

INTRODUCTION

TO THE READER

- This manual is written for an experienced technician to provide technical information needed to maintain and repair this machine.
- Be sure to thoroughly read this manual for correct product information and service procedures.
- If you have any questions or comments, at if you found any errors regarding the contents of this manual, please contact using "Service Manual Revision Request Form" at the end of this manual.
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ADDITIONAL REFERENCES

- Please refer to the materials listed below in addition to this manual.
 - The Operator's Manual
 - The Parts Catalog
- Operation Manual of the Engine
- Parts Catalog of the Engine
- Hitachi Training Material

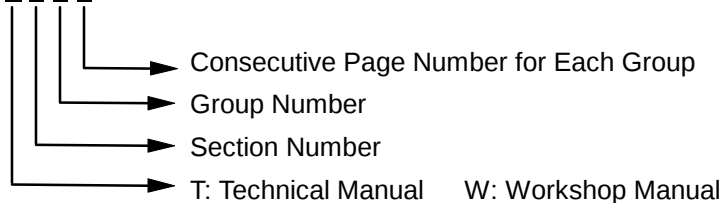
MANUAL COMPOSITION

- This manual consists of two portions:
the Technical Manual and the Workshop Manual.
Use the manuals according to purpose.
- Information included in the Technical Manual:
technical information needed for redelivery and delivery, operation and activation of all devices and systems, operational performance tests, and troubleshooting procedures.
- Information included in the Workshop Manual:
technical information needed for maintenance and repair of the machine, tools and devices needed for maintenance and repair, maintenance standards, and removal/installation and assemble/disassemble procedures.

PAGE NUMBER

- Each page has a number, located on the center lower part of the page, and each number contains the following information:

Example : T 1-3-5



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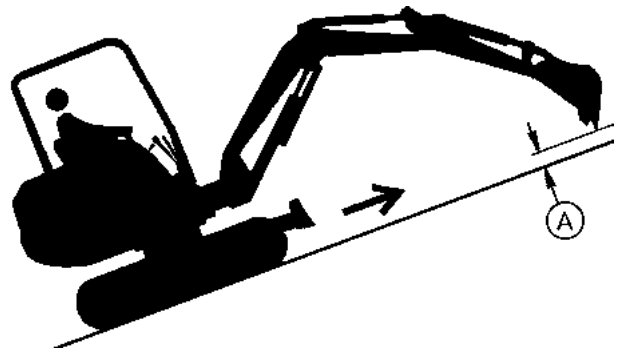
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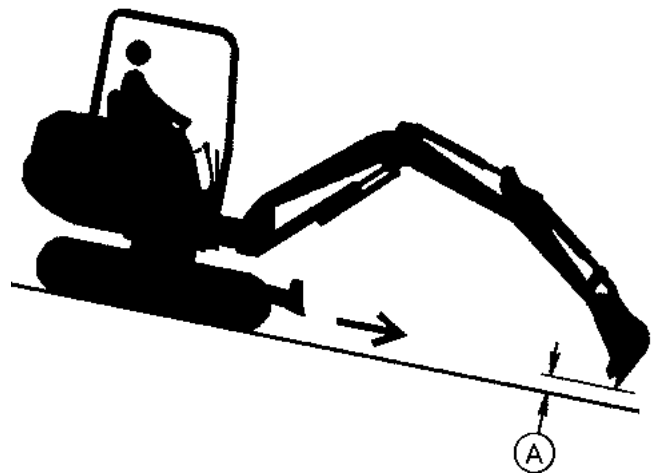
SAFETY

DRIVE MACHINE SAFELY

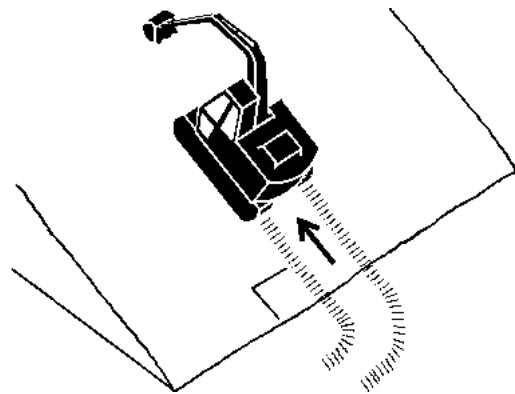
- Before driving the machine, always confirm that the travel levers/pedals direction corresponds to the direction you wish to drive.
- Be sure to detour around any obstructions.
- Avoid traveling over obstructions. Soil, fragments of rocks, and/or metal pieces may scatter around the machine. Don't allow personnel to stay around the machine while traveling.
- Driving on a slope may cause the machine to slip or overturn, possibly resulting in serious injury or death.
- When driving up or down a slope, keep the bucket facing the direction of travel, approximately 200 to 300 mm (A) above the ground.
- If the machine starts to skid or becomes unstable, immediately lower the bucket to the ground and stop traveling.



SA-663

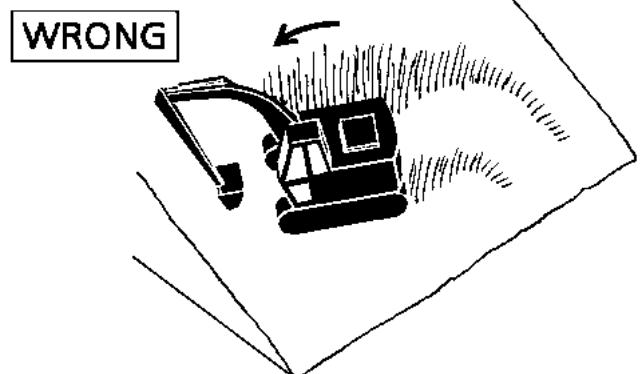


SA-664



SA-441

- Driving across the face of a slope or steering on a slope may cause the machine to skid or turnover. If the direction must be changed, move the machine to level ground, then, change the direction to ensure safe operation.



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SA-589

SAFETY

PREVENT PARTS FROM FLYING

- Grease in the track adjuster is under high pressure. Failure to follow the precautions below may result in serious injury, blindness, or death.
 - Do not attempt to remove GREASE FITTING or VALVE ASSEMBLY.
 - As pieces may fly off, be sure to keep body and face away from valve.
- Travel reduction gears are under pressure.
 - As pieces may fly off, be sure to keep body and face away from AIR RELEASE PLUG to avoid injury. GEAR OIL is hot.
 - Wait for GEAR OIL to cool, then gradually loosen AIR RELEASE PLUG to release pressure.

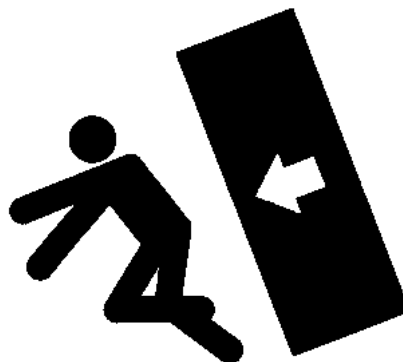


SA-344

503-E01B-0344

STORE ATTACHMENTS SAFELY

- Stored attachments such as buckets, hydraulic hammers, and blades can fall and cause serious injury or death.
- Securely store attachments and implements to prevent falling. Keep children and bystanders away from storage areas.



SA-034

504-E01A-0034

USE TOOLS PROPERLY

- Use tools appropriate for the work to be done.
 - Makeshift tools, parts, and procedures can create safety hazards.
 - For loosening and tightening hardware, use the correct size tools to avoid injury caused by slipping wrenches.
 - Use only recommended replacement parts. (See the parts catalog.)



S522-E01A-0040

SA-040

SECTION AND GROUP CONTENTS

TECHNICAL MANUAL

All information, illustrations and specifications in this manual are based on the latest product information available at the time of publication. The right is reserved to make changes at any time without notice.

