



93204-00090  
November 2010

45ZV-2  
SHOP MANUAL  
- Troubleshooting

*SHOP MANUAL*

*WHEEL LOADER*

*45ZV-2*

***Technical Manual***

***- Troubleshooting***

Powered by KUBOTA V3307-DI-T ENGINE

Serial No. 00193 and up

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# SAFETY

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## ADJUST THE OPERATOR'S SEAT

- A poorly adjusted seat for either the operator or for the work at hand may quickly fatigue the operator leading to miss-operations.
  - The seat should be adjusted whenever changing the operator for the machine.
  - The operator should be able to fully depress the pedals and to correctly operate the control levers with his back against the seat back.
  - If not, move the seat forward or backward, and check again.
  - Adjust the rear view mirror position so that the best rear visibility is obtained from the operator's seat. If the mirror is broken, immediately replace it with a new one.



SA-462

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## ENSURE SAFETY BEFORE RISING FROM OR LEAVING OPERATOR'S SEAT

- Before rising from the operator's seat to open/close either side window or to adjust the seat position, be sure to first lower the front attachment to the ground and then move the loader control lever to the LOCK position. Failure to do so may allow the machine to unexpectedly move when a body part unintentionally comes in contact with a control lever, possibly resulting in serious personal injury or death.
  - Before leaving the machine, be sure to first lower the front attachment to the ground and then move the loader control lever to the LOCK position. Turn the key switch OFF to stop the engine.
  - Before leaving the machine, close all windows, doors, and access covers and lock them up.

# SAFETY

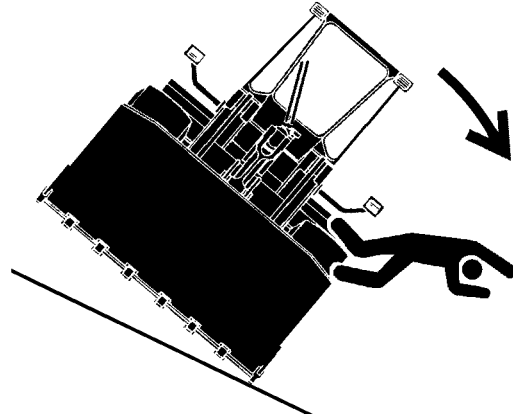
## AVOID TIPPING

DO NOT ATTEMPT TO JUMP CLEAR OF TIPPING MACHINE. MACHINE WILL TIP OVER FASTER THAN YOU CAN JUMP FREE, POSSIBLY RESULTING IN SERIOUS PERSONAL INJURY OR DEATH. IF TIPPING OVER OF THE MACHINE IS PREDICTED, SECURELY HOLD THE STEERING WHEEL TO PREVENT YOUR BODY FROM BEING THROWN OUT OF THE MACHINE.

**MACHINE WILL TIP OVER FASTER THAN YOU CAN JUMP FREE**

### FASTEN YOUR SEAT BELT

- The danger of tipping is always present when operating on a grade, possibly resulting in serious injury or death.  
To avoid tipping:
- Be extra careful before operating on a grade.
  - Prepare machine operating area flat.
  - Keep the bucket low to the ground and close to the machine.
  - Reduce operating speeds to avoid tipping or slipping.
  - Avoid changing direction when traveling on grades.
  - NEVER attempt to travel across a grade steeper than 5 degrees if crossing the grade is unavoidable.
  - Reduce speed as necessary when swinging loads.
- Be careful when working on frozen ground.
  - Temperature increases will cause the ground to become soft and make ground travel unstable.



SA-463

## NEVER UNDERCUT A HIGH BANK

- The edges could collapse or a landslide could occur causing serious injury or death.



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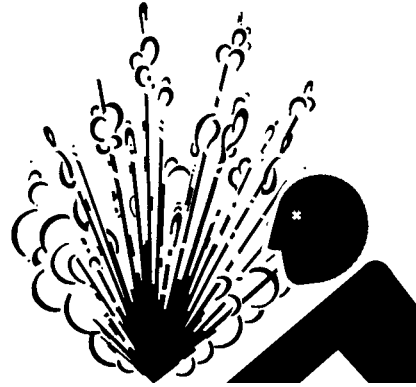
SA-519

# SAFETY

## PREVENT BURNS

Hot spraying fluids:

- After operation, engine coolant is hot and under pressure. Hot water or steam is contained in the engine, radiator and heater lines. Skin contact with escaping hot water or steam can cause severe burns.
  - To avoid possible injury from hot spraying water. DO NOT remove the radiator cap until the engine is cool. When opening, turn the cap slowly to the stop. Allow all pressure to be released before removing the cap.
  - The hydraulic oil tank is pressurized. Again, be sure to release all pressure before removing the cap.



SA-039

Hot fluids and surfaces:

- Engine oil, gear oil and hydraulic oil also become hot during operation. The engine, hoses, lines and other parts become hot as well.
  - Wait for the oil and components to cool before starting any maintenance or inspection work.



SA-225

505-E01B-0498

## REPLACE RUBBER HOSES PERIODICALLY

- Rubber hoses that contain flammable fluids under pressure may break due to aging, fatigue, and abrasion. It is very difficult to gauge the extent of deterioration due to aging, fatigue, and abrasion of rubber hoses by inspection alone.
  - Periodically replace the rubber hoses. (See the page of "Periodic replacement of parts" in the operator's manual.)
- Failure to periodically replace rubber hoses may cause a fire, fluid injection into skin, or the front attachment to fall on a person nearby, which may result in severe burns, gangrene, or otherwise serious injury or death.



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## OPERATIONAL PERFORMANCE TEST / Engine Test

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**Measurement:**

1. Measure the items as followings: slow idle (with no load), fast idle (with no load), fast idle (when the steering is relieved), and fast idle (when the front attachment is relieved).



**CAUTION: Always make sure that the steering area is clear and that co-workers are out of the steering area before starting the measurement.**

2. When measuring, set the switch and test condition as shown in the table below in response to the engine speed to be measured.

