Printed in Japan (K)
( 輸出一般用 )

70Z6 SHOP MANUAL Operational Performance Test Troubleshooting

93208-00821

93208-00821
October 2018

# SHOP MANUAL

## WHEEL LOADER

# 70Z6

## *Operational Performance Test Troubleshooting*

Powered by CUMMINS QSB6.7 Engine
Serial No. 70C7-0101 and up

## Preparation for Performance Tests

Observe the following rules in order to carry out performance tests accurately and safely.

**THE MACHINE**

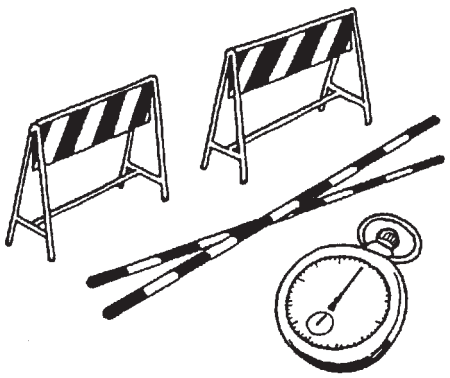
1. Repair any defects and damage found, such as oil or water leaks, loose bolts, cracks and so on, before starting to test.

**TEST AREA and TOOL**

1. Select a hard and flat surface.
2. Secure enough space to allow the machine to run straight more than 200 m (656 ft 2 in), and to make the steering operate.
3. If required, rope off the test area and provide signboards to keep unauthorized personnel away.
4. Prepare the measuring instruments and tools. Use MPDr. if possible.

**PRECAUTIONS**

1. Before starting to test, agree upon the signals to be employed for communication among coworkers. Once the test is started, be sure to communicate with each other using these signals, and to follow them without fail.
2. Operate the machine carefully and always give first priority to safety.
3. While testing, always take care to avoid accidents due to landslides or contact with high-voltage power lines. Always confirm that there is sufficient space for full swings.
4. Avoid polluting the machine and the ground with leaking oil. Use oil pans to catch escaping oil. Pay special attention to this when removing hydraulic pipings.



T105-06-01-003

**MAKE PRECISE MEASUREMENT**

1. Accurately calibrate test instruments in advance to obtain correct data.
2. Carry out tests under the exact test conditions prescribed for each test item.
3. Repeat the same test and confirm that the test data obtained can be produced repeatedly. Use mean values of measurements if necessary.

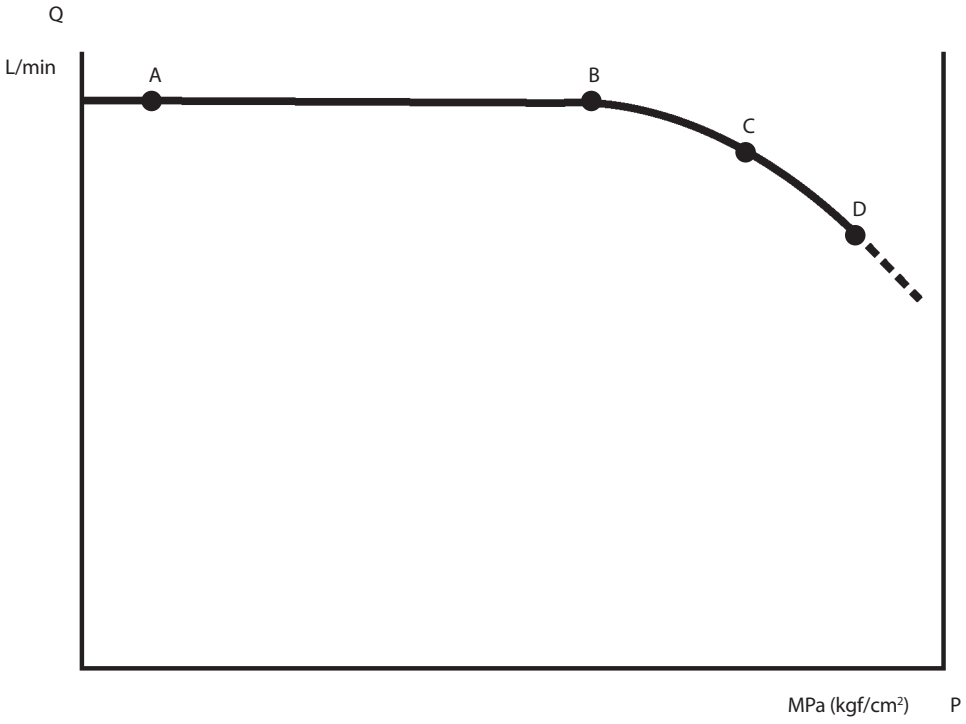
## Main Pump P-Q Diagram

- P-Q Control (Torque Control)
  (Reference: Measured at Test Stand)
  - Rated Pump Speed: 2200 $min^{-1}$ (rpm)
  - Hydraulic Oil Temperature: 50±5 °C (122±9 °F)

*NOTE: Refer to T4-5-16.*

Points on P-Q Line

| | Delivery Pressure MPa (kgf/$cm^2$) | Flow Rate L/min |
|---|---|---|
| A | 4.9 (50) | 210±3 |
| B | 15.7 (160) | 210±5 |
| C | 23.5 (240) | 185±6 |
| D | 27.4 (280) | 158±6 |




T4GB-04-02-001

## Service Brake Function Check

**Summary:**

1. Check the performance of the service brake.
2. The braking capability of the brake is an item of safety control. Be sure to conduct the performance test.

**Preparation:**

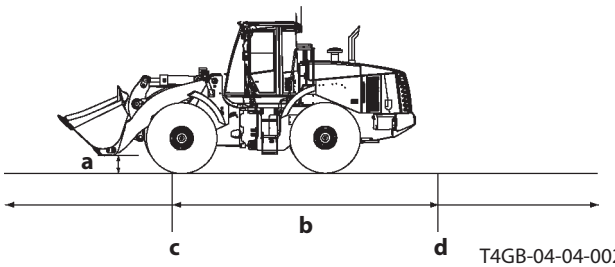
1. Adjust air pressure of the tires evenly in advance.

- Bias Tire: 325 kPa (3.3 kgf/cm$^2$) (47 PSI)
- Radial Tire: 375 kPa (3.8 kgf/cm$^2$) (54 PSI)

2. On a paved dry road, prepare a 150 m (492 ft) straight travel course (a 100 m (328 ft) of acceleration zone and a 50 m (164 ft) of test track) and set the brake starting point.

3. Empty the bucket and hold the lift arm with it floated 0.4 to 0.5 m (1 ft 4 in to 1 ft 8 in) above the ground.

4. Maintain the hydraulic oil temperature at 50±5 °C (122±9 °F). Warm the axle oil satisfactorily by repeating travel operation and brake operation. Make a warm up operation so that the indicators of the coolant temperature monitor and the torque converter oil temperature monitor should rise above the horizontal position.



T4GB-04-04-002

a- 0.4 to 0.5 m (1 ft 4 in to 1 ft 8 in)
b- Stopping Distance
c- Stopping Point
d- Brake Starting Point

## Control Lever Operating Force

**Summary:**

1. Measure a play and operating condition of each control lever, pedal, and steering wheel, and measure operating force of them.

2. Measure maximum operating force of each control lever, pedal, and steering wheel.

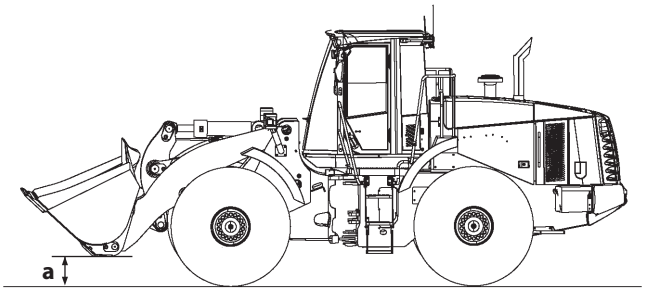
3. Measure the lever stroke along the control lever operation from the grip center of each control lever. Measure at 150 mm (6 in) from the pedal support of each pedal.

