PART NO. TONGE40-EN-00

HITACHI

Reliable solutions

Technical Manual
Operational Principle

ZW 330-6
Wheel Loader

Service Manual consists of the following separate Part No.

Technical Manual (Operational Principle)	: Vol. No.TONGE40-EN
Technical Manual (Troubleshooting)	: Vol. No.TTNGE40-EN
Workshop Manual	: Vol. No.WNGE40-EN

ZW330-6 WHEEL LOADER TECHNICAL MANUAL OPERATIONAL PRINCIPLE

TONGE40-EN-00

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

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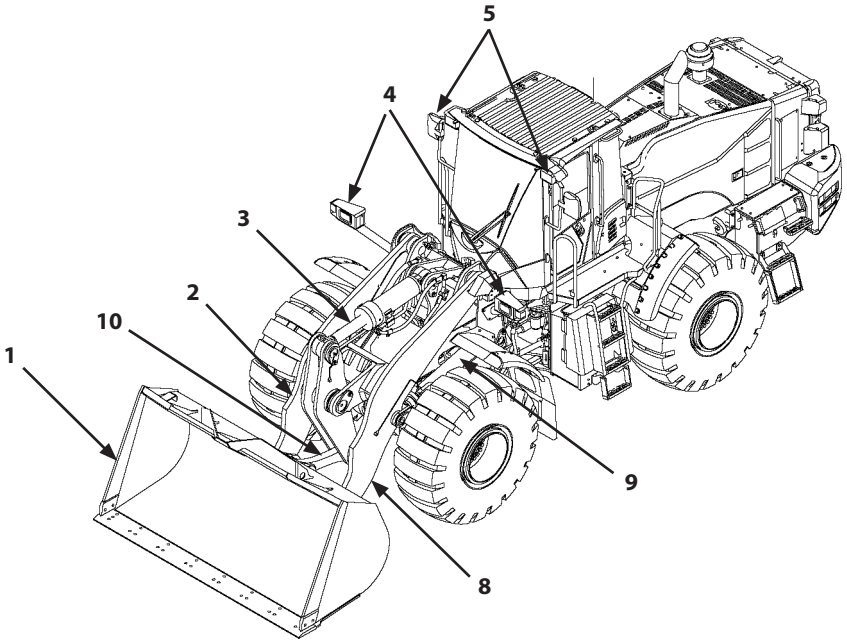
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SYMBOL AND ABBREVIATION

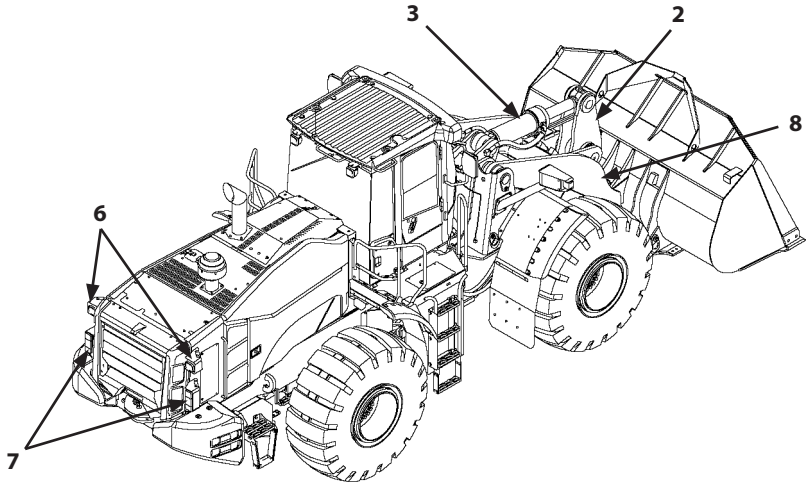
Symbol / Abbreviation	Name	Explanation
TO	Technical manual (Operational principle)	Technical manual (Operational Principle).
TT	Technical manual (Troubleshooting)	Technical manual (Troubleshooting).
T/M	Technical manual	Technical manual.
W, W/M	Workshop manual	Workshop manual (Removal and Installation, Disassembly and Assembly).
MC	Main Controller	Main controller. MC controls the engine, pump, and valve according to the machine operating condition.
ECM	Engine Control Module	Engine controller. ECM controls fuel injection amount according to the machine operating condition.
VGS	Variable Geometry System controller	Variable turbo controller. VGS is an exhaust turbo charged system to supercharge the exhaust energy while running the engine at slow idle speed. VGS optimizes the turbine rotation, improves the performance at slow-speed torque and the acceleration, reduces fuel consumption, and reduces particulate matter (PM) by adjusting the nozzle opening of turbine housing.
GSM	Global System for Mobile communications controller	Communication controller. GSM is a type of wireless communication system, is used in more than on 100 countries around Europe and Asia, and becomes the factual global standards of the mobile telephone.
GPS	Global Positioning System	Global positioning system.
CAN	Controller Area Network	CAN communication. CAN is a serial communications protocol internationally-standardized by ISO (International Organization for Standardization).
A/C	Air Conditioner	Air conditioner.
OP, OPT	Option	Optional component.
MPDr.	Maintenance Pro Dr.	MPDr. is software that troubleshooting, monitoring, and adjustment.
A/I	Auto-Idle	Auto-idle.
WU	Warming-Up	Warming-up.
Li	Low (Slow) Idle	Slow idle engine speed.
ATT	Attachment	Attachment. Attachment is optional parts such as breaker, crusher, and pulverizer in this manual.
HI, Hi	High	Travel fast position.
LO, Lo	Low	Travel slow position.

Main Component

[Overview]



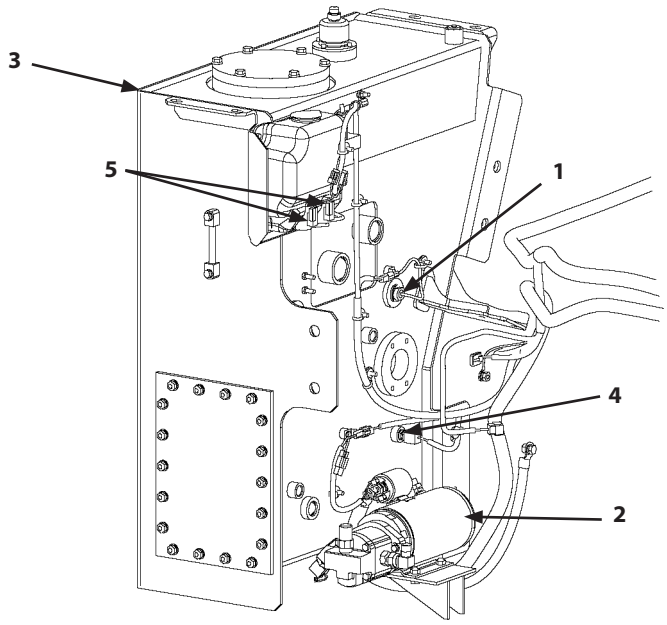
ZW330-6T01-02-01



ZW330-6T01-02-02

1- Bucket
2- Bell Crank
3- Bucket Cylinder
4- Front Combination Light (Headlight, Turn Signal Light, Hazard Light)
5- Front Work Light
6- Rear Work Light
7- Rear Combination Light (Turn Signal Light, Hazard Light, Tail Light, Brake Light)
8- Lift Arm
9- Lift Arm Cylinder
10- Bucket Link

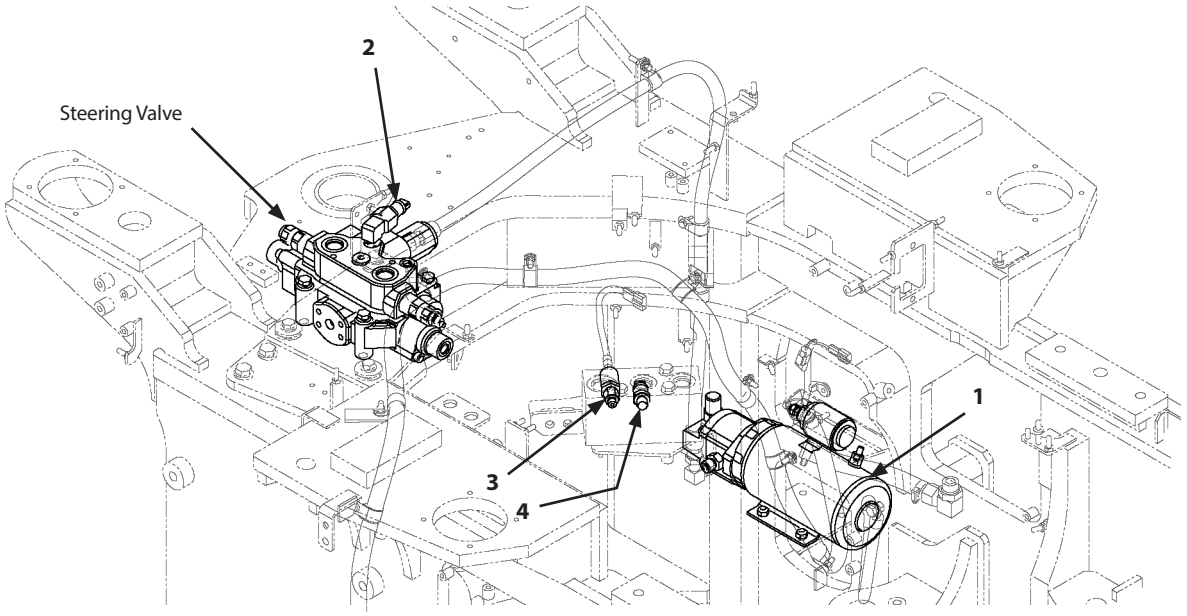
Electrical System (Around Hydraulic Oil Tank)



ZW330-6T01-02-07

1- Hydraulic Oil Level Sensor
2- Emergency Steering Pump
3- Hydraulic Tank
4- Hydraulic Oil Temperature Sensor
5- Window Washer Tank Motor

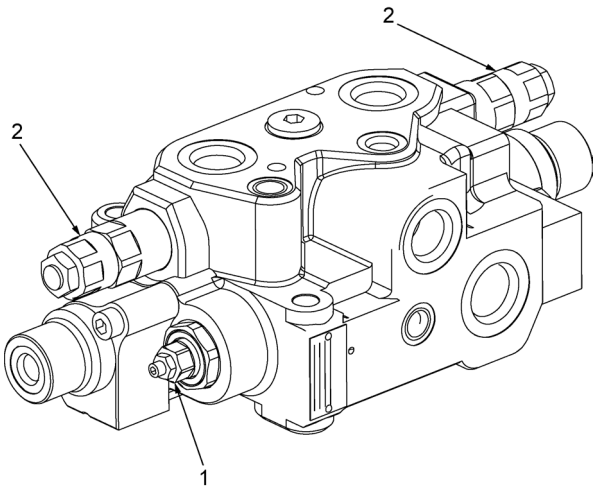
Emergency Steering Group



ZW330-6T01-02-14

1- Emergency Steering Pump
2- Pressure Sensor (Emergency Steering)
3- Pressure Switch (Emergency Steering)
4- Pressure Switch (Main Pump)

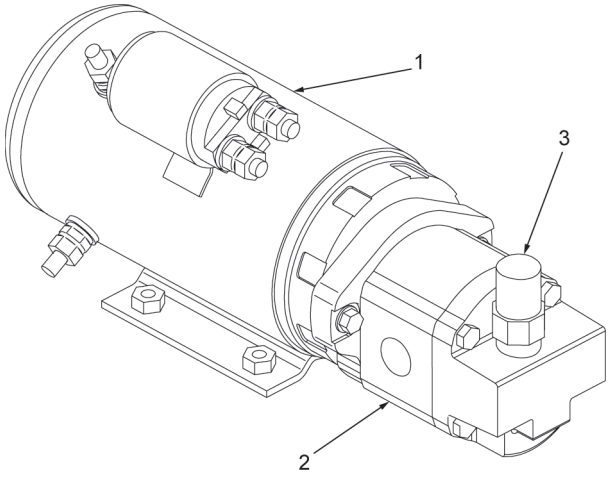
Steering Valve



90T4GB-01-02-20

1- Main Relief Valve
2- Overload Relief Valve

Emergency Steering Pump



90TNED-01-02-19

1- Electric Motor
2- Gear Pump
3- Relief Valve

Engine Accessories

Battery	Type	COM4D-P
	Voltage	12 V
	Capacity	RC = 320 min (Discharge: 25 A at 80 °F)
	Cold Cranking Amps	1000 CCA
	Weight	45.5 kg (100 lb)×2

SECTION 2

SYSTEM

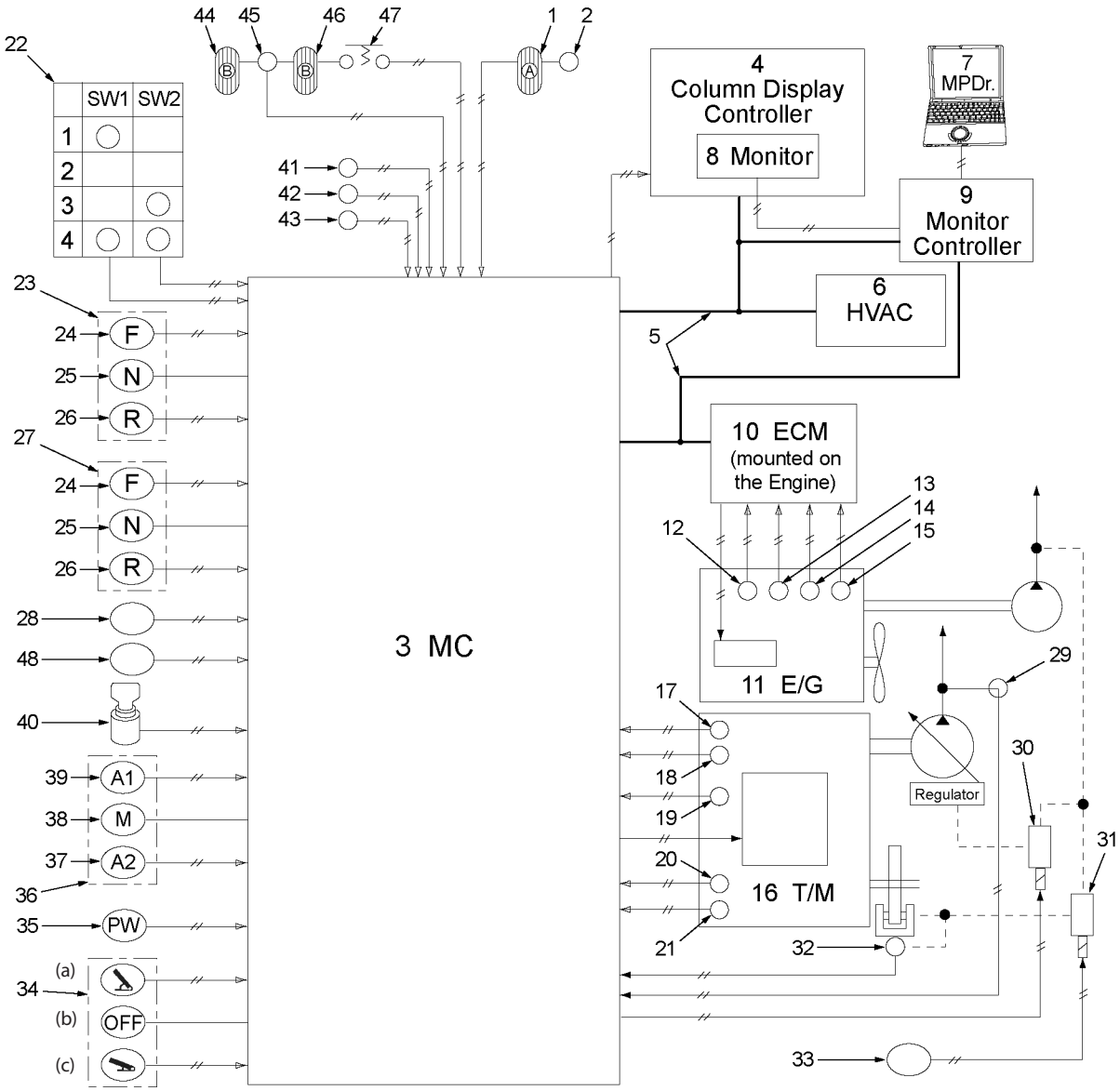
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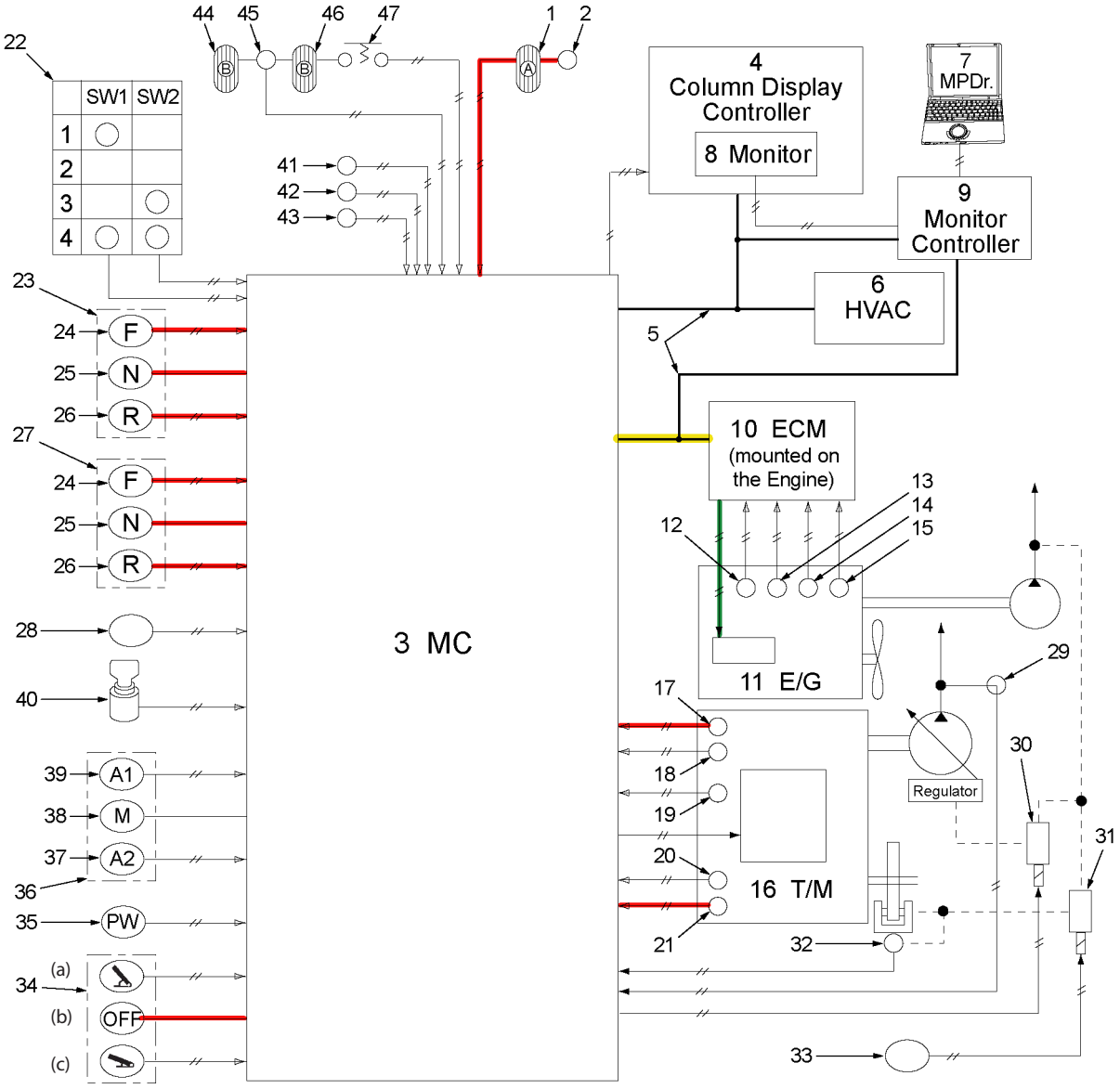
Engine Control System Layout



