

PART NO. TACG90-EN-00

HITACHI

Reliable solutions

Technical Manual

ZX20U-5B Hydraulic Excavator

ZX20U-5B HYDRAULIC EXCAVATOR TECHNICAL MANUAL

 **Hitachi Construction Machinery Co., Ltd.**

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

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TACG90-EN-00

Service Manual consists of the following separate Part No.
Technical Manual : Vol. No.TACG90-EN
Workshop Manual : Vol. No.WACG90-EN
Engine Manual : Vol. No.EACG-EN

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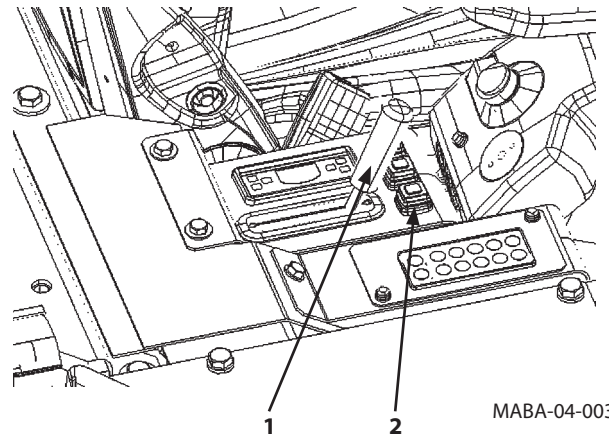
SAFETY

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 travel levers/pedals, pilot control shut-off lever 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 travel pedals during operation, resulting in serious injury or death.

SAFETY

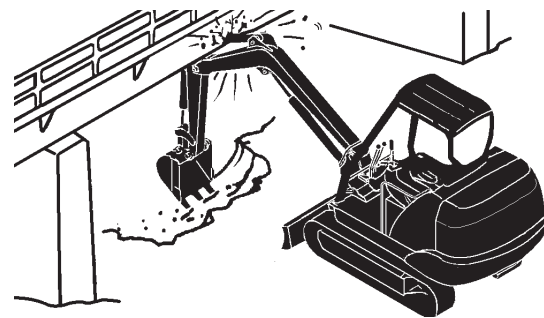
- When the machine descends a slope at high speed, machine weight accelerates descending speed. It may cause collision accident due to misjudging of braking distance or machine turnover due to running on an unexpected obstacle.
Before descending a slope, always ensure that engine control lever (1) is in the slow idle position, and then reduce the engine speed. Turn the travel mode switch (2) to slow speed for ZX26U-5A.
- Be sure to thoroughly warm up the machine before ascending steep slopes. If hydraulic oil has not warmed up sufficiently, sufficient performance may not be obtained.
- Use a signal person when moving, swinging or operating the machine in congested areas. Coordinate hand signals before starting the machine.
- Before moving machine, determine which way to move travel pedals/levers for the direction you want to go. When the travel motors are in the rear, pushing down on the front of the travel pedals or pushing the levers forward moves the machine forward, towards the idlers. An arrow-mark seal is stuck on the inside surface of the side frame to indicate the machine front direction.
- Select a travel route that is as flat as possible. Steer the machine as straight as possible, making small gradual changes in direction.
- Before traveling on them, check the strengths of bridges and road shoulders, and reinforce if necessary.
- Use wood plates in order not to damage the road surface. Be careful of steering when operating on asphalt roads in summer.
- When crossing train tracks, use wood plates in order not to damage them.
- Do not make contact with electric wires or bridges.
- When crossing a river, measure the depth of the river using the bucket, and cross slowly. Do not cross the river when the depth of the river is deeper than the upper edge of the upper roller.
- When traveling on rough terrain, reduce engine speed. Select slow travel speed. Slower speed will reduce possible damage to the machine.
- Avoid operations that may damage the track and undercarriage components.
- During freezing weather, always clean snow and ice from track shoes before loading and unloading machine, to prevent the machine from slipping.



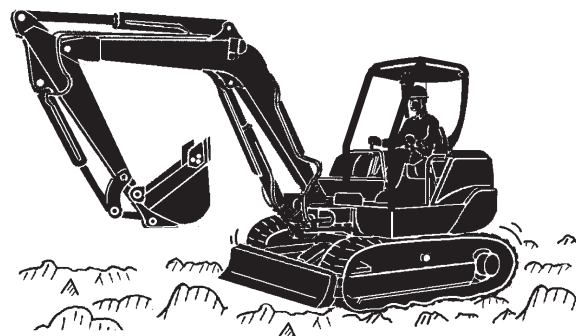
MABA-04-003



M104-05-008



SA-673



M586-05-002

SAFETY

Practice Safe Maintenance

To avoid accidents:

- Understand service procedures before starting 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.

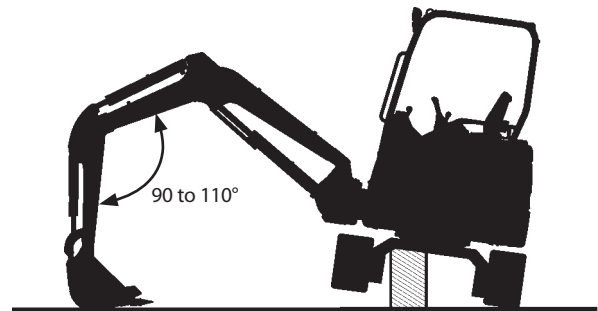
Before servicing the machine:

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 key 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 the 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.
- Inspect certain parts periodically and repair or replace as necessary. Refer to the section discussing that part in the "MAINTENANCE" chapter of operator's 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.
- When cleaning parts, always use nonflammable detergent oil. Never use highly flammable oil such as fuel oil and gasoline to clean parts or surfaces.
- Disconnect battery ground cable (–) before making adjustments to electrical systems or before performing welding on the machine.



SA-028



M1M7-04-006



SA-527

SAFETY

Avoid Heating Near Pressurized Fluid Lines

- Flammable spray can be generated by heating near pressurized fluid lines, resulting in severe burns to yourself and bystanders.
- Do not heat by welding, soldering, or using a torch near pressurized fluid lines or other flammable materials.
- Pressurized lines can be accidentally cut when heat goes beyond the immediate flame area. Install temporary fire-resistant guards to protect hoses or other materials before engaging in welding, soldering, etc..



SA-030

Avoid Applying Heat to Lines Containing Flammable Fluids

- Do not weld or flame cut pipes or tubes that contain flammable fluids.
- Clean them thoroughly with nonflammable solvent before welding or flame cutting them.

Precautions for Handling Accumulator (ZX26U-5A)

High-pressure nitrogen gas is sealed in the accumulator and the gas damper. Inappropriate handling may cause explosion, possibly resulting in serious injury or death.

