

KCM Corporation

80Z6

SHOP MANUAL

Operational Performance Test
Troubleshooting

93209-00770

KCM Corporation

93209-00770
April 2016

SHOP MANUAL

WHEEL LOADER

80Z6

***Operational Performance Test
Troubleshooting***

Powered by CUMMINS QSB6.7 Engine
Serial No. 80C7-0101 and up

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SAFETY

Protect Against Noise

- Prolonged exposure to loud noise can cause impairment or loss of hearing.
- Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortably loud noises.



SA-434

Inspect Machine

- Inspect your machine carefully each day or shift by walking around it before you start it to avoid personal injury.
- In the walk-around inspection, be sure to cover all points described in the “Inspect Machine Daily Before Starting” section in the operator’s manual.



SA-435

SAFETY

Drive Safely with Bucket Loaded

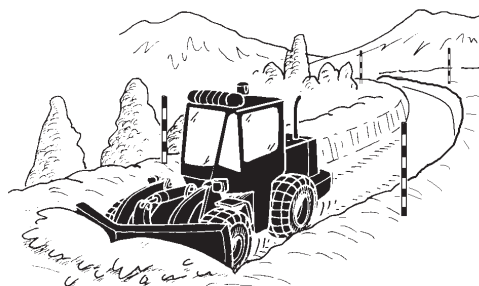
- If the machine is incorrectly operated while driving with the bucket loaded, turning over of the machine may result. Be sure to follow all the instructions indicated below.
 - When driving the machine on a job site with the bucket loaded, hold the bucket as low as possible to keep the machine balanced and to have good visibility.
 - Do not exceed the rated load capacity. Always operate the machine within the rated load capacity.
 - Avoid fast starts, stops, and quick turns. Failure to do so may result in personal injury and / or death.
 - Avoid rapid drive direction changes which could possibly cause personal injury and / or death.



SA-400

Drive on Snow Safely

- Beware of the possibility of slipping or turning over the machine when driving on frozen snow surfaces.
 - The machine may slip more easily than expected on frozen snow surfaces even if the inclination is small. Reduce speed when driving. Avoid fast starts, stops and quick turns.
 - Road shoulder and / or set-up utilities covered with snow are difficult to locate. Be sure where they are before removing snow.
 - Be sure to use tire chains when driving on snow.
 - Avoid applying the brake for quick stops on snow. If a quick stop is required, lower the bucket to the ground.



SA-452

SAFETY

Practice Safe Maintenance

To avoid accidents:

- Understand service procedures before starting work.
- Keep the work area clean and dry.
- Do not spray water or steam inside cab.
- Never lubricate or service the machine while it is moving.
- Keep hands, feet and clothing away from power-driven parts.

Before servicing the machine:

1. Park the machine on a level surface.
2. Lower the bucket to the ground.
3. Run the engine at low idle speed without load for 5 minutes.
4. Turn the key switch to OFF to stop engine.
5. Relieve the pressure in the hydraulic system by moving the control levers several times.
6. Remove the key from the key switch.
7. Attach a "Do Not Operate" tag on the control lever.
8. Turn the control lever lock switch to the lock (🔒) position.
9. Lock bar connects the front and rear frames.
10. Allow the engine to cool.

- If a maintenance procedure must be performed with the engine running, do not leave machine unattended.
- Never work under a machine raised by the lift arm.
- Inspect certain parts periodically and repair or replace as necessary. Refer to the section discussing that part in the "MAINTENANCE" chapter of this manual.
- Keep all parts in good condition and properly installed.
- Fix damage immediately. Replace worn or broken parts. Remove any buildup of grease, oil, or debris.
- When cleaning parts, always use nonflammable detergent oil. Never use highly flammable oil such as fuel oil and gasoline to clean parts or surfaces.
- Disconnect battery ground cable (-) before making adjustments to electrical systems or before performing welding on the machine.



SA-028



SA-312



SA-134



SA-527

SAFETY

Prevent Battery Explosions

- Battery gas can explode.
 - Keep sparks, lighted matches, and flame away from the top of battery.
 - Never check battery charge by placing a metal object across the posts. Use a voltmeter or hydrometer.
 - Do not charge a frozen battery; it may explode. Warm the battery to 16 °C (60 °F) first.
 - Do not continue to use or charge the battery when electrolyte level is lower than specified. Explosion of the battery may result.
 - Loose terminals may produce sparks. Securely tighten all terminals.
 - Connect terminals to the correct electrical poles. Failure to do so may cause damage to the electrical parts or fire.
- Battery electrolyte is poisonous. If the battery should explode, battery electrolyte may be splashed into eyes, possibly resulting in blindness.
 - Be sure to wear eye protection when checking electrolyte specific gravity.



SA-032

Service Air Conditioning System Safely

- If spilled onto skin, refrigerant may cause a cold contact burn.
 - Refer to the instructions described on the container for proper use when handling the refrigerant.
 - Use a recovery and recycling system to avoid leaking refrigerant into the atmosphere.
 - Never touch the refrigerant.