90Z7BT02-02-01

a- Brake Pedal Position: Lightly applied
b- OFF
c- Brake Pedal Position: Fully applied

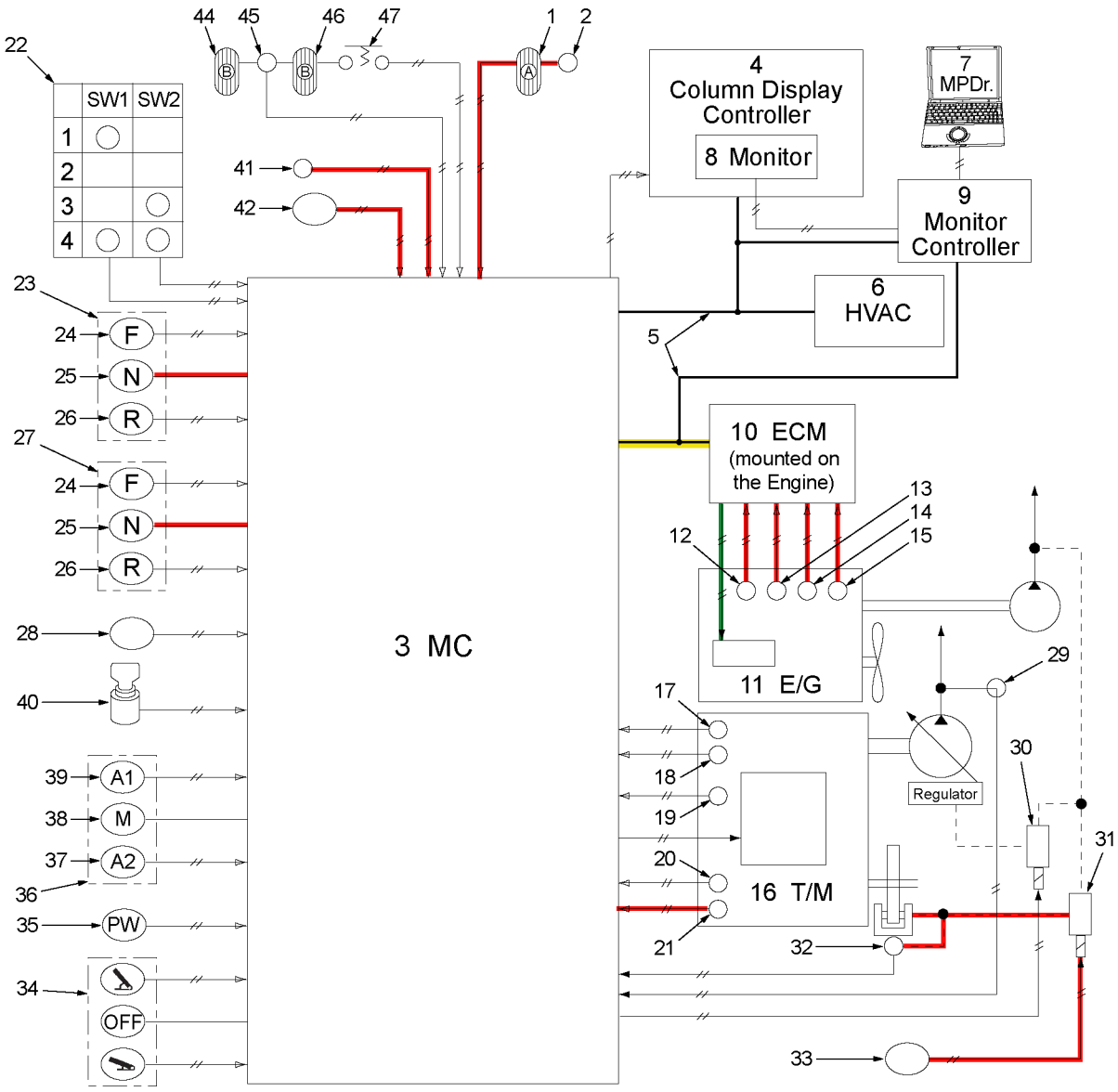
1- Accelerator Pedal
2- Accelerator Pedal Sensor
3- Main Controller (MC)
4- Column Display Controller
5- Controller Area Network (CAN)
6- Air Conditioner Controller
7- Maintenance Pro (MP) Dr.
8- Monitor
9- Monitor Controller
10- Engine Control Module (ECM)
11- Engine
12- Exhaust Gas Temperature Sensor
13- Crankshaft Speed Sensor
14- Camshaft Speed Sensor
15- Coolant Temperature Sensor
16- Transmission
17- Machine Speed Sensor (Backup)
18- Torque Converter Oil Temperature Sensor
19- Torque Converter Input Speed Sensor
20- Torque Converter Output Speed Sensor
21- Machine Speed Sensor
22- Shift Switch
23- Forward/Reverse Lever
24- Forward Position
25- Neutral Position
26- Reverse Position
27- Forward/Reverse Switch
28- Forward/Reverse Selector Switch
29- Pump Delivery Pressure Sensor
30- Torque Control Solenoid Valve
31- Parking Brake Solenoid Valve
32- Pressure Sensor (Parking Brake)
33- Parking Brake Switch
34- Declutch Position Switch
35- Power Mode Selector Switch
36- Travel Mode Selector Switch
37- AUTO 2 Mode
38- Manual Mode
39- AUTO 1 Mode
40- Starter Key Switch
41- Hydraulic Oil Temperature Sensor
42- Pressure Sensor (Lift Arm Raise)
43- Pressure Sensor (Bucket Roll Back)
44- Brake Pedal (Left)
45- Pressure Sensor (Brake Secondary Pressure)
46- Brake Pedal (Right)
47- Brake Pedal (Right) Switch
48- Aftertreatment Device Regeneration Switch



90Z7B-02-02-10

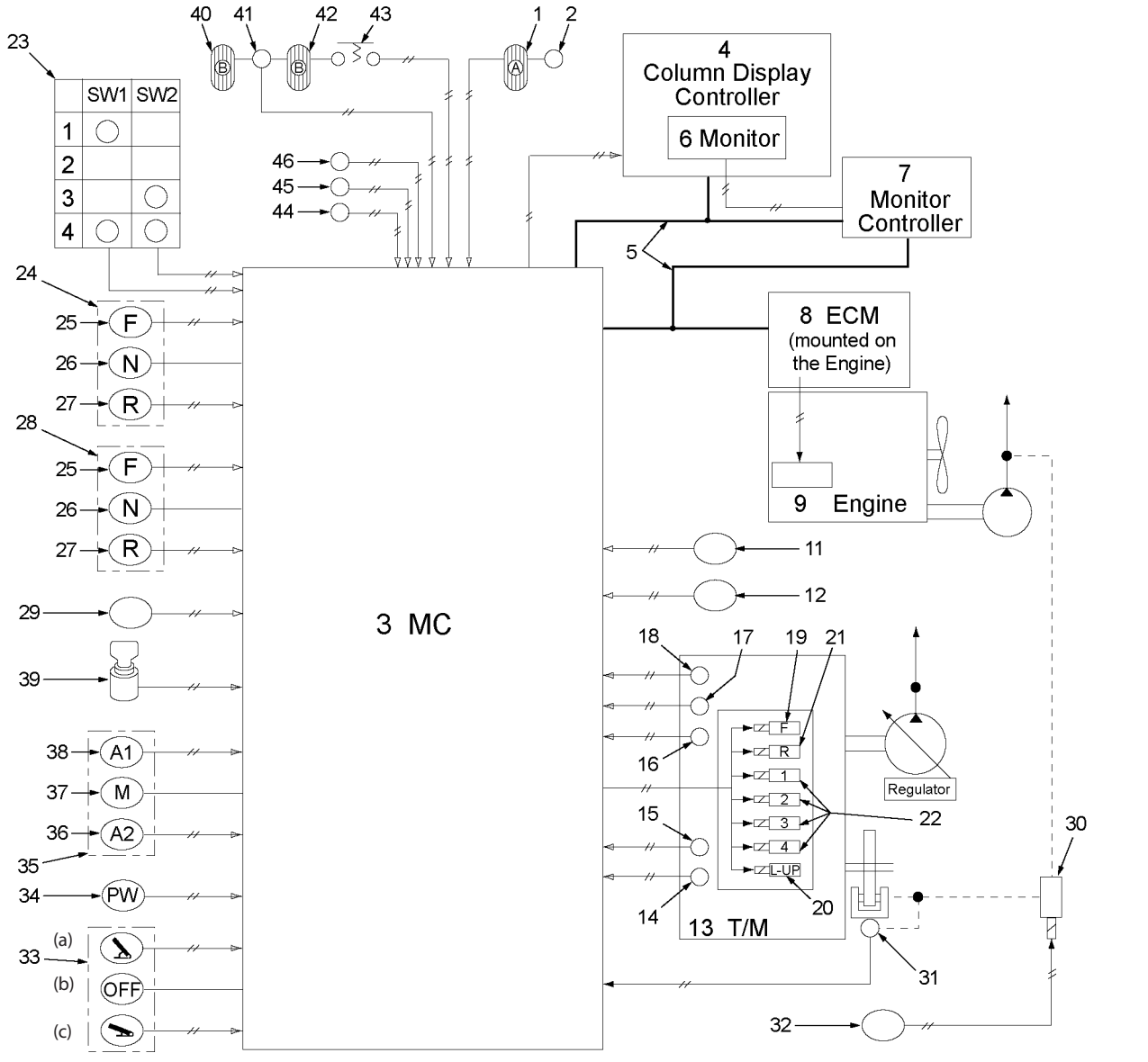
a- Brake Pedal Position: Lightly applied
b- OFF
c- Brake Pedal Position: Fully applied

1- Accelerator Pedal
2- Accelerator Pedal Sensor
3- Main Controller (MC)
4- Column Display Controller
5- Controller Area Network (CAN)
6- Air Conditioner Controller
7- Maintenance Pro (MP) Dr.
8- Monitor
9- Monitor Controller
10- Engine Control Module (ECM)
11- Engine
12- Exhaust Gas Temperature Sensor
13- Crankshaft Speed Sensor
14- Camshaft Speed Sensor
15- Coolant Temperature Sensor
16- Transmission
17- Machine Speed Sensor (Backup)
18- Torque Converter Oil Temperature Sensor
19- Torque Converter Input Speed Sensor
20- Torque Converter Output Speed Sensor
21- Machine Speed Sensor
22- Shift Switch
23- Forward/Reverse Lever
24- Forward Position
25- Neutral Position
26- Reverse Position
27- Forward/Reverse Switch
28- Forward/Reverse Selector Switch
29- Pump Delivery Pressure Sensor
30- Torque Control Solenoid Valve
31- Parking Brake Solenoid Valve
32- Pressure Sensor (Parking Brake)
33- Parking Brake Switch
34- Declutch Position Switch
35- Power Mode Selector Switch
36- Travel Mode Selector Switch
37- AUTO 2 Mode
38- Manual Mode
39- AUTO 1 Mode
40- Starter Key Switch
41- Hydraulic Oil Temperature Sensor
42- Pressure Sensor (Lift Arm Raise)
43- Pressure Sensor (Bucket Roll Back)
44- Brake Pedal (Left)
45- Pressure Sensor (Brake Secondary Pressure)
46- Brake Pedal (Right)
47- Brake Pedal (Right) Switch



90Z7B-02-02-52

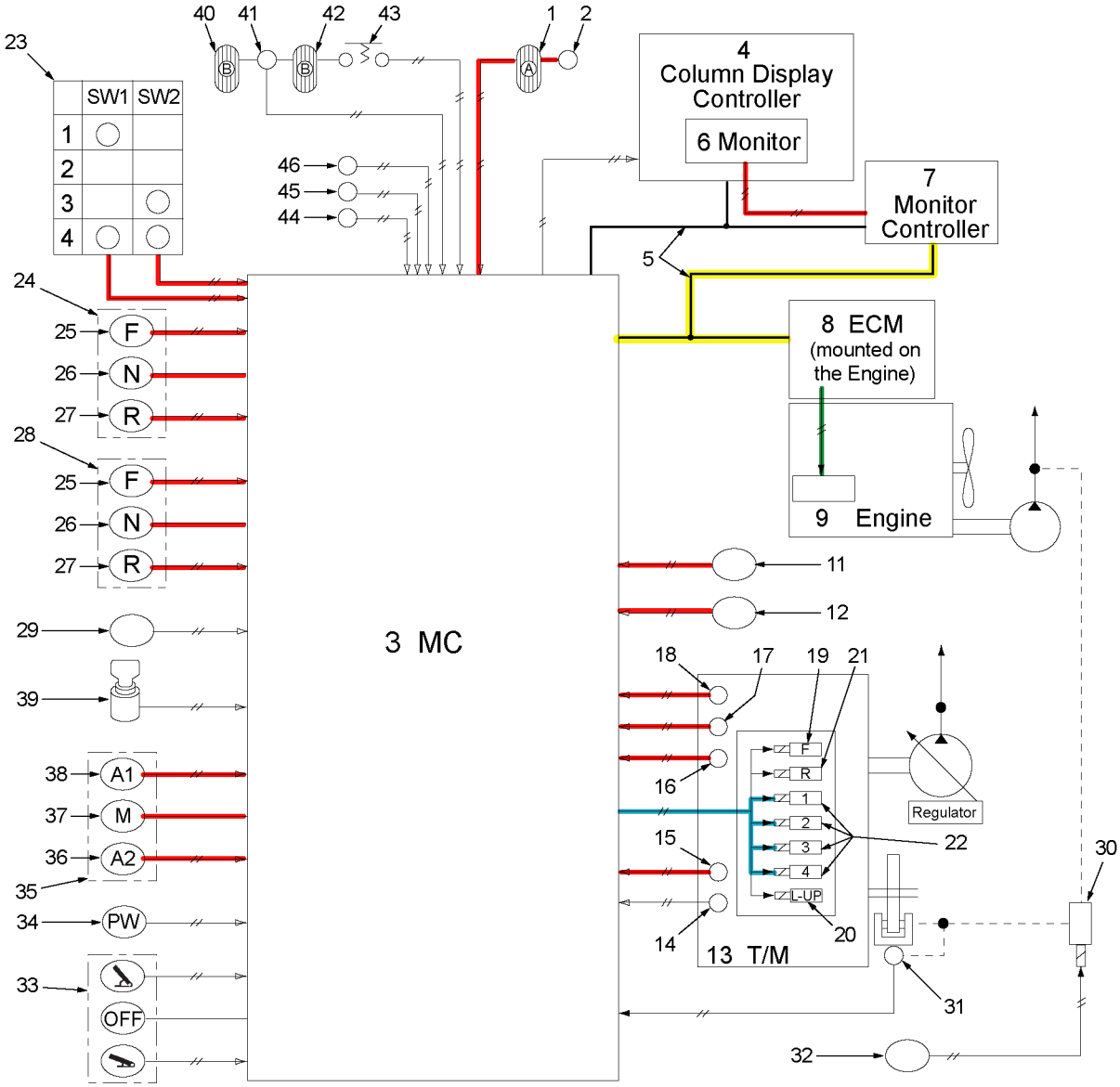
1- Accelerator Pedal
2- Accelerator Pedal Sensor
3- Main Controller (MC)
4- Column Display Controller
5- Controller Area Network (CAN)
6- Air Conditioner Controller
7- Maintenance Pro (MP) Dr.
8- Monitor
9- Monitor Controller
10- Engine Control Module (ECM)
11- Engine
12- Exhaust Gas Temperature Sensor
13- Crankshaft Speed Sensor
14- Camshaft Speed Sensor
15- Coolant Temperature Sensor
16- Transmission
17- Machine Speed Sensor (Backup)
18- Torque Converter Oil Temperature Sensor
19- Torque Converter Input Speed Sensor
20- Torque Converter Output Speed Sensor
21- Machine Speed Sensor
22- Shift Switch
23- Forward/Reverse Lever
24- Forward Position
25- Neutral Position
26- Reverse Position
27- Forward/Reverse Switch
28- Forward/Reverse Selector Switch
29- Pump Delivery Pressure Sensor
30- Torque Control Solenoid Valve
31- Parking Brake Solenoid Valve
32- Pressure Sensor (Parking Brake)
33- Parking Brake Switch
34- Declutch Position Switch
35- Power Mode Selector Switch
36- Travel Mode Selector Switch
37- AUTO 2 Mode
38- Manual Mode
39- AUTO 1 Mode
40- Starter Key Switch
41- Pressure Sensor (Pilot Primary)
42- Aftertreatment Device Regeneration Switch
44- Brake Pedal (Left)
45- Pressure Sensor (Brake Secondary Pressure)
46- Brake Pedal (Right)
47- Brake Pedal (Right) Switch



