

PART NO. TO1J7-E-00

HITACHI

Technical Manual

Operational Principle

ZAXIS

650LC-3

670LCH-3

Hydraulic Excavator

Hitachi Construction Machinery
www.hitachi-c-m.com

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This Service Manual consists of three separate parts:
Technical Manual (Operational Principle)
Technical Manual (Troubleshooting)
Workshop Manual (Workshop Manual in English only)

Part No. TO1J7-E-00
Part No. TT1J7-E-00
Part No. W1J7-E-00

ZAXIS 650LC-3 • 670LCH-3

HYDRAULIC EXCAVATOR

TECHNICAL MANUAL

OPERATIONAL PRINCIPLE

TO1J7-E-00

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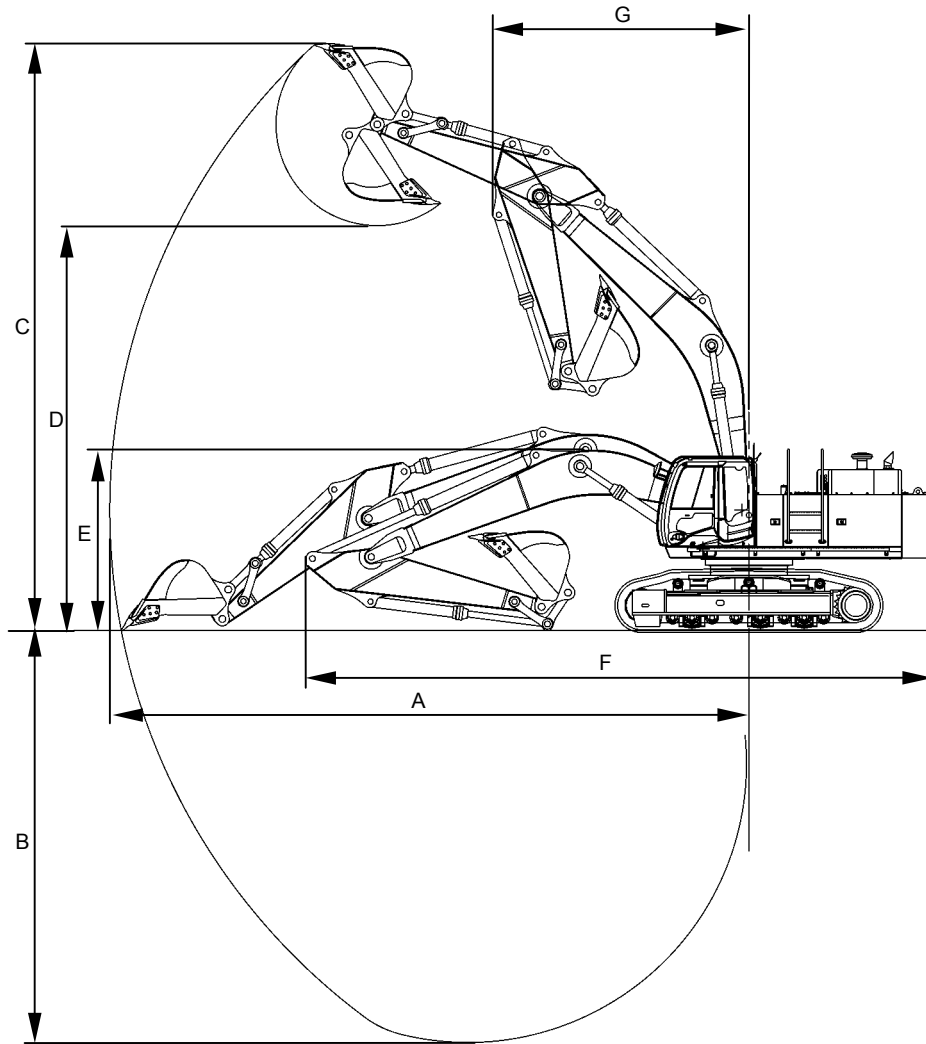
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GENERAL / Specifications

WORKING RANGES

ZAXIS670LCH-3



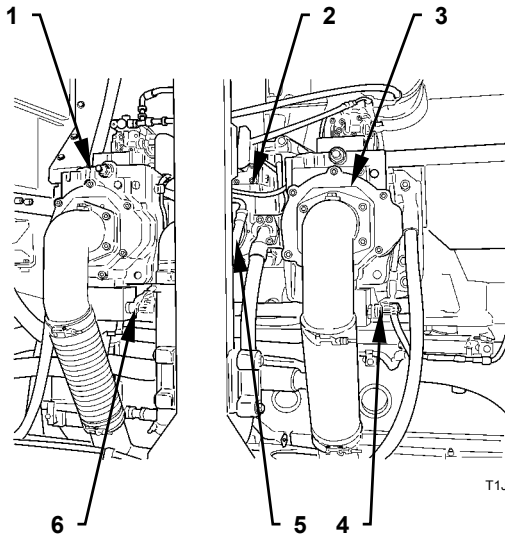
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Item	Category	ZX670LCH-3	
		7.8 m (25 ft 7 in) H Boom	6.8 m (22 ft 4 in) BE Boom
		3.6 m (11 ft 10 in) H Boom	2.9 m (9 ft 6 in) BE Arm
A: Maximum Digging Reach	mm (ft-in)	13280 (43'7")	11800 (38'9")
B: Maximum Digging Depth	mm (ft-in)	7120 (23'4")	7120 (23'4")
C: Maximum Cutting Height	mm (ft-in)	11940 (39'2")	11190 (36'9")
D: Maximum Dumping Height	mm (ft-in)	8020 (26'4")	7330 (24'1")
E: Transport Height	mm (ft-in)	*4460 (14'8")	
F: Overall Transport Length	mm (ft-in)	*13200 (43'4")	
G: Minimum Swing Radius	mm (ft-in)	5780 (18'12")	5240 (17'2")

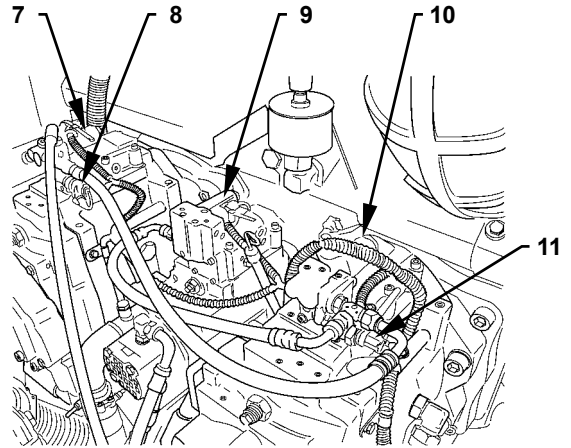
NOTE: "*" The dimensions include the height of the shoe lug.

GENERAL / Component Layout

PUMP DEVICE

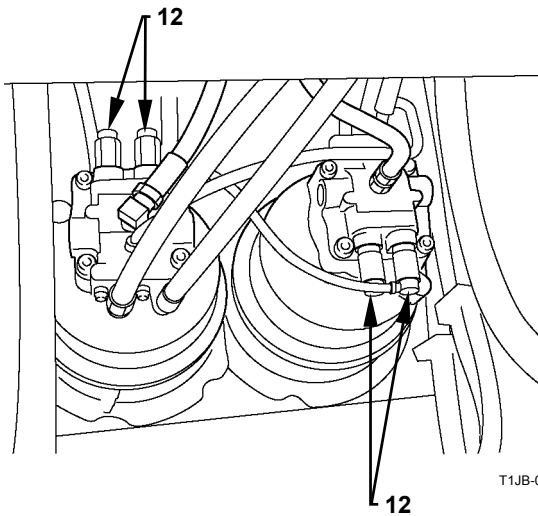


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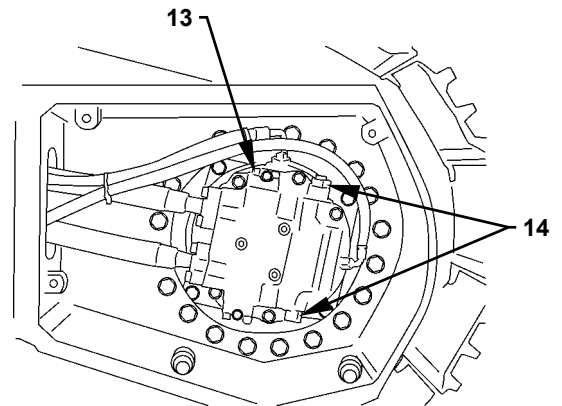
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SWING DEVICE



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TRAVEL DEVICE



M1J1-07-048

- | | | | |
|-------------------------------------|--------------------------------------|---------------------------------------|---------------------------|
| 1 - Pump 1 | 5 - Pilot Pump | 9 - Fan Pump Control Solenoid Valve | 12 - Swing Relief Valve |
| 2 - Fan Pump | 6 - Pump 1 Delivery Pressure Sensor | 10 - Pump 2 Control Solenoid Valve | 13 - Counterbalance Valve |
| 3 - Pump 2 | 7 - Pump 1 Control Solenoid Valve | 11 - Pump 2 Regulator Pressure Sensor | 14 - Travel Relief Valve |
| 4 - Pump 2 Delivery Pressure Sensor | 8 - Pump 1 Regulator Pressure Sensor | | |

