PART NO. TTNFA-EN-00

HITACHI

Reliable solutions

Technical Manual
Troubleshooting

ZW 310-5B 330-5B
Wheel Loader

Service Manual consists of the following separate Part No.

Technical Manual (Operational Principle)	: Vol. No.TONFA-EN
Technical Manual (Troubleshooting)	: Vol. No.TTNFA-EN
Workshop Manual	: Vol. No.WNFA-EN
Engine Manual	: Vol. No.ENFA-EN

ZW310-5B • 330-5B WHEEL LOADER TECHNICAL MANUAL TROUBLESHOOTING

TTNFA-EN-00

Hitachi Construction Machinery Co., Ltd.

URL:http://www.hitachi-c-m.com

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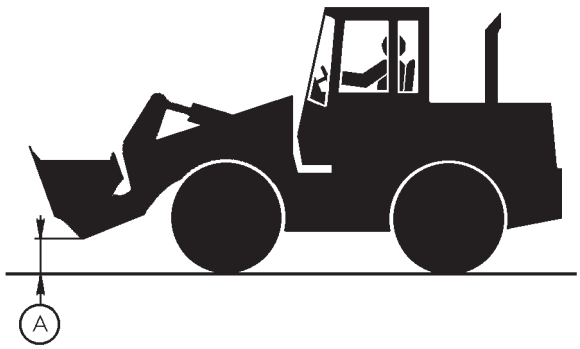
General Precautions for Cab

- 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.



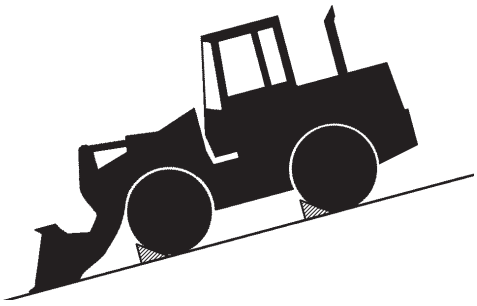
SA-453

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



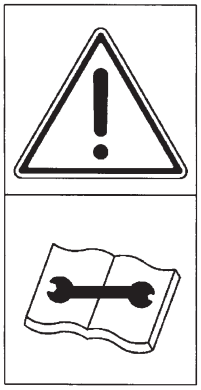
SA-458

- 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.

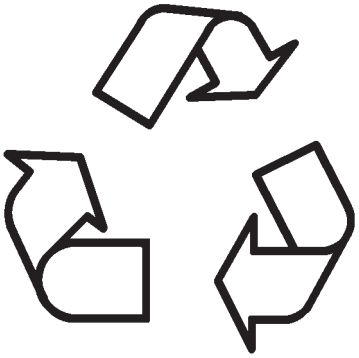
  - A Material Safety Data Sheet (MSDS) provides specific details on chemical products: physical and health hazards, safety procedures, and emergency response techniques.
  - Check the MSDS before you start any job using a hazardous chemical. That way you will know exactly what the risks are and how to 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"

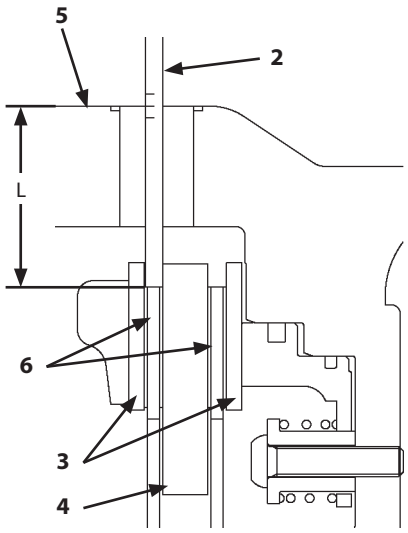
1. Operation speed values and dimensions of the new machine.
2. Operational performance of new components adjusted to specifications. Allowable errors will be indicated as necessary.

Performance Test Designation	Unit	Performance Standard	Remarks	Reference Page
Service Brake Accumulator Pressure				T4-5-20
Accumulator Pressure	MPa (kgf/cm^2) (psi)	16±0.5 (163±5) (2321±73)		
Accumulator Charge Time	sec	15 or less		
Number of Brake Pedal Applications		at least 10 times		
Brake Warning Pressure (Pressure-Decreasing)	MPa (kgf/cm^2) (psi)	6.1±0.5 (62±5) (885±73)		T4-5-22
Brake Warning Pressure (Pressure-Increasing)	MPa (kgf/cm^2) (psi)	6.6±0.5 (67±5) (957±73)		T4-5-24
Transmission Clutch Pressure	MPa (kgf/cm^2) (psi)	2.1 to 2.3 (21 to 23) (305 to 334)		T4-5-26
Torque Converter Pressure	MPa (kgf/cm^2) (psi)			T4-5-28
Inlet Pressure		0.9 to 1.2 (9 to 12) (131 to 174)		
Outlet Pressure		0.3 to 0.5 (3.0 to 5.0) (44 to 73)		

Evaluation:

1. In case wear gauge (2) has entered between brake rings (3, 4) and the model scale of wear gauge (2) and housing surface (5) have coincided, the wear amount of brake disc (6) does not reach the maximum allowable limit of use. In case wear gauge (2) has not entered between brake rings (3, 4) and the model scale is sticking above housing surface (5), brake disc (6) is worn in excess of the maximum allowable limit of use.
2. In the method above, in case the wear amount is beyond the maximum allowable limit of use or in case the service brake portion has been assembled, refer to Operational Performance Standard in T4-2.

- Distance (L) between Housing Surface (5) and Brake Disc (6):
  ZW310-5B: 57 mm (2.25 in)
  ZW330-5B: 68 mm (2.67 in)



T4GB-04-04-006

IMPORTANT: One kind of brake ring (4) and two kinds of brake ring (3) are available. Thickness of them are different as below.
In addition, combination patterns of brake rings (3, 4) may be different depending on serial No.

- Brake ring (4) thickness (new):
  11.9 mm (0.47 in)
- Brake ring (3) thickness (new):
  6.5 mm (0.26 in), 6.9 mm (0.27 in)

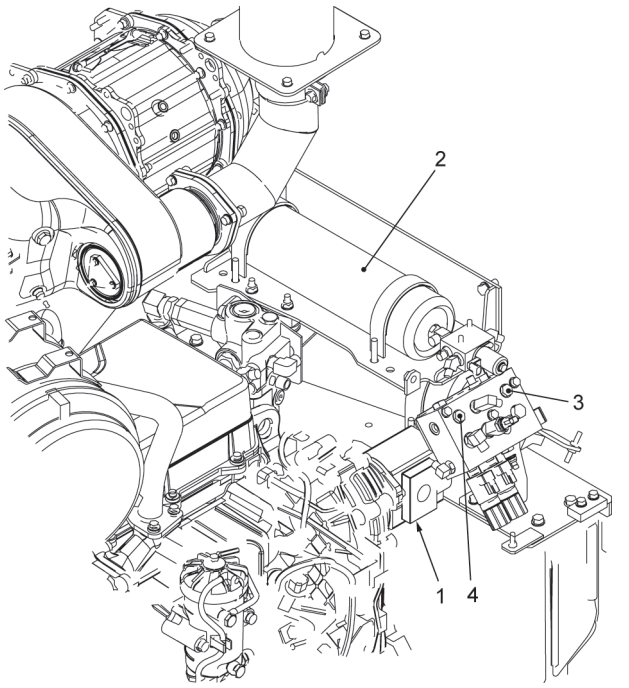
Primary Pilot Pressure (Brake Charge Valve Setting Pressure)

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.)

IMPORTANT: Primary pilot pressure circuit delivers pressure oil from pilot pump (1) to the brake circuit when pressure in service brake accumulator (2) decreases, and accumulates pressure in service brake accumulator (2). Therefore, the brake circuit pressure is higher than the pilot circuit pressure. Use a pressure gauge capable of measuring 16 MPa (165 kgf/cm^2) (2320 psi) or higher.