SA-405

SECTION 4 OPERATIONAL PERFORMANCE TEST

Group 1 Introduction

Preparation for Performance Tests

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

THE MACHINE

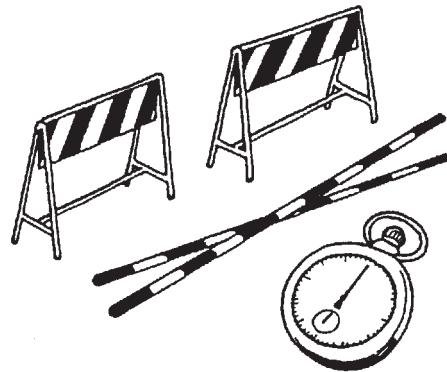
1. Repair any defects and damage found, such as oil or water leaks, loose bolts, cracks and so on, before starting to test.

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.

SECTION 4 OPERATIONAL PERFORMANCE TEST

Group 2 Standard

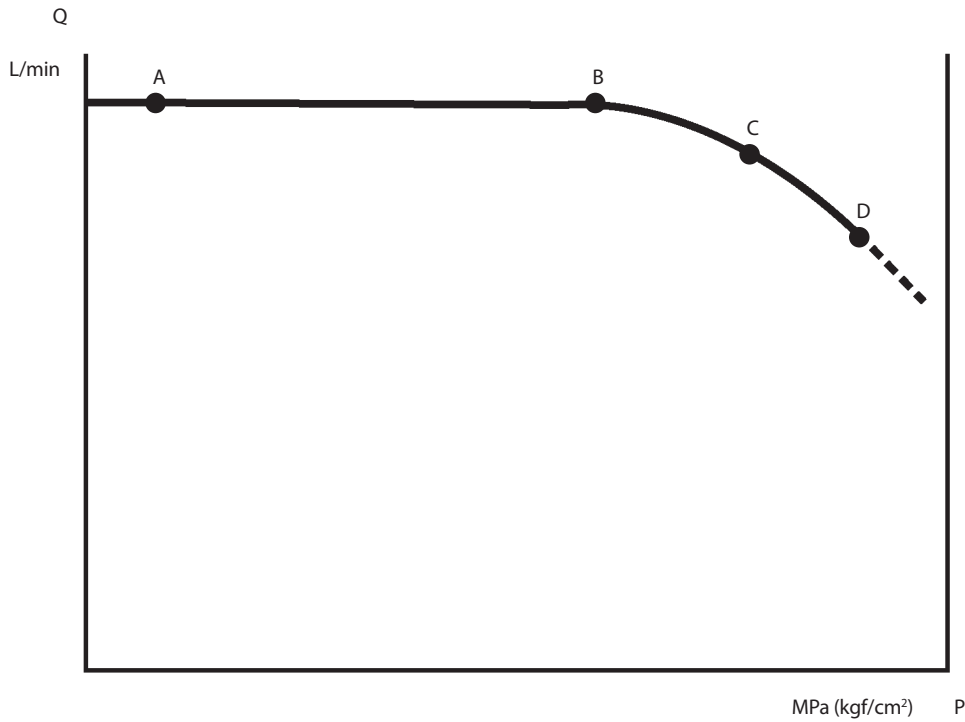
Main Pump P-Q Diagram

- 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)	275±3
B	19.6 (200)	275±5
C	24.5 (250)	243±6
D	27.4 (280)	213±6



T4GB-04-02-001

SECTION 4 OPERATIONAL PERFORMANCE TEST

Group 4 Machine Performance Test

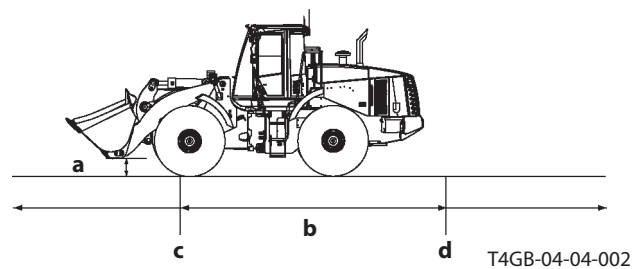
Service Brake Function Check

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. (Refer to Operational Performance Standard.)
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.