GENERAL / Component Specifications

OIL COOLER BYPASS CHECK VALVE

Cracking Pressure.....100±50 kPa (1.0±0.5 kgf/cm²) @ 40 L/min (10.5 US gpm)

BYPASS CHECK VALVE

Relief Set Pressure350±70 kPa (3.6±0.7 kgf/cm²)

SYSTEM / Controller

- Engine Control
 - C Engine Control Dial Control, ECO Control
Controls the engine speed according to the rotation angle of engine control dial. (Engine Control Dial Control)
Reduces the engine speed to 1600 min^{-1} in 1 second in order to reduce fuel consumption and noise level when all the control levers are in neutral. (ECO Control)
 - HP Mode Control
Slightly increases digging power such as arm roll-in operation while excavating deeply.
 - Travel Speed Increase Control
Increases the engine speed and travels faster during travel single operation.
 - E Mode Control
Reduces the target engine speed to 1580 min^{-1} in maximum in order to reduce fuel consumption.
 - Auto-Idle Control
Reduces the engine speed to 1030 min^{-1} in 3.5 seconds when all the control levers are in neutral with the auto-idle switch ON. Therefore, fuel consumption and noise level can be reduced.
 - Attachment Operation Speed Increase Control (Optional)
Set attachment operation speed (breaker) to increase (+) with Dr. ZX. When operating the attachment, engine speed increases to the attachment operating speed set by Dr. ZX.
 - Attachment Operation Speed Decrease Control (Optional)
Set attachment operation speed (breaker) to decrease (-) with Dr. ZX. When the attachment mode is selected, engine speed decreases to the attachment operating speed set by Dr. ZX.

SYSTEM / Controller

ICF: INFORMATION CONTROLLER

Function Outline

- Operating Hours Management
The built-in clock is provided for ICF.
ICF sends data of built-in clock to the monitor unit by using CAN bus line.
- Alarm, Fault Code Memory
ICF memorizes the alarm and fault code from each controller by using CAN bus line in the time series.
The memorized alarm and fault code are sent to the center server by the satellite terminal (optional).
Engine oil pressure alarm and overheat alarm are sent to the center server whenever these occur.
Other alarm and fault code are sent to the center server once a day.
- Fault Code Display
ICF displays the fault code sent from each controller by using CAN bus line on Dr. ZX.
- Maintenance History
When the maintenance key is pushed on the monitor unit, time is recorded.
- Daily Report Data Making
ICF records operating hours, fuel level and fuel amount of use during daily operation, and makes the daily report data.
The daily report data can be sent to the center server by using the satellite terminal (optional).
- Frequency Distribution Data Making
ICF makes the frequency distribution data every 100 hours.
The frequency distribution data can be sent to the center server by using the satellite terminal (optional).
- Cumulative Operating Hours Record
ICF records all hours when the machine is operated.
The cumulative operating hours can be downloaded to Dr. ZX.
- Mail Data Making (Optional)
ICF records the mails sent from the monitor unit and sends them to the center server by the satellite terminal.


SYSTEM / Controller

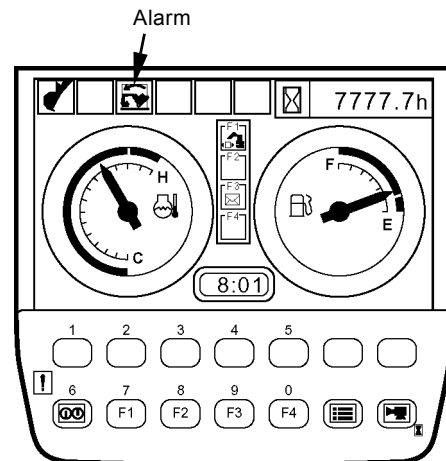
- Overload Alarm
(Only machines equipped with optional parts)

IMPORTANT: When using overload alarm, make overload alarm available by using Dr. ZX.

MC detects suspended load according to the signal from the bottom pressure sensor in boom cylinder. When overload is detected, the monitor unit displays the alarm and sounds the buzzer according to the signal received from MC by using CAN bus line.

If overload of the suspended load is dissolved, the alarm message disappears and the buzzer stops ringing. (Refer to the Control System group / SYSTEM.)

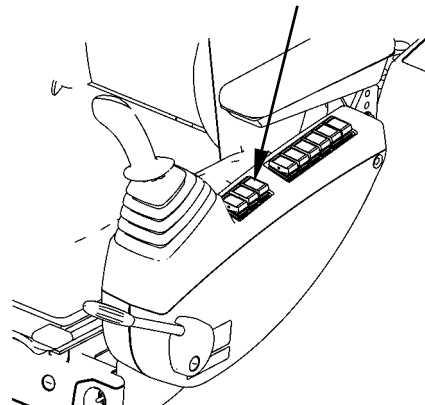
 **NOTE:** Even if the work is done while displaying a screen except the primary screen, when an overload condition is reached, the screen of monitor unit is switched to the primary screen, an alarm message is displayed, and a buzzer is rung. Even after the overload alarm is dissolved, the monitor unit keeps on displaying the primary screen without returning to the screen while the work is done.



Primary Screen

T1V1-05-01-128

Overload Alarm Switch (Optional)



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SYSTEM / Control System

Travel Speed Increase Control

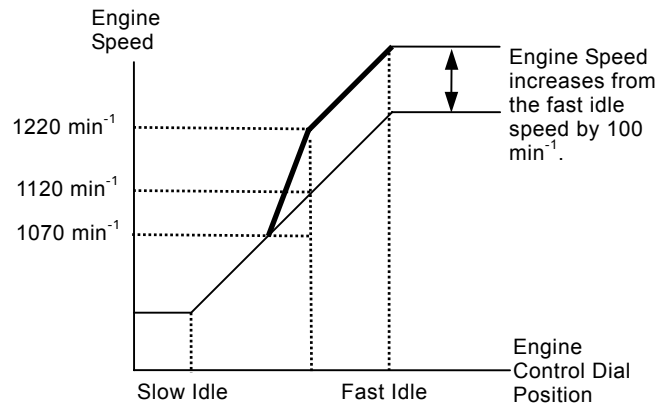
Purpose: Increases the engine speed and travels faster during travel single operation.

Operation:

1. When the following conditions exist, MC sends the signals equivalent to the target engine speed to ECM by using CAN communication.
2. ECM increases the engine speed by 100 min^{-1} from the speed set by the engine control dial and travels faster.

Condition:

- Engine Control Dial: Set the engine speed at 1070 min^{-1} or faster.
- Travel Operation: Operated



SYSTEM / Control System

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SYSTEM / Control System

Overheat Prevention Control

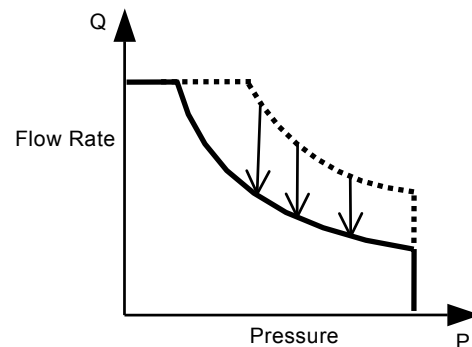
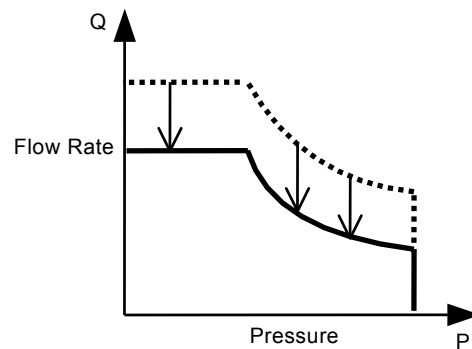
Purpose: Prevents the engine from overheating by reducing the main pump maximum flow rate and pump torque, reducing the load applied to the engine when coolant and hydraulic oil temperatures increase beyond the specified level.

Operation:

1. The signal from coolant temperature sensor is sent to MC via ECM and CAN.
2. When coolant temperature is 99 °C (210 °F) or higher, MC calculates the target pump displacement angle according to the signal from the pump delivery pressure sensor. MC compares the actual pump displacement angle detected by the pump regulator pressure sensor with the target pump displacement angle.
3. MC activates the pump control solenoid valve in order to compensate the difference between the actual and target displacement angles, and decreases 7 % of pump torque.
4. The signal from the oil temperature sensor is sent to MC
5. When coolant temperature is 100 °C (212 °F) or higher, MC calculates the target pump displacement angle according to the signal from the pump delivery pressure sensor. MC compares the actual pump displacement angle detected by the pump regulator pressure sensor with the target pump displacement angle.
6. MC activates the pump control solenoid valve in order to compensate the difference between the actual and target displacement angles, and decreases maximum flow rate and 7 % of pump torque.