	Forward/Reverse Lever	Accelerator Pedal
Slow Idle (with no load)	N	Not depressing
Fast Idle (with no load)	N	Fully depressing
Fast Idle (when steering is relieved)	N	Fully depressing
Fast Idle (when front attachment is relieved)	N	Fully depressing

	Brake Pedal	Parking Brake Switch	Control Lever (Bucket)
Slow Idle (with no load)	-	ON	Transporting position No control lever operation
Fast Idle (with no load)	Fully depressing	ON	Transporting position No control lever operation
Fast Idle (when steering is relieved)	Fully depressing	ON	Transporting position No control lever operation
Fast Idle (when front attachment is relieved)	Fully depressing	ON	Transporting position Bucket is tilted in and relieved.

**Evaluation:**

Refer to Operational Performance Standard in T4-2.

**Remedy:**

Refer to Troubleshooting in T5.

# OPERATIONAL PERFORMANCE TEST / Wheel Loader Test

## HYDRAULIC CYLINDER CYCLE TIME

### Summary:

1. The overall performance of the cylinders drive system (between main pump and each cylinder) is judged by measuring the operating time of the cylinders for the lift arm, bucket and steering.
2. Empty the bucket in advance.

### Preparation:

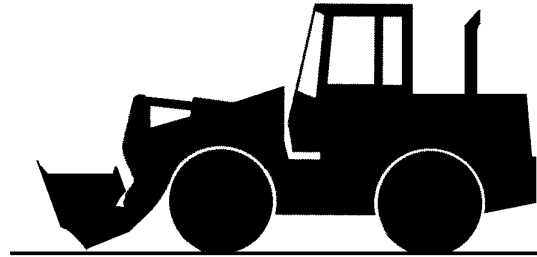
1. Measure by using the following positions.
  - 1-1. Measurement of Lift Arm Cylinder (for Raising)  
Fully tilt the bucket and lower the lift arm.
  - 1-2. Measurement of Lift Arm Cylinder (for Lowering)  
Lower the lift arm until the bucket bottom surface touches the ground horizontally.
  - 1-3. Measurement of Bucket Cylinder  
Raise the lift arm to the highest position.
  - 1-4. Measurement of Steering Cylinder  
Empty the bucket and set the front attachment at the travel forward position.
2. Keep hydraulic oil temperature at  $50\pm 5^{\circ}\text{C}$  ( $122\pm 9^{\circ}\text{F}$ ).



**CAUTION:** Perform this test on soft ground in order to reduce damage to the bucket.

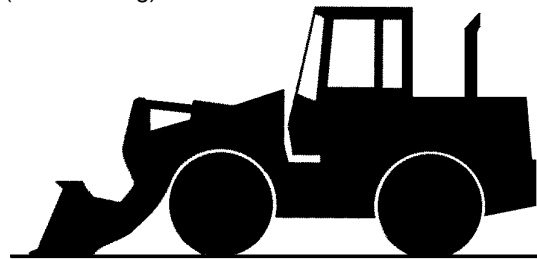
Lift Arm Cylinder:

(for Raising)



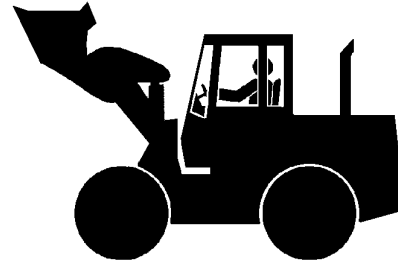
T4GB-04-04-016

(for Lowering)



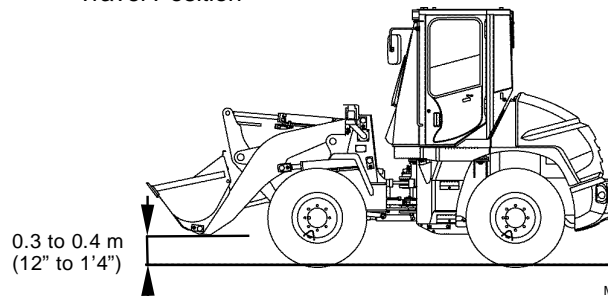
T487-04-03-005

Bucket Cylinder:



T487-04-03-006

Travel Position



M4FG-04-001

## OPERATIONAL PERFORMANCE TEST / Component Test

### HST PUMP RELIEF PRESSURE

#### Summary:

Measure the HST pump relief valve set pressure at the HST pump delivery port to check performance of the HST pump relief valve.

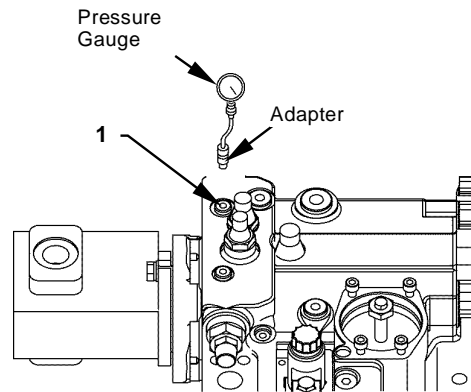


**WARNING: Injection hazard. High-pressure oil in circuit.**

**Be careful with hoses, gauges and all connections to not have leaks.**

#### Preparation:

1. Stop the engine.
2. Remove the plug from HST pump delivery port (MA) (1). Install an adapter, a hose, and a pressure gauge.  
□ : 6 mm (0.24 in)
3. Start the engine. Check for oil leakage at the pressure gauge connection.
4. Maintain hydraulic oil temperature at  $50\pm 5^{\circ}\text{C}$  ( $122\pm 9^{\circ}\text{F}$ ).



T4FG-04-05-008

#### Measurement:

1. Slightly raise the lift arm with the bucket placed against a pile.
2. Select the forward 1st gear, depress the accelerator pedal before a wheel spins, and relieve the HST relief valve.
3. Repeat the measurement three times and calculate the average value.

#### Evaluation:

Refer to Operational Performance Standard in T4-2.

# TROUBLESHOOTING / Diagnosing Procedure

## DIAGNOSING PROCEDURE

These six basic steps are essential for efficient troubleshooting:

### 1. Study the System

Study the machine's technical manuals. Know the system and how it works, and what the construction, functions and specifications of the system components are.



T4GB-05-01-001

### 2. Ask the operator

Before inspecting, get the full story of malfunctions from the operator below.

