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PART NO. T1NG-E-00

HITACHI

Technical Manual

ZX 40U-3 class 40U-3 · 40U-3F 50U-3 class 50U-3 · 50U-3F Hydraulic Excavator

Service Manual consists of the following separate Part No.

Technical Manual	: Vol. No.T1NG-E
Workshop Manual	: Vol. No.W1NG-E

ZX40U-3 · 50U-3 CLASS HYDRAULIC EXCAVATOR TECHNICAL MANUAL

Hitachi Construction Machinery
URL:http://www.hitachi-c-m.com

PRINTED IN JAPAN (K) 2009. 03

RECOGNIZE SAFETY INFORMATION

- These are the **SAFETY ALERT SYMBOLS**.
  - When you see these symbols on your machine or in this manual, be alert to the potential for personal injury.
  - Follow recommended precautions and safe operating practices.



SA-688

UNDERSTAND SIGNAL WORDS

- On machine safety signs, signal words designating the degree or level of hazard - DANGER, WARNING, or CAUTION - are used with the safety alert symbol.
  - **DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
  - **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
  - **CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
  - **DANGER** or **WARNING** safety signs are located near specific hazards. General precautions are listed on **CAUTION** safety signs.
  - Some safety signs do not use any of the designated signal words above after the safety alert symbol are occasionally used on this machine.
- To avoid confusing machine protection with personal safety messages, a signal word **IMPORTANT** indicates a situation which, if not avoided, could result in damage to the machine.
- ***NOTE*** indicates an additional explanation for an element of information.



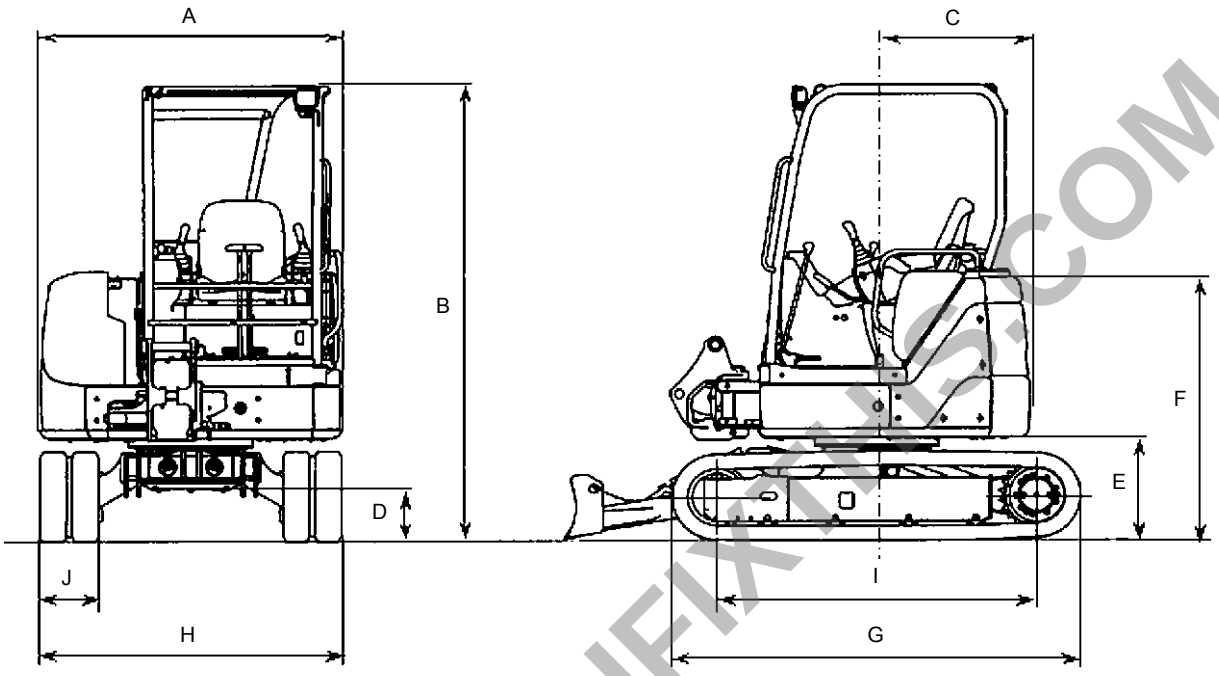
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SPECIFICATIONS