Completion Condition for Overheat Control

- Coolant temperature 95 °C (203 °F) or lower
- Hydraulic oil temperature: 95 °C (203 °F) or lower



SYSTEM / Control System

VALVE CONTROL

The valve control system functions as follows:

- Pressure Increase Selection Control When Traveling
- Power Digging Control
- Auto-Power Lift Control
- Travel Motor Swash Angle Control
- Boom Mode Selector Control
- Boom Flow Rate Control Valve Control

SYSTEM / Control System

Boom Flow Rate Control Valve Control

Purpose: Restricts pressure oil to the boom cylinder from the pump during combined operation of boom lower and arm or boom lower and bucket.

When the boom is lowered due to own weight with the regenerative circuit and pressure oil from the pump is used for other actuator, operating speed of actuator increases.

(Refer to the Control Valve group / COMPONENT OPERATION.)

Operation:


1. When the pressure sensor sends the signal to MC during combined operation of boom lower and arm or boom lower and bucket, MC activates solenoid valve unit (SF).
2. Pressure oil from the pilot pump acts on the switch valve in boom flow rate control valve.
3. Therefore, the switch valve in boom flow rate control valve is shifted and pressure oil which flows to the boom cylinder from the pump is restricted.
4. Consequently, pressure oil from the pump flows to the actuator and operating speed of actuator increases.

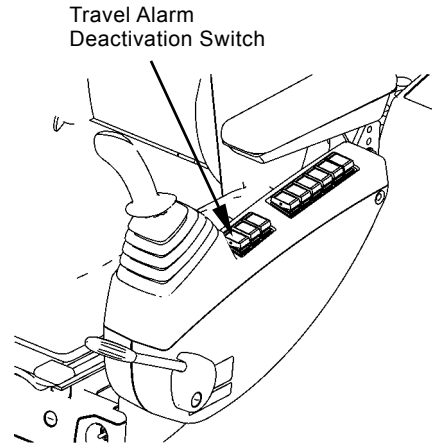
SYSTEM / Control System

Travel Alarm Control (Only Machine Equipped with Optional Parts)

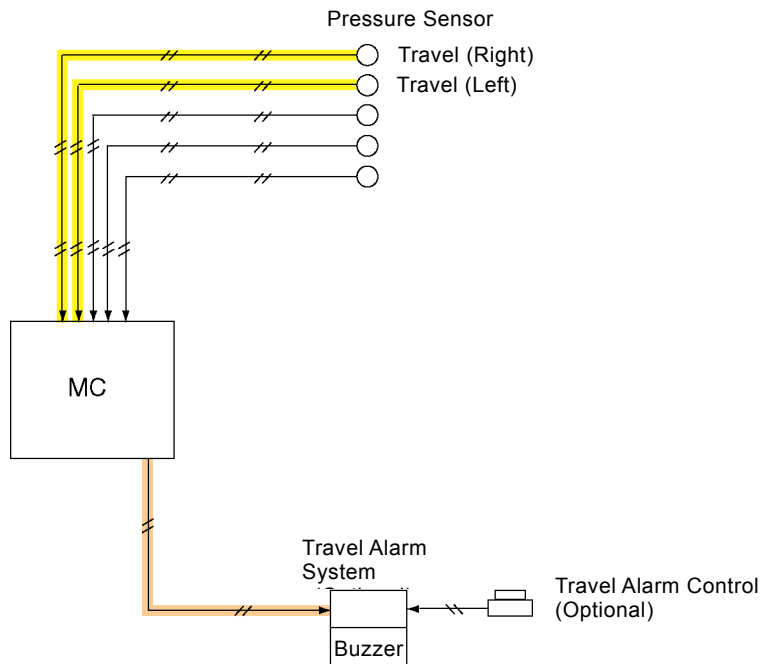
Purpose: Sounds the buzzer while traveling.

Operation: MC receives the signals from travel pressure sensor (travel right or left) when travel operation is made. As long as MC receives this signal, MC sends the signals to the travel alarm device and sounds the buzzer.

 **NOTE:** After traveling continuously for more than 13 seconds, the buzzer can be stopped by using the travel alarm deactivation switch.



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SYSTEM / ECM System

Fuel Injection Timing Control

Purpose: Calculates the best fuel injection timing.

Operation:

1. ECM calculates the fuel injection timing according to engine speed and fuel injection amount.
2. ECM controls the two-way valve in injector by turning ON/OFF according to fuel injection timing.

Fuel Injection Rate Control

Purpose: Improves combustion in the engine cylinder.

Operation:

1. The injector injects small amount of fuel (pilot injection) first and ignites.
2. After igniting, the injector injects fuel (main injection).
3. ECM controls fuel injection timing and fuel injection amount by turning the two-way valve in injector ON/OFF.

Fuel Injection Operation

1. The nozzle in injector is always pressured.
2. When turning the two-way valve ON, high-pressure fuel in the control chamber flows through orifice 1.
3. Therefore, the hydraulic pressure piston is raised and the nozzle opens so that the injection starts.
4. When turning the two-way valve OFF, high-pressure fuel from the common rail flows to the control chamber through orifice 2.
5. Therefore, high-pressure flows to the control chamber and the hydraulic pressure piston is lowered.
6. Consequently, the nozzle is closed and injection stops.

SYSTEM / Hydraulic System

PILOT CIRCUIT


Outline


- Pressure oil from the pilot pump is used to operate the operation control circuit, pump control circuit, valve control circuit, swing parking brake release circuit, travel motor swash angle control circuit, hydraulic oil heat circuit and emergency boom lower circuit.

SYSTEM / Hydraulic System

Emergency Boom Lower Circuit (Refer to the Others (Upperstructure) / COMPONENT OPERATION.)

- The accumulator is provided between pilot pump and pilot shut-off solenoid valve for boom lower at emergency. The accumulator accumulates pressure oil from the pilot pump.
- When the engine stops suddenly and the control lever is operated with the pilot shut-off lever in UNLOCK position, pressure oil from the accumulator flows to each spool in the control valve through each pilot valve.
- Therefore, as the spool in operated control valve is operated, the circuit between main pump and actuator is connected through the control valve spool.
- As pressure oil between control valve and actuator flows to the hydraulic oil tank through the control valve spool, pressure between control valve and actuator decreases.
- Consequently, when the engine stops suddenly, by operating the control lever (boom lower) right away, the front attachment can be lowered onto the ground (due to own weight).

 *NOTE: Immediately after the engine stops, by operating all the control levers, any pressure in the circuit between control valve and actuator can be released.*

 *NOTE: Immediately after the engine stops (the key switch is turned OFF), the battery relay is kept ON for a specified time due to load damp relay operation. (Refer to the Surge Voltage Prevention Circuit in Electrical System group / SYSTEM.) Therefore, electrical current from the battery (fuse #4) flow to the pilot shut-off solenoid valve and the pilot shut-off solenoid valve is kept ON.*

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SYSTEM / Hydraulic System

- Boom Raise / Arm Roll-In (Arm Regenerative Circuit)

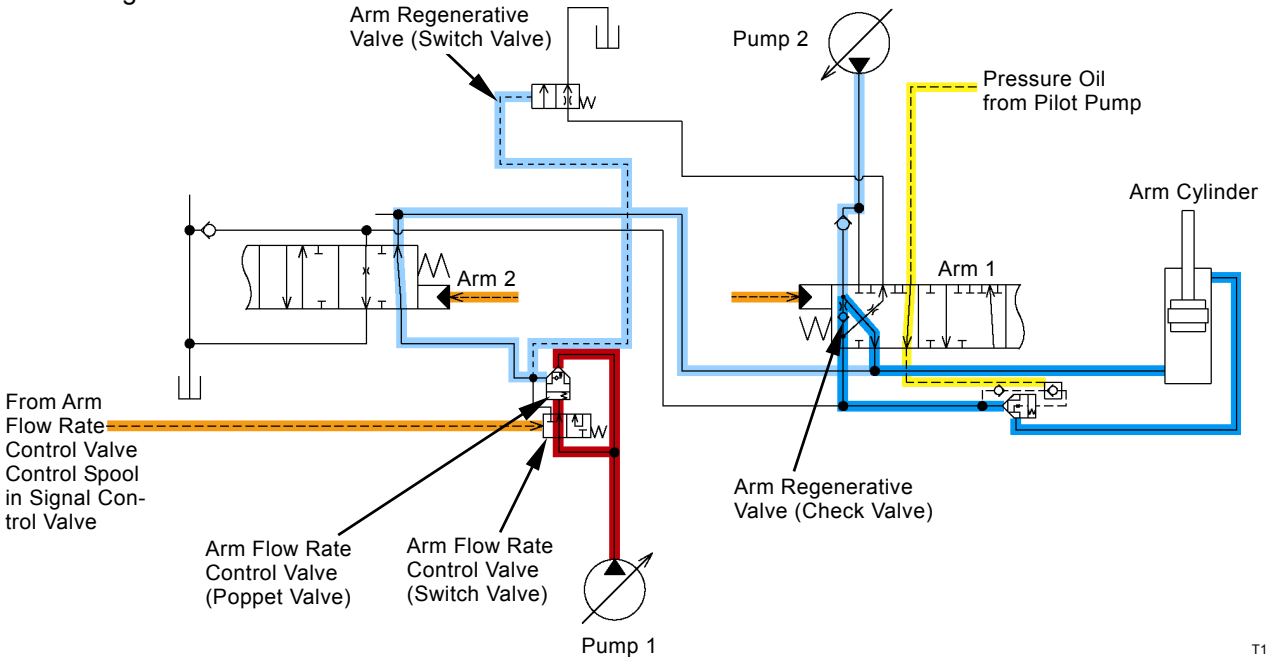
1. Pressure oil from pump 1 is routed to the boom 1 spool and arm 2 spool through the 4-spool parallel circuit.
2. Pressure oil from pump 2 is routed to the boom 2 spool through the arm 1 spool and 5-spool parallel circuit.
3. During combined operation of boom raise and arm roll-in, arm roll-in pilot pressure shifts the arm flow rate control valve control spool in signal control valve.
4. Boom raise pilot pressure flows to the arm flow rate control valve control spool and acts on the switch valve in arm flow rate control valve.
5. When the switch valve is shifted, the poppet valve in arm flow rate control valve moves to the direction to restrict the passage in arm 2 in response to the boom raise control pressure.
6. Consequently, more pressure oil from pump 1 flows to the boom 1 side and boom operating speed is kept.
7. As return oil from the arm cylinder rod side is routed to the arm cylinder bottom side due to the regenerative circuit in arm 1 spool, arm roll-in speed increases.