- (a) How is the machine being used? (Find out if the machine is being operated correctly)
- (b) When was the trouble noticed, and what types of work was the machine doing at that time?
- (c) What are the details of the trouble? Is the trouble getting worse, or did it appear suddenly for the first time?
- (d) Did the machine have any other troubles previously? If so, which system was affected and which parts were repaired before?



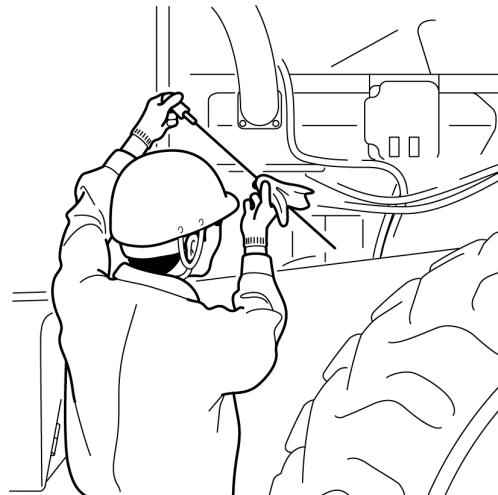
T4GB-05-01-002

### 3. Inspect the machine

Before starting the troubleshooting procedure, check the machine's daily maintenance points, as shown in the operator's manual.

Also, check the electrical system, including the batteries, as troubles in the electrical system such as low battery voltage, loose connections and blown fuses will result in malfunction of the controllers, causing total operational failure of the machine.

If troubleshooting is started without checking for blown fuses, a wrong diagnosis may result, wasting time. Check for blown fuses before troubleshooting. Even if a fuse looks normal by visual inspection, a fine crack is difficult to find. Always use a tester when checking the fuses.

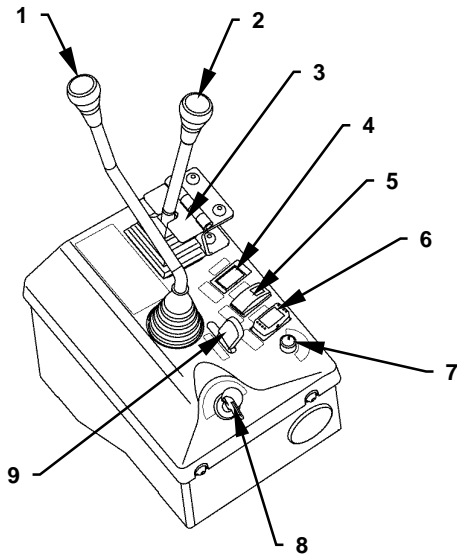


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## TROUBLESHOOTING / Component Layout

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### Right Console



M4FG-01-009

- |  |                                       |                              |                               |
|--|---------------------------------------|------------------------------|-------------------------------|
| 1 - Loader Control Lever                       | 4 - Auxiliary                         | 6 - eco Mode Switch          | 8 - Key Switch                |
| 2 - Auxiliary Control Lever<br>(Optional)      | 5 - Ride Control Switch<br>(Optional) | 7 - Heater Switch (Optional) | 9 - Loader Control Lever Lock |
| 3 - Auxiliary Control Lever<br>Lock (Optional) |                                       |                              |                               |

## TROUBLESHOOTING / Troubleshooting A

### HST CONTROL UNIT ERROR CODE LIST

Error Code	Trouble	Cause	Influenced Control
1-1	Faulty start-up condition	The supplied voltage to the HST control unit is reduced. (10 V or less) The supplied voltage to the HST control unit is raised. (17 V or more) Failure is diagnosed only when the HST control unit starts.	HST pump control HST motor control
2-1	Faulty HST motor displacement angle control output	Faulty harness. Faulty proportional solenoid valve.	HST motor control
2-2	Faulty HST pump displacement angle control output	Faulty harness. Faulty proportional solenoid valve.	HST pump control
2-3	Faulty parking brake control output	Faulty harness. Faulty relay.	Emergency parking brake
2-4	Faulty overrunning buzzer	Open circuit in harness of overrunning buzzer output. Faulty overrunning buzzer.	Buzzer control when overrunning
3-1	Faulty speed sensor	The detected value is 60 km/h (37 mph) or more. Emergency stop of the detected value (The signal is stopped over 15 km/h (9 mph) or more when the HST brake is depressed at 50 % or less in the operable range.)	HST motor control (100 % output)
3-2	Faulty engine speed sensor	The following abnormal values are detected. <ul style="list-style-type: none"> <li>• Less than 300 min<sup>-1</sup> when machine speed is 5 km/h (3 mph) or more.</li> <li>• 0 min<sup>-1</sup> when terminal L of the alternator is 12 V.</li> <li>• Engine speed is beyond 5000 min<sup>-1</sup>.</li> </ul>	HST pump control (40 % output)
3-3	Faulty brake pedal angle sensor low voltage	The sensor input voltage to the HST control unit is 0.25 or less.	HST pump control (50 % output)
3-4	Faulty brake pedal angle sensor high voltage	The sensor input voltage to the HST control unit is 4.75 or more.	HST pump control (50 % output)
3-5	Faulty forward/reverse lever	The following conditions are detected. <ul style="list-style-type: none"> <li>• The forward and the reverse signals are detected at the same time.</li> <li>• Detected machine speed is below in sequence. 3 km/h (2 mph) with engine speed at 1500 min<sup>-1</sup> or more without inputting the forward and the reverse signal. → 0 km/h (0 mph) → 3 km/h (2 mph) with engine speed at 1500 min<sup>-1</sup> or more.</li> </ul>	Control selecting forward and reverse travel operation
4-1	Faulty low voltage	The supplied voltage to the HST control unit is 10 V or less.	Normal operation
4-2	Faulty high voltage	The supplied voltage to the HST control unit is 17 V or more.	Normal operation