Preparation:

1. Stop the engine.
2. Push the air bleed valve on top of the hydraulic oil tank and bleed air.
3. Remove plug (3) on the manifold block of combination valve. Install the pressure gauge to the port.
4. Start the engine and keep the speed at low idle. 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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1- Pilot Pump
2- Brake Accumulator
3- Plug
4- Plug

(Blank)

Accumulator pressure:

1. Select the following conditions:

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

2. Measure the pressure when fully depressing the brake pedal at left side to the floor.
3. Repeat the measurement three times and calculate the mean values.

Number of brake pedal applications:

1. After running the engine at high idle for 1 minute, stop the engine. (Turn the key switch "ON" with engine off.)
2. Repeat stepping on the brake pedal for 5 seconds and releasing for 5 seconds.
3. Count and verify the number of stepping on the brake pedal before the low pressure alarm starts sounding is at least 10 times.

Accumulator charge time:

1. Run the engine at low idle.
2. Measure the time from the low pressure alarm OFF until when the brake charge valve set pressure reaches the cut-out pressure value.
3. Verify the time period is 15 seconds or less.

Evaluation:

Refer to Operational Performance Standard.

Remedy:

Refer to Troubleshooting B.

NOTE: The maximum accumulated brake pressure should equal to the brake charge valve setting value (cut-out). Refer to Primary Pilot Pressure (Brake Charge Valve Setting Pressure) measurement procedure.

Rewrite of Muffler Filter Serial No.

When the muffler filter has been replaced, rewrite the serial No. of muffler filter and upload the muffler filter replacement results to e-Service.

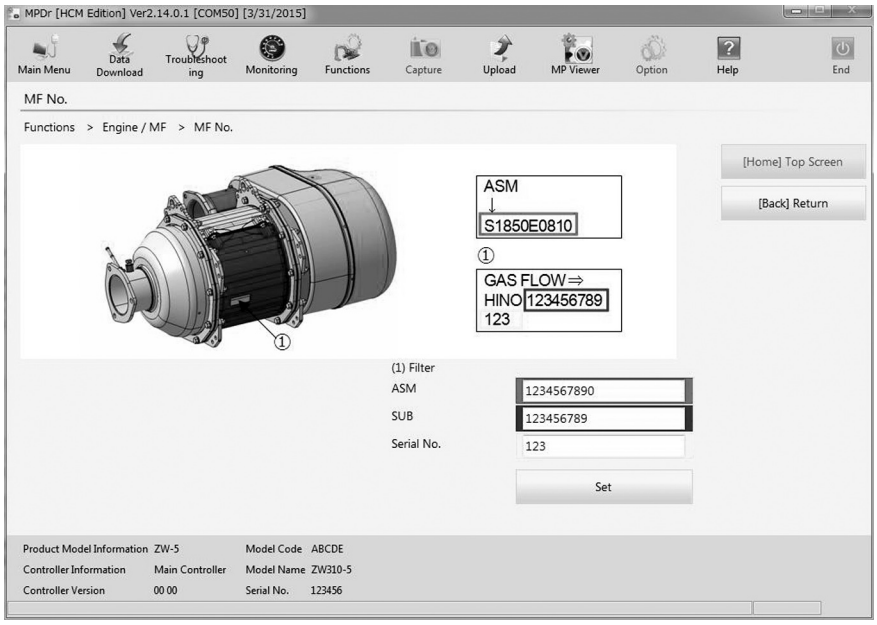
1. Connect MPDr..
2. Set the key switch to the ON position.
3. Select Functions-Engine/Muffler Filter-Muffler Filter NO. with MPDr..
4. Input the following items of Oxidation Catalyst (DOC) and Filter.

- ASM
- SUB
- Serial No.

5. After inputting, select Setting.

IMPORTANT: After inputting Muffler Filter Serial No. is completed, upload the data to e-Service.

NOTE: When the input data is uploaded to e-Service, the M-Find product specification and history will be updated.



TNFA-04-06-004

Electric System Inspection

The precautions and information for the electrical system inspection are explained here. The electrical system inspection contains as follows.

- Precautions for Inspection and Maintenance
- Instructions for Disconnecting Connectors
- Fuse Inspection
- Fusible Link Inspection
- Battery Voltage Check
- Alternator Check
- Continuity Check
- Voltage and Current Measurement
- Check by False Signal
- Test Harness

Continuity Check

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

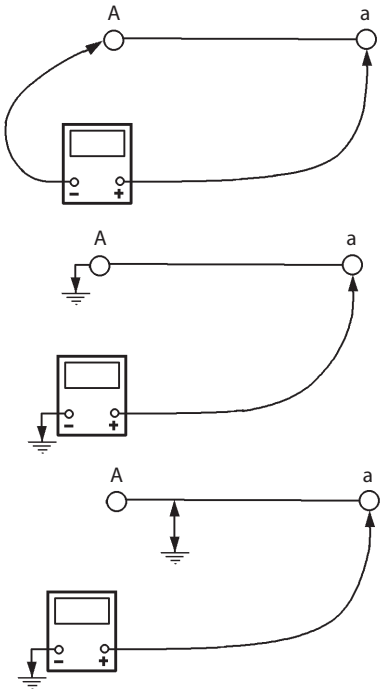
- Single-line continuity check

Disconnect both end connectors of the harness and check continuity between both ends:
- If the ohm-meter reading is: ∞ Ω = Discontinuity
- 0 Ω = Continuity

- When the one end connector is far apart from the other, connect one end of connector (A) to the body by using a clip. Then, check continuity of the harness through the body as illustrated.
  - If the ohm-meter reading is: ∞ Ω = Discontinuity
  - 0 Ω = Continuity

- Single-line short-circuit check

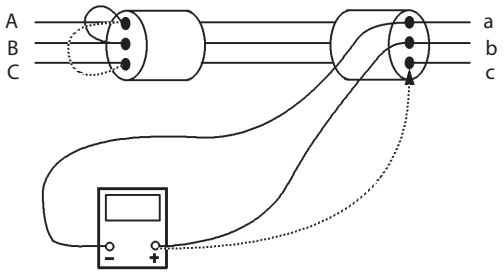
Disconnect both end connectors of the harness and check continuity between one end connector of the harness and the body:
- 0 Ω = Short-circuit is present.
- ∞ Ω = No short-circuit is present.



T107-07-05-003

- Multi-line continuity check

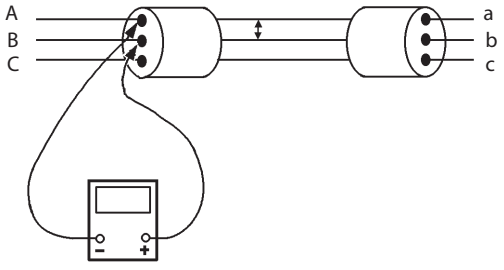
Disconnect both end connectors of the harness, and short-circuit two terminals, (A) and (B), at one end connector, as illustrated. Then, check continuity between terminals (a) and (b) at the other connector.
If the ohm-meter reading is ∞ Ω, either line (A) - (a), or (B) - (b) is in discontinuity.
To find out which line is discontinued, conduct the single line continuity check on both lines individually, or, after changing the short-circuit terminals from (A) - (B) to (A) - (C), check continuity once more between terminals (a) and (c).
By conducting the multi-line continuity check twice, it is possible to find out which line is discontinued.
With terminals (A) and (C) short-circuited, check continuity between terminals (a) and (c).
- 0 Ω = Line (B) - (b) has discontinuity.
- ∞ Ω = Line (A) - (a) has discontinuity.



T107-07-05-004

- Multi-line short-circuit check

Disconnect both end connectors of the harness, and check continuity between terminals (A) and (B) or (C).
- 0 Ω = Short-circuit exists between the lines.
- ∞ Ω = No short-circuit exists between the lines.

