

SAFETY

OPERATE ONLY FROM OPERATOR'S SEAT

- Inappropriate engine starting procedure may cause the machine to runaway, possibly resulting in serious injury or death.
- Start the engine only from the operator's seat.
- NEVER start the engine while standing on the track or on ground.
- Do not start engine by shorting across starter terminals.
- Before starting the engine, confirm that all control levers are in neutral.

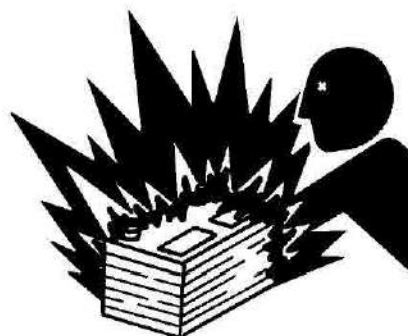


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JUMP STARTING

- Battery gas can explode, resulting in serious injury.
- If the engine must be jump started, be sure to follow the instructions shown in the "OPERATING THE ENGINE" chapter.
- The operator must be in the operator's seat so that the machine will be under control when the engine starts. Jump starting is a two-person operation.
- Never use a frozen battery.
- Failure to follow correct jump starting procedures could result in a battery explosion or a runaway machine.



SA-032

013-E01A-0032-3

KEEP RIDERS OFF MACHINE

- Riders on machine are subject to injury such as being struck by foreign objects and being thrown off the machine.
- Only allow the operator on the machine. Keep riders off.
- Riders also obstruct the operator's view, resulting in the machine being operated in an unsafe manner.



014-E01A-0030-2

SA-660

SAFETY

PRACTICE SAFE MAINTENANCE

To avoid accidents:

- Understand service procedures before doing work.
- Keep the work area clean and dry.
- Do not spray water or steam inside cab.
- Never lubricate or service the machine while it is moving.
- Keep hands, feet and clothing away from power-driven parts.

Before servicing the machine:

1. Park the machine on a level surface.
2. Lower the bucket to the ground.
3. Run the engine at slow idle speed without load for 5 minutes.
4. Turn the key switch to OFF to stop engine.
5. Relieve the pressure in the hydraulic system by moving the control levers several times.
6. Remove the key from the switch.
7. Attach a "Do Not Operate" tag on the control lever.
8. Pull the pilot control shut-off lever to the LOCK position.
9. Allow the engine to cool.

- If a maintenance procedure must be performed with the engine running, do not leave machine unattended.
- If the machine must be raised, maintain a 90 to 110° angle between the boom and arm. Securely support any machine elements that must be raised for service work.
- Never work under a machine raised by the boom.
- Inspect certain parts periodically and repair or replace as necessary. Refer to the section discussing that part in the "MAINTENANCE" chapter of this manual.
- Keep all parts in good condition and properly installed.
- Fix damage immediately. Replace worn or broken parts. Remove any buildup of grease, oil, or debris.
- Disconnect battery ground cable (–) before making adjustments to electrical systems or before welding on the machine.



SA-028



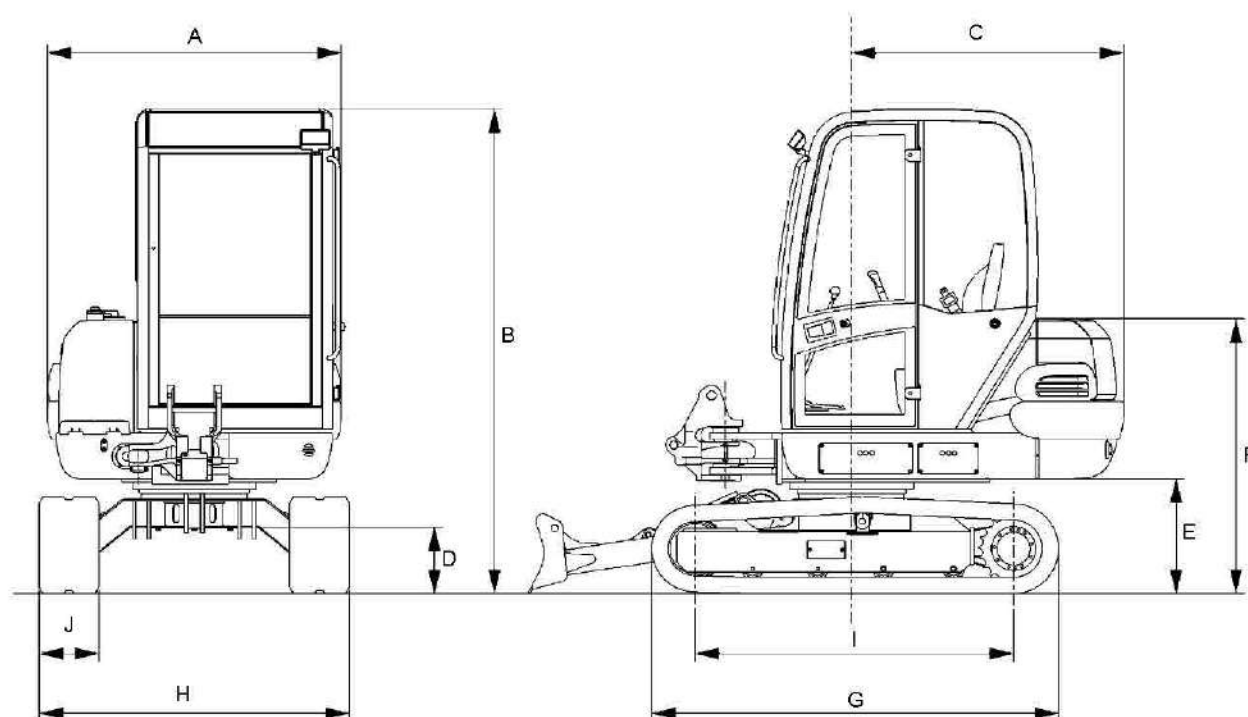
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GENERAL / Specifications

