PART NO. TTNCC-EN-00

HITACHI

Reliable solutions

Technical Manual
Troubleshooting

ZW 120-5B
Wheel Loader

Service Manual consists of the following separate Part No.

Technical Manual (Operational Principle)	: Vol. No.TONCC-EN
Technical Manual (Troubleshooting)	: Vol. No.TTNCC-EN
Workshop Manual	: Vol. No.WNCC-EN
Engine Manual	: Vol. No.ENCB-EN

Hitachi Construction Machinery Co., Ltd.
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ZW120-5B WHEEL LOADER TECHNICAL MANUAL TROUBLESHOOTING

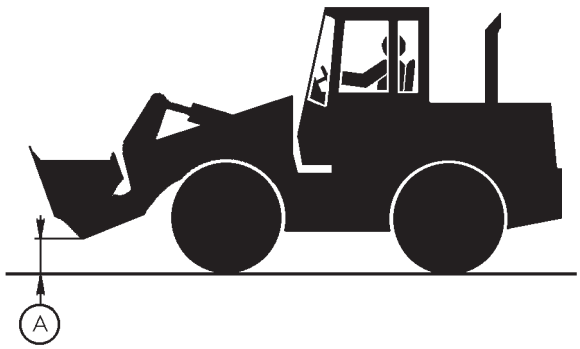
TTNCC-EN-00

General Precautions for Cab

- Before entering the cab, thoroughly remove all dirt and/or oil such as mud, grease, soil or stones that may mess up the cab from the soles of your work boots. If any controls such as a pedal is operated while with dirt and/or oil on the soles of the operator's work boots, the operator's foot may slip off the pedal, possibly resulting in a personal accident.
- Do not mess up around the operator's seat with parts, tools, soil, stones, obstacles that may fold up or turn over, cans or lunch box. The levers or pedals become inoperable if obstacle jams in operation stroke of the accelerator pedal, brake pedals, control lever lock switch or control levers, which may result in serious injury or death.
- Avoid storing transparent bottles in the cab. Do not attach any transparent type window decorations on the windowpanes as they may focus sunlight, possibly starting a fire.
- Refrain from listening to the radio, or using music headphones or mobile telephones in the cab while operating the machine.
- Keep all flammable objects and/or explosives away from the machine.
- After using the ashtray, always cover it to extinguish the match and/or tobacco.
- Do not leave cigarette lighters in the cab. When the temperature in the cab increases, the lighter may explode.
- Use proper floor mat dedicated to the machine. If another floor mat is used, it may be displaced and contact with the accelerator or brake pedals during operation, resulting in serious injury or death.

Travel on Public Roads Safely

- This machine is not allowed to drive on public roads with the bucket loaded.
  - Be sure to empty the bucket.
  - Hold the bucket at mark (A) 300 mm (12 in) above the road surface as illustrated.



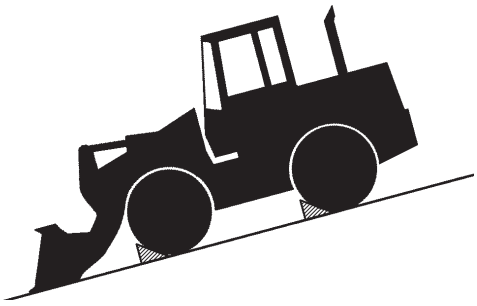
SA-453

Avoid Injury from Rollaway Accidents

- Death or serious injury may result if you attempt to mount or stop a moving machine.

To avoid rollaways:
- Select level ground when possible to park machine.
- Do not park the machine on a grade.
- Lower the bucket to the ground.
- Put the forward / reverse lever (switch) in neutral, and pull up the parking brake switch (lever) in the ON (parking brake) position.
- Run the engine at low idle speed without load for 5 minutes to cool down the engine.
- Stop the engine and remove the key from the key switch.
- Turn the control lever lock switch to the lock (🔒) position.
- Block both tires and lower the bucket to the ground.
- Position the machine to prevent rolling.
- Park at a reasonable distance from other machines.

SA-457



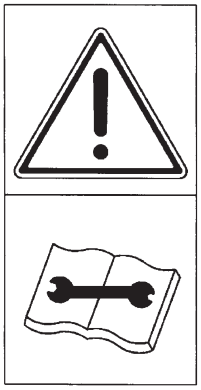
SA-458

- Sufficiently illuminate the work site. Use a maintenance work light when working under or inside the machine.
- Always use a work light protected with a guard. In case the light bulb is broken, spilled fuel, oil, antifreeze fluid, or window washer fluid may catch fire.

SA-037

Warn Others of Service Work

- Unexpected machine movement can cause serious injury.
  - Before performing any work on the machine, attach a "Do Not Operate" tag on the control lever.
    This tag is available from your authorized dealer.



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Support Machine Properly

- Never attempt to work on the machine without securing the machine first.
  - Always lower the attachment to the ground before you work on the machine.
  - If you must work on a lifted machine or attachment, securely support the machine or attachment. Do not support the machine on cinder blocks, hollow tires, or props that may crumble under continuous load. Do not work under a machine that is supported solely by a jack.

SA-527

Handle Chemical Products Safely

- Direct exposure to hazardous chemicals can cause serious injury. Potentially hazardous chemicals used with your machine include such items as lubricants, coolants, paints, and adhesives.

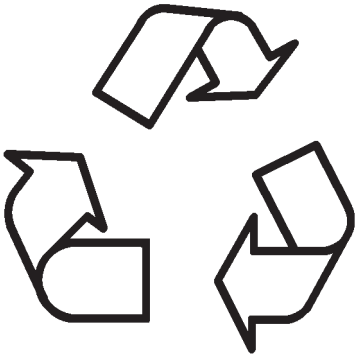
  - A Material Safety Data Sheet (MSDS) provides specific details on chemical products: physical and health hazards, safety procedures, and emergency response techniques.
  - Check the MSDS before you start any job using a hazardous chemical. That way you will know exactly what the risks are and how to do the job safely. Then follow procedures and use recommended equipment.
  - See your authorized dealer for MSDS's (available only in English) on chemical products used with your machine.