**Preparation:**

1. Empty the bucket and hold the lift arm being floated 0.4 to 0.5 m (1 ft 4 in to 1 ft 8 in) above the ground.

2. Maintain the hydraulic oil temperature at 50±5 °C (122±9 °F).

Travel Position




M4GB-04-001

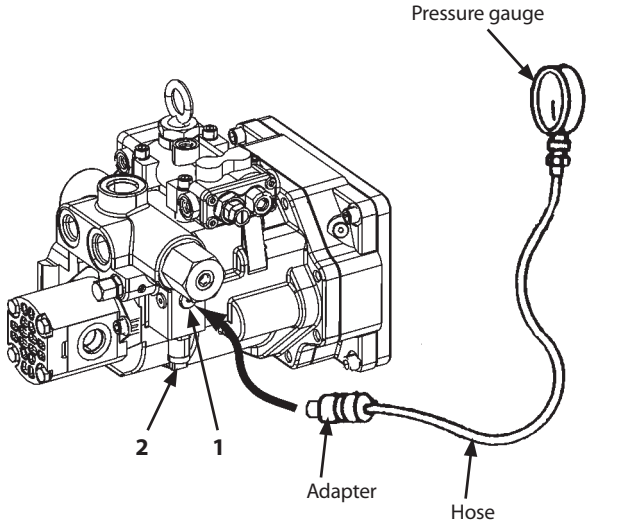
a- 0.4 to 0.5 m (1 ft 4 in to 1 ft 8 in)

## Loading Circuit Main Relief Set Pressure

**Summary:**

Measure the main relief valve set pressure at the delivery port in main pump while operating the lift arm/bucket control lever.

*NOTE: Measure the pressure by using the MPDr.*




TNDB-04-05-008

1- Pump Delivery Pressure Check Port
2- Pump Delivery Pressure Sensor

*NOTE: Available Tool No.*

| | |
|---|---|
| *Pressure gauge:* | *ST 6941* |
| *Adapter:* | *ST 6069* |
| *Hose:* | *ST 6943* |

**Preparation:**

1. Stop the engine.
2. Push the air bleed valve on top of the hydraulic oil tank and bleed air.
3. Remove the plug (G1/4) from delivery pressure check port (1) on the main pump. Install the adapter, the hose, and the pressure gauge.

   : 6 mm (0.24 in)
4. Start the engine. Confirm that no oil leakage is observed at the pressure gauge connection.
5. Maintain the hydraulic oil temperature at 50±5 °C (122±9 °F).

**Measurement:**

1. Select the following conditions:

| Accelerator Pedal | Power Mode Switch | Parking Brake Switch | Forward/Reverse Lever |
|---|---|---|---|
| Full stroke | ON | ON | N |

2. Operate the bucket or lift arm control levers slowly, operate each cylinder to the stroke end, and relieve each function.
3. Repeat the measurement three times and calculate the mean values.

**Evaluation:**

Standard (lift arm/bucket relief operation):
27.4 ~ 29.3 MPa (3974 ~4250 PSI)

- Pilot Characteristics

**Summary:**

Main pump performance is checked by measuring the pump flow rate by using hydraulic tester (5) installed at the main pump delivery port to be measured. Use MPDr. and pressure gauge (18) at the same time.

**IMPORTANT: This measurement procedure is a simple method. In order to measure accurately, disconnect the return circuit from the manifold valve and connect it to the hydraulic oil tank.**

**Preparation:**

1. While referring to steps 1 to step 3 on T4-5-16, install hydraulic tester (5) to the main pump to be measured.

2. Disconnect the hose from regulator port Pi1 (21). Install the plug (G1/4) to the removed hose.

   : 19 mm (0.75 in)

3. Connect regulator port Pi2 (8) to the hydraulic oil tank.

   : 19 mm (0.75 in)

4. Install adapters (15) (3 used) to pressure reducing valve (16). Remove plug (23) from manifold valve (1). Install adapter (13) and hose (14). Connect hose (14) to port P1 of pressure reducing valve (16).

   : 8 mm (0.3 in)

   : 19 mm (0.75 in)

5. Install tee (17) to port P2 of pressure reducing valve (16). Connect pressure gauge (18) and hose (9) to tee (17). Connect hose (9) to the regulator (c).

   : 19 mm (0.75 in)

6. Connect hose (19) and tee (20) to port T of pressure reducing valve (16). Disconnect hose (10) from manifold valve port DR4 (22). Install tee (20) to manifold valve port DR4 (22). Connect hoses (10, 19) to tee (20).

   : 22, 27 mm (0.87, 1.06 in)

7. Remove the vacuum pump. Loosen plug (12) on top of the pump casing. Bleed air from the casing until oil only comes out.

   : 41 mm (1.61 in)

8. Fully open the loading valve of hydraulic tester (5).

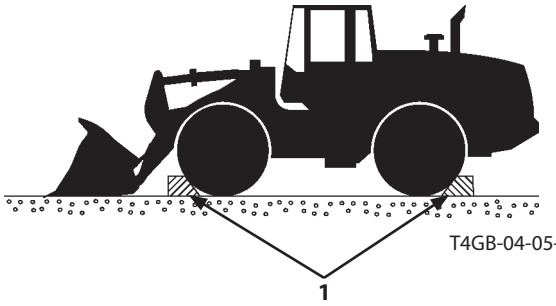
9. Start the engine. Confirm that no oil leakage is observed at the pressure gauge connection.

## Brake Accumulator Pressure

**CAUTION: If air is mixed in the brake system, the brake function is reduced and serious hazard may occur. Bleed air from the brake system after removing and installing the pipe lines and replacing hydraulic oil. (Refer to Troubleshooting B.)**

**Summary:**

Measure the accumulated brake pressure at the accumulator output port. The accumulated brake pressure varies according to operation of the brake. Record the maximum value.



T4GB-04-05-017

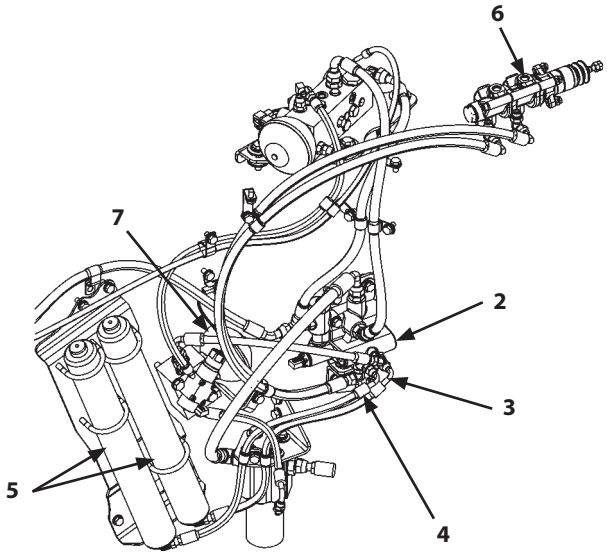
**Preparation:**

**CAUTION: Set blocks (1) onto the front and rear tires in order not to move the machine. Keep away from the machine.**

1. Stop the engine.
2. Push the air bleed valve on top of the hydraulic oil tank and bleed air.
3. Depress the brake pedal at least 50 strokes in order to decrease the accumulated pressure left in accumulator (5) of the brake circuit.
4. Disconnect hoses (3, 4) from brake charge valve (2). Install the tee (7/16-20UNF) and a pressure gauge between brake charge valve (2) and hoses (3, 4).

   : 19 mm (0.75 in)

5. Start the engine. Confirm that no oil leakage is observed at the pressure gauge connection.
6. Maintain the hydraulic oil temperature at 50±5 °C (122±9 °F).



TNDB-04-05-009

2- Brake Charge Valve (Unloader Valve)
3- Hose
4- Hose
5- Service Brake Accumulator
6- Brake Valve
7- Parking Brake Accumulator

(Blank)

## Group 6 Troubleshooting B



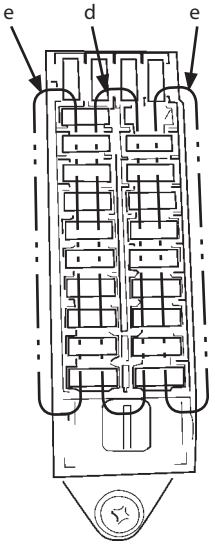
## Group 7 Air Conditioner

## Fuse Inspection

Cracks in a fuse are so fine that it is very difficult or impossible to find by visual inspection. Use a circuit tester in order to correctly inspect fuse continuity. Use a circuit tester in order to correctly inspect fuse continuity by following the instructions described below.