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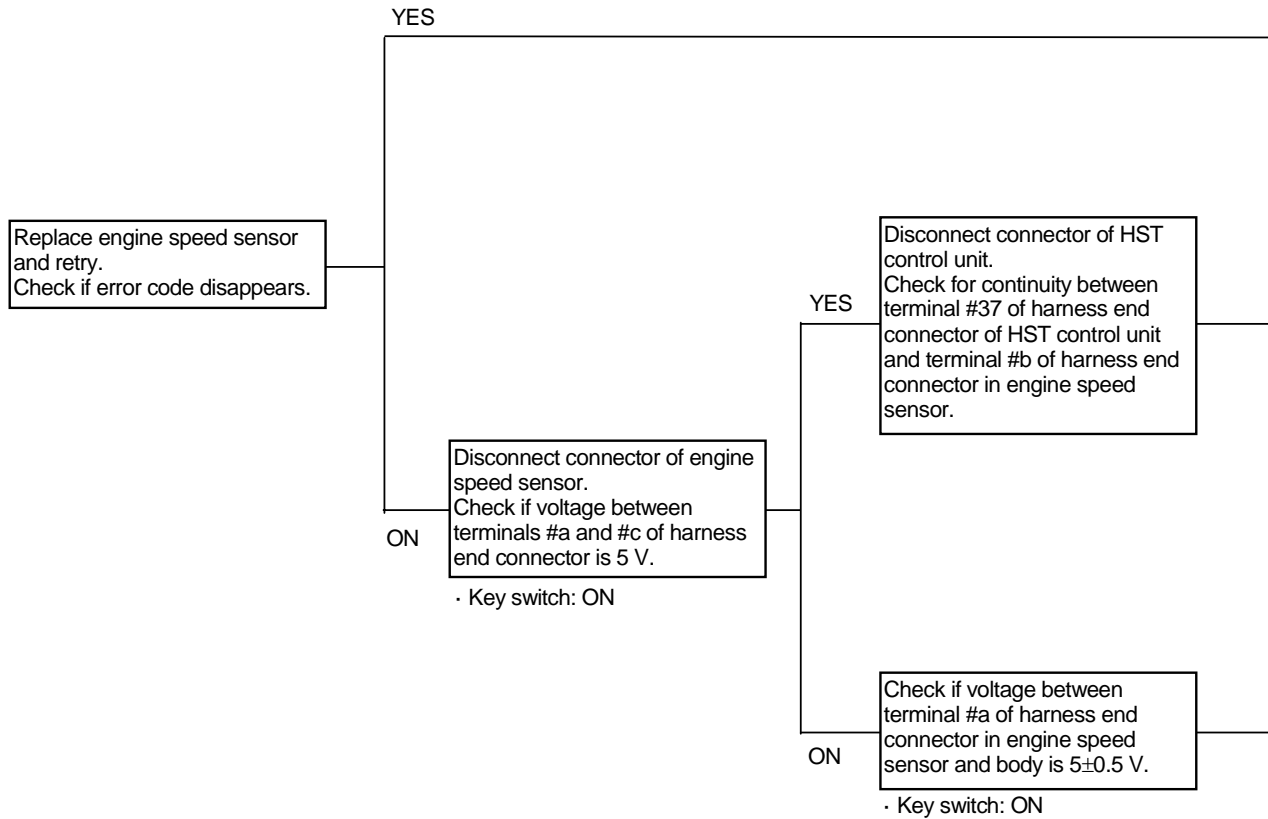
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# TROUBLESHOOTING / Troubleshooting A

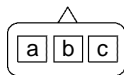
## HST CONTROL UNIT ERROR CODE 3-2

Error Code	Trouble	Cause	Influenced Control
3-2	Faulty engine speed sensor	The following abnormal values are detected. <ul style="list-style-type: none"> <li>• Less than 300 min<sup>-1</sup> when machine speed is 5 km/h (3 mph) or more.</li> <li>• 0 min<sup>-1</sup> when terminal L of the alternator is 12 V.</li> <li>• Engine speed is beyond 5000 min<sup>-1</sup>.</li> </ul>	HST pump control (40% output)



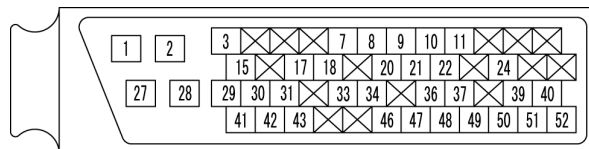
Connector (Harness end of connector viewed from the open end side)