Strictly comply with the following items:

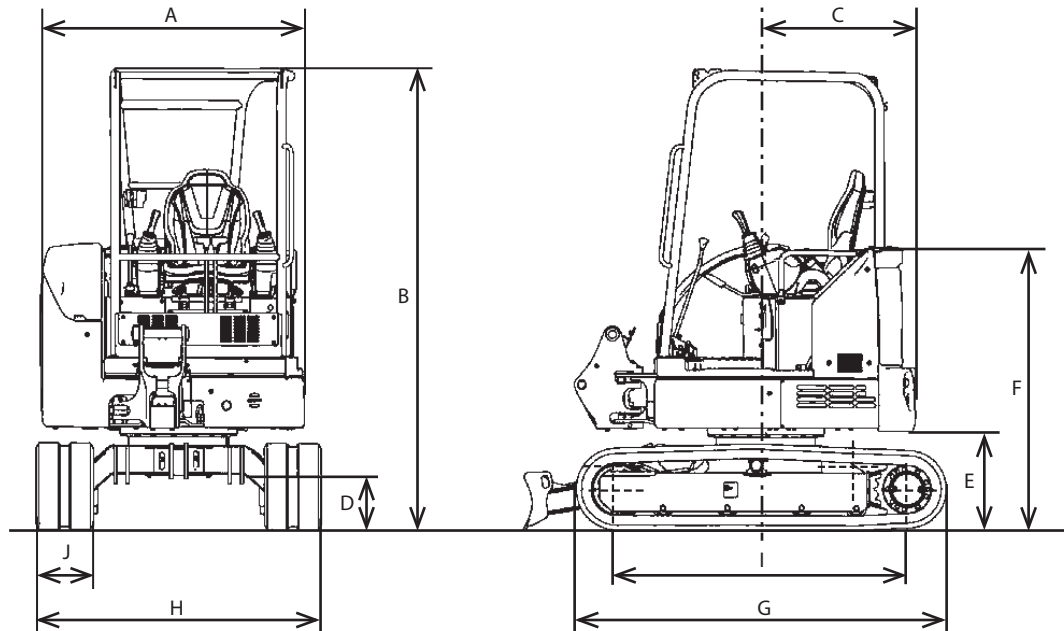
- Do not disassemble the unit.
- Keep the units away from open flames and fire.
- Do not attempt to bore a hole or cut by torch.
- Avoid giving shocks by hitting or rolling the unit.
- Before disposing the unit, sealed gas must be released. Consult your nearest Hitachi dealer.

SECTION 1 GENERAL

Group 1 Specifications

Specifications

ZX20U-5B



MABA-12-004

Model	ZX20U-5B	
Specification		4-Pillars Canopy
Type of Front-End Attachment	-	Boom Swing Type
Bucket Capacity (Heaped)	m ³ (yd ³)	0.070 (0.09)
Operating Weight	kg (lb)	2230 (4920)
Base Machine Weight	kg (lb)	1720 (3790)
Engine	kW/min ⁻¹ (PS/rpm)	3TNV80 12.8/2400 (17.4/2400)
A: Overall Width	mm (ft-in)	1390 (4' 7")
B: Overall Height	mm (ft-in)	2390 (7' 10")
C: Rear End Swing Radius	mm (ft-in)	740 (2' 5")
D: Minimum Ground Clearance	mm (ft-in)	290 (11")
E: Counterweight Clearance	mm (ft-in)	490 (1' 7")
F: Engine Cover Height	mm (ft-in)	1440 (4' 9")
G: Undercarriage Length	mm (ft-in)	1910 (6' 3")
H: Undercarriage Width	mm (ft-in)	1450 (4' 9")
I: Sprocket Center to Idler Center	mm (ft-in)	1500 (4' 11")
J: Track Shoe Width	mm (ft-in)	250 (10")
Ground Pressure	kPa (kgf/cm ² , psi)	24.2 (0.25, 3.5)
Swing Speed	min ⁻¹ (rpm)	9.2 (9.2)
Travel Speed (fast/slow)	km/h (mph)	4.4/2.6 (2.7/1.6)
Gradeability		25° (tan θ = 0.47)

NOTE:

- The dimensions do not include the height of the shoe lug. The dimensions of the machine equipped with rubber crawlers are shown.
- The specifications include additional counterweight and extra attachment lines.

SECTION 1 GENERAL
Group 3 Component Specifications

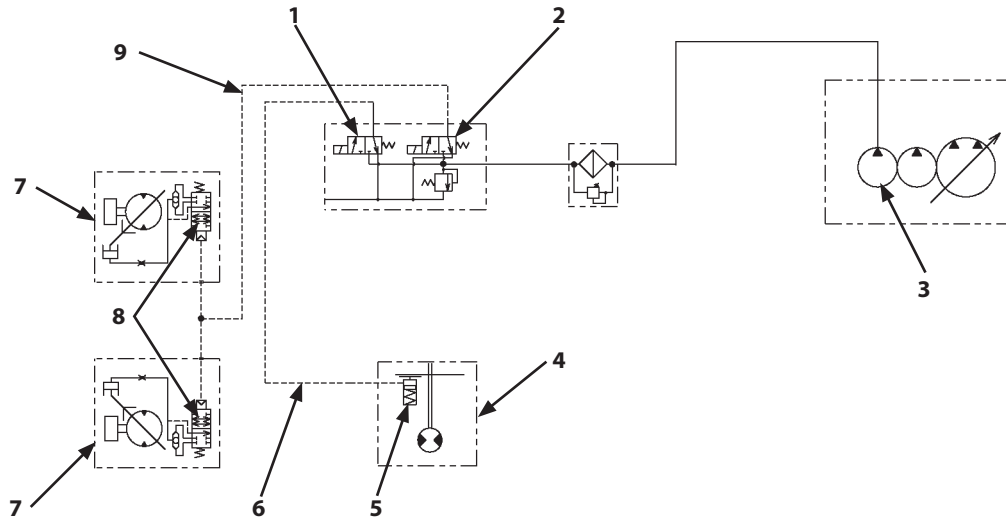
Engine

Model	3TNV80
Type	Diesel, 4-Cycle, Water-cooled, Vertical, Swirl Chamber Type
Cyl. No.- Bore × Stroke	3-80 mm × 84 mm (3.15 in × 3.31 in)
Piston Displacement	1266 cm ³ (77.2 in ³)
Rated Output	12.8 kW/2200 min ⁻¹ (17.4 PS/2200 rpm)
Compression Ratio	23.1
Dry Weight	120 ⁺⁵ ₀ kg (265 ⁺¹² ₀ lb)
Firing Order	1-3-2-1
Rotation Direction	Clockwise (Viewed from fan side)

MEMO

SECTION 2 SYSTEM

Group 1 Hydraulic System



TACD90-02-01-003

- | | | |
|---------------------------------------|--|--|
| 1- Pilot Shut-Off Solenoid Valve | 5- Swing Parking Brake | 9- Travel Motor Displacement Angle Control Circuit |
| 2- Travel Mode Control Solenoid Valve | 6- Swing Parking Brake Release Circuit | |
| 3- Pilot Pump | 7- Travel Motor | |
| 4- Swing Motor | 8- Travel Mode Selector Valve | |

