt (ST 6458).

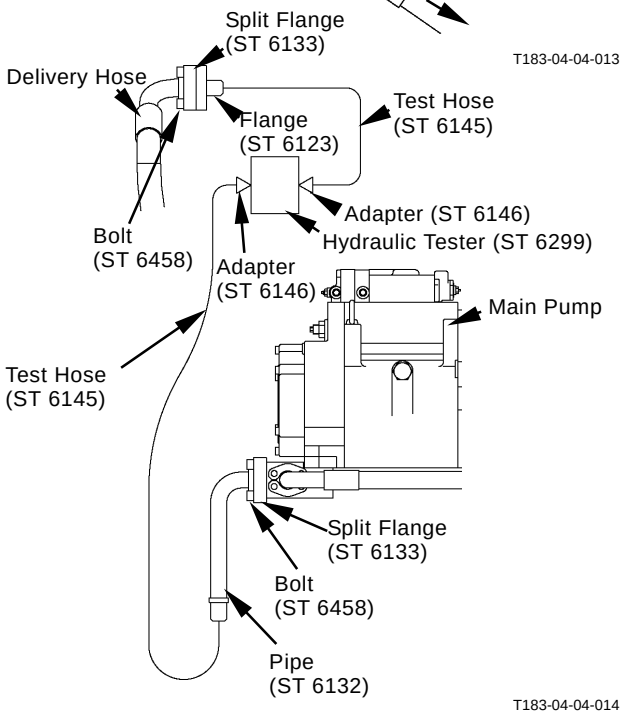
3. Install test hose (ST 6145), adapter (ST 6146) and hydraulic tester (ST 6299) on flange (ST 6123).

4. Install pipe (ST 6132) on the delivery port of the main pump using split flange (ST 6133) and bolt (ST 6458), then install test hose (ST 6145), adapter (ST 6146) and hydraulic tester (ST 6299) on the pipe.
   Remove a plug from the pressure check port on the main pump, then install adapter (ST 6069), hose (ST 6943) and pressure gauge (ST 6941).

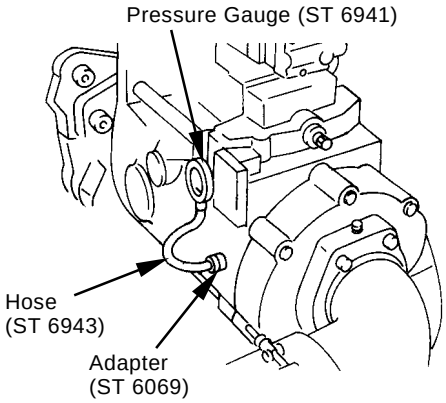
NOTE: MC/V: Main Control Valve
SC/V: Swing Control Valve



T183-04-04-013



T183-04-04-014



T183-04-04-003

Adjustment:

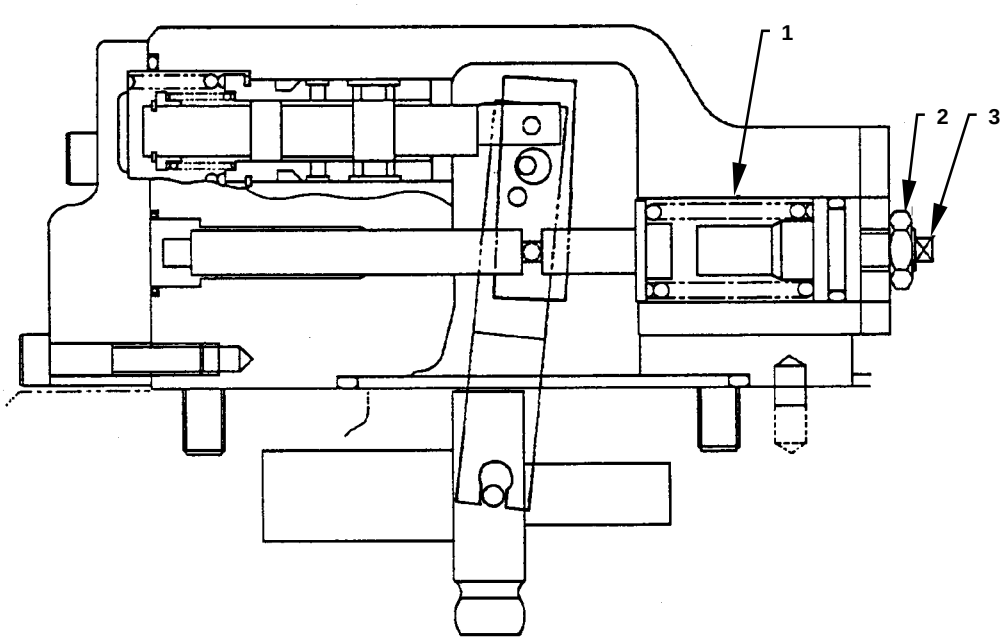
Adjustment of Flow Rate Control

The flow rate control is performed by pump flow rate control pressure Pi. Therefore, the flow rate control is adjusted by resetting the set-force of spring (1).

Loosen nut (2) and turn adjusting screw (3) to reset the set-force of spring (1).

NOTE: When the flow rate control is adjusted, the relief oil minimizing control is also changed at the same time.

: 13 mm : Nut (2)
: 4 mm : Adjusting Screw (3)

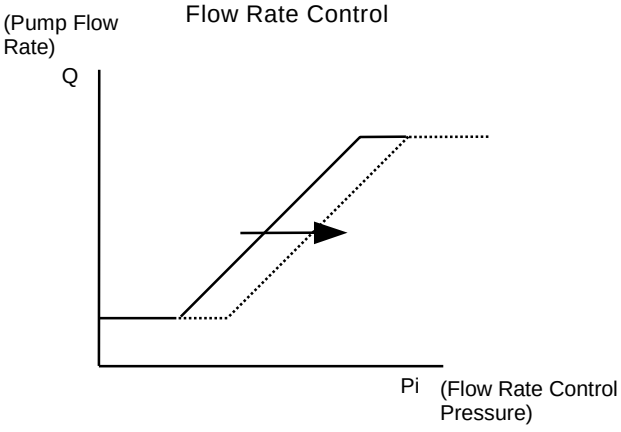


T117-05-04-006

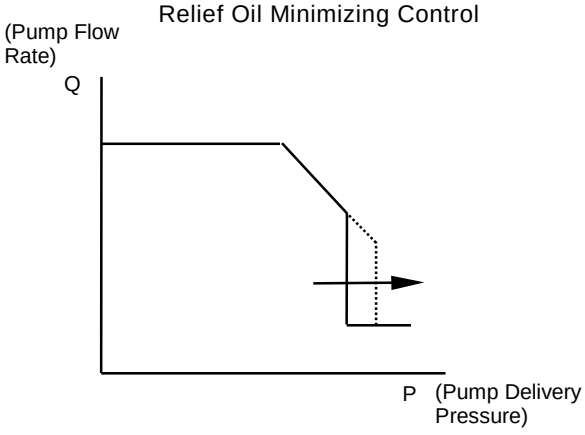
Spring Adjustment Data

Adjusting Screw Turn	1/4
Pressure Change (Pi)	0.13 MPa (1.3 kgf/cm^2) (18.9 psi)
Flow Rate Change	6.8 L/min (1.8 US gal/min)

Flow Rate Control



Relief Oil Minimizing Control



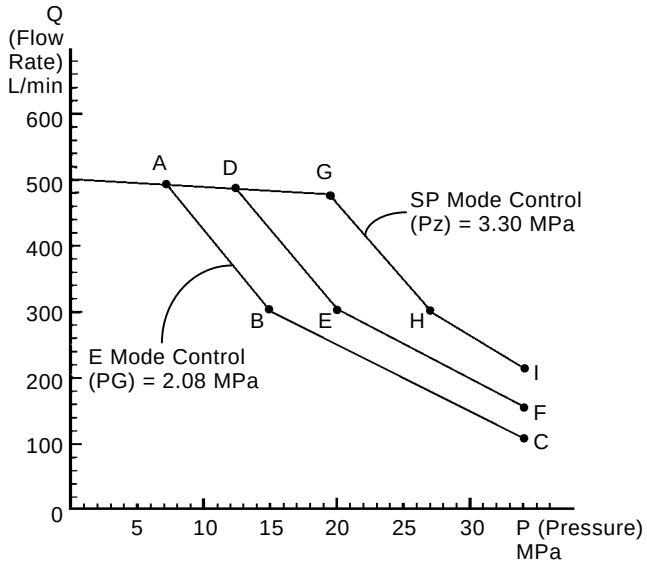
MAIN PUMP P-Q DIAGRAM

- Hydraulic P-Q Control
  - Rated Pump Speed: 1787 min^{-1} (rpm)
  - Pump Gear Reduction Ratio: 1.083
  - Hydraulic Oil Temperature: 50±5 °C (122±9 °F)

NOTE: Refer to T4-4-17.

