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60Z7

SHOP MANUAL

Operational Performance Test Troubleshooting

93206-00310

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May 2015

SHOP MANUAL

WHEEL LOADER

60Z7

Operational Performance Test Troubleshooting

Powered by DEUTZ TCD36 Engine

Serial No. 60D1-5001 and up

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Preparation for Performance Tests

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

THE MACHINE

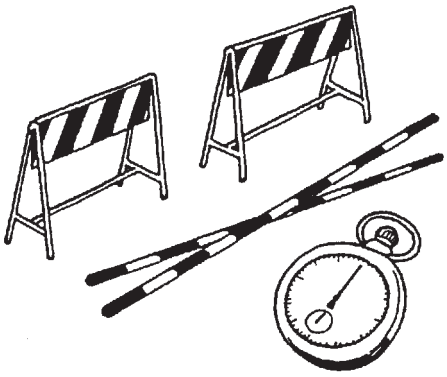
1. Repair any defects and damage found, such as oil or water leaks, loose bolts, cracks and so on, before starting to test.

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.

Measurement:

CAUTION: When measuring with the HST function relieved, put the blocks onto the front and rear tires in order not to move the vehicle and keep away from it.

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

Item	Forward/Reverse Lever, Shift Switch	Accelerator Pedal	Parking Brake Switch	Power Mode Switch
Slow Idle Speed (with no load)	N	No depression	ON	ON/OFF
Fast Idle Speed (with no load)	Forward Second	Full stroke	ON	ON/OFF
Fast Idle Speed (with HST relieved)	Forward Second	Full stroke	OFF	ON/OFF
Fast Idle Speed (with front attachment relieved)	Forward Second	Full stroke	OFF	ON/OFF

Item	Control Lever (Bucket)
Slow Idle Speed (with no load)	Transporting position, No control lever operation
Fast Idle Speed (with no load)	Transporting position, No control lever operation
Fast Idle Speed (with HST relieved)	Transporting position, No control lever operation
Fast Idle Speed (with front attachment relieved)	Transporting position, Bucket is tilted and relieved.

Evaluation:

Refer to Operational Performance Standard (p.T4-2-1).

Remedy:

Refer to Troubleshooting B.

NOTE: Engine System Troubleshooting (T5-6-16).

Bucket Stopper, Lever (Bell Crank) Stopper Clearance

Summary:

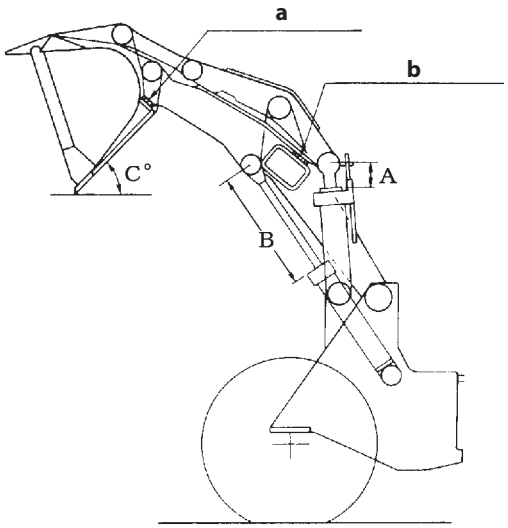
Measure wear and deformation conditions of the bucket stopper (dump side and rollback side) and the clearance between lever (bell crank) stopper (b) and the cross tube.

Preparation:

1. Stop the machine on a plane road surface and operate the parking brake.

Measurement:

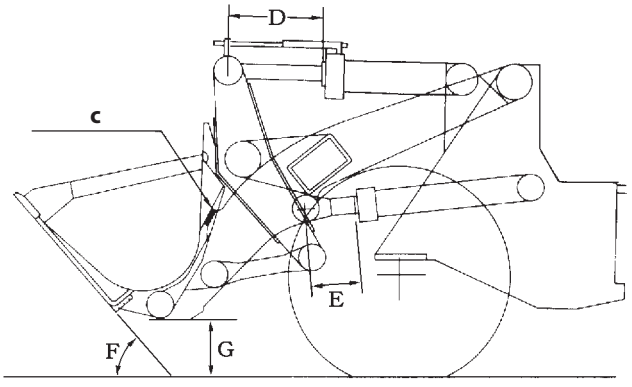
- Bucket Dump Stopper (a)
  1. Raise the lift arm to the highest lifting position and stop the engine.
  2. With the engine stopped, slowly dump the bucket until the bucket dump stoppers (a) contact the lift arm.
  3. At this time, measure strokes (A and B) of the bucket cylinder and the lift arm cylinder and dump angle (C) of the bucket. In addition, measure the clearance between lever stopper (b) and the cross tube.
  4. At the same time, measure the contact condition of bucket dump stopper (a) (left and right) to the lift arm.



T4GB-04-04-008

a- Bucket Dump Stopper b- Lever (Bell Crank) Stopper

- Bucket Rollback Stopper (c)
  1. Raise the lift arm until lift arm cylinder stroke (E) becomes the length of the standard dimension found on the following page.
  2. With engine at idle speed, slowly roll the bucket back until the bucket rollback stoppers (c) just make contact with the lift arm.
  3. At this time, measure strokes (D and E) of the bucket cylinder and the lift arm cylinder and rollback angle (F) of the bucket. In addition, measure height (G) from the ground to the bucket lowest point.
  4. At the same time, measure the contact condition of bucket rollback stoppers (c) (left and right) to the lift arm.



T4GB-04-04-010

c- Bucket Rollback Stopper

HST Pump Delivery Pressure

Summary:

Measure the HST pump output pressure at the check port (MA, MB) (1, 4) of the HST pump in neutral condition.

NOTE: The pressure value can be checked on the MPDr.

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 pressure check port MB (1) of the HST pump. Install nipple (2) (ST 6069) and pressure gauge (3) (ST 6932).

   : 6 mm (0.24 in)

   : 19 mm (0.75 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. Measure pressure with the control levers in neutral without load.

NOTE: Measure at pressure check port MB (1) when measuring the pressure driving in forward direction. Measure at pressure check port MA (4) when measuring the pressure driving in reverse direction.