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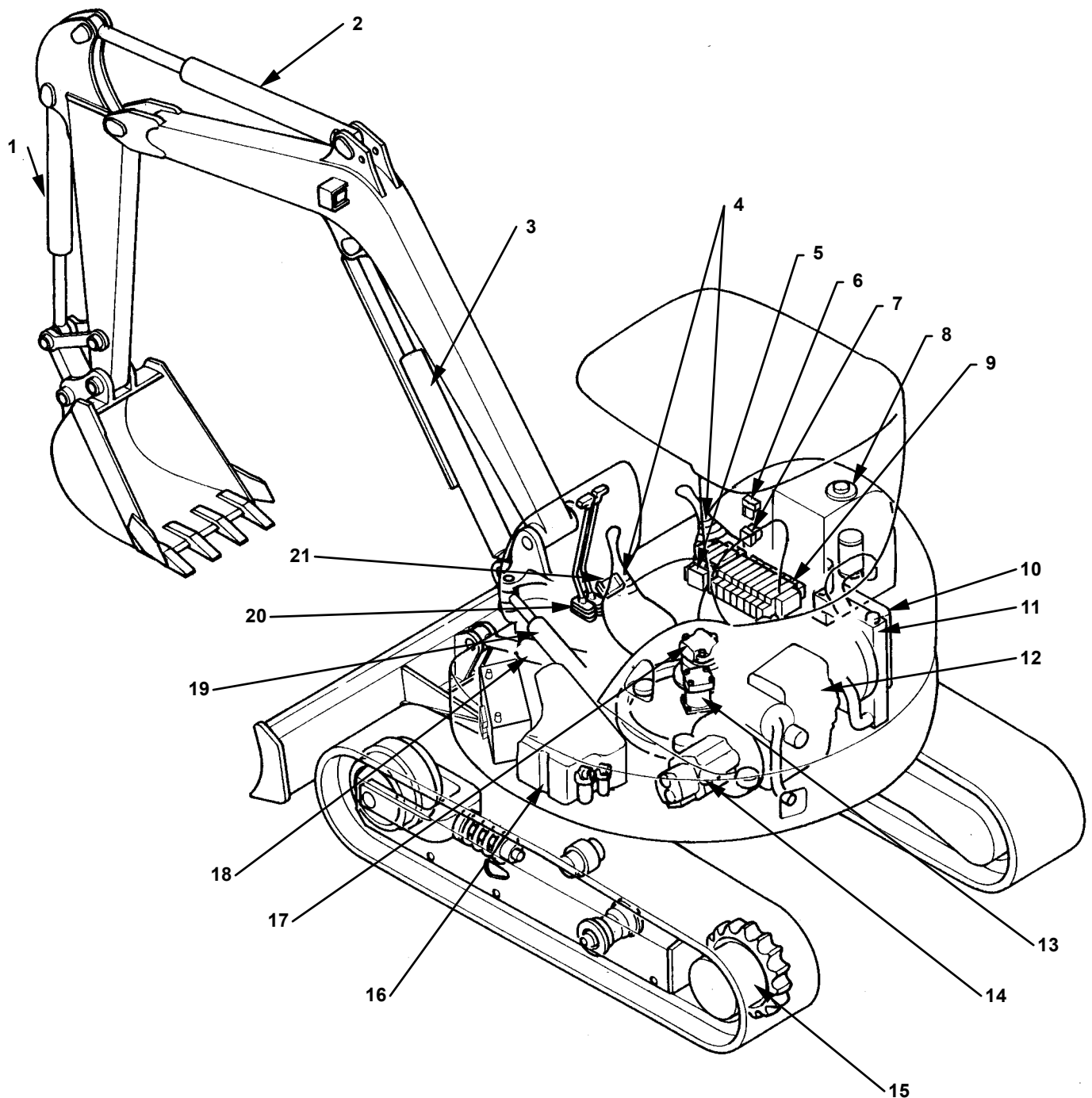
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Tokyo, Japan

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GENERAL / Component Layout

MAIN COMPONENTS



T1LA-01-02-001

- | | | | |
|--|------------------------|--------------------|-----------------------------|
| 1 - Bucket Cylinder | 7 - Solenoid Valve | 12 - Engine | 17 - Swing Device |
| 2 - Arm Cylinder | 8 - Hydraulic Oil Tank | 13 - Center Joint | 18 - Blade Cylinder |
| 3 - Boom Cylinder | 9 - Control Valve | 14 - Pump Device | 19 - Boom Swing Cylinder |
| 4 - Front Attachment / Swing Pilot Valve | 10 - Oil Cooler | 15 - Travel Device | 20 - Travel Pilot Valve |
| 5 - Blade Pilot Valve | 11 - Radiator | 16 - Fuel Tank | 21 - Boom Swing Pilot Valve |
| 6 - Pilot Filter | | | |

GENERAL / Component Specifications

SWING MOTOR

27U

Model MSG-27P-16
Type Swash-Plate Type, Fixed Displacement Axial Plunger Motor

30U

Model MSG-27P-16
Type Swash-Plate Type, Fixed Displacement Axial Plunger Motor

35U

Model MSG-27P-16
Type Swash-Plate Type, Fixed Displacement Axial Plunger Motor

SWING VALVE UNIT

27U

Type Non Counterbalance Valve Type
Relief Set-Pressure 19.5 MPa (200 kgf/cm², 2840 psi) at 16 L/min

30U

Type Non Counterbalance Valve Type
Relief Set-Pressure 13.7 MPa (140 kgf/cm², 1990 psi) at 26 L/min

35U

Type Non Counterbalance Valve Type
Relief Set-Pressure 16.2 MPa (165 kgf/cm², 2350 psi) at 26 L/min

SWING PARKING BRAKE

27U

Type Single-Disc-Wet Negative Type
Release Pressure (Full Stroke)..... 1.5 to 2.3 MPa (12 to 23 kgf/cm², 170 to 327 psi)

30U

Type Single -Disc-Wet Negative Type
Release Pressure (Full Stroke)..... 1.5 to 2.3 MPa (12 to 23 kgf/cm², 170 to 327 psi)

35U

Type Single -Disc-Wet Negative Type
Release Pressure (Full Stroke)..... 1.5 to 2.3 MPa (12 to 23 kgf/cm², 170 to 327 psi)

SYSTEM / Hydraulic System

OUTLINE

The hydraulic system consists of the main circuit and pilot circuit.

Pilot Circuit:

Supplies pressure oil from the pilot pump into the operation circuit, valve control circuit and travel speed changeover circuit.

Main Circuit:

Controls pressure oil from the main pump by the control valve to actuate the cylinders and motors.

SYSTEM / Electrical System

OUTLINE

The electrical system is roughly classified into the main circuit and the monitor circuit.

- Main Circuit
Operates the engine and accessory circuits.
- Monitor Circuit
Consists of the monitors, sensors, and switches to display machine operating conditions.

The main functions and construction of the main circuit are outlined here:

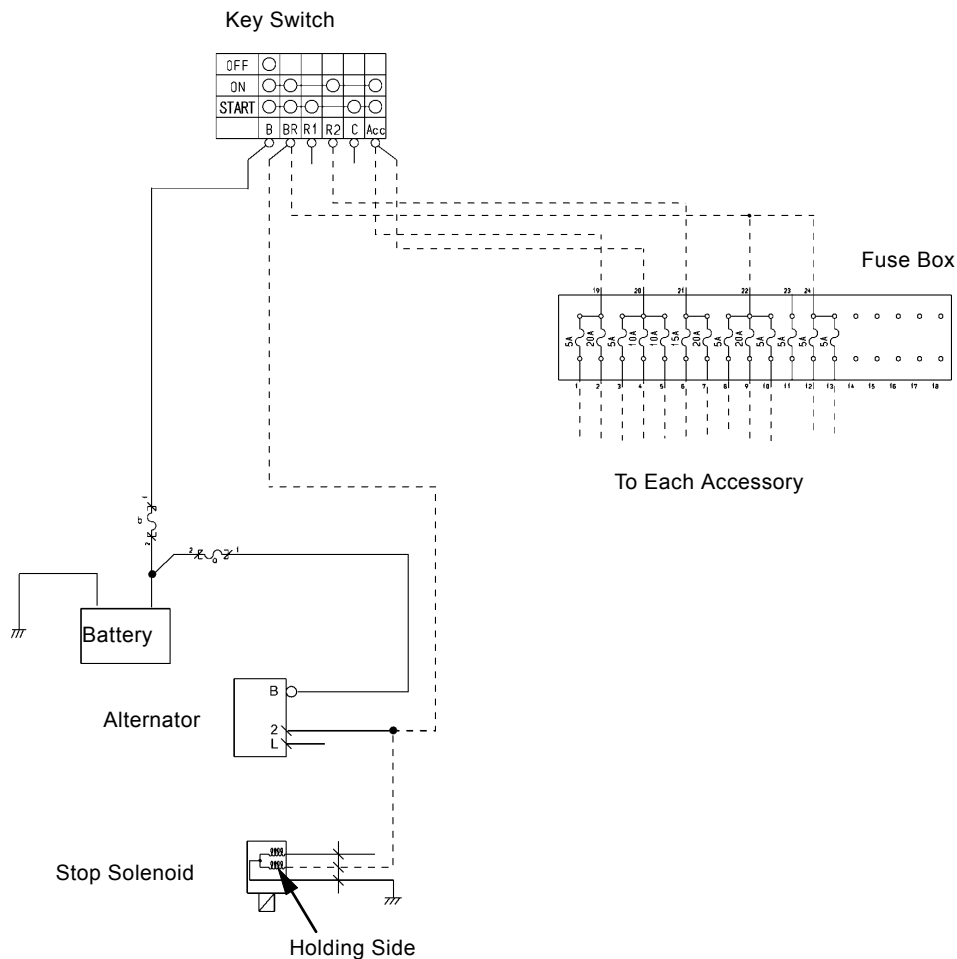
- Power Circuit: Supplies electrical power to all electrical systems on the machine.
(including key switch, battery, fuse box and fusible links)
- Indicator Light Check Circuit: Checks for burned monitor indicators.
(including key switch, fuse box and controller)
- Accessory Circuit: Works with the key switch ON.
(including key switch and fuse box)
- Preheating Circuit: Helps start the engine in cold weather.
(including key switch, QOS sensor, glow timer, glow relay and glow plugs)
- Engine Starting Circuit: Starts the engine.
(including key switch, starter and starter relay 1)
- Charging Circuit: Supplies all electric power to onboard systems and recharges the batteries.
(including alternator and battery)
- Engine Stop Circuit: Stops the engine with the stop solenoid.
(including stop solenoid and alternator)

SYSTEM / Electrical System

ENGINE STOP CIRCUIT (KEY SWITCH OFF)

1. When the key switch is turned from the ON position to the OFF position, key switch terminal B is disconnected from terminals BR, R2 and ACC in the key switch.
2. Current to the accessories from key switch terminal R2 and ACC is stopped.
3. Current to the holding side of the stop solenoid from key switch terminal BR is stopped, deactivating the stop solenoid. Then, the fuel cut lever is moved by spring force to the fuel cut position. Therefore, the fuel isn't supplied, causing the engine to stop.