SA-309

Dispose of Waste Properly

- Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with HITACHI equipment includes such items as oil, fuel, coolant, brake fluid, filters, and batteries.

  - Use leakproof containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.
  - Do not pour waste onto the ground, down a drain, or into any water source.
  - Air conditioning refrigerants escaping into the air can damage the Earth's atmosphere. Government regulations may require a certified air conditioning service center to recover and recycle used air conditioning refrigerants.
  - Inquire on the proper way to recycle or dispose of waste from your local environmental or recycling center, or from your authorized dealer.



SA-226

SECTION 4 OPERATIONAL PERFORMANCE TEST

Group 1 Introduction

Operational Performance Tests

Use operational performance test procedure to quantitatively check all system and functions on the machine.

Purpose of Performance Tests

1. To comprehensively evaluate each operational function by comparing the performance test data with the standard values.
2. According to the evaluation results, repair, adjust, or replace parts or components as necessary to restore the machine's performance to the desired standard.
3. To economically operate the machine under optimal conditions.

Kinds of Tests

1. Base machine performance test is to check the operational performance of each system such as engine, travel, and hydraulic cylinders.
2. Hydraulic component unit test is to check the operational performance of each component such as hydraulic pump, motor, and various kinds of valves.

Performance Standards

"Performance Standard" is shown in tables to evaluate the performance test data.

Precautions for Evaluation of Test Data

1. To evaluate not only that the test data are correct, but also in what range the test data are.
2. Be sure to evaluate the test data based on the machine operation hours, kinds and state of work loads, and machine maintenance conditions.

The machine performance does not always deteriorate as the working hours increase. However, the machine performance is normally considered to reduce in proportion to the increase of the operation hours. Accordingly, restoring the machine performance by repair, adjustment, or replacement shall consider the number of the machine's working hours.

Definition of "Performance Standard"

1. Operation speed values and dimensions of the new machine.
2. Operational performance of new components adjusted to specifications. Allowable errors will be indicated as necessary.

Engine Speed

Summary:

1. Measure the engine speed by using the monitor unit or MPDr.
2. Measure the engine speeds in each mode.

NOTE: If the engine speed is not adjusted correctly, all other performance data will be unreliable. Consequently, measure the engine speed before performing all other tests in order to check that the engine speed meets specification.

Preparation:

1. Select the service menu of monitor (of MPDr.).
2. Warm up the machine until coolant temperature reaches 50 °C (122 °F) or more and hydraulic oil temperature is 50±5 °C (122±9 °F).

Parking Brake Function Check

Summary:

1. Measure the parking brake function on a specified slope.

Preparation:

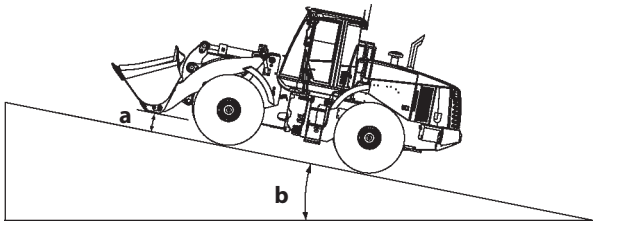
1. Measure on a pavement surface with a gradient of 20 % (11.31°).
2. Empty the bucket and hold the bucket with it raised 0.4 to 0.5 m (1 ft 4 in to 1 ft 8 in) above the ground.
3. Maintain the hydraulic oil temperature at 50±5 °C (122±9 °F). Warm the axle oil satisfactorily by repeating travel operation and brake operation.

Measurement:

1. Climb the slope and set the parking brake switch to the ON position.
2. Stop the engine.
3. After the machine has stopped, put a mark (white line) on the tire and the road surface respectively.
4. After five minutes have passed, measure the amount of movement between white lines of tire and road surface.
5. Repeat the measurement three times and calculate the mean values.

Evaluation:

Refer to Operational Performance Standard.



T4GB-04-04-003

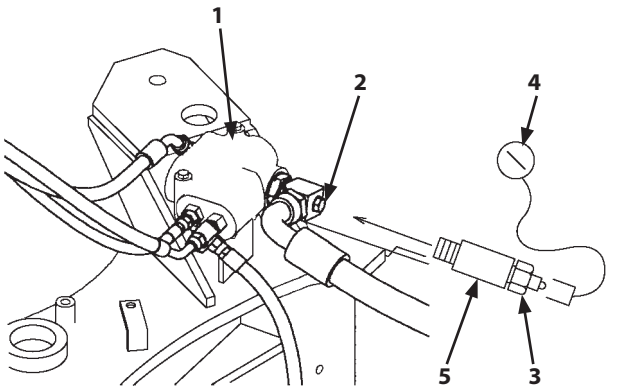
a- 0.4 to 0.5 m (1 ft 4 in to 1 ft 8 in) b- 20 % (11.31°)

Main Pump Delivery Pressure

Preparation:

1. Stop the engine.
2. Push the air bleed valve on top of the hydraulic oil tank and bleed air.
3. Remove plug (2) of the main piping inlet in priority valve (1). Install adapter (5) (ST 6453), nipple (3) (ST 6069), and pressure gauge (4) (ST 6932).

   : 17 mm, 19 mm, 22 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)



T4FJ-04-05-001

1- Priority Valve
2- Plug
3- Nipple
4- Pressure Gauge
5- Adapter

Measurement:

1. Select the following conditions.

Accelerator Pedal	Power Mode Switch	Parking Brake Switch	Forward/ Reverse Lever	Steering
Full stroke	ON	ON	N	Neutral

2. Measure pressure with the control levers in neutral without load.
3. Repeat the measurement three times and calculate the mean values.

Evaluation:

Refer to Operational Performance Standard.

Remedy:

Refer to Troubleshooting B.

Measurement:

1. Select the following conditions.

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

2. Install the articulation lock bar. Slowly operate the steering wheel and relieve the steering.
3. Repeat the measurement three times and calculate the mean values.

Evaluation:

Refer to Operational Performance Standard.

Remedy:

Refer to Troubleshooting B.