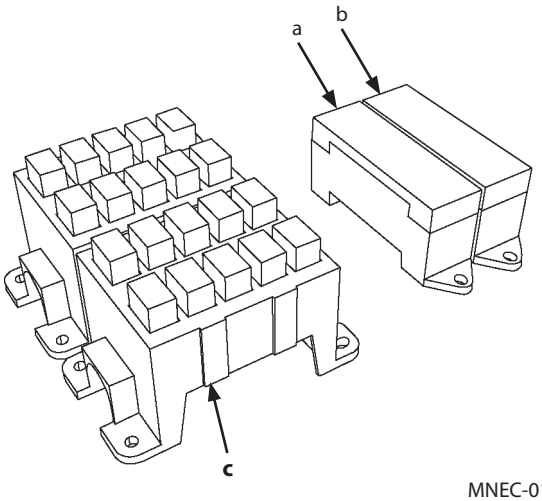
1. Set the key switch to the ON position. When the key switch is in the ON position, current from key switch terminal M turns the battery relay ON so that electric power is supplied to all circuits except the glow plug relay circuit. (Refer to the circuit diagram.)
2. Remove the fuse box cover. Set a circuit tester. (Measurement Range: 0 to 30 V)
3. Ground the negative probe of circuit tester to the body. Touch the terminals located (e) of fuse box one-by-one with the positive probe of circuit tester. When normal continuity of a fuse is intact, the circuit tester will indicate 20 to 25 V (battery voltage).

*NOTE: Check the glow plug relay circuit fuse with the key switch set in the ON position and follow the procedure in step 3.*



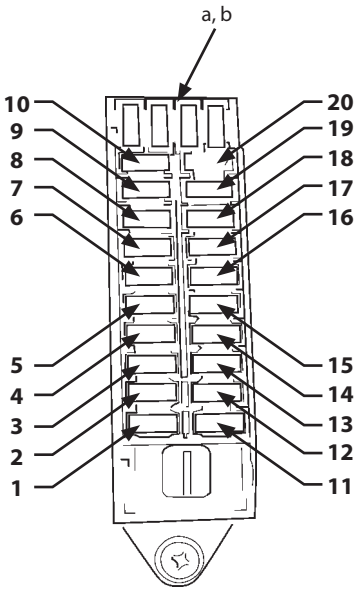

M178-07-034

d- Terminals connected to the power source
e- Terminals connected to loads (accessories)




MNEC-01-047

a- Fuse Box A
b- Fuse Box B
c- Relay Box

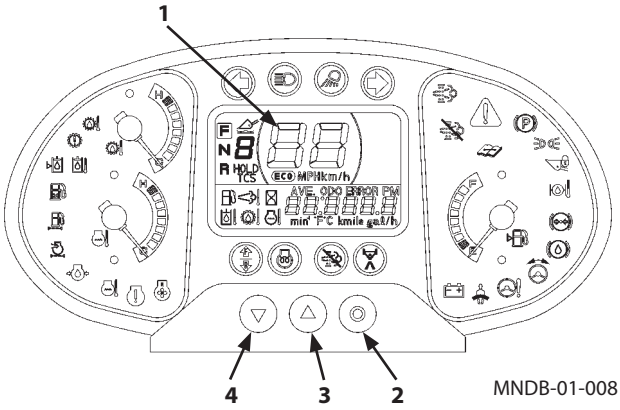



M178-07-034

| Engine | Key Switch | Location to be Measured | | Specification |
|---|---|---|---|---|
| Accessory Circuit | | | | |
| Stopped | ON | Between (12) and Ground: | Key Switch (ACC) | 20 to 25 V |
| Stopped | ON | Between (13) and Ground: | Radio | 20 to 25 V |
| Stopped | ON | Between (5) and Ground: | Fusible Link A (65A) | 20 to 25 V |

### Monitor Display

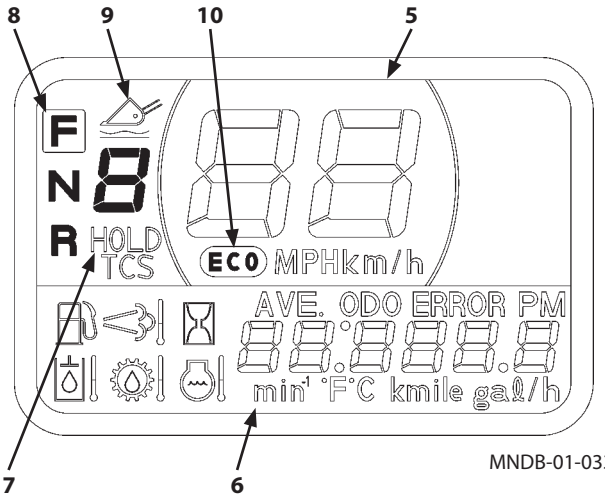
1- Monitor Display
2- Monitor Display Mode Switch
3- Monitor Display Selection Switch (Up)
4- Monitor Display Selection Switch (Down)
5- Speedometer
6- Machine Information Display
7- Hold Indicator
8- Forward/Reverse and Shift Position Indicator
9- Ride Control Indicator (Option)
10- ECO Indicator



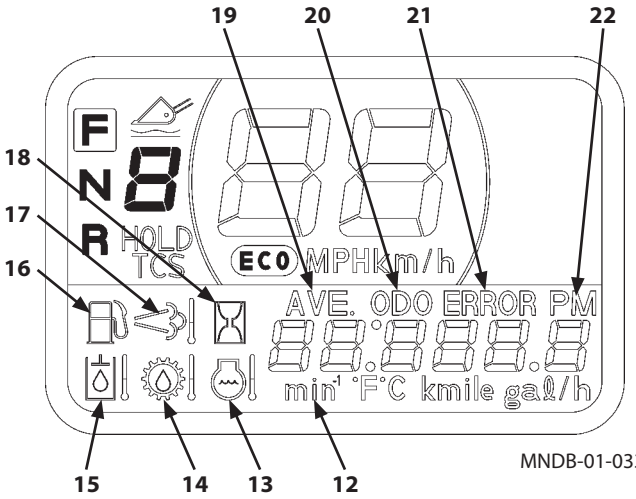
MNDB-01-008

### Vehicle Information Display (6)

12- Engine Speed Display
13- Coolant Temperature Display
14- Transmission Oil Temperature Display
15- Hydraulic Oil Temperature Display
16- Fuel Consumption Display
17- (Unused)
18- Hour Meter Display
19- Average Fuel Consumption Display
20- Odometer Display
21- Fault Code Display
22- (Unused)