ZX40U-3 Class



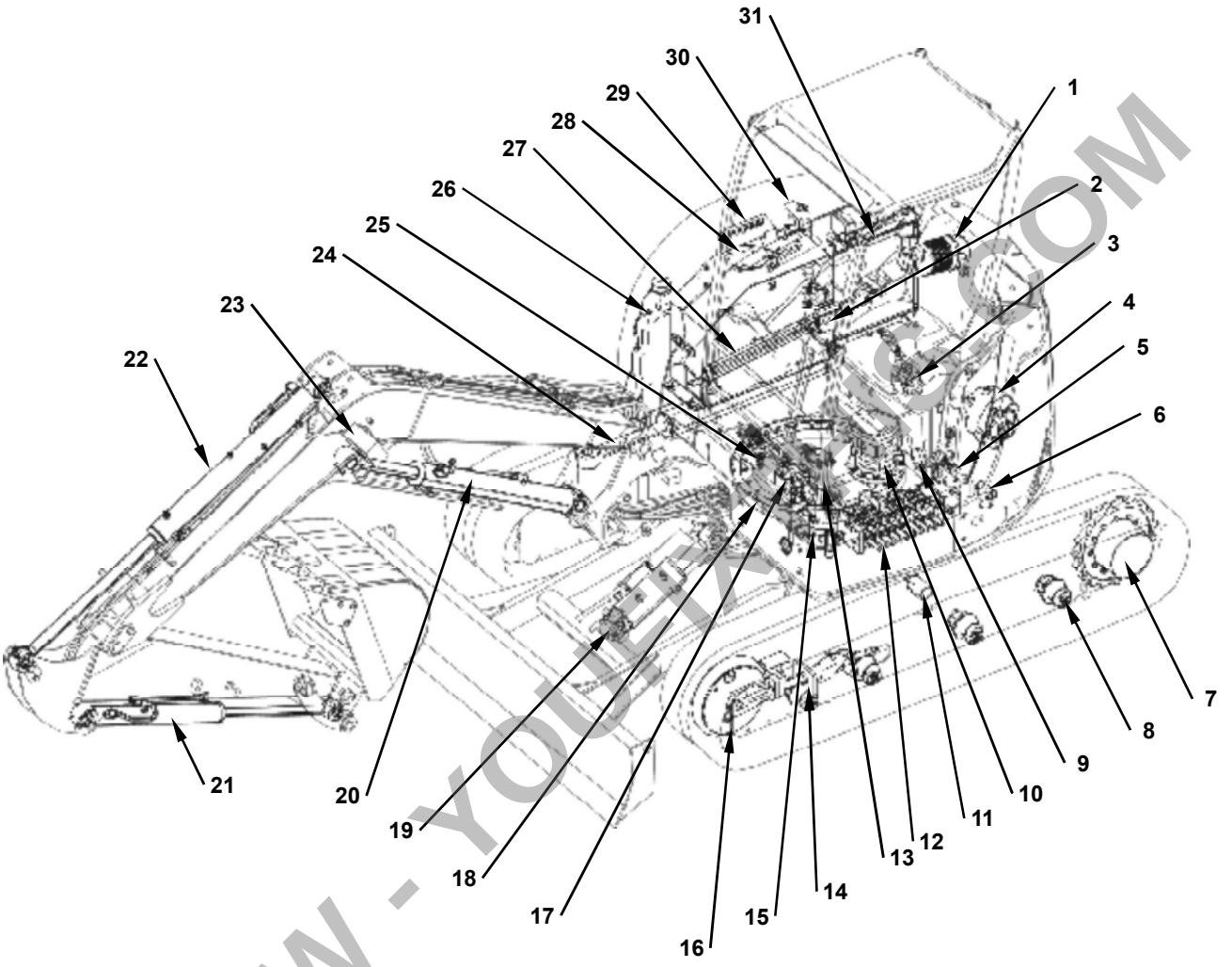
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Type		ZX40U-3 class	
		Canopy	Cab
Type of Front-End Attachment		Boom Swing Type	
Bucket Capacity (Heaped)	m^3 (yd^3)	0.14 (0.18)	
Operating Weight	kg (lb)	4570 (10080)	4730 (10430)
Base Machine Weight	kg (lb)	3400 (7500)	3550 (7830)
Engine	kW/min^{-1} (PS/rpm)	Yanmar EDM-4TNV88 28.4/2400 (38.6/2400)	
A: Overall Width	mm (ft·in)	1850 (6′1″)	
B: Overall Height	mm (ft·in)	2510 (8′3″)	2550 (8′4″)
C: Rear-End Swing Radius	mm (ft·in)	980 (3′3″)	
D: Minimum Ground Clearance	mm (ft·in)	340 (1′1″)	
E: Counterweight Clearance	mm (ft·in)	610 (2′0″)	
F: Engine Cover Height	mm (ft·in)	1510 (4′11″)	
G: Undercarriage Length	mm (ft·in)	2500 (8′2″)	
H: Undercarriage Width	mm (ft·in)	1960 (6′5″)	
I: Sprocket Center to Idler Center	mm (ft·in)	1990 (6′6″)	
J: Track Shoe Width	mm (ft·in)	400 (1′4″) (Rubber Crawler)	
Ground Pressure	kPa (kgf/cm^2, psi)	26 (0.27, 3.8)	27 (0.28, 3.9)
Swing Speed	min^{-1} (rpm)	9.0 (9.0)	
Travel Speed (fast/slow)	km/h (mph)	4.2/2.7 (2.6/1.7)	
Gradeability		30° (tan θ = 0.58)	

NOTE: The dimensions do not include the height of the shoe lug.