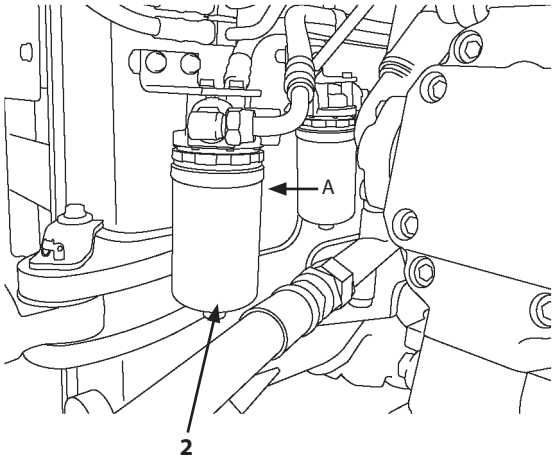
IMPORTANT: The steering relief set pressure cannot be adjusted by the relief valve in priority valve (1). The relief valve should be replaced as an assembly in case it is faulty.

Primary Pilot Pressure (Hydraulic Operated Type: Optional)

Preparation:

1. Stop the engine.
2. Push the air bleed valve on top of the hydraulic oil tank and bleed air.
3. Disconnect hose (1) from HST charge oil filter (2). Install adapter (3) (ST 6477), nipple (4) (ST 6069), and pressure gauge (5) (ST 6932) between HST charge oil filter (2) and hose (1).

   : 19 mm, 22 mm, 27 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)



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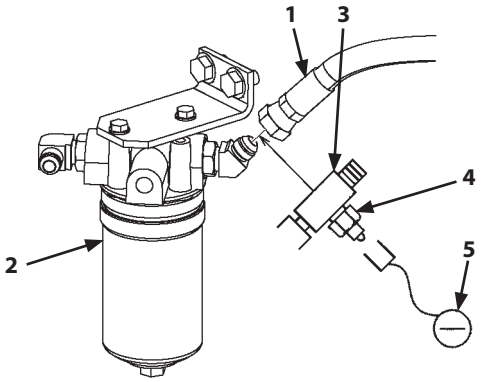
View A



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1- Hose
2- HST Charge Oil Filter
3- Adapter
4- Nipple
5- Pressure Gauge

MEMO

3. Precautions for connecting and disconnecting terminal connectors.

- When disconnecting the wire harnesses, grasp them by their connectors. Do not pull on the wire itself. Release the lock first before attempting to separate connectors, if a lock is provided. (Refer to Instructions for Disconnecting Connector on T5-1-8.)
- The water-resistant connectors keep water out. If water enters them, water will not easily drain from them. When checking the water-resistant connectors, take extra care not to allow water to enter the connectors. If water gets into the connectors, reconnect only after the connectors are thoroughly dried.
- Before connecting the terminal connectors, check that no terminals are bent (3) or coming off (4). In addition, as most connectors are made of brass, check that no terminals are rusting (2).
- When connecting terminal connectors provided with a lock, insert them together until the lock "clicks."
- Pull the wire harness near the connector in order to check if it is correctly connected.

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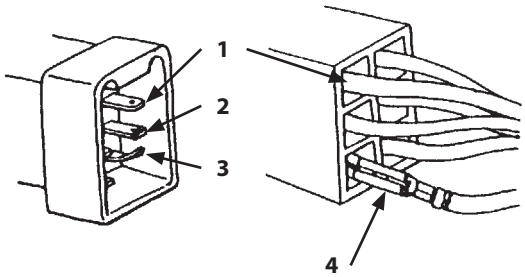

TDAA-05-08-003

1- Correct
2- Rusting
3- Bent
4- Coming Off

4. Precaution for using a circuit tester.

- Before using a circuit tester, refer to the instructions in the circuit tester manual. Then, set the circuit tester to meet the object to be measured, voltage range and current polarity.
- Before starting the connector test, always check the connector terminal numbers, referring to the circuit diagram. When the connector size is very small, and the standard probe size is too large to be used for testing, wind a fine piece of sharpened wire or a pin around the probe to make the test easier.
- When checking the connector by using a circuit tester, insert a tester probe from the wire harness end of connector in order not to damage the terminal inside connector.

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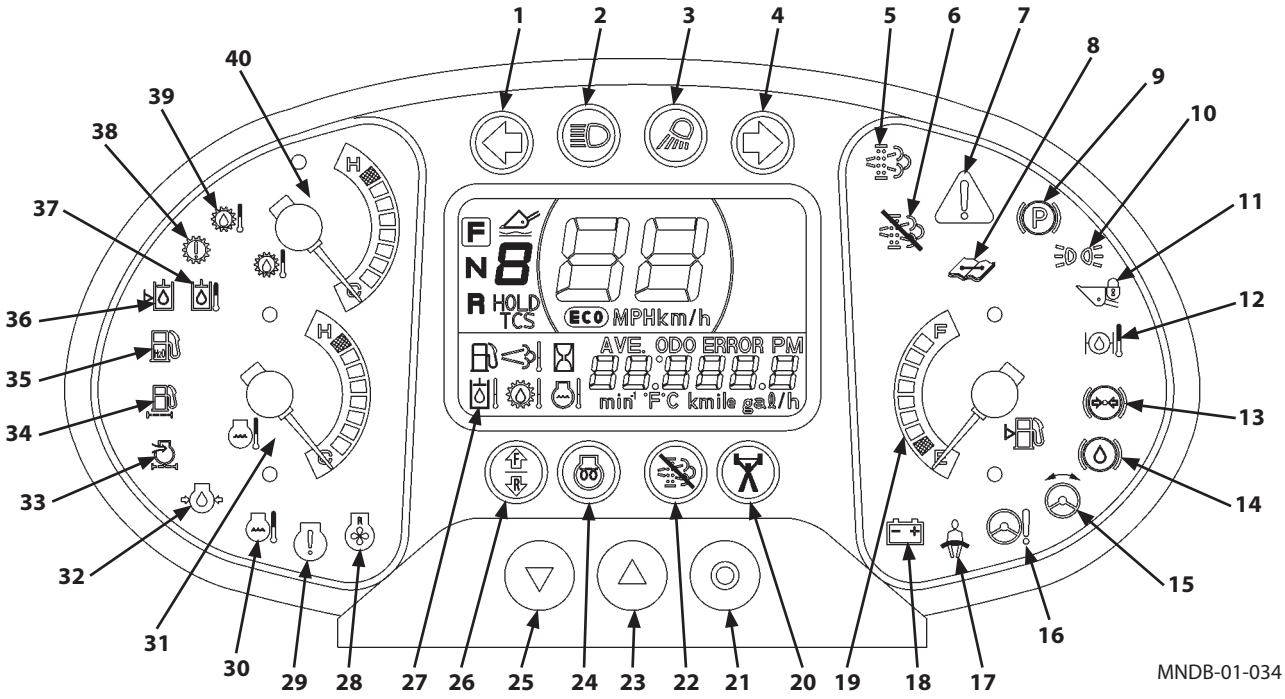
Outline