MNDB-01-033

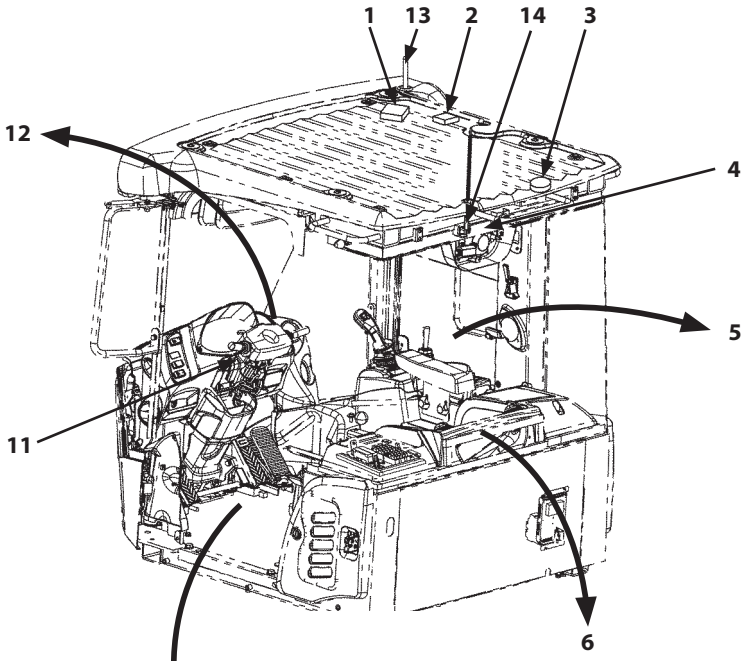


MNDB-01-033

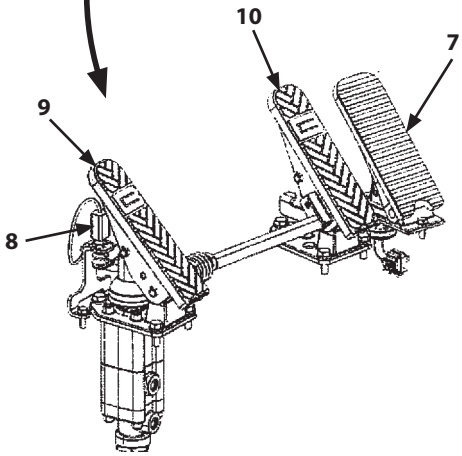
**List of Frequency Distribution Data**

| Item | Details |
|---|---|
| Pump Load | Frequency distribution of main pump delivery pressure |
| Radiator Coolant Temperature (79 °C or less) | Total hours when coolant temperature is less than 80 °C during a day. |
| Radiator Coolant Temperature (80 to 93 °C) | Total hours when coolant temperature is 80 °C or more and less than 94 °C during a day. |
| Radiator Coolant Temperature (94 to 104 °C) | Total hours when coolant temperature is 94 °C or more and less than 105 °C during a day. |
| Radiator Coolant Temperature (105 °C or more) | Total hours when coolant temperature is 105 °C or more during a day. |
| Hydraulic Oil Temperature (49 °C or less) | Total hours when hydraulic oil temperature is less than 50 °C during a day. |
| Hydraulic Oil Temperature (50 to 89 °C) | Total hours when hydraulic oil temperature is 50 °C or more and less than 90 °C during a day. |
| Hydraulic Oil Temperature (90 to 99 °C) | Total hours when hydraulic oil temperature is 90 °C or more and less than 100 °C during a day. |
| Hydraulic Oil Temperature (100 °C or more) | Total hours when hydraulic oil temperature is 100 °C or more during a day. |
| Torque Converter Oil Temperature (49 °C or less) | Total hours when torque converter oil temperature is less than 50 °C during a day. |
| Torque Converter Oil Temperature (50 to 89 °C) | Total hours when torque converter oil temperature is 50 °C or more and less than 90 °C during a day. |
| Torque Converter Oil Temperature (90 to 109 °C) | Total hours when torque converter oil temperature is 90 °C or more and less than 110 °C during a day. |
| Torque Converter Oil Temperature (110 °C or more) | Total hours when torque converter oil temperature is 110 °C or more during a day. |

## Electrical System (Cab)



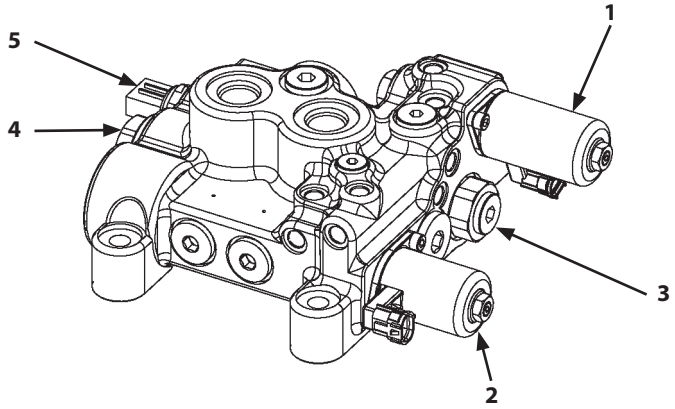

TNED-01-02-029




TNEJ-01-02-013

1- Radio
2- Upper Switch Panel (Option)
3- Speaker
4- Rear Wiper Motor
5- Components Related with Right Console (Refer to T5-4-8.)
6- Components Related with Controllers and Relays (Refer to T5-4-7.)
7- Accelerator Pedal Sensor (Accelerator Pedal)
8- Brake Light Switch
9- Brake Pedal
10- Brake Pedal (Option)
11- Front Wiper Motor
12- Components Related with Monitor and Switches (Refer to T5-4-9.)
13- GPS Antenna (Option)
14- Communication Antenna (Option)

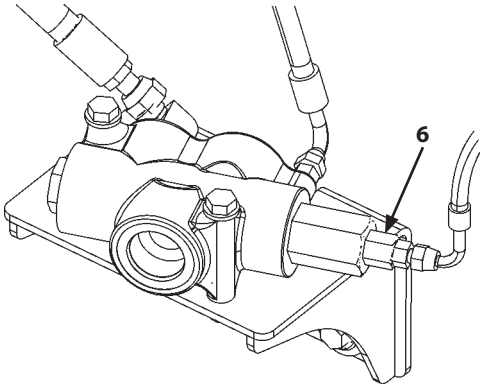
## Fan Valve (Option)




TNEE-01-02-031

1- Fan Speed Control Solenoid Valve
2- Fan Reverse Rotation Control Solenoid Valve
3- Fan Control Valve
4- Fan Reverse Rotation Spool
5- Fan Pump Delivery Pressure Sensor

## Priority Valve




TNDB-01-02-033

6- Main Relief Valve (Steering)

MPDr. Fault Code Reference Table (Continued)

| Fault Code | MPDr. Message | Category | Reference 1 | Reference 2 |
|---|---|---|---|---|
| 114100-2 | Communication Terminal: Abnormal EEPROM | Communication Terminal | T5-5-24 | - |
| 114101-2 | Communication Terminal: Abnormal IB/OB Queue | Communication Terminal | T5-5-24 | - |
| 114102-2 | Communication Terminal: Abnormal Local Loop Back | Communication Terminal | T5-5-24 | - |
| 114103-2 | Communication Terminal: No Satellite Found | Communication Terminal | T5-5-24 | - |
| 114104-2 | Communication Terminal: Remote Loop Back Error 1 | Communication Terminal | T5-5-24 | - |
| 114105-2 | Communication Terminal: Remote Loop Back Error 2 | Communication Terminal | T5-5-24 | - |
| 114106-2 | Communication Terminal: Transmission/Receiving Data Unmatched | Communication Terminal | T5-5-24 | - |

Proportional Solenoid Valve Failure

| Fault Code | Trouble or MPDr. Message | Cause | Symptoms in Machine Operation When Trouble Occurs | Remedy |
|---|---|---|---|---|
| 111411-2 | Hydraulic Fan Reverse Rotation P/S Valve Abnormal FB | Solenoid valve output: 140 mA or more, feedback current: More than 920 mA or less than 70 mA; both are detected. | The fan reverse rotation control becomes ineffective. Fan rotation direction (in normal / reverse) cannot change manually and automatically. | Check the wire harness. |
| 111411-3 | Hydraulic Fan Reverse Rotation P/S Valve FB High Current | Current: more than 920 mA | Fan rotation direction is fixed in reverse. | Check the wire harness. |
| 111411-4 | Fan Reverse Rotation P/S Valve FB Low Current | Current: less than 70 mA | Fan rotation direction (in normal / reverse) cannot change manually and automatically. | Check the wire harness. |

| Fault Code (MP.Dr.) | Trouble (Cause) | Fault Code (INSITE) | Lighting Indicator |
|---|---|---|---|
| 97-3 | Water in Fuel Indicator Sensor Circuit-Voltage Above Normal, or Shorted to High Source. High voltage detected at the water in fuel circuit. | 428 | Service Indicator |
| 97-4 | Water in Fuel Indicator Sensor Circuit-Voltage Below Normal, or Shorted to Low Source. Low voltage detected at the water in fuel circuit. | 429 | Service Indicator |
| 97-15 | Water in Fuel Indicator-Data Valid but Above Normal Operational Range-Least Severe Level. Water has been detected in the fuel filter. | 418 | Service Indicator (Blinking) |
| 100-1 | Engine Oil Rifle Pressure-Data Valid but Below Normal Operational Range-Most Severe Level. Oil pressure signal indicates oil pressure below the engine protection critical limit. | 415 | Engine Warning Indicator |
| 100-2 | Engine Oil Rifle Pressure-Data Erratic, Intermittent, or Incorrect. An error in the engine oil pressure switch signal was detected by the ECM. | 435 | Service Indicator |
| 100-3 | Engine Oil Rifle Pressure 1 Sensor Circuit-Voltage Above Normal, or Shorted to High Source. High signal voltage detected at the engine oil pressure circuit. | 135 | Service Indicator |
| 100-4 | Engine Oil Rifle Pressure 1 Sensor Circuit-Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at engine oil pressure circuit. | 141 | Service Indicator |

