ZW330 WHEEL LOADER TECHNICAL MANUAL TROUBLESHOOTING

PART NO. TT92C1-E-01

HITACHI

Technical Manual
Troubleshooting

ZW 330
Wheel Loader

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Service Manual consists of the following separate Part No.

Technical Manual (Operational Principle)	: Vol. No.TO92C1-E
Technical Manual (Troubleshooting)	: Vol. No.TT92C1-E
Workshop Manual	: Vol. No.W92C1-E

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Cautions Regarding Troubleshooting

Important points

The important points for troubleshooting is to carefully read the operation manual and shop manual to get enough information on the operation, circuits, structure, and function of each component. If you have enough knowledge of each component and system, you can easily determine the cause of the problem.

There may be various causes for each problem, therefore experience will be needed to determine which is the actual cause of the problem.

It is necessary to know the normal operation of each component. In addition, it is also important to know the abnormal condition when a problem occurs. This chapter shows various examples of past problems, and describes possible causes and remedies for each problem.

Before starting troubleshooting

To prevent incorrect diagnosis, talk with the persons concerned, particularly with the operator, to get enough information on the problem. If possible, check the machine by repeating the symptom.

If the problem cannot be repeated, do not provide any repair service.

For instance, assume that the operator complains that the boom power is low, and the rim-pull is also low. In this case, there are two possible causes ; low hydraulic power and low rim-pull. The remedies against both causes are much different from each other.

If you hastily determine the wrong cause without checking the actual condition of the problem, it will take too much time and expense to solve the problem. As a result, you will not be trusted by the user.

The following questions will be helpful in determining of the cause. Answer the questions to prevent an incorrect diagnosis.

1. Did the problem occur suddenly ?
2. When did the operator notice the problem ?
3. Is there any past problem that may be the cause of this problem ?
4. When the problem occurred, what kind of work was the operator doing ?
5. Has the machine had the same kind of problem before ?
6. Has the machine been repaired or inspected recently ?
7. Does the machine have any other problem ?

Troubleshooting

- Check before determination of cause
  A problem may be caused by poor daily maintenance, such as lack of grease, low or improper oil or a clogged filter. Be sure to check the machine for oil level, appearance, unpleasant odor, etc. to prevent time loss due to other unnecessary tests.

- Inspection procedure
  As a rule, check the easy-to-be-repaired system first (excluding the cases where the cause can be easily determined based on the past experiences).

  This machine is controlled by electrical, hydraulic, and mechanical systems. The most easy-to-be-repaired system is the electrical system. Check the electrical system first. If no problem is detected in the electrical system, check the hydraulic system, and then the mechanical system.

Note
Check the error code on the MODM at first !

8. Machine moves reverse when starting to climb up on a slope using inching brake.

Check before starting work.

1. Check the error code No. shown on the MODM.

Possible cause	Symptoms / check point: After pedal release, too much time is required to move.	Solution
Large time lag in clutch engagement	*	Refer to description of time lag (No.5) *
Inching set-up condition abnormal	○	Set-up normally
Defective inching sensor	○	Replacement

8. ELS (Efficient Loading System) does not work. (Excavating and scooping tractive power does not become up during ELS working condition.)

Check before starting work.

1. Check the error code No. shown on the MODM.

Possible cause	Pressing ELS switch, it does not function.	Without pressing ELS switch, if functions.	At upper position of ELS setting, ELS works.									Solution
ELS switch defective	○											Repair
Solenoid valve coil or wiring failure	○											Disassembly & repair
Solenoid valve spool stuck	○											Disassembly & repair
Relief valve set pressure is extremely low.		○										Disassembly & repair
Main controller failure	○		○									Replacement
Kickout sensor defective or link, rod bent			○									Replacement or repair
Speed sensor failure	○											Replacement

Electrical Group

1. Instrument panel does not indicate properly.

Check before starting work.
1. Check the fuses.
2. Check if bulb(es) of monitor is / are burnt out.
3. Check the error code No. shown on the MODM.