1- Left Turn Signal Light Indicator
2- High Beam Indicator
3- Work Light Indicator
4- Right Turn Signal Light Indicator
5- (Unused)
6- (Unused)
7- Service Indicator
8- Maintenance Indicator
9- Parking Brake Indicator
10- Clearance Light Indicator
11- Control Lever Lock Indicator (Optional)
12- (Unused)
13- (Unused)
14- Brake Oil Low Level Indicator
15- Emergency Steering Indicator (Optional)
16- Low Steering Oil Pressure Indicator (Optional)
17- Seat Belt Indicator (Optional)
18- Discharge Warning Indicator
19- Fuel Gauge
20- Power Mode Indicator
21- Monitor Display Selection Switch
22- (Unused)
23- Monitor Display Selection Switch (Up)
24- Preheat Indicator
25- Monitor Display Selection Switch (Down)
26- (Unused)
27- Monitor Display
28- (Unused)
29- Engine Warning Indicator
30- Overheat Indicator
31- Coolant Temperature Gauge
32- Engine Oil Low Pressure Indicator
33- (Unused)
34- (Unused)
35- (Unused)
36- (Unused)
37- (Unused)
38- HST Warning Indicator
39- HST Oil Temperature Indicator
40- HST Oil Temperature Gauge

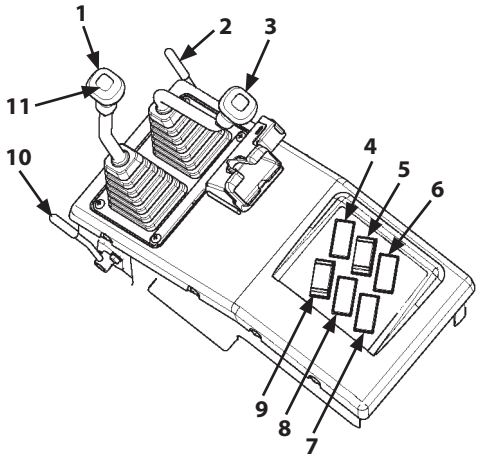
NOTE: Refer to the separated volume, Operator's Manual for details of the monitor panel.

List of Frequency Distribution Data

Item	Details
Engine Speed	Frequency distribution of engine speed.
Front Attachment Circuit Pressure	Frequency distribution of front attachment circuit pressure.
Output Shaft Torque	Frequency distribution of output shaft torque.
Radiator Coolant Temperature	Frequency distribution of coolant temperature.
HST Oil Temperature	Frequency distribution of HST oil temperature.
Vehicle Speed	Frequency distribution of vehicle speed.
HST Motor 1 Displacement Angle	Frequency distribution of HST motor displacement angle.
Output Shaft Speed	Frequency distribution of output shaft speed.
Select Speed Shift	Frequency distribution of select speed shift.
Slow Speed (L) Select	Frequency distribution of slow speed (L) select.
HST Circuit Pressure/Engine Speed	Frequency distribution of HST circuit pressure and engine speed.

Right Console

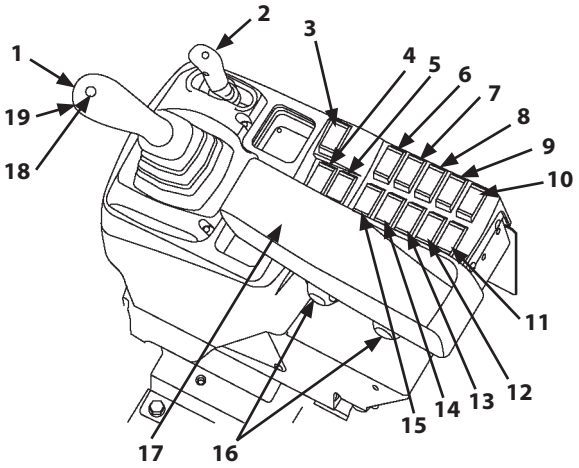
- Manual Type (Standard)



MNCB-01-005

1- Control Lever
2- Auxiliary Control Lever Lock (Optional)
3- Auxiliary Control Lever (Optional)
4- Ride Control Switch (Optional)
5- Power Mode Switch
6- Back Buzzer Switch (Optional)
7- Emergency Steering Operation Check Switch (Optional)
8- Auxiliary
9- Traction Control Switch
10- Control Lever Lock
11- Quick Shift Switch (QSS)