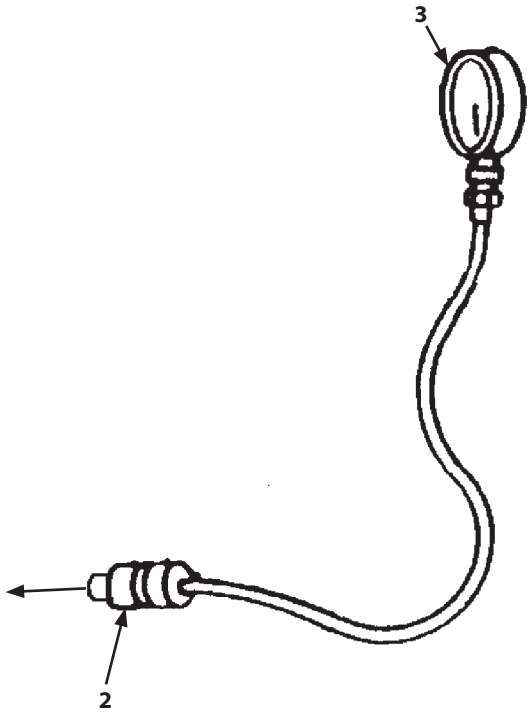
3. Repeat the measurement three times and calculate the mean values.

Evaluation:

Standard (neutral): 2.1±0.3 MPa (304.6±43.5 PSI)

Remedy:

Refer to Troubleshooting B.



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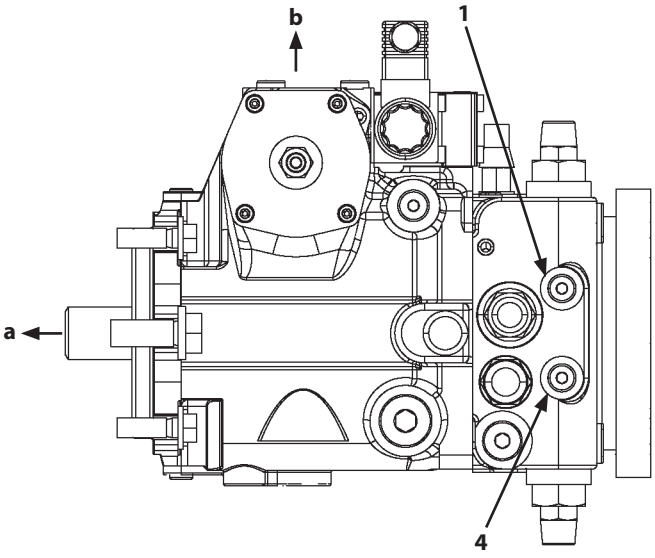


T4FJ-04-05-004

a- Engine Side
b- Machine Right Side
1- Pressure Check Port MB (Forward Side)
2- Nipple
3- Pressure Gauge
4- Pressure Check Port MA (Reverse Side)

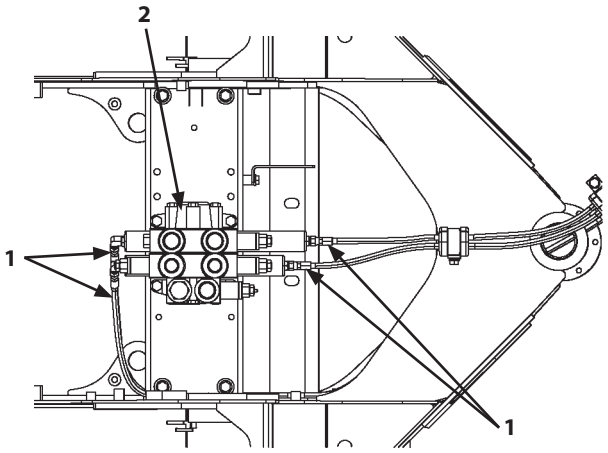
Overload Relief Valve Set Pressure

Summary:

1. The circuit pressure must be increased by applying an external force while blocking the return circuit from the control valve. This measuring method is hazardous and the results obtained with this method are unreliable.
2. The oil flow rate used to set the overload relief pressure is far less than that used to set the main relief pressure. Therefore, measuring the overload pressure in the main circuit by increasing the main relief set pressure more than the overload valve set-pressure is not a proper method. In addition, main relief valve may be designed to leak a small quantity of oil before reliving. In this case, its pre-leaking start pressure must be increased more than the overload relief valve set pressure. However, the pre-leaking start pressure is not always increased more than the overload relief valve set-pressure as the adjustable upper limit of the main relief valve set-pressure is provided. Accordingly, the overload relief valve assembly should be removed from the machine and checked on a specified test stand at a correct oil flow rate.

   Some overload relief valves come in contact with the control valve body to block the oil passage. When this type of overload relief valve is checked, the control valve body must be precisely finished as the test unit. Provide one control valve other than that on the machine as a test kit.
3. If the overload relief valve performance must be checked on the machine, however, measure the main relief pressure while releasing each front function respective to the measuring overload relief valve. And, assume that the overload relief valve is functioning correctly if the obtained main relief pressure is within the specified value range.

Secondary Pilot Pressure (Hydraulic Operated Type: Option)



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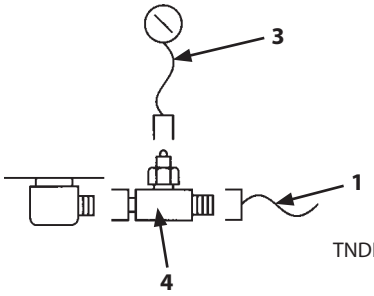

TNDF-04-05-004

1- Pilot Hose
2- Control Valve
3- Pressure Gauge
4- Tee

Preparation:

1. Stop the engine.
2. Push the air bleed valve on top of the hydraulic oil tank and bleed air.
3. Measure pressure between the pilot valve and control valve (2).
   Remove pilot hose (1) from the circuit to be measured at the control valve (2) side.
   Install tee (4) (ST 6573) and pressure gauge (3) (ST 6932).

   : 17, 19, 22 mm (0.67, 0.75, 0.87 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	Control Lever Lock Switch
Full stroke	ON	ON	N	Release

2. Measure pilot pressure by using pressure gauge (2) with the lift arm and bucket control levers operated to full stroke.
3. Repeat the measurement three times and calculate the mean values.

Evaluation:

Standard: 3.2 MPa (464 PSI)

Remedy:

Refer to Troubleshooting B.