90Z7B-02-02-27

a- Brake Pedal Position: Lightly applied
b- OFF
c- Brake Pedal Position: Fully applied

1- Accelerator Pedal
2- Accelerator Pedal Sensor
3- Main Controller (MC)
4- Column Display Controller
5- Controller Area Network (CAN)
6- Monitor
7- Monitor Controller
8- Engine Control Module (ECM)
9- Engine
10- -
11- Downshift Switch (DSS)
12- Hold Switch
13- Transmission
14- Torque Converter Oil Temperature Sensor
15- Torque Converter Input Speed Sensor
16- Torque Converter Output Speed Sensor
17- Machine Speed Sensor (Backup)
18- Machine Speed Sensor
19- Forward Clutch Solenoid Valve
20- Lock-Up Clutch Solenoid Valve
21- Reverse Clutch Solenoid Valve
22- Speed Shift Solenoid Valve
23- Shift Switch
24- Forward/Reverse Lever
25- Forward Position
26- Neutral Position
27- Reverse Position
28- Forward/Reverse Switch
29- Forward/Reverse Selector Switch
30- Parking Brake Solenoid Valve
31- Pressure Sensor (Parking Brake)
32- Parking Brake Switch
33- Declutch Position Switch
34- Power Mode Selector Switch
35- Travel Mode Selector Switch
36- AUTO 2 Mode
37- Manual Mode
38- AUTO 1 Mode
39- Key Switch
40- Brake Pedal (Left)
41- Pressure Sensor (Brake Secondary Pressure)
42- Brake Pedal (Right)
43- Brake Pedal (Right) Switch
44- Lift Arm Angle Sensor
45- Pressure Sensor (Lift Arm Raise)
46- Pressure Sensor (Bucket Dump)



90Z7B-02-02-32

1- Accelerator Pedal
2- Accelerator Pedal Sensor
3- Main Controller (MC)
4- Column Display Controller
5- Controller Area Network (CAN)
6- Monitor
7- Monitor Controller
8- Engine Control Module (ECM)
9- Engine
11- Downshift Switch (DSS)
12- Hold Switch
13- Transmission
14- Torque Converter Oil Temperature Sensor
15- Torque Converter Input Speed Sensor
16- Torque Converter Output Speed Sensor
17- Machine Speed Sensor (Backup)
18- Machine Speed Sensor
19- Forward Clutch Solenoid Valve
20- Lock-Up Clutch Solenoid Valve
21- Reverse Clutch Solenoid Valve
22- Speed Shift Solenoid Valve
23- Shift Switch
24- Forward/Reverse Lever
25- Forward Position
26- Neutral Position
27- Reverse Position
28- Forward/Reverse Switch
29- Forward/Reverse Selector Switch
30- Parking Brake Solenoid Valve
31- Pressure Sensor (Parking Brake)
32- Parking Brake Switch
33- Declutch Position Switch
34- Power Mode Selector Switch
35- Travel Mode Selector Switch
36- AUTO 2 Mode
37- Manual Mode
38- AUTO 1 Mode
39- Key Switch
40- Brake Pedal (Left)
41- Pressure Sensor (Brake Secondary Pressure)
42- Brake Pedal (Right)
43- Brake Pedal (Right) Switch
44- Lift Arm Angle Sensor
45- Pressure Sensor (Lift Arm Raise)
46- Pressure Sensor (Bucket Dump)

Fan Control, Valve Control

The fan control system and valve control consist of the following.

- Fan Speed Control
- Fan Reverse Rotation Control
- Lift Arm and Bucket Selection Circuit Control
- Ride Control

JSS Control System (Option)

JCU (Joystick Steering Control Unit) is mainly used for the joystick steering control of the vehicle operation. Each signal from the armrest switch, joystick steering selector switch, and joystick steering lever is sent to JCU and is processed in the logic circuit.
JCU activates the 2-spool solenoid valve unit and cut off solenoid valve, and controls the steering operation of the vehicle.

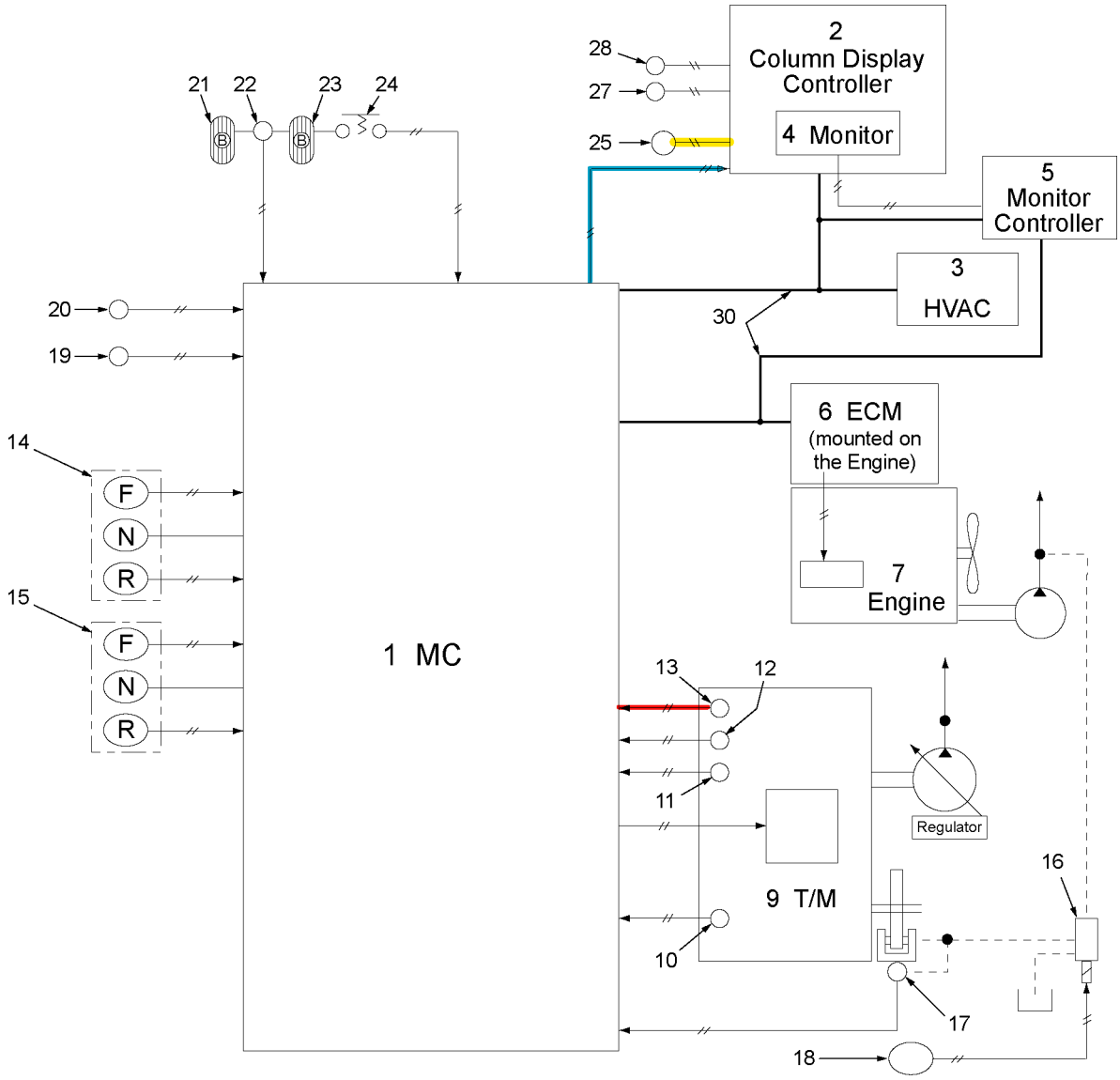
NOTE: JCU is an optional controller.

NOTE: JSS: Joystick Steering System

Other Controls

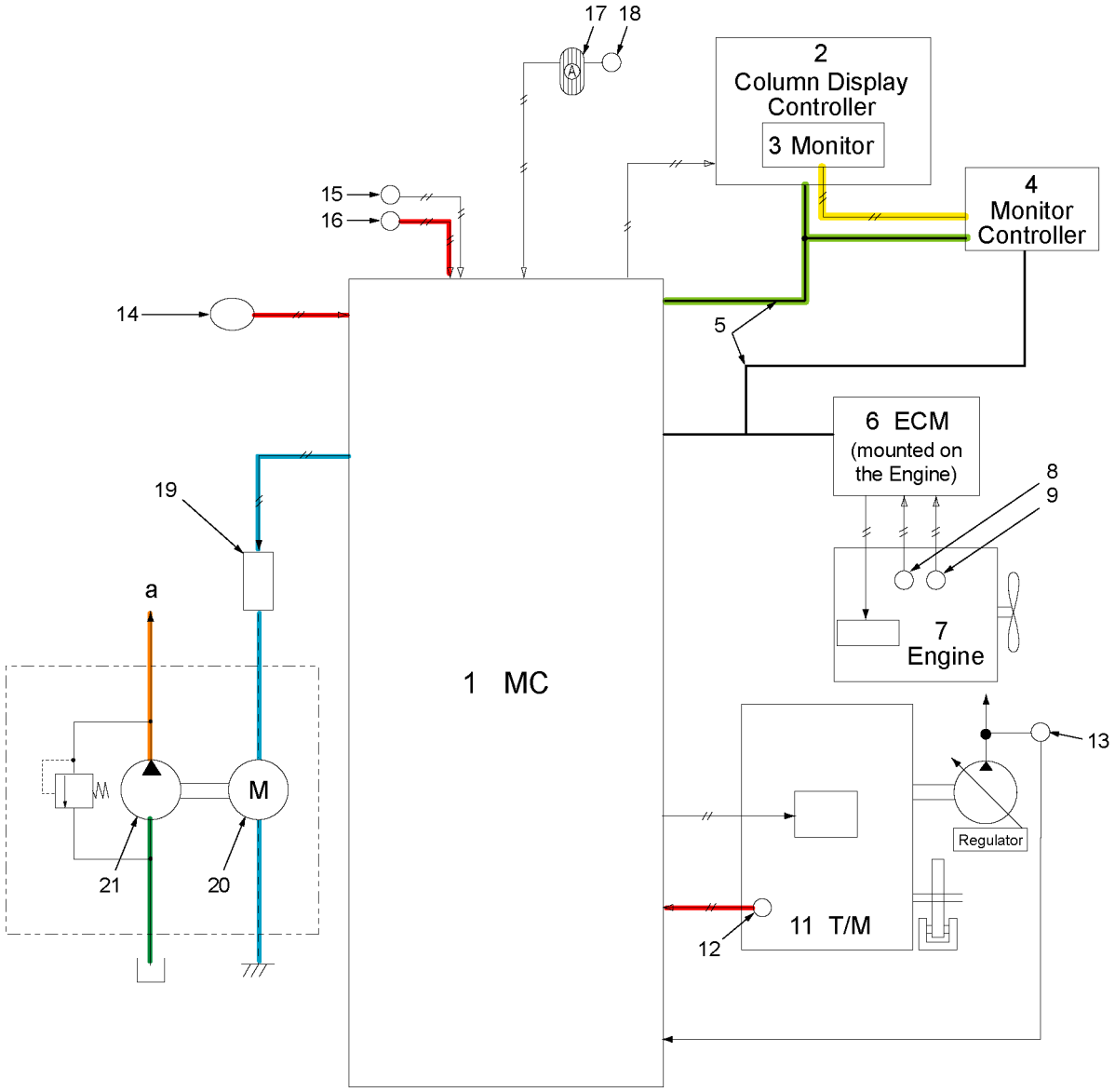
The other controls consist of the followings.

- Transmission Alarm Control
- Parking Brake Operation Indicator Control
- Brake Low Oil Pressure Indicator Control
- Low Steering Oil Pressure Indicator Control
- Overrun Alarm Control
- Lift Arm Auto Leveler Height Kickout Control
- Lift Arm Auto Leveler Lower Kickout Control
- Quick Power Mode Control
- Auto Shut-Down Control
- Emergency Steering Control



90Z7B-02-02-40

1- Main Controller (MC)
2- Column Display Controller
3- Air Conditioner Controller
4- Monitor
5- Monitor Controller
6- Engine Control Module (ECM)
7- Engine
9- Transmission
10- Torque Converter Input Speed Sensor
11- Torque Converter Output Speed Sensor
12- Machine Speed Sensor (Backup)
13- Machine Speed Sensor
14- Forward/Reverse Lever
15- Forward/Reverse Switch
16- Parking Brake Solenoid Valve
17- Pressure Sensor (Parking Brake)
18- Parking Brake Switch
19- Pressure Sensor (Brake Primary Pressure)
20- Steering Pressure Switch
21- Brake Pedal (Left)
22- Pressure Sensor (Brake Secondary Pressure)
23- Brake Pedal (Right)
24- Brake Pedal (Right) Switch
25- Alarm
27- Parking Brake Indicator
28- Low Brake Oil Pressure Indicator
29- Low Steering Oil Pressure Indicator
30- Controller Area Network (CAN)



90TNED-02-02-47

a- To Steering Valve

1- Main Controller (MC)
2- Column Display Controller
3- Monitor
4- Monitor Controller
5- Controller Area Network (CAN)
6- Engine Control Module (ECM)
7- Engine
8- Camshaft Speed Sensor
9- Crankshaft Speed Sensor
11- Transmission
12- Machine Speed Sensor
13- Pump Delivery Pressure Sensor
14- Emergency Steering Check Switch
15- Steering Pressure Switch
16- Emergency Steering Pump Delivery Pressure Sensor
17- Accelerator Pedal
18- Accelerator Pedal Sensor
19- Emergency Steering Pump Relay
20- Emergency Steering Motor
21- Emergency Steering Pump

Fuel Injection Control

Engine Control Module (ECM) monitors the engine operation status according to the signals from each sensor and the Main Controller (MC), and provides outputs for the following fuel injection control.

ECM controls:
- Fuel Injection Volume
- Fuel Injection Timing
- Fuel Injection Rate and Frequency
- Fuel Injection Pressure

Operation of Fuel Injection:

1. Pressurized fuel from the supply pump is supplied to the common rail in the cylinder head.

2. The fuel is sent to the injectors via the fuel connector in the cylinder head.

3. The ECM turns ON/OFF the injector solenoid (1) to properly control the injector operation according to the engine conditions.

4. When turning ON the electromagnetic coil in an injector solenoid (1), valve (2) opens and the circuit to the fuel tank is connected. High-pressure fuel in control chamber (4) returns to the fuel tank.