SPECIFICATIONS

ZAXIS30, 35



M1LS-12-001

Type		ZAXIS30		ZAXIS35	
		Canopy	Cab	Canopy	Cab
Type of Front-End Attachment		Boom Swing Type		Boom Swing Type	
Bucket Capacity (Heaped)	m ³ (yd ³)	PCSA 0.092 (0.12) CECE 0.08		PCSA 0.11 (0.14) CECE 0.10	
Operating Weight	kg (lb)	2875 (6340)	2960 (6530)	3100 (6830)	3185(7020)
Basic Machine Weight	kg (lb)	2100 (4630)	2185 (4820)	2270 (5000)	2355 (5190)
Engine	kW/min ⁻¹ (PS/rpm)	Kubota V1505 19.9/2300 (27.1/2300)			
A: Overall Width	mm (ft in)	1470 (4'10")			
B: Canopy Cab Height	mm (ft in)	2420 (7'11")			
C: Rear-End Swing Radius	mm (ft in)	1370 (4'6")		1390 (4'7")	
D: Minimum Ground Clearance	mm (ft in)	*330 (1'1")			
E: Counterweight Clearance	mm (ft in)	*575 (1'11")			
F: Engine Cover Height	mm (ft in)	*1370 (4'6")			
G: Undercarriage Length	mm (ft in)	2030 (6'8")			
H: Undercarriage Width	mm (ft in)	1550 (5'1")			
I: Sprocket Center to Idler Center	mm (ft in)	1595 (5'3")			
J: Track Shoe Width	mm (ft in)	300 (11.8") (Rubber Crawler)			
Ground Pressure	kPa (kgf/cm ² ,psi)	25.7 (0.26, 3.7)	27.0 (0.27, 3.8)	29.0 (0.30, 4.3)	30.0 (0.31, 4.4)
Swing Speed	min ⁻¹ (rpm)	8.8 (8.8)			
Travel Speed (fast/slow)	km/h (mph)	4.3/2.9 (2.7/1.8)			
Gradeability	(tan θ)	58% (30°)			

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

GENERAL / Component Specifications

ENGINE

ZAXIS30, 35

Manufacturer	KUBOTA
Model	V1505
Type	Diesel, 4-Cycle, Water-Cooled, Whirl Chamber Type
Cyl. No. - Bore×Stroke	4-78 mm×78.4 mm (3.07 in×3.09 in)
Piston Displacement	1498 cm ³ (91.4 in ³)
Rated Output	19.9 kW/2300 min ⁻¹ (27.1 PS/2300 rpm)
Compression Ratio	23
Dry Weight	131 kg (289 lb)
Firing Order	1-3-4-2
Rotation Direction	Clockwise (Viewed from fan side)

COOLING SYSTEM

Cooling Fan	Dia. 380 mm, 8 Blades (F-Type), Drawn-In Type
Fan Pulley Ratio	Engine rpm × 1.17
Thermostat (Atmospheric Pressure)	Full open temp. 71 °C (160 °F) Cracking temp. 85 °C (185 °F)
Water Pump	Centrifugal Belt Driven Type

LUBRICATION SYSTEM

Lubrication Pump Type	Trochoid Pump
Oil Filter	Full-Flow Paper Driven Type

STARTING SYSTEM

Motor	DC Series Reduction Type
Voltage/Output	12 V/1.4 kW

PREHEAT SYSTEM

Preheating Method	Glow Plug
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ENGINE STOP SYSTEM

Stop Method	Fuel Shut-Off
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GENERAL / Component Specifications

ZAXIS30, 35

SWING DEVICE

	ZAXIS30, 35	ZAXIS40, 50
Type	Two-Stage Reduction Planetary Gear	←
Reduction Gear Ratio	15.5	20.615
Weight	32 kg (70.5 lb)	46 kg (101 lb)