 **NOTE:** Surge voltage to be developed when stopping the engine doesn't arise because the alternator generation circuit is directly connected to the battery. (The batteries function as a condenser.)



T1LA-02-02-006

COMPONENT OPERATION / Pump Device

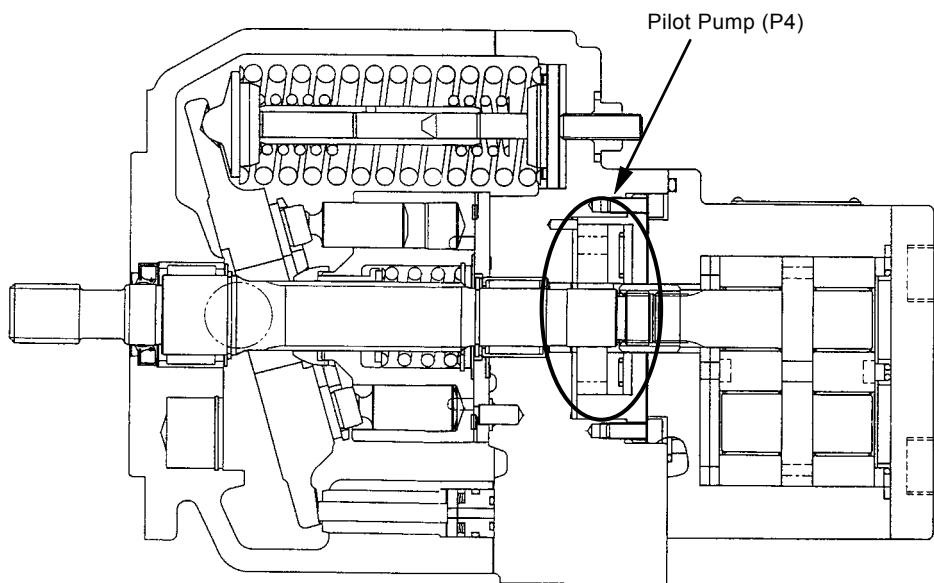
PILOT PUMP (P4) (27U)

The inner rotor is splined to the shaft, and engages the outer rotor.

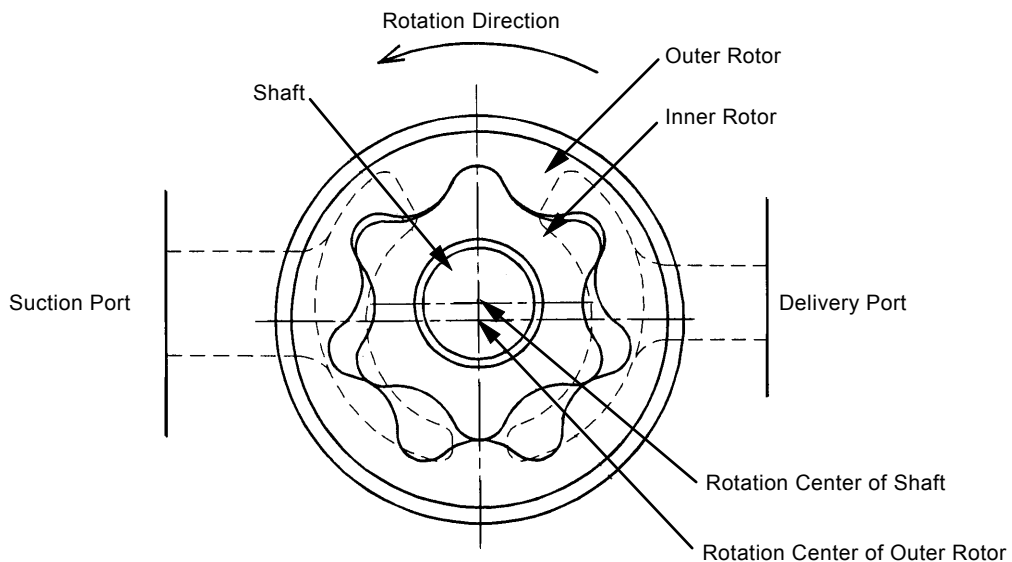
The engine rotation drives the shaft directly, and it rotates the inner rotor. When the inner rotor rotates, the outer rotor also rotates.

The rotational center of outer rotor is eccentric to the rotation center of the shaft.

Thereby, the hydraulic oil from the suction port fills the spaces between the rotors, then discharges through the delivery ports.



T574-03-01-001



T571-03-01-004

COMPONENT OPERATION / Swing Device

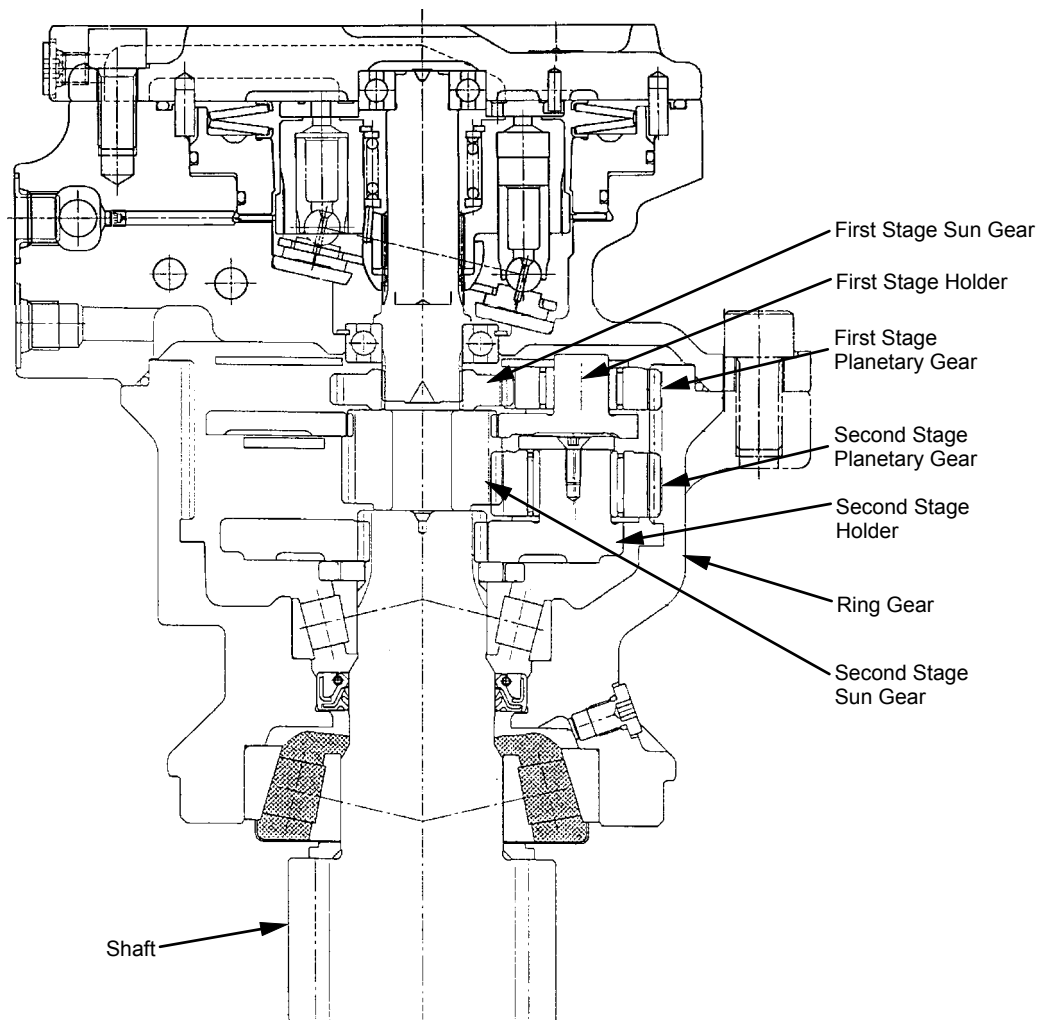
- 30U, 35U

The swing reduction gear is a two-stage planetary-gear reduction type.