SECTION 2 SYSTEM

Group 2 Electrical System

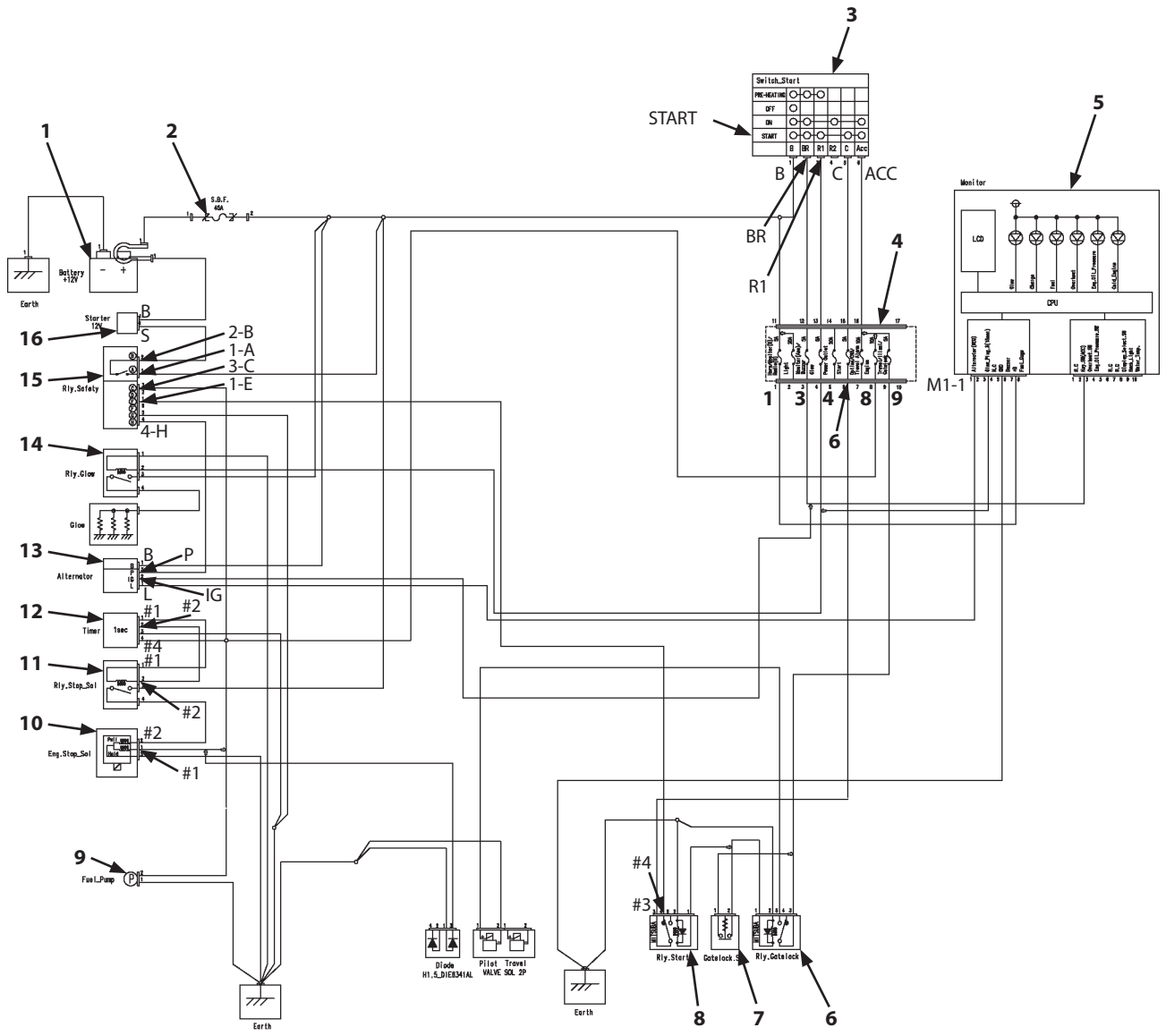
Outline

The electrical circuit is broadly divided into the main circuit and monitor circuit.

- **Main Circuit:**
The main circuit operates the engine and the accessory related circuits.
- **Monitor Circuit:**
The monitor circuit displays the machine operating conditions. The monitor circuit consists of the monitor controller, sensors, relays, and switches.

SECTION 2 SYSTEM

Group 2 Electrical System



TACC50-02-02-004

- | | | |
|-------------------|--------------------------|--------------------------|
| 1- Battery | 5- Monitor Controller | 9- Fuel Pump |
| 2- Slow Blow Fuse | 6- Pilot Shut-Off Relay | 10- Engine Stop Solenoid |
| 3- Key Switch | 7- Pilot Shut-Off Switch | 11- Power Relay |
| 4- Fuse Box | 8- Starter Relay 1 | 12- One-Second Timer |
| | | 13- Alternator |
| | | 14- Glow Plug Relay |
| | | 15- Starter Relay 2 |
| | | 16- Starter |

SECTION 2 SYSTEM

Group 2 Electrical System

Monitor Circuit

The major functions and circuits in the monitor circuit are as follows.

- **Indicator Circuit:** The indicator circuit turns the indicator ON due to the signals from switches and sensors. (Alternator Indicator, Fuel Level Indicator, Overheat Indicator, Engine Oil Pressure Indicator, Preheat Indicator)
- **Work Light/Monitor Internal Light Circuit:** The work light/monitor internal light circuit is operated when the work light switch is in the ON position. (Work Light, Monitor Internal Light)
- **Gauge Circuit:** The gauge circuit operates the hour meter. Also the gauge circuit controls the fuel gauge and the coolant temperature indicator according to the signals from sensors. (Hour Meter, Fuel Gauge, Coolant Temperature Indicator)

SECTION 3

COMPONENT OPERATION

CONTENTS

Group 1 Pump Device

Outline	T3-1-1
Main Pump P1, Main Pump P2	T3-1-2
Main Pump P3, Pilot Pump P4	T3-1-3
Output Power Control Operation	T3-1-4

Group 2 Swing Device

Outline	T3-2-1
Swing Reduction Gear	T3-2-2
Swing Motor	T3-2-3
Parking Brake	T3-2-4
Valve Unit	T3-2-5

Group 3 Control Valve

Outline	T3-3-1
Hydraulic Circuit	T3-3-10
Arm Regenerative Valve	T3-3-14
Flow Combiner Valve	T3-3-16
Main Relief Valve	T3-3-18
Overload Relief Valve	T3-3-20
Make-Up Valve	T3-3-24

Group 4 Pilot Valve

Outline	T3-4-1
Operation (Front Attachment/Swing and Travel Pilot Valves)	T3-4-5
Operation (Boom Swing/Blade/Auxiliary Pilot Valve)	T3-4-11
Shockless Function (Only for Travel Pilot Valve)	T3-4-16
Shuttle Valve	T3-4-17

Group 5 Travel Device

Outline	T3-5-1
Travel Reduction Gear	T3-5-2
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Parking Brake	T3-5-6
Travel Brake Valve	T3-5-8

Group 6 Others (Upperstructure)

2-Spool Solenoid Valve	T3-6-1
AUX Function Solenoid Valve (OP)	T3-6-5

Group 7 Others (Undercarriage)

Swing Bearing	T3-7-1
Center Joint	T3-7-2
Track Adjuster	T3-7-4

SECTION 3 COMPONENT OPERATION

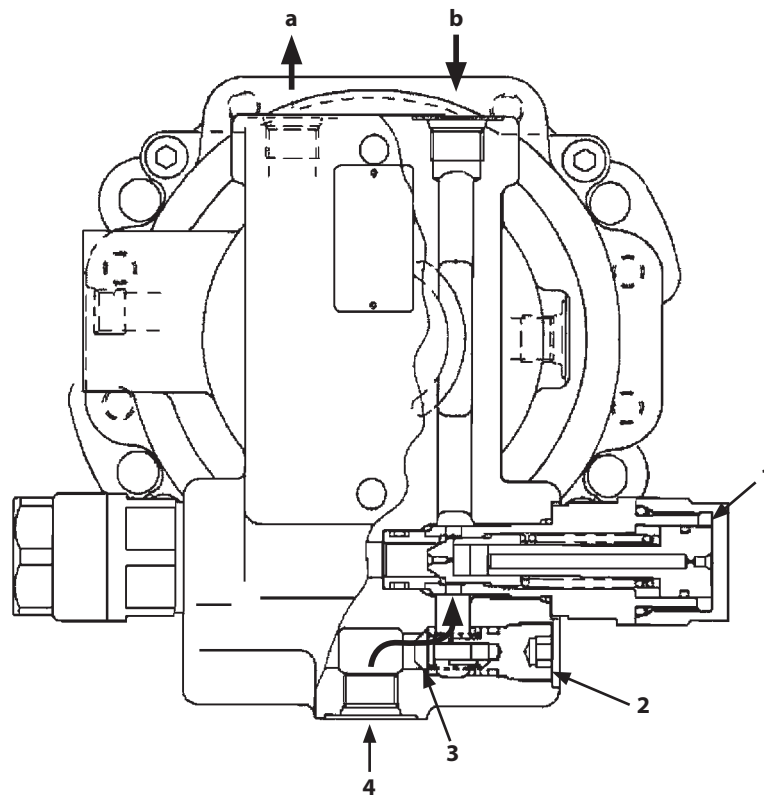
Group 2 Swing Device

Valve Unit

The valve unit consists of make-up valve (2) and relief valve (1). Make-up valve (2) prevents cavitation in the circuit from occurring. Relief valve (4) prevents surge pressure in the circuit from occurring and protects the circuit from being overloaded.