SWING MOTOR

Type	Swash-Plate Type, Fixed Displacement Axial Plunger Motor
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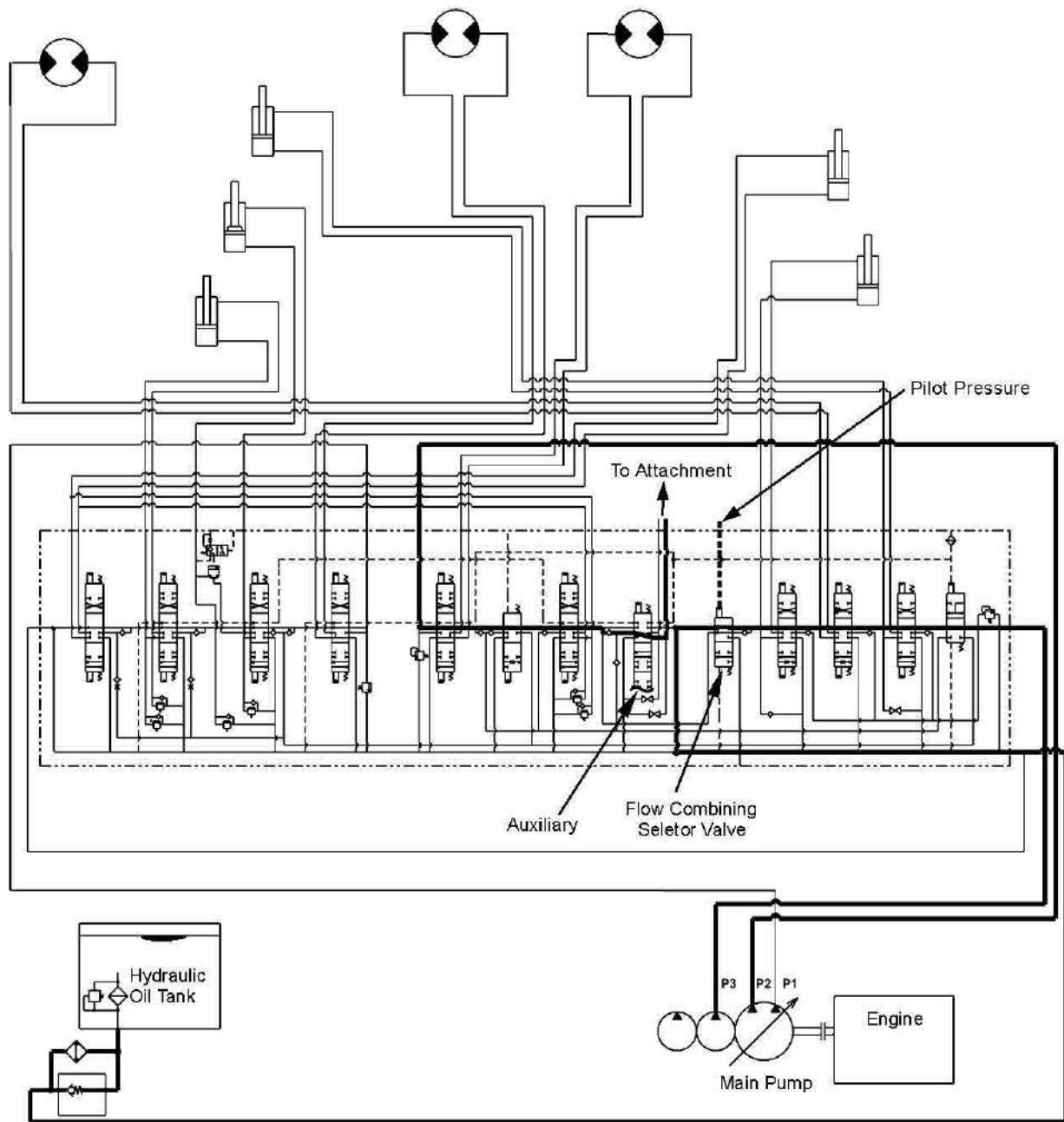
SWING VALVE UNIT

	ZAXIS30, 35	ZAXIS40, 50
Type	Non Counterbalance Valve Type	←
Relief Set Pressure	20.6 MPa (210 kgf/cm ²) at 13 L/min	24.5 MPa (250 kgf/cm ²) at 40 L/min

SWING PARKING BRAKE

Type	Single-Disc-Wet Negative Type
Relief Pressure (Full Stroke)	Less than 2.9 MPa (Less than 30 kgf/cm ²)

SYSTEM / Hydraulic System



T1LS-02-01-005

COMPONENT OPERATION / Pump Device

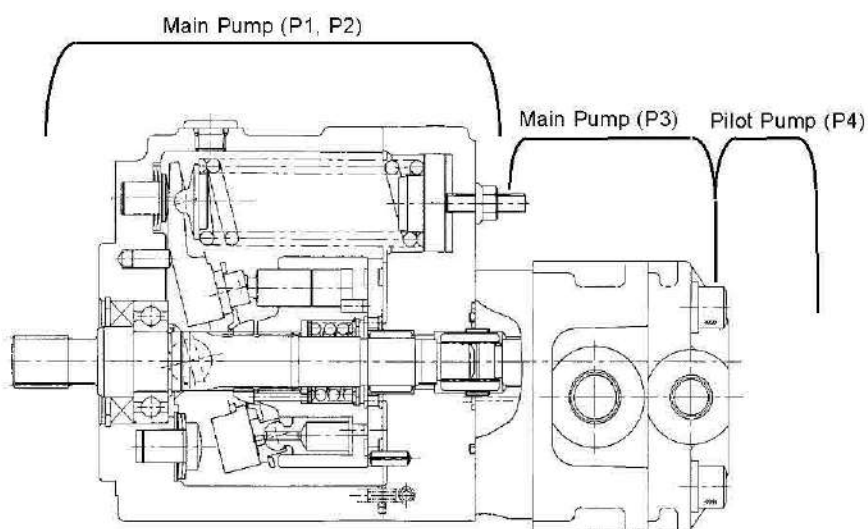
OUTLINE

The pump device is a direct-engine-drive type, consisting of main pumps (P1, P2, P3) and pilot pump (P4).