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MAIN COMPONENTS

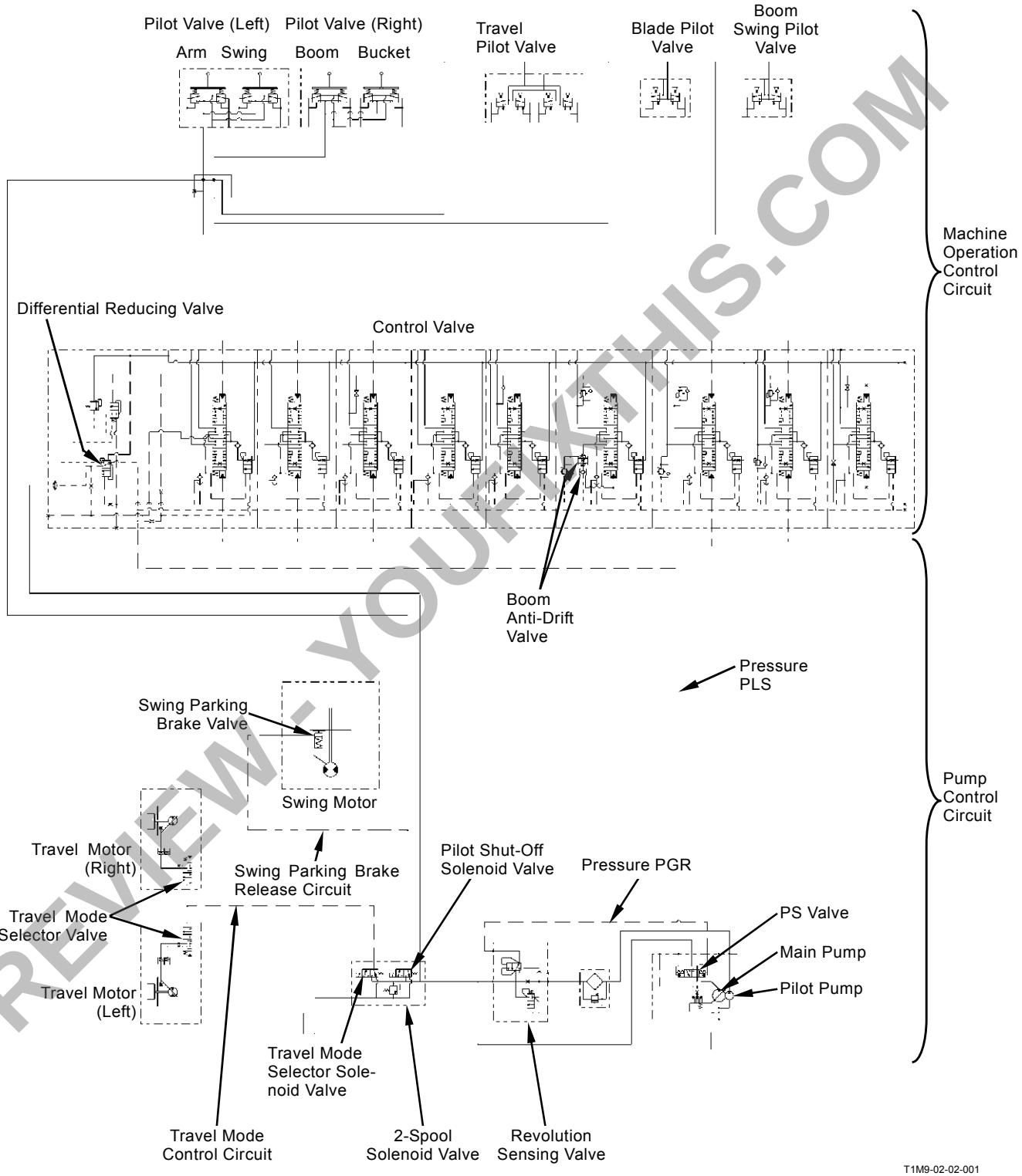


T1M9-01-02-005

1 - Air Cleaner
2 - Blade Pilot Valve
3 - Front Pilot Valve
4 - Pump Device
5 - Revolution Sensing Valve
6 - Pilot Filter
7 - Travel Device
8 - Lower Roller
9 - Back Pressure Valve
10 - Swing Device
11 - Upper Roller
12 - Control Valve
13 - Center Joint
14 - Track Adjuster
15 - 2-Spool Solenoid Valve
16 - Front Idler
17 - Travel Pilot Valve
18 - Swing Bearing
19 - Blade Cylinder
20 - Boom Cylinder
21 - Bucket Cylinder
22 - Arm Cylinder
23 - Work Light
24 - Boom Swing Cylinder
25 - Boom Swing Pilot Valve
26 - Fuel Tank
27 - Tilt-Up Device
28 - Hydraulic Oil Tank
29 - Battery
30 - Reserve Tank
31 - Radiator/Oil Cooler

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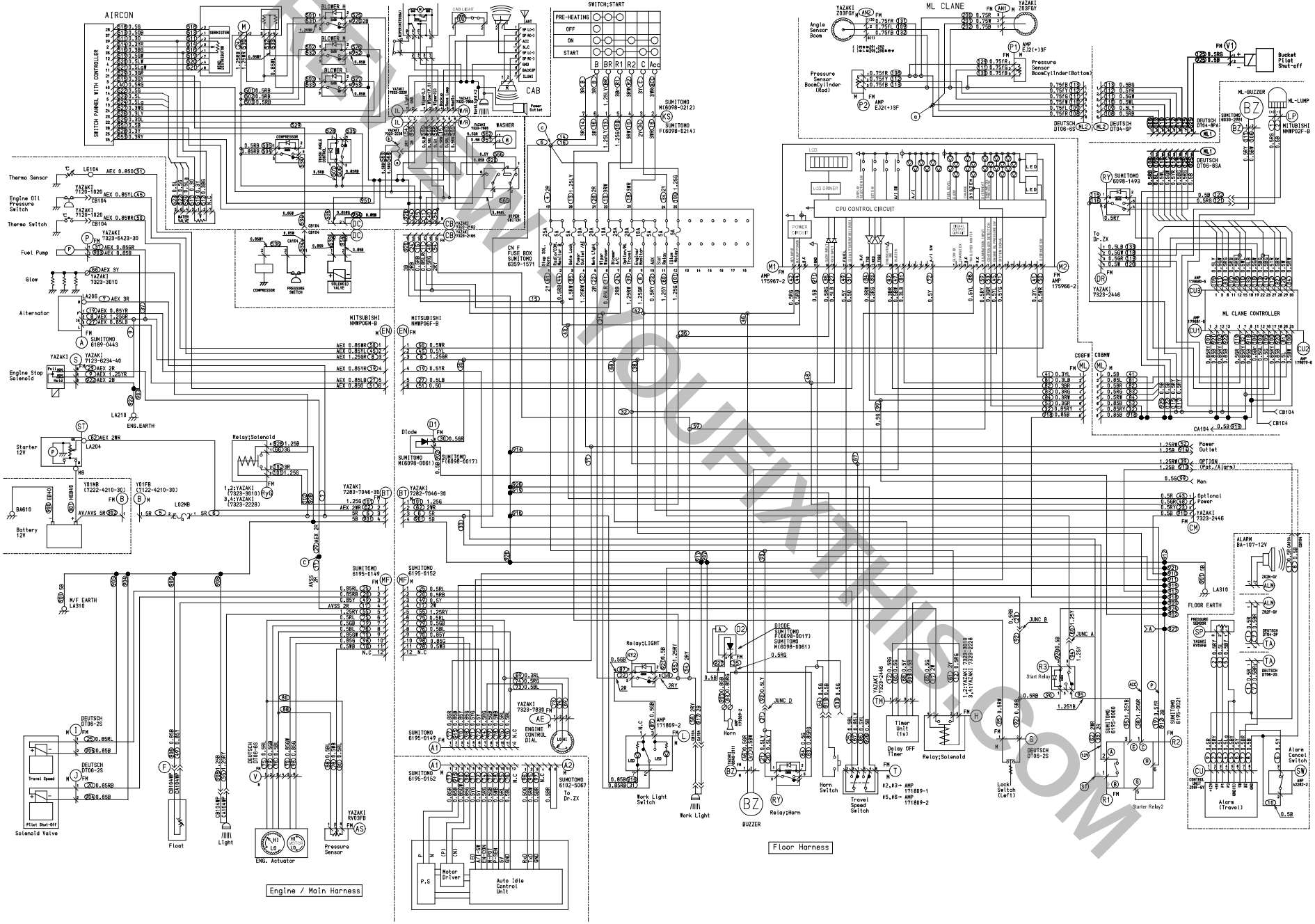
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Attach to Vol. No.: T1NG-E-00

ZX40U-3/50U-3 ELECTRICAL CIRCUIT DIAGRAM (Standard)

ML specification is only available Japanese domestic market.