Operation in Arm Regenerative Circuit:

1. When arm is rolled in with the arm rolled-out position, arm speed becomes faster comparing with pressure oil amount from pump 2 due to arm own weight.
2. Therefore, pressure between pump 2 and arm cylinder bottom decreases.
3. When pressure in the cylinder bottom side is lower than that in rod side, the check valve is opened.
4. Therefore, return oil from the cylinder rod side is routed to the bottom side, is combined with oil from pump 2, and combined oil is routed to the cylinder bottom side.
5. Consequently, the regenerative operation is operated and cylinder speed increases.

 **NOTE:** Refer to the Flow Rate Control Valve in Control Valve group / COMPONENT OPERATION.

Arm Regenerative Circuit



T1J1-02-04-012

SYSTEM / Electrical System

STARTING CIRCUIT (KEY SWITCH: START)

1. When the key switch is turned to the START position, terminal B is connected to terminals M and ST in the key switch.
2. As current from terminal M excites the battery relay, battery current is routed to starter terminal B and starter relay 2 terminal B through the battery relay.
3. Current from terminal ST flows to starter relay 2 terminal S through the starter cut relay.
4. Current flows to the starter relay 2 coil and starter relay 2 is turned ON.
5. Current flows to starter terminal C from starter relay 2 terminal C.
6. Consequently, the relay in starter is turned ON so that the starter begins rotating.
7. On the other hand, current from key switch terminal M flows to MC, ICF, the monitor unit and ECM through fuse #18 as a signal indicating that the key switch is in the ON or START position.
8. As soon as ECM receives this signal, ECM turns the ECM main relay ON.
9. Current from the battery flows to ECM through fuse #8, the ECM main relay and fuse #14 and the main power is turned ON.
10. ECM makes the engine starting condition.

SYSTEM / Electrical System

PILOT SHUT-OFF CIRCUIT (KEY SWITCH: ON)

1. When the pilot shut-off lever is turned to the UNLOCK position, the pilot shut-off switch is turned ON.
2. Electrical current from fuse #4 flows to the ground through the pilot shut-off relay and pilot shut-off switch so that the pilot shut-off relay is excited.
3. At the same time, the starter cut relay is connected to the ground circuit.
4. When the pilot shut-off relay is excited, the ground in pilot shut-off solenoid valve is connected to the ground through the pilot shut-off relay and security relay.
5. Therefore, the pilot shut-off solenoid valve is turned ON, pressure oil from the pilot pump is routed to the pilot valve.
6. When the key switch is turned to the START position, the starter cut relay is excited.
7. When the starter cut relay is excited, the circuit between terminal ST in the key switch and terminal S in starter relay 2 is blocked.
8. Therefore, when the pilot shut-off lever is in the UNLOCK position the key switch is turned to the START position, the engine does not start.

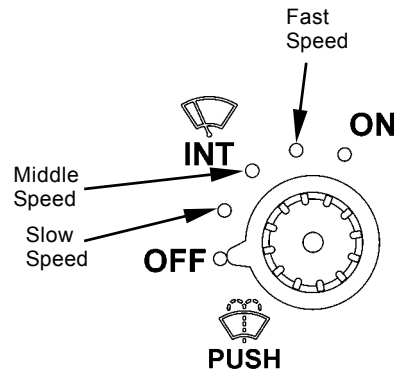
SYSTEM / Electrical System

WIPER / WASHER CIRCUIT

Wiper Circuit

Operation:

1. The wiper / washer switch sends the electrical signal on position the INT. in response to the set intervals to the monitor unit.
2. The monitor unit connects terminal #A2 to the ground according to the input intervals.
3. Therefore, the wiper relay repeats to turn ON and OFF.
4. When the wiper relay is turned ON, current from fuse #2 flows to the wiper motor and the wiper moves.



Washer Operation

M178-01-016

Operation:

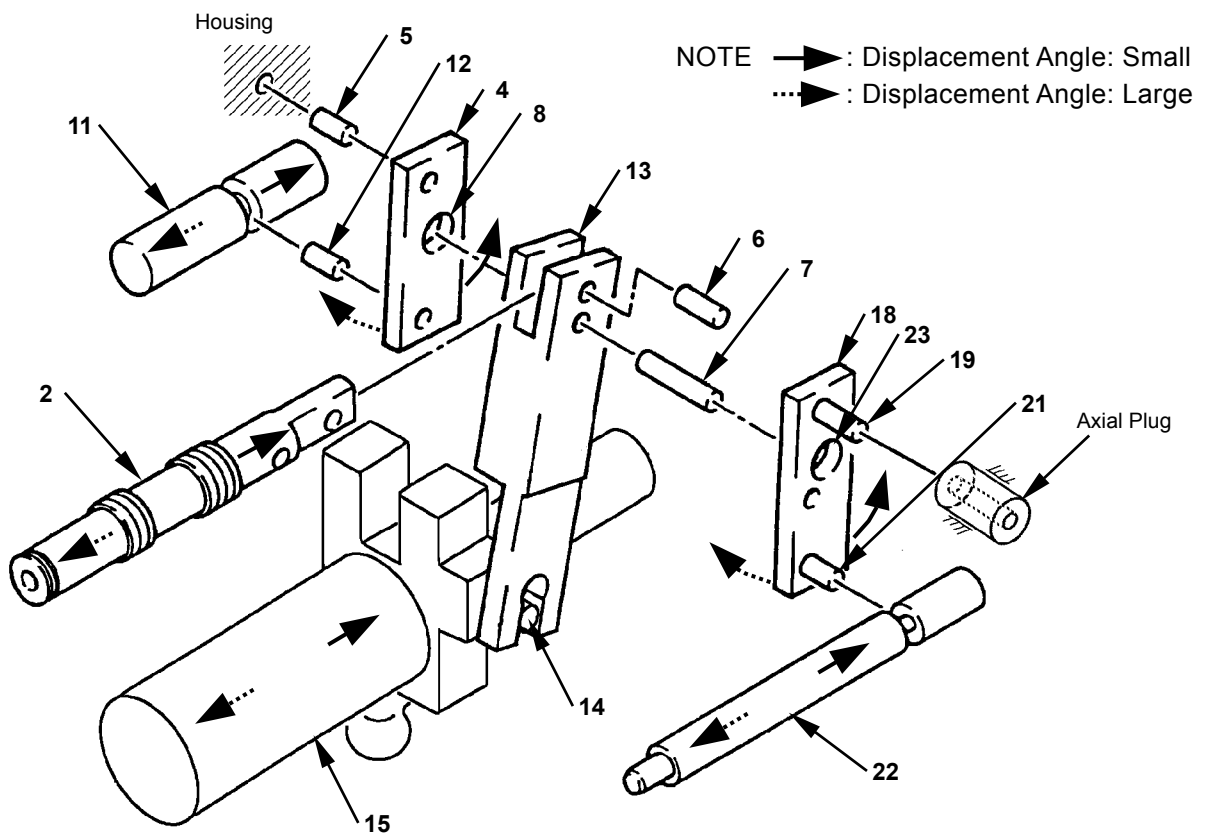
1. While pushing the wiper/washer switch, the monitor unit receives the electrical signal from the wiper/washer switch.
2. The monitor unit connects terminal #A10 to the ground and the washer relay is excited.
3. Current from fuse #2 flows to the washer motor and washer liquid jets.

Position ITN.	Set Time
Slow	8 seconds
Middle	6 seconds
Fast	3 seconds

COMPONENT OPERATION / Pump Device

Link Mechanism

- The movement of pilot piston (22) is transmitted through pin (21) to lever 1 (18). Lever 1 (18) is turned about pin (19) which is fixed to the axial plug.
- The movement of pilot piston (11) is transmitted through pin (12) to lever 2 (4). Lever 2 (4) is turned about pin (5) which is fixed to the housing.
- Pin (7) is attached to feedback lever (13). Both ends of pin (7) are inserted into holes (23, 8) on lever 1 (18) and lever 2 (4).
- Therefore, when lever 1 (18) or lever 2 (4) turns, pin (7) contacts the hole of the turned lever. Feedback lever (13) turns about pin (14) attached to servo piston (15).
- In addition, when servo piston (15) moves, feedback lever (13) is moved through pin (14).
- At this time, as neither lever 1 (18) nor lever 2 (4) move, feedback lever (13) turns about pin (7).