The swing motor rotation force is transmitted to the first stage sun gear.

The rotation of first stage sun gear is reduced by the first stage planetary gear and the ring gear and is transmitted to the second stage sun gear via the first stage holder.

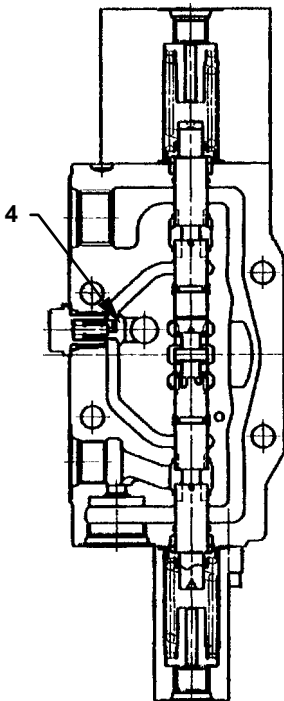
The rotation of the second stage sun gear is reduced by the second stage planetary gear and ring gear and rotates the shaft via the second stage holder.



T575-03-02-001

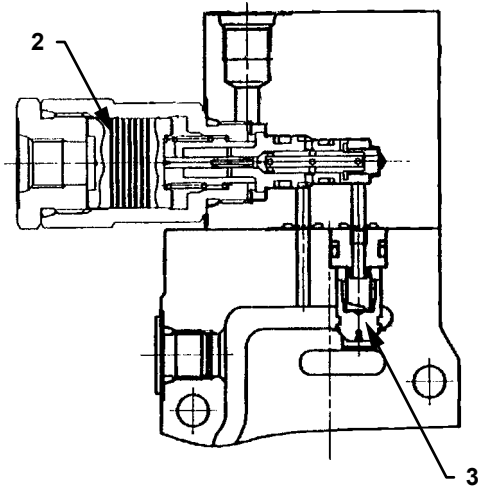
COMPONENT OPERATION / Control Valve

Section L (Boom)



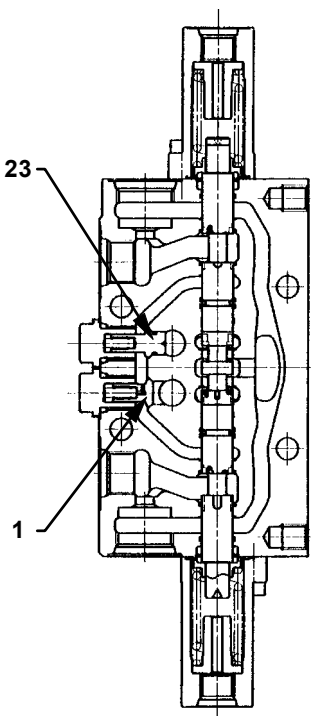
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Section K-K



T1LA-03-03-023

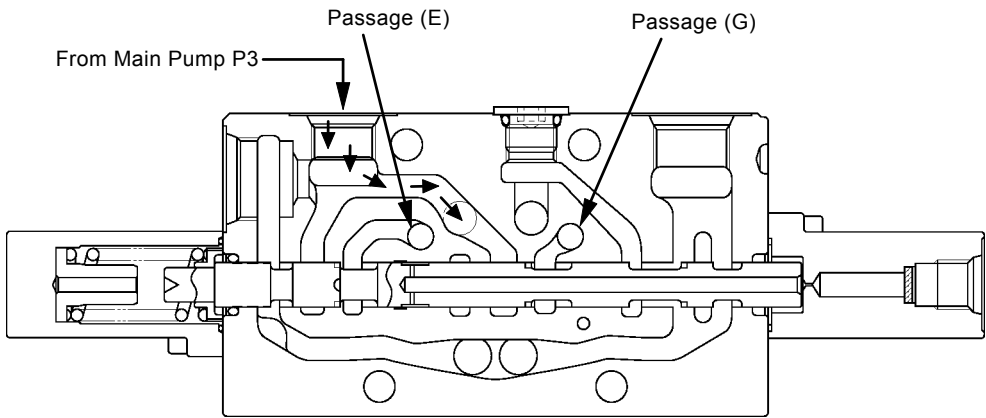
Section M (Bucket)



T1LA-03-03-024

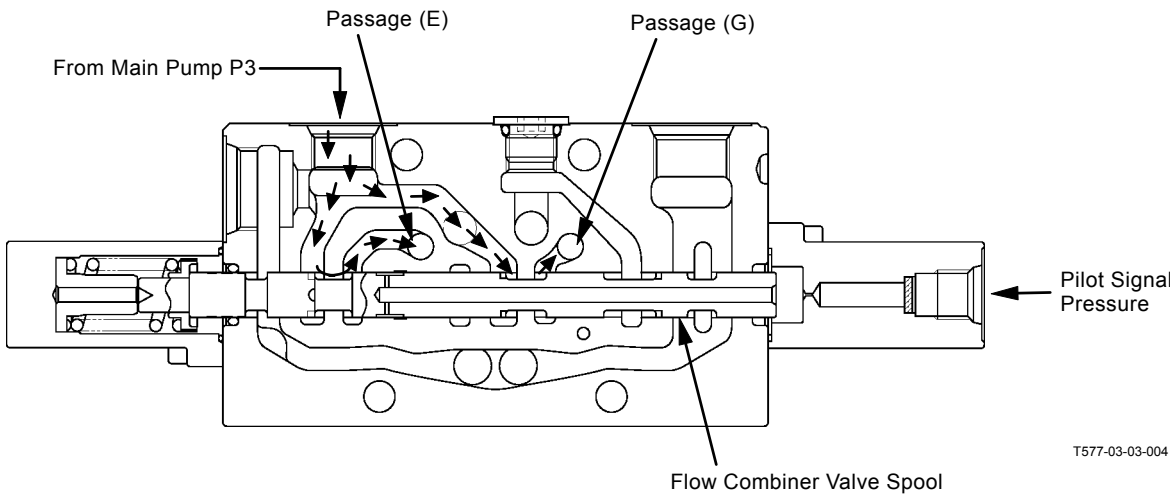
COMPONENT OPERATION / Control Valve

Flow Combiner Valve in Neutral



T577-03-03-003

Flow Combiner Valve When Operated



T577-03-03-004

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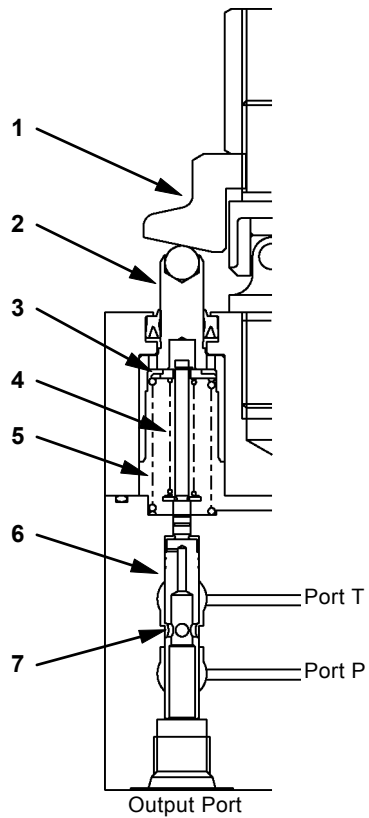
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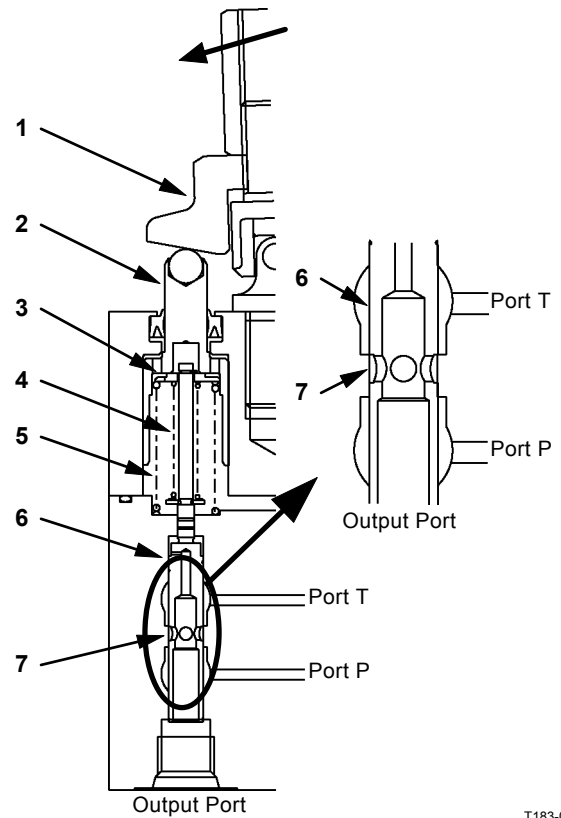
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COMPONENT OPERATION / Pilot Valve