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INTRODUCTION

Troubleshooting charts shown in this section indicate the orderly procedures for inspecting and finding out the cause(s) of problems in the machine.

This section is comprised of five groups: Diagnosing Procedure, Troubleshooting A (diagnosis of machine by system failure indicator), Troubleshooting B (diagnosis of machine by symptom), Troubleshooting C (diagnosis of monitor), and Electric System Inspection.

- Diagnosing Procedure

- Troubleshooting A (diagnosis of machine by system failure indicator)
  This procedure is used when system failure indicator of the monitor flickers or is lit.

  Example) System failure indicator: Flickering every 1 second (engine control dial wire breakage and shortcircuit)

- Troubleshooting B (diagnosis of machine by symptom)
  This procedure is used for diagnosis by symptoms.
  This is used in case flickering and lighting do not take place after diagnosis by system failure indicator.

  Example: Even if the engine control dial is rotated, engine speed remains unchanged.

- Troubleshooting C (diagnosis of monitor)
  This procedure is used when there are malfunction on components regarding monitor, such as gauges or indicators.

  Example: Fuel gauge is not operated.

- Electrical System Inspection
  This procedure is used when the information on precaution for electrical system inspection or inspection method is needed.

  Example: Fuse inspection

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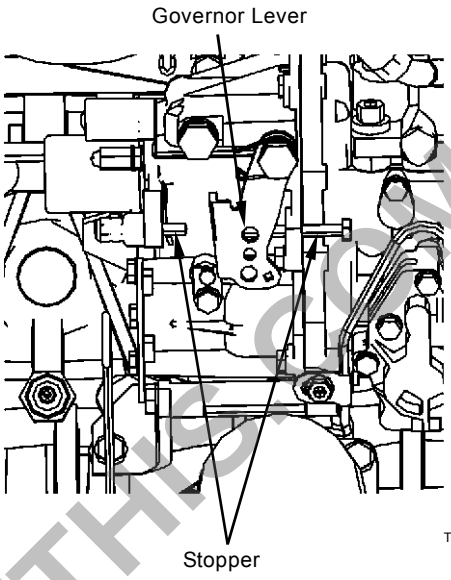
ENGINE SPEED

Summary:

1. Be sure to check the engine speed before performing all other tests since it always affects test results.

Preparation:

1. Warm up the machine until the engine coolant temperature reaches 50 °C (122 °F) or more and hydraulic oil temperature is 50±5 °C (122±9 °F).
2. Confirm that the fuel injection pump governor lever comes into contact with the slow-idle and fast-idle stoppers according to the engine control dial operation.
3. Put a reflection mark onto the crank pulley side by using a non-contact type engine speed meter. (Reference Tool: ONO SOKKI HT-4200)



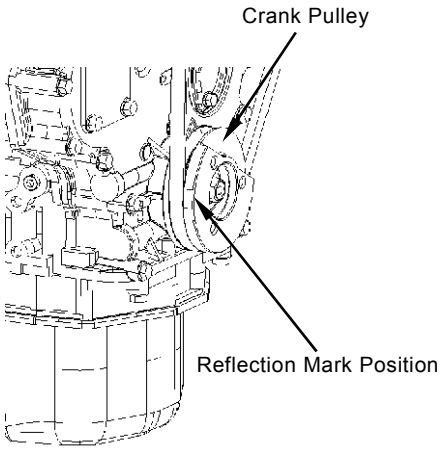
T1M9-04-02-019

Measurement:

1. Depending upon the engine speed to be measured, make measurement as per the following table.

	Engine Control Dial	Auto-Idle Switch
Slow Idle (No-load)	Slow Idle	OFF
Fast Idle (No-load)	Fast Idle	OFF

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



T1ND-04-03-001

Evaluation:

Refer to Operational Performance Standard in T4-2.

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SAFETY ALERT SYMBOL AND HEADLINE NOTATIONS

In this manual, the following safety alert symbol and signal words are used to alert the reader to the potential for personal injury of machine damage.

⚠ This is the safety alert symbol. When you see this symbol, be alert to the potential for personal injury.
Never fail to follow the safety instructions prescribed along with the safety alert symbol.
The safety alert symbol is also used to draw attention to component/part weights.
To avoid injury and damage, be sure to use appropriate lifting techniques and equipment when lifting heavy parts.

- ⚠ **CAUTION:**
  Indicated potentially hazardous situation which could, if not avoided, result in personal injury or death.

- **IMPORTANT:**
  Indicates a situation which, if not conformed to the instructions, could result in damage to the machine.

- *NOTE:*
  Indicates supplementary technical information or know-how.

UNITS USED

- SI Units (International System of Units) are used in this manual.
  MKSA system units and English units are also indicated in parenthheses just behind SI units.
  Example : 24.5 MPa (250 kgf/cm^2, 3560 psi)

  A table for conversion from SI units to other system units is shown below for reference purposees.