Make-Up Valve

When the upperstructure is swung downward on a slope, the upperstructure is accelerated by its own weight and moves quicker than the swing motor drive speed developed by the pump oil flow rate. Therefore, cavitation can occur in the circuit. In order to prevent cavitation, when pressure in the circuit is lower than pressure at port T (4) (hydraulic oil tank), poppet (3) opens, draws hydraulic oil into the circuit, and compensates the lack of pump oil flow rate.



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a- To Control Valve

b- From Control Valve

1- Relief Valve

2- Make-Up Valve

3- Poppet

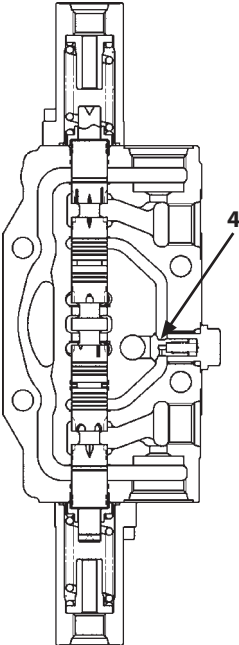
4- Port T

SECTION 3 COMPONENT OPERATION

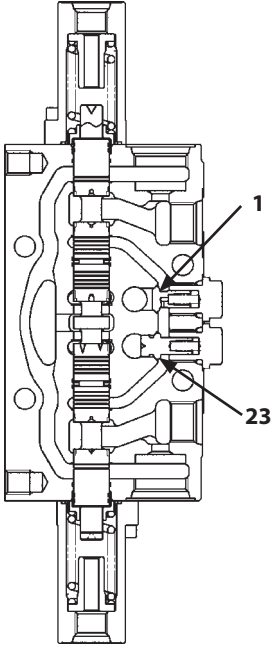
Group 3 Control Valve

Section I (Boom)

Section J (Bucket)



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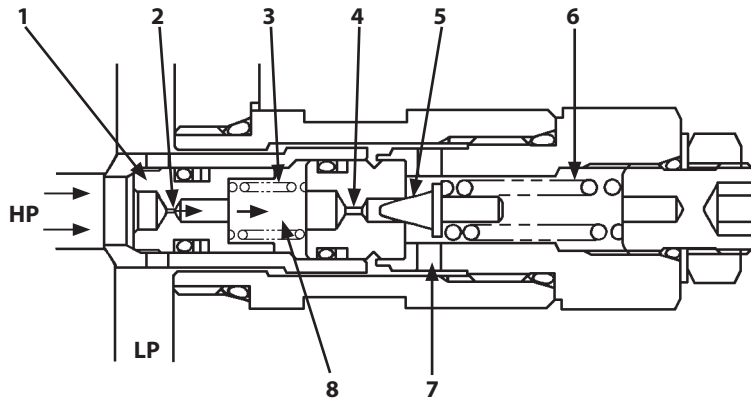


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SECTION 3 COMPONENT OPERATION

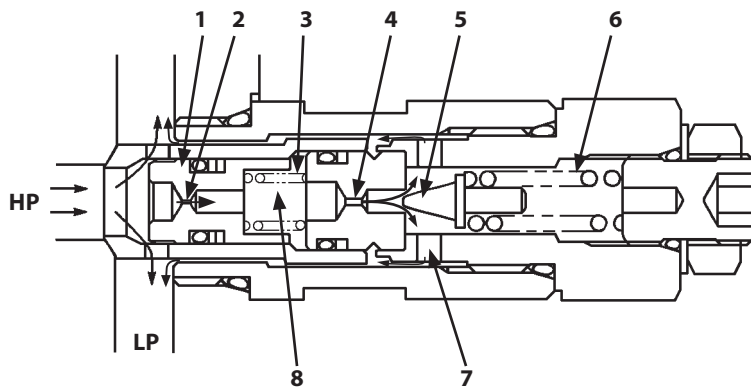
Group 3 Control Valve

During Normal Operation



TADB-03-03-010

During Relief Operation



T554-02-06-011

HP- Main Circuit

LP- Hydraulic Oil Tank

1- Main Poppet
2- Orifice

3- Spring
4- Orifice

5- Pilot Poppet
6- Spring

7- Passage
8- Spring Chamber

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SECTION 3 COMPONENT OPERATION

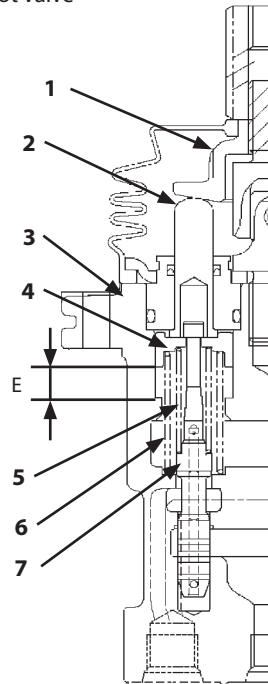
Group 4 Pilot Valve

Operation (Front Attachment/Swing and Travel Pilot Valves)

The spool (7) head comes in contact with the upper surface of spring guide (4). Spring guide (4) is kept raised by return spring (6).

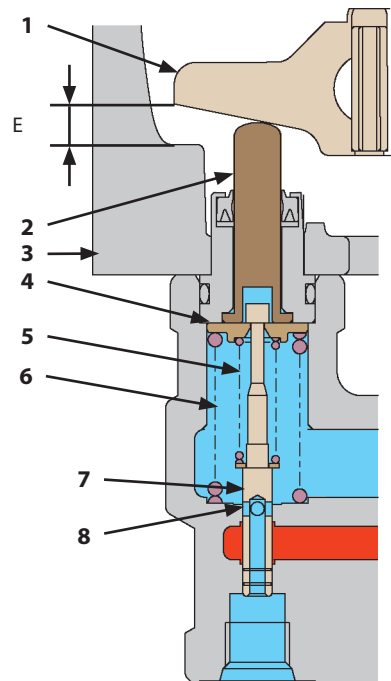
NOTE: Total lever strokes for front attachment and swing controls are determined by stroke dimension (E) of pusher (2). Total lever stroke for travel control is determined by stroke dimension (E) of cam (1).