Main Pump P-Q Diagram

	Q L/min (US gal/min)	P MPa (kgf/cm^2, psi)
A	490 (129)	8.4 (86, 1218)
B	312 (82)	15.7 (160, 2276)
C	107 (28)	33.3 (340, 4828)
D	485 (128)	12.6 (128, 1827)
E	307 (81)	19.9 (203,2885)
F	151 (40)	33.3 (340, 4828)
G	477 (126)	19.2 (196, 2784)
H	299 (79)	26.5 (270, 3842)
I	220 (58)	33.3 (340, 4828)



T183-04-04-005

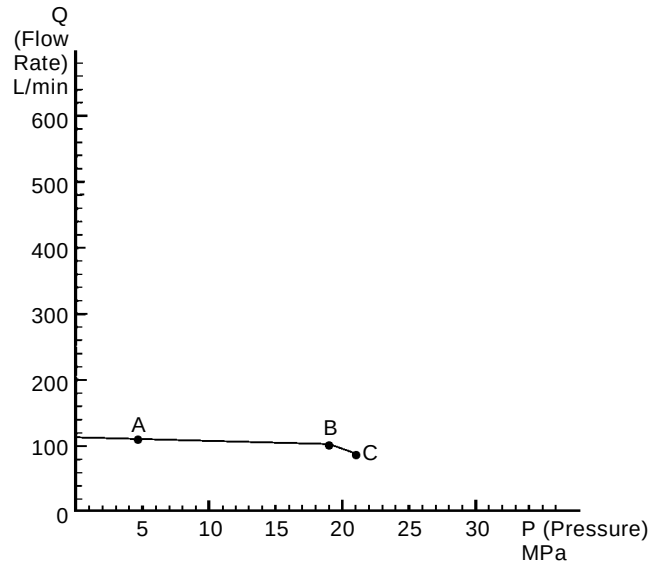
OIL COOLER FAN MOTOR DRIVE PUMP P-Q DIAGRAM

- Hydraulic P-Q Control
  - Rated Pump Speed: 1825 min^{-1} (rpm)
  - Pump Gear Reduction Ratio: 1.106
  - Hydraulic Oil Temperature: 50±5 °C (122±9 °F)

NOTE: Refer to T4-4-23.

Oil Cooler Fan Motor Drive Pump P-Q Diagram

	Q L/min (US gal/min)	P MPa (kgf/cm^2, psi)
A	100 (26)	4.9 (50, 710)
B	97 (25)	18.8±0.5 (192±5, 2726±72.5)
C	82 (21)	21.6 (220, 3132)



T183-04-04-017

BUILT-IN DIAGNOSING FUNCTION DISPLAY LIST

Main Controller A

Display Order	Description	Monitored Result	Unit	Remarks
1.	Hour Meter	○○○○○ h		Standard Mode
2.	Trip1	○○○○○ h		Standard Mode (Subtraction)
3.	Trip2	○○○○○ h		Standard Mode (Subtraction)
4.	Engine Actual Speed	n ○○○○	min^{-1}	Possible to display
5.	Hydraulic Oil Temperature	○○○	℃	Possible to display
6.		L1 ○○	—	Display Purpose Only
7.		L2 ○○○	%	Display Purpose Only
8.	Fault Code *	0 ○○	—	Possible to display
9.	Main Pump 1 Pressure	1 ○○○○	MPa	Possible to display
10.	Main Pump 2 Pressure	2 ○○○○	MPa	Possible to display
11.	Main Pump 3 Pressure	3 ○○○○	MPa	Possible to display
12.	Front Operation Pressure	4 ○○○○	MPa	Possible to display
13.	Travel Operation Pressure	5 ○○○○	MPa	Possible to display
14.	Engine Exhaust Gas Temperature	6 ○○○○	℃	Possible to display
15.	EC Angle	7 ○○○○	V	Possible to display
16.	Digital Input 0	8 ○○	2 Digits displayed in Hexadecimal Number **	Possible to display
17.	Digital Input 1	9 ○○	2 Digits displayed in Hexadecimal Number **	Possible to display
18.	Digital Input 2	A ○○	2 Digits displayed in Hexadecimal Number **	Possible to display
19.	Digital Input 3	b ○○	2 Digits displayed in Hexadecimal Number **	Possible to display
20.	Digital Output	c ○○	2 Digits displayed in Hexadecimal Number **	Possible to display
21.	Proportional Valve ON/OFF Output	d ○○	2 Digits displayed in Hexadecimal Number **	Possible to display
22.	Hydraulic Oil Cooling Output Current	E ○○○○	mA	Possible to display
23.	Power Increase Output Current	F ○○○○	mA	Possible to display

*NOTE: * Refer to T5-1-14 for the Fault Codes.*
*** Refer to T5-1-8 and T5-1-11 for 2 Digits displayed in Hexadecimal Number.*

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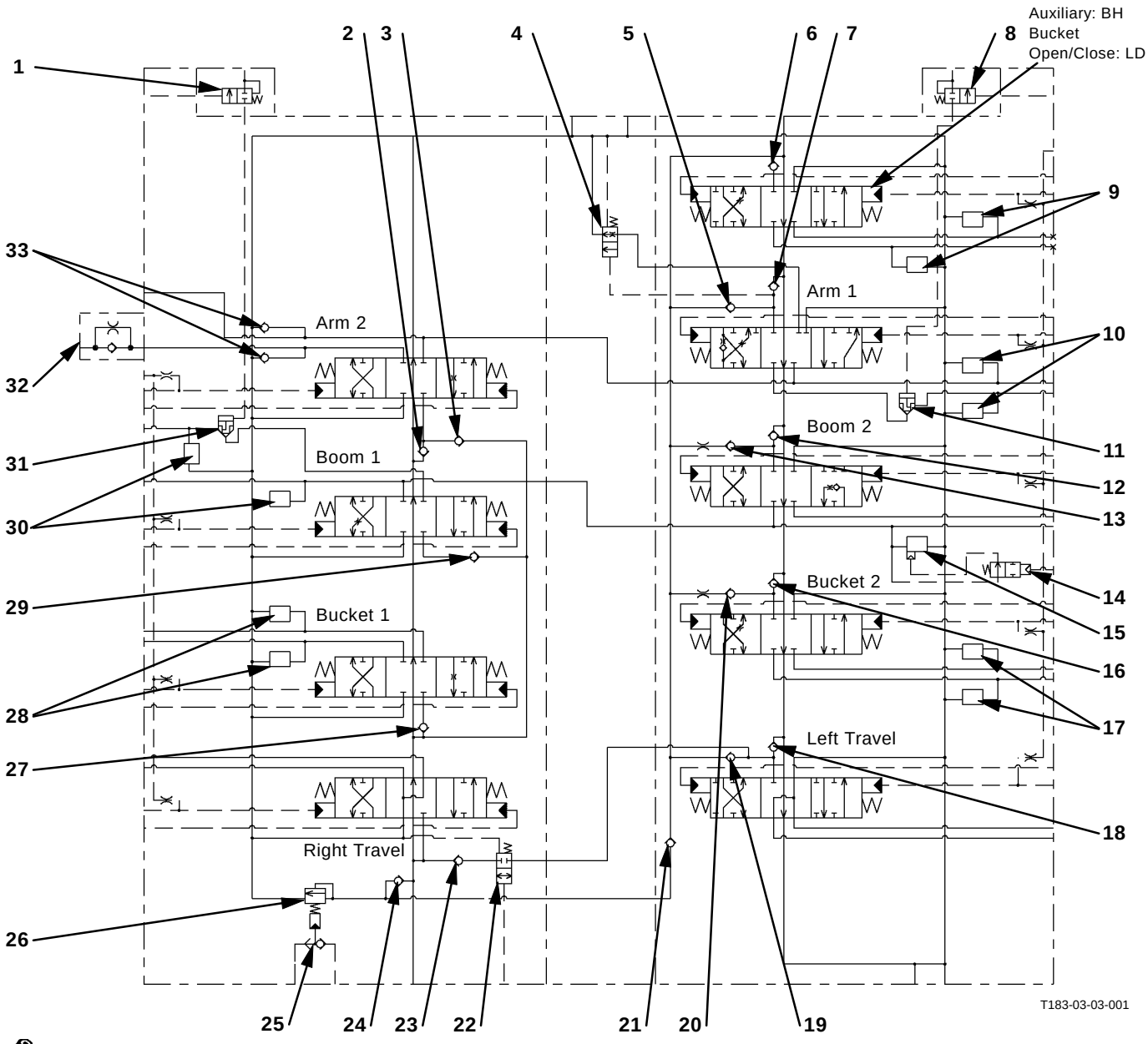


NOTE: BH: Backhoe
LD: Loading Shovel

1 - Holding Valve Switch Valve (Boom)
2 - Load Check Valve (Arm 2 Tandem Circuit)
3 - Load Check Valve (Arm 2 Parallel Circuit)
4 - Arm Regenerative Valve
5 - Load Check Valve (Arm 1 Parallel Circuit)
6 - Load Check Valve (Auxiliary Tandem Circuit)
7 - Load Check Valve (Arm 1 Tandem Circuit)
8 - Holding Valve Switch Valve (Arm)
9 - Overload Relief Valve (Aux.: BH, Bucket Open/Close: LD)
10 - Overload Relief Valve (Arm)
11 - Holding Valve Check Valve (Arm)
12 - Load Check Valve (Boom 2 Tandem Circuit)
13 - Load Check Valve (Boom 2 Parallel Circuit)
14 - Overload Relief Valve (Boom Mode Selection)
15 - Boom Overload Relief Pressure Switch Valve
16 - Load Check Valve (Bucket 2 Tandem Circuit)
17 - Overload Relief Valve (Bucket 2)
18 - Load Check Valve (Left Travel Tandem Circuit)
19 - Load Check Valve (Left Travel Parallel Circuit)
20 - Load Check Valve (Bucket 2 Parallel Circuit)
21 - Check Valve (Main Relief Pressure Combining Circuit)
22 - Flow Combiner Valve
23 - Check Valve (Travel Flow Combine Circuit)
24 - Check Valve (Main Relief Pressure Combining Circuit)
25 - Shuttle Valve
26 - Main Relief Valve
27 - Load Check Valve (Bucket 1 Tandem Circuit)
28 - Overload Relief Valve (Bucket 1)
29 - Load Check Valve (Boom1 Parallel Circuit)
30 - Overload Relief Valve (Boom)
31 - Holding Valve Check Valve (Boom)
32 - Slow Return Valve
33 - Make-up Valve (Arm 2)