Engine Speed Sensor Connector



T4FG-05-04-007

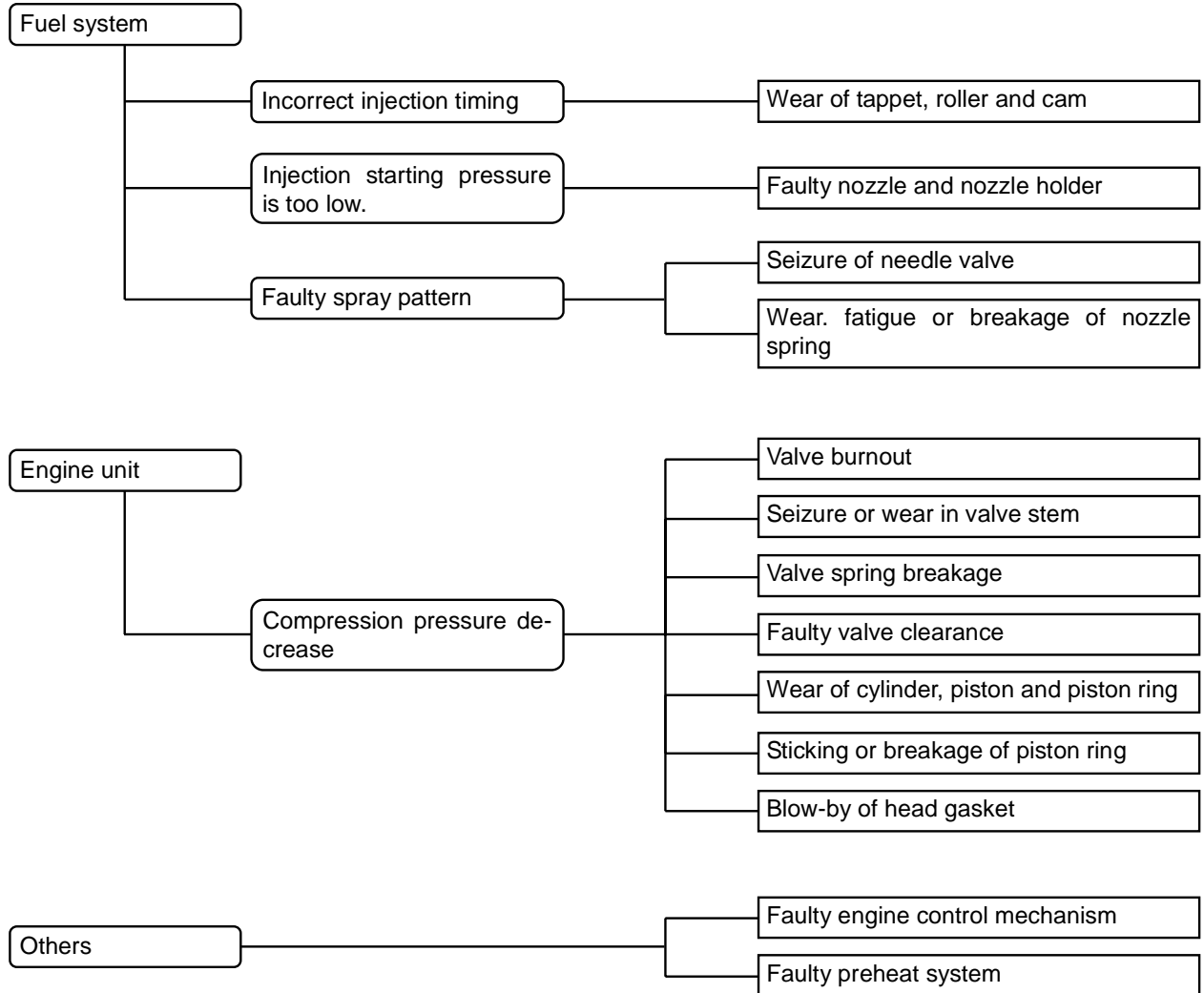
HST Control Unit Connector



T4FG-05-04-001

## TROUBLESHOOTING / Troubleshooting B

Trouble symptoms 2. Hard to start engine



# TROUBLESHOOTING / Troubleshooting B

## TRAVEL SYSTEM TROUBLESHOOTING

<b>Trouble symptoms</b>	<b>A-1. The vehicle does not travel at all (traveling is impossible forward and reverse)</b>
-------------------------	--

(1) Oil shortage in the hydraulic oil tank

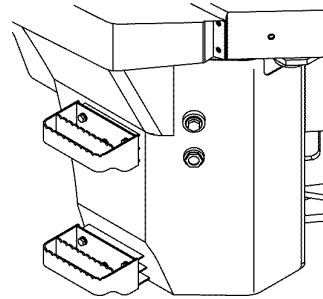
Check the hydraulic oil level.

1. Park the machine on level ground.
2. Lower the bucket or the attachment to the ground horizontally.
3. Stop the engine. Check that the oil level of the sight glass is between the upper limit mark and the lower limit mark.

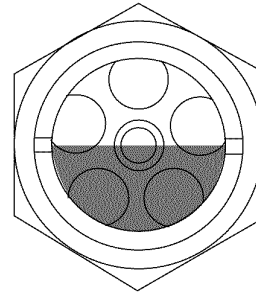
Hydraulic oil level is low.

Hydraulic oil level is normal.

Repair oil leak and add oil.



T4FG-05-02-001



M4EJ-07D-002

(2) Clogged suction strainer

Remove suction strainer (1) in the hydraulic oil tank. Check for restrictions.

Restricted

Not restricted

Check HST filter element (2) and hydraulic oil filter element (3). Check for the foreign particles, which cause suction strainer (1) restriction.

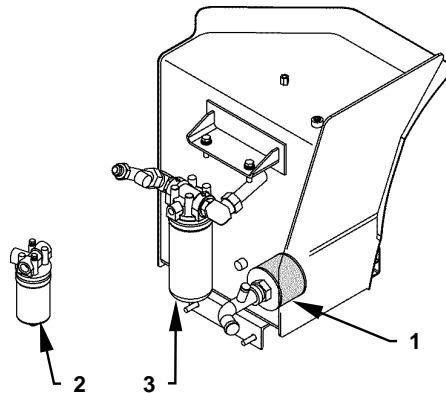
Clean suction strainer

Repair of hydraulic cylinders and hose

(Metal fragments including copper powder)

Repair of hydraulic pump

(Nylon and rubber pieces)



T4FG-05-02-002

## TROUBLESHOOTING / Troubleshooting B

<b>Trouble symptoms</b>	<b>A-4. Travel at engine low idle speed.</b>
-------------------------	--

(1) Engine low idle speed is too high.

Measure the engine low idle speed.

1. Measure the engine low idle speed according to Engine Performance Test / Engine speed.
2. As for specification, refer to Operational Performance Standard.

Out of Specification

1. The adjustment of accelerator linkage is faulty. Even if the accelerator pedal is returned, the pedal does not get in contact with the low idle stopper in the governor.
2. Foreign objects get caught in the accelerator pedal and the accelerator pedal is not returned completely.
3. Rust and sticking of accelerator linkage.

Within Specification

Faulty bleeding air from HST circuit.

1. Fill HST pump and motor with hydraulic oil.
2. Place directional selector lever in neutral.
3. Idle at low idle for 3 minutes.

System should be free from air at this point.

(2) Faulty bleeding air from HST circuit

1. When the machine travels with the forward/reverse lever set in the Neutral position, check the hydraulic oil. (Especially pay attention to viscosity.)
2. After the engine starts, when the machine travels with the forward/reverse lever set in the Neutral position for a moment, bleed air from HST circuit.  
Cause of trapping air is replacement of hydraulic oil filter or element, repair of motor or residual air when replacing HST piping or hose. If any cause cannot be found, as air may be sucked from the loosened part of HST piping and hose, check and retighten the hose and piping.