Possible cause	Symptoms / check point: One of the monitor lamps will not light after setting the starter key to ON.	Two or more monitor lamps will not light after setting the starter key to ON.	During operation, one of the monitor lamps lights improperly.	During operation, two or more monitor lamps light improperly.	One of the gauge pointers does not move.	All the gauge pointers do not move.	One of the gauges does not indicate properly. *	Pointers of all the gauges are deflected to their limits.	Hour meter does not operate.	Energized T/M solenoid valve does not correspond with the shift lever position.			Solution
Bulb of monitor lamp burnt out	○												Bulb replacement
Defective sensor or improper wiring			○		○		○						Sensor replacement
Loosen connector or improper electrical wiring	○	○			○	○		○	○				Repairing cable
Defective controller	○	○	○	○	○	○	○	○	○	○			Controller replacement
Defective gauge or meter					○		○	○	○				Replacement
Defective instrument panel						○							Replacement
T/M solenoid valve improperly connected.										○			Properly connect

FAULT CODE/ LAMP	DESCRIPTION	ZW330
EG758 Yellow	Injector Metering Rail #2 Pressure Malfunction.	
EG778 Yellow	Engine Speed Sensor (Camshaft) - data erratic, intermittent, or incorrect.	
EG951 None	Cylinder Power Imbalance Detected.	◯
EG1117 None	Power Lost with Ignition ON - data erratic, intermittent, or incorrect.	
EG1358 Yellow	Accelerator Pedal Position Sensor 1 Circuit - voltage above normal or shorted high.	
EG1359 Yellow	Accelerator Pedal Position Sensor 1 Circuit - voltage below normal or shorted low.	
EG1361 Yellow	Remote Accelerator Pedal Position Sensor 1 Circuit - voltage below normal or shorted low.	
EG1376 Orange	Engine Camshaft Speed / Position Sensor - data erratic, intermittent, or incorrect.	
EG1595 Yellow	Remote Accelerator Pedal Position Sensor 1 Circuit - voltage above normal or shorted high.	
EG1597 Orange	Engine Control Module Critical Internal Failure - bad intelligent device or component.	
EG1845 Orange	Water in Fuel Indicator Sensor Circuit - voltage above normal or shorted to high source.	
EG1846 Orange	Water in Fuel Indicator Sensor Circuit - voltage below normal or shorted to low source.	
EG1852 Yellow	Water in Fuel Indicator - data valid but above normal operational range - moderately severe level.	
EG1911 Yellow	Injector Metering Rail 1 Pressure - above normal operating range.	
EG2185 Yellow	Sensor Supply Voltage #4 Circuit - shorted high.	
EG2186 Yellow	Sensor Supply Voltage #4 Circuit - shorted low.	
EG2215 Yellow	Fuel Pump Delivery Pressure - data valid but below normal operational range - moderately severe level.	
EG2249 Yellow	Fuel Pump Delivery Pressure Sensor Circuit - shorted low.	
EG2261 Orange	Fuel Pump Delivery Pressure - data valid but above normal operational range - least severe level.	
EG2262 Orange	Fuel Pump Delivery Pressure - data valid but below normal operational range - least severe level.	
EG2265 Yellow	Fuel Priming Pump Control Signal Circuit - shorted high.	
EG2266 Yellow	Fuel Priming Pump Control Signal Circuit - shorted low.	
EG2311 Yellow	Fueling Actuator #1 Circuit Error - condition exists.	
EG2321 None	Engine Speed Sensor #1 - data erratic, intermittent, or incorrect.	
EG2322 None	Engine Speed Sensor #2 - data erratic, intermittent, or incorrect.	
EG2697 Orange	Accelerator Pedal Position Sensor Circuit and Idling Position Detection Switch Circuit - data erratic, intermittent, or incorrect.	
EG2963 None	Engine Coolant Temperature High - warning.	

Measurement for Performance Check

03

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Cause of extremely high or low measurement value and solution

Minimum no-load speed (LI) or maximum no-load speed (HI) low

Possible cause	Solution
Insufficient warm up	Warm up
Malfunctioning accelerator pedal or harness	Inspection & repair
Clogged fuel filter	Clean
Defective fuel pump	Repair
Defective fuel injection nozzle	Repair
Valve clearances incorrect	Adjustment
Insufficient compression pressure	Repair

The engine speed is too high in torque converter stall mode.

Possible cause	Solution
Slipping transmission clutch or defect inside of transmission	Disassembly & repair
Defect inside torque converter	Disassembly & repair

The engine speed is too low in torque converter stall mode.

Caused by reduction in engine power

Possible cause	Solution
Clogged air cleaner element	Cleaning
Improper type of fuel	Fuel replacement
Clogged fuel filter or suction strainer	Clean or replace
Frozen fuel / wax build up	Use antifreeze mixture
Malfunctioning accelerator pedal or harness	Inspection & repair
Defective fuel pump	Repair
Defective fuel injector nozzle	Repair
Insufficient compression pressure	Repair
Hydraulic load is extremely large	Inspection & repair
Malfunctioning torque converter	Inspection & repair

The engine speed is too high in multiple control valve relief mode.