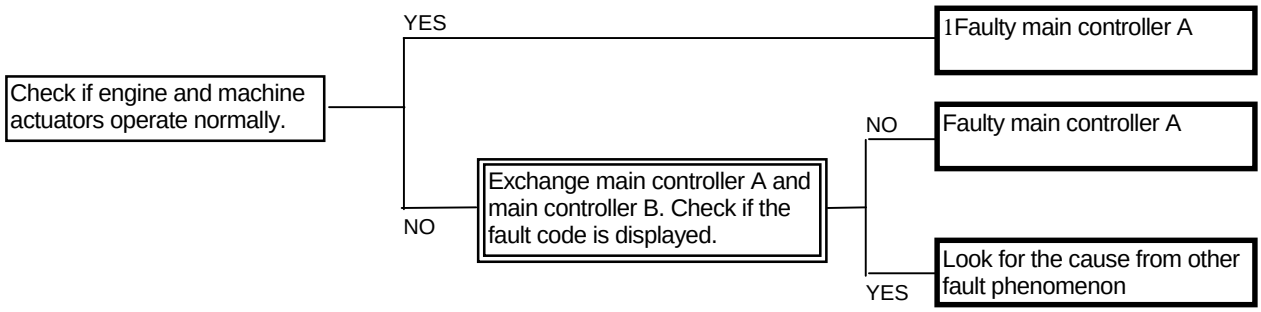
NOTE: BH: Backhoe
LD: Loading Shovel

Control Valve Side

Port Name	Connecting to	Note
Port 1	Control Valve	Boom Raise Pilot Pressure
Port 2	4	Plug
Port 3	4	Plug
Port 4	4	Plug
Port 5	4	Plug
Port 6	Control Valve	Arm Roll-Out Pilot Pressure (BH) Arm Roll-In Pilot Pressure (LD)
Port 7	Control Valve	Arm Roll-In Pilot Pressure (BH) Arm Roll-Out Pilot Pressure (LD)
Port 8	Control Valve	Bucket Roll-In Pilot Pressure
Port 9	Control Valve	Left Travel Forward Pilot Pressure
Port 10	Control Valve	Left Travel Reverse Pilot Pressure
Port 11	Control Valve	Right Travel Forward Pilot Pressure
Port 12	Control Valve	Right Travel Reverse Pilot Pressure
Port 13	Control Valve	Auxiliary Close Pilot Pressure (BH) Bucket Close Pilot Pressure (LD)
Port 14	Control Valve	Auxiliary Open Pilot Pressure (BH) Bucket Open Pilot Pressure (LD)
Port SE	Shuttle Valve	Boom Raise Priority Pilot Pressure
Port SM	Shuttle Valve	Auxiliary
Port SN	Shuttle Valve	Swing Brake Release
Port SP	Shuttle Valve	Swing Brake Release
Port SL	Control Valve	Combiner Valve Shifting Pressure
Port SK	4	Plug

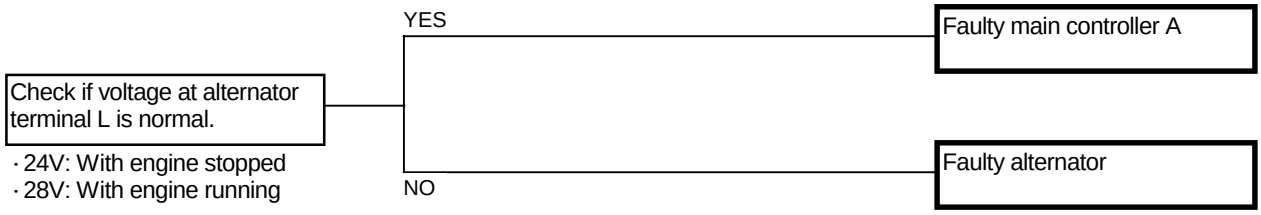
MAIN CONTROLLER A

FAULT CODE 01
ABNORMAL EEPROM
FAULT CODE 02
ABNORMAL RAM
FAULT CODE 03
ABNORMAL A/D CONVERSION

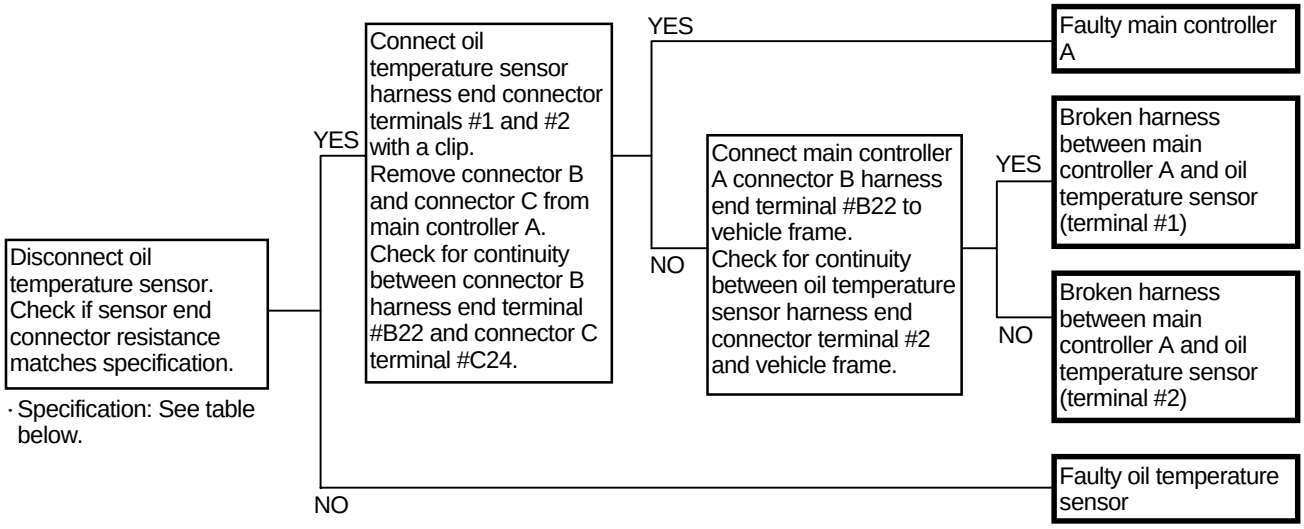


* Even if any fault codes are still displayed after retrying, the machine can be used unless there are malfunctioning on the engine or machine.

FAULT CODE 04
ABNORMAL SENSOR VOLTAGE



FAULT CODE 25
ABNORMAL OIL TEMPERATURE SENSOR

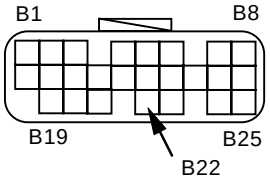


Oil Temperature Sensor Specification

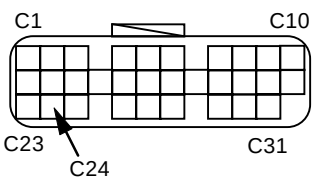
Oil Temperature		Resistance(kT)
(∀C)	(∀F)	
-20	-4	16.2∂1.6
0	32	(5.88)
20	68	2.45∂0.24
40	104	(1.14)
60	140	(0.534)
80	176	0.322

Connector (Harness End Connector Viewed from the Open End Side)

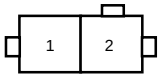
Main Controller A
Connector B



Connector C



Oil Temperature Sensor



All Actuator System Troubleshooting

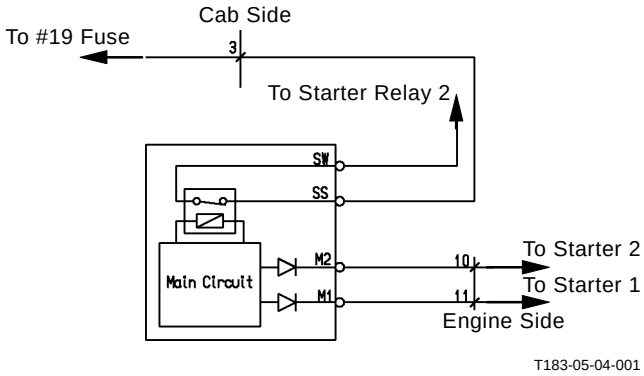
Trouble Symptom / Parts	A-1 All actuator speeds are slow.	A-2 All actuators are inoperable.	A-3 Actuator does not stop even if lever is returned to neutral.	A-4 SP mode is inoperable.
Main Controller A	●			●
Switch Box				●
Flow Rate Decrease Solenoid Valve	●			
Power Decrease Solenoid Valve	●			
Power Increase Solenoid Valve				●
Engine Speed Sensor 1	●			●
Spool			●	
Main Relief Valve	●			
Main Pump / Regulator	●			●
Pilot Pump		●		
Pilot Valve			●	
Pilot Relief Valve		●		
Shuttle Valve (Swing Make-Up)	●			
Shockless Valve (Pump 2 Regulator Pressure Pi Circuit Side)	●			

(2)Relay System Troubleshooting

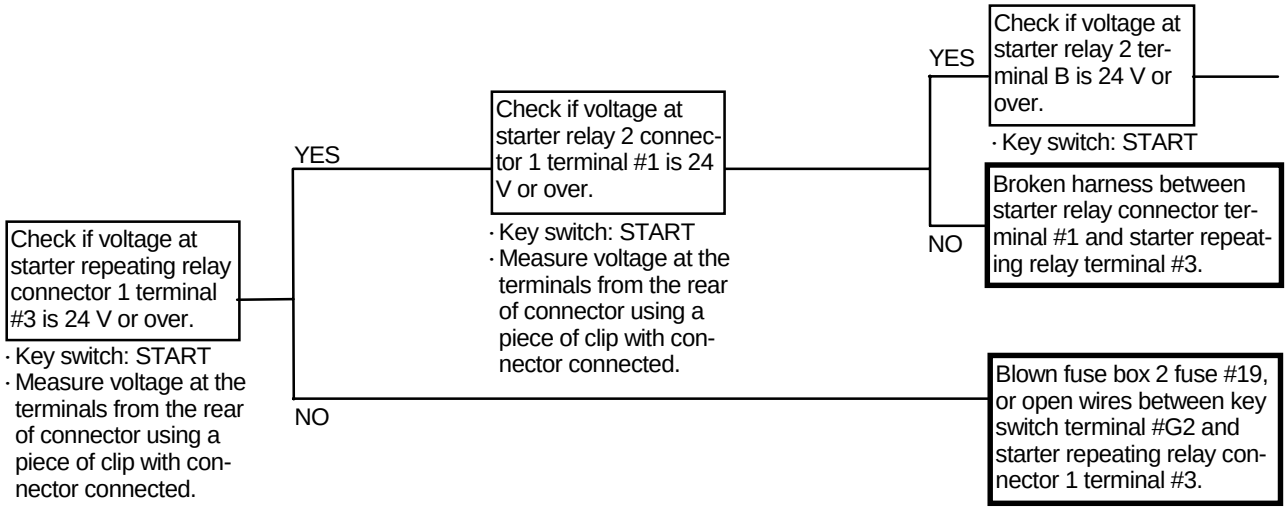
Before troubleshooting, check the start repeating relay unit separately.