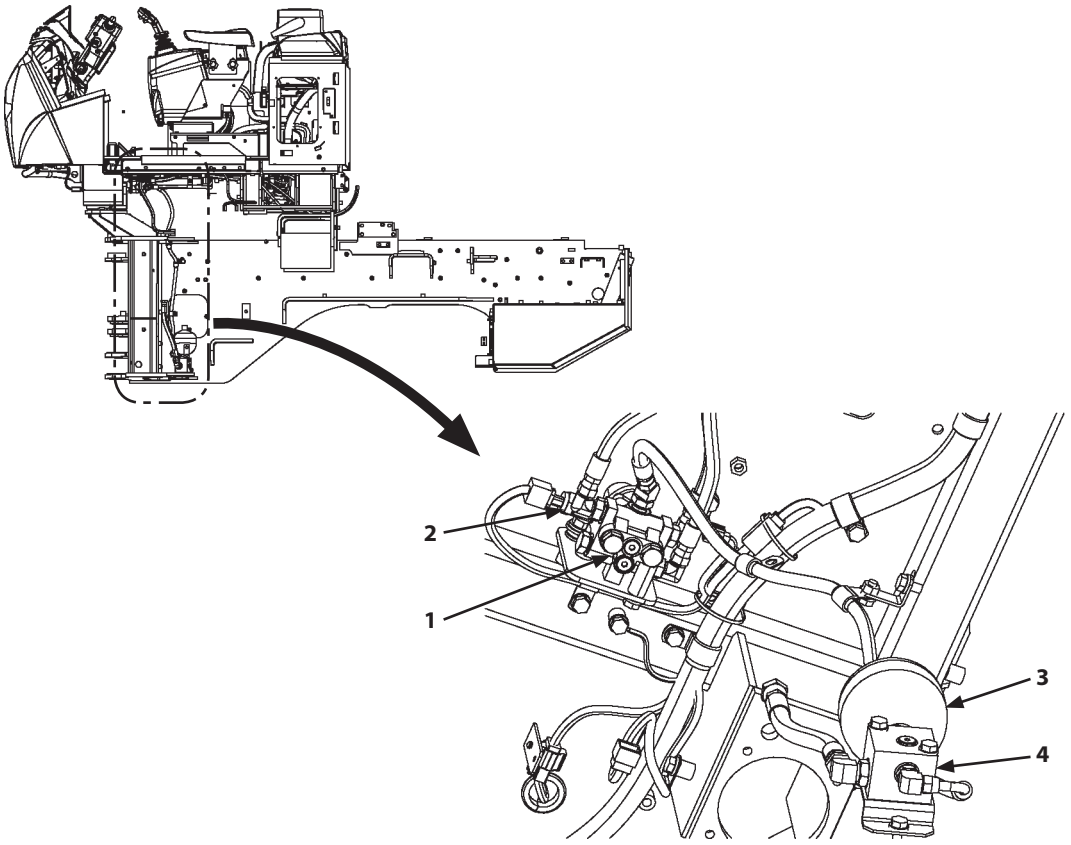
- Hydraulic Pilot Type (Optional)



MNCB-01-006

1- Joystick Type Lever
2- Auxiliary Control Lever (Optional)
3- Control Lever Lock Switch
4- Auxiliary
5- Traction Control Switch
6- Power Mode Switch
7- Auxiliary
8- Auxiliary
9- Back Buzzer Switch (Optional)
10- Auxiliary
11- Emergency Steering Operation Check Switch (Optional)
12- Auxiliary
13- Auxiliary
14- Auxiliary
15- Ride Control Switch (Optional)
16- Armrest Adjust Handle
17- Armrest
18- Quick Shift Switch (QSS)
19- Horn Switch

Pilot Shut-Off Solenoid Valve (Hydraulic Operated Type: Optional)



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1- Pilot Shut-Off Solenoid Valve
2- Pressure Sensor (Primary Pilot Pressure)
3- Pilot Accumulator
4- Check Valve

Air Conditioner Controller Fault Code List

Fault Code	Trouble	Cause	Symptoms in Machine Operation When Trouble Occurs	Remedy
E11	Open circuit in recirculated air sensor	Voltage: more than 4.95 V	Operation is controlled under such circumstance as no recirculated air sensor is provided.	Check the wire harness. Replace the recirculated air sensor.
E12	Shorted circuit in recirculated air sensor	Voltage: less than 0.3 V	Operation is controlled under such circumstance as no recirculated air sensor is provided.	Check the wire harness. Replace the recirculated 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 wire 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 wire harness. Replace the outdoor ambient temperature sensor.
E17	Open circuit in solar radiation sensor	-	Operation is controlled under such circumstance as no solar radiation sensor is provided.	Check the wire harness. Replace the solar radiation 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 wire 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 wire 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 wire harness. Replace the frost sensor.

Fault Code		Trouble	Cause	Symptoms in Machine Operation When Trouble Occurs	Remedy
DEUTZ	HCM				
388	190-0	Engine Overrun	Engine speed is more than specification (2750 min^{-1}).	No output power change.	Check HST pump delivery pressure. Check the HST motor.
389			Engine speed is more than specification (2774 min^{-1}).		
421	190-2	Cam Angle Sensor Error	ECM measures an angle deviation between cam shaft and crank shaft to the target. The offset angle between crank shaft and cam shaft is too large. Offset error between crank revolution sensor and cam angle sensor.	No output power change.	Check the wire harness. Replace the cam angle sensor.
419	190-8	Cam Angle Sensor Error	Cam angle sensor signal reception is abnormal. Faulty wire harness.	No output power change.	Check the wire harness. Replace the cam angle sensor.
422		Crank Revolution Sensor Error	Crank revolution sensor signal reception is abnormal. Faulty wire harness.	No output power change.	Check the wire harness. Replace the crank revolution sensor.
390	190-11	Engine Overrun	Engine speed is more than specification (2860 min^{-1}).	No output power change.	Check HST pump delivery pressure. Check the HST motor.
420	190-12	Cam Angle Sensor Error	Cam angle sensor signal reception is abnormal. Faulty wire harness.	No output power change.	Check the wire harness. Replace the cam angle sensor.
423		Crank Revolution Sensor Error	Crank revolution sensor signal reception is abnormal. Faulty wire harness.	No output power change.	Check the wire harness. Replace the crank revolution sensor.

MC Fault Codes 111004, 111910, 111914

Preparation

- Disconnect the connectors from each controller.
- Check the wiring connections first.
- Check the CAN1 harness between the controllers.
  (Refer to CAN1 Harness Check on T5-5-30 to 32.)

Fault Code	Trouble	Inspection Method	Cause
111004-2	CAN Communication Error 1	Continuity check (open circuit)	Open circuit in wire harness
		Discontinuity check (shorted circuit)	Shorted circuit in wire harness
111910-2	CAN Engine Speed Reception Failure	Continuity check (open circuit)	Open circuit in wire harness
		Discontinuity check (shorted circuit)	Shorted circuit in wire harness
111914-2	CAN Coolant Temperature Data Reception Failure	Continuity check (open circuit)	Open circuit in wire harness
		Discontinuity check (shorted circuit)	Shorted circuit in wire harness

MC Fault Code 111434

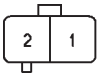
Preparation

- Check the wiring connections first.