Possible cause	Solution
Relief valve pressure too low	Adjustment or disassembly
Defective pump / pump seals	Disassembly & repair

The engine speed is too low in multiple control valve relief mode.

Possible cause	Solution
Engine low power	Inspection & repair
Extremely high relief pressure of multiple control valve	Adjustment

The engine speed is too high in torque converter stall plus multiple control valve relief mode.

Possible cause	Solution
Slipping transmission clutch or defect inside of transmission or T/C	Disassembly & repair
Relief pressure too low	Adjustment
Defective pump / pump seals	Disassembly & repair

The engine speed is too low in torque converter stall plus multiple control valve relief mode.

Possible cause	Solution
Engine low power	Inspection & repair
Extremely high relief pressure of multiple control valve or steering valve	Adjustment
Malfunctioning torque converter	Repair

Measuring loading circuit overload relief pressure

1. Attach the pressure gauge to the port (3).
   ((1) for the rod side, (2) for the bottom side, (3) for the both sides.)

2. Adjust the main relief valve pressure to 24.5 MPa (250 kgf/cm^2) (3,555 psi) + 1/4 additional turn, so the pressure is above the overload relief pressure.

Bucket cylinder bottom side (gauge port (2) or (3))

1. Lower the boom to the lowest limit.

2. Move the bucket control lever to the roll back position.

3. Set the shift lever to the forward position.

Note
To avoid "Hibernate mode".
In "Hibernate mode", decrease the engine speed 800 min^{-1} to 725 min^{-1} under following condition.
When the transmission shift lever is placed in "N" position, the engine coolant temperature is higher than 60ºC, and the engine speed is held at 950 min^{-1} or less for 10 seconds.

4. Keep the engine speed at low idle.

5. Hold the bucket control lever at the roll back position and record the pressure.

Bucket cylinder rod side (gauge port (1) or (3))

1. Keep the boom horizontal.

2. Move the bucket control lever to the dump position, hold and then measure and record the pressure.

Adjusting overload relief pressure

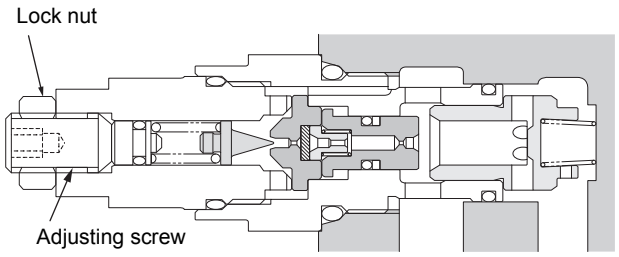
Loosen the lock nut and adjust the pressure by the adjusting screw.

Turn clockwise the adjusting screw to raise the set pressure, or turn counterclockwise the adjusting screw to lower the set pressure.

IMPORTANT

At the completion of check and adjustment of overload relief valve pressure, be sure to reset the main relief valve to the original condition.

Overload relief valve



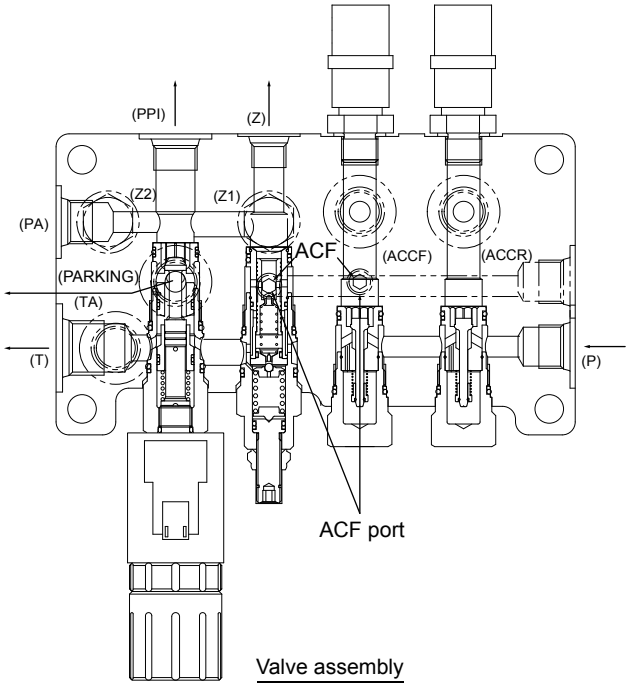
95ZV43005

Brake Circuit Oil Pressure

⚠ WARNING

Unexpected movement of the machine may cause an accident resulting in injury or death. Therefore, to provide repair service with the engine running, be sure to observe the following items:
- Park the machine on level ground.
- Apply the parking brake.
- Block the tires with chocks to prevent the tires from moving.
- Determine the signals between the service men.