Quantity	To Convert From	Into	Multiply By	Quantity	To Convert From	Into	Multiply By
Length	mm	in	0.03937	Pressure	MPa	kgf/cm^2	10.197
	mm	ft	0.003281		MPa	psi	145.0
Volume	L	US gal	0.2642	Power	kW	PS	1.360
	L	US qt	1.057		kW	HP	1.341
	m^3	yd^3	1.308	Temperature	°C	°F	°C×1.8+32
Weight	kg	lb	2.205	Velocity	km/h	mph	0.6214
Force	N	kgf	0.10197		min^{-1}	rpm	1.0
	N	lbf	0.2248	Flow rate	L/min	US gpm	0.2642
Torque	N·m	kgf·m	1.0197		mL/rev	cc/rev	1.0
	N·m	lbf·ft	0.7375				

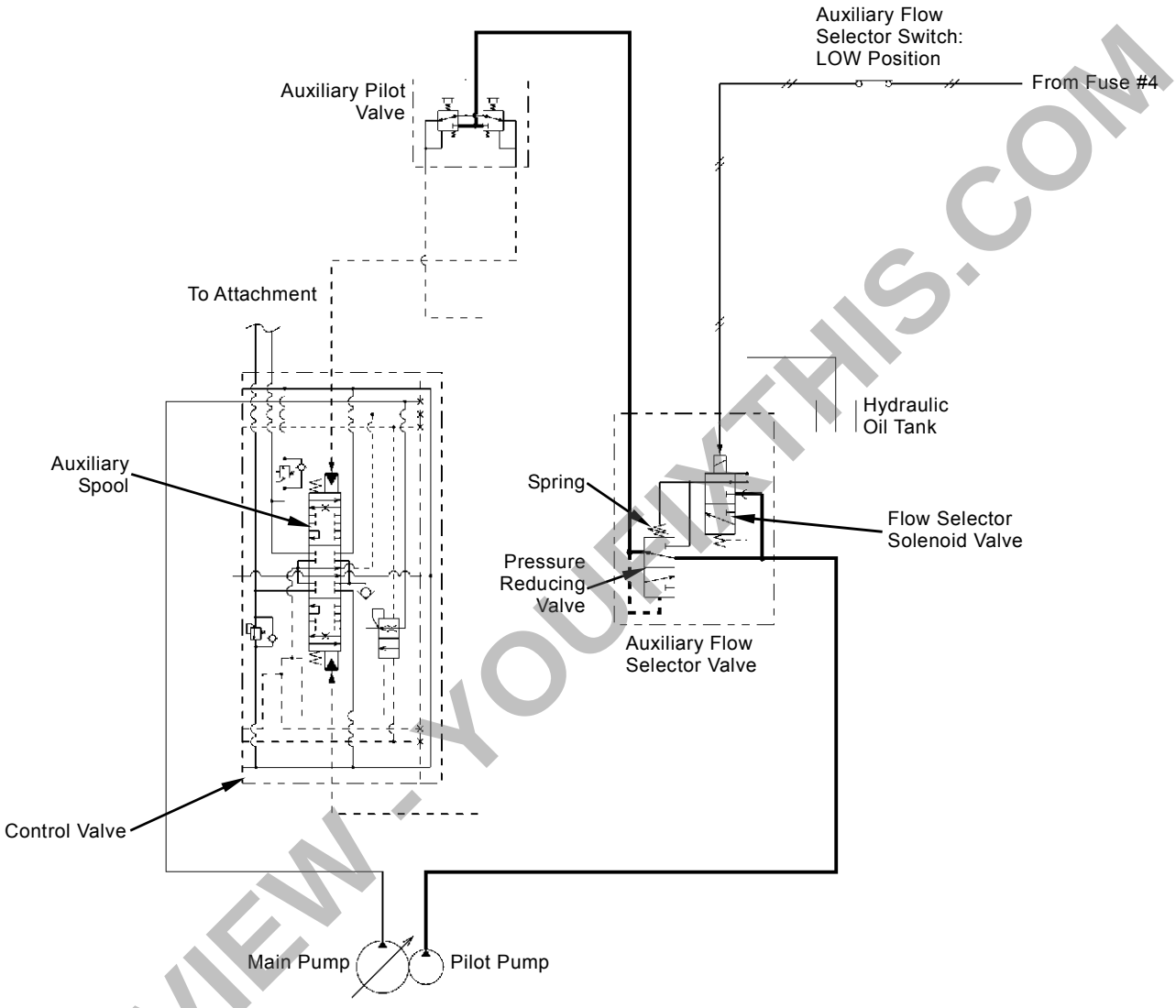
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NOTE: The illustration indicates the system operation when the auxiliary flow selector switch is placed in the LOW position.

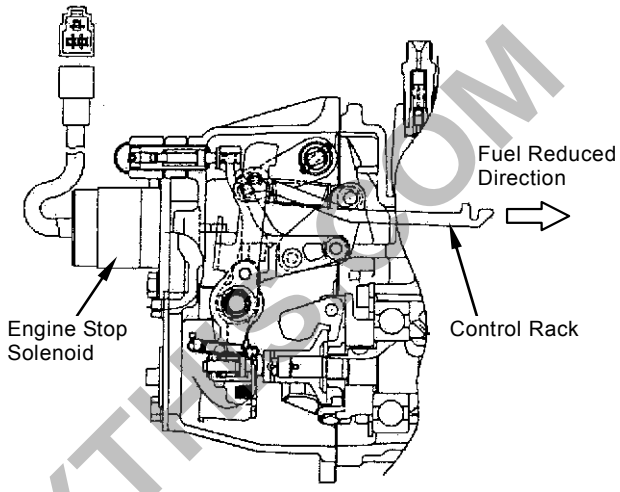
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ENGINE STOP CIRCUIT (KEY SWITCH: OFF)

1. When the key switch is turned from the ON position to the OFF position, terminal B is disconnected from terminals BR, R2, and ACC in the key switch. Therefore, power source for each circuit is stopped.
2. Current which flows from terminal ACC in the key switch to the holding side of the engine stop solenoid through fuse #9 is stopped, and the engine stop solenoid is released. When the engine stop solenoid is released, the control rack is moved to the stop position by the spring. Therefore, as fuel is not supplied, the engine stops.

NOTE: Surge voltage developed until the engine stops is supplied to the battery as terminal B in the alternator is directly connected to the battery.