Front Attachment /
Swing Pilot Valve



TACC-03-04-003

Travel Pilot Valve

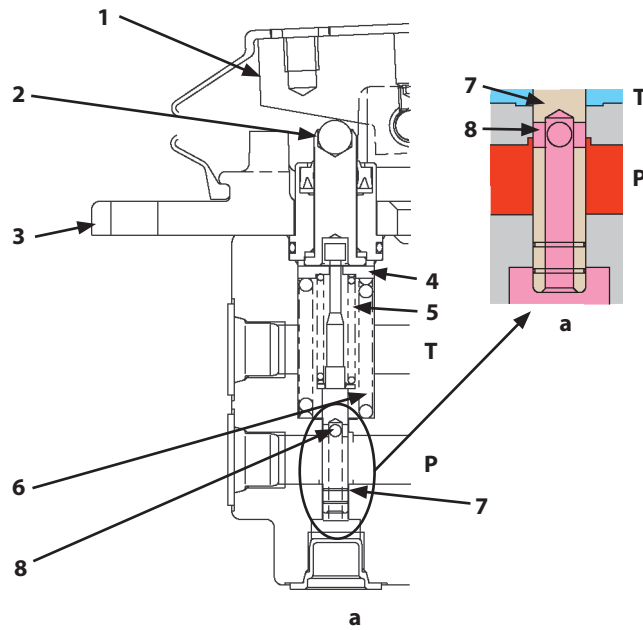


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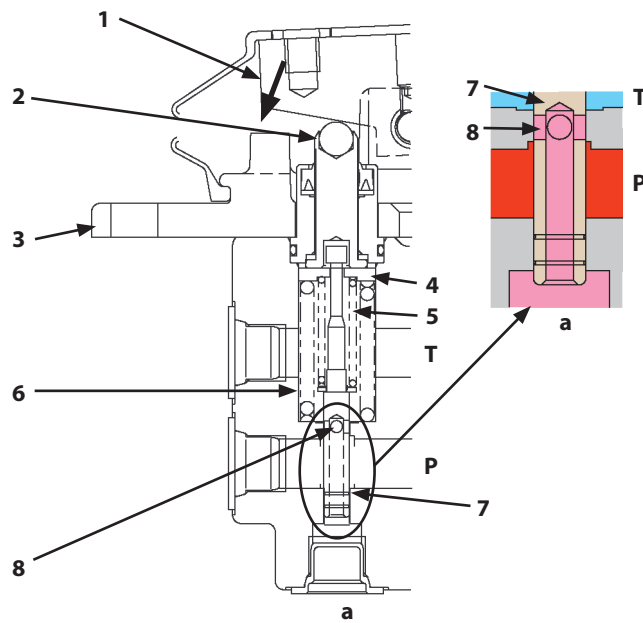
- | | | | |
|-----------|-----------------|-------------------|----------|
| 1- Cam | 3- Casing | 5- Balance Spring | 7- Spool |
| 2- Pusher | 4- Spring Guide | 6- Return Spring | 8- Hole |

SECTION 3 COMPONENT OPERATION

Group 4 Pilot Valve



TADB-03-04-009



TADB-03-04-010

P- Port P

T- Port T

a- Output Port

1- Cam
2- Pusher

3- Plate
4- Spring Guide

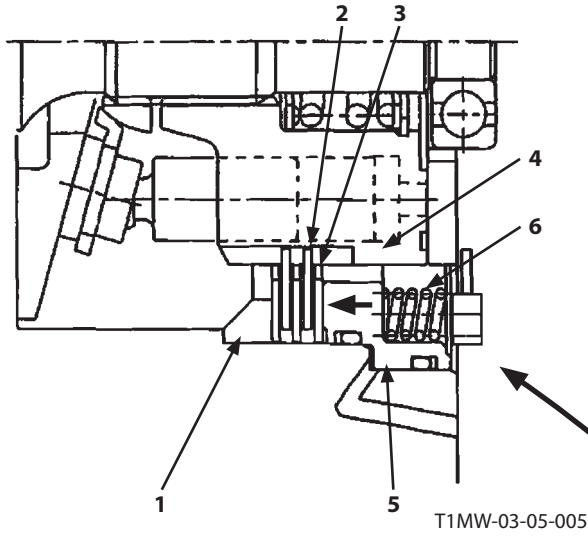
5- Balance Spring
6- Return Spring

7- Spool
8- Hole

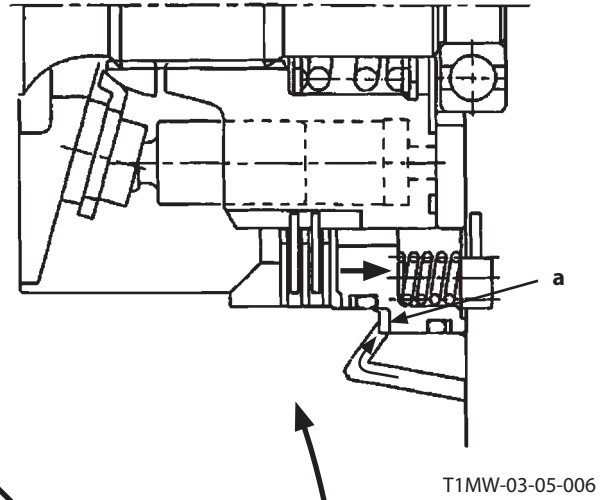
SECTION 3 COMPONENT OPERATION

Group 5 Travel Device

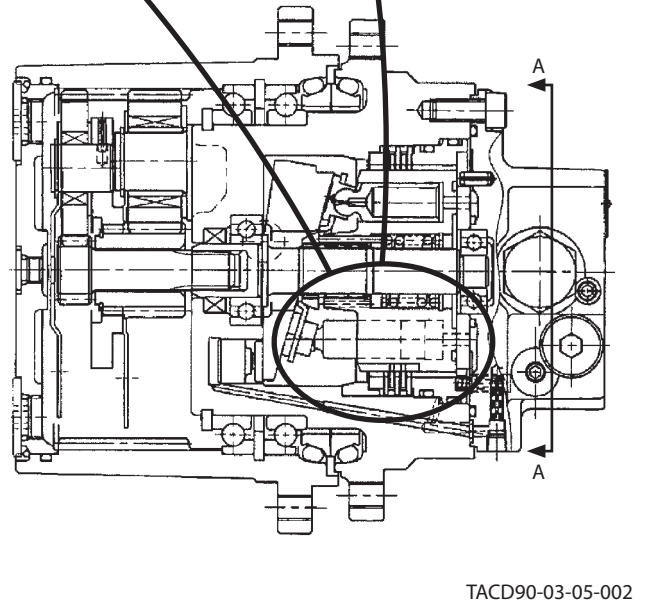
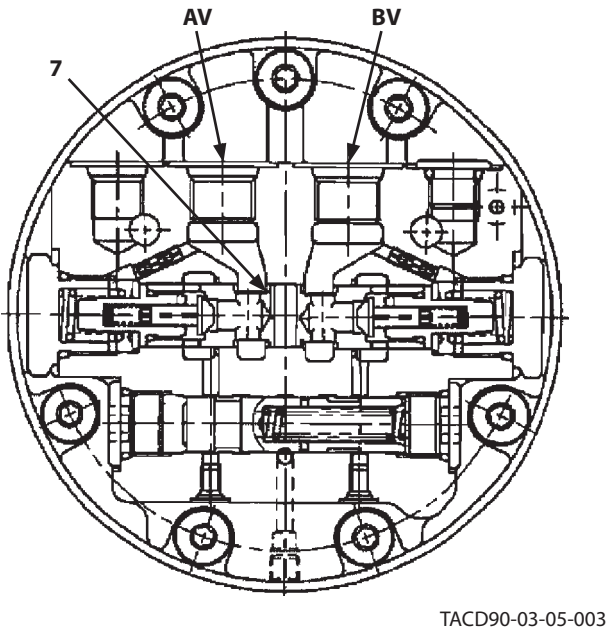
When brake is applied:



When brake is released:



Section A-A



AV- Port AV
(Pressure oil from main pump)

BV- Port BV
(Pressure oil from main pump)

a- Brake Piston Chamber

1- Housing
2- Friction Plate

3- Plate
4- Rotor

5- Brake Piston
6- Spring

7- Counterbalance Valve Spool

SECTION 3 COMPONENT OPERATION

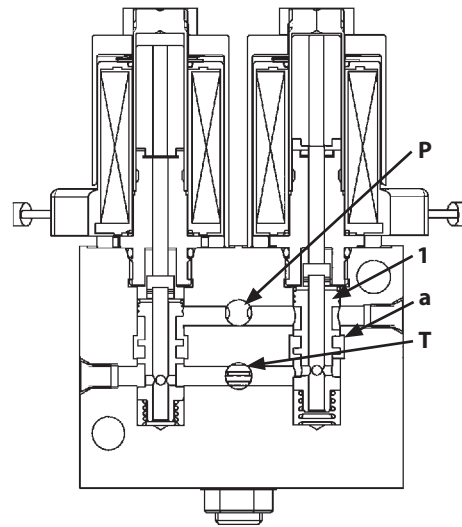
Group 6 Others (Upperstructure)

- Travel Mode Selector Solenoid Valve

- Slow Speed Position

1. When the travel mode switch is turned OFF (set to slow speed position), the travel mode selector relay is turned OFF and the travel mode selector solenoid valve is turned OFF. (Refer to SYSTEM / Electrical System.)
2. Pressure oil from the pilot pump is blocked by spool (1) in the travel mode selector solenoid valve.
3. Consequently, the travel mode selector valve in travel motor is not shifted and the travel motor rotates at slow speed.