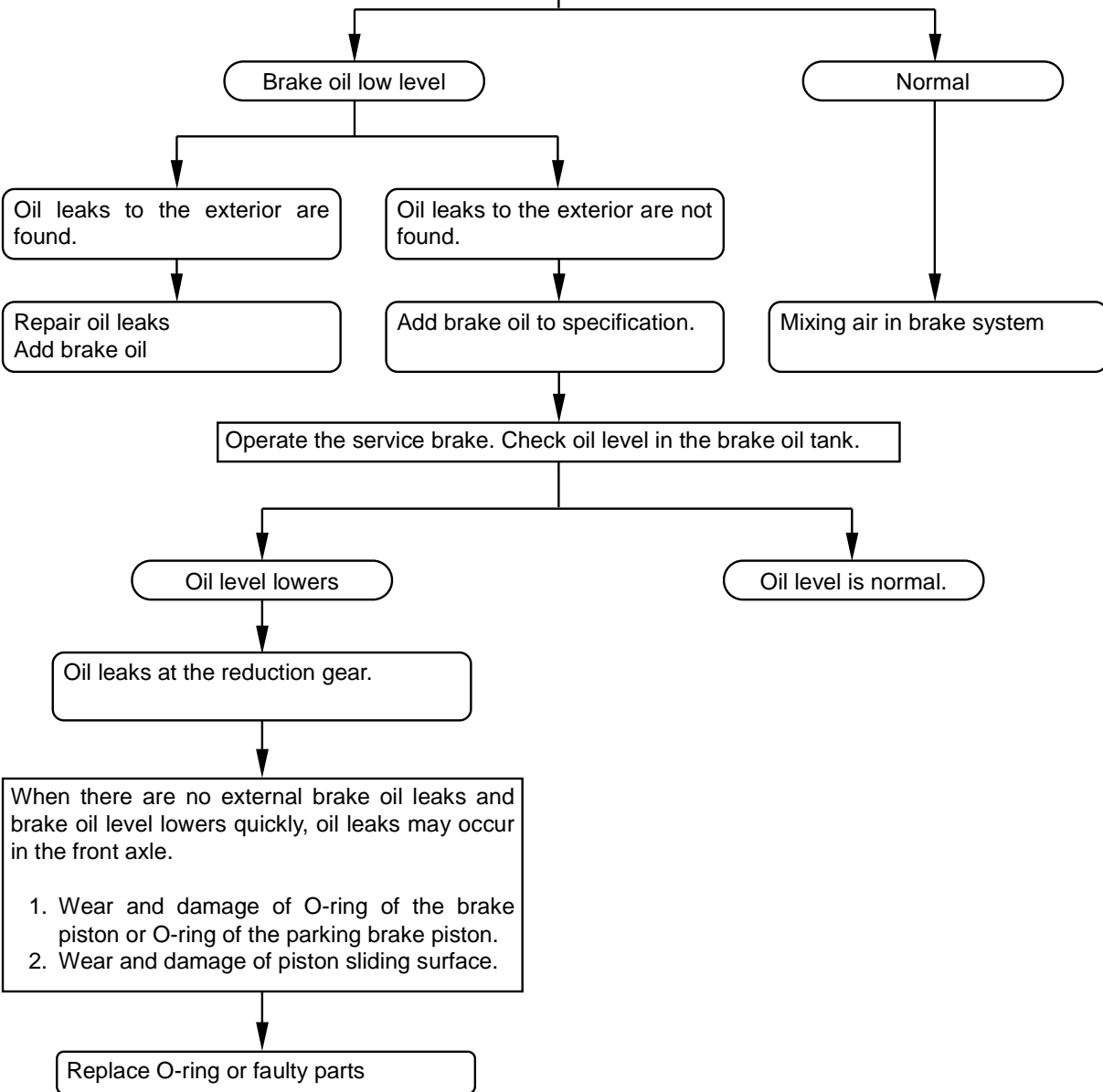
# TROUBLESHOOTING / Troubleshooting B

## BRAKE SYSTEM TROUBLESHOOTING

Trouble symptoms B-1. Brake valve application force decreases

(1) Leakage from the brake piping

Check oil amount in the brake oil tank in the master cylinder. If oil level is low, check for oil leaks from the master cylinder and brake piping.



## TROUBLESHOOTING / Troubleshooting B

Trouble symptoms	C-1. Steering operation is impossible or heavy
------------------	--

(3) Faulty steering valve (sticking or wear of spool and sleeve)

Measure the operating force of steering wheel.

1. Park the machine on a level paved road in traveling position. Release the parking brake.
2. Keep hydraulic oil temperature at operating temperature (40 to 60°C (104 to 140°F)).
3. The bucket must be empty.
4. Measure the operating (rotational) force of steering wheel at engine low idle speed and high idle speed in this condition. At the same time, check for unevenness (sticking) of operating (rotational) force.

As for specification, refer to Operational Performance Standard.

Measure the slip amount of steering wheel.

1. Turn the steering wheel completely to the right or left and cause the chassis to contact the frame stopper (end of stroke).
2. While turning the steering wheel from this point, the steering wheel rotates while slipping due to the internal leaks of steering valve.  
Measure the revolutions of steering wheel per 1 minute.

Specification

Specification on a new machine: 3.5 rev/min

When the amount of steering wheel slippage reaches 5.25 rev/min or more, steering valve repair or replacement is required as the internal leaks become excessive.

Out of Specification

Repair or replace steering valve

## TROUBLESHOOTING / Troubleshooting B

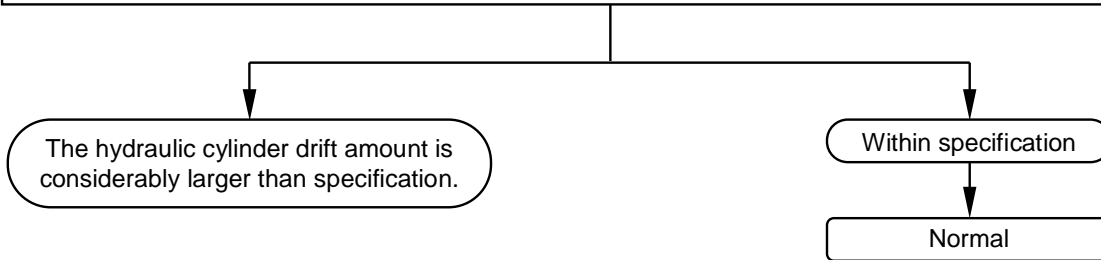
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Trouble symptoms	D-2. Excessive lift arm cylinder drift at the neutral position of control lever
------------------	---

### Measure the lift arm cylinder drift.

For complaints that the "Lift arm drifts at the Hold (Neutral) position of control valve", first check the lift arm drift specification.