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

SECTION 4 OPERATIONAL PERFORMANCE TEST

Group 4 Machine Performance Test

Control Lever Operating Force

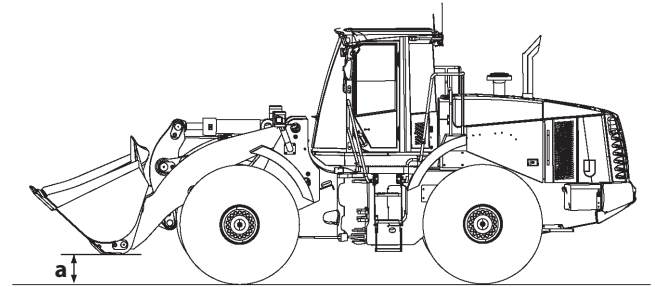
Summary:

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 with it 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)

SECTION 4 OPERATIONAL PERFORMANCE TEST

Group 5 Component Test


Main Relief Set Pressure

Summary:

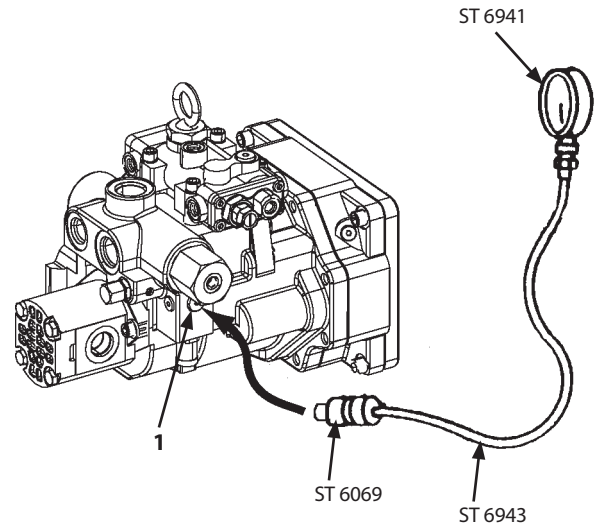
1. Measure the main relief valve set pressure at the delivery port in main pump.

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 (ST 6069), the hose (ST 6943), and the pressure gauge (ST 6941).

 : 6 mm

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).



T4GB-04-05-008

- 1- Pump 1 Delivery Pressure Check Port

SECTION 4 OPERATIONAL PERFORMANCE TEST

Group 5 Component Test

- 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. The measured data will be lower by approx. 5 % than the accurately measured value. In order to measure accurately, disconnect the return circuit from the control 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

3. Connect regulator port Pi2 (8) and port VQ (2) to the hydraulic oil tank.


 : 19 mm

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

 : 19 mm

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

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

 : 22 mm, 27 mm

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

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.

SECTION 4 OPERATIONAL PERFORMANCE TEST

Group 5 Component Test

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:

1. 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.

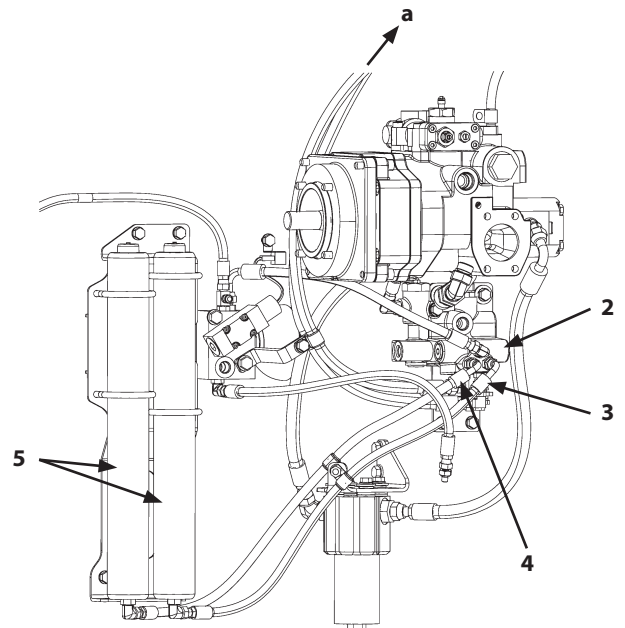
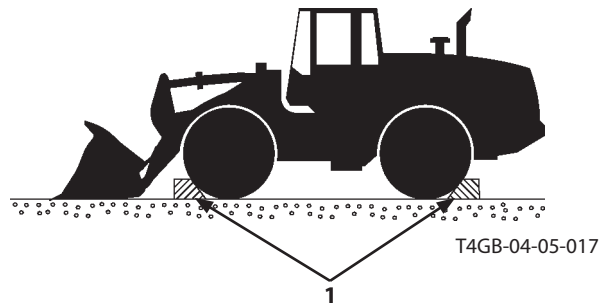
Preparation:

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

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).



a- To Brake Valve

SECTION 4 OPERATIONAL PERFORMANCE TEST
Group 5 Component Test

(Blank)

Steering System Troubleshooting	T5-6-69
Travel System Troubleshooting	T5-6-73
Brake System Troubleshooting	T5-6-83
Other System Troubleshooting.....	T5-6-87
Exchange Inspection	T5-6-101
Air Bleeding Procedures for Brake (Axle).....	T5-6-103

Group 7 Air Conditioner

Outline	T5-7-1
Functions of Main Parts	T5-7-6
Troubleshooting.....	T5-7-11
Air Conditioner Controller Fault Code List.....	T5-7-12
Air Conditioner Controller Fault Codes	
E11 to E22.....	T5-7-13
Air Conditioner Controller Fault Codes	
E43 to E92.....	T5-7-14
Work after Replacing Components	T5-7-36
Refill Compressor Oil	T5-7-37
Charge Air Conditioner with Refrigerant	T5-7-38
Hose and Pipe Tightening Torque.....	T5-7-46