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2 - Spool	7 - Pin	13 - Feedback Lever	19 - Pin
4 - Lever 2	8 - Hole	14 - Pin	21 - Pin
5 - Pin	11 - Compensating Rod	15 - Servo Piston	22 - Pilot Piston
6 - Pin	12 - Pin	18 - Lever 1	23 - Hole

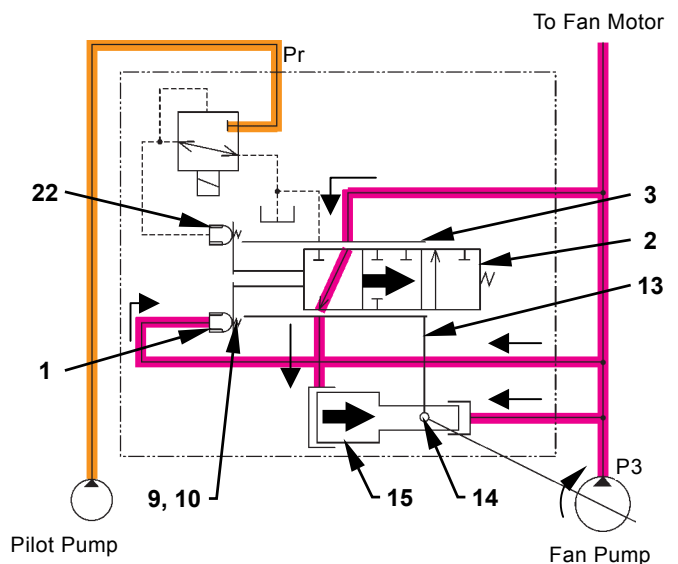
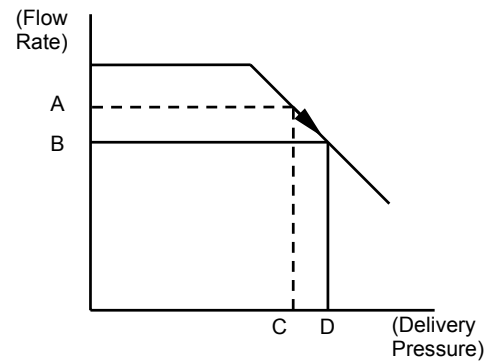
COMPONENT OPERATION / Pump Device

Control by Own Pump Delivery Pressure

 **NOTE:** This control is performed in case speed increases beyond the rated speed when starting.

• Decreasing Flow Rate

1. When own pump delivery pressure P3 increases from C to D, compensating piston (1) moves compensating rod (11) to the right until compensating piston (1) balances with outer spring (10) and inner spring (9).
2. Compensating rod (11) moves lever 2 (4) through pin (12). Lever 2 (4) rotates counterclockwise about pin (5) fixed to the housing.
3. Pin (7), which is attached to feedback lever (13), is inserted into hole (8) of lever 2 (4). Therefore, feedback lever (13) rotates clockwise about pin (14) by the turning of lever 2 (4) and moves spool (2) to the right.
4. When spool (2) moves, own pump delivery pressure P3 acts on the large chamber in servo piston (15) through spool (2). Although own pump delivery pressure P3 acts on the small chamber, servo piston (15) moves to the right due to the difference in pressure receiving area.
5. The pump displacement angle reduces according to the movement of servo piston (15) and the pump delivery flow rate decreases.
6. As own pump delivery pressure P3 acts on compensating piston (1), although piston (15) moves, compensating rod (11) and lever 2 (4) do not move.
7. When servo piston (15) moves, feedback lever (13) moves through pin (14). As neither compensating rod (11) nor lever 2 (4) moves, feedback lever (13) rotates counterclockwise about pin (7) and move spool (2) to the left.
8. The notches on spool (2) and sleeve (3) are closed completely and own pump delivery pressure P3 does not act on the large chamber in servo piston (15), so that the movement of servo piston (15) stops moving.
9. With the above operation, pump delivery flow rate is decreased from A to B, and load of the pump is reduced.



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COMPONENT OPERATION / Swing Device

VALVE UNIT

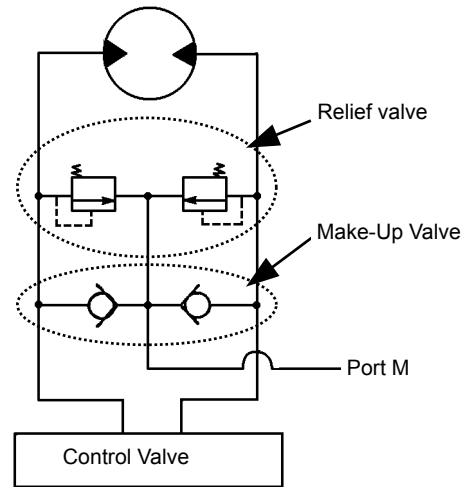
The valve unit consists of make-up valve and relief valve.

The make-up valve prevents cavitation in the circuit and the relief valve prevents surge pressure and overloads in the circuit.

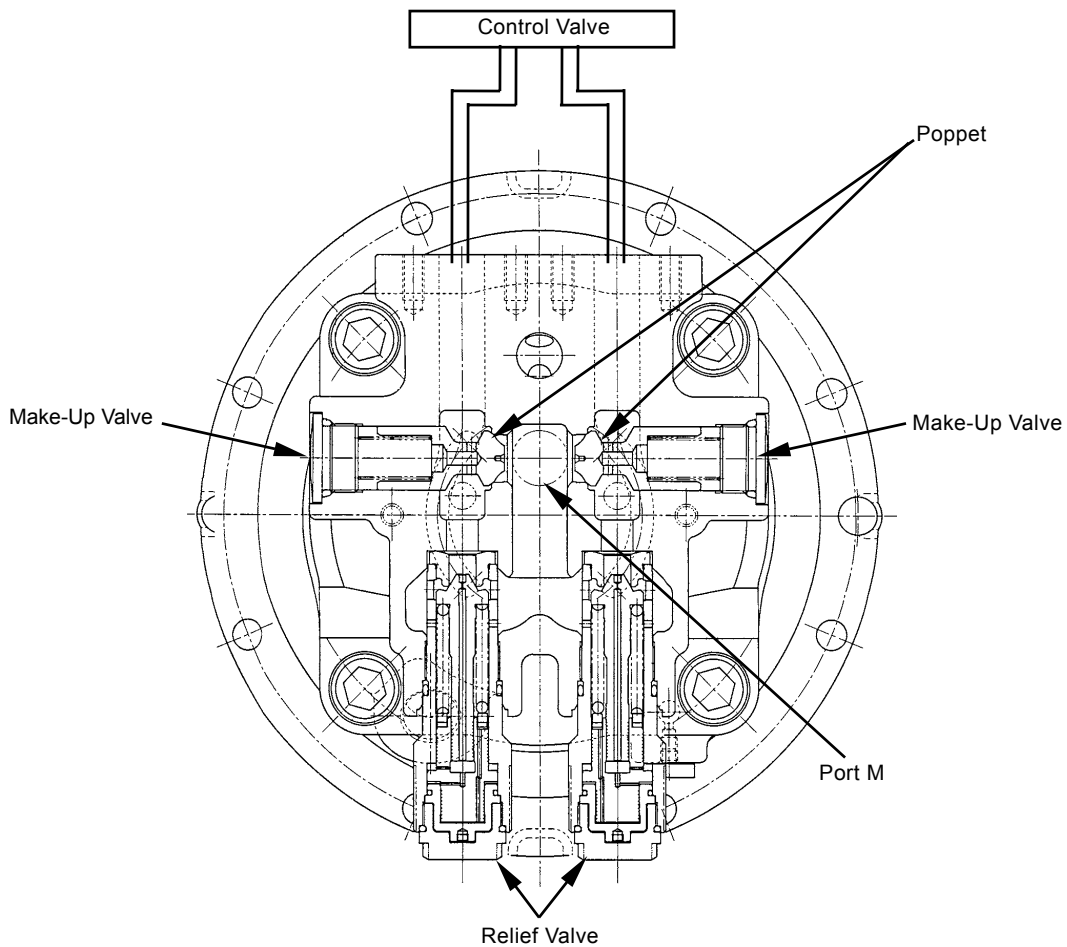
Make-Up Valve

During swing stopping operation, the swing motor is driven by the inertial force of swing frame. The swing motor is turned forcibly in excess of oil pressure from the pump, so that cavitation may be generated in the motor.

In order to avoid this cavitation, when pressure in the swing circuit becomes lower than that in the return circuit (port M), the poppet opens to draw hydraulic oil, and compensates the lack of oil feed.