The main pump consists of two different types, variable displacement axial plunger pump swash plate type (P1, P2) and gear pump (P3). They supply high pressure oil to the control valve. The plunger pump has a dual delivery port design, so it functions as two pumps.

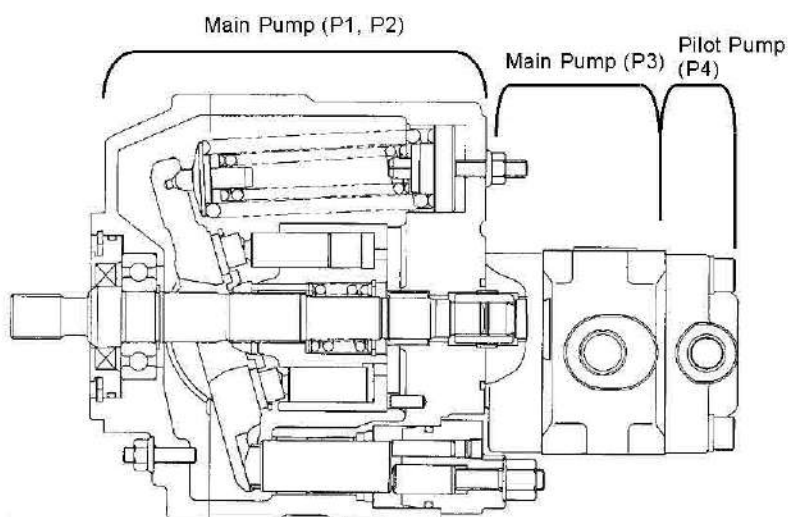
The pilot pump (P4) is a gear-type, it supplies pressure oil to the pilot circuit.

ZAXIS30, 35



T565-03-01-001

ZAXIS40, 50



T1LS-03-01-001

COMPONENT OPERATION / Swing Device

Relief Valve

The relief valve functions to reduce shocks developed when starting or stopping swing movement (shockless) and to protect the circuit from overloading (relief).

- Shockless Operation

When the pressure in the circuit increases, the pressure oil enters in the piston chamber via the orifice of poppet and housing, to move the piston to the left.

The pressure in the spring chamber is kept low during the movement of piston. Therefore, the pressure at port HP opposes the spring set force only, and the poppet opens to relieve the hydraulic oil under low pressure whenever the pressure at port HP is low.

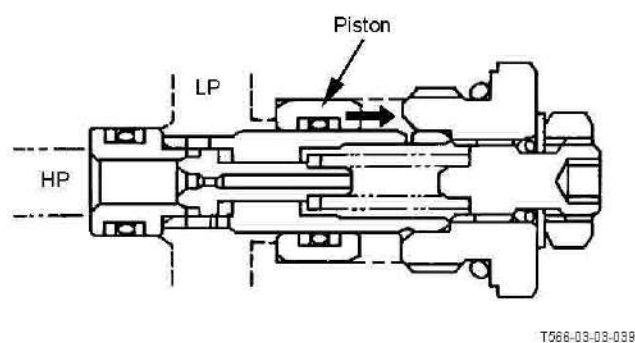
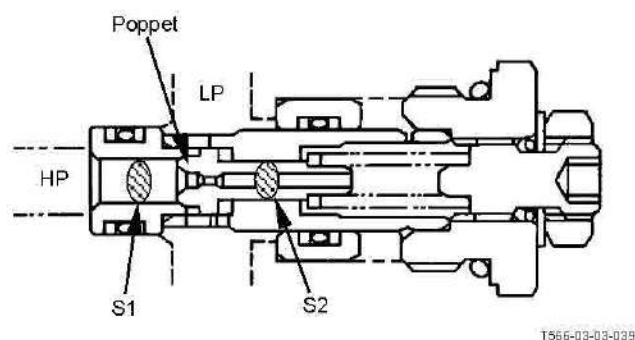
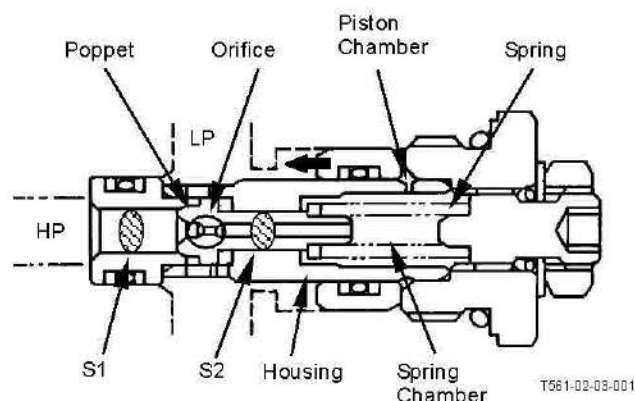
Therefore, the pressure stops temporally increasing and shocks are reduced when starting or stopping the swing operation. When the piston moves to the stroke end, the pressure in the spring chamber becomes equal to the pressure at port HP. As a result, the relief set force becomes to the normal pressure, so the poppet closes.