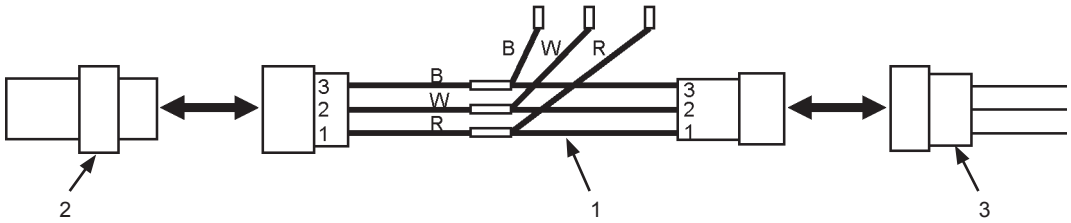


T107-07-05-005

- Pressure Sensor Test Harness

Connect a test harness to the harness end connector of pressure sensor. Check the state of pressure sensor circuit.

Pressure Sensor Test Harness (Example)



TDAA-05-06-003

1- Test Harness (Ground, Output, 5 V Lines)
2- Dummy Connector
3- Harness Connector for Sensor Connection

1. Connect the male end connector of test harness (1) to harness end connector (3).
2. Connect a dummy sensor (2) to the female end connector of test harness (1).
3. Check the output voltage.

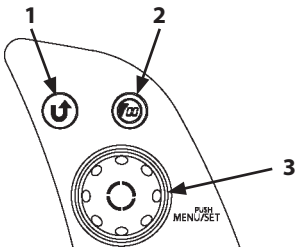
Main Controller (T/M)

Item	Unit	Data
Demand Engine Speed	min^{-1}	Command value of engine speed from MC to ECM.
Actual Engine Speed	min^{-1}	Input signal from ECM
Accelerator Pedal	V	Input signal from accelerator pedal sensor
Hydraulic Oil Temperature	°C	Input signal from hydraulic oil temperature sensor
Torque Converter Oil Temperature	°C	Input signal from torque converter oil temperature sensor
Axle Oil Temperature	°C	Input signal from axle oil temperature sensor
Target Hydraulic Fan Speed	min^{-1}	Calculated signal from actual engine speed and control signal to fan control valve
Pump Delivery Pressure	MPa	Input signal from pump delivery pressure sensor
Vehicle Speed (For Speedometer)	km/h	Converted signal from machine speed sensor into speed per hour
Torque Converter Input Speed	min^{-1}	Input signal from torque converter input speed sensor
Torque Converter Output Speed	min^{-1}	Input signal from torque converter output speed sensor
Intermediate Gear Speed	min^{-1}	Input signal from intermediate gear speed sensor
Transmission Output Speed	min^{-1}	Input signal from transmission output speed sensor
Actual Vehicle Speed	km/h	Converted signal from machine speed sensor into speed per hour
Parking Brake Pressure	MPa	Input signal from pressure sensor (parking brake)
Service Brake Primary Pressure	MPa	Input signal from pressure sensor (brake primary pressure)
Service Brake Secondary Pressure (For clutch Cut Off)	MPa	Input signal from pressure sensor (brake secondary pressure for clutch cut)
Torque Converter Speed Ratio	%	Calculated signal from actual engine speed and torque converter output speed by MC (T/M)
Vehicle Speed Pulse	pulse	Actual transmission output speed pulse
Warning Buzzer	0: OFF 1: ON 2: ON 3: ON	Auto idling-stop alarm ON/OFF status

Symbol	Alarm	Monitor Message	Remedy
 M183-01-067	Air Cleaner Restriction Alarm	Air Cleaner Elements Are Clogged. Clean Or Replace Air Cleaner Element.	Follow Trouble Screen on the monitor.
 MNEC-01-010	Water Separator Alarm	Water Separator Is Full. Drain Water.	Follow Trouble Screen on the monitor.
 MDDA-01-034	System Failure Alarm	Machine Network System Is Abnormal. Contact Your Nearest Authorized Dealer.	Refer to Troubleshooting A.

Monitor Operation:

1. Turn select / confirm knob (3) and select Monitoring (4) on Service Menu.



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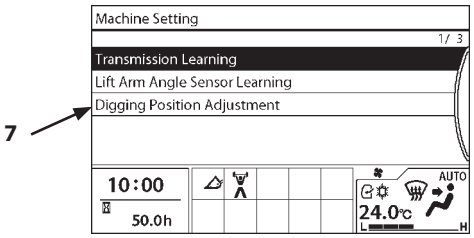
2. Push select / confirm knob (3) and turn it to select Machine Setting - Digging Position Adjustment (7) menu.

3. When pushing select / confirm knob (3), the Digging Position Adjustment screen appears.



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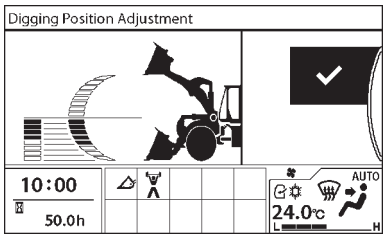
4. Turn select / confirm knob (3) and select the check mark.
   When pushing select / confirm knob (3), the setting has been completed.

5. When the digging position has been changed, the digging position and lift arm angle position settings are changed.



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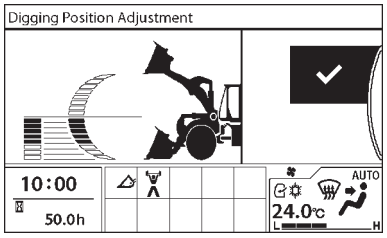
6. When pushing return to previous screen switch (1), the previous screen appears.

7. When pushing return to basic screen switch (2), the basic screen appears.



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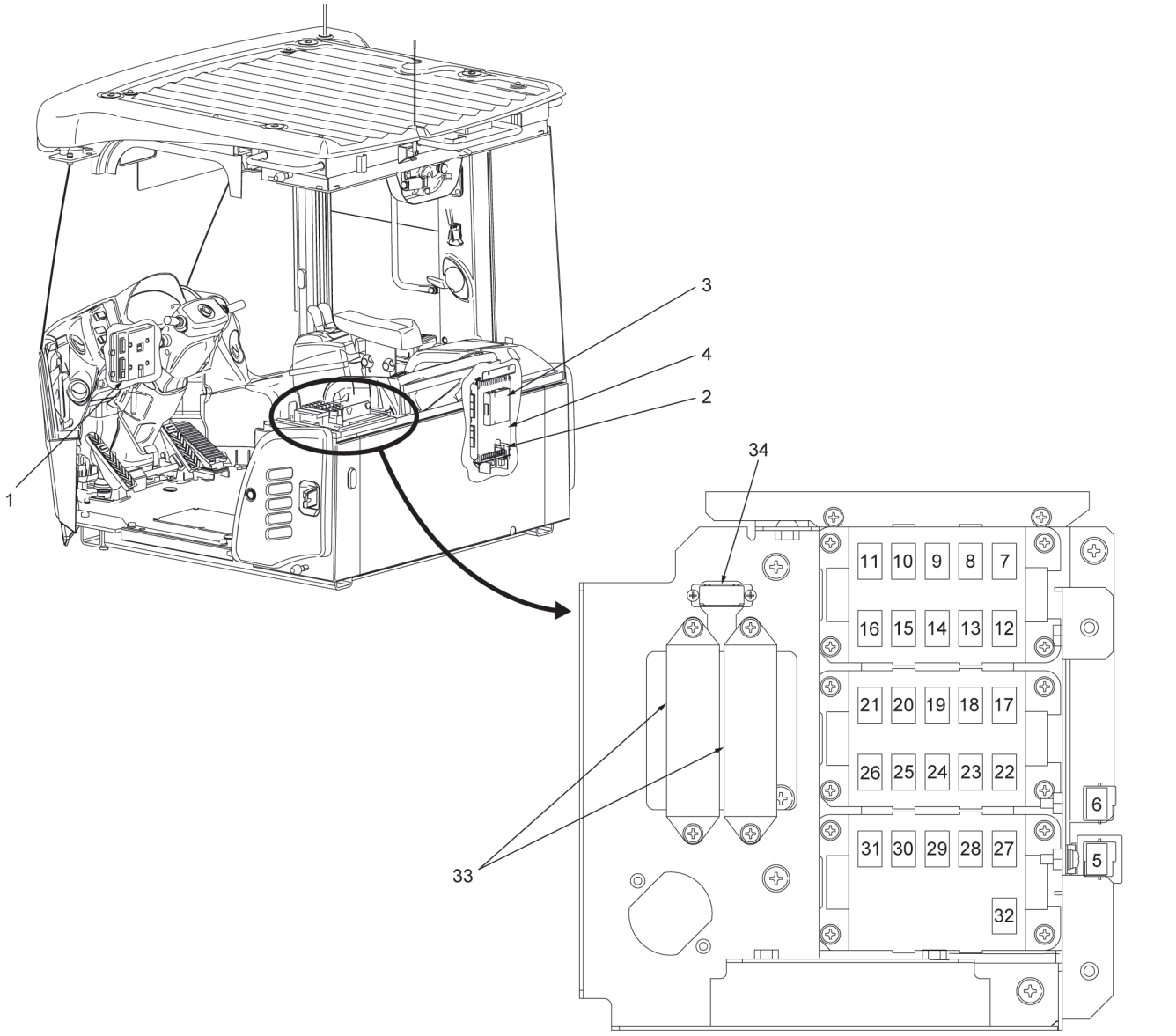
List of Total Operating Hours