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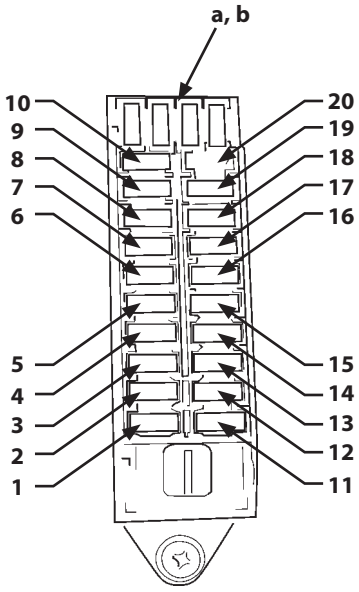
Fuse Inspection

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. (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 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: All terminals located along the lengthwise center line of fuse box are connected to the power source, while terminals located away from center of the fuse box are connected to loads (accessories). Therefore, test all fuses in the same method.



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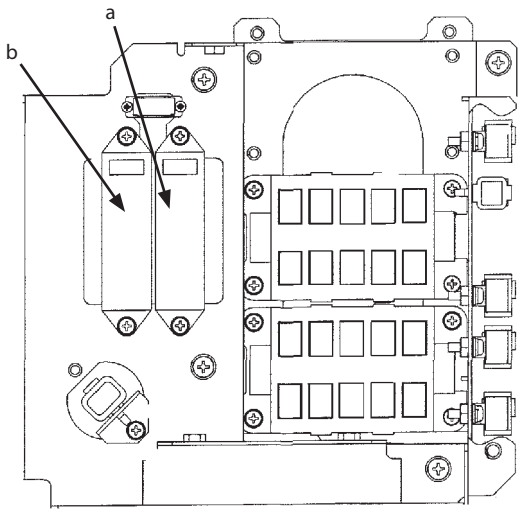
a- Fuse Box A b- Fuse Box B

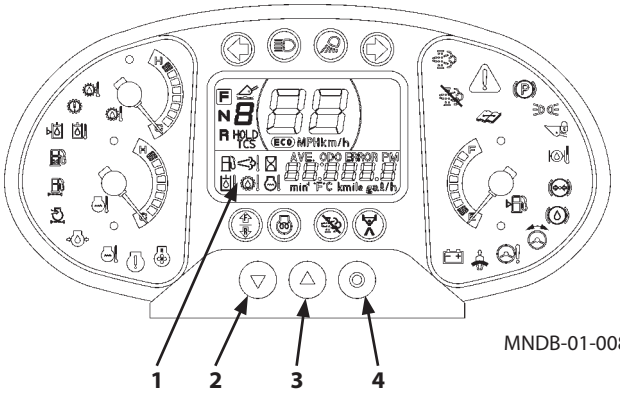


TNED-01-02-009

Engine	Key Switch	Location to be Measured		Specification
Starting Circuit				
Started	START	Between (16) and Ground:	Battery Relay (Coil)	20 to 25 V
Started	START	Between (17) and Ground:	Battery Relay (Switch)	20 to 25 V
Started	START	Between (18) and Ground:	Starter Relay 1	20 to 25 V
Started	START	Between (19) and Ground:	Starter Relay 1	20 to 25 V
Started	START	Between (20) and Ground:	ECM (K73)	20 to 25 V
Started	START	Between (21) and Ground:	Fuse Box A	20 to 25 V
Started	START	Between (22) and Ground:	Key Switch	20 to 25 V
Started	START	Between (23) and Ground:	ECM (K88)	20 to 25 V
Started	START	Between (24) and Ground:	MC (#13)	20 to 25 V
Started	START	Between (25) and Ground:	MC (E41)	20 to 25 V
Started	START	Between (26) and Ground:	MC (E42)	20 to 25 V

How to display service menu

1. Push monitor display selection switches (2, 3) beyond two seconds at the same time while the clock is displayed on Vehicle Information Display Screen (1) with the key switch set in the ON position or the engine running. By this operation, Service Menu is added to Vehicle Information Display Screen (1).
2. When setting the key switch to the OFF position, the normal menu appears.



MNDB-01-008

Engine Speed

Current Engine Speed (5) is displayed. (Figure A) When pushing monitor display selection switch (3) once on this screen, Coolant Temperature is displayed.

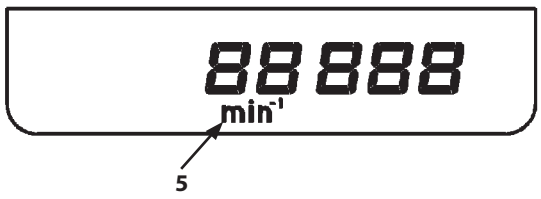
Coolant Temperature

Current Engine Coolant Temperature (6) is displayed. (Figure B) When pushing monitor display selection switch (3) once on this screen, Transmission Oil Temperature is displayed.

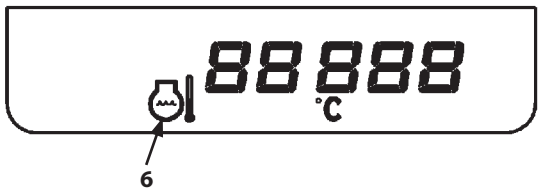
HST Oil Temperature

Current HST Oil Temperature (7) is displayed. (Figure C) When pushing monitor display selection switch (3) once on this screen, Fault Code is displayed.