- Relief Operation

When the pressure in the circuit increases, the force which acting on poppet (Pressurized Area $(S1-S2) \times \text{Pressure at Port HP}$) exceeds the spring force, so the poppet opens to allow the hydraulic oil to be relieved.

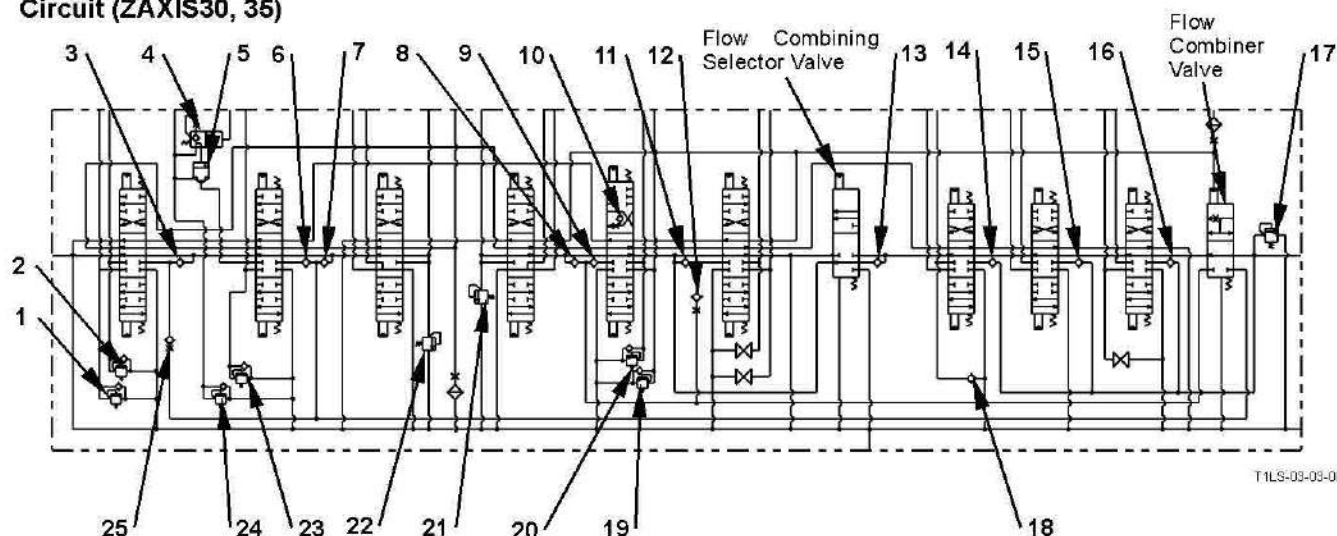
- Quick Return Operation of Piston

This operation is to return the piston to the original position. The shockless operation is performed as the piston moves from right to left. Therefore, when stopping the swing operation, move the piston to right. When returning the swing lever to the neutral position, the back pressure arises in the return circuit due to the swing inertial force. The piston is returned to the original position quickly by the back pressure.



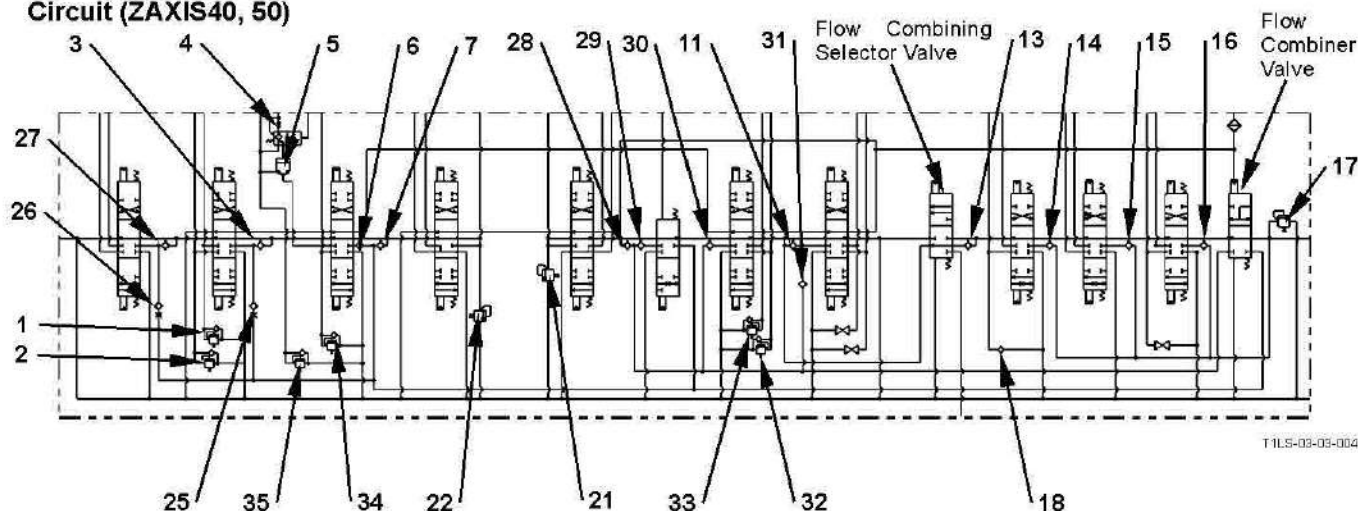
COMPONENT OPERATION / Control Valve

Circuit (ZAXIS30, 35)