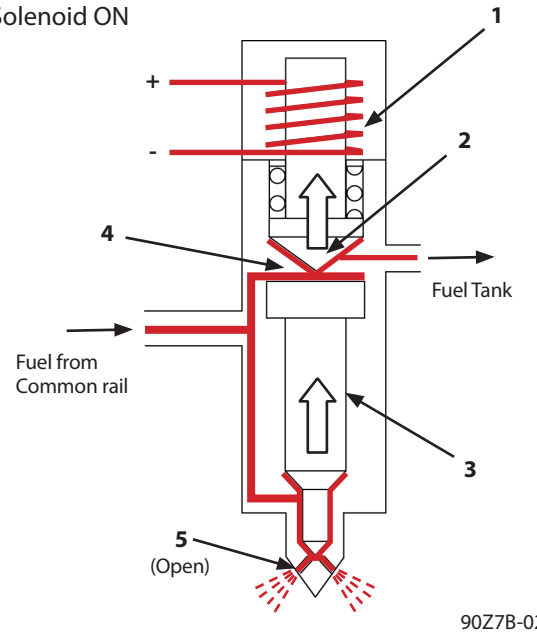
5. This lowers the pressure in control chamber (4) and force to press hydraulic piston (3) decreases. Then hydraulic piston (3) raises and causes nozzle (5) to open and start injection.

NOTE: Fuel pressure from the common rail is always applied to injector nozzle (5).

6. When turning OFF the electromagnetic coil in an injector solenoid (1), valve (2) is closed and the circuit to the fuel tank is closed. High-pressure fuel from the common rail flows to control chamber (4).

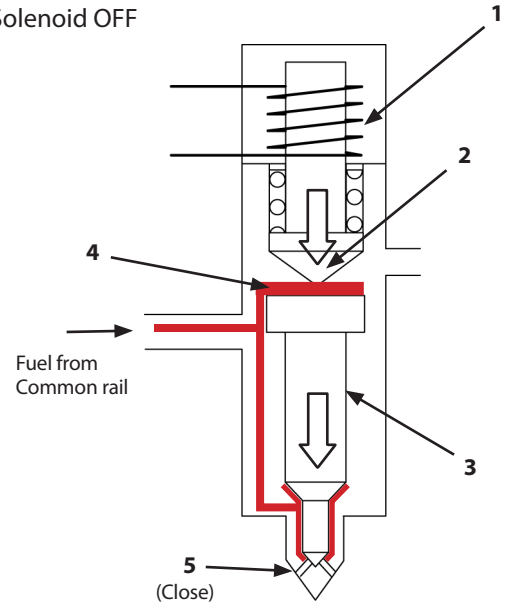
7. High-pressure fuel flows to control chamber (4), and hydraulic piston (3) is lowered by the pressure difference due to movement of hydraulic piston (3). This closes nozzle (5) and fuel injection stops.

- Solenoid ON



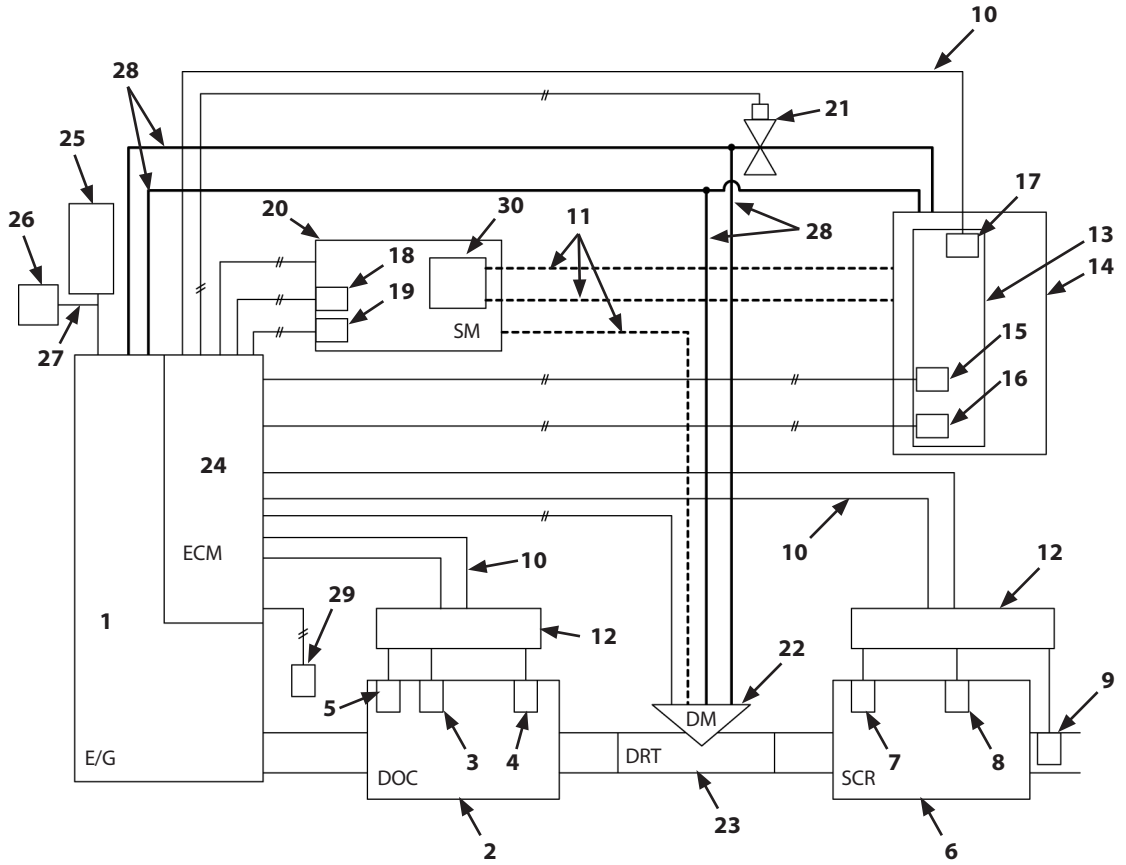
90Z7B-02-03-05

- Solenoid OFF



90Z7B-02-03-06

1- Injector Solenoid
2- Valve
3- Hydraulic Piston
4- Control Chamber
5- Injector Nozzle



90Z7B-02-03-04

1- Engine
2- DOC (Diesel Oxidation Catalyst)
3- DOC Inlet Exhaust Temperature Sensor
4- DOC Outlet Exhaust Temperature Sensor
5- NOx Sensor (DOC Inlet)
6- SCR Catalyst
7- SCR Inlet Exhaust Temperature Sensor
8- SCR Outlet Exhaust Temperature Sensor
9- NOx Sensor (SCR Outlet)
10- CAN
11- DEF Piping
12- NOx Sensor Module
13- DEF Sensor Unit
14- DEF Tank
15- DEF Tank Level Sensor
16- DEF Tank Temperature Sensor
17- DEF Quality Sensor
18- DEF Pressure Sensor
19- DEF Supply Module Temperature Sensor
20- DEF Supply Module
21- Coolant Control Valve
22- Dosing Module
23- DRT (Decomposition Reactor Tube)
24- ECM
25- Monitor Controller
26- MC
27- CAN
28- Coolant Piping
29- TBAP (Temperature Barometric Atmospheric Pressure) Sensor
30- Reverting Valve

Outline

Hydraulic system is divided into the pilot circuit, main circuit, and emergency steering circuit.

Pilot Circuit:

Power Source	Oil Control Method	Supplied to
Accessory (Pilot) Pump	Brake Charge Valve	Service Brake Circuit
	Combination Valve (Brake Manifold, Solenoid Valve)	Parking Brake Circuit
		Lift Arm / Bucket Operation Control Circuit
	Pilot Valve	
	Fan Control Valve	Fan Motor
	Priority Hammer Valve	Lift Arm / Bucket Cylinders

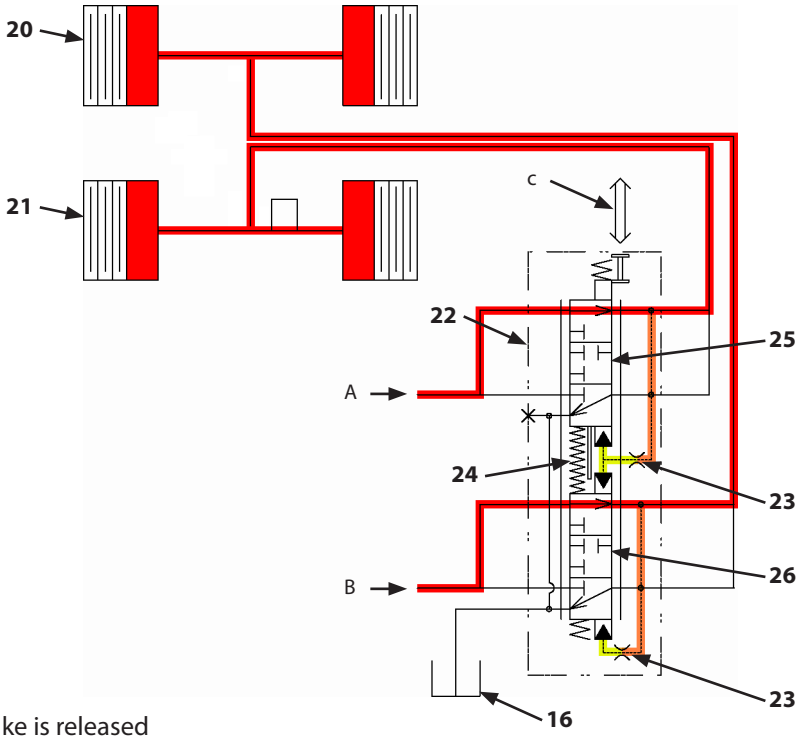
Main Circuit:

Power Source	Oil Control Method	Supplied to
Main Pump	Steering Valve	Steering Cylinder
	Multiple Control Valve	Lift Arm / Bucket Cylinder
		Pump Control Circuit
	Ride Control Valve	Ride Control Circuit

Emergency Steering Circuit:

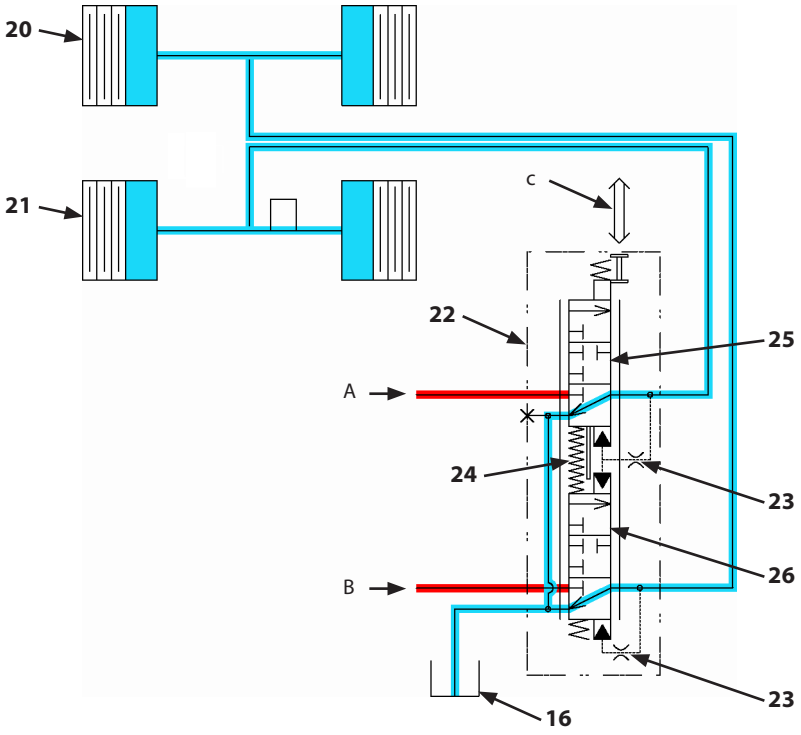
Power Source	Oil Control Method	Supplied to
Emergency Steering Pump	Steering Valve	Steering Cylinder

- When the service brake is applied



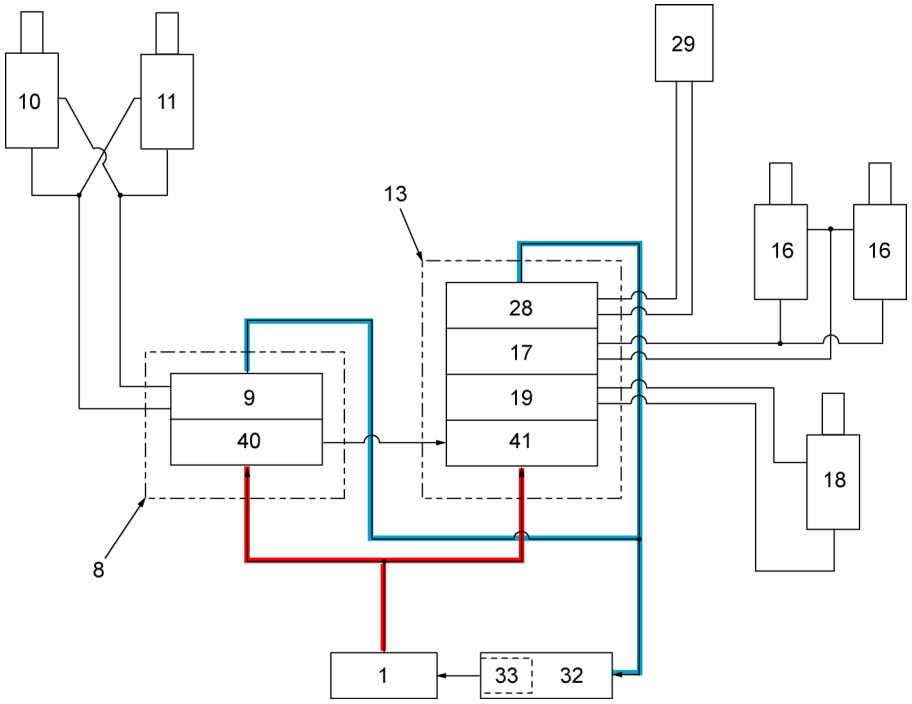
90TNED-02-04-20

- When the service brake is released



90TNED-02-04-18

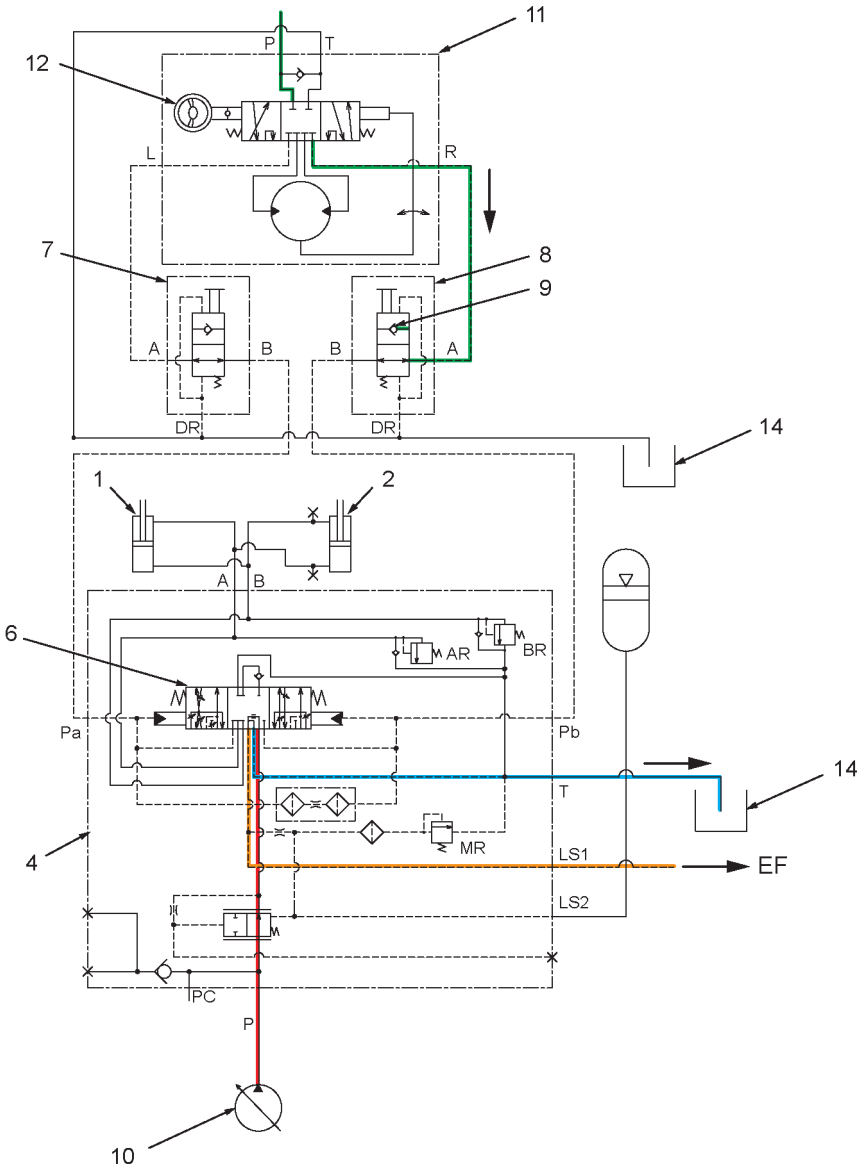
A- From Brake Charge Valve (Front Brake Operating Pressure Oil)
B- From Brake Charge Valve (Rear Brake Operating Pressure Oil)
c- Brake Pedal
16- Hydraulic Tank
20- Rear Brake
21- Front Brake
22- Brake Valve
23- Orifice
24- Spring
25- Brake Spool (Top)
26- Brake Spool (Bottom)