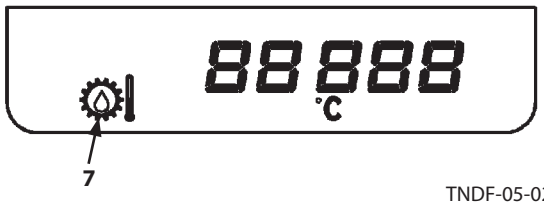
A



B



C



TNDF-05-02-005

Communication System

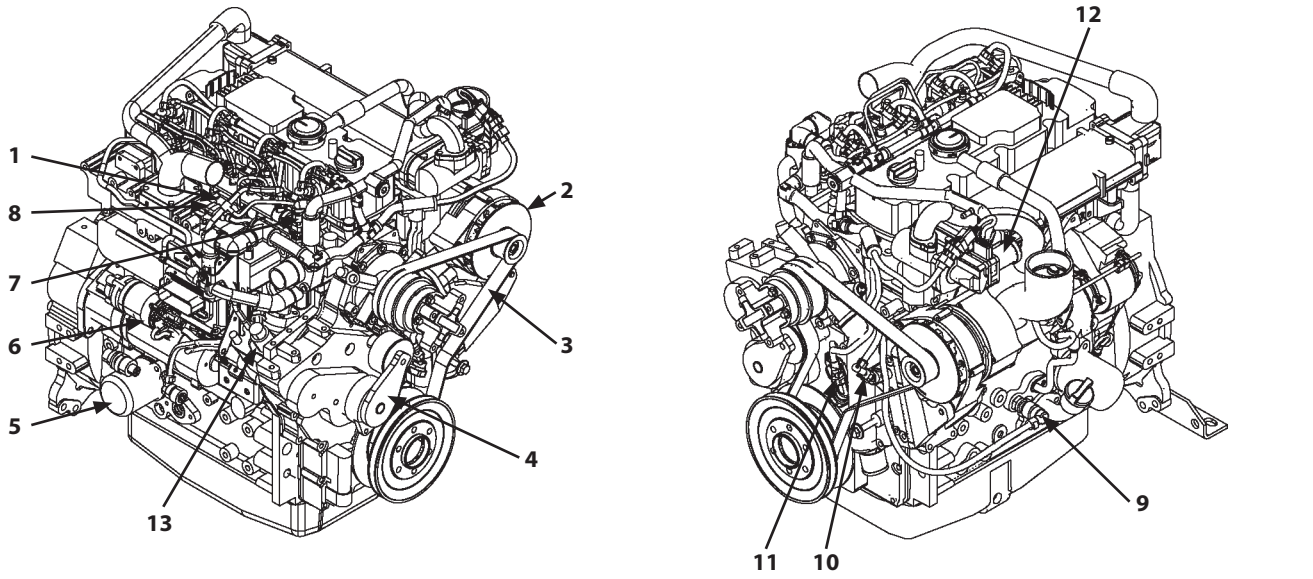
The communication system is used for the machine maintenance, "e-Service" by transmitting various data of the machine regularly via the communication terminal.

NOTE: Depending on the circumstances of the machine (ex. in the building, in the tunnel, affected by the surrounding buildings and affected of noise), the data transfer rate may become slower, or the communication might not be established. The communication system transmits digital data through the radio wave. If there is excessively noise or use of electrical equipment which causes noise near the machine, they cause reduces data transfer rate or communication might not be established at worst.

The communication system consists of communication terminal, GPS antenna and communication antenna. The functions of each equipment are as follows.

- Communication Terminal:
  Receives the data from information controller and GPS antenna, and sends the data to the communication antenna.
- GPS Antenna:
  Receives positional information of the machine.
- Communication Antenna:
  Communicates the data.

Engine



TNCC-01-02-010

1- Common Rail Pressure Sensor
2- Alternator
3- Fan Belt
4- Auto Tension Pulley
5- Engine Oil Filter
6- Starter
7- Coolant Temperature Sensor
8- Boost Pressure/Boost Temperature Sensor
9- Engine Oil Pressure Sensor
10- Cam Angle Sensor
11- Crank Speed Sensor
12- EGR Valve
13- Supply Pump

Contents of Diagnosis

Fault Code

Preparation

Tools for a diagnosis and contents needing inspection beforehand are explained.

How to Read Table

Fault Code	Trouble or MP Dr. Message	Inspection Method	Evaluation	Cause
(A)	(B)	(C)	(D)	(E)
		(F)	(G)	(H)

- A: Fault code
- B: Trouble details or message displayed on the Maintenance Pro Dr.
- C, F: Inspection method for trouble cause
- D, G: Evaluation specification of check results
- E, H: Trouble cause for the fault code

Procedure:

1. Check an applicable line depending on displayed fault cord (A).
2. After checking or measuring on Inspection Method (C), refer to Evaluation (D) and judge the results.
3. In case the results are satisfied with Evaluation (D), the trouble cause becomes Cause (E).
   In case the results are not satisfied with Evaluation (D), go to the next procedure, Inspection Method (F).

Circuit Diagram of Test Harness

A connection point of the test harness and a point to check are explained.
(Only Pressure Sensor System Troubleshooting)

Monitor Controller Fault Code List

Fault Code	Trouble	Cause	Remedy
120500-2	Overheat Alarm	Coolant temperature is high while the engine runs.	Check the wire harness. Replace the overheat switch.
120501-2	Engine Warning Alarm	Faulty engine system.	Refer to Engine Troubleshooting Manual.
120502-2	Engine Oil Pressure Alarm	Engine oil pressure is reduced.	Check the wire harness. Replace the engine oil pressure switch.
120504-2	Hydraulic Oil Level Alarm	Hydraulic oil level is lowered. Open circuit in wire harness.	Check the wire harness. Replace the hydraulic oil level switch.
120505-2	Brake Pressure Alarm	Brake oil pressure decreases.	Check the wire harness. Replace the pressure sensor (brake primary pressure).
120506-2	Steering Oil Pressure Alarm	Faulty steering pressure switch (option).	Check the wire harness. Replace the steering pressure switch (option).
120507-2	Transmission Error Alarm	Faulty transmission system.	Check the wire harness.
120510-2	HST Oil Temperature Alarm	HST oil temperature is high while the engine runs.	Check the wire harness. Replace the HST oil temperature sensor.
120512-2	Emergency Steering Alarm (Lighting)	Faulty secondary steering system (option).	Check the wire harness. Replace the secondary steering pump delivery pressure sensor.
120515-2	Engine Alarm	Faulty engine system	Refer to Engine Troubleshooting Manual.
120518-2	Emergency Steering Alarm (Blinking)	Faulty secondary steering pump (option).	Check the wire harness. Replace the secondary steering operation check switch (option).

ECM Fault Code List

Fault Code		Trouble	Cause	Symptoms in Machine Operation When Trouble Occurs	Remedy
DEUTZ	HCM				
101	111-1	Abnormal Coolant Level Switch	Faulty coolant level switch. Coolant level is too low. Leakage in cooling system Faulty wire harness.	-	Check the wire harness. Replace the common rail pressure sensor.
877	157-3	Common Rail Pressure Sensor Circuit High Input	Faulty common rail pressure sensor. Shorted circuit in wire harness to the power source. Faulty wire harness.	No output power change.	Check the wire harness. Replace the accelerator pedal sensor. Check the CAN harness. Replace the MC.
878	157-4	Common Rail Pressure Sensor Circuit Low Input	Faulty common rail pressure sensor. Shorted circuit in wire harness to the ground. Faulty wire harness.	No output power change.	Check the wire harness. Replace the common rail pressure sensor.
1180	168-0	Abnormally High Battery Voltage (Battery voltage is over the limit.)	Faulty alternator. Faulty ECM. Faulty wire harness.	The output power decreases.	Check the wire harness. Replace the alternator. Replace the ECM.
1181	168-1	Abnormally Low Battery Voltage (Battery voltage is below the limit.)	Faulty battery. Faulty alternator. Faulty wire harness.	No output power change.	Check the wire harness. Replace the battery. Check the alternator.
47	168-2	Abnormal Alternator	Faulty alternator. Faulty wire harness.	No output power change.	Check the wire harness. Replace the alternator.
45	168-3	Alternator Circuit High Input (Battery voltage is over warning threshold.)	Faulty alternator. Faulty ECM. Faulty wire harness.	No output power change.	Check the wire harness. Replace the alternator. Replace the ECM.
46	168-4	Alternator Circuit Low Input (Battery voltage is below warning threshold.)	Faulty alternator. Faulty wire harness.	No output power change.	Check the wire harness. Replace the alternator.