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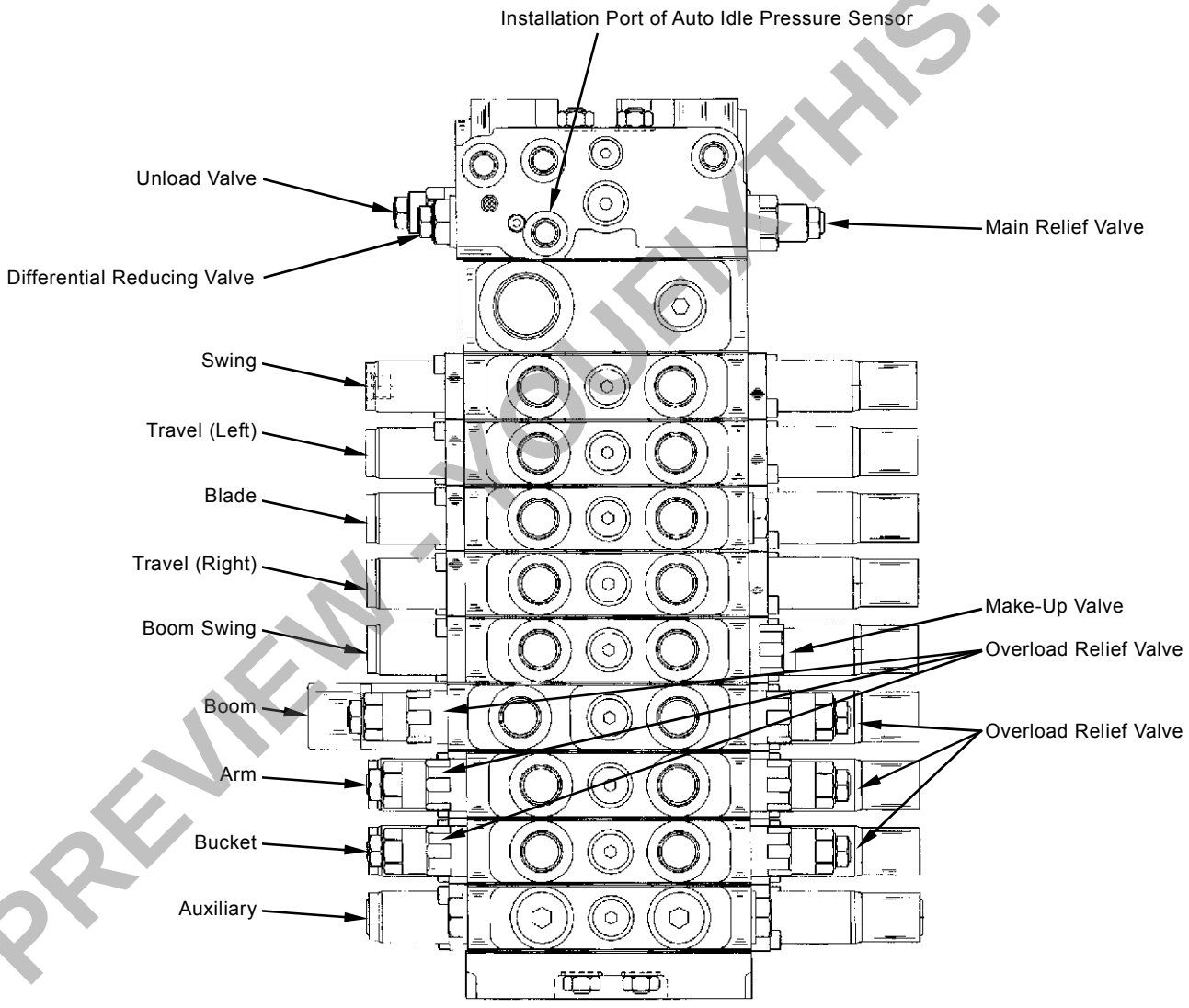
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OUTLINE

The control valve controls the oil pressure along with the flow rate and direction in the hydraulic circuit. The major components in the hydraulic circuit are the main relief valve, overload relief valve, make-up valve, unload valve, differential reducing valve, and pressure compensators. All spools are fully operated by the pilot pressure oil.

Also, the control valve is provided with an Auto-Idle pressure sensor for use in Auto-Idle control.
(Refer to SYSTEM/Control System)



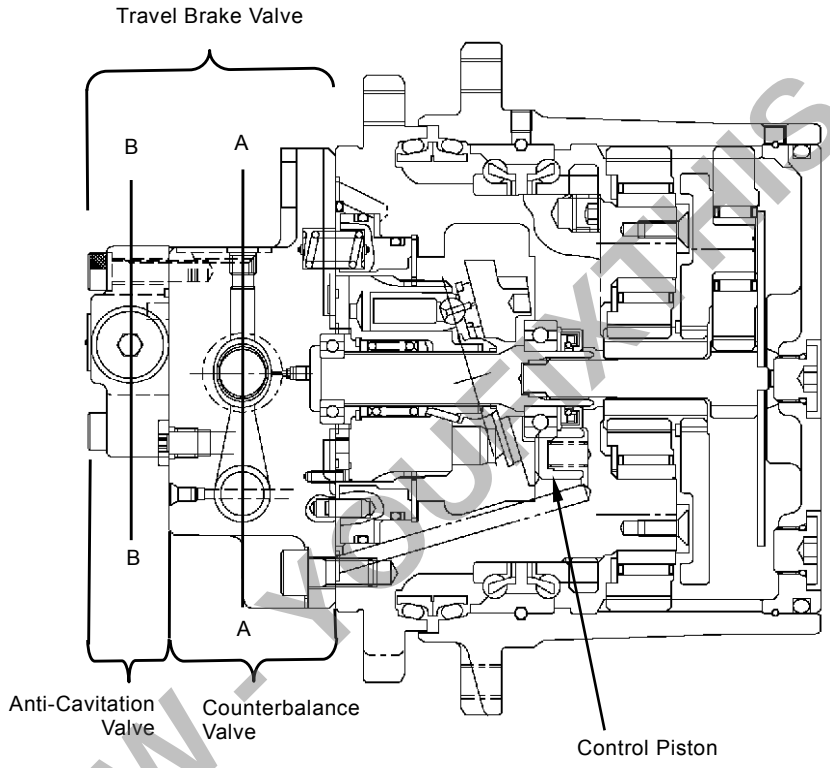
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TRAVEL BRAKE VALVE