Test Procedures

1. Disconnect connectors 1 and 2 connected to the starter repeating relay.
2. Supply voltage of 24V to all of relay end connector terminals #3, #10 and #11 from the battery. (Connect directly from the battery using harnesses.)
3. Measure the voltage at relay end connector 2 terminal #1. Check if it indicates 24 V.
   * When 0 V is indicated, the starter repeating relay is faulty.
4. Remove one of the harnesses connected to relay end connector terminals #10 or #11, then connect it to the vehicle frame.
5. Measure voltage at connector 2. Check if the voltage indicates 24 V - 0 V alternately.
   * When either 24 V or 0 V is indicated, the starter repeating relay is faulty.

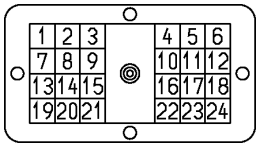


T183-05-04-001



Connector

Starter Repeating Relay Connector 1 (Relay Side)

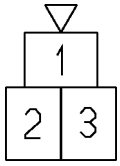


T183-05-04-002

Starter Relay 2 Connector 2

T146-05-04-006

Starter Relay 2 Connector 1

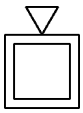


T183-05-04-101

Starter Relay 2 Terminal B Connector

T146-05-04-006

Starter Relay 2 Terminal C Connector

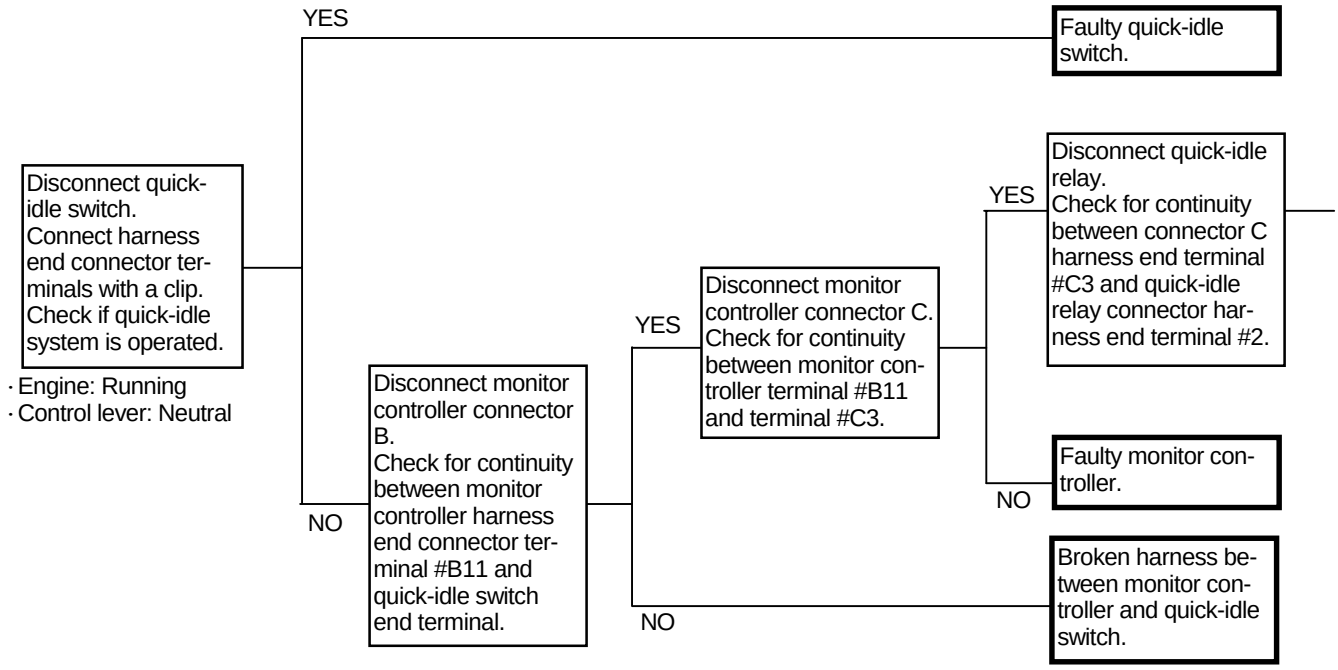


T146-05-04-008

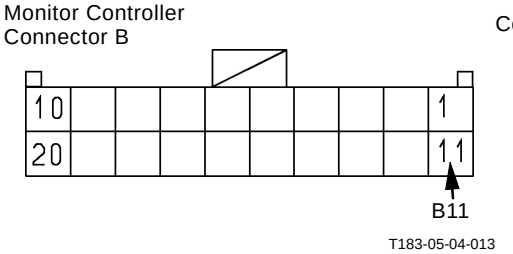
E-6 Quick-idle system is inoperable.

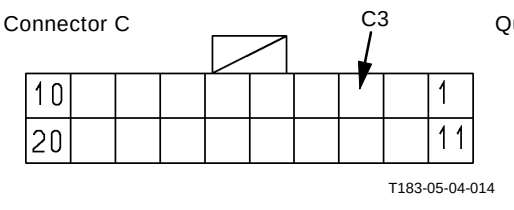
- Check for loose harness connections beforehand.

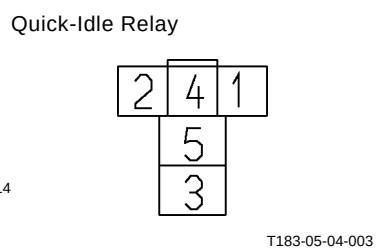
NOTE: When the auto-idle switch is turned ON, the quick-idle system operates after 3 seconds.



Connector

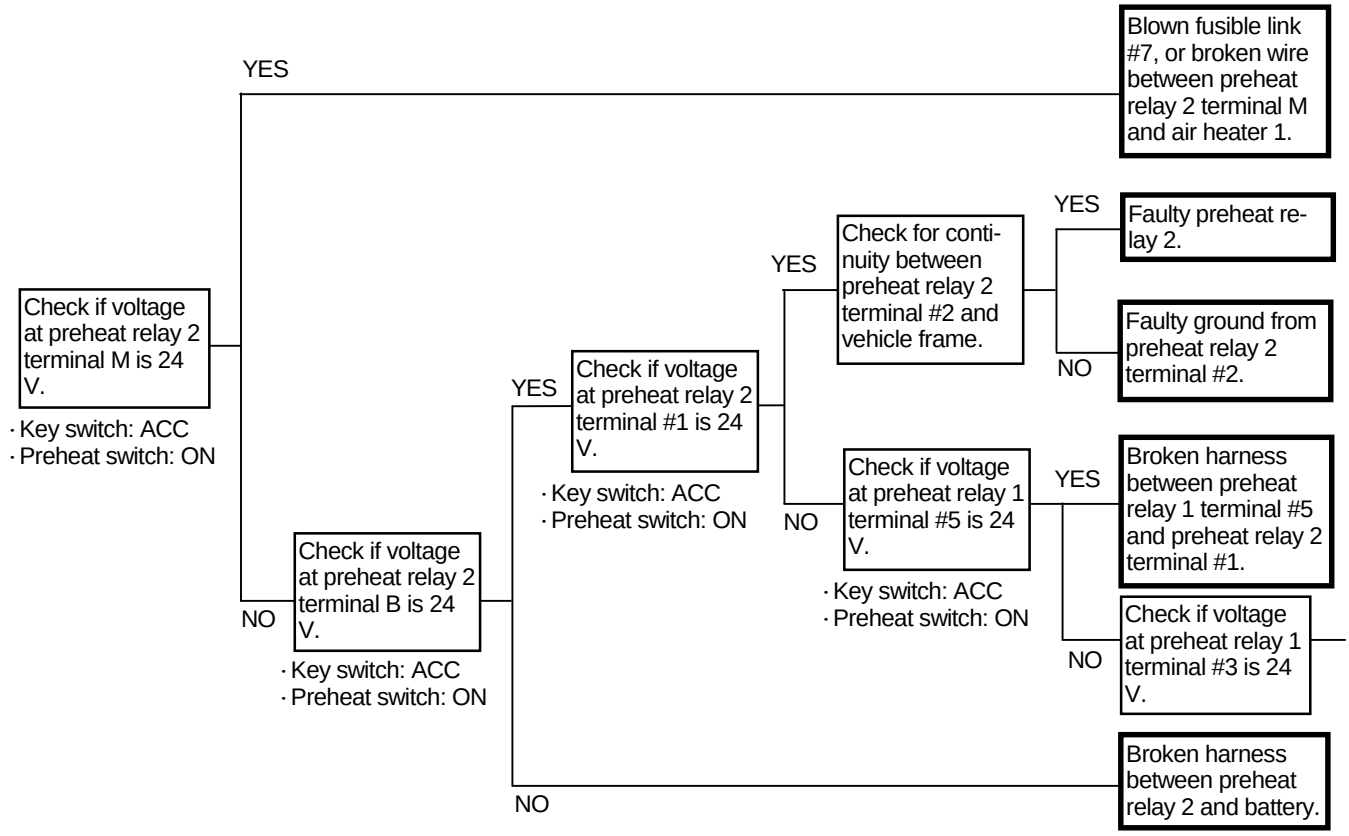






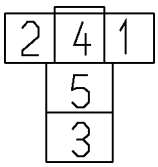
E-11 Even if preheat switch is pressed, air heater 1 does not operate. (Engine is difficult to start)

- This troubleshooting should be applied only when the air heater 1 in the engine doesn't operate. In case the preheat indicator only doesn't light, refer to Troubleshooting C.
- When the preheat switch is pressed, the air heater 1 is heated by electricity for 60 seconds. When measuring voltages in the circuit, check the voltage within 60 seconds after pressing the preheat switch, or turn the preheat switch OFF and wait for more than 60 seconds. Then, press the preheat switch again.