ECM Fault Code List

Fault Code		Trouble	Cause	Symptoms in Machine Operation When Trouble Occurs	Remedy
DEUTZ	HCM				
559	523895-13	Abnormal Adjustment Value Programming of Injector #1	Injector #1 is faulty.	No output power change.	Check injector #1.
560	523896-13	Abnormal Adjustment Value Programming of Injector #3	Injector #3 is faulty.	No output power change.	Check injector #3.
561	523897-13	Abnormal Adjustment Value Programming of Injector #4	Injector #4 is faulty.	No output power change.	Check injector #4.
562	523898-13	Abnormal Adjustment Value Programming of Injector #2	Injector #2 is faulty.	No output power change.	Check injector #2.
836	523906-3	Fuel Solenoid Pump Circuit High Input	Faulty fuel solenoid pump. Faulty fuel pump relay. Faulty wire harness.	No output power change.	Check the wire harness. Replace the fuel pump relay. Replace the fuel solenoid pump.
837	523906-4	Fuel Solenoid Pump Circuit Low Input	Faulty fuel solenoid pump. Faulty fuel pump relay. Faulty wire harness.	No output power change.	Check the wire harness. Replace the fuel pump relay. Replace the fuel solenoid pump.
834	523906-5	Open Circuit in Fuel Solenoid Pump	Faulty fuel solenoid pump. Faulty fuel pump relay. Faulty wire harness.	No output power change.	Check the wire harness. Replace the fuel pump relay. Replace the fuel solenoid pump.
835	523906-12	Abnormal Fuel Solenoid Pump Power Source	Faulty fuel solenoid pump. Faulty fuel pump relay. Faulty wire harness.	No output power change.	Check the wire harness. Replace the fuel pump relay. Replace the fuel solenoid pump.
360	523982-0	Abnormally High Battery Voltage	Faulty alternator. Faulty wire harness.	No output power change.	Check the wire harness. Replace the alternator.
361	523982-1	Abnormally Low Battery Voltage	Faulty alternator. Faulty wire harness.	No output power change.	Check the wire harness. Replace the alternator.
1505	524057-2	Fuel Pressure Increasing Error	Faulty fuel solenoid pump. Faulty fuel pressure switch. Faulty fuel pump relay. Faulty wire harness.	No output power change.	Check the wire harness. Replace the fuel pressure switch. Replace the fuel pump relay. Replace the fuel solenoid pump.

MC Fault Code 111422

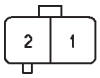
Preparation

- Check the wiring connections first.

Fault Code	Trouble	Inspection Method	Evaluation	Cause
111422-2	Ride Control Solenoid Valve Abnormal FB	Measure resistance between solenoid valve #1 and #2.	0/∞ Ω (Specification: 23.2±0.4 Ω)	Faulty solenoid valve
		Measure voltage between solenoid valve harness end #1 and the body.	0 V	Open circuit in wire harness #1
		Monitor Ride Control P/S FB.	0 mA	Open circuit in wire harness #2
		-	Normal in above check	Shorted circuit in wire harness between #1 and #2

Connector (Wire harness end)

- Solenoid Valve Connector



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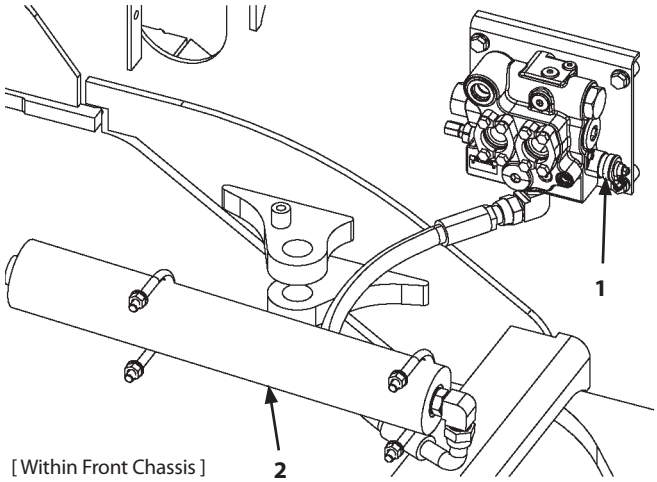

[Within Front Chassis]

60TNCC-01-02-14

1- Ride Control Solenoid Valve
2- Ride Control Accumulator

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Monitor Controller Fault Code 115000

Preparation

- Check the wiring connections first.
- Check the CAN1 harness between the controllers.
  (Refer to CAN1 Harness Check on T5-5-54 to 56.)

Fault Code	Trouble	Inspection Method	Cause
115000-2	CAN Communication Error 1	Continuity check (open circuit)	Open circuit in wire harness
		Discontinuity check (shorted circuit)	Shorted circuit in wire harness

Monitor Controller Fault Codes 120506, 120507, 120510, 120512, 120515, 120518

Fault Code	Trouble	Inspection Method	Evaluation	Cause
120506-2	Steering Oil Pressure Alarm	Diagnose on fault codes of MC.	-	-
120507-2	Transmission Error Alarm	Diagnose on fault codes of MC.	-	-
120510-2	HST Oil Temperature Alarm	Diagnose on fault codes of MC.	-	-
120512-2	Emergency Steering Alarm (Lighting)	Diagnose on Troubleshooting B.	-	-
120515-2	Engine Alarm	Diagnose on fault codes of ECM.	-	-
120518-2	Emergency Steering Alarm (Blinking)	Diagnose on Troubleshooting B.	-	-