T183-03-04-002



T183-03-04-004

1 - Cam
2 - Pusher

3 - Spring Guide
4 - Balance Spring

5 - Return Spring
6 - Spool

7 - Hole

COMPONENT OPERATION / Travel Device

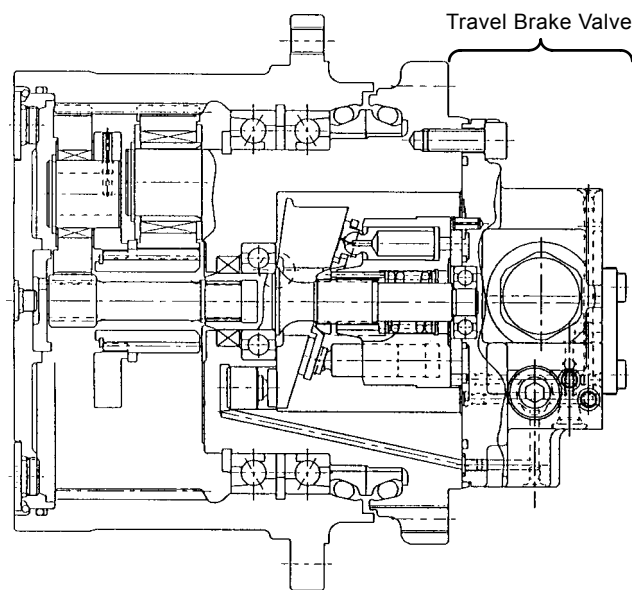
TRAVEL BRAKE VALVE

27U:

The travel brake valve consists of counterbalance valve, and travel speed changeover valve.

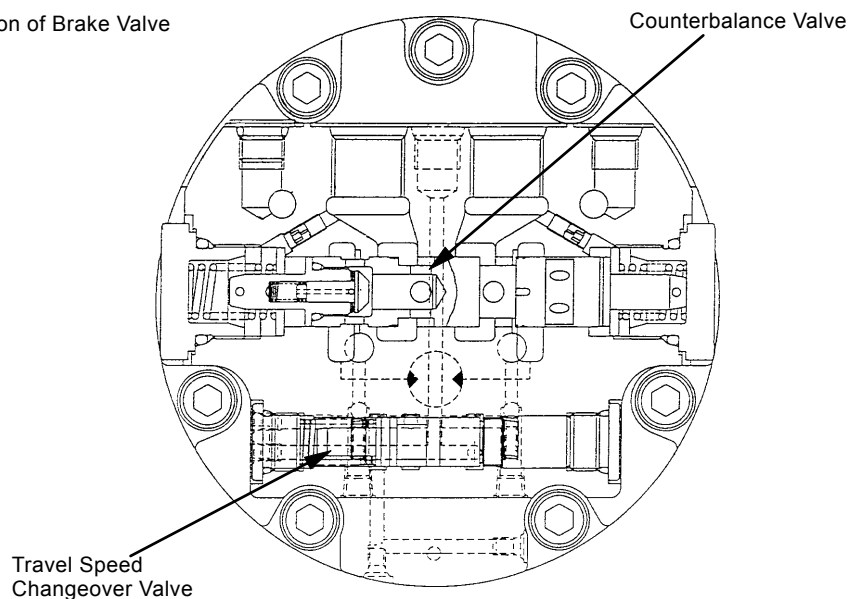
The counterbalance valve has two functions; one is to start and stop the travel smoothly, and the other is to prevent the machine from running away while descending slopes.

The travel speed changeover valve is switched by pressure oil from the travel speed changeover solenoid valve. It switches the travel speed by the control piston.



T574-03-05-001

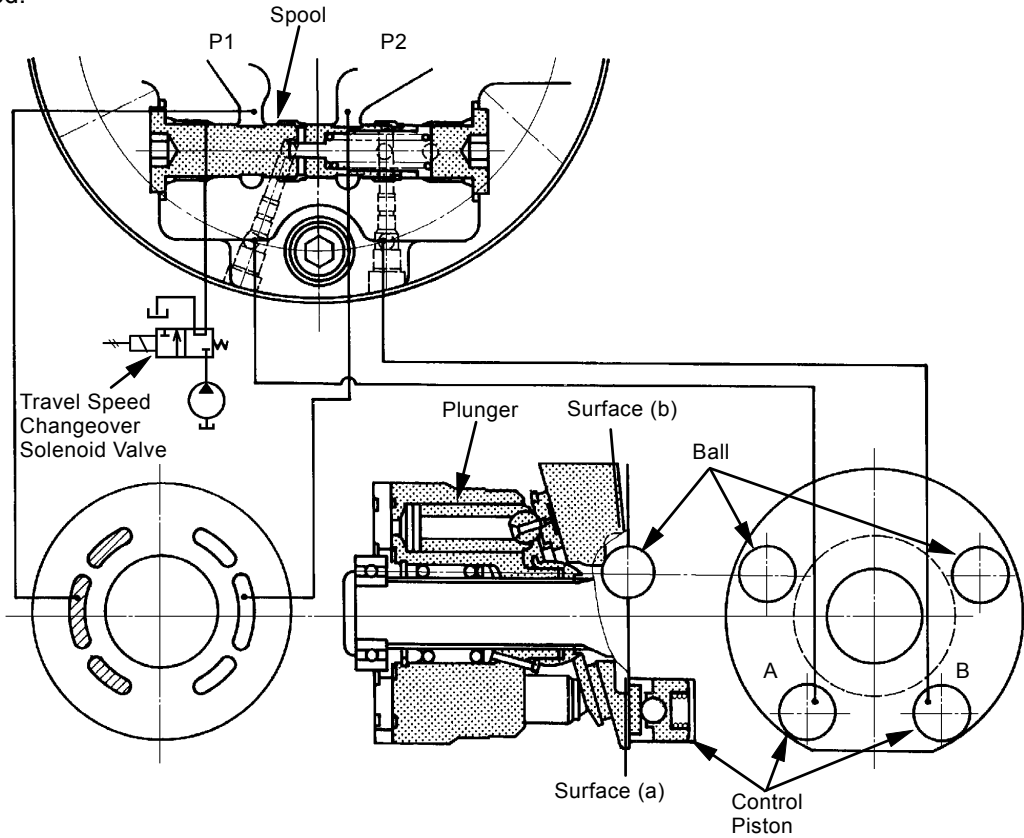
Section of Brake Valve



T571-03-05-006

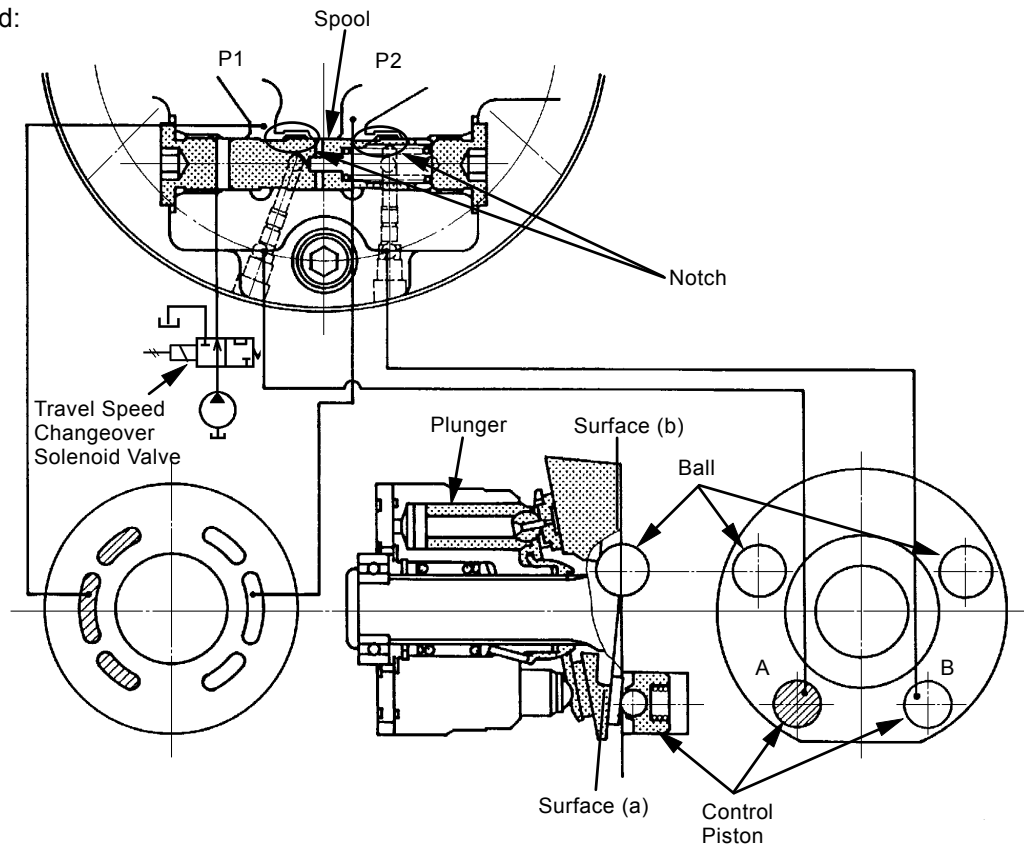
COMPONENT OPERATION / Travel Device

At Slow Speed:



T565-03-05-005

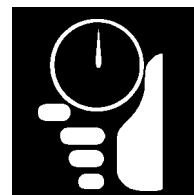
At Fast Speed:



T565-03-05-006

SECTION 4

OPERATIONAL PERFORMANCE TEST



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Swing Motor Drainage	T4-5-12
Travel Motor Drainage	T4-5-14

OPERATIONAL PERFORMANCE TEST / Engine Test

VALVE CLEARANCE

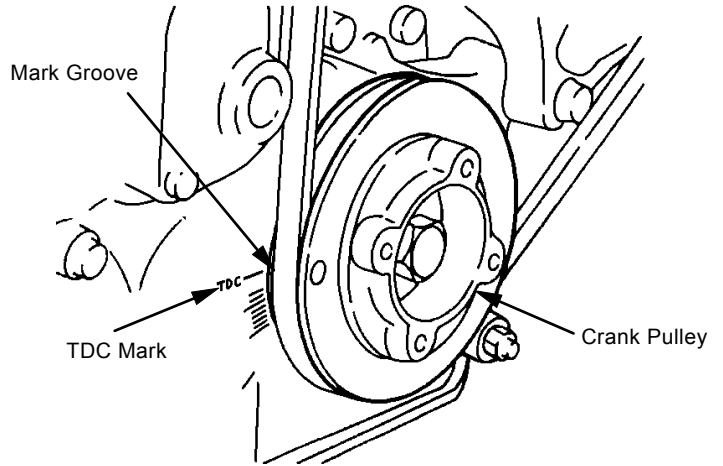
Summary:

1. Perform the measurement when the engine is cold.
2. Before removing the head cover, clean the area around the head cover to prevent the entry of dust into the engine.

Preparation:

1. Remove the head cover.
 2. Locate the top dead center (TDC) in the compression stroke. Align "Mark Groove" on crank pulley with "TDC Mark" on timing gear case cover.
- In this position, cylinder No.1 is at the top dead center in the compression stroke.

 **NOTE:** The flywheel can be easily turned after the glow plugs are removed.



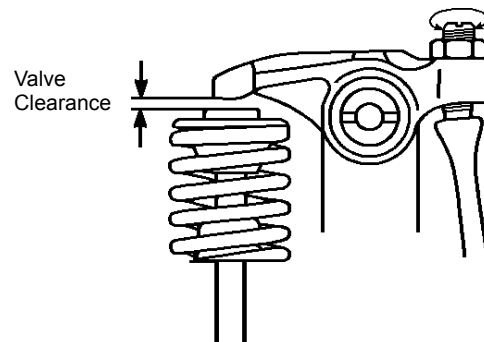
T533-06-02-001

Measurement:

1. Measure the valve clearance between the rocker arm and valve.
2. When the measurement is started from cylinder No.1, measure the clearances of valves marked (○) in the table below.

Cylinder No.	1		2		3	
	I	E	I	E	I	E
Cylinder No.1 at top dead center	○	○	○			○
Cylinder No.1 at overlap				×	×	

3. Turn flywheel 360°, then measure the valve clearances marked (×) in the above table.



T532-06-02-001

Evaluation:

Refer to T4-2 Operational Performance Standard.

Adjustment:

If the measured value is not within specification, loosen the lock nut and adjust valve clearance by turning the adjusting bolt, then tighten lock nut.

OPERATIONAL PERFORMANCE TEST / Excavator Test

SWING MOTOR LEAKAGE

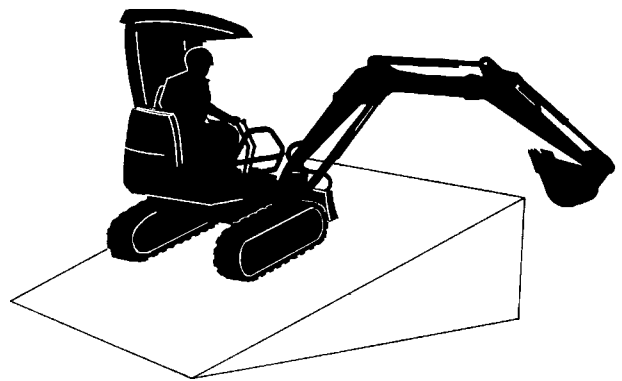
Summary:

To check swing parking brake performance, measure the upperstructure drift after parking the machine on a slope with the upperstructure positioned 90° to the slope.

(Mechanical brake for swing parking is installed on swing device.)

Preparation:

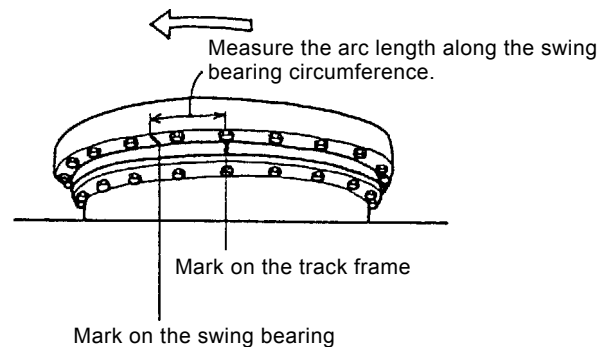
1. Check the lubrication of swing gear and swing bearing.
2. Load the bucket with either soil or a weight equivalent to the weight standard.
With: 27U: 120 kg (265 lb)
30U: 120 kg (298 lb)
35U: 165 kg (364 lb)
3. With the arm rolled out and bucket rolled in, hold the bucket so that the height of bucket pin is even with the boom foot pin.
4. Park the machine on a flat slope with a gradient of $15 \pm 1^\circ$.
5. Climb the slope, then swing the upperstructure 90° toward the slope. Make aligning marks on the swing bearing circumference and track frame.
6. Maintain the hydraulic oil temperature at $50 \pm 5^\circ\text{C}$ ($122 \pm 9^\circ\text{F}$).



T570-06-03-006

Measurement:

1. Start the engine and maintain engine speed at idle speed. After 5 minutes, measure the difference between the marks on the swing bearing circumference and the track frame.
2. Perform the measurement under the following two conditions:
 - When the brake is applied(with the pilot control shut-off lever in the LOCK position).
 - When the brake is released(with the pilot control shut-off lever in the UNLOCK position).
3. Perform the measurement on both right and left swing directions.
4. Perform the measurement three times in each direction and calculate the average values.



T105-06-03-010

Evaluation:

Refer to T4-2 Operational Performance Standard.

Remedy:

Refer to T5-2 "Troubleshooting A".

OPERATIONAL PERFORMANCE TEST / Component Test

PRIMARY PILOT PRESSURE

Preparation:

1. Stop the engine.
2. Turn the filling cap on hydraulic oil tank to bleed air.
3. Disconnect the hose (PF 3/8) at the pilot filter. Install pressure gauge assembly (ST 6932) with tee (ST 6639) and adapter (ST 6069) to the pilot filter.
🔧 : 22 mm
4. Start the engine and check for oil leakage from the gauge connection.
5. Maintain the hydraulic oil temperature at 50 ± 5 °C (122 ± 9 °F).

Measurement:

1. Run engine at fastidle speed.
2. Measure the pressure without load.
3. Perform the measurement three times and calculate the average value.

Evaluation:

Refer to T4-2 Operational Performance Standard.

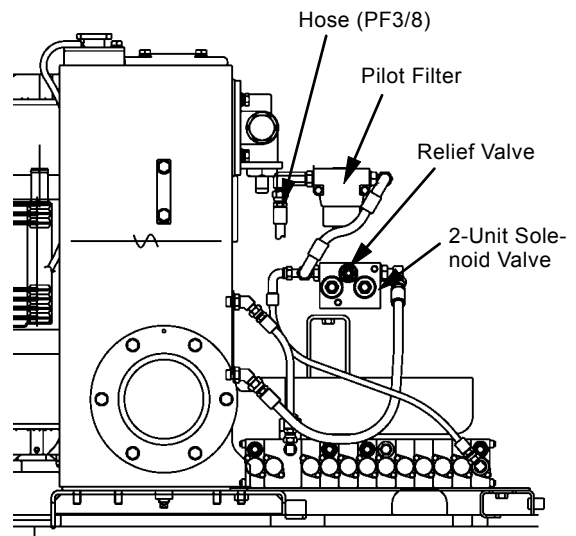
Adjustment:

Adjustment the relief valve on 2-unit solenoid valve if necessary.