90TNED-02-04-01

1- Main Pump
8- Steering Valve
9- Steering Spool
10- Steering Cylinder (Left)
11- Steering Cylinder (Right)
13- Multiple Control Valve
16- Lift Arm Cylinder
17- Lift Arm Spool
18- Bucket Cylinder
19- Bucket Spool
28- Auxiliary Spool (OPT)
29- Attachments (OPT)
32- Hydraulic Tank
33- Suction Filter
40- Meter-in Compensation Valve
41- Bleed-off Compensation Valve

- Full Right Turn

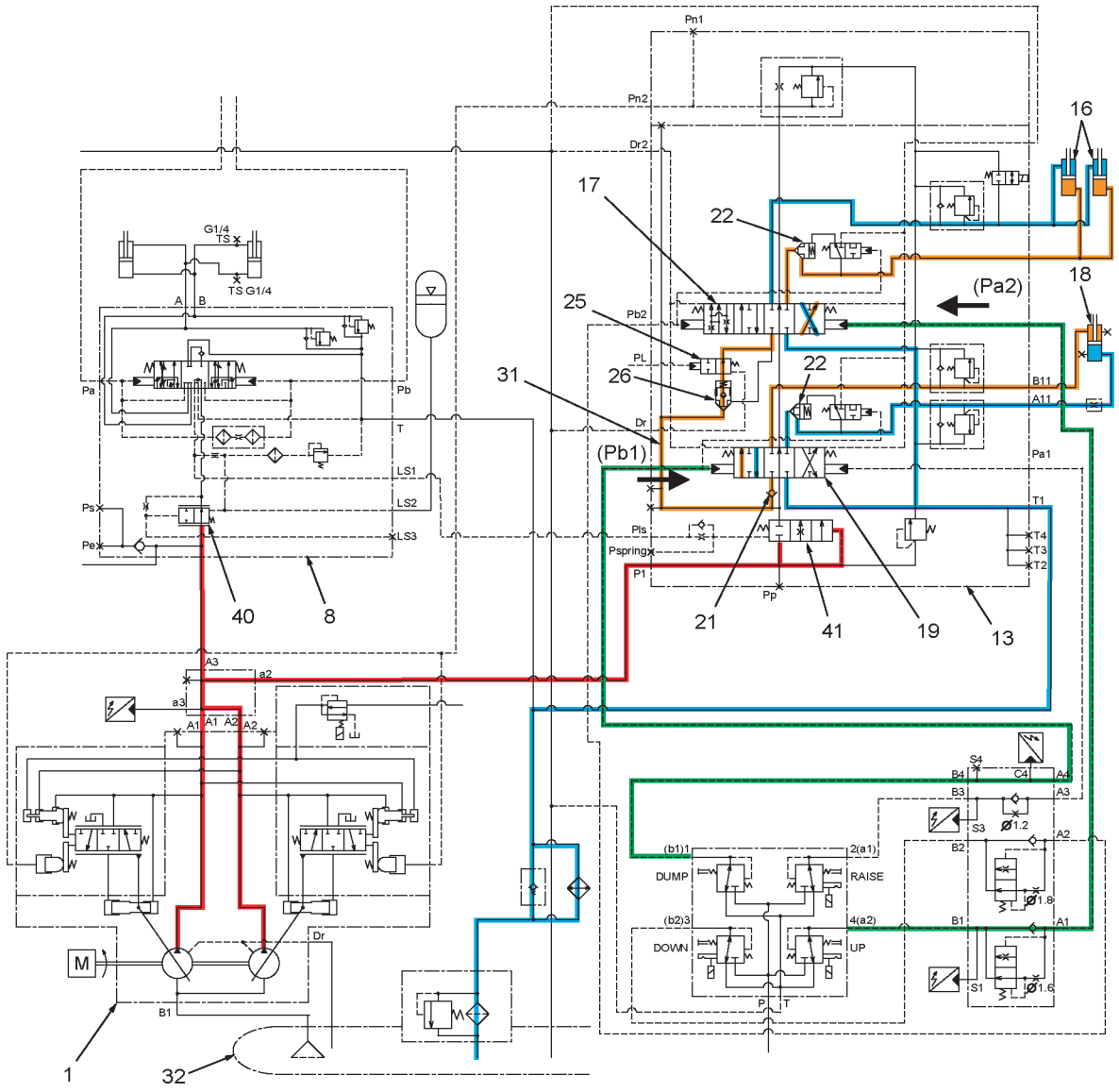


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EF- To Multiple Control Valve (Bleed-off Compensation Valve)

1- Steering Cylinder (Left)
2- Steering Cylinder (Right)
4- Steering Valve
6- Steering Spool
7- Stop Valve (Left)
8- Stop Valve (Right)
9- Check Valve
10- Main Pump
11- Steering Pilot Valve® (Steering Pilot Valve)
12- Steering Wheel
14- Hydraulic Tank

- Combined operation of lift arm raise / bucket dump

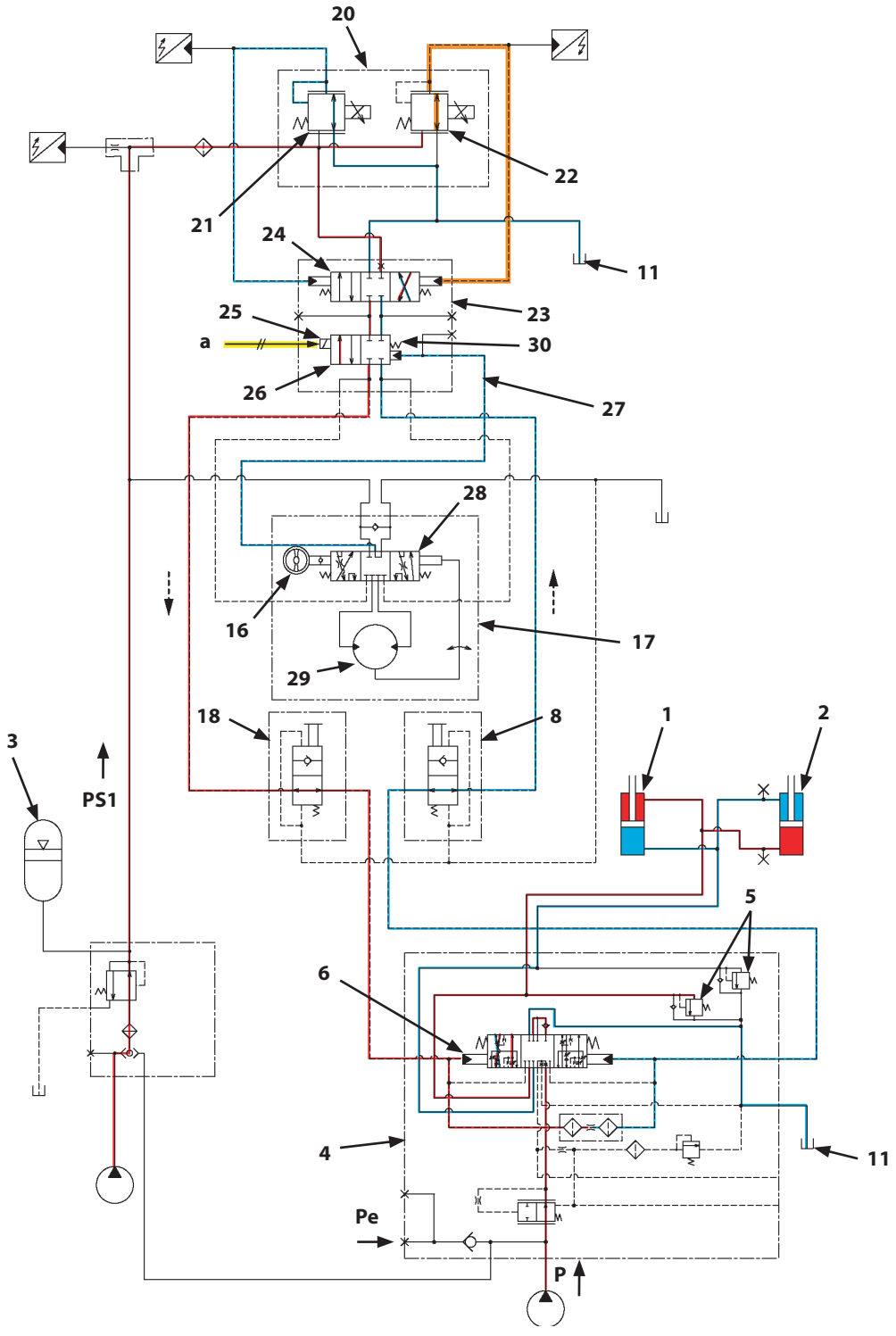


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Pb1- Bucket Dump (Pilot Pressurized Oil)

Pa2- Lift Arm Raise (Pilot Pressurized Oil)

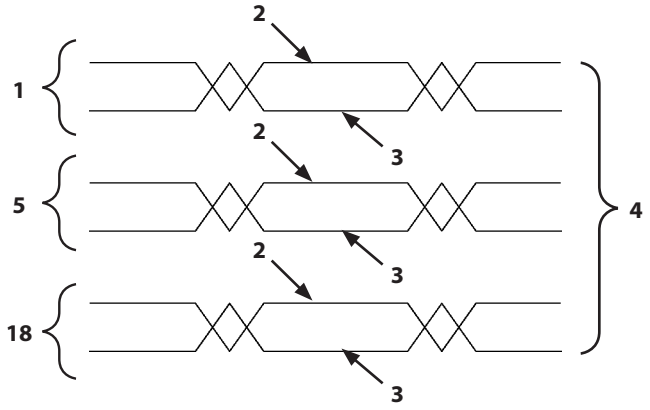
1- Main Pump
8- Steering Valve
13- Multiple Control Valve
16- Lift Arm Cylinder
17- Lift Arm Spool
18- Bucket Cylinder
19- Bucket Spool
21- Load Check Valve
22- Anti-Drift Valve
25- Lift Arm Flow Rate Control Valve (Selector Valve)
26- Lift Arm Flow Rate Control Valve (Logic Valve Poppet)
31- Parallel Circuit
32- Hydraulic Tank
41- Bleed-off Compensation Valve



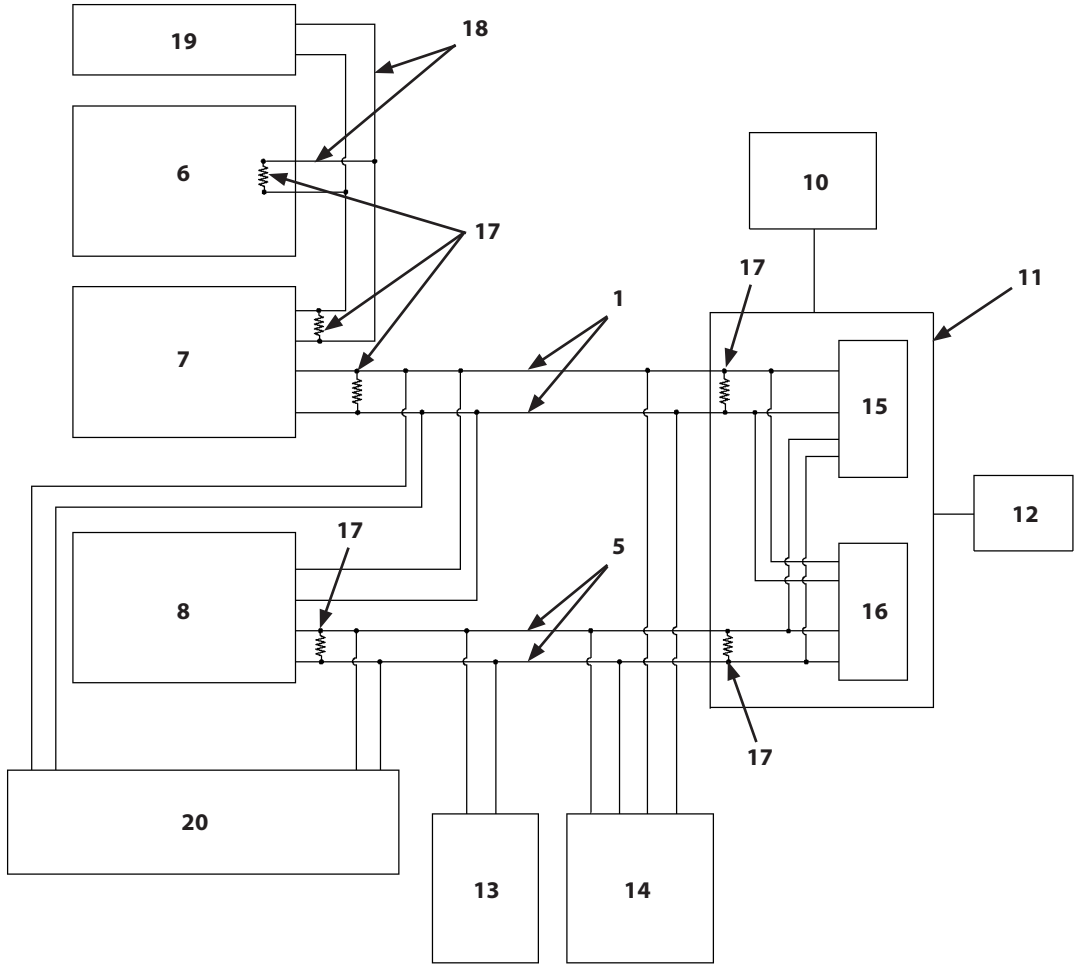
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PS1- Pilot Pressure Oil from Charging Circuit
P- Main Pump Pressure Oil
Pe- Emergency Steering Pump Pressure Oil
a- Signal (ON/OFF) from JCU

1- Steering Cylinder (Left)
2- Steering Cylinder (Right)
3- Joystick Steering Accumulator (OP)
4- Steering Valve
5- Overload Relief Valve
6- Steering Spool
8- Stop Valve (Right)
11- Hydraulic Oil Tank
16- Steering wheel
17- Steering Pilot Valve
18- Stop Valve (Left)
20- 2-Spool Solenoid Valve Unit
21- Right Steering Proportional Solenoid Valve
22- Left Steering Proportional Solenoid Valve
23- Joystick Steering Valve
24- Spool
25- Cut Off Solenoid Valve
26- Spool
27- Pilot Pressure LS
28- Spool
29- Gerotor
30- Spring



90Z7B-TDAA-02-05-01



90Z7BT02-01-01

1- CAN 1
2- CAN-H (High)
3- CAN-L (Low)
4- CAN Bus
5- CAN 2
6- VGS Controller (Variable Geometry System)
7- ECM (Engine Controller)
8- MC (Main Controller)
9- -
10- Communication Controller
11- Monitor Control Unit (DSZ)
12- MP (Maintenance Pro) Dr.
13- Air Conditioner Controller
14- Column Display Controller
15- Monitor Controller
16- Information Control Unit
17- Termination Resistor (120 Ω)
18- CAN 3
19- SCR Controller
20- JCU (Joystick Steering Controller) (Option)

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Regulator Operation

Regulator (4) is an IC chip and keeps the generating voltage constant.

1. When generating voltage increases more than the set voltage, regulator (6) decreases current to field coil (FC) and generating voltage at stator coil (SC) decreases.

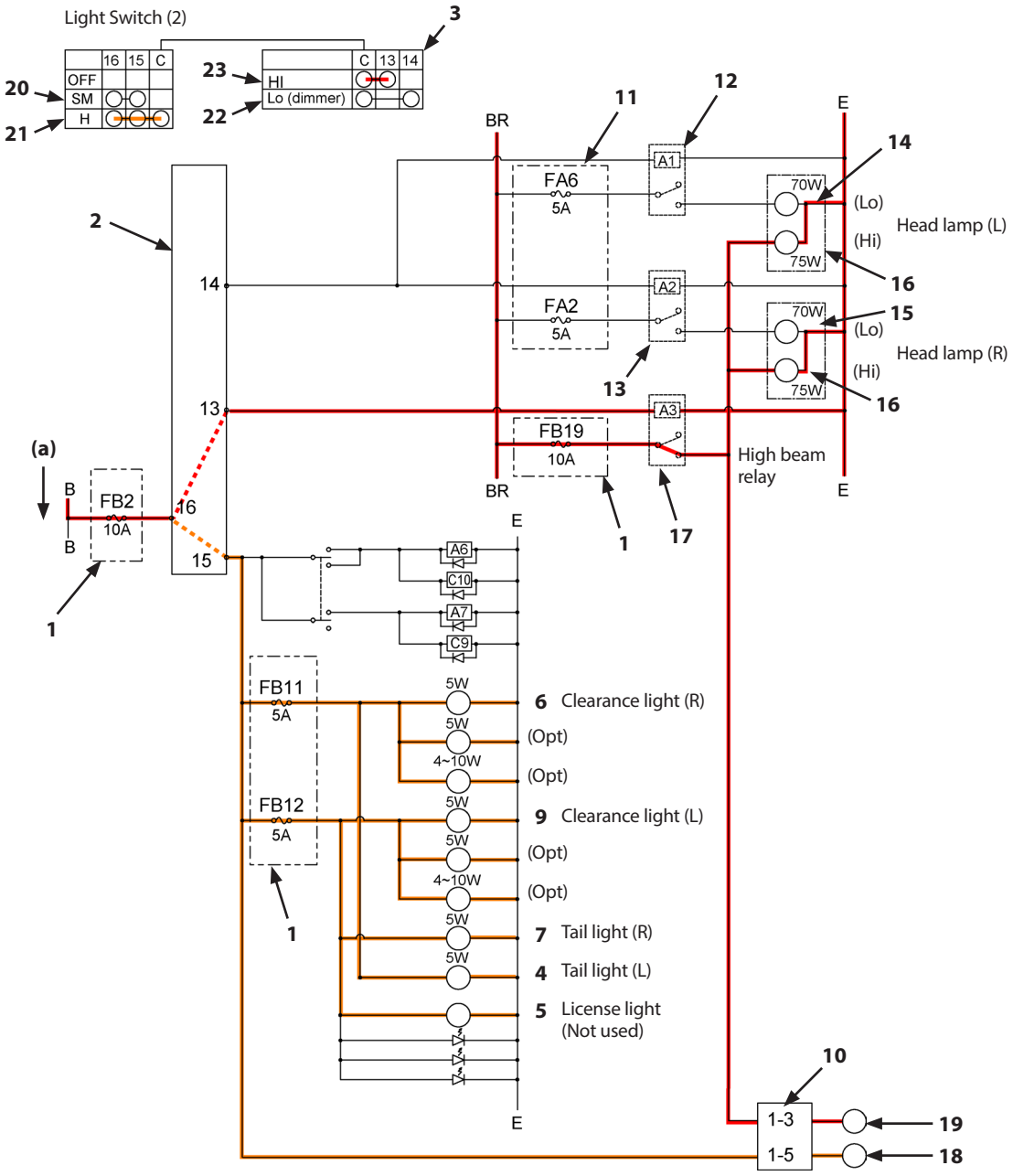
2. When generating voltage decreases lower than the set voltage, regulator (6) increases current to field coil (FC) and generating voltage at stator coil (SC) increases.