Fault Code	Trouble	Inspection Method	Evaluation	Cause
111434-2	Driving Control Solenoid Valve Abnormal FB	Measure resistance between solenoid valve #1 and #2.	0/∞ Ω	Faulty solenoid valve
		Measure voltage between solenoid valve harness end #1 and the body.	0 V	Open circuit in wire harness #1
		Measure resistance between solenoid valve harness end #2 and the body.	∞ Ω	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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Air Conditioner Controller Fault Codes E11 to E22

Preparation

- Check the wiring connections first.
- Before inspection, set the key switch to the ON position.

Fault Code	Trouble	Inspection Method	Evaluation	Cause
E11	Open circuit in re-circulated air sensor	Measure resistance between sensor #1 and #2.	∞ Ω (Specification: 300 to 430 kΩ)	Faulty sensor
		Measure voltage between sensor harness end #1 and the body.	0 V	Open circuit in wire harness #1
		-	Normal in above check	Open circuit in wire harness #2
E12	Shorted circuit in re-circulated air sensor	Measure resistance between sensor #1 and #2.	0 Ω ((Specification: 300 to 430 kΩ)	Faulty sensor
		-	Normal in above check	Shorted circuit in harness #1 and #2.
E13	Open circuit in outdoor ambient temperature sensor	Measure resistance between sensor #1 and #2.	∞ Ω ((Specification: 100 to 210 kΩ)	Faulty sensor
		Measure voltage between sensor harness end #1 and the body.	0 V	Open circuit in wire harness #1
		-	Normal in above check	Open circuit in wire harness #2
E14	Shorted circuit in outdoor ambient temperature sensor	Measure resistance between sensor #1 and #2.	0 Ω ((Specification: 100 to 210 kΩ)	Faulty sensor
		-	Normal in above check	Shorted circuit in wire harness between #1 and #2
E18	Shorted circuit in solar radiation sensor	Check continuity between sensor harness end #1 and #2.	0 Ω	Shorted circuit in wire harness between #1 and #2
		-	Normal in above check	Faulty sensor
E21	Open circuit in frost sensor	Measure resistance between sensor #1 and #2.	∞ Ω ((Specification: 100 to 115 kΩ)	Faulty sensor
		Measure voltage between sensor harness end #1 and the body.	0 V	Open circuit in wire harness #1
		-	Normal in above check	Open circuit in wire harness #2
E22	Shorted circuit in frost sensor	Measure resistance between sensor #1 and #2.	0 Ω ((Specification: 100 to 115 kΩ)	Faulty sensor
		-	Normal in above check	Shorted circuit in wire harness between #1 and #2

Parts / Item	HST Oil Temperature Sensor	HST Circuit Pressure Sensor	Pressure Sensor (Front Attachment Pressure)
Function	Monitors hydraulic oil temperature.	Detects HST circuit pressure.	Detects pump delivery pressure (main , steering).
Symptoms in control system when trouble occurs	MC recognizes that hydraulic oil temperature is 120 °C when open circuit occurs. (Hydraulic oil temperature: 120 °C is not displayed on monitoring.))	When output is 0 V or 5 V, the following symptoms occur.	When output is 0 V or 5 V, the following symptoms occur.
Symptoms in machine operation when trouble occurs	Even if hydraulic oil temperature is 0 °C or less when starting the engine, auto-warming up control is not operated.	The maximum speed and maximum traction force are limited.	The traction control is not activated.
Evaluation by Fault Code	-	115014	-
Evaluation by Monitoring	MC: HST Oil Temperature	MC: HST Circuit Pressure	MC: Front Attachment Pressure
Evaluation by using Test Harness	-	-	-
Note	-	Possible to judge if sensor or harness is faulty by switching pressure sensor with other delivery pressure sensor.	Possible to judge if sensor or harness is faulty by switching pressure sensor with other delivery pressure sensor.
Descriptions of Control (Operational Principle Section in T/M)	T2-2	T2-2	T2-2

Trouble Symptom / Parts	F-4 When lift arm raise or bucket roll-in is operated, lift arm or bucket starts to move after moving slightly down.
ECM	○
Monitor	
Lift Arm Angle Sensor (Optional)	
Pilot Pump	
Brake Charge Valve	
Manifold Valve	
Pilot Valve	
Slow Return Valve	
Spool (Control Valve)	
Overload Relief Valve (Control Valve)	
Load Check Valve (Control Valve)	●
Cylinder	●
Main Pump	
Remark	

Brake System Troubleshooting

Trouble Symptom / Parts	B-1 Parking brake is not released.	B-2 Parking brake is not applied.	B-3 Service brake braking force becomes weak.
Monitor Controller	○		
Key Switch	○ (ON)	○ (ON)	
Battery			
Fuse Box A	● (#14, #20)	● (#14, #20)	
Parking Brake Switch	● (Released)	● (Applied)	
Parking Brake Relay 1	● (OFF)	● (ON)	
Parking Brake Relay 2	● (ON)	● (OFF)	
Brake Pedal			●
Parking Brake	●	●	
Brake/Transmission Pump	○	○	○
Parking Brake Solenoid Valve	●	●	
Brake Valve			●
Axle			●
Remark			

Front Attachment System Troubleshooting

F-1 All front attachment actuator power are weak.

- In case the trouble occurs only when the hydraulic oil temperature is low, high viscosity of hydraulic oil may be the cause.
- The main relief valve or overload relief valve in control valve may be faulty if speed is enough but the power is weak.
- The front attachment hydraulic system is controlled by the main pump, priority valve, and control valve. When the steering system control is normal, the priority valve should be normal. Therefore, if only the front attachment system is abnormal, the main pump and control valve may be faulty.

Main Relief Valve Set Pressure	Specification (MPa)	Remark
Lift arm and bucket relief operation	$20.6^{+1.2}_{-0.5}$	

Preparation

- If operating speeds are extremely slow, pump control may be faulty. Faulty pilot system may also cause this trouble.

Procedure	Inspection Method	Condition	Evaluation	Cause
1	Monitor Pump Delivery Pressure.	Lift arm relief operation	The measured value are not within the specification.	Faulty main relief valve (Front Attachment) (readjust)
2	-	-	Normal in above check	Find out cause of trouble by tracing other trouble symptoms.