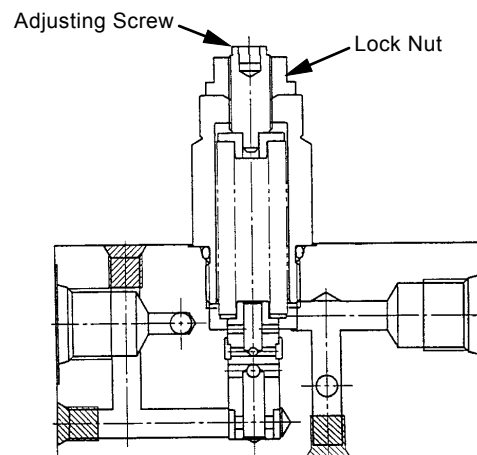
1. Loosen the lock nut.
2. Turn the adjusting screw to adjust the pressure.
🔧 : 5 mm
3. Tighten the lock nut.
🔧 : 17 mm
🔧 : 20 to 29 N·m (2 to 3 kgf·m, 14 to 22 lbf·ft)
4. After completing the adjustment, recheck the set pressure.

📎 **NOTE:** Standard change in pressure.

Screw Turns		1/4	1/2	3/4	1
Change in Relief Pressure	kPa	147	294	441	588
	(kgf/cm ²)	(1.5)	(3)	(4.5)	(6)
	(psi)	(21)	(43)	(64)	(85)



T1LA-04-04-001



T574-03-06-002

OPERATIONAL PERFORMANCE TEST / Component Test

(Blank)

TROUBLESHOOTING / Diagnosing Procedure

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 three groups: Troubleshooting A (diagnosis of machine by symptom), Troubleshooting B (diagnosis of monitor) and Electric System Check.

- Troubleshooting A (diagnosis of machine by symptom)

This procedure is used when operating the diagnosis by the symptom.

Example: Starter does not rotate.

- Troubleshooting B (diagnosis of monitor)

This procedure is used when there are malfunction on components regarding monitor, such as gauges or indicators.

Example: Fuel gauge does not operate.

- Electric System Check

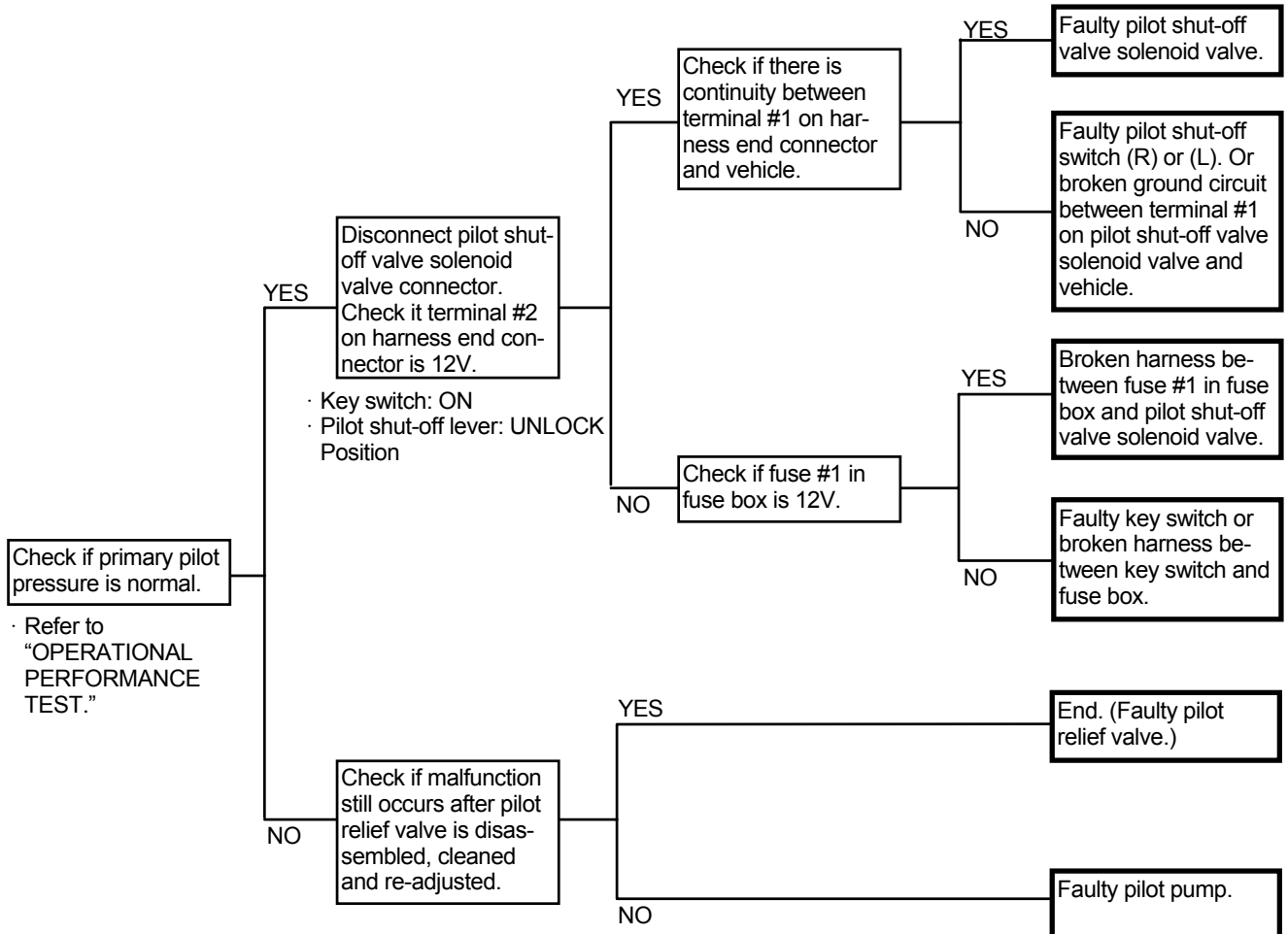
This procedure is used when the information on precaution for electric system inspection or inspection method is needed.

Example: Fuse inspection.

TROUBLESHOOTING / Troubleshooting A

All actuators do not work.

- As the main circuit consists of 3 systems (3 main relief valves are located), the possibility of failure in all main relief valve is small.



Connector

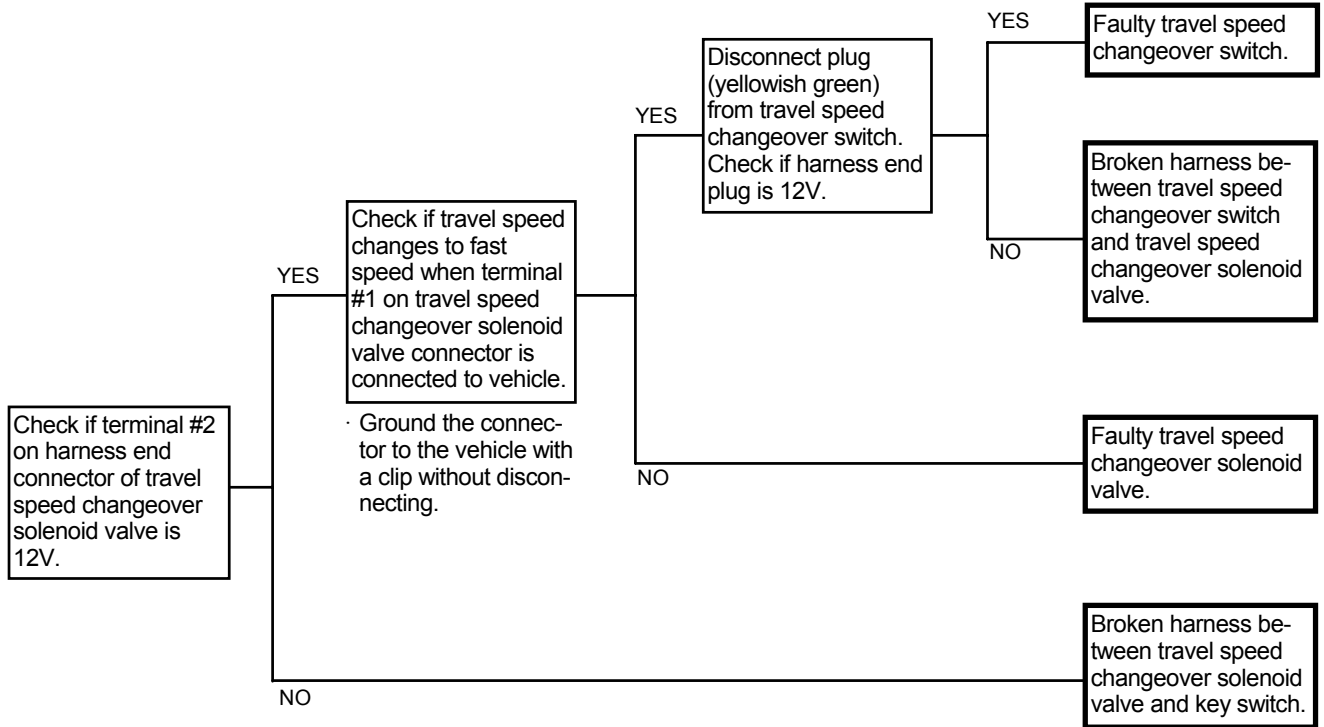
Pilot Shut-Off Switch
Pilot Shut-Off Valve Solenoid Valve