3. The above operation is repeated so that the alternator (3) generating voltage is kept constant.

Monitor Circuit

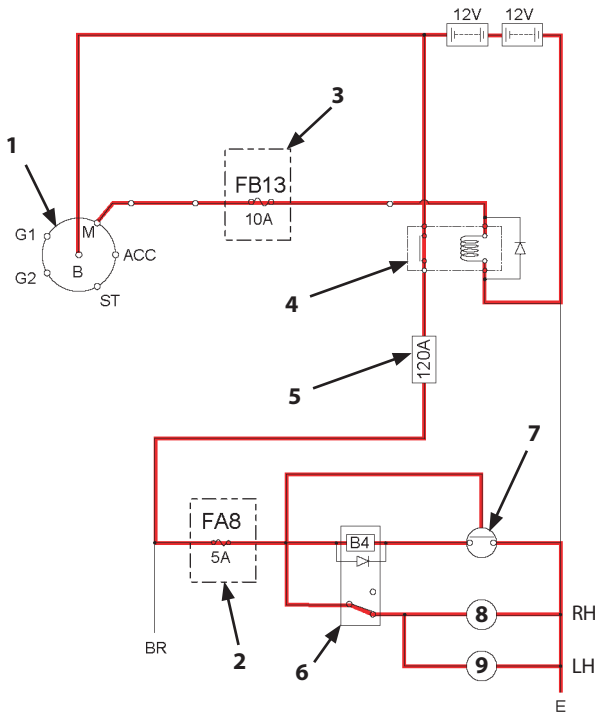
The major functions and circuits in the monitor circuit are as follows.

- Air Conditioner Circuit:
  Operates the air conditioner.
  (Monitor Controller (DSZ), Switch Panel, Air Conditioner Unit)



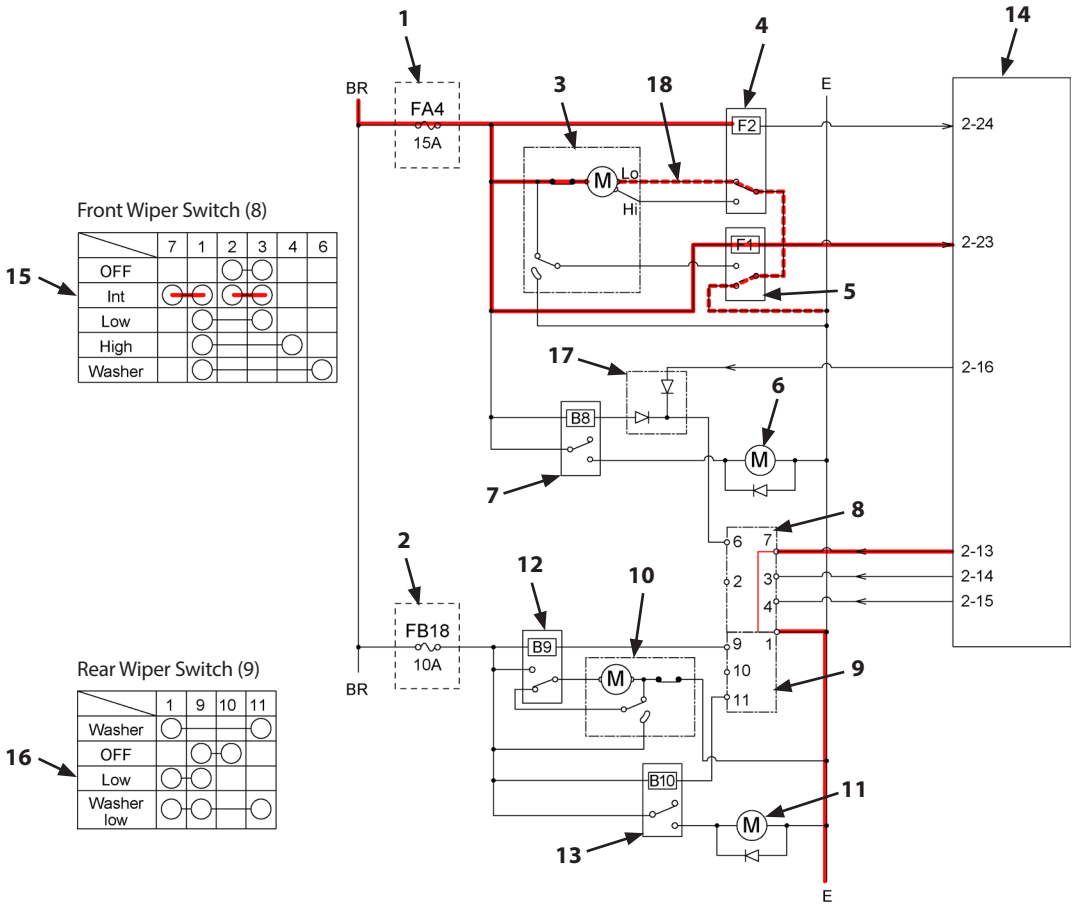
90Z7B-02-05-16

1- Fuse Box B
2- Light Switch
3- Dimmer Switch
4- Tail Light (Left)
5- Unused
6- Clearance Light (Right)
7- Tail Light (Right)
9- Clearance Light (Left)
10- Column Display Controller (Monitor)
11- Fuse Box A
12- Head Light Relay (Left)
13- Head Light Relay (Right)
14- Head Light (Left)
15- Head Light (Right)
16- High Beam
17- High-Beam Relay
18- Clearance Light Indicator
19- High-Beam Indicator
20- Clearance Light Position
21- Head Light Position
22- Low-Beam Position
23- High-Beam Position



90Z7B-02-05-21

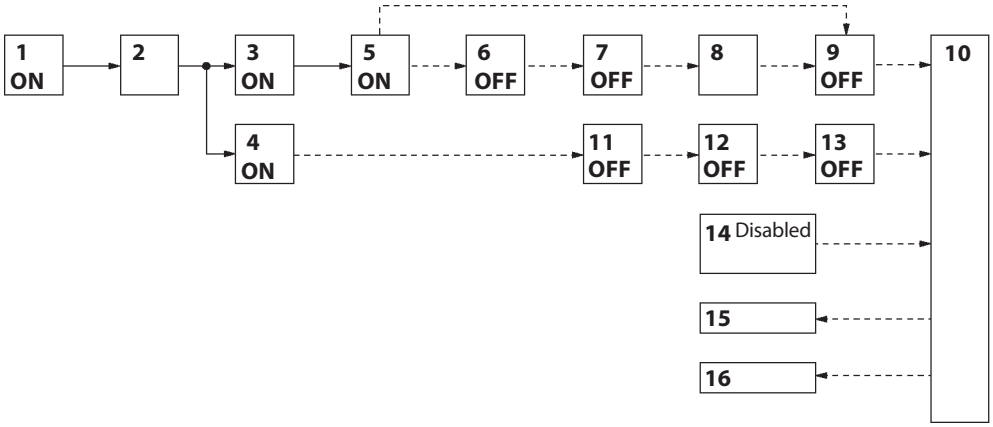
1- Key Switch
2- Fuse Box A
3- Fuse Box B
4- Battery Relay
5- Fusible Link (120 A)
6- Brake Light Relay
7- Brake Light Switch
8- Brake Light (Right)
9- Brake Light (Left)



90Z7B-02-05-25

1- Fuse Box A
2- Fuse Box B
3- Front Wiper Motor
4- Front Wiper Relay 2
5- Front Wiper Relay 1
6- Front Washer Motor
7- Front Washer Relay
8- Front Wiper/Washer Switch
9- Rear Wiper/Washer Switch
10- Rear Wiper Motor
11- Rear Washer Motor
12- Rear Wiper Relay
13- Rear Washer Relay
14- Column Display Controller (Monitor)
15- Intermittent (INT.) Position
16- LOW Position
17- Diode H
18- Slow Speed Circuit

- Armrest Switch 1 (3), Armrest Switch 2 (4): ON
- Joystick Steering Selector Switch (6): OFF



TNEK-05-08-029

Electrical Component	2	3	4	5	6	7	8	9
JCU(10) (Terminal)	24V	ON Detection	ON Detection	ON	OFF	OFF	-	OFF
	B-5/B-6	C-4	C-10	D-24	C-6	D-15	-	D-6

Electrical Component	11	12	13	14	15	16	1
JCU(10) (Terminal)	OFF	OFF	OFF Detection	Enabled	N/A	N/A	ON
	A-2	A-2	C-11	B-4/B-12	E-6/E-20	E-7/E-9	A-10

1- Key Switch
2- Fuse #20 (Fuse Box A)
3- Armrest Switch 1
4- Armrest Switch 2
5- JSS OFF Relay
6- Joystick Steering Selector Switch
7- JSS ON Relay
8- Diode B
9- JSS Hold Relay
10- JCU
11- Cut Off Relay 1
12- Cut Off Relay 2
13- Cut Off Solenoid Valve
14- Joystick Steering Lever
15- Right Steering Proportional Solenoid Valve
16- Left Steering Proportional Solenoid Valve

SECTION 3

COMPONENT OPERATION

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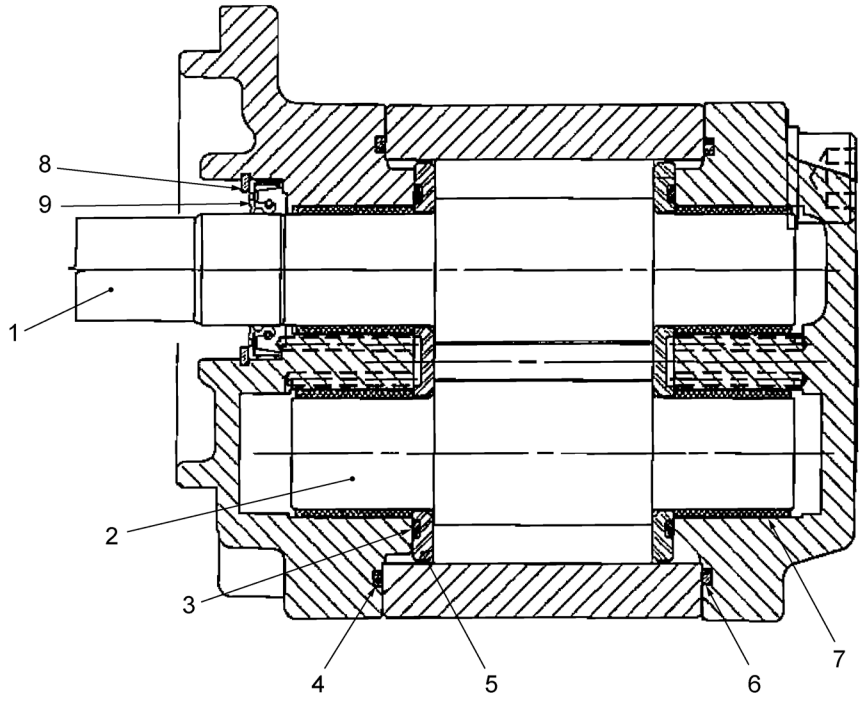
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Pilot Pump Structure



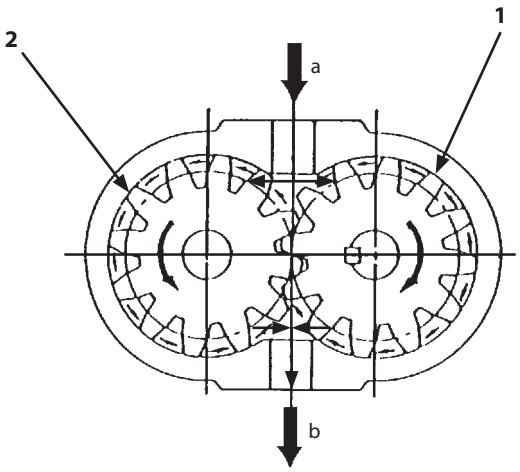
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1- Drive Gear
2- Driven Gear
3- Back-up Ring, Gasket
4- Gasket
5- Side Plate
6- Gasket
7- Bush
8- Retainer Ring
9- Oil Seal

Pump Operation

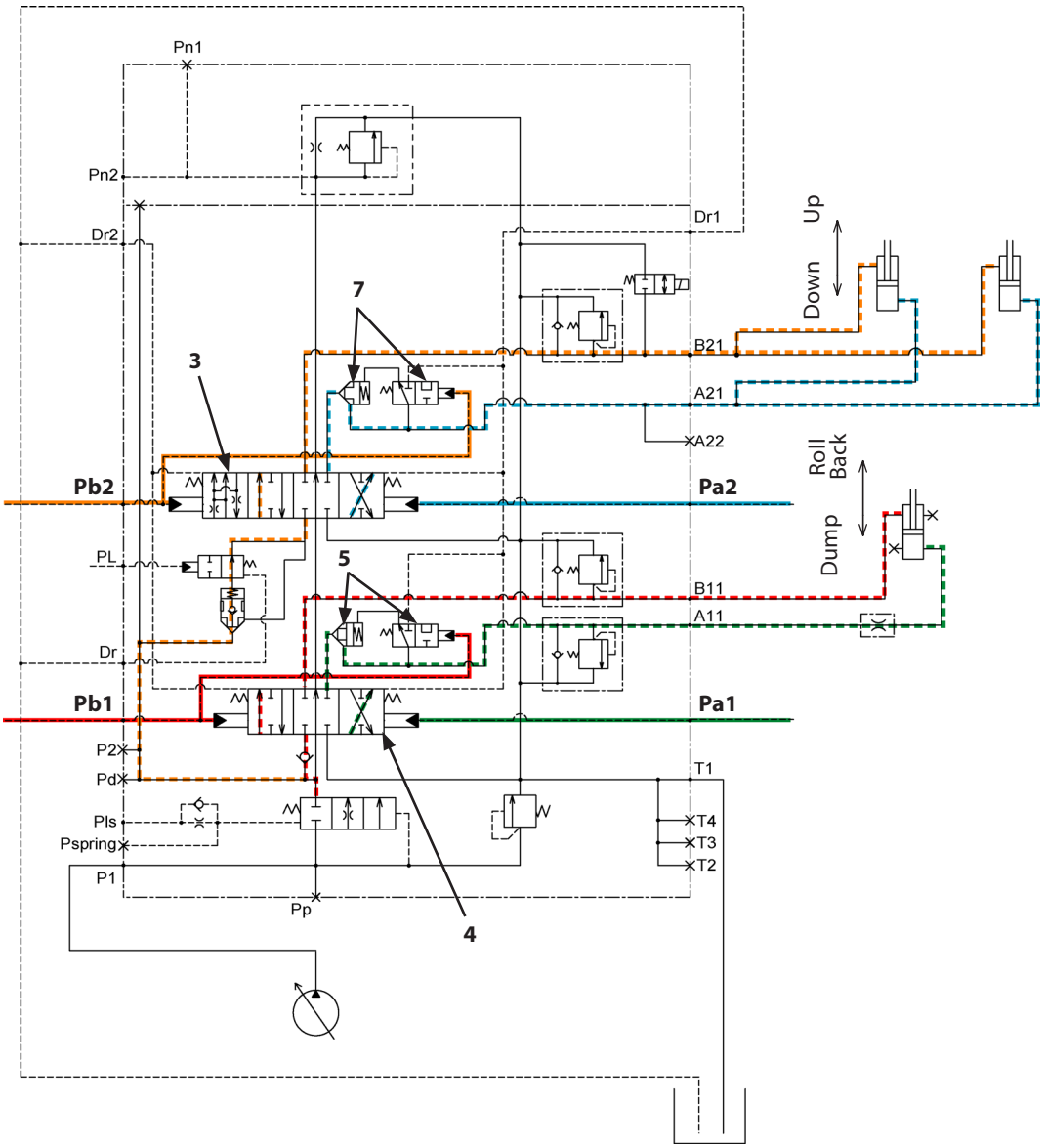
Drive gear (1) is driven by the engine through the transmission accessory drive, which rotates driven gear (2) as they are engaged.