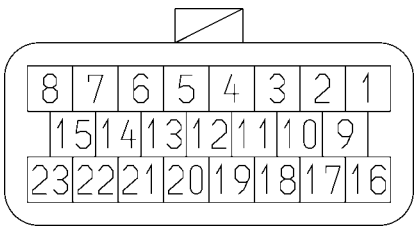
Connector

Preheat Relay 1



T183-05-04-003

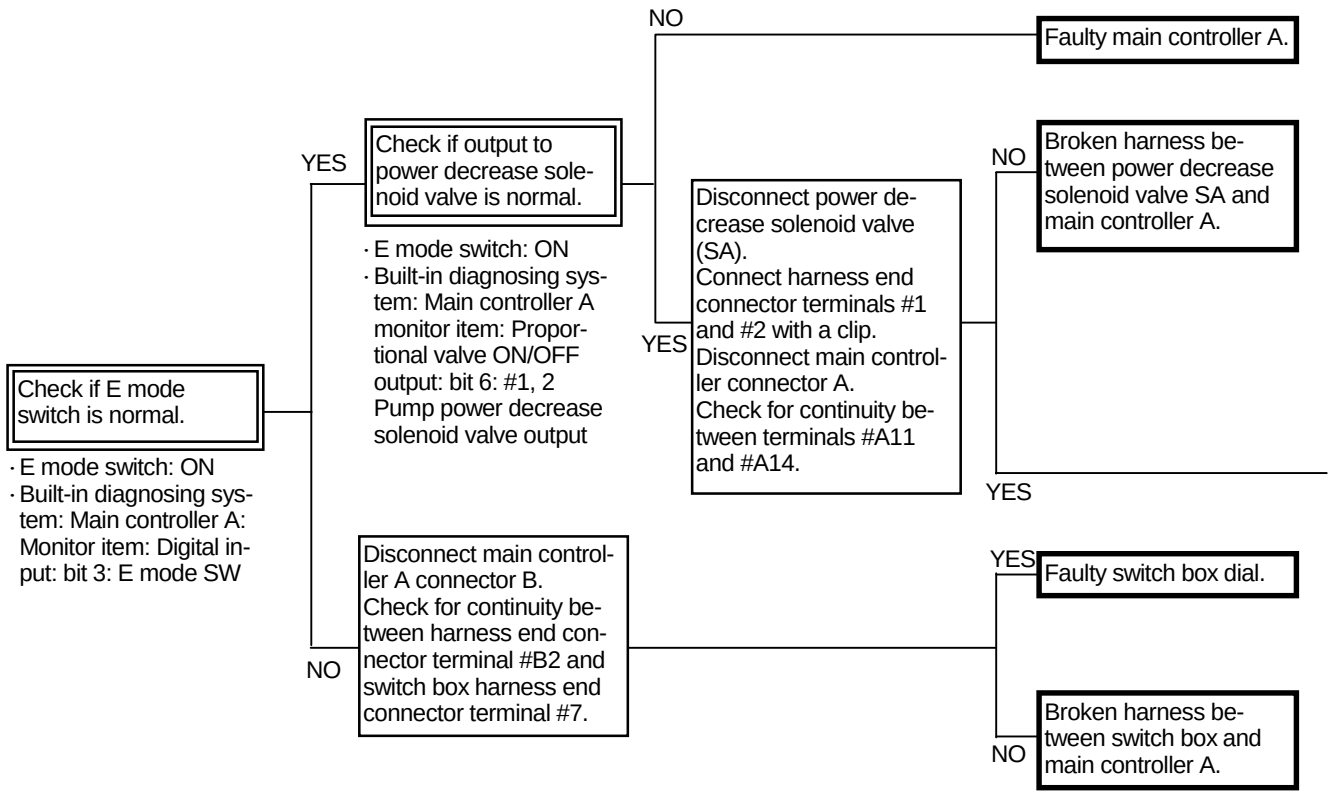
ECM Connector J2 (white)



T146-05-03-004

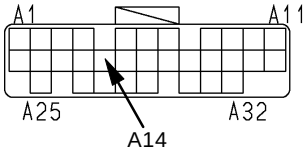
A-5 E mode is inoperable.

- In case main controller, power decrease solenoid valve or regulator of main pump 3 is inoperable, engine may stall below 1400 min^{-1} even if E mode switch is turned OFF.
- Check for loose harness connections beforehand.

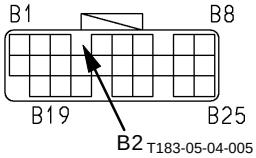


Connector

Main Controller A
Connector A

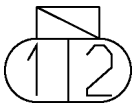


Connector B



T183-05-04-005

Power Decrease Solenoid Valve

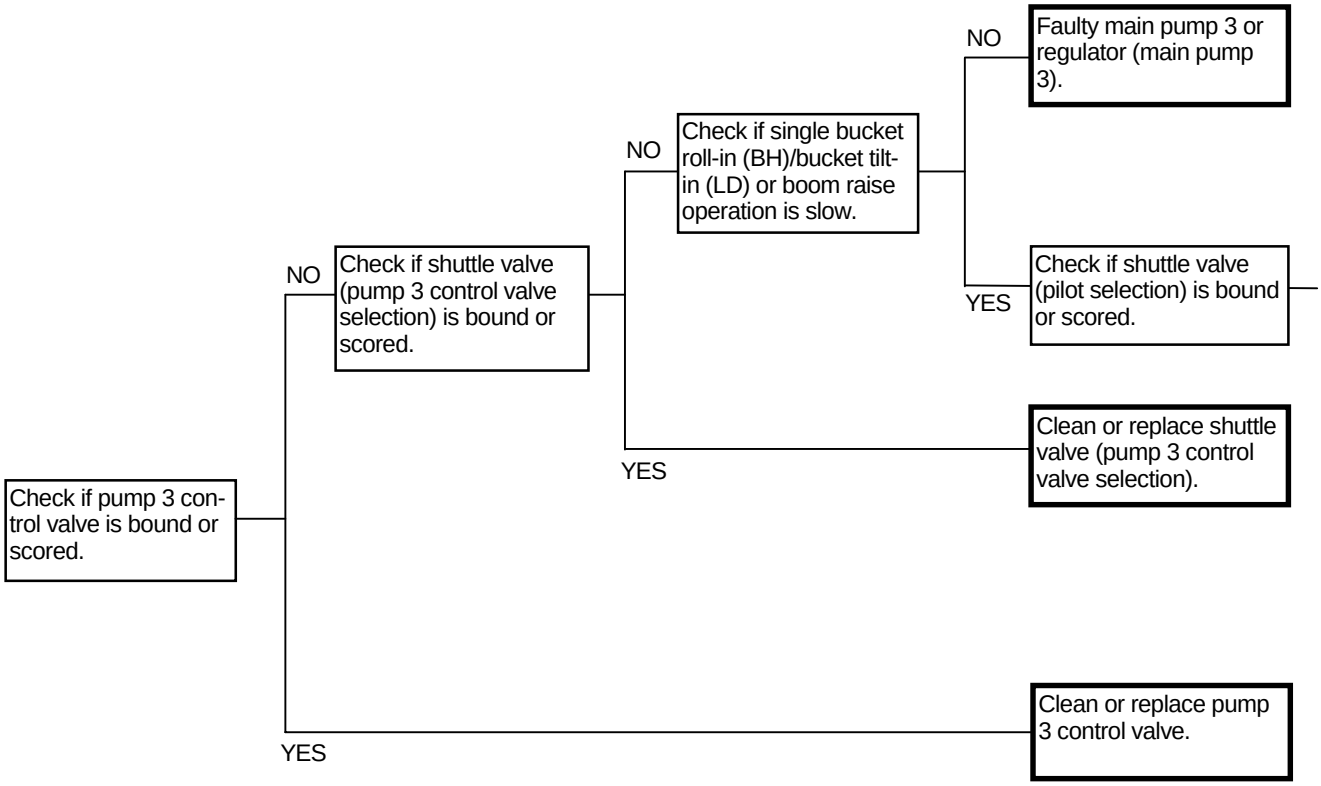


T183-05-04-010

F-6 Single arm roll-in (BH)/arm extend (LD), bucket roll-in (BH)/bucket tilt-in (LD) or boom raise operation is slow.