| Fault Code (MP.Dr.) | Trouble (Cause) | Fault Code (INSITE) | Lighting Indicator |
|---|---|---|---|
| 656-5 | Injector Solenoid Driver Cylinder 6 Circuit-Current Below Normal, or Open Circuit. High resistance detected on injector Number 6 circuit or no current detected at Number 6 injector driver or return pin when the voltage supply at the harness is on. | 325 | Service Indicator |
| 677-3 | Starter Relay Driver Circuit-Voltage Above Normal, or Shorted to High Source. Open circuit or high voltage detected at starter lockout circuit. | 584 | Service Indicator |
| 677-4 | Starter Relay Driver Circuit-Voltage Below Normal, or Shorted to Low Source. Low voltage detected at starter lockout circuit. | 585 | Service Indicator |
| 697-3 | Auxiliary PWM Driver 1 Circuit-Voltage Above Normal, or Shorted to High Source. High signal voltage detected at the analog torque circuit. | 2557 | Service Indicator |
| 697-4 | Auxiliary PWM Driver 1 Circuit-Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at the analog torque circuit. | 2558 | Service Indicator |
| 702-3 | Auxiliary Input/Output 2 Circuit-Voltage Above Normal, or Shorted to High Source. High signal voltage or open circuit has been detected at the auxiliary input/output 2 circuit. | 527 | Service Indicator |
| 703-3 | Auxiliary Input/Output 3 Circuit-Voltage Above Normal, or Shorted to High Source. Low signal voltage has been detected at the auxiliary input/output 2 circuit. | 529 | Service Indicator |
| 723-2 | Engine Camshaft Speed / Position Sensor-Data Erratic, Intermittent, or Incorrect. The ECM has detected an error in the camshaft position sensor signal. | 778 | Service Indicator |

| TCU Fault Code | Trouble | Cause | Behavior of TCU | Repair Procedure |
|---|---|---|---|---|
| 5480-3 | Abnormal First Speed Clutch Proportional Solenoid Valve High Voltage | Shorted circuit in power circuit because of faulty wire harness or faulty connector.<br>Faulty proportional solenoid valve. | Turn TCU to neutral.<br>After returning the forward/reverse lever to neutral, operate it again.<br>Then, machine can travel only at first or second speed.<br>If other proportional solenoid valve is abnormal, TCU is fixed to neutral. | Check the wire harness between TCU and transmission control valve.<br>Check the connector between TCU and transmission control valve.<br>Check resistance in the proportional solenoid valve. (19 Ω at 20 °C (68 °F))<br>Check the internal wire harness in transmission control valve. |
| 5480-4 | Abnormal First Speed Clutch Proportional Solenoid Valve Low Voltage | Grounding to body because of faulty wire harness or faulty connector.<br>Faulty shorted circuit to other proportional solenoid valve output circuit in TCU because of faulty wire harness or faulty connector.<br>Faulty proportional solenoid valve. | Turn TCU to neutral.<br>After returning the forward/reverse lever to neutral, operate it again.<br>Then, machine can travel only at first or second speed.<br>If other proportional solenoid valve is abnormal, TCU is fixed to neutral. | Check the wire harness between TCU and transmission control valve.<br>Check the connector between TCU and transmission control valve.<br>Check resistance in the proportional solenoid valve. (19 Ω at 20 °C (68 °F))<br>Check the internal wire harness in transmission control valve. |
| 5480-5 | Open Circuit in First Speed Clutch Proportional Solenoid Valve | Faulty contact of wire harness, connector, and TCU.<br>Faulty proportional solenoid valve. | Turn TCU to neutral.<br>After returning the forward/reverse lever to neutral, operate it again.<br>Then, machine can travel only at first or second speed.<br>If other proportional solenoid valve is abnormal, TCU is fixed to neutral. | Check the wire harness between TCU and transmission control valve.<br>Check the connector between TCU and transmission control valve.<br>Check resistance in the proportional solenoid valve. (19 Ω at 20 °C (68 °F))<br>Check the internal wire harness in transmission control valve. |

| TCU Fault Code | Trouble | Cause | Behavior of TCU | Repair Procedure |
|---|---|---|---|---|
| 5675-2 | High-Speed Forward Clutch Slipping. When operating the high-speed forward clutch, if the value calculated by the signal of transmission intermediate shaft speed sensor is different from the actual value of torque converter output speed sensor, TCU determines that the clutch slipping occurs. | High-speed forward clutch pressure is low. Main clutch pressure is low. Faulty transmission intermediate shaft speed sensor. Faulty torque converter output speed sensor. Faulty clutch. | Turn TCU to neutral. After returning the forward/reverse lever to neutral, operate it again. Then, machine can travel at first or second speed. If other clutch is abnormal, TCU is fixed to neutral. | Check the high-speed forward clutch pressure. Check the main clutch pressure. Check the signal of transmission intermediate shaft speed sensor. Check the signal of torque converter output speed sensor. Replace the clutch. |
| 5680-2 | Low-Speed Forward Clutch Slipping. When operating the low-speed forward clutch, if the value calculated by the signal of transmission intermediate shaft speed sensor is different from the actual value of torque converter output speed sensor, TCU determines that the clutch slipping occurs. | Low-speed forward clutch pressure is low. Main clutch pressure is low. Faulty transmission intermediate shaft speed sensor. Faulty torque converter output speed sensor. Faulty clutch. | Turn TCU to neutral. After returning the forward/reverse lever to neutral, operate it again. Then, machine can travel at first or second speed. If other clutch is abnormal, TCU is fixed to neutral. | Check the low-speed forward clutch pressure. Check the main clutch pressure. Check the signal of transmission intermediate shaft speed sensor. Check the signal of torque converter output speed sensor. Replace the clutch. |
| 5685-2 | Reverse Clutch Slipping. When operating the reverse clutch, if the value calculated by the signal of transmission intermediate shaft speed sensor is different from the actual value of torque converter output speed sensor, TCU determines that the clutch slipping occurs. | Reverse clutch pressure is low. Main clutch pressure is low. Faulty transmission intermediate shaft speed sensor. Faulty torque converter output speed sensor. Faulty clutch. | Turn TCU to neutral. After returning the forward/reverse lever to neutral, operate it again. Then, machine can travel at first or second speed. If other clutch is abnormal, TCU is fixed to neutral. | Check the reverse clutch pressure. Check the main clutch pressure. Check the signal of transmission intermediate shaft speed sensor. Check the signal of torque converter output speed sensor. Replace the clutch. |

## CAN1 Harness Check

**Preparation**

- Before continuity check, set the key switch to the OFF position.

**Evaluation**

| | Continuity (0 Ω) | Discontinuity (∞ Ω) |
|---|---|---|
| Continuity check (open circuit) | Correct | Discontinuity |
| Discontinuity check (shorted circuit) | Shorted circuit | Correct |

| Inspection | CAN Harness | MC | ECM | TCU | Information Controller | Column Display Controller | A/C |
|---|---|---|---|---|---|---|---|
| Continuity check between MC and each controller | High side | #A28 | #B46 | #25 | #C5 | #2-B30 | #8 |
| | Low side | #A29 | #B47 | #26 | #C11 | #2-B29 | #9 |
| Discontinuity check between CAN circuit and ground circuit in each controller | High side | #A28-#D1 | #B46-#A1 | #25-#1 | #C5-#C14 | #2-B30-#1-B28 | #8-#26 |
| | | #A28-#E1 | #B46-#A2 | #25-#2 | #C5-#C15 | - | - |
| | | #A28-#E2 | - | - | - | - | - |
| | | #A28-#E5 | - | - | - | - | - |
| | | #A28-#E6 | - | - | - | - | - |
| | Low side | #A29-#D1 | #B47-#A1 | #26-#1 | #C5-#C14 | #2-B29-#1-B28 | #9-#26 |
| | | #A29-#E1 | #B47-#A2 | #26-#2 | #C5-#C15 | - | - |
| | | #A29-#E2 | - | - | - | - | - |
| | | #A29-#E5 | - | - | - | - | - |
| | | #A29-#E6 | - | - | - | - | - |