Unloader valve setting pressure



85V2E53001

⚠WARNING



Injection Hazard
Depress brake pedal 80~100 times to completely discharge the brake accumulators prior to removing these test plugs.

135ZV52035

Brake line main pressure is regulated by the unloader valve.

Check & Adjustment

13, 23, 33, 43, 53, 73

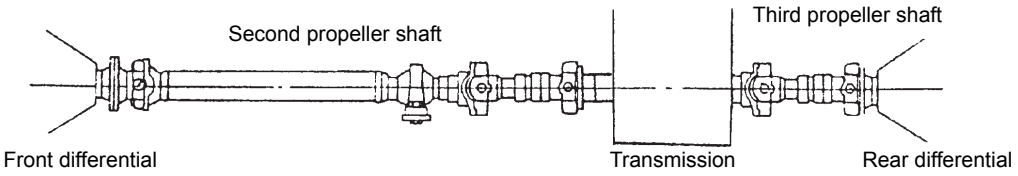
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Propeller Shaft

Propeller shaft phase

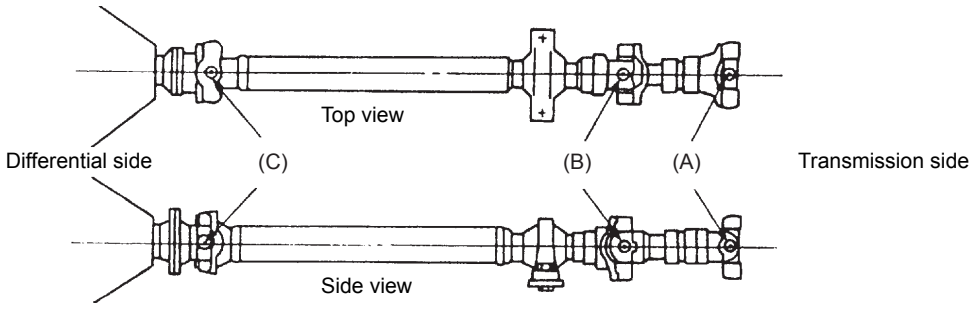


95ZV22007

Adjust the yokes of the second and third propeller shafts to the same direction (phase).

- The propeller shaft attaches to the transmission shaft. The shaft from the front differential to the rear differential is referred to as the propeller shaft. The propeller shaft articulates as the machine turns.
  When the propeller shaft is articulated due to machine steering, differences in the yoke phases (directions) will cause unbalance between the transmission torque and the reaction force. As a result, the propeller shaft will extremely vibrate, and the service life of the shaft will be shortened.

Second propeller shaft alignment



95ZV22008

- As misalignment may produce an abnormal noise, be sure to align points (A), (B), and (C) of the yokes when reassembling the propeller shaft.

Check & Adjustment Hydraulic Group

Loading/Steering Circuit Relief Valve/Ride Control Circuit Reducing Valve (OPT) 43-2
Hydraulic Cylinder 43-15
Stop Valve 43-17

Standard measurement value MPa (kgf/cm^2) (psi)

Steering line main relief pressure (at maximum speed)	20.6±0.5 (210±5) (2,986±71)
Steering line overload relief pressure (at idling speed)	$24.5^{+1.0}_{0}$ (250^{+10}_{0}) ($3,555^{+142}_{0}$)
Pilot line	3.5 (36) (512)

Hydraulic oil temp : 50±5ºC (120±9ºF)

Reference

Releasing residual pressure from tank and pipes

Keep the bottom surface of the bucket horizontal, and stop the engine when the bucket is approximately 30 cm (1 ft.) above the ground.

Tilt down the bucket until it comes in contact with the ground. Place the bucket control lever in the roll back position, and then lower the boom.

Push down on, then open the cap of the hydraulic tank to release the residual pressure.