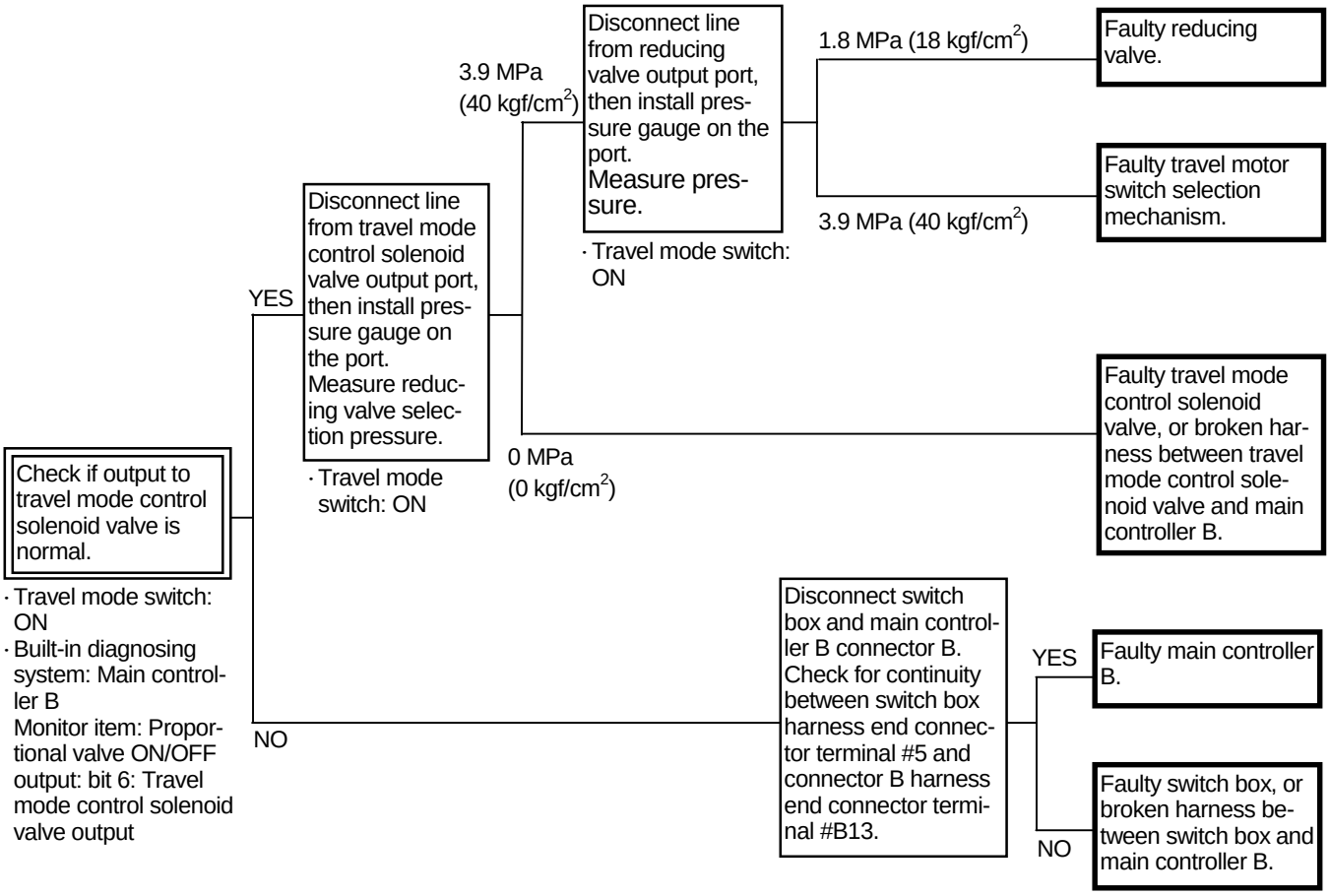
NOTE: BH: Backhoe
LD: Loading Shovel

- The pump 3 control valve is switched at single arm roll-in/arm extend (LD), bucket roll-in (BH)/bucket tilt-in or boom raise operation, so that pressure oil from the pilot circuit is applied directly to the main pump 3 regulator as flow rate decrease pressure Pi. Therefore, the delivery volume of the main pump 3 increases.
  (Refer to the pages for the Pilot Circuit and Main Pump 3 Flow Rate Control Circuit in the Hydraulic System group in the SYSTEM section in the Technical Manual (Operational Principle))



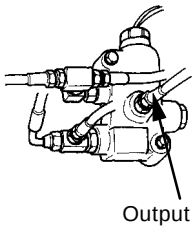
T-2 Fast travel is inoperable.

- If the other solenoid valves are also not activating, check the fuse.
- Check for loose harness connections beforehand.



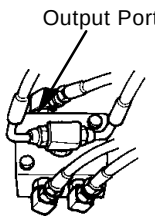
Connector
(Harness End Connector Viewed from the Open End Side)

Travel Mode Control Solenoid Valve (Lower Side)



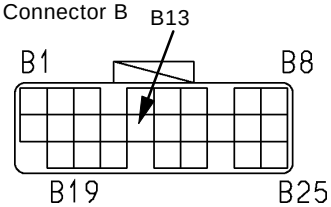
T183-05-04-019

Reducing Valve



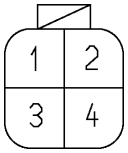
T183-05-04-020

Main Controller B Connector B



T183-05-04-021

Travel Mode Control Solenoid Valve



T183-05-04-022

Switch Box

7	6	5	●	4	3	2	1		
16	15	14	13	12	11	10	9	8	

T183-05-04-004

Proximity Switch Adjustment Procedure

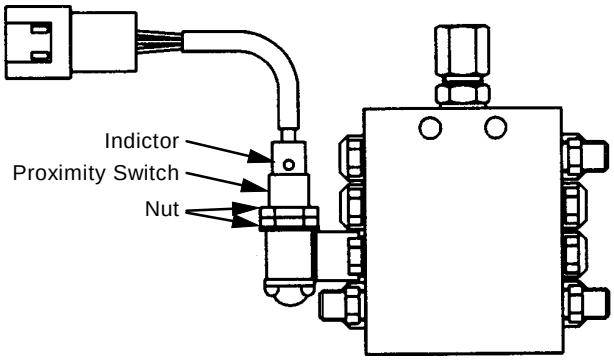
1. Loosen the nut.
   : 17 mm

2. Slowly tighten the proximity switch by hand until the end of the proximity switch touches the protrusion.

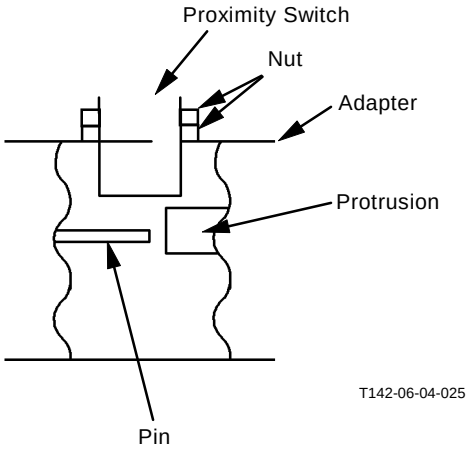
3. Loosen the proximity switch 1/2 to 1 turn. Be sure that the indicator faces in the direction of as the figure on the right.

IMPORTANT: The proximity switch may break.
Do not excessively tighten the nuts.

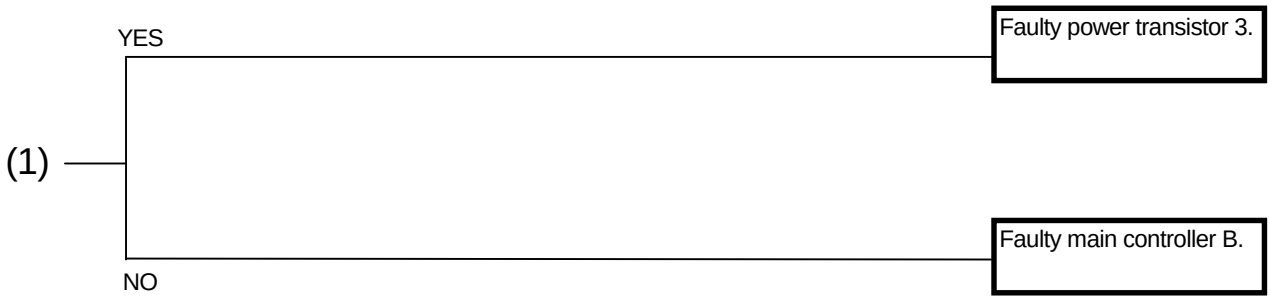
4. Tighten the nut to secure the proximity switch.
   : 17 mm
   : 0.78 N ﬁm (0.08 kgf ﬁm, 0.57lbf ﬁt)



T142-06-04-024



T142-06-04-025



※ Please fill in all sections and return this AIR CONDITIONER TROUBLE REPORT to Hitachi Tsuchiura Works Quality Assurance Dept. after experiencing a problem with your machine's air conditioning system.

{ AIR CONDITIONER TROUBLE REPORT } File No.

(1) What

Model	(Serial No.)		
Operation Type	Manual	Semi-Auto	Full-Auto
Delivery Date	Year Month		

Checked by:

(2) When

Date	Year Month Day		Operating Hour (h)	
Time	Morning	Daytime	Evening	Night
Frequency	Every Day	Once a Week	Once a Month	Times per

(3) Where

Job Site Address	State County Town	
Access Road Condition	Paved	Not Paved (Gravel Sand Soil)

(4) How (Operating Conditions)

Weather		Fine	Cloudy	Rain	Snow
Atmospheric Temperature		Very Hot	Hot	Cold	Very Cold
Operating Conditions		Parking	Traveling	Working	
Control Panel	Temperature Control	Paint blanks equal to red indicators. / Fill in set-temperature when full-auto operation			
	A/C	ON		OFF	
	Air Induction	Re-Circulation		Fresh Air Circulation	
	AUTO	ON	OFF	Not Available	
	Fill following items when operated in manual mode or when manual control type unit is used.				
	Vent Position	Front	Front / Rear	Foot	Front / Rear and Foot
	Fan	First	Second Third	Fourth	Fifth Sixth

(5) How (Problem Symptom)

Abnormal Compressor Operation	
Symptom	Not turned ON
	Not turned OFF
	Others
Uncontrollable air temperature	
Symptom	No cool air
	No warm air
	Others
Uncontrollable air volume	
Symptom	Air flows in Hi mode only
	No air flows
	Small air volume
	Others
Uncontrollable vent hole	
Symptom	Vent hole isn't selected
	Others
Abnormal panel indication	
Faulty Indicator	Vent Hole
	A/C
	AUTO
	Fresh Air Circulation
	Fan OFF
	Fan (Lo ∉ ∉∉ Hi)
	Temperature Control
Symptom	Stays OFF
	Stays ON
	Blinks
	Others

{Check Result}

(1) Is problem reproducible ?