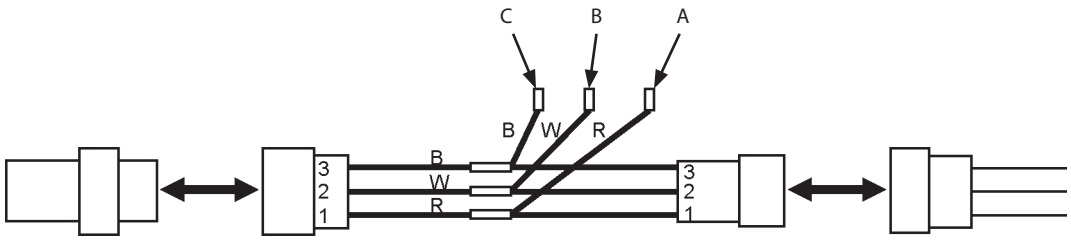
## MC Fault Codes 111204, 111206

**Preparation**

- Check the wiring connections first.
- Connect the test harness (Tool No. ST 6701) and dummy sensor equivalent to #4436271.
- Before inspection, set the key switch to the ON position.

| Fault Code | Trouble or MPDr. Message | Inspection Method | Evaluation | Cause |
|---|---|---|---|---|
| 111204-3 | Pump Delivery Pressure Sensor Circuit High Input | Retry by using MPDr. | Un-displayed fault code | Faulty sensor. |
| | | Measure voltage between B and body. | Voltage: 4.75 V or more | Shorted circuit in wire harness #1 and #2. |
| 111204-4 | Pump Delivery Pressure Sensor Circuit Low Input | Retry by using MPDr. | Un-displayed fault code | Faulty sensor. |
| | | Measure voltage between A and body. | Voltage: less than 0.25 V | Open circuit in wire harness #1. |
| | | Measure voltage between A and C (GND). | Voltage: less than 0.25 V | Open circuit in wire harness #3. |
| | | - | Normal in above check. | Open circuit in wire harness #2. |
| 111206-3 | Hyd. Fan Circuit Pressure Sensor Circuit High Input | Retry by using MPDr. | Un-displayed fault code | Faulty sensor. |
| | | Measure voltage between B and body. | Voltage: 4.75 V or more | Shorted circuit in wire harness #1 and #2. |
| 111206-4 | Hyd. Fan Circuit Pressure Sensor Circuit Low Input | Retry by using MPDr. | Un-displayed fault code | Faulty sensor. |
| | | Measure voltage between A and body. | Voltage: less than 0.25 V | Open circuit in wire harness #1. |
| | | Measure voltage between A and C (GND). | Voltage: less than 0.25 V | Open circuit in wire harness #3. |
| | | - | Normal in above check. | Open circuit in wire harness #2. |

*NOTE: The pump delivery pressure sensor is installed to the hydraulic pump. (See p. T5-4-15.)*
*The fan circuit pressure (fan pump delivery pressure) sensor is located above the fuel tank. (See p. T5-4-13.)*




TDAA-05-06-003

(Blank)

| Parts / Item | Forward/Reverse Selector Switch (Option) | Forward/Reverse Switch (Option) |
|---|---|---|
| Function | Shifts forward/reverse lever and forward/reverse switch operations. | Shifts forward clutch solenoid valve, and reverse clutch solenoid valve of transmission. |
| Symptoms in control system when trouble occurs | TCU makes forward/reverse lever operation effective. | TCU makes forward/reverse lever operation effective. |
| Symptoms in machine operation when trouble occurs | Functions of forward/reverse lever become effective. | Functions of forward/reverse lever become effective. |
| Evaluation by Fault Code | - | TCU: 5040 |
| Evaluation by Monitoring | TCU: Forward/Reverse Selector Switch | TCU: Option Forward/Reverse Switch (N)/(F)/(R) |
| Evaluation by using Test Harness | - | - |
| Note | The operation is effective with forward/reverse lever and forward/reverse switch set in the neutral position. | When forward/reverse lever is operated, forward/reverse selector switch operation becomes ineffective. (forward/ reverse lever priority) |
| Descriptions of Control (Refer to F&S S/M) | T2-2, T2-5 | T2-2, T2-5 |

| Parts / Item | Machine Speed Sensor |
|---|---|
| Function | Detects transmission output shaft speed. |
| Symptoms in control system when trouble occurs | When abnormality is detected, the following symptoms occur. |
| Symptoms in machine operation when trouble occurs | The speed meter continues to display 0 km/h.<br>The overrun alarm control is not effective.<br>The ride control (option) is not effective. |
| Evaluation by Fault Code | TCU: 5170 |
| Evaluation by Monitoring | MC: Machine Speed Pulse |
| Evaluation by using Test Harness | - |
| Note | Refer to p. 5-4-17 for the sensor location.<br>Possible to judge if speed sensor is faulty by switching pressure sensor with other speed sensor. |
| Descriptions of Control (Refer to F&S S/M) | T2-2 |

| Trouble Symptom / Parts | E-4<br>Power mode is not shifted when pushing power mode switch. | E-5<br>Even if key switch is turned OFF, engine does not stop. |
|---|---|---|
| MC | ○ | ○ |
| ECM | | ● |
| TCU | | |
| Information Controller | ○ | |
| Monitor | ○ | |
| Column Display Controller | | |
| MPDr. | ○ | |
| Key Switch | | ● |
| Accelerator Pedal Sensor | | |
| Power Mode Switch | ● | |
| Forward/Reverse Lever | | |
| Forward/Reverse Selector Switch (Option) | | |
| Forward/Reverse Switch (Option) | | |
| Battery | | |
| Battery Relay | | ○ |
| Fuse Box A | | |
| Fuse Box B | | |
| Neutral Relay | | |
| Load Dump 2 Relay | | ○ |
| Starter Relay 1 | | |
| ECM Main Relay | | ○ |
| Fuel Pump Relay | | |
| Starter | | |
| Engine Unit | | |
| Coolant Temperature Sensor | | |
| Glow Plug Relay | | |
| Glow Plug | | |
| Pump Delivery Pressure Sensor | | |
| Remark | | |

●: Check required ○: Related

| Trouble Symptom / Parts | S-4<br>Secondary steering (option) is not operated. (Check automatic operation when the engine starts) |
|---|---|
| MC | ● |
| TCU | |
| Information Controller | |
| Monitor | |
| MPDr. | ● (Setting: ON) |
| Battery | |
| Fuse Box A | ○ (#20) |
| Secondary Steering Relay (Option) | ● |
| Machine Speed Sensor | ○ |
| Pilot Pump | |
| Brake Charge Valve | |
| Manifold Valve | |
| Steering Pressure Switch (Option) | ● |
| Secondary Steering Pump Delivery Pressure Sensor (Option) | ○ |
| Steering Cylinder (Left, Right) | |
| Steering Accumulator | |
| Main Pump | |
| Secondary Steering Motor (Option) | ○ |
| Secondary Steering Pump (Option) | ○ |
| Remark | |

●: Check required ○: Related

| Trouble Symptom / Parts | O-10<br>Wiper is not operated. | O-11<br>Washer is not operated. | O-12<br>Cab light is not ON. |
|---|---|---|---|
| MC | | | |
| Information Controller | | | |
| Column Display Controller | ● | | |
| Key Switch | ○ (ON) | ○ (ON) | |
| Battery | | | ○ |
| Fuse Box A | | | |
| Fuse Box B | ● (#3, #5)*1 | ● (#3, #5)*1 | ● (#11) |
| Front Wiper/ Washer Switch | ● | ● | |
| Rear Wiper/ Washer Switch | ● | ● | |
| Cab Light Switch | | | ● |
| Rear Cab Light Switch | | | ● |
| Door Open/Close Switch (Cab) | | | ● |
| Front Wiper Relay 1 | ● | | |
| Front Wiper Relay 2 | ● (Fast Speed) | | |
| Rear Wiper Relay | ● | | |
| Front Washer Relay | | ● | |
| Rear Washer Relay | | ● | |
| Front Wiper Motor | ● | | |
| Rear Wiper Motor | ● | | |
| Front Washer Motor | | ● | |
| Rear Washer Motor | | ● | |
| Remark | | | |