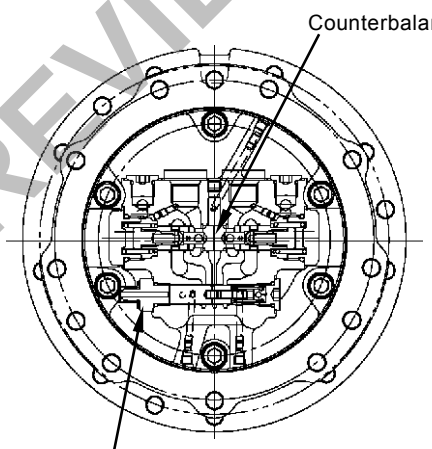
The travel brake valve consists of the counterbalance valve, the anti-cavitation valve, and the travel mode selector valve.
The counterbalance valve has two functions; one is to start and stop the travel smoothly, and the other is to prevent the machine from running away while descending slopes.
The anti-cavitation valve reduces occurrence of cavitation in the motor when the motor is stopped.
The travel mode selector valve is shifted by pressure oil from the travel mode selector solenoid valve, controls the control piston, and shifts the travel mode.



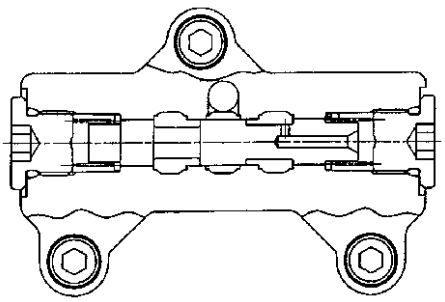
T1N0-03-06-002

Anti-Cavitation Valve (Section B-B)

Counterbalance Valve (Section A-A)



T1N0-03-06-003



T1LD-03-05-010

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ENGINE COMPRESSION PRESSURE

Summary:

1. Measure compression pressure in the cylinders and check for a reduction in engine power.
2. Check exhaust gas color. Keep track of engine oil consumption.
3. Check for abnormalities in the intake system including the air cleaner.

Preparation:

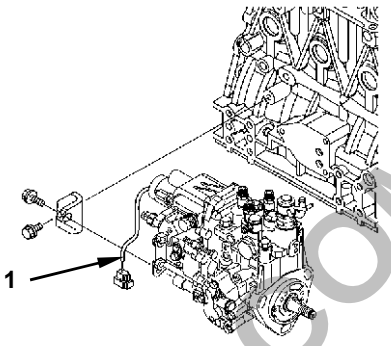
1. Warm up the engine.
2. Disconnect the negative terminal at the battery. Disconnect the engine stop solenoid (1) connector. Connect the negative terminal to the battery.
3. Disconnect the fuel injection pipe and remove the fuel injection valve from the cylinder to be measured.
4. Turn the starter and crank the engine.
5. Install a compression gauge kit (YANMAR TOL-97190080) to the cylinder to be measured.
6. Confirm that the batteries are charged.

Measurement:

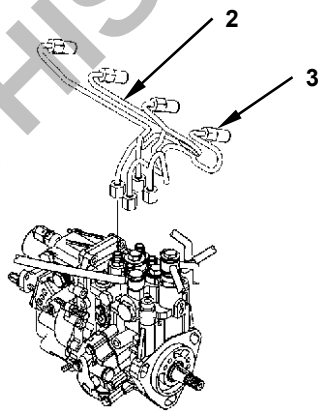
1. Turn the starter. Record the compression pressure of each cylinder after the pressure gauge pointer becomes stable.
2. Repeat the measurement three times and calculate the mean values.

Evaluation:

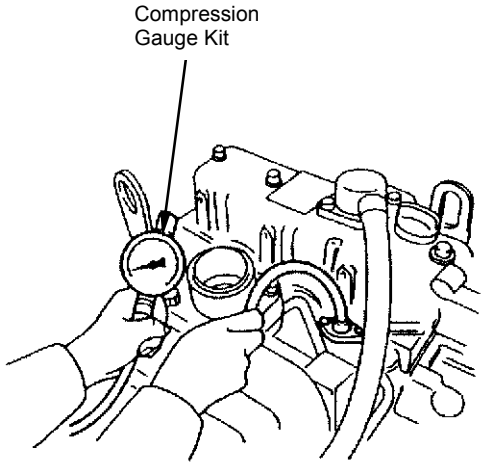
Refer to Operational Performance Standard in T4-2.



T1N0-04-03-014



T1N0-04-03-012



T1M9-04-02-001

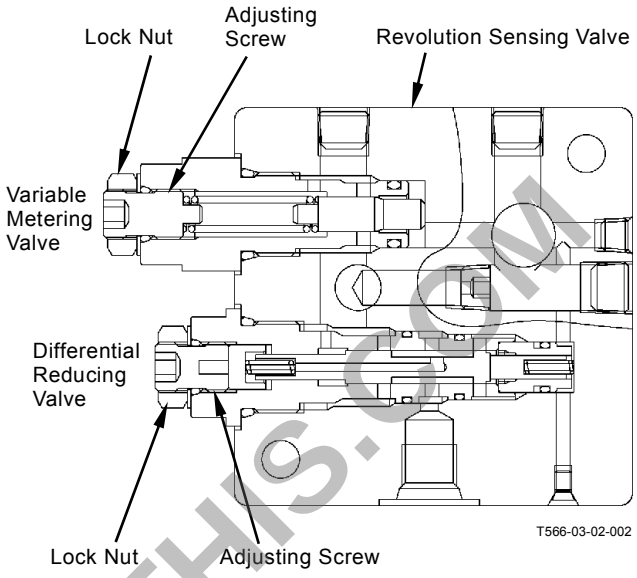
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Revolution Sensing Valve Adjustment Procedure

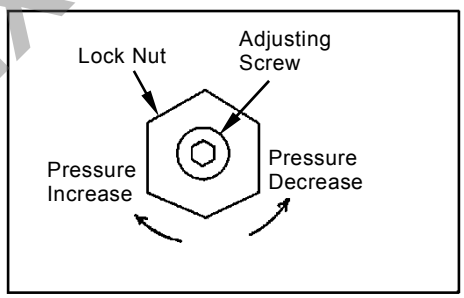
NOTE: Before loosening the lock nut, make the alignment marks on the adjusting screw, lock nut and valve. Using these alignment marks, the number of turns of the adjusting screw can be checked easily.