Item		Details
Hour Meter End		Hour meter's value accumulated in machine's monitor
Travel Distance		Odometer's value accumulated in machine's monitor
Engine Operating Hours	Power Mode OFF Hours	Total engine operating hours selecting power mode (OFF)
	Power Mode ON Hours	Total engine operating hours selecting power mode (ON)
Travel Operating Hour	AUTO 1 Mode Traveling Hours	Total operating hours of travel mode (AUTO 1 mode)
	AUTO 2 Mode Traveling Hours	Total operating hours of travel mode (AUTO 2 mode)
	Manual Mode Traveling Hours	Total operating hours of travel mode (Manual mode)
MC Communication Error Time		Total hours of MC communication error
ECM Communication Time Out Time		Total hours of ECM communication time out

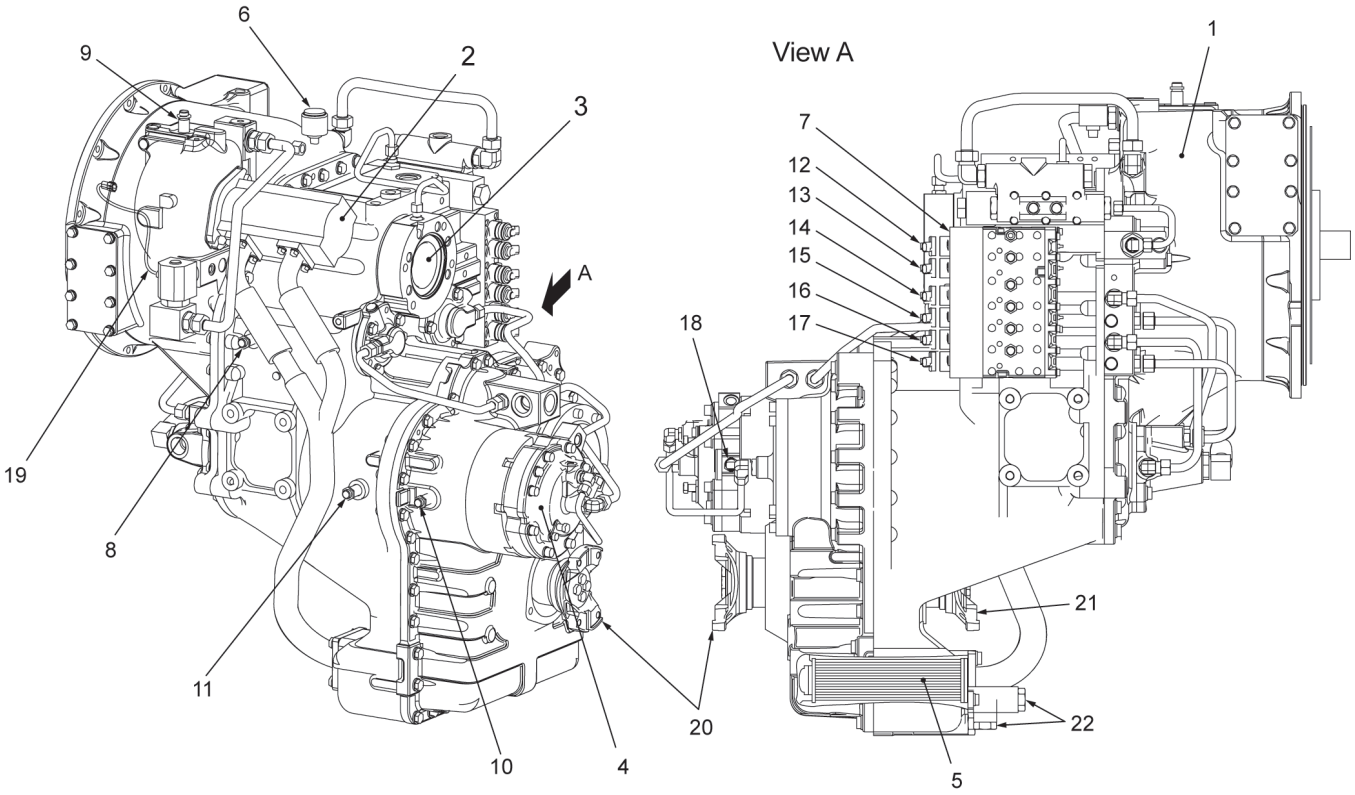
Controller and Relays



90TNED-01-02-30

1- Monitor Controller
2- Flasher Relay
3- Air Conditioner Controller
4- MC (Main Controller)
5- Main Relay 1
6- Main Relay 2
7- Head Light Relay (Left)
8- Head Light Relay (Right)
9- High-Beam Relay
10- Bucket Leveler Relay
11- Back Lamp and Alarm Relay
12- Work Light Relay (Front)
13- Work Light Relay (Rear)
14- Right Turn Signal Light Relay
15- Horn Relay
16- Starter Cut Relay
17- Parking Brake Relay 1
18- Parking Brake Relay 2
19- Pilot Shut-Off Relay
20- Brake Light Relay
21- Load Dump Relay
22- Neutral Relay
23- Left Turn Signal Light Relay
24- Front Washer Relay
25- Rear Wiper Relay
26- Rear Washer Relay
27- Engine Actuator Relay
28- Engine ECM Main Relay
29- Muffler Filter Relay 1
30- Muffler Filter Relay 2
31- Work Light Relay (Front) (OPT)
32- Work Light Relay (Rear) (OPT)
33- Fuse Box
34- MPDr. Connector

Transmission and Torque Converter Assembly



90T4GB-01-02-26a

1- Torque Converter
2- Torque Converter Charging Pump
3- Main Pump Drive Shaft
4- Parking Brake
5- Strainer
6- Air Breather
7- Transmission Control Valve
8- Torque Converter Output Speed Sensor
9- Torque Converter Input Speed Sensor
10- Speed Sensor
11- Speed Sensor (Backup)
12- Proportional Solenoid Valve (For Forward Clutch)
13- Proportional Solenoid Valve (For Reverse Clutch)
14- Proportional Solenoid Valve (For 1st Speed Clutch)
15- Proportional Solenoid Valve (For 2nd Speed Clutch)
16- Proportional Solenoid Valve (For 3rd Speed Clutch)
17- Proportional Solenoid Valve (For 4th Speed Clutch)
18- Parking Brake Pressure Sensor
19- Transmission Oil Temperature Sensor
20- Flange (for 2nd Propeller Shaft)
21- Flange (for 3rd Propeller Shaft)
22- Drain Port