TROUBLESHOOTING / Troubleshooting A

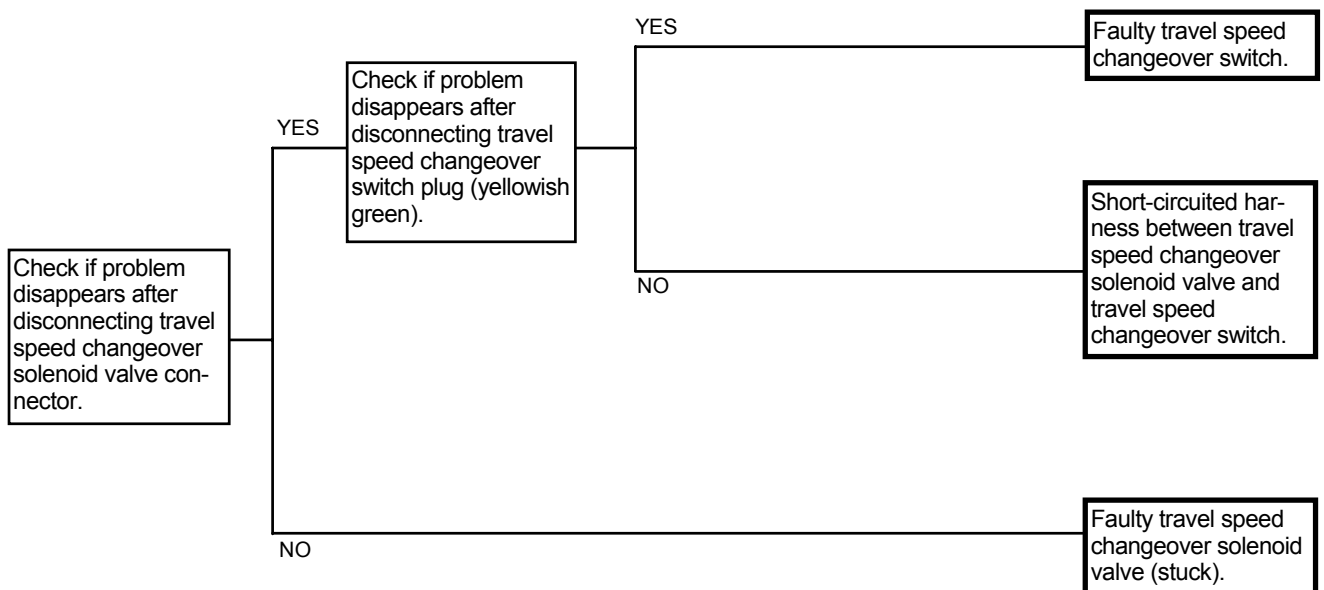
Travel speed does not change to the fast speed.

- Be sure to inspect connection prior to trouble shooting.

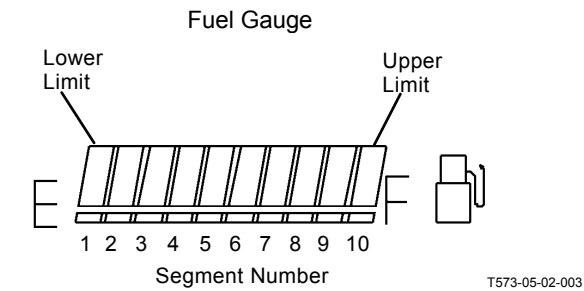
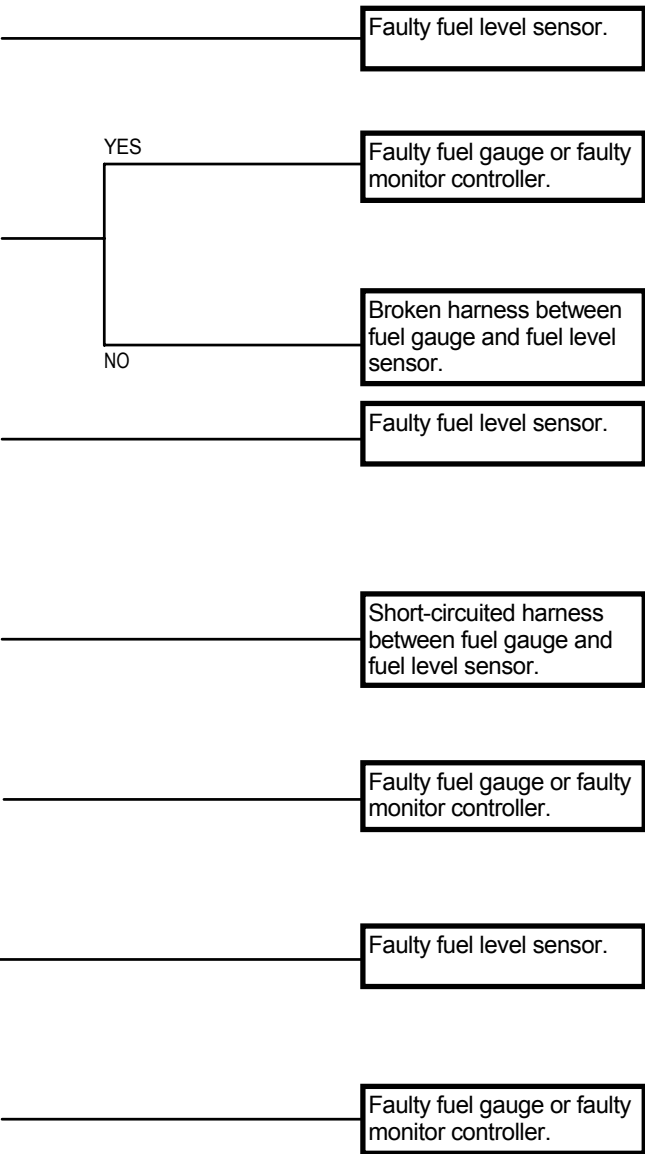


Travel speed does not change to the slow speed.

- Be sure to inspect connection prior to trouble shooting.



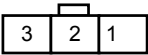
TROUBLESHOOTING / Troubleshooting B



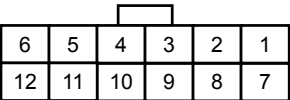
	Segment Number	Resistance (Ω)
F	10	13±2
	9	20±2
	8	27±2
	7	34±2
	6	40±2
	5	48±2
	4	56±2
	3	67±2
	2	79±2
E	1	

Connector

Fuel Level Sensor



Monitor Panel



TROUBLESHOOTING / Electrical System Inspection

FUSE CONTINUITY TEST

Fuse failure is often caused by a fine crack in the fuse, and such fine cracks are very hard to detect by visual inspection.

Checking fuse continuity with a tester is far superior to sight inspection.

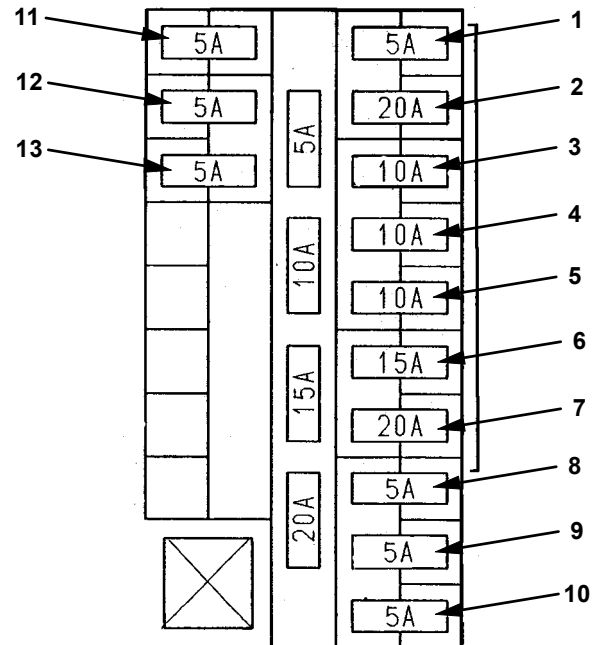
1. Turn the key switch ON

When key switch is turned ON, the power is supplied to all circuit from key switch R2 and Acc Terminal (Refer to Circuit Diagram).

2. Remove the fuse box cover and set the correct voltage measurement range of the tester.
(Measurement range: 0 to 14.5 V)

3. Connect the negative probe to the vehicle ground, and touch the outside terminal of each fuse with the positive probe of the tester.

When normal continuity of a fuse is intact, the tester will indicate 12 volts.



M1LA-07-011

Number	Capacity	Connected to
1	5 A	Pilot Shut-Off Valve Solenoid Valve
2	20 A	Light
3	5 A	Horn, Traval Speed Change over Solenoid Valve
4	10 A	Auxiliary
5	10 A	ENG. Electrical Component
6	15 A	Air Conditioner Wiper
7	20A	Air Conditioner Heater
8	5 A	Fuel Feed Pump
9	20A	Travel Alarm
10	5 A	Monitor
11	5 A	Radio Backup
12	5 A	Auto-Idle
13	5 A	Radio

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