SECTION 5 TROUBLESHOOTING

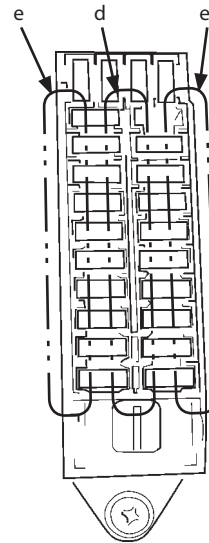
Group 1 Diagnosing Procedure

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.

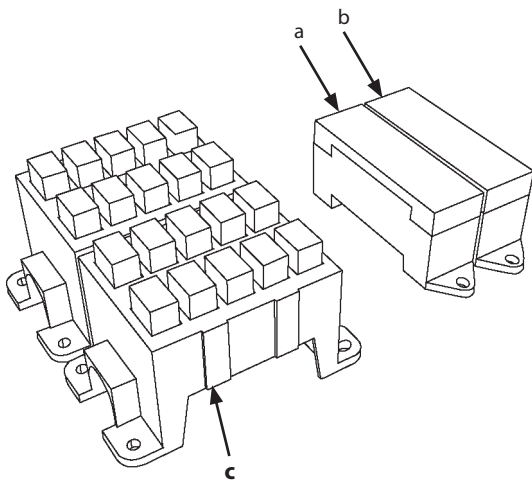
1. Set the key switch to the ON position. When the key switch is in the ON position, current from key switch terminal M turns the battery relay ON so that electric power is supplied to all circuits except the glow plug relay circuit. (Refer to the circuit diagram.)
2. Remove the fuse box cover. Set a 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

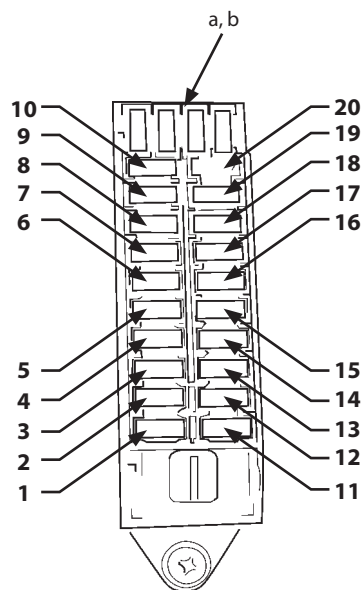
- d- Terminals connected to the power source
- e- Terminals connected to loads (accessories)



MNEC-01-047

- a- Fuse Box A
- b- Fuse Box B

- c- Relay Box



M178-07-034

SECTION 5 TROUBLESHOOTING

Group 1 Diagnosing Procedure

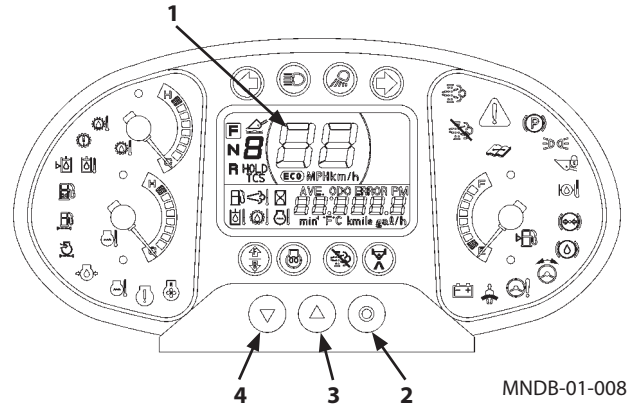
Engine	Key Switch	Location to be Measured	Specification
Accessory Circuit			
Stopped	ON	Between (12) and Ground: Key Switch (ACC)	20 to 25 V
Stopped	ON	Between (13) and Ground: Radio	20 to 25 V
Stopped	ON	Between (5) and Ground: Fusible Link A (65A)	20 to 25 V

SECTION 5 TROUBLESHOOTING

Group 2 Monitor

Monitor Display

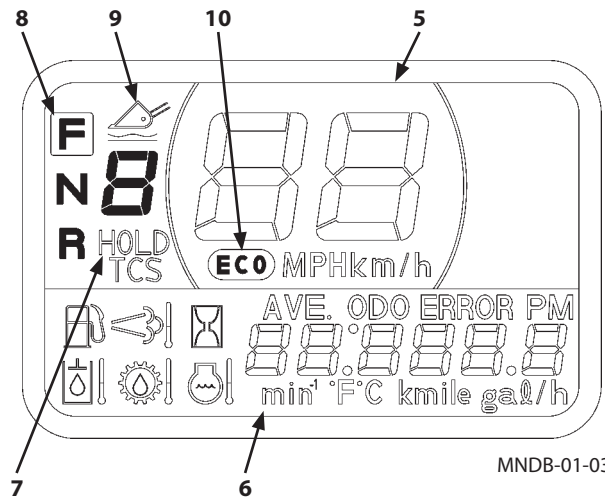
- 1- Monitor Display
- 2- Monitor Display Mode Switch
- 3- Monitor Display Selection Switch (Up)
- 4- Monitor Display Selection Switch (Down)
- 5- Speedometer
- 6- Machin Information Display
- 7- Hold Indicator
- 8- Forward/Reverse and Shift Position Indicator
- 9- Ride Control Indicator
- 10- ECO Indicator