Pilot Failure

Fault Code	Trouble or MP Dr. Message	Cause	Symptoms in Machine Operation When Trouble Occurs.	Remedy
111200-3	Lift Arm Raise Pilot Pressure Sensor Circuit High Input	Voltage: 4.75 V or more	Bucket speed is slow during combined operation of lift arm and bucket. Ride control is not activated. Speed shift delay control is always delayed at AUTO 2 mode.	Check the harness. Replace the pressure sensor (lift arm raise).
111200-4	Lift Arm Raise Pilot Pressure Sensor Circuit Low Input	Voltage: less than 0.25 V	Bucket speed is slow during combined operation of lift arm and bucket. Ride control is not activated. Speed shift delay control is always delayed at AUTO 2 mode.	Check the harness. Replace the pressure sensor (lift arm raise).
111202-3	Bucket Tilt Pilot Pressure Sensor Circuit High Input	Voltage: 4.75 V or more	Bucket speed is slow during combined operation of lift arm and bucket.	Check the harness. Replace the pressure sensor (bucket tilt (roll back)).
111202-4	Bucket Tilt Pilot Pressure Sensor Circuit Low Input	Voltage: less than 0.25 V	Bucket speed is slow during combined operation of lift arm and bucket.	Check the harness. Replace the pressure sensor (bucket tilt (roll back)).
111203-3	Bucket Dump Pilot Pressure Sensor Circuit High Input	Voltage: 4.75 V or more	Bucket speed is slow during combined operation of lift arm and bucket. Speed shift delay control is always delayed at AUTO 2 mode.	Check the harness. Replace the pressure sensor (bucket dump).
111203-4	Bucket Dump Pilot Pressure Sensor Circuit Low Input	Voltage: less than 0.25 V	Bucket speed is slow during combined operation of lift arm and bucket. Speed shift delay control is always delayed at AUTO 2 mode.	Check the harness. Replace the pressure sensor (bucket dump).

Learning Failure

Fault Code	Trouble or MP Dr. Message	Cause	Symptoms in Machine Operation When Trouble Occurs.	Remedy
111720-2	Lift arm angle sensor is uncalibrated.	The lift arm angle sensor calibration is not performed. Or, it fails.	Dual lift arm auto leveler cannot be set.	Perform lift arm angle sensor calibration.

Switch Failure

Fault Code	Trouble or MP Dr. Message	Cause	Symptoms in Machine Operation When Trouble Occurs.	Remedy
111904-2	Column FNR SW Failure	Shift lever F & R contact ON at the same time.	Transmission is in the neutral condition.	Check the harness. Replace the switch.
111905-2	Implement FNR SW Failure	Shift switch F & R contact ON at the same time.	Transmission is in the neutral condition.	Check the harness. Replace the switch.

Column Display Controller Fault Code List

Fault Code	Trouble or MP Dr. Message	Cause	Symptoms in Machine Operation When Trouble Occurs.	Remedy
115001-2	Abnormal REG input H level	Alternator generating voltage: 33.5 V or more	The alternator indicator is ON.	Check the harness. Check the battery. Check the alternator.
115002-2	CAN Communication Error 2	Faulty column display controller Faulty CAN2 harness	Alarm lamps and indicators do not light correctly.	Check the harness. Replace the column display controller.
115003-2	Abnormal EEPROM	Faulty column display controller.	-	Replace the column display controller.
115011-3	Fuel Level Sensor Circuit High Input	131±5 Ω or less continues for 5 seconds.	The fuel gauge (pointer) points to E.	Check the harness. Replace the fuel level sensor.
115011-4	Fuel Level Sensor Circuit Low Input	4±2 Ω or less continues for 5 seconds.	The fuel gauge (pointer) points to E.	Check the harness. Replace the fuel level sensor.
115018-2	Abnormal 24V Output	Faulty column display controller.	-	Check the harness. Replace the column display controller.

ECM Fault Code List

Fault Code		Trouble or MP Dr. Message	Cause
MPDr.	HINO		
5208-0	P1458	EGR Actuator Malfunction 1 (Severe Failure)	Faulty EGR valve or harness Faulty battery Faulty ECM
5209-0	P1459	EGR Actuator Malfunction 2 (Mild Failure)	Faulty EGR valve or harness Faulty ECM
5633-0 5633-1 5633-2	P1601	Fuel Injector Adjustment Data Error QR Code Error QR Code Non-writing	Faulty ECM
8204-0	P200C	DPF Over Temperature	Faulty DPF cleaner Faulty exhaust gas temperature sensor or harness Defective engine chassis
8242-0 8243-0	P2032 P2033	Exhaust Temperature Sensor Failure (DPR Outlet) (Out Of Range - Low Input) Exhaust Temperature Sensor Failure (DPR Outlet) (Out Of Range - High Input)	Faulty exhaust gas temperature sensor (DPF outlet) or harness Faulty ECM or harness
8448-0 8451-0	P2100 P2103	Intake Throttle Valve DC Motor Failure (Circuit Low) Intake Throttle Valve DC Motor Failure (Circuit High)	Faulty intake throttle valve Faulty ECM or harness
8449-0	P2101	Intake Throttle Valve Functional Failure	Faulty intake throttle valve (stuck) Faulty ECM or harness
8744-0 8745-0	P2228 P2229	Barometric Pressure Sensor (Out Of Range - Low Input) Barometric Pressure Sensor (Out Of Range - High Input)	Temporary malfunction due to radio interference noise Faulty ECM or harness
9290-0	P244A	DPF Pressure Difference (Low) (Muffler Filter Dissolution Damage)	Faulty DPF Faulty differential pressure sensor Clogged or damaged differential pressure pipe or hose
9291-0	P244B	DPF Pressure Difference (High) (Muffler Filter Incomplete Regeneration due to Abnormal Blockage)	Clogged differential pressure pipe Faulty DPF cleaner Faulty differential pressure sensor Defective engine chassis

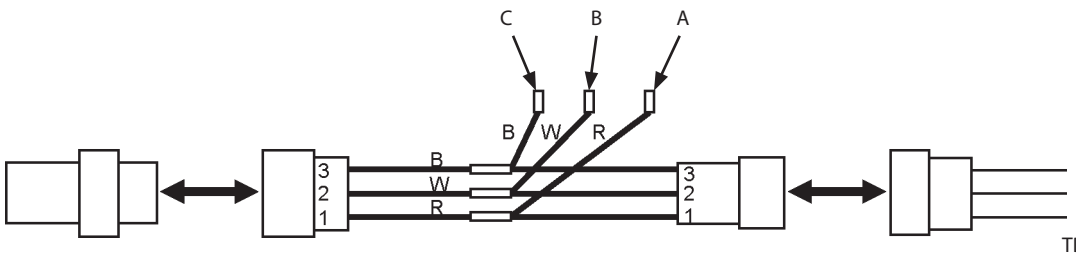
Fault Code	Trouble or MP Dr. Message	Inspection Method	Cause
113004-2	(Monitor Controller) Main Controller Communication Error 2	Continuity check (open circuit)	Open circuit in harness.
		Discontinuity check (shorted circuit)	Shorted circuit in harness.
113006-2	(Monitor Controller) ICF Communication Error 2	Continuity check (open circuit)	Open circuit in harness.
		Discontinuity check (shorted circuit)	Shorted circuit in harness.
113007-2	(Monitor Controller) Column Controller Communication Error	Continuity check (open circuit)	Open circuit in harness.
		Discontinuity check (shorted circuit)	Shorted circuit in harness.
114012-2	(Information Controller) Main Controller Communication Error 2	Continuity check (open circuit)	Open circuit in harness.
		Discontinuity check (shorted circuit)	Shorted circuit in harness.
114014-2	(Information Controller) Monitor Controller Communication Error 2	- - -	Defective monitor controller
114015-2	(Information Controller) Column Controller Communication Error	Continuity check (open circuit)	Open circuit in harness.
		Discontinuity check (shorted circuit)	Shorted circuit in harness.