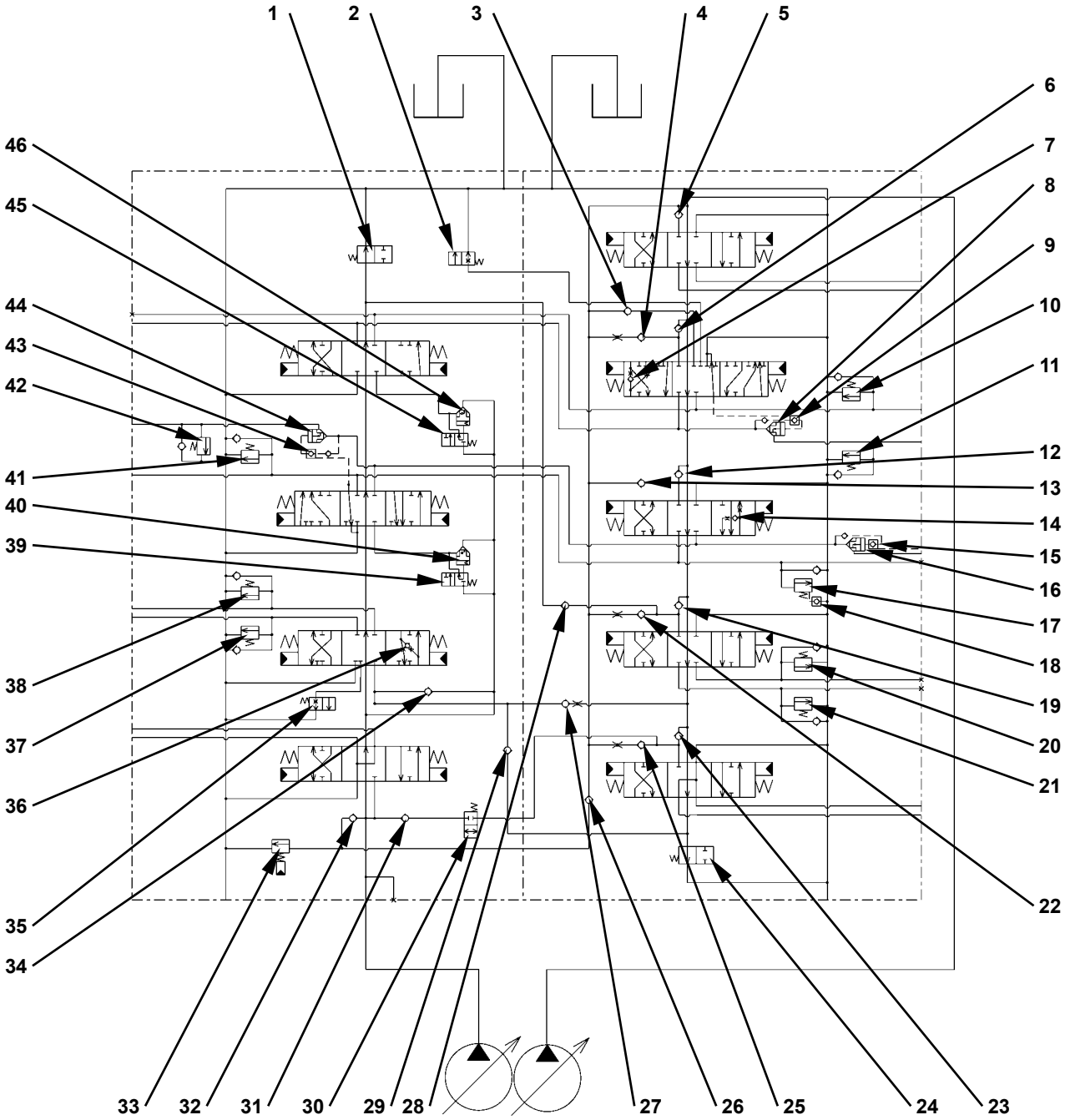


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T178-03-02-004

COMPONENT OPERATION / Control Valve



T1J7-03-03-003

COMPONENT OPERATION / Control Valve

Pilot Control Circuit

Pressure oil (indicated with numbers) from the pilot valve acts on the spool in control valve in order to move the spool.

In the following operations, pressure oil moves the spool and acts on the valves as follows.

- During auxiliary operation, pressure oil moves the auxiliary spool and shifts the bypass shut-out valve in 4-spool section. (Optional)

The air bleed circuit is located on the upper section of control valve and bleeds any air trapped inside automatically.

External Pilot Pressure Circuit


- As the boom 1 spool is shifted during boom lower operation, pressure oil from the pilot pump acts on the boom anti-drift valve and releases the lock of boom anti-drift valve.
- As the arm 1 spool is shifted during arm roll-in operation, pressure oil from the pilot pump acts on the arm anti-drift valve and releases the lock of arm anti-drift valve.
- Pressure in the main relief valve is increased by pilot pressure from solenoid valve (SG)
- The boom overload relief control valve is shifted by pilot pressure from solenoid valve unit (SC).
- The boom flow rate control valve is shifted by pilot pressure from solenoid valve unit (SF).
- The flow combiner valve is shifted by pilot pressure from the flow combiner valve control spool in signal control valve.
- The arm flow rate control valve is shifted by pilot pressure from the arm flow rate control valve control spool in signal control valve.

COMPONENT OPERATION / Control Valve

ANTI-DRIFT VALVE

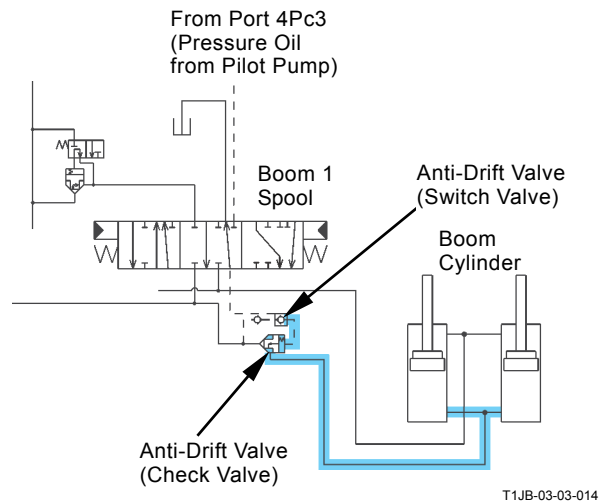
The anti-drift valve is provided in the circuits of boom cylinder bottom side and arm cylinder rod side, and prevents the cylinders from drifting.

The anti-drift valve for boom spool 1 and 2 are provided in the circuit of boom cylinder bottom side.

 **NOTE:** Both boom and arm anti-drift valves are identical in construction. Therefore, the boom anti-drift valve for boom spool 1 is explained as an example.

Holding Operation

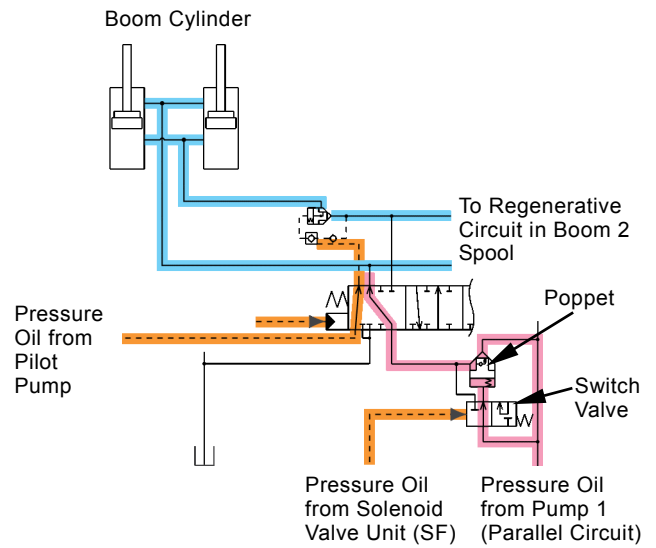
1. Pressure oil from the boom cylinder bottom side flows to the spring (5) chamber and the spring (4) chamber in switch valve (3) through orifice (7) in check valve (6).
2. When the control lever in neutral (boom 1, spool (8): neutral), pressure oil from port 4Pc3 is blocked so that switch valve (3) in the anti-drift valve is not shifted.
3. Consequently, as check valve (6) is pushed by force of spring (5) and pressure of the spring (5) chamber, and the return circuit is blocked, drift amount of the cylinder is reduced.



COMPONENT OPERATION / Control Valve

Flow Rate Control Operation

1. Pilot pressure from solenoid valve unit (SF) shifts the switch valve in boom flow rate control valve.
2. As pressure oil from pump 1 acts on the piston through switch valve, the piston moves downward (upward in the circuit diagram).
3. Therefore, back pressure in the poppet increases and the force to close the poppet valve appears.
4. Consequently, the poppet restricts flow rate to the boom 1 spool and pressure oil is supplied to other actuators which load pressure is higher at.