T1LS-03-03-003

Circuit (ZAXIS40, 50)



T1LS-03-03-004

- | | | | |
|--|---|--|---|
| 1 - Overload Relief Valve
(Bucket: Rod Side) | 10 - Arm Regenerative Valve | 19 - Overload Relief Valve
(Arm: Bottom Side) | 28 - Load Check Valve
(Boom 2 Tandem Circuit) |
| 2 - Overload Relief Valve
(Bucket: Bottom Side) | 11 - Load Check Valve
(Auxiliary Tandem Circuit) | 20 - Overload Relief Valve
(Arm: Rod Side) | 29 - Load Check Valve
(Boom 2 Tandem Circuit) |
| 3 - Load Check Valve
(Bucket Tandem Circuit) | 12 - Check Valve (Orifice)
(Auxiliary Parallel Circuit) | 21 - Main Relief Valve
(Main Pump P2) | 30 - Load Check Valve
(Arm 1 Parallel Circuit) |
| 4 - Boom Anti-Drift Valve
(Selector Valve) | 13 - Load Check Valve
(Main Pump P3 Parallel
Circuit) | 22 - Main Relief Valve
(Main Pump P1) | 31 - Load Check Valve
(Auxiliary Parallel Circuit) |
| 5 - Boom Anti-Drift Valve
(Check Valve) | 14 - Load Check Valve
(Boom Swing Parallel Cir-
cuit) | 23 - Overload Relief Valve
(Boom: Rod Side) | 32 - Overload Relief Valve
(Arm 1: Rod Side) |
| 6 - Load Check Valve
(Boom Tandem Circuit) | 15 - Load Check Valve
(Swing Parallel Circuit) | 24 - Overload Relief Valve
(Boom: Bottom Side) | 33 - Overload Relief Valve
(Arm 1: Bottom Side) |
| 7 - Load Check Valve
(Boom Tandem Circuit) | 16 - Load Check Valve
(Blade Parallel Circuit) | 25 - Load Check Valve
(Bucket Parallel Circuit) | 34 - Overload Relief Valve
(Boom 1: Rod Side) |
| 8 - Load Check Valve
(Arm Tandem Circuit) | 17 - Main Relief Valve
(Main Pump P3) | 26 - Load Check Valve
(Arm 2 Parallel Circuit) | 35 - Overload Relief Valve
(Boom 1: Bottom Side) |
| 9 - Load Check Valve
(Arm Tandem Circuit) | 18 - Make-Up Valve
(Boom Swing: Bottom
Side) | 27 - Load Check Valve
(Arm 2 Tandem Circuit) | |

COMPONENT OPERATION / Pilot Valve

OUTLINE

The pilot valve controls the pilot pressure to move the control valve spools.

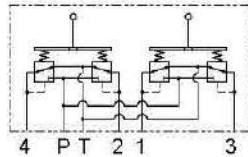
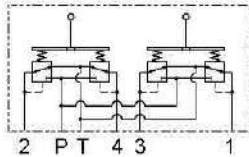
The pilot valve operates the control valve spool in response to the lever stroke due to the PPC (Pressure Proportional Control Valve) function.

The 4-port pilot valve is used for front attachment, swing, and travel operation. The 2-port pilot valve is used for blade, swing and auxiliary operation.

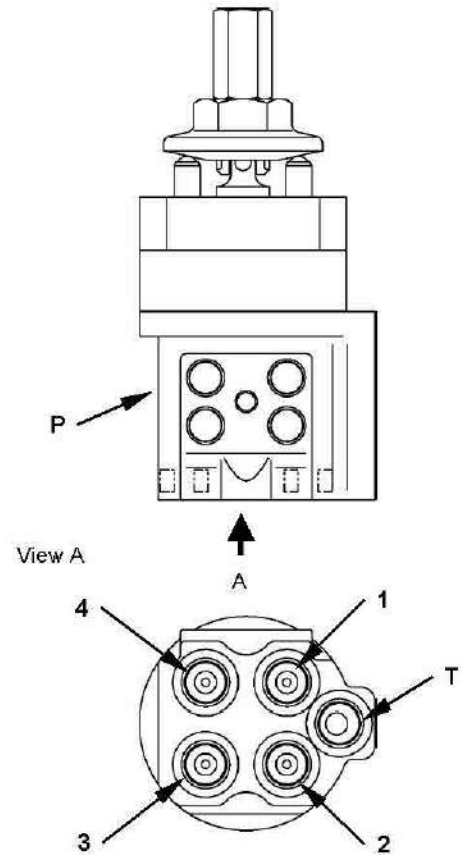
• Front and Swing Pilot Valve

	Port No.	ISO Standard
Right	1	Bucket Roll-Out
	2	Boom Lower
	3	Bucket Roll-In
	4	Boom Raise
Left	1	Right Swing
	2	Arm Roll-Out
	3	Left Swing
	4	Arm Roll-In