MC Fault Codes 111311, 111313, 111600, 111601, 111602

Preparation

- Check the wiring connections first.
- Connect the test harness and dummy sensor.
- Before inspection, set the key switch to the ON position.

Fault Code	Trouble or MP Dr. Message	Inspection Method	Evaluation	Cause
111311-3	Service Brake Primary Pressure Sensor Circuit High Input	Retry by using MPDr.	Un-displayed fault code	Faulty sensor.
		Measure voltage between B and chassis.	Voltage: 4.75 V or more	Shorted circuit in harness #1 and #2.
111311-4	Service Brake Primary Pressure Sensor Circuit Low Input	Retry by using MPDr.	Un-displayed fault code	Faulty sensor.
		Measure voltage between A and chassis.	Voltage: less than 0.25 V	Open circuit in harness #1.
		Measure voltage between A and C (GND).	Voltage: less than 0.25 V	Open circuit in harness #3.
		-	Normal in above check.	Open circuit in harness #2.
111313-3	Parking Brake Pressure Sensor Circuit High Input	Retry by using MPDr.	Un-displayed fault code	Faulty sensor.
		Measure voltage between B and chassis.	Voltage: 4.75 V or more	Shorted circuit in harness #1 and #2.
111313-4	Parking Brake Pressure Sensor Circuit Low Input	Retry by using MPDr.	Un-displayed fault code	Faulty sensor.
		Measure voltage between A and chassis.	Voltage: less than 0.25 V	Open circuit in harness #1.
		Measure voltage between A and C (GND).	Voltage: less than 0.25 V	Open circuit in harness #3.
		-	Normal in above check.	Open circuit in harness #2
111600-3	T/M Output Speed Sensor Failure	Check harness	Abnormal in harness check	Abnormal harness.
			Normal in harness check	Faulty sensor.
111600-4	T/M Out Speed Sensor Circuit Low Input	Check harness	Abnormal in harness check	Abnormal harness.
			Normal in harness check	Faulty sensor.
111601-3	Torque Converter Output Speed Sensor Failure	Check harness	Abnormal in harness check	Abnormal harness.
			Normal in harness check	Faulty sensor.
111602-3	Intermediate Shaft Speed Sensor Failure	Check harness	Abnormal in harness check	Abnormal harness.
			Normal in harness check	Faulty sensor.



TDAA-05-06-003

MC Fault Code 111900

Preparation

- Check the wiring connections first.

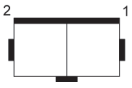
Fault Code	Trouble or MP Dr. Message	Inspection Method	Evaluation	Cause
111900-4	Torque Converter Oil Temperature Sensor Circuit Low Input	Measure resistance between sensor #1 and #2.	Refer to the table.	Faulty sensor.
		-	Normal in above check.	Shorted circuit in harness #1.
111900-3	Torque Converter Oil Temperature Sensor Circuit High Input	Measure resistance between sensor #1 and #2.	Refer to the table.	Faulty sensor.
		Measure voltage between sensor harness end #1 and chassis.	0 V	Open circuit in harness #1.
		-	Normal in above check.	Open circuit in harness #2.

Specification of Transmission Oil Temperature Sensor

Transmission Oil Temperature (°C (°F))	Resistance (kΩ)
-30 (-22)	-
-20 (-4)	77.0
-10 (14)	47.4
0 (32)	30.0
10 (50)	19.5
20 (68)	13.0
30 (86)	8.9
40 (104)	6.2
50 (122)	4.0
60 (140)	3.1
70 (158)	2.3
80 (176)	1.8
90 (194)	1.3
100 (212)	1
110 (230)	0.8
120 (248)	0.6

Connector (Harness end)

- T/M Oil Temperature Sensor



90Z7-05-CN11

Air Conditioner Controller Fault Codes 11 to 22

Preparation

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

Fault Code	Trouble or MP Dr. Message	Inspection Method	Evaluation	Cause
11	Open circuit in re-circulated air sensor	Measure resistance between sensor #1 and #2.	∞ Ω (Normal value: 300 to 430 kΩ)	Faulty sensor.
		Measure voltage between sensor harness end #1 and chassis.	0 V	Open circuit in harness #1.
		-	Normal in above check.	Open circuit in harness #2.
12	Shorted circuit in re-circulated air sensor	Measure resistance between sensor #1 and #2.	0 Ω (Normal value: 300 to 430 kΩ)	Faulty sensor.
		-	Normal in above check.	Shorted circuit in harness #1 and #2.
13	Open circuit in outdoor ambient temperature sensor	Measure resistance between sensor #1 and #2.	∞ Ω (Normal value: 100 to 210 kΩ)	Faulty sensor.
		Measure voltage between sensor harness end #1 and chassis.	0 V	Open circuit in harness #1.
		-	Normal in above check.	Open circuit in harness #2.
14	Shorted circuit in outdoor ambient temperature sensor	Measure resistance between sensor #1 and #2.	0 Ω (Normal value: 100 to 210 kΩ)	Faulty sensor.
		-	Normal in above check.	Shorted circuit in harness #1 and #2.
18	Shorted circuit in solar radiation sensor	Check continuity between sensor harness end #1 and #2.	0 Ω	Shorted circuit in harness #1 and #2.
		-	Normal in above check.	Faulty sensor.
21	Open circuit in frost sensor	Measure resistance between sensor #1 and #2.	∞ Ω (Normal value: 100 to 115 kΩ)	Faulty sensor.
		Measure voltage between sensor harness end #1 and chassis.	0 V	Open circuit in harness #1.
		-	Normal in above check.	Open circuit in harness #2.
22	Shorted circuit in frost sensor	Measure resistance between sensor #1 and #2.	0 Ω (Normal value: 100 to 115 kΩ)	Faulty sensor.
		-	Normal in above check.	Shorted circuit in harness #1 and #2.

Parts / Item	Parking Brake Switch	Front Control Lever Lock Switch	Pilot Shut-Off Solenoid Valve
Function	Shifts parking brake solenoid valve.	Shifts pilot shut-off solenoid valve.	Opens and closes the front pilot circuit.
Symptoms in control system when trouble occurs	Same as shown below.	Same as shown below.	Same as shown below.
Symptoms in machine operation when trouble occurs	Although the parking brake switch is turned ON/OFF, the parking brake is not released/ applied with the engine running.	Open circuit: Front control lever lock switch is always OFF. Pilot shut-off solenoid valve is not shifted. The lift arm and bucket are not operated although the control lever is operated with the front control lever lock switch set in UNLOCK position. Shorted circuit: Front control lever lock switch is always ON.	When closed: The lift arm and bucket are not operated. (Pilot pressure oil is not supplied to pilot valve.) When open: Pilot pressure oil is always supplied to pilot valve.
Evaluation by Fault Code	-	-	-
Evaluation by Monitoring	Column Display Controller: Parking Brake Signal Output	MC: Pilot Primary Pressure	-
Evaluation by using Test Harness	-	-	-
Note	Although the parking brake is turned OFF, the parking brake is applied with the engine stopped.	-	The pilot shut-off solenoid valve can be manually turned ON/OFF.
Descriptions of Control (Operational Principle Section in S/M)	T2-2, T2-5	T2-4	T2-5

Parts / Item	Parking Brake Solenoid Valve	Pump Swash Plate Tilt Solenoid Valve (Pump Torque Control Solenoid)
Function	Applies and releases parking brake by using pilot pressure oil.	Supplies control pressure to main pump.
Symptoms in control system when trouble occurs	Same as shown below.	Same as shown below.
Symptoms in machine operation when trouble occurs	When closed: The parking brake is not released. (Pilot pressure oil is not supplied to parking brake.) When open: The parking brake is applied. (Pilot pressure oil is supplied to parking brake.)	The muffler filter alarm is displayed on the monitor. High current: Pump torque of main pump is kept minimum. The loading movement becomes slow. Low current: Engine speed regulation for digging is deactivated.
Evaluation by Fault Code	-	111413
Evaluation by Monitoring	-	MC: Pump Swash Angle P/S Output, Pump Swash Angle P/S Output FB
Evaluation by using Test Harness	-	-
Note	This solenoid valve can be manually turned ON/OFF.	-
Descriptions of Control (Operational Principle Section in S/M)	T2-2, 2-4	T2-2