1. Measure the hydraulic cylinder drift amount according to Operational Performance Test.
2. As for specification, refer to Operational Performance Standard.



## TROUBLESHOOTING / Troubleshooting B

**Trouble symptoms** D-6. Bucket roll back time is too long or operation force is weak.


(5) All of measurement values in paragraph 1 to paragraph 3 of Measurement of Overload Relief Valve Hydraulic Pressure are the same or lower than the main relief valve specification. In addition, measurement value in paragraph 2 is to specification.

Faulty overload relief valve or faulty adjustment of overload valve (3)

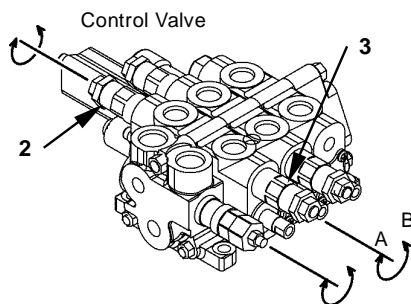
### <Adjustment Methods>

- (1) According to paragraph 3 of Measurement of Overload Relief Valve Hydraulic Pressure, hydraulic pressure of overload relief valve (3) can be measured by using an oil pressure gauge.
- (2) Loosen lock nut (6) of overload relief valve (3)
- (3) While reading the needle of oil pressure gauge, turn adjusting screw (7) by using a hexagonal Allen wrench so that the needle indicates specified pressure.  
A: Tightening (clockwise) → Oil pressure increases  
B: Loosening (counterclockwise) → Oil pressure decreases

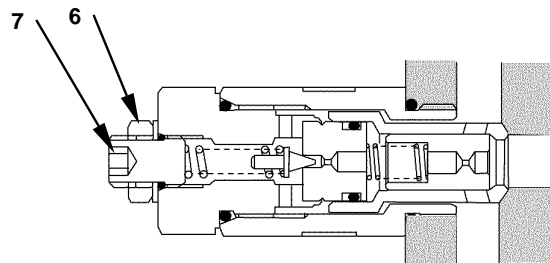
Specification: Refer to Operational Performance Standard

 **NOTE:** As the relief sensitivity is exceedingly sensitive, do not loosen quickly.

- Hold adjusting screw (7) by using a hexagonal Allen wrench and secure by using lock nut (6)
- Measure the overload relief pressure again and confirm that set pressure is to specification.
- Adjust the main relief valve set pressure to specification.



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T4FG-03-02-013

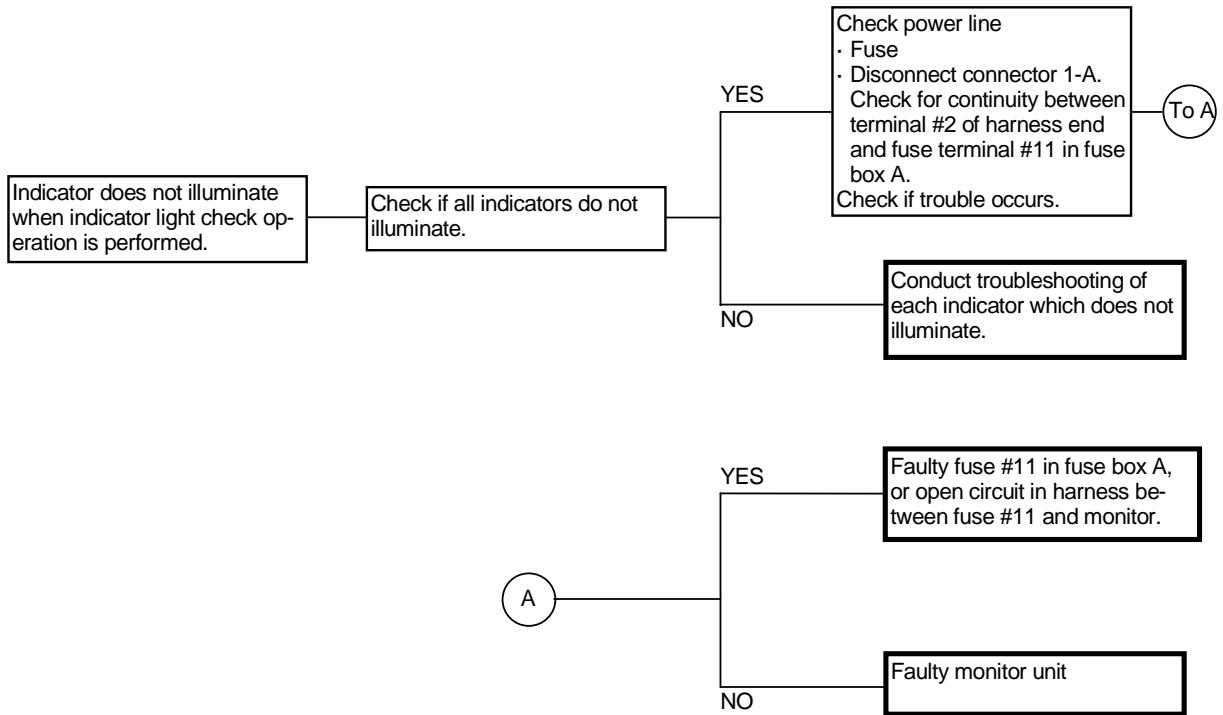
(6) When measurement values in paragraph 2 of Measurement of Overload Relief Valve Hydraulic Pressure is higher than specification, refer to paragraph 4 and adjust overload relief valve (2)

(7) When measurement values in paragraph 3 of Measurement of Overload Relief Valve Hydraulic Pressure is higher than specification, refer to paragraph 5 and adjust overload relief valve (3)

# TROUBLESHOOTING / Troubleshooting C

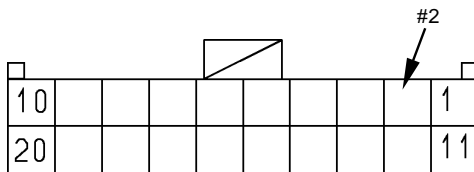
## MALFUNCTION OF INDICATOR LIGHT CHECK SYSTEM

- Check the wiring connections first.