1. Loosen the variable metering valve lock nut on the revolution sensing valve.
2. Slightly tighten the variable metering valve adjusting screw so that the variable metering valve doesn't operate. Tighten the adjusting screw until the adjusting screw end face is retracted from the lock nut by approximately 1 mm.
   : 6 mm
3. Run the engine at the minimum speed (1150 min^{-1} (rpm)). Loosen the differential reducing valve lock nut. Turn the differential reducing valve adjusting screw so the pressure PRG matches the value below.
   Pressure PGR: 0.5 MPa (5 kgf/cm^2, 72.5 psi)
   : 17 mm
   : 6 mm
4. Increase the engine speed to the maximum speed (2540 min^{-1} (rpm)). Loosen the variable metering valve lock nut. Turn the variable metering valve adjusting screw so the pressure PRG matches the value below.
   Pressure PGR: 1.96 MPa (20 kgf/cm^2, 284 psi)
   : 17 mm
   : 6 mm
5. Tighten both the variable metering valve and differential reducing valve lock nuts.
   : 17 mm
   : 34 to 39 N·m
   (3.5 to 4 kgf·m, 25 to 29 lbf·ft)
6. After completing adjustment, recheck the set pressure.



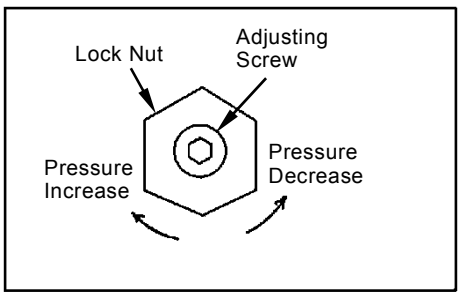
T566-03-02-002

(Variable Metering Valve)



W107-02-05-129

(Differential Reducing Valve)



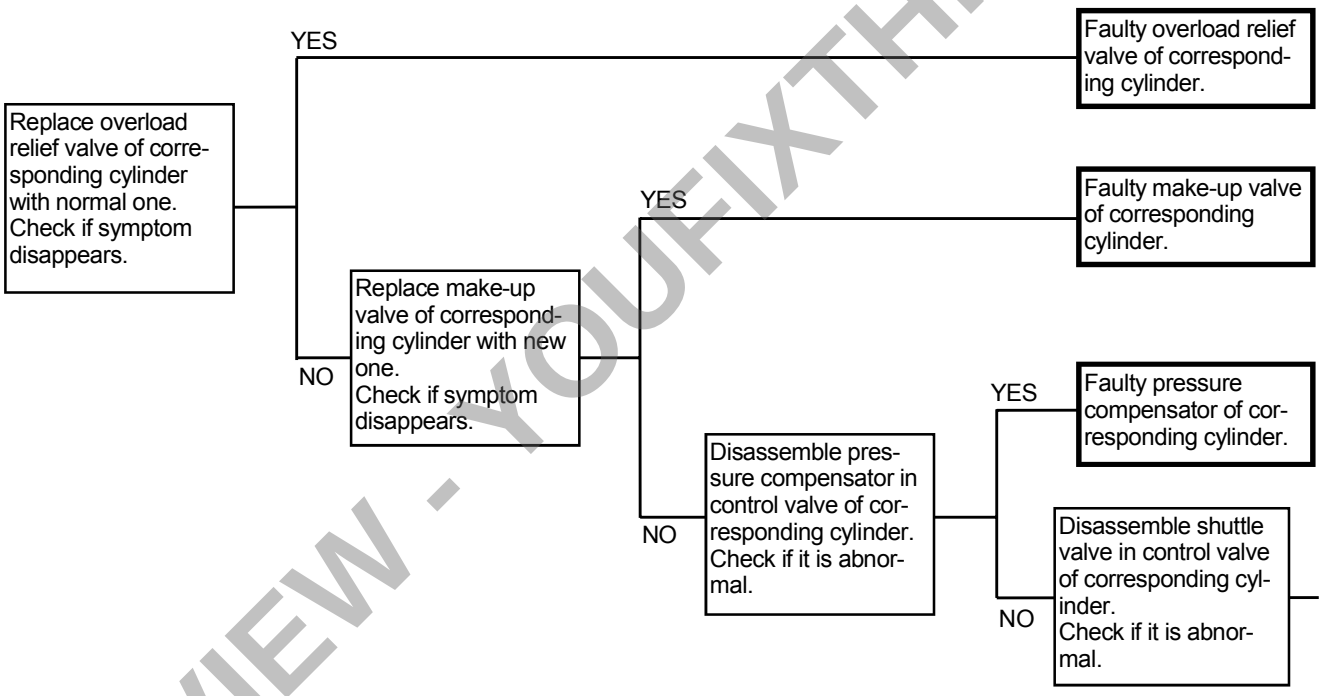
W107-02-05-129

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Some cylinders are not operated, speed are slow, or power are weak.

- In case the cylinder speeds are slow, the pump delivery flow rate may be reduced. If the pump delivery flow rate is reduced due to some problems, only actuators requiring more oil flow rate than the reduced pump flow rate look to be slow.
- In case the cylinder power are weak, the relief valve set pressure may be lower than specific one. Be careful not to mix the problem of slow with that of weak as these symptoms are different from each other.



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CAUTION: Wait until the high-pressure-side pressure drops to less than 980 kPa (10 kgf/cm^2, 142 psi) before attempting to disconnect the high-pressure-side charge hose. Otherwise, refrigerant and compressor oil may spout.

13. After checking refrigerant quantity, disconnect the low-pressure-side charge hose first. Wait for the high-pressure-side pressure to drop to less than 980 kPa (10 kgf/cm^2, 142 psi). Disconnect the high-pressure-side charge hose.

NOTE: For environmental protection, do not discharge residual refrigerant inside the charge hose, no matter how small the amount is.

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