1- Drive Gear
2- Driven Gear



T137-02-03-005

a- Inlet Port
b- Outlet Port



90Z7BT03-02-06

Pa1- Bucket Roll Back

Pb1- Bucket Dump

Pa2- Lift Arm Raise

Pb2- Lift Arm Lower

3- Lift Arm Spool

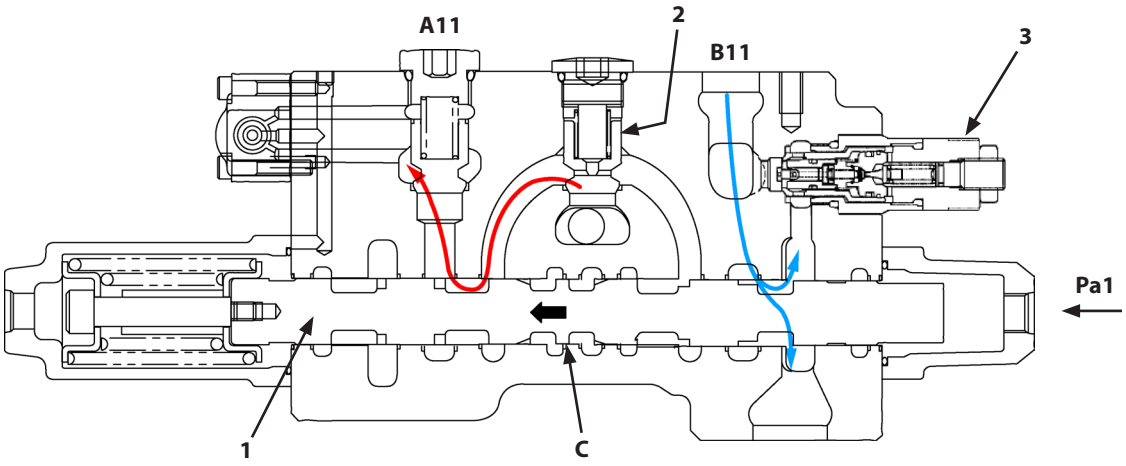
4- Bucket Spool

5- Bucket Anti-Drift Valve

7- Lift Arm Anti-Drift Valve

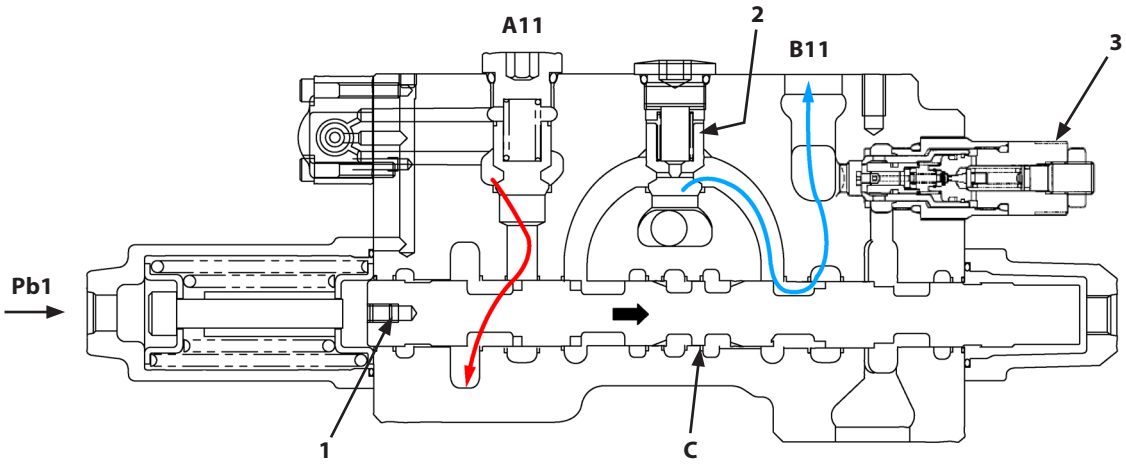
Bucket Spool Operation

Roll Back Position:



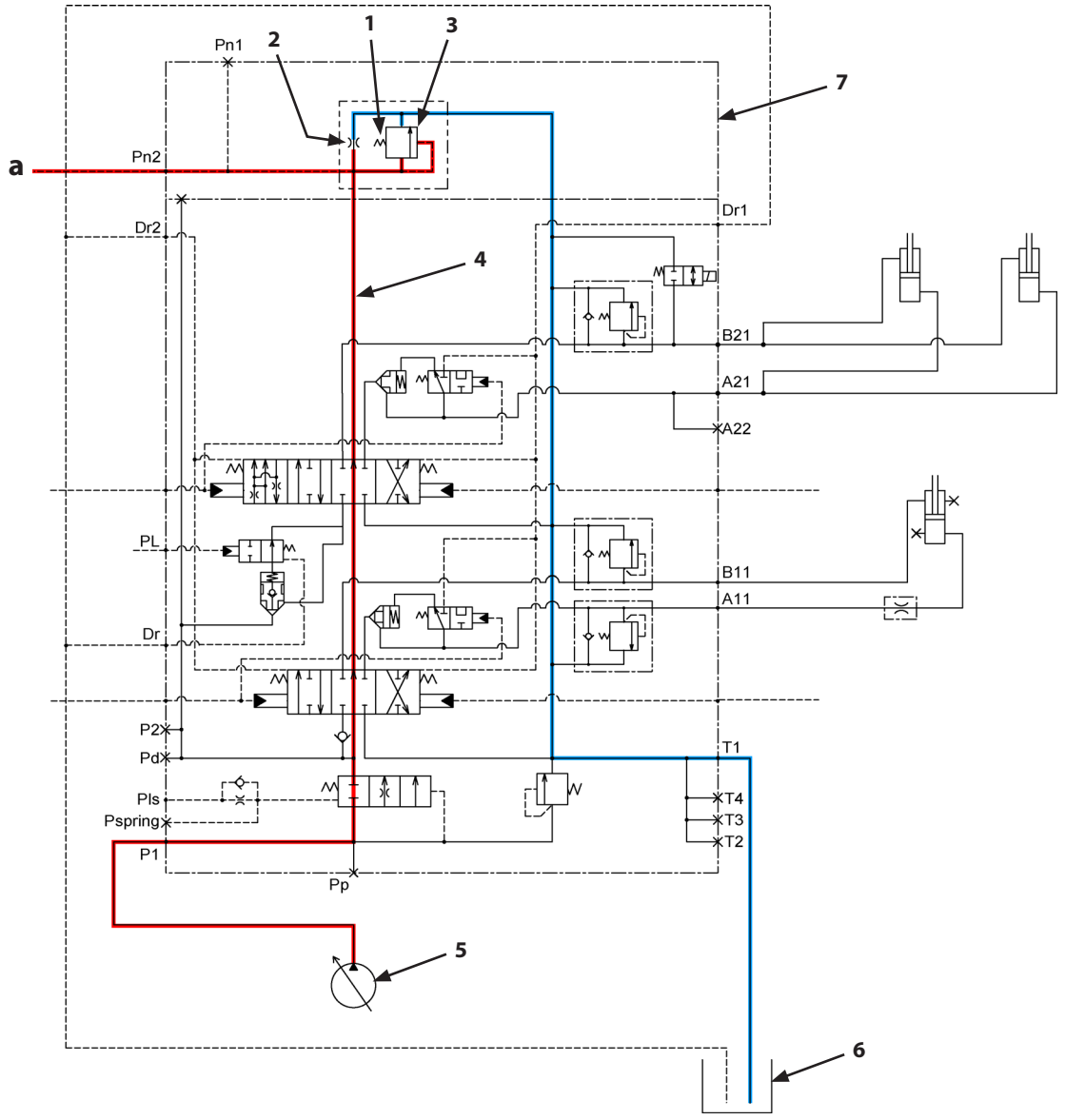
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Dump Position:



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1- Spool
2- Load Check Valve
3- Overload Relief Valve with Make-Up Function



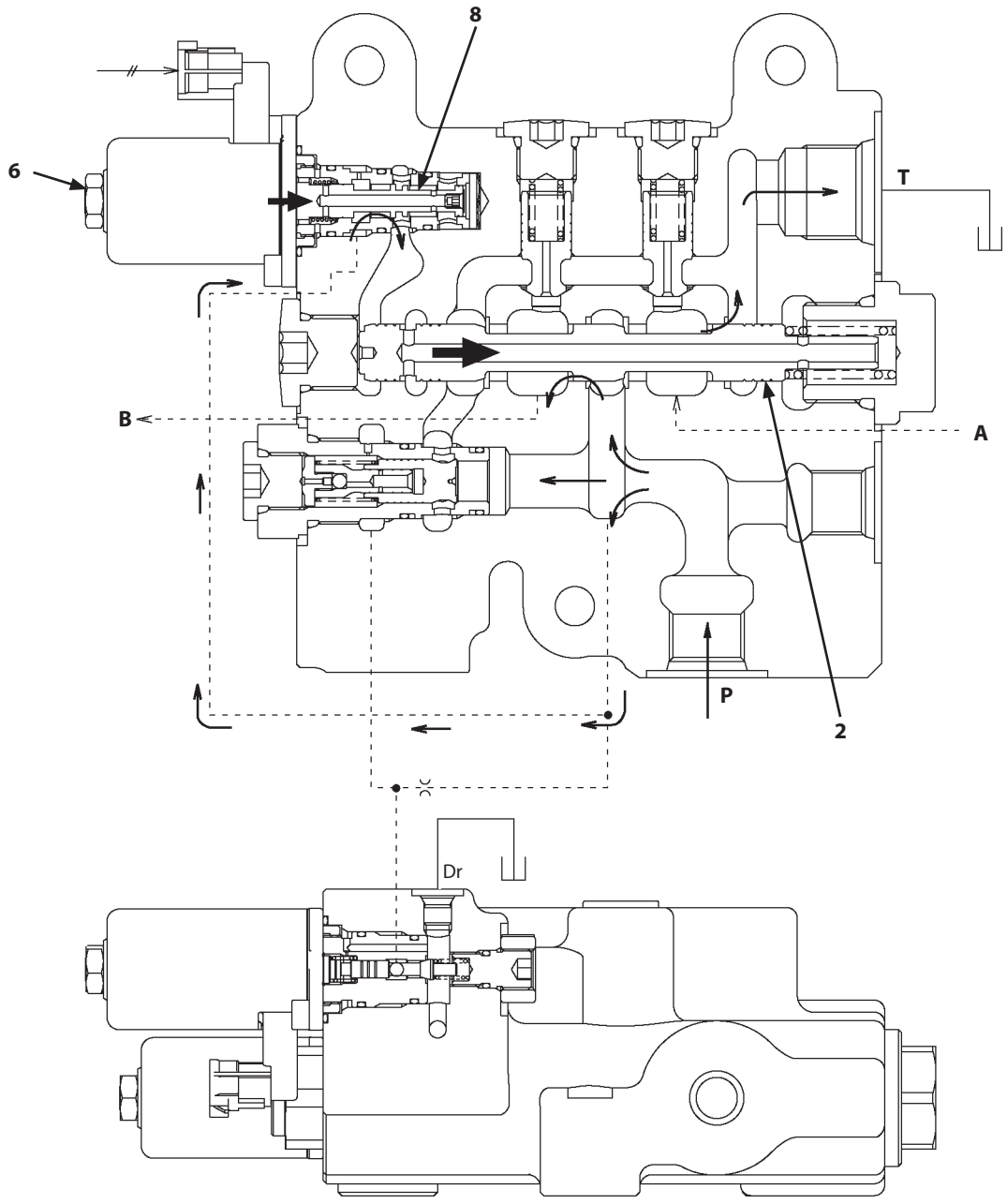
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a- To Main Pump Regulator

1- Spring
2- Orifice
3- Poppet
4- Neutral Circuit
5- Main Pump
6- Hydraulic Tank
7- Multiple Control Valve

Fan Control Valve

(Reverse Rotation)



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P- From Pilot Pump
T- To Hydraulic Tank
Dr- To Hydraulic Tank
A- To Fan Motor (Normal Rotation Side)
B- To Fan Motor (Reverse Rotation Side)

2- Fan Reverse Rotation Spool
6- Fan Reverse Rotation Control Solenoid Valve
8- Spool

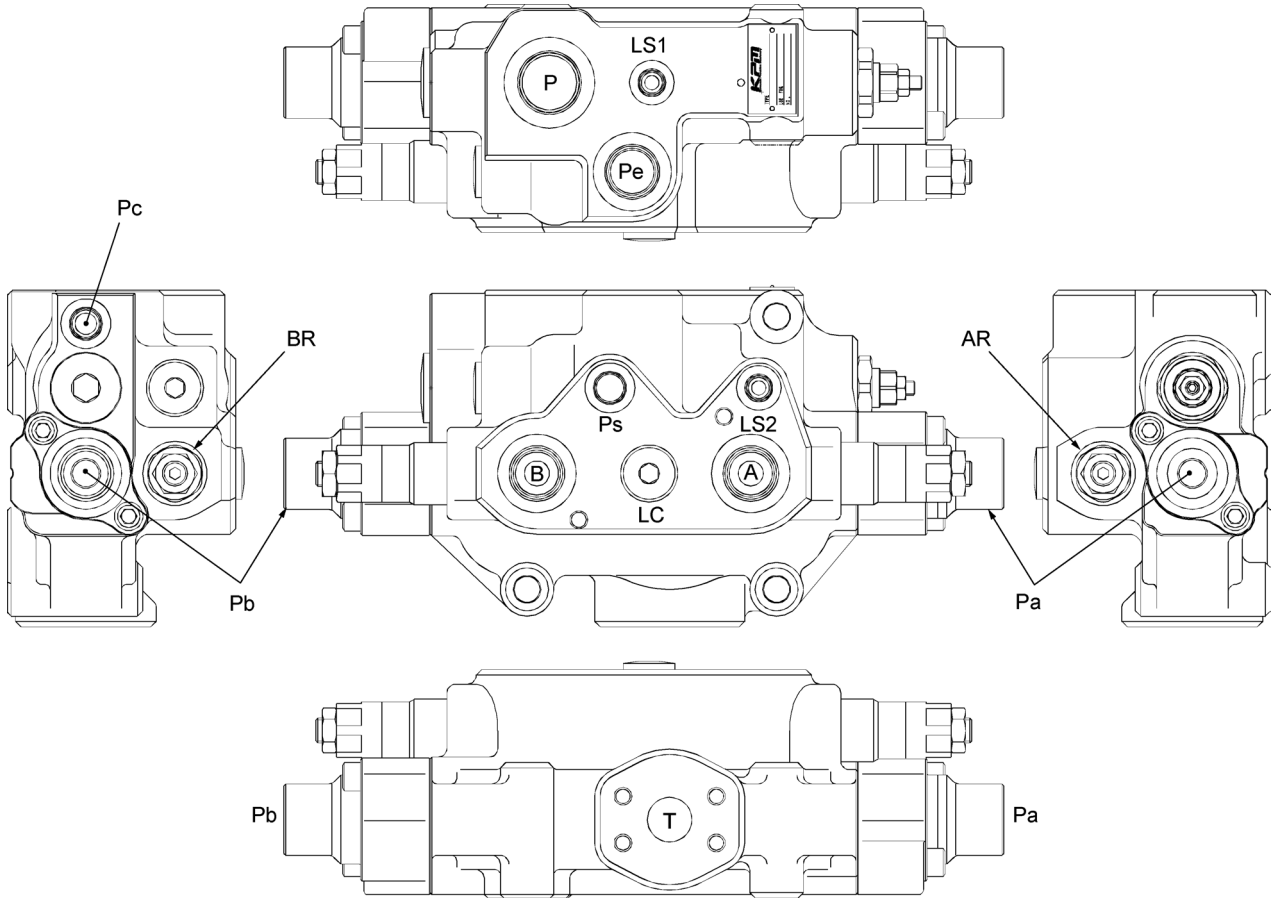
Outline

The steering valve is located between the main pump and the steering cylinders.

The steering valve supplies pressurized oil from the main pump to the steering cylinders in response to pilot pressure of the steering pilot valve (Steering Pilot Valve).

Steering cylinder circuits are protected with the overload relief valves.