All Actuator System Troubleshooting

Trouble Symptom / Parts	A-3 Actuator of front attachment does not stop even if a control lever is set to neutral.	A-4 Auto or manual regeneration of muffler filter cannot be performed. (It fails.)
Main Controller (MC)		○
Engine Control Module (ECM)		○
Monitor Controller		○
Monitor		○
Key Switch		
Accelerator Pedal Sensor		○
Forward/Reverse Lever		○ (Neutral)
Forward/Reverse Selector Switch		
Forward/Reverse Switch		○ (Neutral)
Pilot Shut-Off Relay		
Front Control Lever Lock Switch		●
Muffler Filter Switch		●
Battery		
Muffler Filter Differential Pressure Sensor		○
Engine Unit		
Engine Speed Sensor (Main)		
Engine Speed Sensor (Sub)		
Coolant Temperature Sensor		○
Exhaust Temperature Sensor		
Main Pump		○
Pilot Pump		
Pump Regulator		●
Pump Delivery Pressure Sensor		○
Manifold Valve		
Torque Control Solenoid Valve		○
Pilot Shut-Off Solenoid Valve		
Pressure Sensor (Primary Pilot Pressure)		○
Pilot Valve	●	
Control Valve	●	●
Bleed-Off Compensation Spool (Control Valve)		●
Muffler Filter Regeneration Control Solenoid Valve		●
Pilot Filter		
Hydraulic Oil Temperature Sensor		
Torque Converter Oil Temperature Sensor		
Pressure Sensor (Parking Brake)		○

●: Check required ○: Related

Travel System Troubleshooting

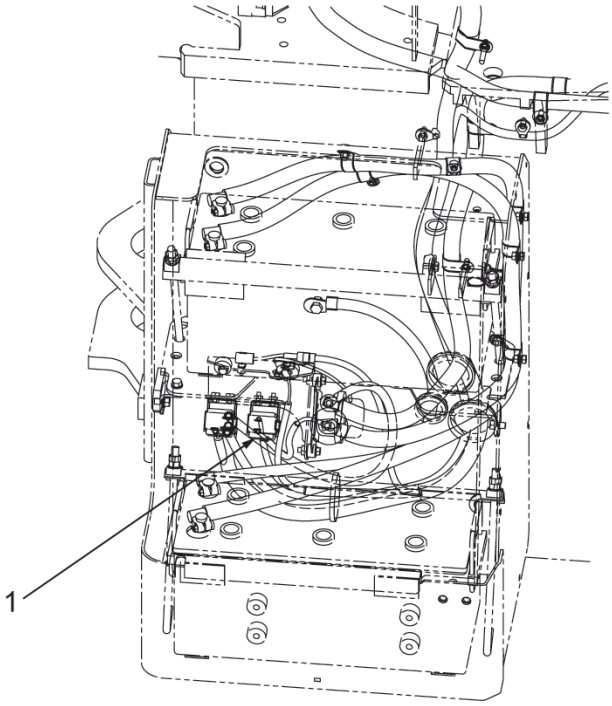
Trouble Symptom / Parts	T-7 Speed shift is not shifted down when pushing downshift switch (DSS).	T-8 Speed shift is not held when pushing hold switch. (Effective in automatic speed shift control mode)	T-9 Speed shift retard control is not activated. (Effective in automatic speed shift control mode)
Main Controller (MC)	○	○	●
Monitor Controller			○
Monitor			
Key Switch			○ (ON)
Battery			●
Fuse Box A			
Fuse Box B	○ (#1, #9)	○ (#1, #9)	
Accelerator Pedal Sensor			
Brake Pedal (Right) Switch			
Travel Mode Selector Switch			●
Power Mode Switch			○
Forward/Reverse Lever			●
Forward/Reverse Switch			○
Forward/Reverse Selector Switch			○
Shift Switch			
Downshift Switch (DSS)	●		
Hold Switch		●	
Drive Unit (Transmission Assy)	○	○	○
Transmission Control Valve	●	●	○
Torque Converter Input Speed Sensor	○		○
Torque Converter Output Speed Sensor	○		○
Transmission Intermediate Shaft Speed Sensor			
Machine Speed Sensor	●	●	●
Speed Shift Solenoid Valve	●	●	●
Transmission Oil Filter			○
Transmission Oil Filter Restriction Switch			
Pressure Sensor (Parking Brake)			
Lift Arm Angle Sensor			
Pressure Sensor (Lift Arm Raise)			○
Pressure Sensor (Bucket Dump)			○

●: Check required ○: Related

E-5 Even if key switch is turned OFF, engine does not stop.

Preparation

- Remove 70 A fusible link (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.



90Z7-MNEC-01-82

F-3 Front attachment drifts remarkably.

Leakage Check Within the Lift Arm Cylinder

1. Lower the bucket edge onto the ground with the bucket cylinder rod slightly extended from the fully retracted position.
2. Remove the hose from the lift arm cylinder rod side, and drain the oil from the cylinder and the hose. (Cover the removed hose ends to prevent dust or dirt.)
3. Extend the bucket cylinder rod, and lift the bucket. If any oil comes out from the hose connection port and the lift arm cylinder rod retracts, oil leakage occurs within the cylinder.
   If no oil comes out from the hose connection port but the lift arm cylinder rod retracts, oil leakage occurs in the control valve.

Procedure	Inspection Method	Condition	Evaluation	Cause
1	Set the front control lever lock switch to LOCK position	-	The symptom disappears	Faulty pilot valve
2	Replace the overload relief valve	-	The symptom disappears	Faulty overload relief valve
3	Replace the anti-drift valves (lift arm, bucket)	-	The symptom disappears	Faulty anti-drift valve
3	Disassemble and inspect the anti-drift valves (lift arm, bucket)	-	Abnormality found	Faulty anti-drift valve housing
4	Disassemble and inspect the cylinder	-	Abnormality found	Faulty cylinder (seal kit)
5	-	-	The above checks resulted all normal.	Damaged control valve spool Broken spring Loosened spool end

S-3 Shock of steering operation is large.

Preparation

- Check that the steering wheel is not abnormal first.
- The steering valve and stop valve may be faulty.
- Refer to SYSTEM / Hydraulic System.
- Release any remaining pressure before checking gas pressure in the accumulator.

Procedure	Inspection Method	Condition	Evaluation	Cause
1	Disassemble and inspect the stop valve	-	There is abnormality	Faulty stop valve
2	Disassemble and inspect the steering valve	-	There is abnormality	Faulty steering valve (stuck spool, clogged orifice)
3	-	-	The above checks resulted all normal.	Faulty steering cylinder (faulty seal kit)

T-9 Speed shift retard control is not activated.

Preparation

- Check the speed shift delay control setting with the monitor first.
- Check the parking brake is OFF (not applied).
- Refer to SYSTEM / Control System / Speed Shift Delay Control.
- Check the wiring connections first.

Procedure	Inspection Method	Condition	Evaluation	Cause
1	Monitor Forward/Reverse Lever (F), (R)	Forward/reverse lever: F and R	N is displayed	Faulty forward/reverse lever Open circuit in harness between forward/reverse lever and main controller (MC)
2	Monitor Travel Mode Selector Switch	Travel mode: AUTO 1/AUTO 2 mode	Manual mode is displayed (0 is displayed on the monitor)	Faulty driving mode switch Open circuit in harness between driving mode switch and MC
3	Monitor Machine Speed (For Speedometer)	Travel operation	Speedometer: 0 km/h (mph)	Faulty machine speed sensor Open circuit in harness between machine speed sensor and monitor controller
4	Monitor Shift Switch	Shift switch: 2nd	Other than 2nd is displayed	Faulty shift switch Open circuit in harness between shift switch and MC
5	-	-	The above checks resulted all normal.	Find out cause of trouble by tracing other trouble symptoms

O-5 Turn signal light is not operated.