Connector (Harness end of connector viewed from the open end side)

Monitor Unit  
Connector 1-A




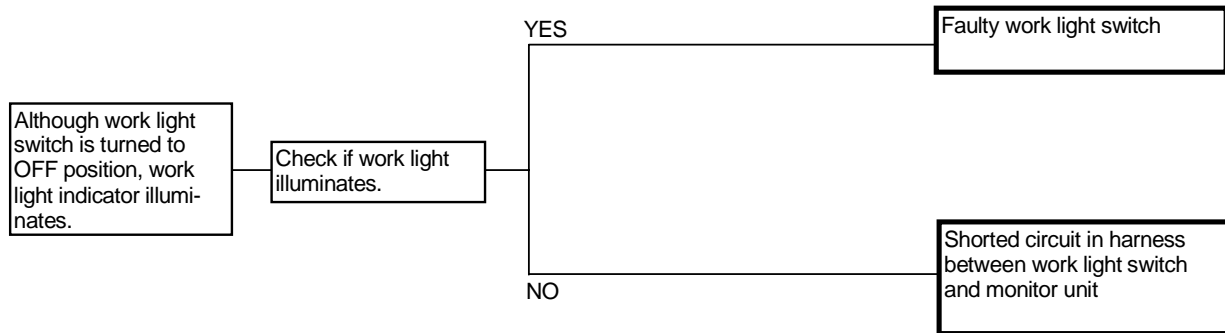
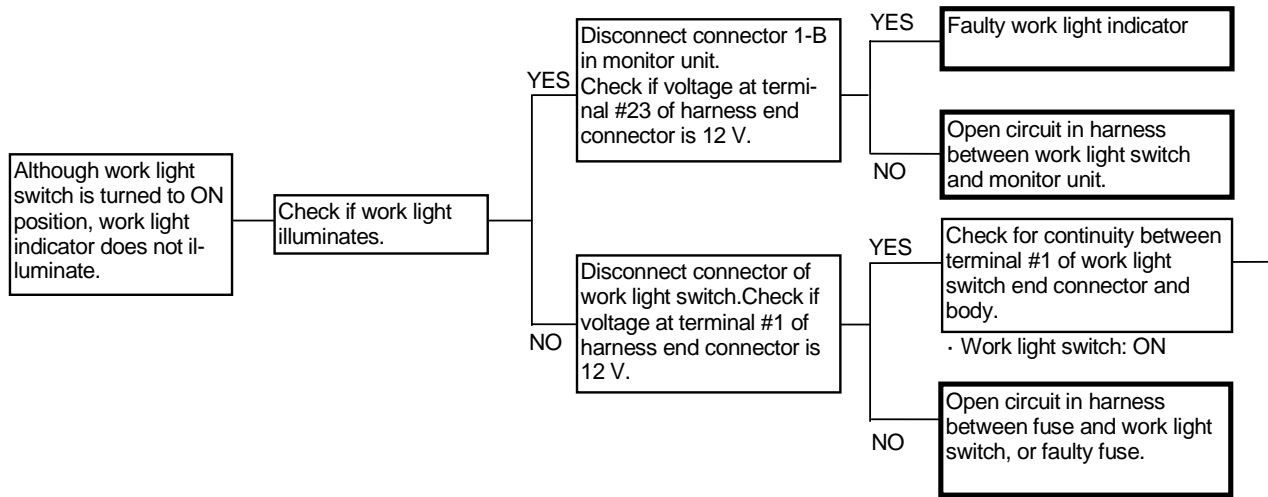
T183-05-04-013

## TROUBLESHOOTING / Troubleshooting C

### MALFUNCTION OF WORK LIGHT INDICATOR

- Check if the working light switch and headlight switch are in the ON position.
- If the clearance light indicator also does not light, the common circuit for clearance light indicator and working light indicator may be faulty. Refer to MALFUNCTION OF CLEARANCE LIGHT INDICATOR.
- Check the wiring connections first.

 NOTE: Front work light is optional.



## TROUBLESHOOTING / Troubleshooting C


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### MALFUNCTION OF SERVICE INDICATOR

- When the following troubles occur, the service indicator illuminates in order to show the trouble to the operator. Stop and maintain the machine.
- Although the machine is maintained and if the service indicator does not go out, another indicator on monitor must illuminate. Refer to the pages corresponding to the indicator in this group or diagnose according to Troubleshooting A.
- Although there is no trouble and if the service indicator does not go out, the logic circuit in monitor unit may be faulty.

(When an abnormal value is detected, the service indicator illuminates;)

- Faulty charging by the alternator
- Illuminating the engine warning indicator
- Illuminating the HST warning indicator

 **NOTE:** *When the parking brake is applied with the engine running and the forward/reverse lever is set in neutral position, the parking brake indicator and the service indicator illuminate. This is normal.*

## TROUBLESHOOTING / Troubleshooting C

### MALFUNCTION OF MONITOR DISPLAY

- The data on the monitor display is shown after the signal has been directly entered from the sensors. This activates the logic circuit of the monitor unit. Therefore, check if the sensors corresponding to the trouble are normal.

Description		Cause of Trouble	
Data on liquid crystal display	Neutral indicator	The sensor system detecting the related signal is faulty. (As for the machine, some trouble must occur. Refer to Troubleshooting A and conduct the remedy.)	
	Forward/reverse indicator		
	Driving mode indicator		
	Speedometer		
	Ride control indicator	Refer to T5-3-33.	
Data on data display	Odometer	Displayed in normal mode	The sensor system detecting the related signal is faulty. (As for the machine, some trouble must occur. Refer to Troubleshooting A and conduct the remedy.) As for these troubles, the liquid crystal display in monitor unit may be faulty or the logic circuit may be faulty.
	Hour meter	Displayed in normal mode	

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