Measuring steering circuit main relief pressure

1. Attach the pressure gauge to gauge port (1) or (2).

2. In case the pressure gauge is installed to (1), steer the machine to the left until the front and rear chassis contact each other.
   Continue to hold the steering wheel fully turned.

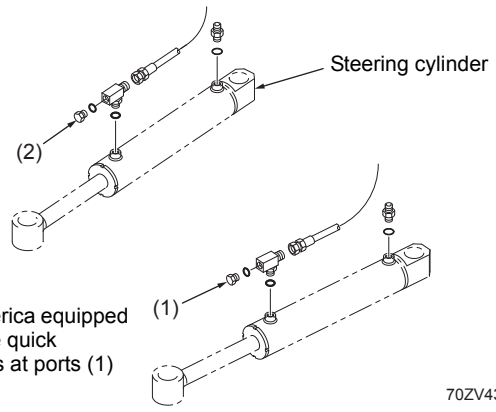
Note
Because the stop valve is installed into the steering line, oil pressure does not reach the set point when the steering is fully turned.

When measuring oil pressure, be sure to apply the articulation stopper or screw the stopper (bolt) in until the front and rear chassis contact each other.

⚠ WARNING

If the machine begins to move with the articulation stopper applied, it may cause an accident resulting in injury or death.
After the measurement, be sure to disconnect and store the articulation stopper.

3. Increase the engine speed to high idle, and measure and record the pressure.



Note
North America equipped M/c's have quick connectors at ports (1) and (2).

Adjusting steering line main pressure

Loosen the lock nut and adjust the pressure by the adjusting screw.

Turn clockwise the adjusting screw to raise the steering line main pressure.

Method 1

Refer to "Brake Main pressure 1" "Brake Main pressure 2" of MODM "Input/Output Monitor" section.

Method 2

If the pressure gauge is not available as described "Method 2", apply the "Method 1".

Measurement instrument

Hydraulic pressure gauge
20 MPa (200 kgf/cm^2) (3,000 psi)

Gauge port

ACF port on valve assembly
Rc (PT) 1/8

Standard measurement value

Cut-out	11.8±0.5 MPa (120±5 kgf/cm^2) (1,706±71 psi)
Cut-in	6.9±1.0 MPa (70±10 kgf/cm^2) (995±142 psi)

Measurement procedure

1. Lower the boom to the lowest limit, and tilt the bucket down to the ground.
   Then set the parking brake switch to the "ON" position.

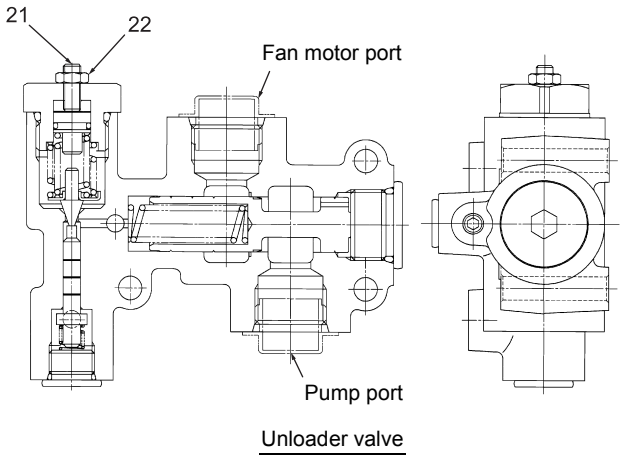
2. Stop the engine. Repeatedly depress and release the brake pedal till you feel light brake to discharge accumulator pressure.

3. Remove one of the ACF port plug on the valve assembly and attach the pressure gauge to the port.

4. Start the engine, and keep the speed at low idle. Measure and record the pressure when the pointer of the pressure gauge stops rising (cut-out pressure).

5. Keep the engine at low idle, and repeatedly depress and release the brake pedal to reduce the accumulator pressure. Measure and record the pressure when the pointer of the pressure gauge stops and then starts rising again (cut-in pressure).

Adjusting unloader valve setting pressure



1. Loosen lock nut (22).

2. Adjust the pressure by adjusting screw (21). Turn the screw clockwise to raise the pressure.

Note
In a case that the "ON" or "OFF" pressure does not match the standard setting pressure, set the "ON" (cut-in) pressure to the standard setting pressure.

Tightening torque
: ACF port plug: 11.3 N-m (1.15 kgf-m) (8.3 lb-ft)
: Lock nut (22): 16.7 N-m (1.7 kgf-m) (12.3 lb-ft)

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