Parts / Item	Ride Control Switch (Option)	Secondary Steering Operation Check Switch (Option)
Function	Shifts ride control solenoid valve and activates or deactivates the ride control.	Checks operation of secondary steering pump.
Symptoms in control system when trouble occurs	Same as shown below	Same as shown below
Symptoms in machine operation when trouble occurs	Open circuit: Ride control switch is always OFF. Even if ride control switch is turned ON, the ride control is not activated. Shorted circuit: Ride control switch is always ON.	Even if secondary steering operation check switch is set to ON side, secondary steering pump is not operated.
Evaluation by Fault Code	-	-
Evaluation by Monitoring	MC: Ride Control Switch	MC: Emergency Steering Operation Check Switch
Evaluation by using Test Harness	-	-
Note	-	-
Descriptions of Control (Refer to F&S S/M)	T2-2, T2-4	T2-2

Front Attachment System Troubleshooting

Trouble Symptom / Parts	F-1 All front attachment actuator power are weak.	F-2 Some cylinders are not operated or speed are slow. (Manual Type)	F-3 Some cylinders are not operated or speed are slow. (Hydraulic Pilot Type) (Option)
ECM	○		
Battery			
Pilot Shut-Off Relay			
Control Lever Lock Switch			
HST Charging Pump	○		
Priority Valve (Brake Charge Valve)	○		
Pilot Relief Valve (Brake Charge Valve)	○		
Pilot Reducing Valve (Manifold Valve)	○		
Control Lever Lock Solenoid Valve			
Pilot Valve			●
Spool (Control Valve)	○	●	●
Main Relief Valve (Front Attachment)	●		○
Overload Relief Valve (Control Valve)			●
Cylinder		●	●
Main Pump	○		
Pressure Sensor (Front Attachment Pressure)	○		
Priority Valve (Main)	○		
Remark			

●: Check required
○: Related

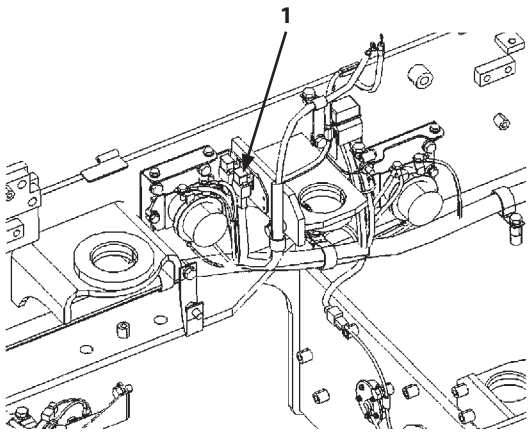
Trouble Symptom / Parts	T-7 Quick shift switch function is not activated even if quick shift switch is depressed.	T-8 Fast speed is not selected even if quick shift switch is released.	T-9 Travel slow-speed selecting function is not activated.
MC	○	○	○
Battery			
Fuse Box A			
Fuse Box B			
Accelerator Pedal Sensor			
Forward/Reverse Lever			
Shift Switch	○	○	
Quick Shift Switch	●	●	
Slow Speed (L) Select Switch			●
Transmission	●	●	
Travel Mode Selector Solenoid Valve	○	●	
Machine Speed Sensor	●	●	
Brake/ Transmission Pump	●	●	
Travel Mode Selector Valve	●	●	
Displacement Angle Control Solenoid Valve (HST Motor)			●
Propeller Shaft			
Axle			
Displacement Angle Control Cylinder (HST Motor)			●
Remark			

●: Check required
○: Related

E-4 Even if key switch is turned OFF, engine does not stop.

Preparation

- Remove fusible link A (1) and stop the engine as emergency procedures first.
- In case other trouble symptoms occur, perform troubleshooting of these troubles first.
- If the fault code is not displayed, the key switch may be faulty.
- Refer to SYSTEM/Electrical System.
- Check the wiring connections first.



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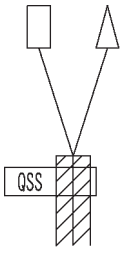
T-7 Quick shift switch function is not activated even if quick shift switch is depressed.

- Perform these steps when the fault codes of MC are not displayed.
- Conditions that quick-shift control functions
  Shift Switch: Hi
  Machine Speed: Less than 10 km/h (6.2 mph)
- Check the wiring connections first.

Procedure	Inspection Method	Condition	Evaluation	Cause
1	Short-circuit the connector of the quick shift switch.	Shift Switch: Hi Position Travel: Fast speed	Travel: Slow speed	Faulty quick shift switch
2	Check continuity between terminal #9 of MC connector of wire harness end and the body.	Connect the male end connector of quick shift switch to the body.	∞ Ω	Open circuit in wire harness between quick shift switch and MC
3	Measure voltage between terminal #1 of travel mode selector solenoid valve connector of wire harness end and the body.	Key Switch: ON	0 V	Open circuit in wire harness between travel mode selector solenoid valve and MC
4	Check continuity between terminal #2 of travel mode selector solenoid valve connector of wire harness end and the body.	Key Switch: ON	∞ Ω	Open circuit in wire harness between travel mode selector solenoid valve and the ground
5	Inspect the travel mode selector valve.	-	There is abnormality.	Faulty travel mode selector valve
6	Measure delivery pressure of the brake/transmission pump.	Accelerator Pedal: Full stroke Power Mode Switch: ON Parking Brake Switch: ON Forward/Reverse Lever: N	Less than 1.6 MPa (232 PSI)	Faulty brake/transmission pump
7	Check continuity between terminals #1 and #2 of machine speed sensor.	-	570 Less than 570 Ω or 1050 Ω or more	Faulty machine speed sensor
8	Check continuity between MC harness end connector terminals #17 and #18.	Short-circuit in wire harness between wire harness end connector terminals #1 and #2 of machine speed sensor.	∞ Ω	Open circuit in wire harness between machine speed sensor and MC
9	-	-	Normal in above check	Faulty transmission

Connector (Wire harness end)

- Quick Shift Switch



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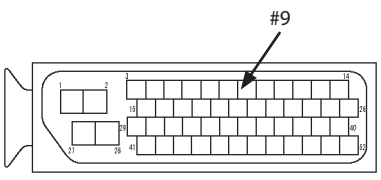
- MC Connector



T4FC-05-05-001

O-3 Head light is not shifted to high beam.

Preparation

- Check fuses #17 and #19 in fuse box A when the high beams at both sides are not ON.
- Check that the light switch is in the head light position.
- Failure of the high beam indicator lighting will be also affected.
- Refer to SYSTEM/Electrical System.
- Check the wiring connections first.