Reproducible
Not reproducible

(2) Pressure (To be measured at gauge manifold)

Low Pressure
High Pressure

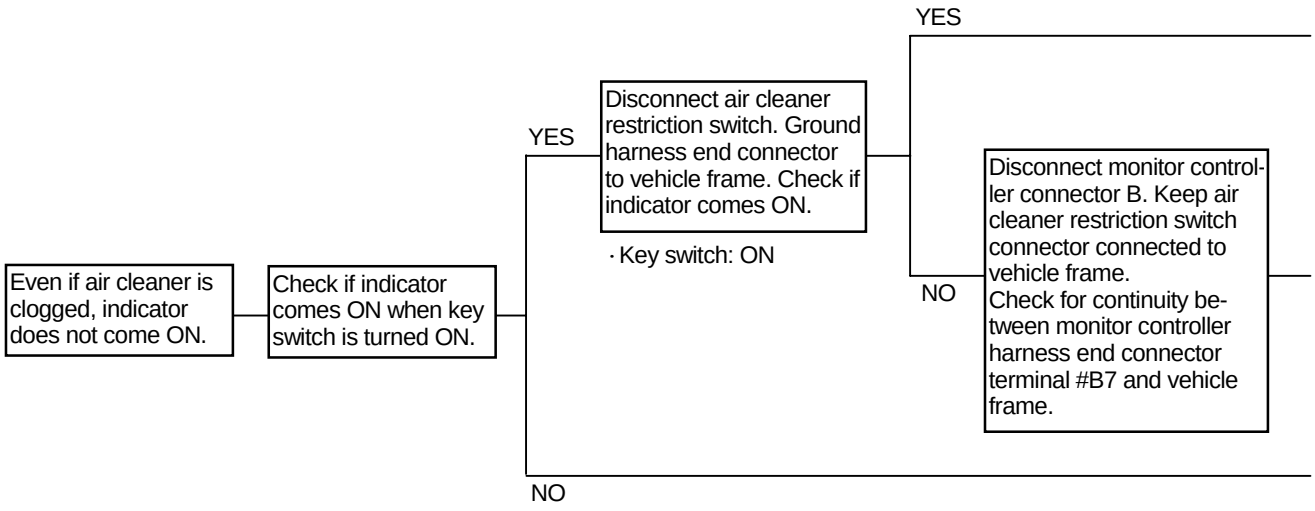
(3) Which parts have been replaced ?

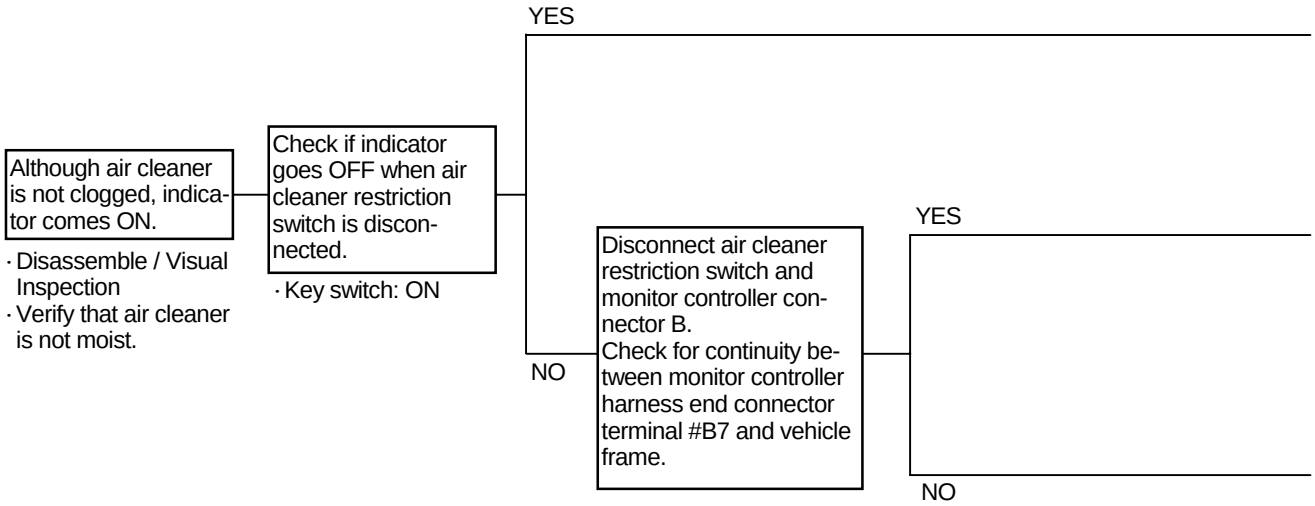
1 2

1 Before replacing the control amplifier, be sure to check that the connectors are correctly connected while repeatedly disconnecting and reconnecting connectors.

MALFUNCTION OF AIR CLEANER RESTRICTION INDICATOR

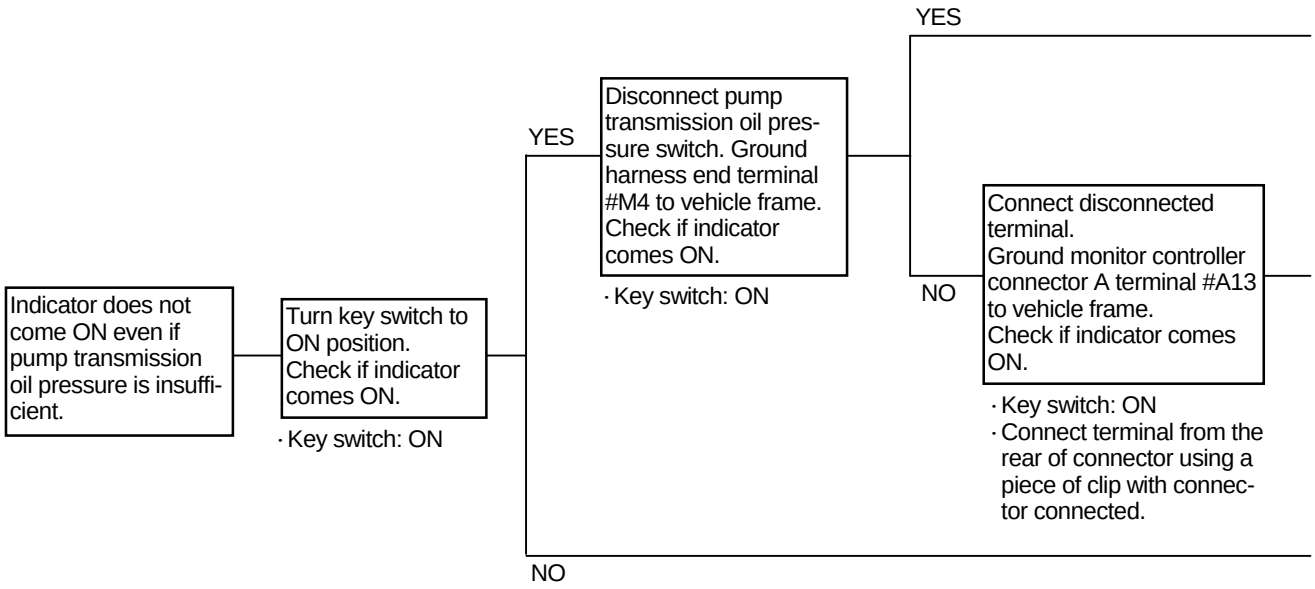
- Check for loose harness connections beforehand.