Slow Speed Position

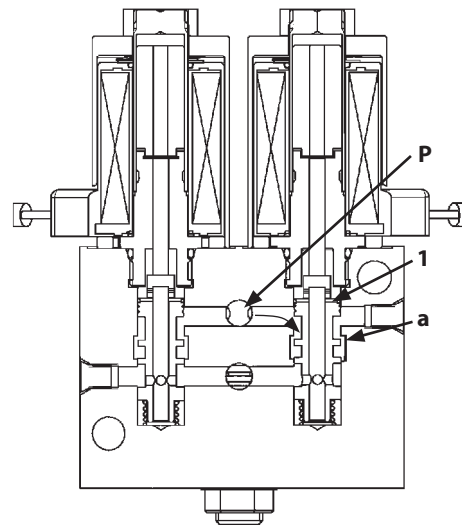


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- Fast Speed Position

1. When the travel mode switch is turned ON (set to fast speed position), the travel mode selector relay is turned ON and the travel mode selector solenoid valve is turned ON. (Refer to SYSTEM / Electrical System.)
2. Therefore, spool (1) in the travel mode selector solenoid valve is pushed down and pressure oil from the pilot pump flows to both right and left travel motors.
3. Consequently, the travel mode selector valve in travel motor is shifted and travel motor rotates at fast speed.

Fast Speed Position



TACC50-03-06-004

P- From Pilot Pump
a- To Travel Motor
1- Spool

T- Returning Oil to Hydraulic Oil Tank

SECTION 4

OPERATIONAL PERFORMANCE TEST

CONTENTS

Group 1 Introduction

Operational Performance Tests.....	T4-1-1
Preparation for Performance Tests	T4-1-2

Group 2 Standard

Operational Performance Standard Table	T4-2-1
Main Pump P1, Main Pump P2 P-Q Diagram	T4-2-7

Group 3 Engine Test

Engine Speed	T4-3-1
--------------------	--------

Group 4 Machine Performance Test

Travel Speed	T4-4-1
Track Revolution Speed	T4-4-2
Mistrack Check.....	T4-4-3
Travel Parking Leakage	T4-4-4
Swing Speed.....	T4-4-5
Swing Function Drift Check	T4-4-6
Swing Motor Leakage	T4-4-8
Maximum Swingable Slant Angle.....	T4-4-10
Swing Bearing Play	T4-4-12
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Control Lever Stroke	T4-4-21
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Group 5 Component Test

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Main Relief Set Pressure	T4-5-4
Overload Relief Valve Set Pressure	T4-5-7
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Travel Motor Drainage	T4-5-12

Group 6 Adjustment

Engine Control Lever Adjustment	T4-6-1
---------------------------------------	--------

SECTION 4 OPERATIONAL PERFORMANCE TEST

Group 2 Standard

Main Pump P1, Main Pump P2 P-Q Diagram

• P-Q Control (Torque Control) (Air Conditioner: OFF)
 (Reference: Calculated Valve)

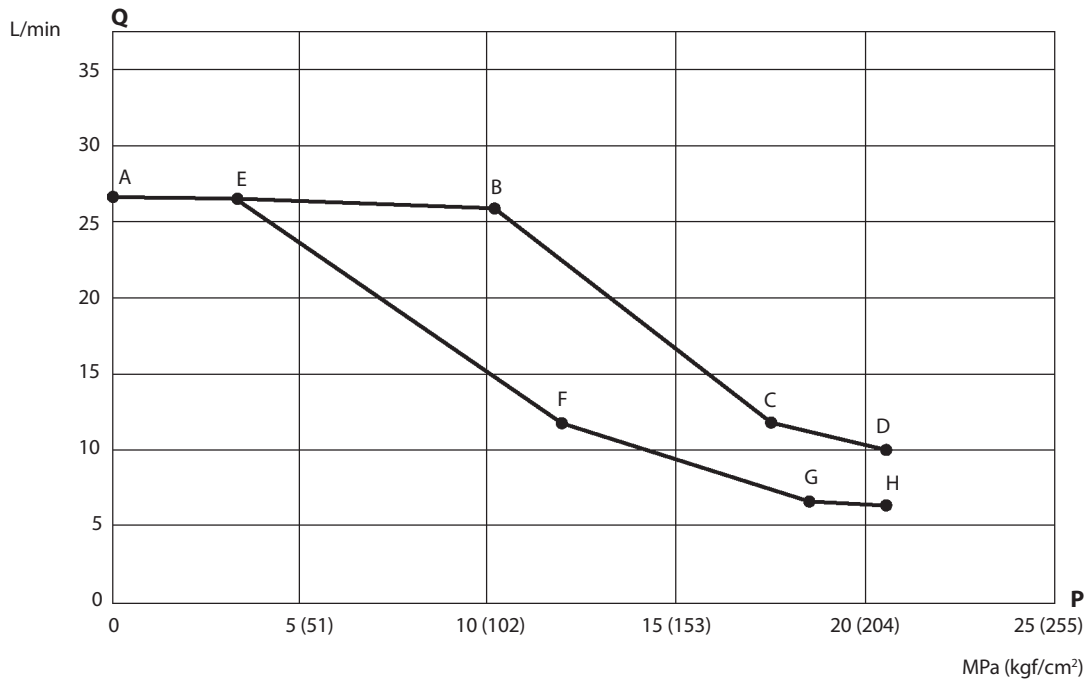
- Rated Pump Speed: 2200 min⁻¹ (rpm)
- Hydraulic Oil Temperature: 50±5 °C (122±9 °F)
- Pilot Pump Pressure: 4.1 MPa (42 kgf/cm², 595 psi)

• Points on P-Q Line (P3=0.98 MPa (1.0 kgf/cm², 140 psi))

	Delivery Pressure MPa (kgf/cm ² , psi)	Flow Rate L/min (gpm)
A	0 (0, 0)	26.4 (6.97)
B	10.1 (105, 1460)	25.9 (6.84)
C	17.5 (180, 2540)	12.1 (3.20)
D	20.6 (210, 2990)	9.9 (2.62)

• Points on P-Q Line (P3=20.6 MPa (210 kgf/cm², 2990 psi))

	Delivery Pressure MPa (kgf/cm ² , psi)	Flow Rate L/min (gpm)
A	0 (0, 0)	26.4 (6.97)
E	2.9 (30.0, 420)	26.3 (6.95)
F	11.6 (120, 1680)	12.1 (3.20)
G	18.3 (185, 2650)	6.4 (1.69)
H	20.6 (210, 2990)	6.3 (1.66)



TACD90-04-02-001

P- Delivery Pressure

Q- Flow Rate

SECTION 4 OPERATIONAL PERFORMANCE TEST

Group 4 Machine Performance Test


Swing Speed

Summary:


1. Measure the time required to swing three complete turns and check the performance of the swing device system (from the main pump to the swing motor).