Steering System Troubleshooting

S-1 Steering cylinder operation is slow. Steering cylinder operation is not operated.

Main Relief Valve Set Pressure	Specification (MPa)	Remark
Steering relief operation	$17.2^{+1.5}_{-0.5}$	

Preparation

- If the main pump is abnormal, lift arm and bucket operations may be abnormal. Inspect the main pump.
- Check if the steering shaft is deformed or stuck.

Procedure	Inspection Method	Condition	Evaluation	Cause
1	Measure pump delivery pressure.	Steering relief operation	The measured value is not within the specification.	Faulty main pump in priority valve
2	Measure pressure at port P in the steering valve.	Steering relief operation	The measured values are not within the specification.	Faulty priority valve
3	Measure pressure at ports L and R in the steering valve.	Port L: Steering (left) relief operation Port R: Steering (right) relief operation	The measured values are not within the specification.	Faulty steering valve
4	-	-	Normal in above check	Faulty steering cylinder

T-8 Fast speed is not selected even if quick shift switch is released.

- Check the wiring connections first.

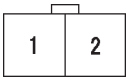
Procedure	Inspection Method	Condition	Evaluation	Cause
1	Disconnect the connector of the quick shift switch.	Shift Switch: Hi Position Vehicle Speed: Slowly accelerate from 10 km/h.	Travel: Fast speed	Faulty quick shift switch
2	Check continuity between the male end connector of quick shift switch and the body.	Disconnect the connector of MC.	0 Ω	Shorted circuit in harness between shift switch and MC
3	Check continuity between terminal #1 of travel mode selector solenoid valve connector of wire harness end and the body.	Disconnect the connector of MC.	0 Ω	Shorted circuit in harness between travel mode selector solenoid valve and MC
4	Inspect the travel mode selector solenoid valve.	-	There is abnormality.	Faulty travel mode selector solenoid valve
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	Faulty brake/transmission pump
7	Check continuity between terminals #1 and #2 of vehicle speed sensor.	-	570 Less than 570 Ω or 1050 Ω or more	Faulty vehicle 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 vehicle speed sensor.	∞ Ω	Open circuit in wire harness between vehicle speed sensor and MC
9	-	-	Normal in above check	Faulty transmission

Connector (Wire harness end)

- Quick Shift Switch

TNCC-05-06-004

- Travel Mode Selector Solenoid Valve



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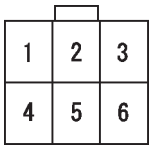
Connector (Wire harness end)

- Light Switch



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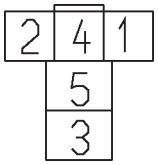
- High Beam Relay



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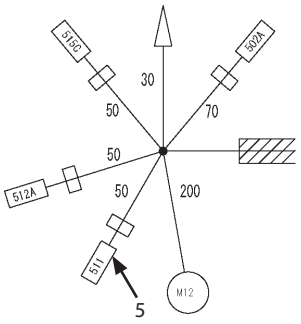

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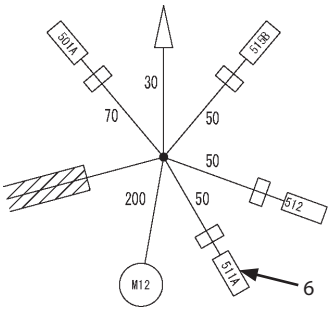
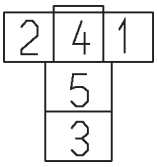


TNCC-05-06-006

Procedure	Inspection Method	Condition	Evaluation	Cause
8	Measure voltage between terminal #1 of rear 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 rear work light relay and work light switch
9	Check continuity between terminal #2 of rear work light relay connector of wire harness end and the body.	-	∞ Ω	Open circuit in wire harness between rear work light relay and the ground
10	Measure voltage between terminal #3 of rear 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 A and rear work light relay
11	Measure voltage between terminal #1 of rear work light 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 rear work light relay and the rear work light

Connector (Wire harness end)

- Rear Work Light Relay



T183-05-04-003

- Rear Work Light

TNED-05-06-006

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Malfunction of Preheat Indicator

- Check the wiring connections first.

The preheat indicator lights even when the heater plug is not operated.

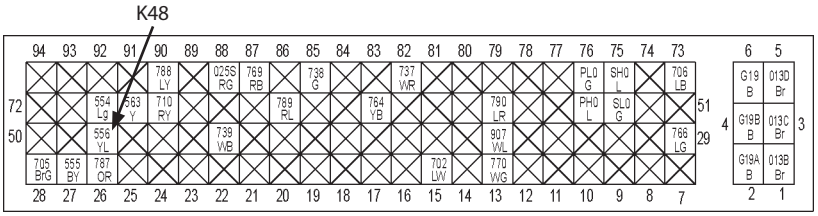
	Inspection Method	Condition	Evaluation	Cause
1	Disconnect ECM-2 connector from ECM.	Key Switch: ON	Preheat Indicator: OFF	Faulty ECM
2	Check continuity between terminal K48 of ECM-2 connector of wire harness end and the body.	Key Switch: ON	0 Ω	Shorted circuit in wire harness between ECM and monitor controller
3	-	-	Normal in above check	Faulty monitor controller

The preheat indicator does not light even when the heater plug is operated.

	Inspection Method	Condition	Evaluation	Cause
1	Disconnect ECM-2 connector from ECM. Connect the wire harness end of ECM-2 connector terminal K48 to the body.	Key Switch: ON	Preheat Indicator: ON	Faulty ECM
2	Connect the wire harness end of monitor controller 1-B connector terminal #21 to the body.	Key Switch: ON	Preheat Indicator: ON	Open circuit in wire harness between ECM and monitor controller
3	-	-	Normal in above check	Faulty monitor controller

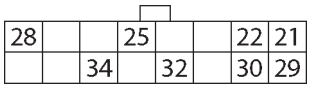
Connector (Wire harness end)

- ECM-2 Connector



TNCC-05-07-002

- Monitor Controller 1-B Connector



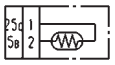
TNDF-05-05-006

Malfunction of Low Steering Oil Pressure Indicator (OPT)

- When this trouble occurs, the fault corresponding to the emergency steering pressure switch in MC must be displayed. Refer to Troubleshooting A and conduct the remedy.
- When there is no trouble, the monitor controller may be faulty.