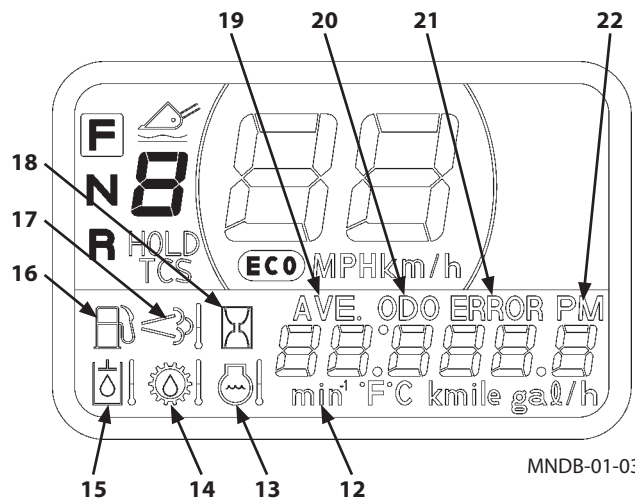
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Vehicle Information Display (6)

- 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

SECTION 5 TROUBLESHOOTING

Group 3 e-Service

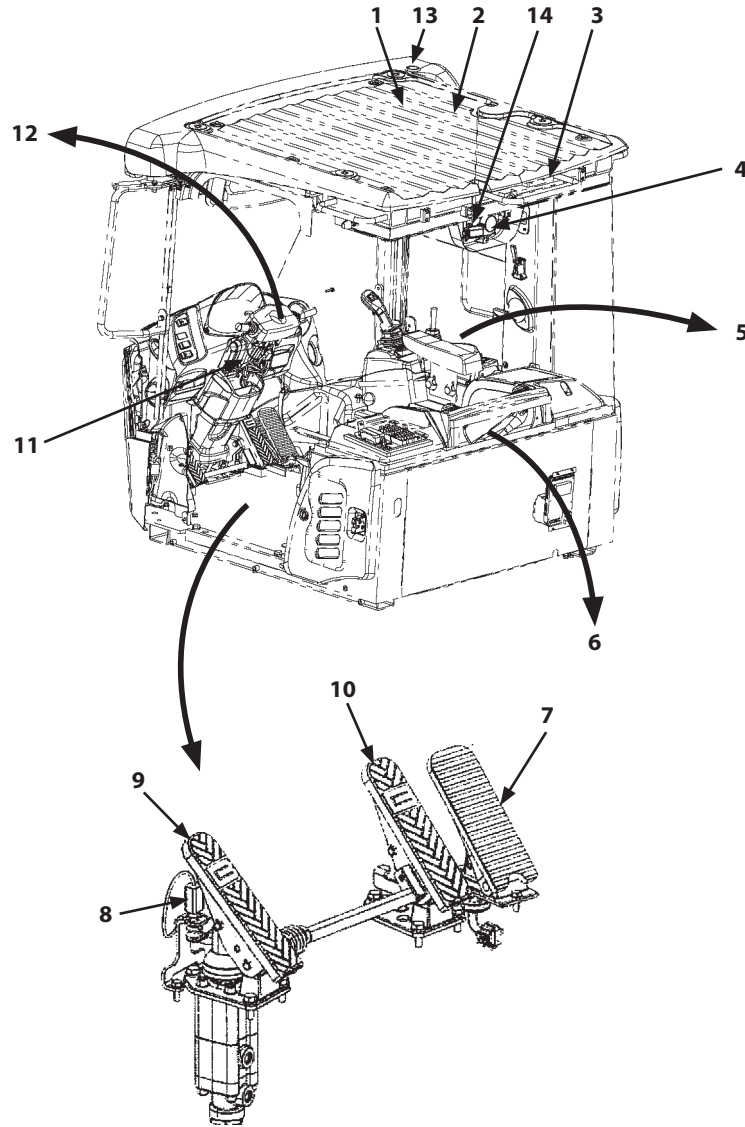
List of Frequency Distribution Data

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.