Preparation:

1. Check lubrication of the swing gear and the swing bearing.
2. Place the machine on a flat and solid ground with ample space for swinging. Do not conduct this test on a slope.
3. Fully retract the arm cylinder. Fully extend the bucket cylinder. Hold the boom so that the arm end pin height is the same as the boom foot pin height. Empty the bucket.

 **NOTE:** In case a sufficient space for the measurement is difficult to find, carry out the measurement with the boom fully raised and the arm fully rolled-in.

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

 **CAUTION:** Prevent personal injury. Always make sure that the area is clear and that coworkers are out of the swing area before starting the measurement.

Measurement:

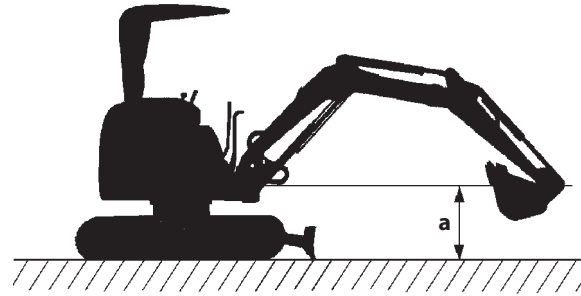
1. Set the engine to the fast idle speed.
2. Operate the swing control lever fully.
3. Measure the time required to swing 3 turns in one direction.
4. Check in both clockwise and counterclockwise directions.
5. Repeat the measurement three times and calculate the mean values.

Evaluation:

Refer to Operational Performance Standard.

Remedy:

Refer to Troubleshooting B.



TADB-04-05-007

a- The height as boom foot pin height

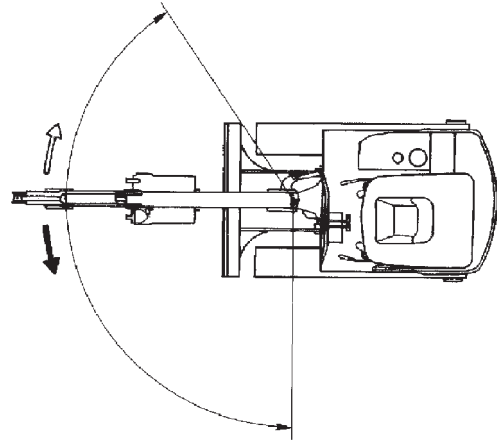


TADB-04-04-018

SECTION 4 OPERATIONAL PERFORMANCE TEST

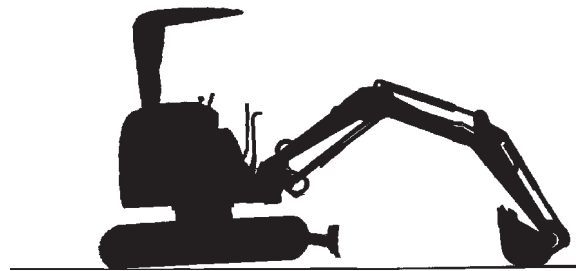
Group 4 Machine Performance Test

- Measurement of the cycle time of the boom swing cylinder:
With the arm cylinder fully retracted and the bucket cylinder fully extended, hold the bucket at the height as boom foot pin height. Set the boom swing cylinder in either the right or left swing stroke end position.



TADB-04-04-010

- Measurement of the cycle time of the blade cylinder:
Raise the machine off the ground by using the front attachment in order to be able to move the blade cylinder to fully stroke.



TADB-04-04-019


SECTION 4 OPERATIONAL PERFORMANCE TEST

Group 5 Component Test

Primary Pilot Pressure

Preparation:

1. Stop the engine.
2. Slowly loosen the cap of the hydraulic oil tank and bleed air.
3. Remove hose (9/16-18UNF) (3) at the pilot filter (2) connection part. Install tee (ST 6450), adapter (ST 6069), and pressure gauge assembly (ST 6932) to the pressure check port.

 : 19mm, 22 mm

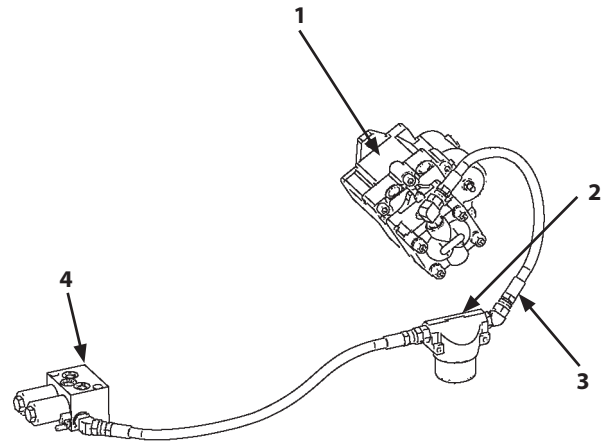
4. Start the engine. Confirm that no oil leakage is observed at the pressure gauge connection.
5. Maintain the hydraulic oil temperature at 50 ± 5 °C (122 ± 9 °F)

Measurement:

1. Measure the pilot pressure with the engine speed set at the fast idle speed without load by using the pressure gauge.
2. Repeat the measurement three times and calculate the mean values.

Evaluation:

Refer to Operational Performance Standard.



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1- Pump Device
2- Pilot Filter

3- Hose (9/16-18UNF)
4- 2-Spool Solenoid Valve

SECTION 4 OPERATIONAL PERFORMANCE TEST

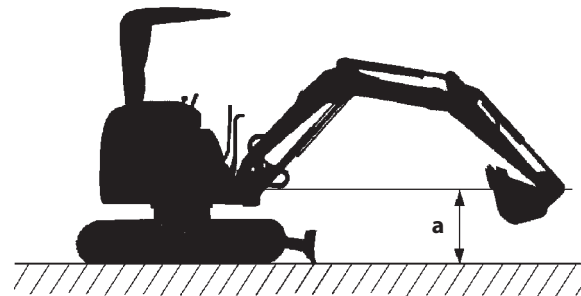
Group 5 Component Test

Measurement:

CAUTION: Always make sure that the area is clear and that co-workers are out of the swing area before starting the measurement. Also, take care not to fall off the machine while the measuring.

- Amount of Oil Drained While Swinging the Upperstructure
 1. Fully retract the arm cylinder. Fully extend the bucket cylinder. Hold the boom so that the arm tip pin height is the same as the boom foot pin height. The bucket must be empty.
 2. Start the engine. Operate and hold the swing control lever in the full stroke. After the swing speed reaches a constant maximum speed, start the draining oil measurement when drain oil starts coming out from the drain hose end.
 3. Repeat the measurement at least three times in both clockwise and counterclockwise directions, and calculate the mean values.
 4. The measuring time should be more than 45 seconds.

- Amount of Oil Drained While Relieving Swing Motor Circuit
 1. Thrust the bucket teeth into the ground so that the upperstructure does not swing.
 2. Start the engine. Operate and hold the swing control lever in the full stroke. Start the draining oil measurement when drain oil starts coming out from the drain hose end.
 3. Repeat the measurement at least three times in both clockwise and counterclockwise directions, and calculate the mean values.
 4. The measuring time should be more than 45 seconds.



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a - The same height as boom foot pin height

Evaluation:

Refer to Operational Performance Standard.