Procedure	Inspection Method	Condition	Evaluation	Cause
1	Switch the high beam relay with other general relay.	Key Switch: ON Light Switch: H Position Dimmer Switch: Hi (High-Beam) Position	High Beam: ON	Faulty high beam relay
2	Short-circuit in wire harness between wire harness end terminals #2 and #4 of light switch.	Key Switch: ON	High Beam: ON	Faulty light switch or faulty dimmer switch
3	Measure voltage between terminal #1 of high beam relay connector of wire harness end and the body.	Key Switch: ON Light Switch: H Position Dimmer Switch: Hi (High-Beam) Position	0 V	Open circuit in wire harness between dimmer switch and high beam relay
4	Measure voltage between terminal #3 of high beam relay connector of wire harness end and the body.	Key Switch: ON Light Switch: H Position Dimmer Switch: Hi (High-Beam) Position	0 V	Open circuit in wire harness between fuse box A and high beam relay
5	Check continuity between terminal #2 of high beam relay connector of wire harness end and the body.	-	∞ Ω	Open circuit in wire harness between high beam relay and the ground
6	Check continuity between connector (511A) (6) and the body.	Key Switch: ON Light Switch: H Position Dimmer Switch: Hi (High-Beam) Position	∞ Ω	Open circuit in wire harness between high beam relay and head light high-beam (RH)
7	Check continuity between connector (511) (5) and the body.	Key Switch: ON Light Switch: H Position Dimmer Switch: Hi (High-Beam) Position	∞ Ω	Open circuit in wire harness between high beam relay and head light high-beam (RH)

O-9 Work light does not light.

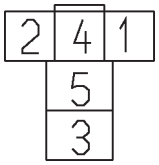
Preparation

- Check that the work lights are not broken first.
- The light switch may be faulty (O-1) when the work lights at both front and rear sides are not ON at the same time.
- Check fuse #16 in fuse box A and fuse #15 in fuse box B when only the light at one side is not ON.
- Failure of the work light indicator blinking will be also affected.
- Refer to SYSTEM/Electrical System.
- Check the wiring connections first.

Procedure	Inspection Method	Condition	Evaluation	Cause
1	Switch the front work light relay and rear work light relay with other general relays.	Key Switch: ON Work Light Switch: Front and Rear Work Light	Work Light: ON	Faulty front work light relay and faulty rear work light relay
2	Short-circuit in wire harness between wire harness end terminals #1 and #2, terminals #1 and #5 of the work light switch.	Key Switch: ON	Work Light: ON	Faulty work light switch
3	Measure voltage between terminal #1 of work light switch connector of wire harness end and the body.	Key Switch: ON	0 V	Open circuit in wire harness between light switch and work light switch
4	Measure voltage between terminal #1 of front work light relay connector of wire harness end and the body.	Key Switch: ON Work Light Switch: Front and Rear Work Light	0 V	Open circuit in wire harness between front work light relay and work light switch
5	Check continuity between terminal #2 of front work light relay connector of wire harness end and the body.	-	∞ Ω	Open circuit in wire harness between front work light relay and the ground
6	Measure voltage between terminal #3 of front work light relay connector of wire harness end and the body.	Key Switch: ON Work Light Switch: Front and Rear Work Light	0 V	Open circuit in wire harness between fuse box B and front work light relay
7	Measure voltage between wire harness end connector of front work light and the body.	Key Switch: ON Work Light Switch: Front and Rear Work Light	0 V	Open circuit in wire harness between front work light relay and the front work light

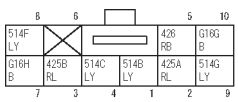
Connector (Wire harness end)

- Front Work Light Relay



T183-05-04-003

- Work Light Switch



TNCC-05-06-009

Precautions for Towing

CAUTION: Never attempt to tow the machine if the brake system is in need of repair.

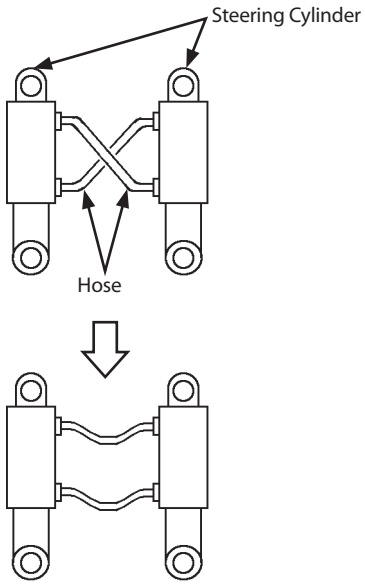
Avoid towing the machine as much as possible. If the machine is to be unavoidably towed, beware of the following points.

IMPORTANT: Do not tow the machine with the parking brake applied. Damage to the parking brake may result.

- If the engine is operable:
  Keep the engine running so that the steering and brake system are operable. Release the parking brake.

- If the engine is inoperable:
  Removal of the propeller shaft
  - When the parking brake cannot be released, manually release the parking brake. (Refer to the "How to Release Parking Brake" on p. T5-6-90.) Then, Remove the front and rear propeller shafts. At this time, wedge wheel stoppers to all tires to prevent the machine from moving.
  - The steering system is inoperable when the engine is stopped. Changing the hydraulic hose connections between the rod end side and the head end side only of one steering cylinder enables the steering wheel operation.

NOTE: Take care not to spill oil when disconnecting the hoses.



M4GB-06-007

Malfunction of HST Oil Temperature Gauge

- Perform these steps when the fault code of monitor controller is not displayed.
- Check the wiring connections first.

The HST oil temperature gauge pointer does not move at all.

Procedure	Inspection Method	Condition	Evaluation	Cause
1	Short-circuit in wire harness between HST oil temperature sensor harness end terminals #1 and #2.	Key Switch: ON	The gauge pointer reaches the (H) side.	Faulty HST oil temperature sensor
2	Check continuity between terminal #24 of monitor controller 2-B connector of wire harness end and the body.	Connect the HST oil temperature sensor harness end terminal #1 to the body.	∞ Ω	Open circuit in wire harness between monitor controller and HST oil temperature sensor
3	-	-	Normal in above check	Faulty monitor controller

The HST oil temperature gauge pointer swings over scale.