●: Check required ○: Related

*NOTE: *1) Fuse #3: Front Wiper, Fuse #5: Rear Wiper*

### A-5 Fan speed does not change.

**Preparation**

- The sensors detect the conditions necessary to operate fan speed control. Therefore, if these sensors fails, fan speed control becomes ineffective.
- Accelerator pedal sensor, coolant temperature sensor, boost temperature sensor, hydraulic oil temperature sensor, torque converter oil temperature sensor, and pressure sensor (refrigerant pressure) are also engaged in the fan speed control. However, if these sensors fail, other operating functions will be also affected.
- Refer to SYSTEM/Control System/Fan Reverse Rotation Control.

| Procedure | Inspection Method | Condition | Evaluation | Cause |
|---|---|---|---|---|
| 1 | Monitor Target Hydraulic Fan Speed | Engine: Running | Fan speed does not change according to accelerator pedal depressing amount | Faulty ECM, TCU, or MC |
| 2 | Monitor Hydraulic Fan Circuit Pressure | Engine: Running | Fan pump delivery pressure does not change according to accelerator pedal depressing amount | Faulty fan pump |
| 3 | Disassemble and inspect the fan speed control solenoid valve | - | There is abnormality | Faulty fan speed control solenoid valve |
| 4 | Disassemble and inspect the fan control valve | - | There is abnormality | Faulty fan control valve |
| 5 | - | - | The check mentioned above is normal | Faulty fan motor |

*NOTE: The fan pump is mounted to the engine (see p.T5-4-14).*
*Refer to p.T5-4-13 and T5-4-16 for the fan system components.*

### F-8 Lift arm auto leveler lower kickout control (Optional) is not activated.

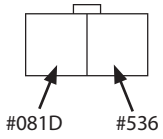
**Preparation**

- Refer to SYSTEM/Control System/Lift Arm Auto Leveler Lower Kickout Control.
- Check the wiring connections first.
- Check #16 fuse in fuse box A.

| Procedure | Inspection Method | Condition | Evaluation | Cause |
|---|---|---|---|---|
| 1 | Measure voltage between pilot valve lift arm lower side coil harness end #081D and body | Key switch: ON | 0 V | Open circuit in wire harness between #16 fuse in fuse box A and pilot valve lift arm lower side coil |
| 2 | Check continuity between pilot valve lift arm lower side coil harness end #536 and body | Lift arm lower, detent control lever operation | 0 Ω | Faulty ground in pilot valve lift arm lower side coil |
| 3 | Monitor Lift Arm Auto Leveler Switch (lower) | Lift arm auto leveler switch (lower): ON | OFF is displayed | Faulty lift arm auto leveler switch (lower) |
| 4 | - | - | The check mentioned above is normal | Faulty pilot valve lift arm lower side coil |

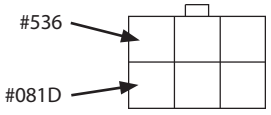
**Connector (Wire harness end)**

- Pilot Valve (Fingertip Control Lever Type) Dual Auto Leveler (Optional)




TNDJ-05-06-003

- Pilot Valve (Multi-Function Joystick Lever Type) Dual Auto Leveler (Optional)




T8UC-05-04-004

**T-4 Travel mode can not be shifted.**

**Preparation**

- Check the wiring connections first.

| Procedure | Inspection Method | Condition | Evaluation | Cause |
|---|---|---|---|---|
| 1 | Monitor Travel Mode Selector Switch | Travel mode selector switch: AUTO 1/AUTO 2 mode | Manual mode is always displayed (0 is displayed on the monitor) | Faulty travel mode selector switch, or open circuit in wire harness between travel mode selector switch and MC |
| 2 | - | - | The check mentioned above is normal | Faulty MC |

(Blank)

**O-10 Wiper is not operated.**

**Preparation**

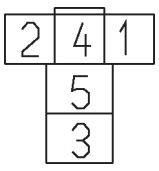
- The wiper is driven by electric power routed via the relay circuit. The relay circuit of front wiper is controlled by the column display controller.
- In case the wiper is not operated, first check if the wiper relay is activated. Next, check if electric power is routed to the wiper motor.
- In case the front washer is also not operated, check #3 fuse in fuse box B. In case the rear washer is also not operated, check #5 fuse in fuse box B.
- Refer to SYSTEM/Electrical System.
- Check the wiring connections first.

- Front Wiper

| Procedure | Inspection Method | Condition | Evaluation | Cause |
|---|---|---|---|---|
| 1 | Monitor Front Wiper Relay 1 Output | Key switch: ON Front wiper/ washer switch: LOW | OFF is displayed | Faulty column display controller |
| 2 | Monitor Front Wiper Relay 2 Output | Key switch: ON Front wiper/ washer switch: HIGH | OFF is displayed | Faulty column display controller |
| 3 | Monitor Front Wiper Switch | Key switch: ON Front wiper/ washer switch: LOW/HIGH | The position of front wiper/washer switch is not identical to the display of monitoring | Faulty front wiper/washer switch, or open circuit in wire harness between front wiper/ washer switch and column display controller, or open circuit in harness between front wiper relay 1/2 and column display controller |
| 4 | Switch front wiper relay 1/2 with other general relay | Key switch: ON Front wiper/ washer switch: LOW/HIGH | Wiper is operated | Faulty front wiper relay 1/2 |
| 5 | - | - | The check mentioned above is normal | Faulty front wiper motor |

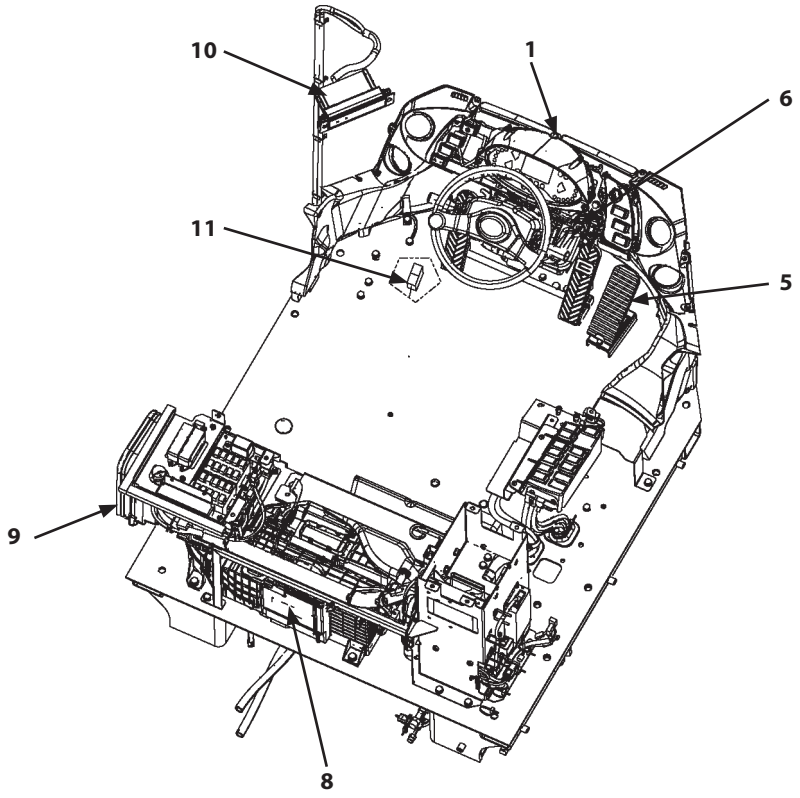
**Connector (Wire harness end)**

- Front Wiper Relay 1
- Front Wiper Relay 2

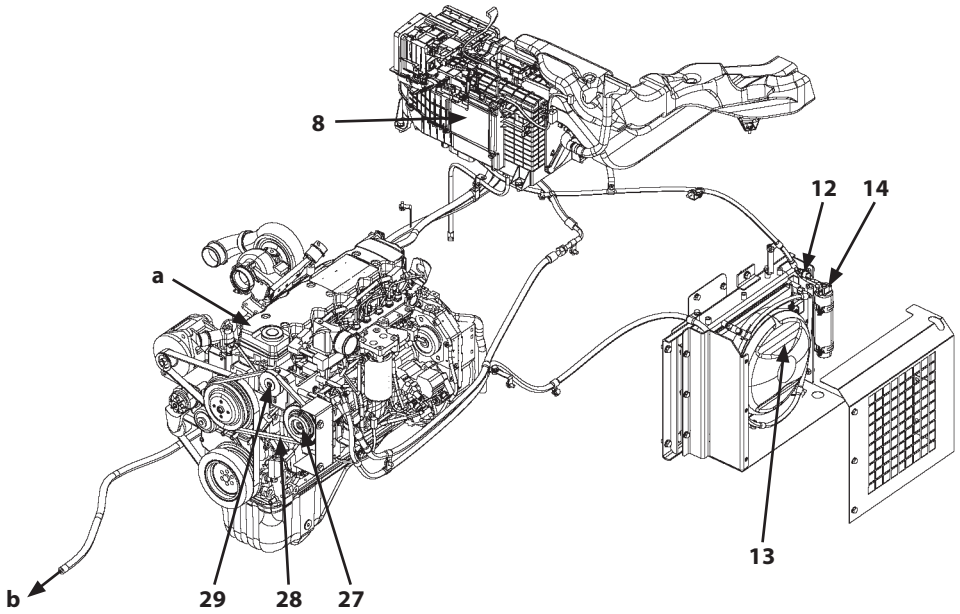



T183-05-04-003

### Component Layout




TNDF-05-07-001




TNEJ-05-07-001

a- Engine
b- To Radiator (Lower)