SECTION 5 TROUBLESHOOTING

Group 4 Component Layout

Electrical System (Cab)



TNED-01-02-029

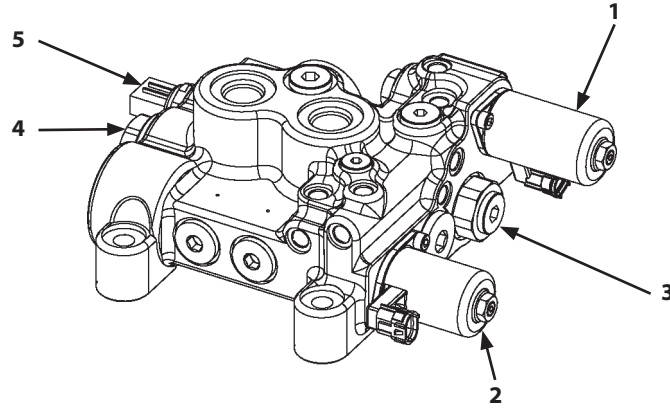
TNEJ-01-02-013

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

SECTION 5 TROUBLESHOOTING

Group 4 Component Layout

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

SECTION 5 TROUBLESHOOTING

Group 5 Troubleshooting A

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	-

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SECTION 5 TROUBLESHOOTING

Group 5 Troubleshooting A

Proportional Solenoid Valve Failure

Fault Code	Trouble	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.

SECTION 5 TROUBLESHOOTING

Group 5 Troubleshooting A

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

SECTION 5 TROUBLESHOOTING

Group 5 Troubleshooting A

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

SECTION 5 TROUBLESHOOTING

Group 5 Troubleshooting A

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. Faulty proportional solenoid valve.	Turn TCU to neutral. After returning the forward/reverse lever to neutral, operate it again. Then, machine can travel only at first or second speed. If other proportional solenoid valve is abnormal, TCU is fixed to neutral.	Check the wire harness between TCU and transmission control valve. Check the connector between TCU and transmission control valve. Check resistance in the proportional solenoid valve. (19 Ω at 20 °C (68 °F)) 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. Faulty shorted circuit to other proportional solenoid valve output circuit in TCU because of faulty wire harness or faulty connector. Faulty proportional solenoid valve.	Turn TCU to neutral. After returning the forward/reverse lever to neutral, operate it again. Then, machine can travel only at first or second speed. If other proportional solenoid valve is abnormal, TCU is fixed to neutral.	Check the wire harness between TCU and transmission control valve. Check the connector between TCU and transmission control valve. Check resistance in the proportional solenoid valve. (19 Ω at 20 °C (68 °F)) 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. Faulty proportional solenoid valve.	Turn TCU to neutral. After returning the forward/reverse lever to neutral, operate it again. Then, machine can travel only at first or second speed. If other proportional solenoid valve is abnormal, TCU is fixed to neutral.	Check the wire harness between TCU and transmission control valve. Check the connector between TCU and transmission control valve. Check resistance in the proportional solenoid valve. (19 Ω at 20 °C (68 °F)) Check the internal wire harness in transmission control valve.

SECTION 5 TROUBLESHOOTING

Group 5 Troubleshooting A

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.

SECTION 5 TROUBLESHOOTING

Group 5 Troubleshooting A

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	-	-	-	-	-

SECTION 5 TROUBLESHOOTING

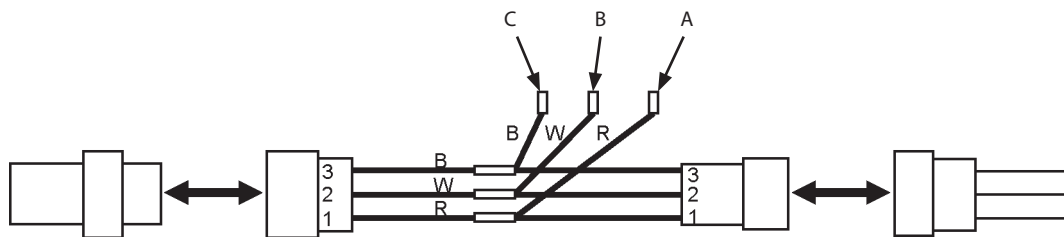
Group 5 Troubleshooting A

MC Fault Codes 111204, 111206

Preparation

- Check the wiring connections first.
- Connect the test harness (ST 6701) and dummy sensor equivalent to #4436271.
- Before inspection, set the key switch to the ON position.

Fault Code	Trouble	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.