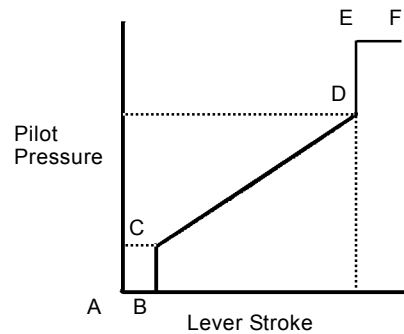


T450-03-03-047

COMPONENT OPERATION / Pilot Valve

During Metering or Decompressing (Output Curve: C to D)

1. When the control lever is further tilted in order to move pusher (2) downward more, hole (7) on spool (6) is opened to port P and pressure oil in port P flows into the output port.
2. Pressure in the output port acts on the bottom surface of spool (6) so that spool (6) is pushed upward.
3. Until upward force acting on the bottom surface of spool (6) overcomes the balance spring (4) force, balance spring (4) is not compressed so that spool (6) is not raised and pressure in the output port increases.
4. As pressure in the output port increases, the force to push spool (6) upward increases. When this force overcomes the balance spring (4) force, balance spring (4) is compressed so that spool (6) is moved upward.
5. As spool (6) is moved upward, hole (7) is closed so that pressure oil from port P stops flowing into the output port and pressure in the output port stops increasing.
6. As spool (6) is moved downward and balance spring (4) is compressed, pressure acting on the bottom surface of spool (6) increases until pressure balances with the increasing spring force. This increasing pressure becomes pressure at the output port.



T523-02-05-001

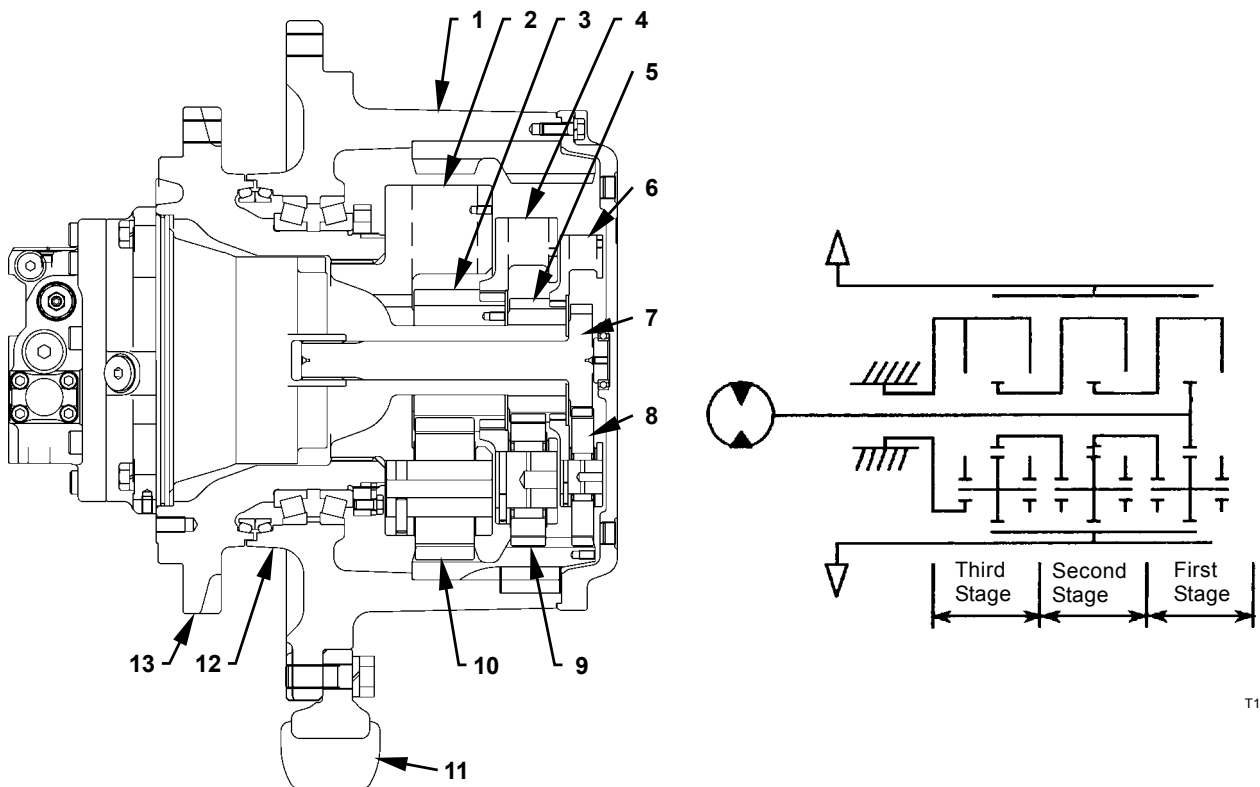
COMPONENT OPERATION / Travel Device

TRAVEL REDUCTION GEAR

The travel reduction gear is a three-stage reduction planetary gear type.

The travel motor rotates shaft (7). This rotation is transmitted to third stage carrier (2) and ring gear (1) via first stage planetary gear (8), first stage carrier (6), second stage sun gear (5), second stage planetary gear (9), second stage carrier (4), third stage sun gear (3) and third stage planetary gear (10).

Third stage carrier (2) is fixed to by housing (13) and does not rotate. Ring gear (1) and sprocket (11) are bolted to drum (12), and are rotated together.



T1J7-03-05-002

T111-03-04-011

- | | | | |
|--------------------------|---------------------------|---------------------------------|---------------|
| 1 - Ring Gear | 5 - Second Stage Sun Gear | 8 - First Stage Planetary Gear | 11 - Sprocket |
| 2 - Third Stage Carrier | 6 - First Stage Carrier | 9 - Second Stage Planetary Gear | 12 - Drum |
| 3 - Third Stage Sun Gear | 7 - Shaft | 10 - Third Stage Planetary Gear | 13 - Housing |
| 4 - Second Stage Carrier | | | |

COMPONENT OPERATION / Travel Device

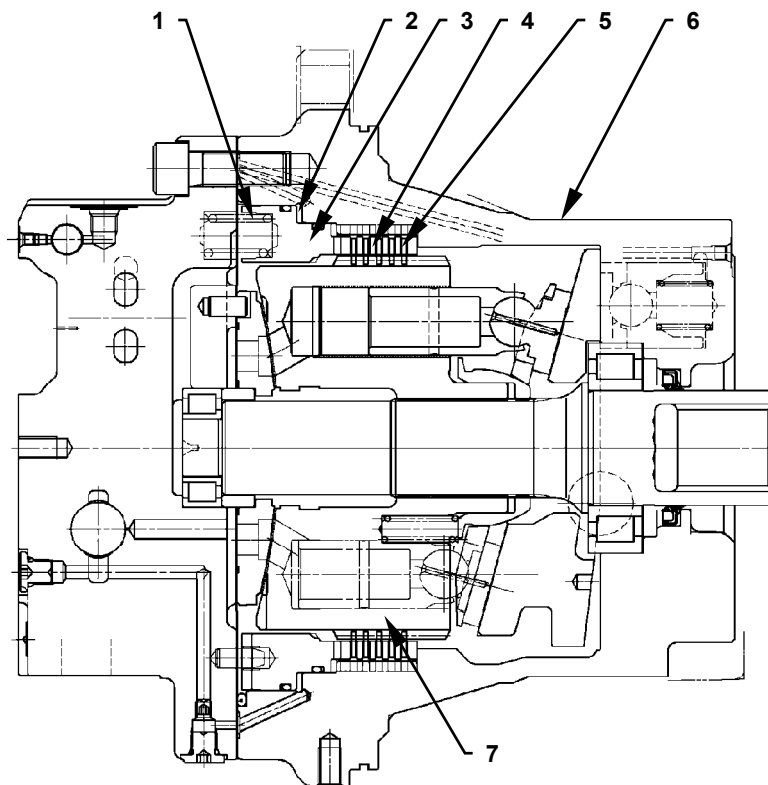
PARKING BRAKE

The parking brake is a negative-type brake released when pilot pressure oil is applied to piston chamber (2). The parking brake is automatically applied except during travel operation.

Friction plate (5) is connected to rotor (7) and plate (4) is connected to casing (6) via spline couplings respectively.

When spring (1) pushes piston (3) and friction plate (5) comes into contact with plate (4), the parking brake is applied.

(Refer to the pilot circuit in the Hydraulic Circuit Group / SYSTEM as for pilot oil flow.)