1- Solar Radiation Sensor
5- Accelerator Pedal
6- Key Switch
8- Air Conditioner Unit
9- Fresh Air Filter
10- Air Conditioner Controller (Switch Panel)
11- Outdoor Ambient Temperature Sensor
12- High/Low Pressure Switch
13- Air Conditioner Condenser
14- Receiver Tank
27- Compressor
28- V Belt (A/C)
29- Pulley (A/C)

## Air Conditioner Controller Fault Code List

| Fault Code | Trouble | Cause | Symptoms in Machine Operation When Trouble Occurs. | Remedy |
|---|---|---|---|---|
| E11 | Open circuit in re-circulated air sensor | Voltage: more than 4.95 V | Operation is controlled under such circumstance as no re-circulated air sensor is provided. | Check the harness. Replace the re-circulated air sensor. |
| E12 | Shorted circuit in re-circulated air sensor | Voltage: less than 0.3 V | Operation is controlled under such circumstance as no re-circulated air sensor is provided. | Check the harness. Replace the re-circulated air sensor. |
| E13 | Open circuit in outdoor ambient temperature sensor | Voltage: more than 4.88 V | Operation is controlled under such circumstance as no outdoor ambient temperature sensor is provided. | Check the harness. Replace the outdoor ambient temperature sensor. |
| E14 | Shorted circuit in outdoor ambient temperature sensor | Voltage: less than 0.096 V | Operation is controlled under such circumstance as no outdoor ambient temperature sensor is provided. | Check the harness. Replace the outdoor ambient temperature sensor. |
| E18 | Shorted circuit in solar radiation sensor | Voltage: more than 5.04 V | Operation is controlled under such circumstance as no solar radiation sensor is provided. | Check the harness. Replace the solar radiation sensor. |
| E21 | Open circuit in frost sensor | Voltage: more than 4.79 V | The compressor clutch is disengaged. (The compressor stops.) | Check the harness. Replace the frost sensor. |
| E22 | Shorted circuit in frost sensor | Voltage: less than 0.096 V | The compressor clutch is disengaged. (The compressor stops.) | Check the harness. Replace the frost sensor. |
| E43 | Abnormal air vent damper servo motor | Shorted circuit: Voltage: 0 V<br>Open circuit: Voltage: more than 5 V | Air vent damper servo motor becomes inoperable. | Check the harness. Replace the air vent damper servo motor. |
| E44 | Abnormal air mix damper servo motor | Shorted circuit: Voltage: less than 0.2 V<br>Open circuit: Voltage: more than 4.8 V | Air mix damper servo motor servo motor becomes inoperable. | Check the harness. Replace the air vent damper servo motor. |
| E51 | Abnormal high/low refrigerant pressure | Voltage: 0 V | The compressor clutch is disengaged. (The compressor stops.) | Check the harness. Replace the high/low pressure switch. |
| E91 | CAN communication error | Faulty CAN1 harness between monitor controller and air conditioner controller | Air conditioner stops. | Check the CAN1 harness. Replace air conditioner controller. |
| E92 | CAN bus off error | Faulty air conditioner controller<br>Faulty CAN1 harness | Air conditioner stops. | Check the CAN1 harness. Replace air conditioner controller. |

**Faulty cooling (5)**

Condition:

- Fault Code: 44 (Abnormal air mix damper servo motor)

| | |
|---|---|
| Faulty wiring, open circuit, disconnection of connector | Wirings inspection |
| Faulty servo motor | Replace |
| Clogged foreign matter | Remove foreign matter |

Condition:

- Fault Code: 51 (Abnormal high/low refrigerant pressure)

| | | | |
|---|---|---|---|
| High pressure cut is operated | Abnormally high ambient temperature | | |
| | Lack of condenser cooling | Clogged fin with dirt or mud | Cleaning of fin (washing) |
| | Overcharge air conditioner with refrigerant | Remove refrigerant thoroughly and recharge refrigerant to proper level after purging | |
| | Air incorporation in refrigeration cycle | Remove refrigerant thoroughly and recharge refrigerant to proper level after purging | |
| Low pressure cut is operated | Abnormally low ambient temperature | | |
| | Low refrigerant | Low refrigerant quantity | Charge refrigerant to proper level |
| | | Gas leak | Check leak and charge with refrigerant after repairing faulty |
| | Faulty compressor | Swash plate shoe is locked | Replace compressor |
| | | Piston is locked | Replace compressor |
| | | Faulty suction discharge valve | Replace compressor |
| | Faulty expansion valve | Clogged valve (foreign matter) | Replace valve |
| | | Temporary clogged due to freezing valve (water intrusion) | Thoroughly perform purging after replacing valve and receiver |

**Cooling circuit check by using manifold gauge**

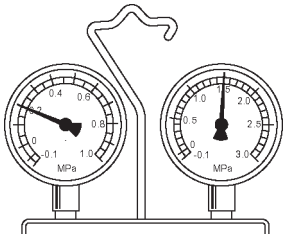
Condition:

- Engine Speed: 1500 $min^{-1}$
- Cab Window: Fully Open
- Air Conditioner: ON
- Airflow volume: Maximum
- Temperature Control Switch: Maximum cool
- Fresh / re-circulated air selection: Re-circulated Air
- Air conditioner inlet temperature: 30 to 35 °C

1. In normal

- Low-pressure side pressure: 0.15 to 0.25 MPa
- High-pressure side pressure: 1.37 to 1.57 MPa

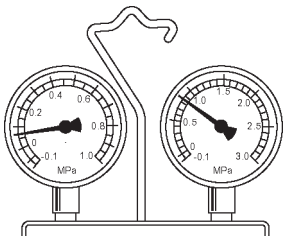
*NOTE: The reading of manifold gauge may depend on conditions.*



TDAA-05-07-018

2. Lack of refrigerant quantity

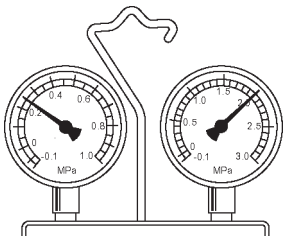
| | |
|---|---|
| Trouble | Pressure is low on both sides of high-pressure and low-pressure. Cooling performance is low. |
| Cause | Refrigerant quantity is low. Gas leak. |
| Remedy | Check and repair of gas leak. Charge air conditioner with refrigerant. |



TDAA-05-07-019

3. Excessive refrigerant, lack of condenser cooling

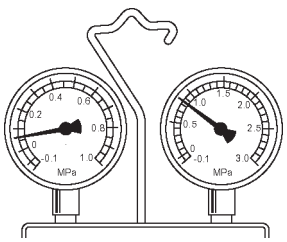
| | |
|---|---|
| Trouble | Pressure is high on both sides of high-pressure and low-pressure. Cooling performance is low. |
| Cause | Overcharge air conditioner with refrigerant. Faulty condenser cooling. |
| Remedy | Adjust refrigerant quantity. Clean condenser. Check for machine cooling system. |



TDAA-05-07-020

4. Water incorporation in circuit.

| | |
|---|---|
| Trouble | After using a certain period of time, low-pressure side gradually indicates negative pressure. |
| Cause | Water is mixed in circuit. |
| Remedy | Replace receiver tank. Thoroughly perform purging before charging refrigerant to remove water. |



TDAA-05-07-021