TDA4-05-06-003

SECTION 5 TROUBLESHOOTING
Group 5 Troubleshooting A

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SECTION 5 TROUBLESHOOTING

Group 6 Troubleshooting B

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 (Operational Principle Section in F&S S/M)	T2-2, T2-5	T2-2, T2-5

SECTION 5 TROUBLESHOOTING

Group 6 Troubleshooting B

Parts	Vehicle Speed Sensor
Item	
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. The overrun alarm control is not effective. The ride control is not effective.
Evaluation by Fault Code	TCU: 5170
Evaluation by Monitoring	MC: Vehicle Speed Pulse
Evaluation by using Test Harness	-
Note	Possible to judge if speed sensor is faulty by switching pressure sensor with other speed sensor.
Descriptions of Control (Operational Principle Section in F&S S/M)	T2-2

SECTION 5 TROUBLESHOOTING

Group 6 Troubleshooting B

Trouble Symptom	E-4	E-5
Parts	Power mode is not shifted when pushing power mode switch.	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

SECTION 5 TROUBLESHOOTING

Group 6 Troubleshooting B

Trouble Symptom	S-4
Parts	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 (OP)	●
Vehicle Speed Sensor	○
Pilot Pump	
Brake Charge Valve	
Manifold Valve	
Steering Pressure Switch (OP)	●
Secondary Steering Pump	○
Delivery Pressure Sensor (OP)	
Steering Cylinder (Left, Right)	
Steering Accumulator	
Main Pump	
Secondary Steering Motor (OP)	○
Secondary Steering Pump (OP)	○
Remark	

●: Check required ○: Related

SECTION 5 TROUBLESHOOTING

Group 6 Troubleshooting B

Trouble Symptom	O-10 Wiper is not operated.	O-11 Washer is not operated.	O-12 Cab light is not ON.
Parts			
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

SECTION 5 TROUBLESHOOTING

Group 6 Troubleshooting B

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

SECTION 5 TROUBLESHOOTING

Group 6 Troubleshooting B

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

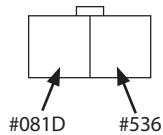
Preparation

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

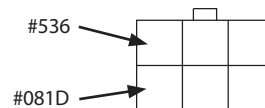
Procedure	Inspection Method	Condition	Evaluation	Cause
1	Measure voltage between pilot valve lift arm lower side coil harness end #081D and body	Key switch: ON	0 V	Open circuit in wire harness between #16 fuse in fuse box A and pilot valve lift arm lower side coil
2	Check continuity between pilot valve 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 (Option)
- Pilot Valve (Multi-Function Joystic Lever Type) Dual Auto Leveler (Option)



TNDJ-05-06-003



T8UC-05-04-004

SECTION 5 TROUBLESHOOTING

Group 6 Troubleshooting B

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

SECTION 5 TROUBLESHOOTING
Group 6 Troubleshooting B

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SECTION 5 TROUBLESHOOTING

Group 6 Troubleshooting B

O-10 Wiper is not operated.

Preparation

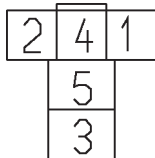
- The wiper is driven by electric power routed via the relay circuit. The relay circuit of front wiper is controlled by the column display controller.
- In case the wiper is not operated, first check if the wiper relay is activated. Next, check if electric power is routed to the wiper motor.
- In case 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