- Frost Sensor (CN12)

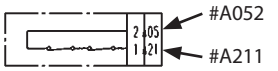
Monitors the fin temperature which is cooled by the evaporator. When the temperature is higher than 3 °C (approx. 4.2 kΩ), the controller turns the compressor relay ON. When the temperature is lower than 2 °C (approx. 4.5 kΩ), the controller turns the compressor relay OFF. Therefore, the evaporator in the air conditioner unit is prevented from freezing. The electrical resistance in the frost sensor is 100 Ω to 115 kΩ.



TDAA-05-07-006

- High/Low Pressure Switch (CN14)

Controls the compressor clutch solenoid while monitoring the compressor circuit pressure. The high/low pressure switch consists of a pressure gauge and a switch. The pressure gauge detects the lower pressure range (0.196 MPa to 0.216 MPa) and the surge pressure range (2.55 MPa to 3.14 MPa). When the circuit pressure is reduced to the lower pressure range or increases to the surge pressure range, the pressure gauge turns the switch OFF so that the compressor operation stops.
If the pressure is reduced to the lower range, a lack of refrigerant is suspected. Therefore, damage to the compressor due to a lack of refrigerant is prevented. In case the pressure increases to the surge range, damage to the air conditioner circuit parts due to excessively high circuit pressure is prevented.



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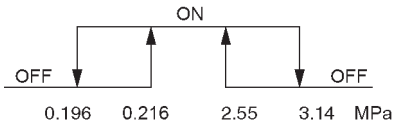
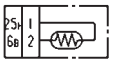


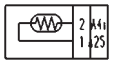
TDAA-05-07-014

- Re-circulated Air Sensor (CN11)

Monitors the temperatures (0 to 25 C) around the re-circulated air inlet as the interior air temperatures and converts them to the electrical resistance values. The temperatures 0 °C to 25 °C corresponds to a resistance of 1.645 kΩ (0 °C) to 5 kΩ (25 °C) respectively.
The electrical resistance in the air circulation sensor is 300 Ω to 430 kΩ.



TDAA-05-07-008



TDAA-05-07-009

- Outdoor Ambient Temperature Sensor (CN15)

Monitors the temperature around the rear side of the machine as the fresh air temperature, and converts the temperature to the electrical resistance value. The electrical resistance in the fresh air sensor is 100 Ω to 210 kΩ.

A: Frosted evaporator

Frosted evaporator	Stop air conditioner and melt ice			
	With voltage applied to magnet clutch	Faulty magnet clutch circuit	Check of clutch circuit	Replace clutch relay
		Faulty wiring of frost sensor	Shorted circuit check	Repair
		Faulty frost sensor characteristics	Characteristic check	Replace frost sensor.
		Frost sensor is out of evaporator range (faulty sensitivity)	Reinsert (floating distance from evaporator is 3 mm or less)	
	No voltage applied to magnet clutch		Faulty magnet clutch	Replace magnet clutch

A: Frosted evaporator

Frosted evaporator	Stop air conditioner and melt ice			
	With voltage applied to magnet clutch	Faulty magnet clutch circuit	Check of clutch circuit	Replace clutch relay
		Faulty wiring of evaporator sensor	Shorted circuit check	Repair
		Faulty the frost sensor characteristics	Characteristic check	Replace frost sensor
		Frost sensor is out of evaporator range (faulty sensitivity)	Reinsert (floating distance from evaporator is 3 mm or less)	
	No voltage applied to magnet clutch		Faulty magnet clutch	Replace magnet clutch

Refill Compressor Oil

When replacing the cooling circuit parts, refill compressor oil to the specified level.

Replacement parts	Compressor	Condenser	Evaporator	Receiver	D hose (between compressor and condenser)	L hose (between condenser and unit)	S hose (between unit and compressor)
Oil-replenishing quantity	Refer to the following.	40 cm^3 (2.4 in^3)	40 cm^3 (2.4 in^3)	20 cm^3 (1.2 in^3)	6 to 9 cm^3/m (0.4 to 0.5 in^3/m)	2 to 4 cm^3/m (0.1 to 0.2 in^3/m)	8 to 11 cm^3/m (0.5 to 0.7 in^3/m)

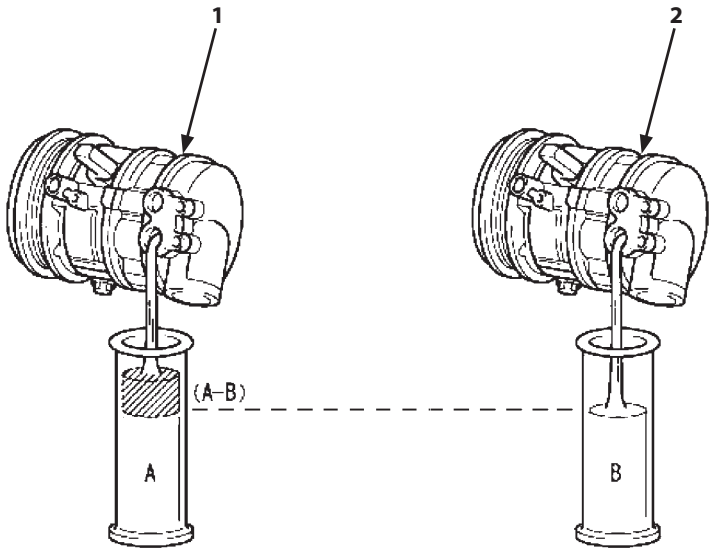
- In case of replacing compressor

New compressor (1) is charged with oil required for cooling circuit. When replacing new compressor (1), drain excess oil from new compressor (1). Adjust oil level so that it is the same level as oil (B) in compressor (2) to be replaced.

NOTE: Compressor oil quantity: 160 cm^3 (9.8 in^3)

- Compressor oil refill container

Oil type	Part No	Quantity
ND-OIL8	4422696	40 cm^3 (2.4 in^3)



TDAA-05-07-015

1- New Compressor 2- Replacing Compressor