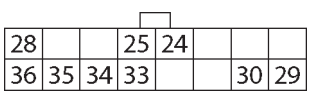
Procedure	Inspection Method	Condition	Evaluation	Cause
1	Disconnect the HST oil temperature sensor terminal.	Key Switch: ON	The gauge pointer returns to zero.	Faulty HST oil temperature sensor
2	Check continuity between terminal #24 of monitor controller 2-B connector of wire harness end and the body.	Key Switch: ON Disconnect the HST oil temperature sensor terminal.	0 Ω	Shorted circuit in wire harness between monitor controller and HST oil temperature sensor
3	-	-	Normal in above check	Faulty monitor controller

The HST oil temperature gauge pointer keeps moving unstably.

Procedure	Inspection Method	Condition	Evaluation	Cause
1	Visually inspect the HST oil temperature gauge.	Short-circuit in wire harness at HST oil temperature sensor harness end terminals #1 and #2. Key Switch: ON	The gauge pointer reaches the (H) side and is stabilized.	Faulty HST oil temperature sensor
2	-	-	Normal in above check	Faulty monitor controller

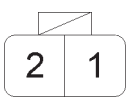
Connector (Wire harness end)

- Monitor Controller 2-B Connector



TNCC-05-05-013

- HST Oil Temperature Sensor



TCJB-05-06-004

Malfunction of Maintenance Light

- The maintenance light lights when the hour meter reaches the set replacement interval for lubrication system and filter. (Refer to the operator's manual.)
  The maintenance light lighting is controlled in the logic circuit of monitor controller.
  Therefore, if the maintenance light lights during the time when it must go out, the monitor may be faulty.

- If the maintenance light does not light during the time when it must light, the monitor controller may be faulty.

Malfunction of Secondary Steering Indicator (Option)

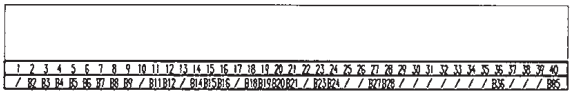
- Check that fuse #4 (fuse box B) is normal.
- Refer to Troubleshooting B as for the secondary steering troubleshooting.
- When there is no trouble, the monitor controller may be faulty.

Functions of Main Parts

The functions of the main parts for the air conditioner are described below. The connector No. is shown in the parentheses after the part name.

- Controller

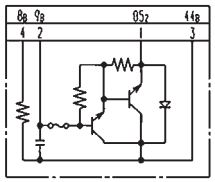
Controls the air conditioning system. According to the operator's requests sent via the switches, and the information regarding the air and refrigerant temperature sent from the sensors, the controller judges the air conditioner operating status and controls the blower motor and/or compressor operation as needed by operating the relays. In addition, the controller informs the operator of the air conditioner operating status by displaying the information on the monitor panel.



TNDB-05-07-002

- Power Transistor (CN7)

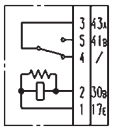
An electric switch to control blower motor voltage.



TDAA-05-07-003

- Blower Motor Relay (CN3)

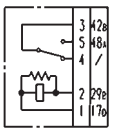
Supplies 24 volts of electricity to the blower motor when the air conditioner is operated. The blower motor relay is turned ON when excited by the current from terminal #30 in controller.



TDAA-05-07-004

- Compressor Relay (CN4)

Supplies 24 volts of electricity to the compressor clutch when the air conditioner is operated. The compressor relay is turned ON when excited by the current from terminal #29 in controller.



TDAA-05-07-005

Faulty cooling (1)

Condition:

- Fault code: Un-displayed
- Airflow volume: faulty

Blower motor rotates	Normal speed	Clogged re-circulated air filter		Filter cleaning
		Clogged fresh air filter		Filter cleaning
		Obstacles are found in inlet area		Remove obstacles
		Deformation or breakage of blower		Replacement of blower
		Frosted evaporator		To A
		Adhered dirt on evaporator surface		Evaporator surface cleaning
	Slow speed	Power source decreases		Check battery charging system
		Poor battery terminal contact		Repair
		Faulty blower motor		Replace
		Faulty power transistor		Replace
Blower motor does not rotate	Faulty blower motor relay			Replace
	Faulty blower motor			Replace
	Faulty power transistor			Replace
	Blower interferes with case			Repair
	Faulty controller			Replace the controller
	Faulty ground in body			Make sure to ground
	Faulty wiring, disconnection of connector			Wirings inspection
	Blowout of power transistor thermal fuse due to locked motor			Replace motor
	Blowout of fuse	Replace with the same capacity fuse	Blower motor is locked	Replace blower motor
			Faulty wiring	Refer to wiring diagram and check
			Shorted circuit	Wirings inspection

Faulty heating (1)

Condition:

- Fault code: Un-displayed

Faulty air flow volume	Blower motor rotates	Normal speed	Clogged re-circulated air filter		Filter cleaning
			Clogged fresh air filter		Filter cleaning
			Obstacles are found in inlet area		Remove obstacles
			Deformation or breakage of blower		Replacement of blower
			Frosted evaporator		To A
			Adhered dirt on evaporator surface		Evaporator surface cleaning
		Slow speed	Power source decreases		Check battery charging system
			Poor battery terminal contact		Repair
			Faulty blower motor		Replace
			Faulty power transistor		Replace
	Blower motor does not rotate	Blowout of fuse	Replace with the same capacity fuse	Blower motor is locked	Replace blower motor
				Faulty wiring	Refer to wiring diagram and check
				Shorted circuit	Wirings inspection
		Faulty blower motor relay			Replace
		Faulty blower motor			Replace
		Faulty power transistor			Replace
		Blower interferes with case			Repair
		Faulty controller			Replace the controller
		Faulty ground in body			Make sure to ground
		Faulty wiring, disconnection of connector			Wirings inspection
		Blowout of power transistor thermal fuse due to locked motor			Replace motor
Air flow volume is normal	Coolant temperature is low				
	Coolant temperature is normal	Disconnection of air mix damper link			Setting link again
		Air incorporation in hot-water circuit			Air Bleeding Circuit
		Clogging, breakage and bending of piping			Repair or replace.
		Extremely low ambient temperature			
		Low engine coolant level			Charge engine coolant to proper level
		Broken heater core			Replace heater core

Work after Replacing Components

The following work is required after replacing compressor, high pressure hose, low pressure hose, condenser, receiver tank, liquid hose, and air conditioner unit. The same work is required when gas leakage is found.

1. Refill Compressor Oil
2. Charge Air Conditioner with Refrigerant

- Purging
- Charge air conditioner with refrigerant
- Warm-up operation
- Inspection

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