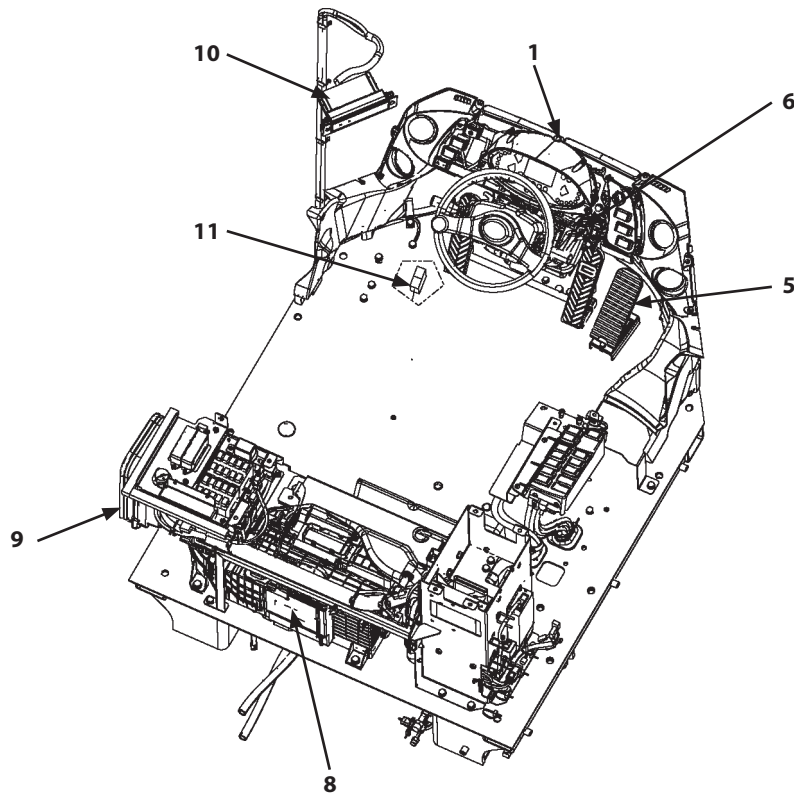


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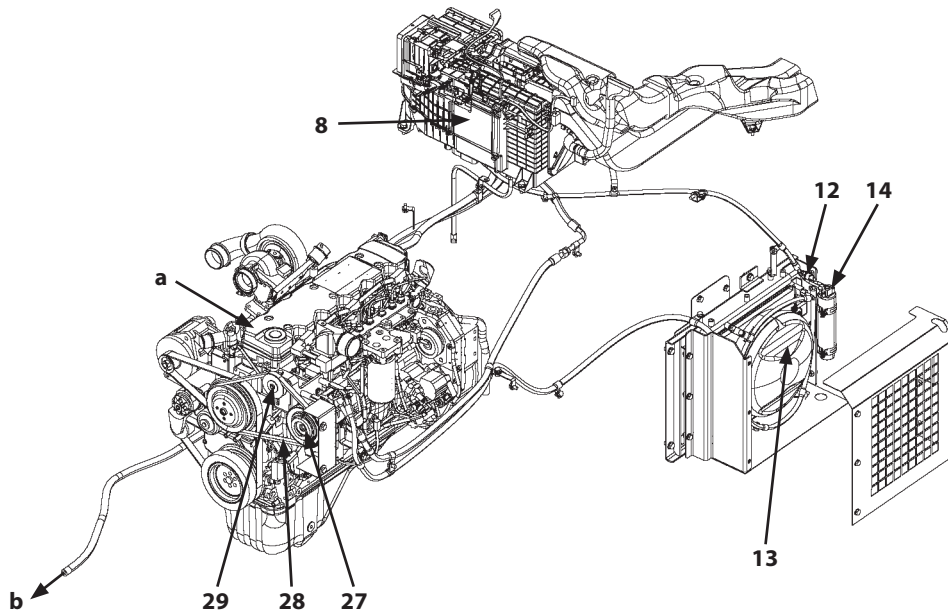
SECTION 5 TROUBLESHOOTING

Group 7 Air Conditioner

Component Layout



TNDF-05-07-001



TNEJ-05-07-001

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

SECTION 5 TROUBLESHOOTING

Group 7 Air Conditioner

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 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 Open circuit: Voltage: more than 4.8 V	Air mix damper 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 Faulty CAN1 harness	Air conditioner stops.	Check the CAN1 harness. Replace air conditioner controller.

SECTION 5 TROUBLESHOOTING

Group 7 Air Conditioner

Faulty cooling (4)

Condition:

- Fault Code: Un-displayed
- Airflow volume: Normal
- Compressor: Compressor does not rotate normally

Broken V belt or slipping		Replace V belt				
Faulty compressor (locked)		Replace				
Faulty magnet clutch	Repair or replace.	Open circuit in stator coil		Replace		
		Air gap between rotor and stator is too large		Repair or Replacement		
		Clutch slipping	Slip caused by key breakage or inserting no key		Replace key	
			Greasy clutch surface		Remove oil	
			Layer shorted coil		Replace	
			Battery voltage drop		Charge	
Clogged foreign matter between rotor and stator		Overhaul				
Clutch does not operate due to faulty electrical system	Check wiring	Faulty controller			Replace the controller	
		Faulty compressor clutch relay			Replace	
		Faulty frost sensor			Replace	
		Faulty high/low refrigerant pressure switch			Replace	
		Abnormal high pressure	Too high (2.54 MPa or more)	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	
				Abnormally low ambient temperature		
		Too low (0.98 MPa or less)	Low refrigerant		To B	
Clogged during refrigeration cycle			To C			
Faulty expansion valve			To D			
Frosted evaporator			To A			

SECTION 5 TROUBLESHOOTING

Group 7 Air Conditioner

Blower motor does not operate.

Preparation

- Check the wiring connections first.

Procedure	Inspection Method	Condition	Evaluation	Cause (check point)
1	Switch compressor relay with blower motor relay.	Key Switch: ON Blower Switch: ON	Blower motor does not operate.	Faulty blower motor relay.
2	Measurement of voltage between terminal #41B of blower motor relay harness end and body.	Key Switch: ON	0 V	Open circuit in harness between fuse #3 and blower motor relay.
3	Measurement of voltage between terminal #43B of blower motor harness end and body.	Key Switch: ON Blower Switch: ON	0 V	Open circuit in harness between blower motor relay and blower motor.
4	Continuity check between terminals #1 and #2 of blower motor harness end.	-	0 Ω	Faulty blower motor.
5	Measurement of voltage between terminal #44B of power transistor harness end and body.	Key Switch: ON Blower Switch: ON	0 V	Open circuit in harness between blower motor and power transistor.
6	Measurement of voltage between terminal #9B of power transistor harness end and body.	Key Switch: ON Blower Switch: ON	0 V	Faulty air conditioner controller.
7	-	-	Procedures as steps 1 to 6 above are normal.	Faulty power transistor.

Connector (Harness end)

- Blower Motor Relay



TDAB-05-07-020

- Blower motor



TDAB-05-07-027

- Power Transistor



TDAB-05-07-028

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