T1JB-03-05-003

1 - Spring
2 - Piston Chamber

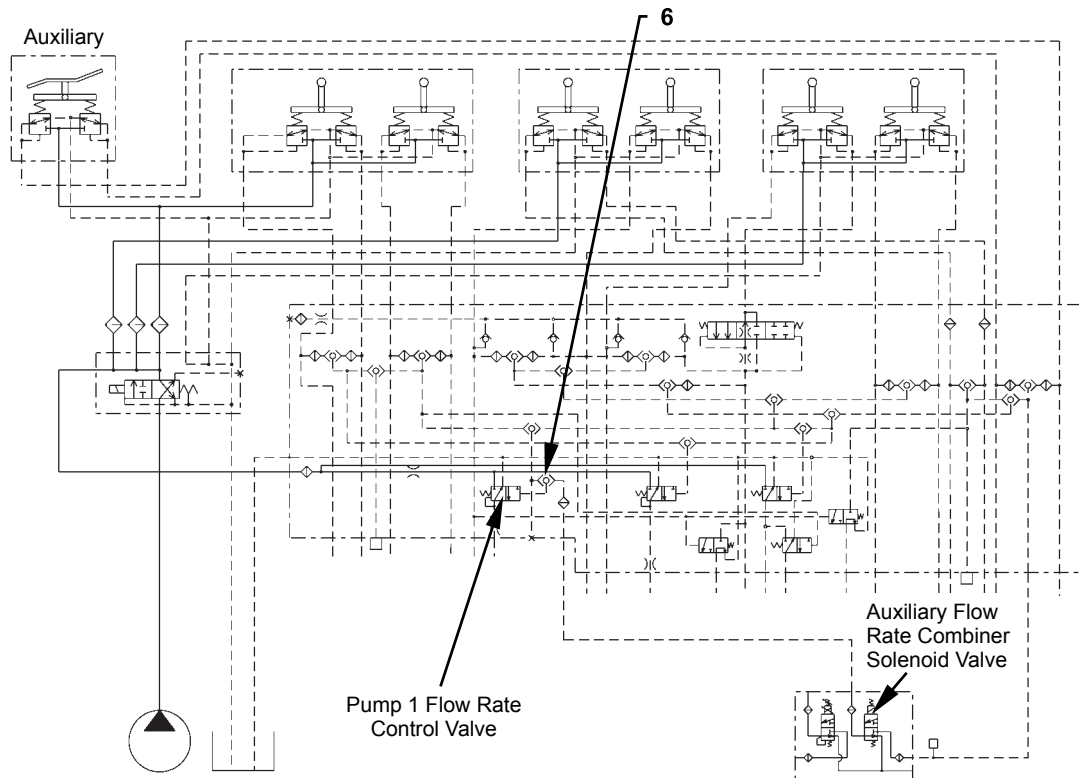
3 - Piston
4 - Plate

5 - Friction Plate
6 - Casing

7 - Rotor

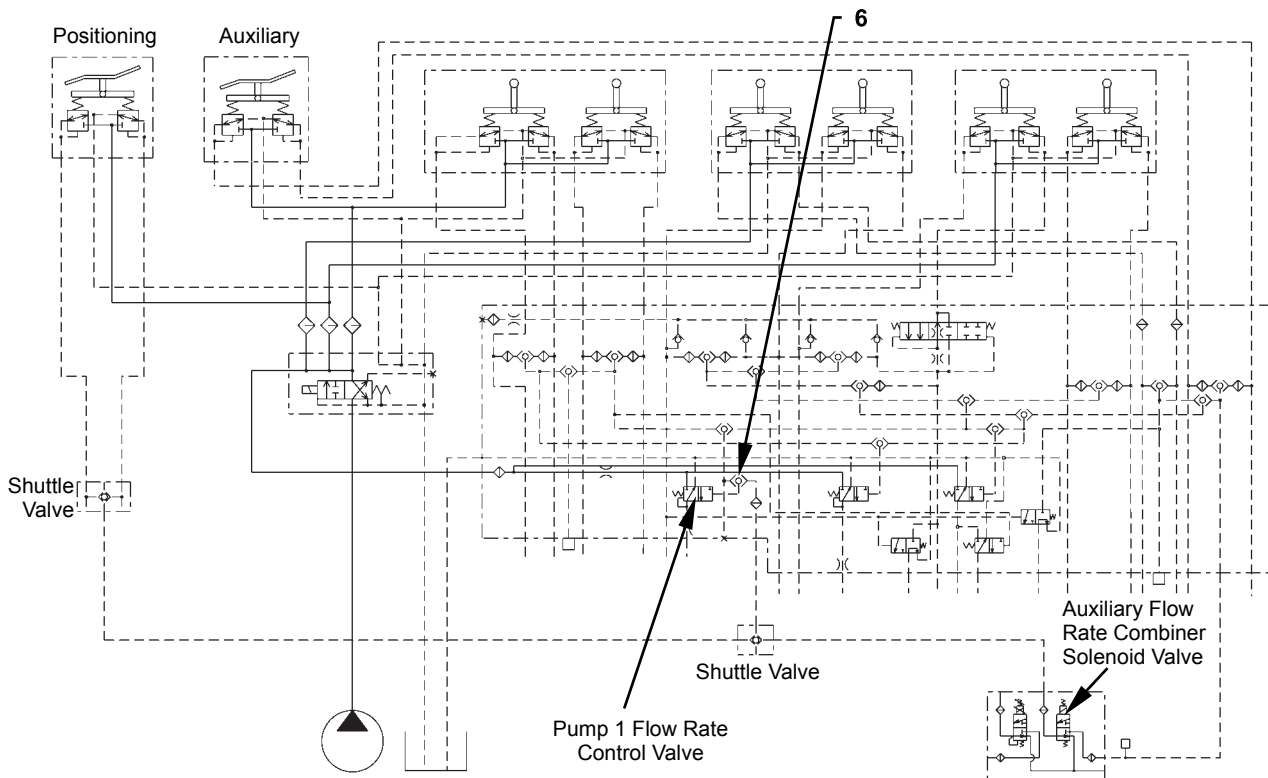
COMPONENT OPERATION / Signal Control Valve

Machine with Monoblock Boom and Auxiliary Flow Combining Attached (Optional)



T1V1-03-06-007

Machine with 2-Piece Boom and Auxiliary Combining Attached (Optional)



T1V1-03-06-006

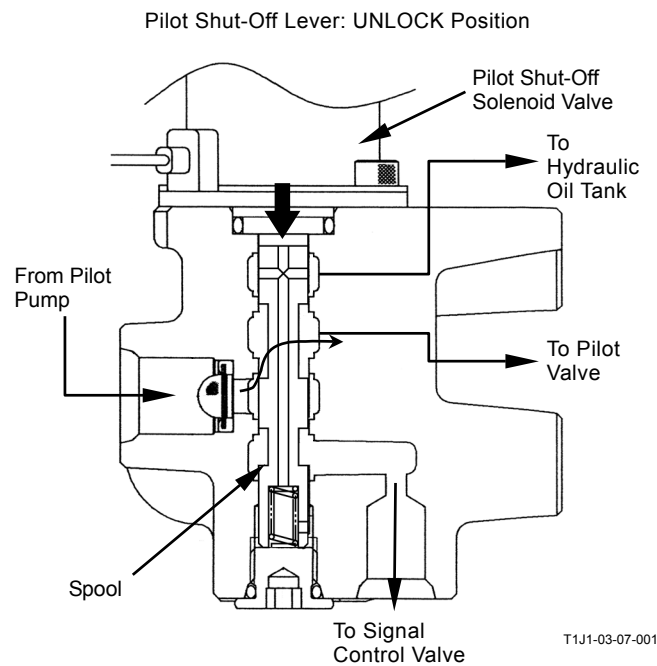
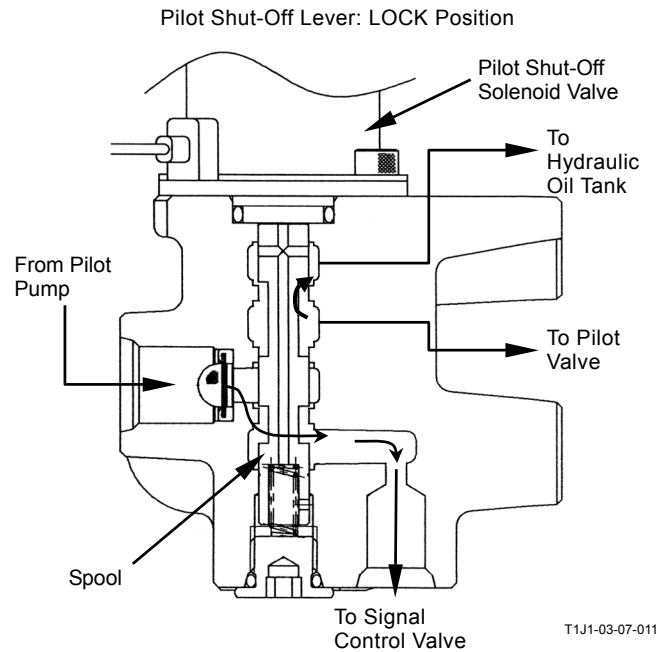
COMPONENT OPERATION / Others (Upperstructure)

- Pilot Shut-Off Lever: LOCK Position

1. When the pilot shut-off lever is in the LOCK position, the pilot shut-off relay is turned OFF and the pilot shut-off solenoid valve is turned OFF. (Refer to Electrical System/ SYSTEM.)
2. Pressure oil from the pilot pump flows to the signal control valve through the spool in pilot shut-off solenoid valve.
3. Oil from the pilot valve flows to the hydraulic oil tank.
4. Therefore, although the control lever is operated, the pilot valve is not operated.

- Pilot Shut-Off Lever: UNLOCK Position

1. When the pilot shut-off lever is in the UNLOCK position, the pilot shut-off relay is turned ON and the pilot shut-off solenoid valve is activated.
2. Therefore, the Circuit to signal control valve and hydraulic oil tank are blocked by the spool in pilot shut-off valve.
3. Pressure oil from the pilot pump flows to the pilot valve.
4. Consequently, when the control lever is operated, the pilot valve is operated.



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