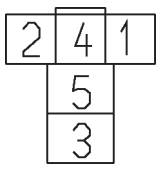
Preparation

- Check #6 fuse in fuse box A when all turn signal lights do not blink.
- Refer to SYSTEM / Electrical System.
- Check the wiring connections first.

Procedure	Inspection Method	Condition	Evaluation	Cause
1	Operate the turn signal lever to the right and left	Key switch: ON	All turn signal lights do not blink.	Faulty turn signal lever Open circuit in harness between turn signal lever and #6 fuse in fuse box A
2	Measure voltage between turn signal light relay (left) harness end #1 and chassis	Key switch: ON Turn signal lever: Left position	0 V	Open circuit in harness between turn signal light relay (left) and turn signal lever Faulty diode P
3	Measure voltage between turn signal light relay (right) harness end #1 and chassis	Key switch: ON Turn signal lever: Right position	0 V	Open circuit in harness between turn signal light relay (right) and turn signal lever Faulty diode k
4	-	-	The above checks resulted all normal.	Faulty #6 fuse in fuse box A

Connector (Harness end)

- Turn Signal Light Relay (Left/Right)



T183-05-04-003

Exchange Inspection

Exchange inspection method is a troubleshooting method to find the trouble location by exchanging the suspected part / component with another part / component having identical characteristics.

Many sensors and solenoid valves used on this machine are identical. Therefore, by using this switch-check method, faulty part /component, and/or harness can be easily found.

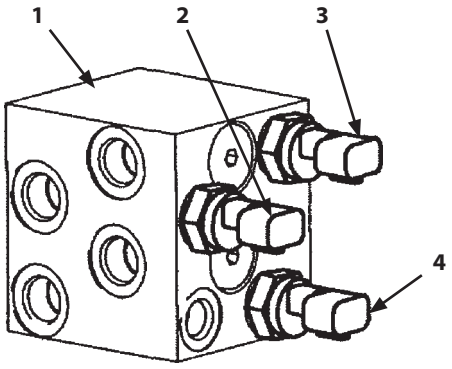
Example: Lift Arm Raise Pilot Pressure Sensor High Input (MC Fault Code 111200-3)

Check Method:

1. Switch connectors of pressure sensor (lift arm raise) and pressure sensor (bucket dump).
2. Retry troubleshooting.

Result:
In case Bucket Dump Pilot Pressure Sensor High Input (MC fault code 111203-3) is displayed, the pressure sensor (lift arm raise) is considered to be faulty.

In case Lift Arm Raise Pilot Pressure Sensor High Input (MC fault code 111200-3) is displayed, the pressure sensor (lift arm raise) harness is considered to be faulty.

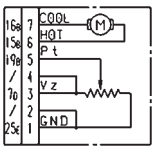


TNED-01-02-022

1- Flow Regulator Valve
2- Pressure Sensor (Bucket Tilt (Roll Back))
3- Pressure Sensor (Lift Arm Raise)
4- Pressure Sensor (Bucket Dump)

- Air Mix Damper Servo Motor (CN9)

Controls opening/closing of the air mixing door in response to the set temperature.
The damper consists of a motor, link mechanism, and potentiometer.
The motor opens or closes the air mix door via the link mechanism.
The potentiometer converts the link movements (the mix door strokes) to the voltage. Both ends of the potentiometer are energized by 5 V from terminals #7 (+) and #25 (-) in controller so that the potentiometer outputs voltage of 0.5 to 4.5 V from the center terminal to terminal #19 in controller corresponding to the link movement.
When the set temperature is determined by temperature UP/DOWN signal from the controller, the controller calculates voltage (Vr) corresponding the link position.
Further more, the controller checks the air mix door position by voltage (Vf) from the potentiometer.
Then, after the controller decides the motor rotational direction (polarity of motor) based on the differential voltage between Vr and Vf, the controller sends out the current from terminals #15 and #16.
The controller drives the motor until voltage (Vf) becomes equal to voltage (Vr).



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Others

- Faulty air vent switch

Fault code is un-displayed	Disconnection of link	Setting link again
Fault code 43 (Abnormal air vent damper servo motor)	Faulty wiring, open circuit, disconnection of connector	Wirings inspection
	Faulty servo motor	Replace
	Clogged foreign matter	Remove foreign matter

- Faulty fresh / re-circulated air selection

Fault code is un-displayed	Disconnection of link	Setting link again
	Faulty wiring, open circuit, disconnection of connector	Wirings inspection
	Faulty servo motor	Replace
	Clogged foreign matter	Remove foreign matter

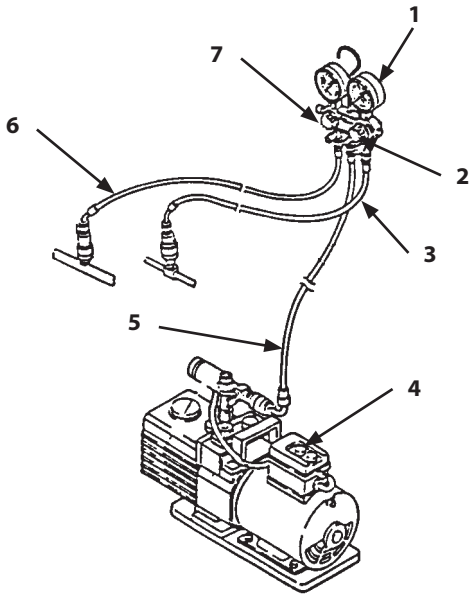
- Ambient temperature is higher or lower than set-temperature

Fault code 11 (Open circuit in re-circulated air sensor)	Open circuit in harness, disconnection of connector	Wirings inspection
	Open circuit in air circulation sensor	Replace
Fault code 12 (Shorted circuit in re-circulated air sensor)	Shorted circuit in harness	Wirings inspection
	Shorted circuit in air circulation sensor	Replace
Fault code is un-displayed (Normal re-circulated air sensor)	Faulty cooling, faulty heating	Check by referring to the items of faulty cooling and faulty heating

Procedures for charging air conditioner with refrigerant

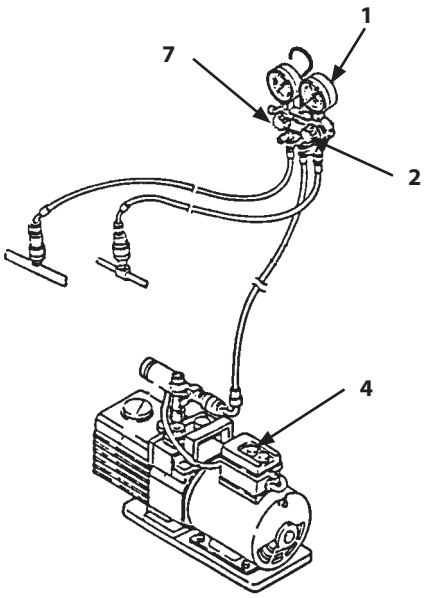
IMPORTANT: Do not mistake the charge hose connections.

1. Close high pressure valve (2) and low pressure valve (7) on manifold gauge (1).
   Connect high-pressure side charge hose (3) and low-pressure side charge hose (6) on manifold gauge (1) to the high-pressure side charge valve ("D" marked) and to the low-pressure side charge valve ("S" marked) located on the compressor, respectively.
   Connect charge hose (5) located on the center of manifold gauge (1) to vacuum pump (4).



W115-02-10-005

2. Open high pressure valve (2) and low pressure valve (7) on manifold gauge (1).
   Perform purging for 10 minutes or more by operating vacuum pump (4).



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