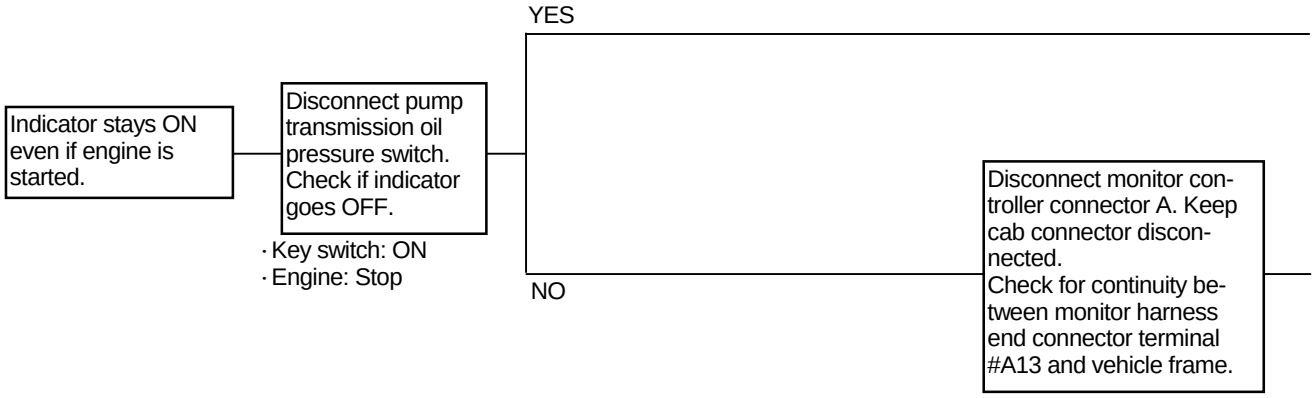




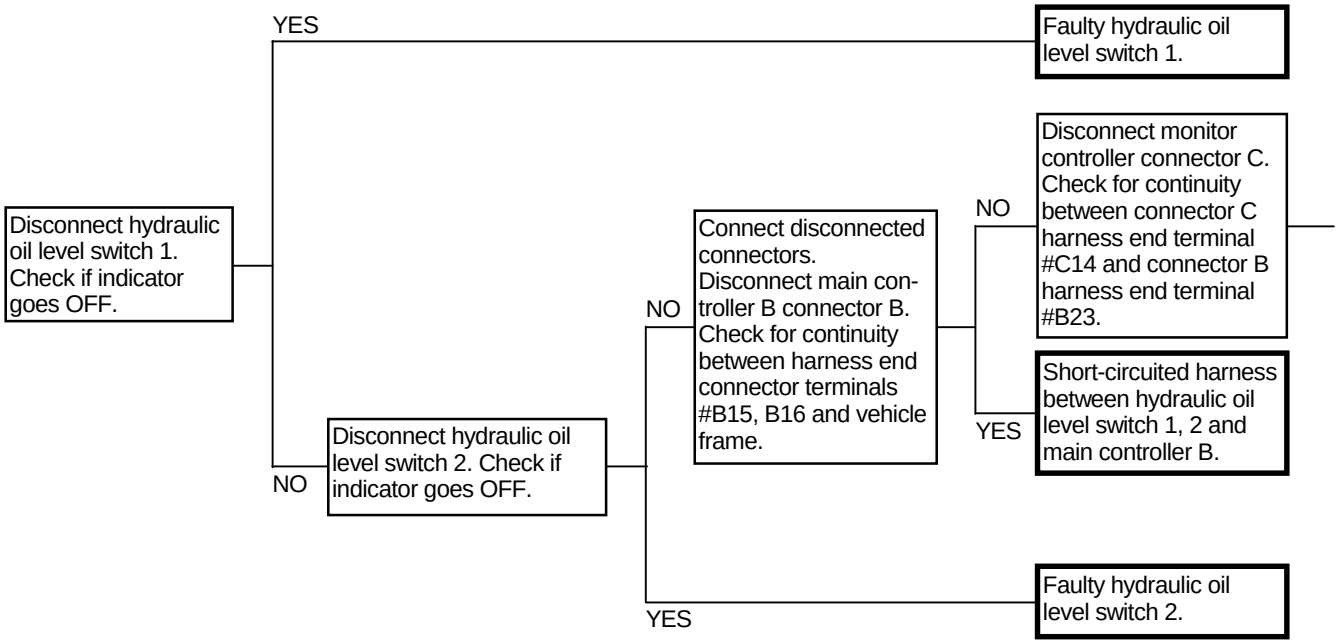
MALFUNCTION OF PUMP TRANSMISSION OIL PRESSURE INDICATOR

- Check for loose harness connections beforehand.



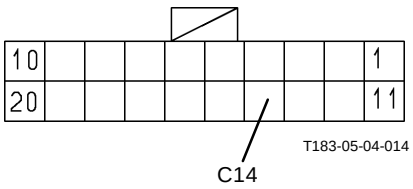


Indicator Comes ON Even If Hydraulic Oil Level Is Normal



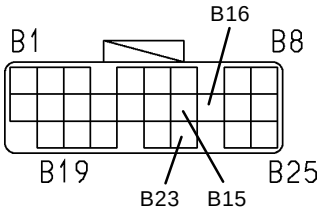
Connector

Monitor Controller
Connector C



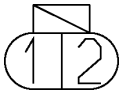
T183-05-04-014

Main Controller B
Connector B



T183-05-04-021

Hydraulic Oil Level Switch 1, 2



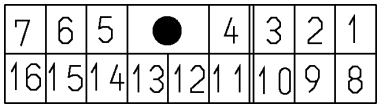
T183-05-04-010

MALFUNCTION OF AUTO-IDLE INDICATOR

- Check for loose harness connections beforehand.

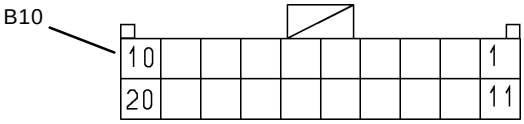
Connector

Switch Box

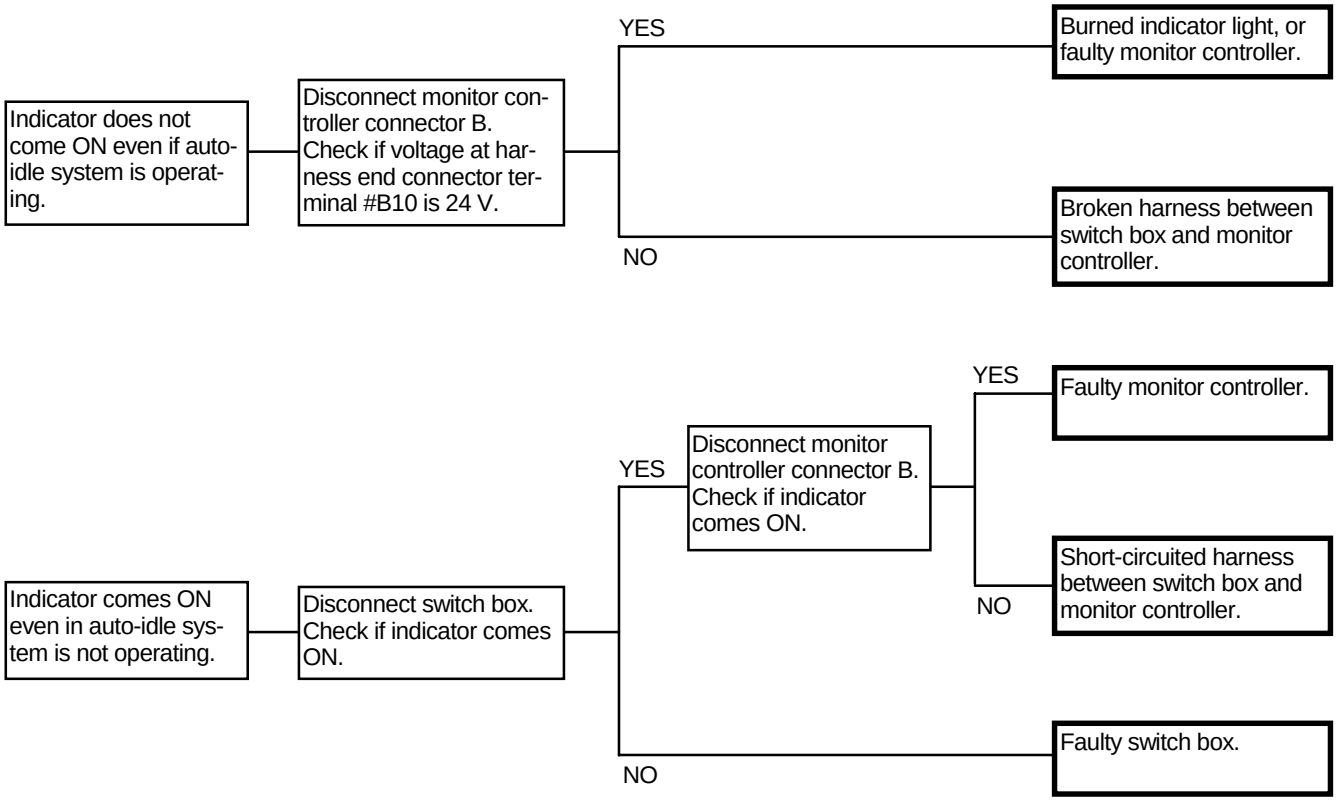


T183-05-04-004

Monitor Controller
Connector C



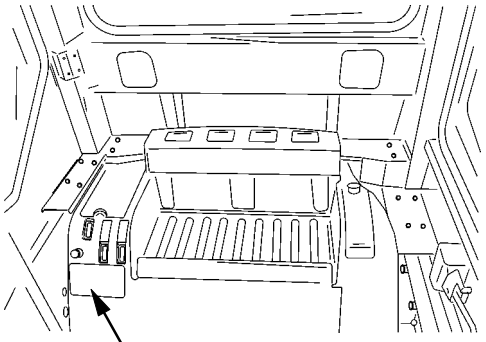
T183-05-04-013



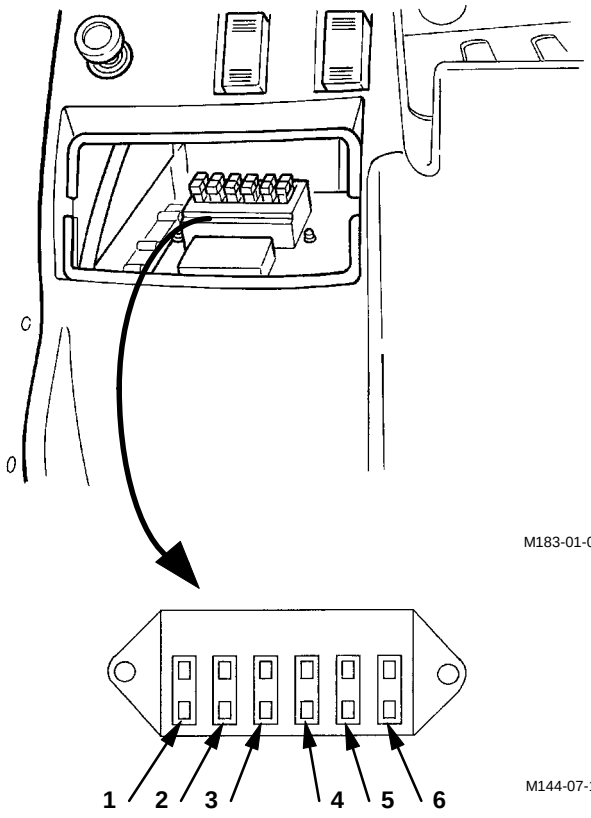
(Blank)

Fuse Box (ECM)

Remove side cover from the right console in the cab. Fuses are located in the position as illustrated to the right.



M183-01-008



M183-01-082

M144-07-111

Connection in Fuse Box (ECM)

Fuse No.	Description	Capacity	Connected to	Remarks
1	ECM Main Power Source	20 A	ECM Relay	Main power source
2	Preheat Switch	5 A	Engine Diagnostic Switch, Preheat Switch	Power source
3	Preheat Relay	5 A	Preheat Relay 1	Power source
4	ECM Relay	5 A	ECM Relay	Power Source
5	DLU Main Power Source	5 A	DLU	Power source
6	OPT 5	20 A		