Hydraulic Symbol



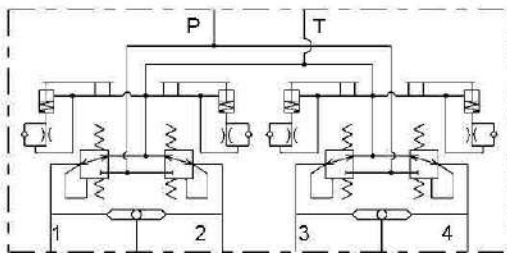
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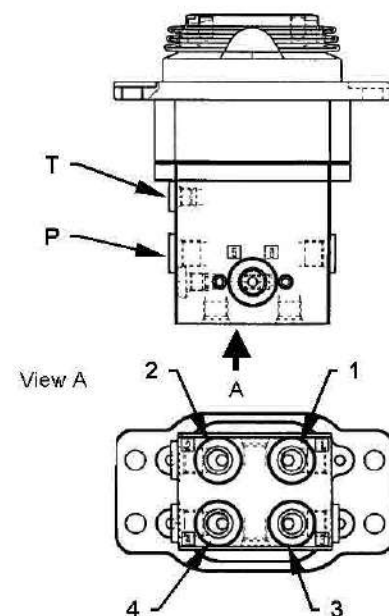
T567-03-04-001

• Travel Pilot Valve

Port No.	
1	Left Travel Reverse
2	Left Travel Forward
3	Right Travel Reverse
4	Right Travel Forward



T573-03-04-003



T585-03-04-005

OPERATIONAL PERFORMANCE TEST / Introduction

PREPARATION FOR PERFORMANCE TESTS

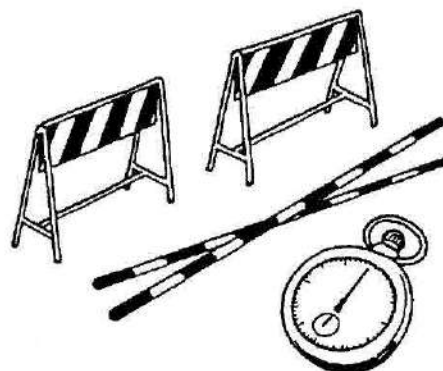
Observe the following rules in order to carry out performance tests accurately and safely.

THE MACHINE

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

TEST AREA

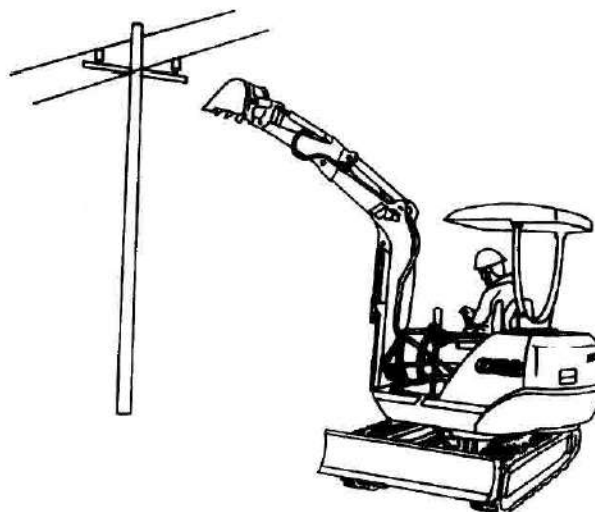
1. Select a hard and flat surface.
2. Secure enough space to allow the machine to run straight more than 20 m (65 ft 7 in), and to make a full swing with the front attachment extended.
3. If required, rope off the test area and provide signboards to keep unauthorized personnel away.



T105-06-01-003

PRECAUTIONS

1. Before starting to test, agree upon the signals to be employed for communication among coworkers. Once the test is started, be sure to communicate with each other using these signals, and to follow them without fail.
2. Operate the machine carefully and always give first priority to safety.
3. While testing, always take care to avoid accidents due to landslides or contact with high-voltage power lines. Always confirm that there is sufficient space for full swings.
4. Avoid polluting the machine and the ground with leaking oil. Use oil pans to catch escaping oil. Pay special attention to this when removing hydraulic pipings.



T005-06-01-003

MAKE PRECISE MEASUREMENT

1. Accurately calibrate test instruments in advance to obtain correct data.
2. Carry out tests under the exact test conditions prescribed for each test item.
3. Repeat the same test and confirm that the test data obtained can be produced repeatedly. Use mean values of measurements if necessary.