* Conversion of amount of drain oil measured into the per-minute value

First measure the amount of drain oil by using a calibrated container. Then, convert the measured drain oil into the per-minute value by using the formula below:

$$\Delta Q = 60 \times q / t$$

ΔQ : Amount of drain oil per minute (L/min)

t : Measured time (seconds)

q : Total amount of drain oil (L)

SECTION 5 TROUBLESHOOTING

Group 1 Diagnosing Procedure

Introduction

Refer to the inspection and troubleshooting procedures after any machine trouble has occurred. The inspection and troubleshooting procedures are presented in an orderly sequence in this section to quickly find the cause of machine trouble and solution.

The troubleshooting section in this manual consists of three groups; Diagnosing Procedure, Troubleshooting B (base machine diagnosis starting with inspection of abnormal operational status), and Troubleshooting C (monitor diagnosis).

- Diagnosing Procedure
This group explains procedures of troubleshooting and precautions and/or information for the electrical system inspection.

Example: Fuse Inspection

- Troubleshooting B (base machine diagnosis starting with inspection of abnormal operational status)
Refer to troubleshooting B for diagnosis by using trouble symptom.

Example: Starter does not rotate.

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

Example: The fuel gauge is not operated.


SECTION 5 TROUBLESHOOTING

Group 1 Diagnosing Procedure

Battery Voltage Check


1. Turn the key switch OFF. Check the voltage between the battery positive terminal and the body (ground).

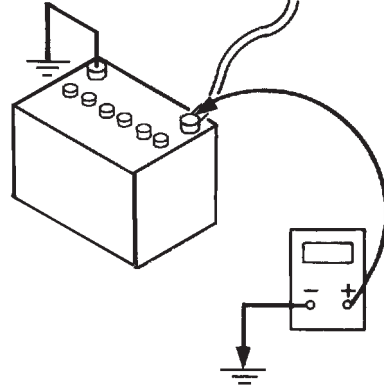
Normal Voltage: 12 V

 *NOTE: If the voltage is abnormal, recharge or replace the battery.*

2. Start the engine. Check the voltage between the battery positive terminal and the body (ground).

Normal Voltage: 14.5 V

 *NOTE: If the voltage is abnormal, check the charging system.*



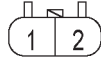
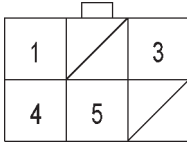
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SECTION 5 TROUBLESHOOTING

Group 2 Troubleshooting B

Connector (Wire harness end)

- Starter Relay 2



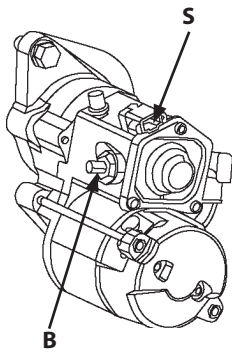
TAEBJ0-05-04-001

- Starter Relay 1



TDEB-05-06-006

- Starter



TABA50-05-02-001

B- Terminal B

S- Terminal S

SECTION 5 TROUBLESHOOTING

Group 2 Troubleshooting B

F-2 Some cylinders are not operated or speeds are slow.

	Specification	Remark
Secondary Pilot Pressure (MPa)	2.9±0.5	When the control lever is fully operated

Overload Relief Pressure (MPa)	Specification	Remark
Boom	27.5±1.0	
Arm, Bucket	23.5±1.0	

Preparation

- The main circuit consists of 3 systems (3 main relief valves are located). In case one of main relief valves is faulty, it may lead to failure in the actuator operation of the corresponding system.

Main Pump P1: Travel (Left), Boom, Bucket

Main Pump P2: Travel (Right), Arm, Auxiliary

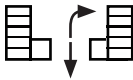
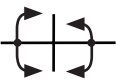
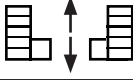
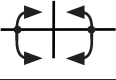

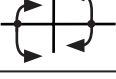
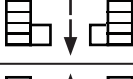



Main Pump P3: Swing, Blade, Boom Swing

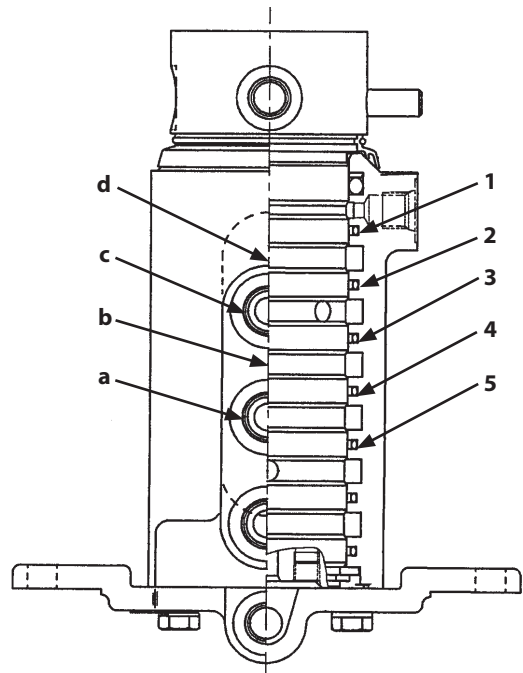
Procedure	Inspection Method	Condition	Evaluation	Cause
1	Measure secondary pilot pressure of corresponding cylinder.	Fully operate the control lever of corresponding cylinder.	The value is not within the specification. (Specification: 2.9±0.5 MPa)	Faulty pilot valve of corresponding cylinder
2	Measure relief pressure of corresponding cylinder.	-	The value is not within the specification.	Faulty overload relief valve of corresponding cylinder
3	-	-	Normal in above check	Stuck control valve spool or faulty cylinder (faulty seal kit)

SECTION 5 TROUBLESHOOTING

Group 2 Troubleshooting B

Relationship between Faulty Seal Location and Mistrack Direction

Serial No.	When traveling straight	When pivot turn is performed
1		
2		
3		
4		
5		



TACC50-05-02-001

- a- Travel (Left Reverse) c- Travel (Left Forward)
- b- Travel (Right Reverse) d- Travel (Right Forward)

SECTION 5 TROUBLESHOOTING

Group 3 Troubleshooting C

Malfunction of Fuel Gauge

- Check the wiring connections first.
- Only malfunction of the fuel gauge is explained as an example here. Refer to T5-3-9 for malfunction of the fuel level indicator.
- When all segments in the fuel gauge blink, the wire harness between monitor controller terminal M1-8 and fuel sensor may be open or shorted.

Even when fuel is sufficient, all segments in the fuel gauge do not light.

Procedure	Inspection Method	Condition	Evaluation	Cause
1	Short-circuit in wire harness between fuel sensor harness end #1 and #2.	Key Switch: ON Disconnect fuel sensor connector.	All segments in the fuel gauge blink.	Faulty fuel sensor
2	-	-	Normal in above check	Faulty monitor controller

Even when fuel is reduced, all segments in the fuel gauge light.

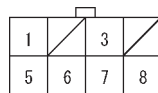
Procedure	Inspection Method	Condition	Evaluation	Cause
1	Disconnect fuel sensor connector.	Key Switch: ON	All segments in the fuel gauge blink.	Faulty fuel sensor
2	-	-	Normal in above check	Faulty monitor controller

The segments in fuel gauge unstably light.

Procedure	Inspection Method	Condition	Evaluation	Cause
1	Short-circuit in wire harness between fuel sensor harness end #1 and #2.	Key Switch: ON Disconnect fuel sensor connector.	All segments in the fuel gauge blink.	Faulty fuel sensor
2	-	-	Normal in above check	Faulty monitor controller

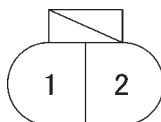
Connector (Wire harness end)

- Monitor Controller M1



TACC50-05-03-001

- Fuel Sensor



T6LE-05-05-017

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