OPERATIONAL PERFORMANCE TEST / Engine Test

ENGINE COMPRESSION PRESSURE

- ZAXIS30, 35

Summary

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

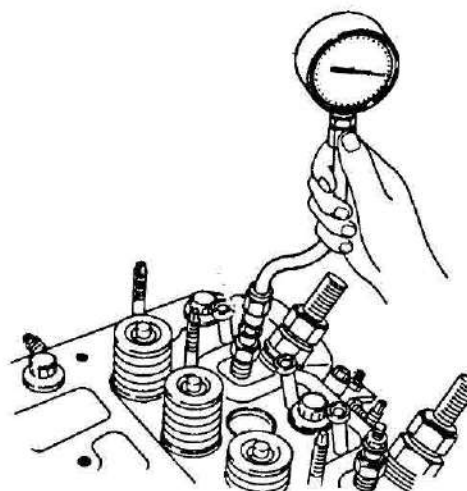
Preparation:

1. Confirm that valve clearances are correct.
2. Confirm that the batteries are charged completely.
3. Warm up the engine.



CAUTION: After warming up the engine, take care to measure the engine compression pressure without a burn.

4. After the engine stops, disconnect the air cleaner, muffler, and all the injection nozzles.
5. Connect the compression tester assembly (KUBOTA, Part No.: 07909-30208) and compression gauge to the injection nozzle mounting position. (Be sure to tighten them sufficiently to prevent air leakage.)



T571-04-02-001

Measurement:

1. Turn the starter to crank the engine. Record the compression pressure of each cylinder.
2. Repeat measurement three times and calculate the mean value.

Evaluation:

Refer to T4-2 Standard.

OPERATIONAL PERFORMANCE TEST / Excavator Test

TRACK REVOLUTION SPEED

Summary:

With the track raised off ground, measure the track revolution cycle time to check the total track drive system.

Preparation:

1. Adjust the track sag of both side tracks equally.
2. On the track to be measured, mark one shoe with chalk.

CAUTION: Support the lifted track securely with wooden blocks.

3. Swing the upperstructure 90° and lower the bucket to raise the track off ground. Keep the boom-arm angle between 90 to 110° as shown.

Measurement:

1. The test should be performed with each mode (slow and fast travel speeds) in the fastidle speed.
2. Operate the travel control lever of the raised track in the full forward or reverse stroke.
3. Measure the time required for 3 revolutions of shoe in both directions.
4. Raise the other track and repeat the procedures.
5. Repeat steps (2) and (4) three times for each track and calculate the mean values.

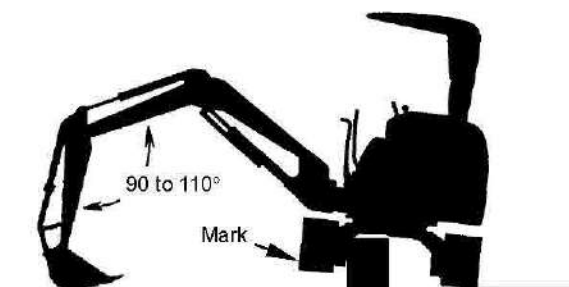
Evaluation:

Refer to T4-2 Operational Performance Standard.

NOTE: The measured values may vary widely. The evaluation based on the results obtained from the 20 m (65.5 ft) travel speed check is more recommendable.

Remedy:

Refer to T5-2 "Troubleshooting A".

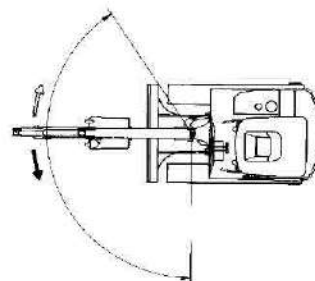


T570-06-03-009

OPERATIONAL PERFORMANCE TEST / Excavator Test

- 1-4. When measuring the boom swing cylinder:
Set the boom swing cylinder in either the right or left swing stroke end position.

Boom Swing Cylinder



- 1-5. When measuring the blade cylinder:
(ZAXIS18 only: The blade/adjustable track selector switch is turned to the OFF position.)
Lower the bucket to the ground to raise the machine front off the ground and secure the height space to allow the blade to move up-and-down full stroke.

Blade Cylinder

T523-06-03-006

2. Maintain hydraulic oil temperature at 50 ± 5 °C (122 ± 9 °F).

Measurement:

1. Run engine at fast idle speed.
Operate each cylinder as follows:
(The cylinder stroke excludes the cushion range.)
 - 1-1. Measure the boom cylinder.
Measure the time required to raise or lower the boom while operating the boom control lever full stroke.



T570-06-03-007

TROUBLESHOOTING / Troubleshooting A

Faulty starter.

Faulty harness between battery and starter, or incorrect connection.

YES
Faulty harness between starter relay and fusible link or faulty key switch.

NO
Faulty fusible link b.

Faulty starter relay.

Faulty harness between terminal #1 on starter relay and terminal S on starter.

Faulty battery.

Measure voltage at terminals #1 and #3 on starter relay.

· Key switch : START

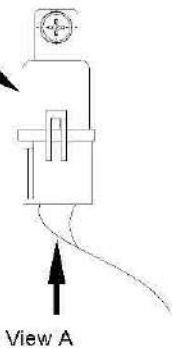
Voltage at terminal
#1: 0 V
#3: 0 V

Check if fusible link b (65 A) (Red wire) is normal (not blown).
· Visual Inspection

Voltage at terminal
#1: 0 V
#3: 12 V

Voltage at terminal
#1: 12 V
#3: 12 V

Starter Relay



Connector (View A)



T57S-05-02-001