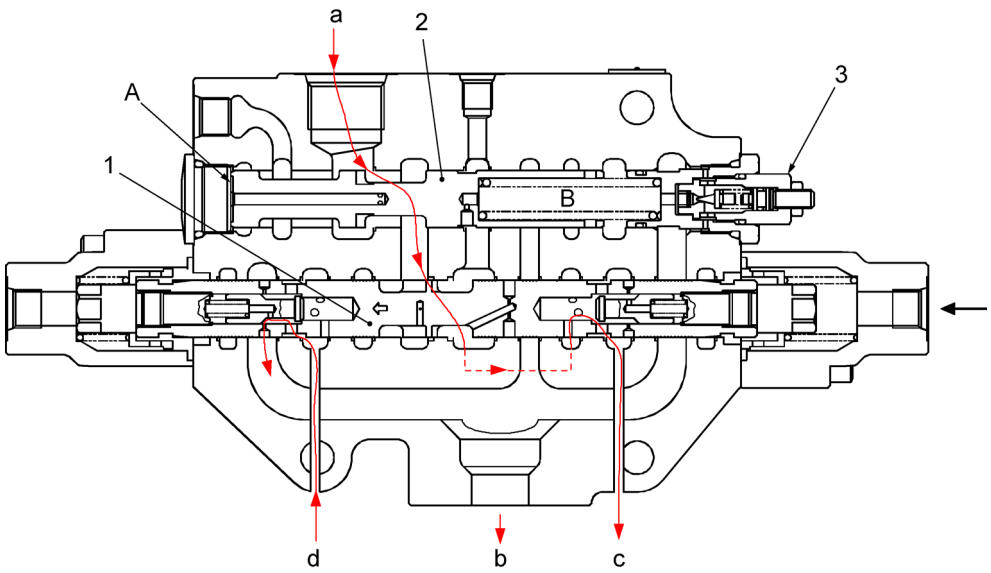
Steering Valve Overview



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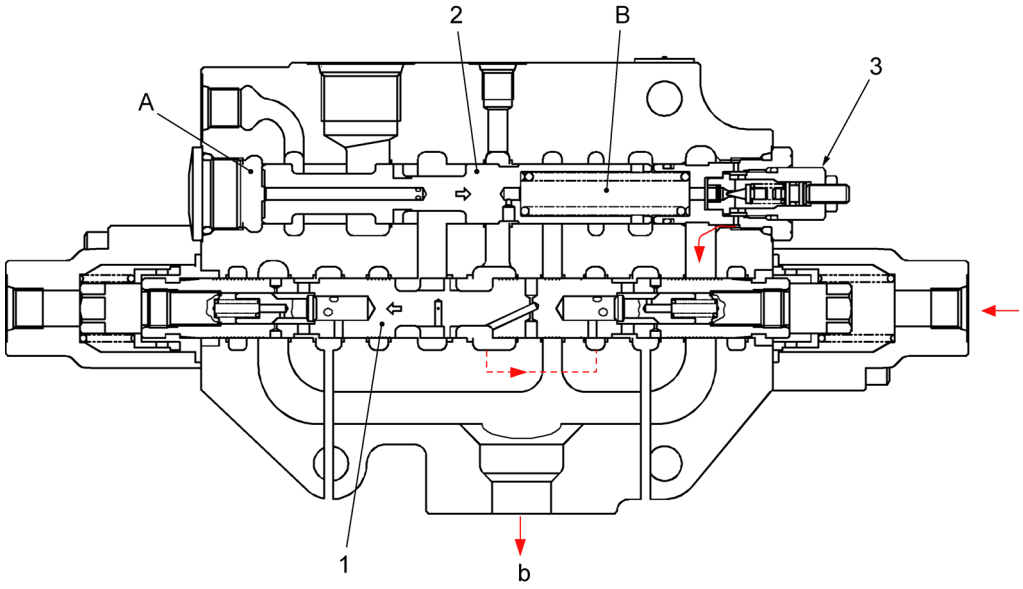
Main Relief Valve Operation

Normal Operation:



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Relief Operation:



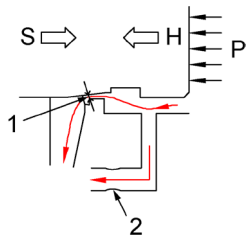
90Z7-03-05-07

a- From Pump b- To Tank c- To Steering Cylinder d- From Steering Cylinder

1- Steering Spool 2- Meter-In Compensation Spool 3- Main Relief Valve

When pilot flow is low:

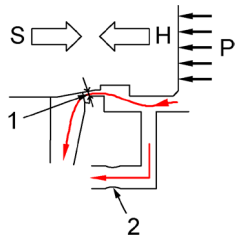
When the spool is pushed in a little, opening the flow amplifier notch (1) a little, the pilot oil easily flows out, and the spool will not be pushed in any further.
(The hydraulic force applied at the end of the spool (H) is in balance with the force of the return spring (S).)



90Z7-03-05-11

When pilot flow rises:

As the opening of the flow amplifier notch (1) is narrow, the pressure inside the end cover is raised higher, pushing the spool in.
When the spool is pushed in, the opening of the flow amplifier notch (1) becomes larger, making it easier for pilot oil to flow out; thus, the rise in pressure stops and the spool is stopped at a position where the hydraulic force applied to the end of the spool (H) is in balance with the force of the return spring (S).



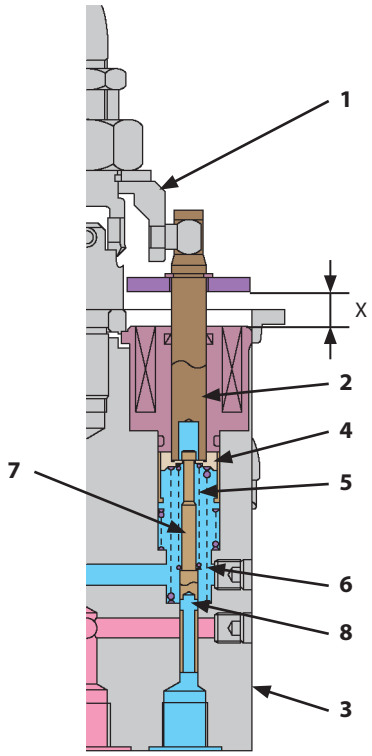
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P- Pilot Pressure
H- Hydraulic Force
S- Return Spring Force
1- Flow Amplifier Notch Opening
2- Pilot Orifice

Operation

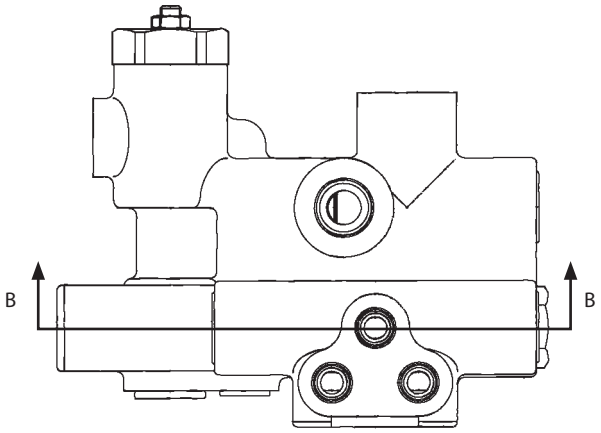
The spool (7) head comes in contact with the upper surface of spring guide (4). Spring guide (4) is kept raised by return spring (6).

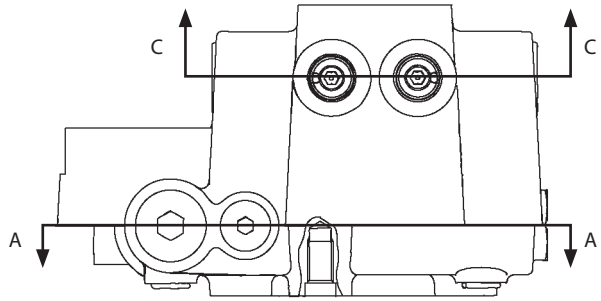
NOTE: Total lever stroke is determined by stroke dimension (X) of stem (2).



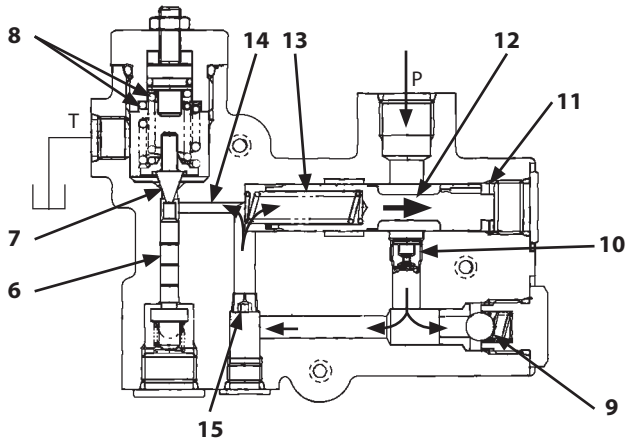
TNED-03-06-003

1- Cam
2- Stem
3- Case
4- Spring Guide
5- Balance Spring
6- Return Spring
7- Spool
8- Hole

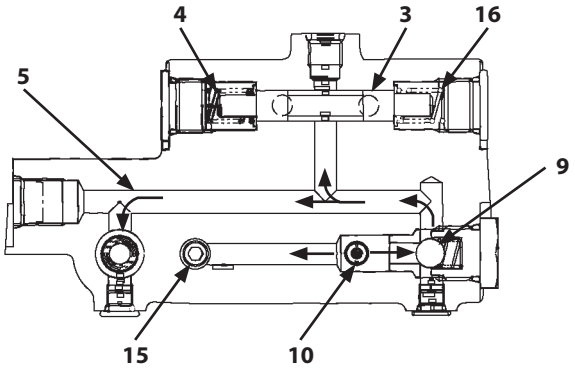




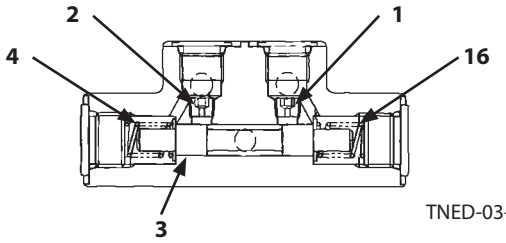
Section A-A



Section B-B



Section C-C



TNED-03-07-017

P- Port P (From Pilot Pump)
T- Port T (To Hydraulic Tank)

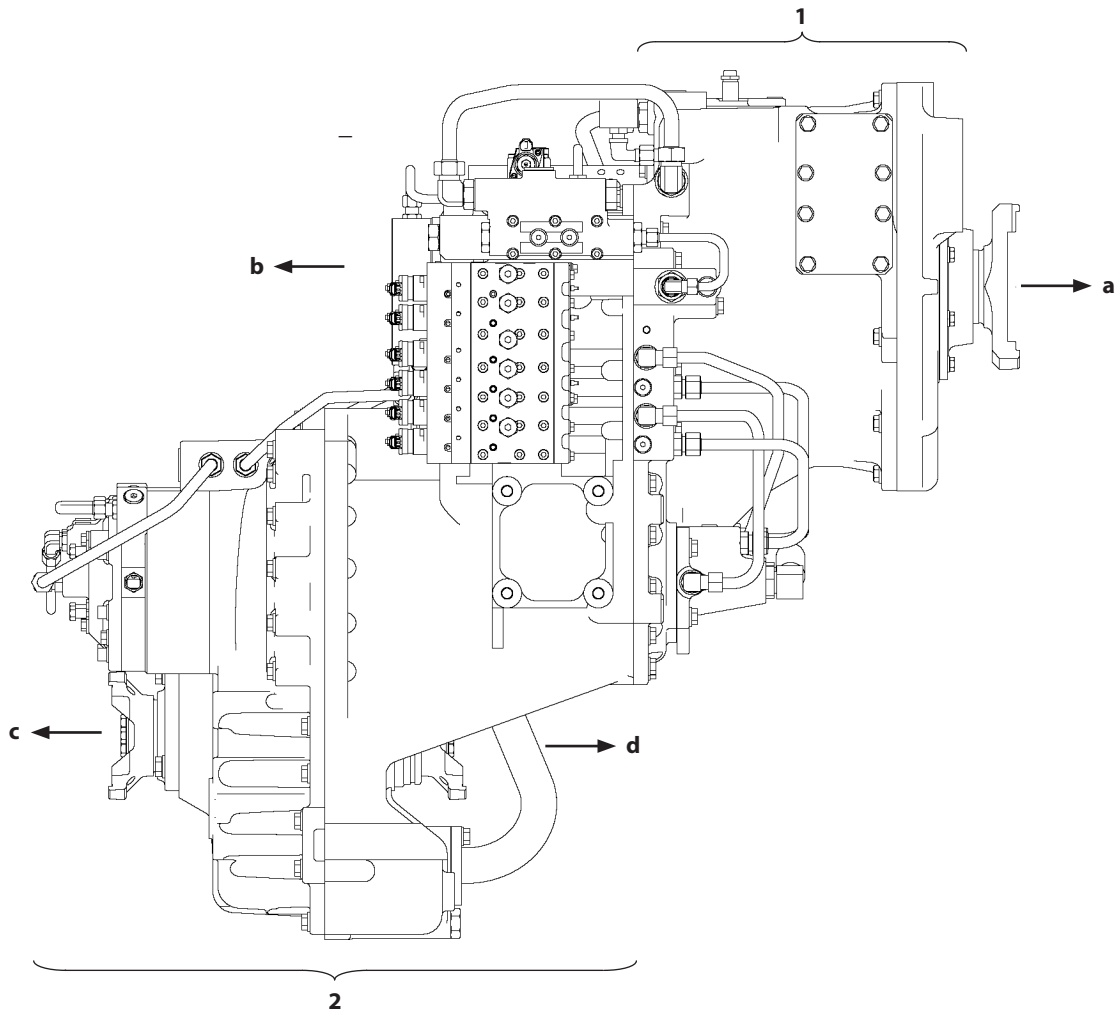
1- Orifice
2- Orifice
3- Spool
4- Spring
5- Passage
6- Plunger
7- Valve Pilot
8- Spring
9- Check Valve
10- Orifice
11- Oil Chamber
12- Priority Valve
13- Spring
14- Passage
15- Orifice
16- Spring

Outline

The selectable range drive unit consists of transmission (2) and torque converter (1).

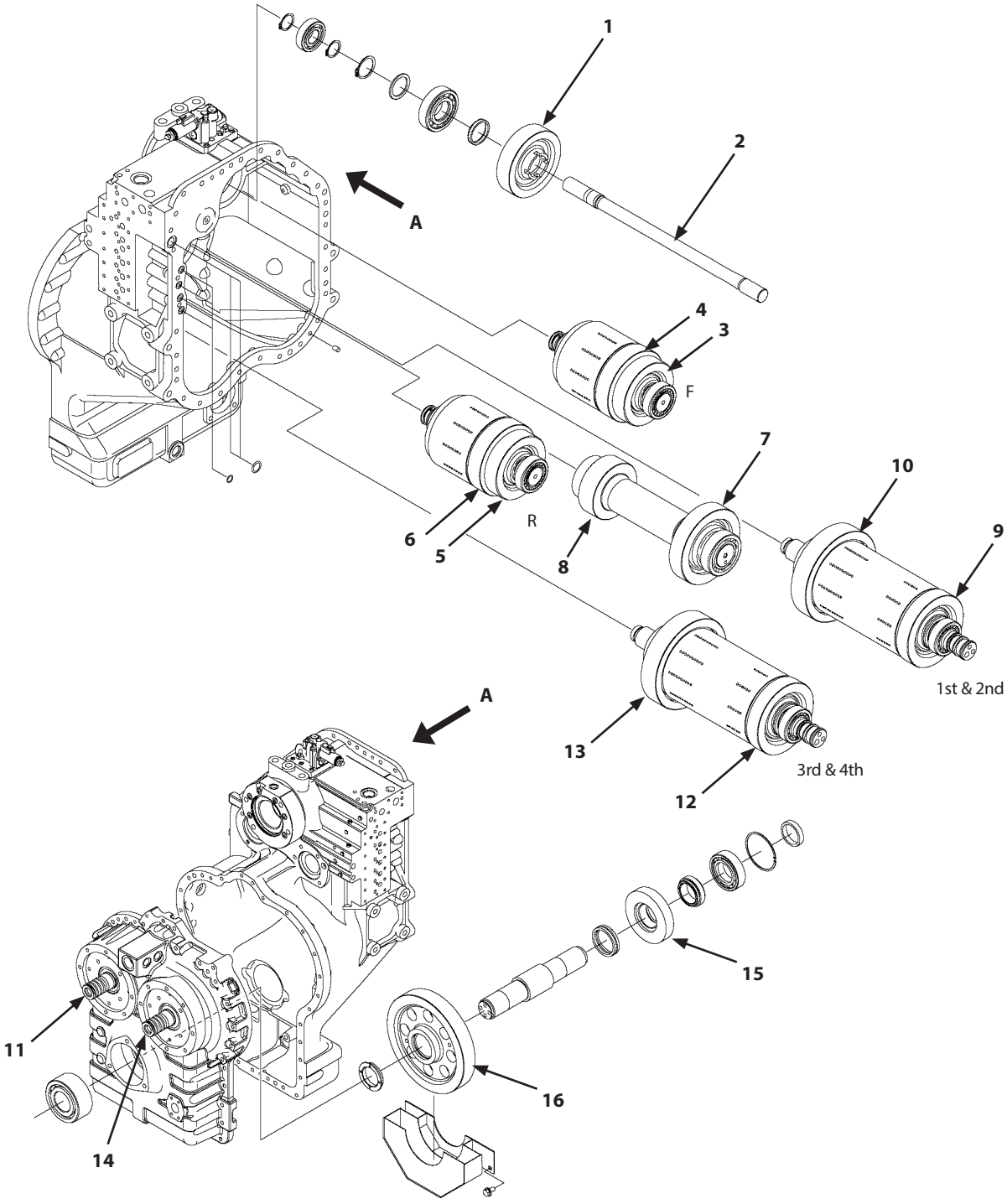
The drive unit is connected with the engine through the first propeller shaft.

The engine output power is transmitted from the engine flywheel to transmission (2) through the first propeller shaft and torque converter (1).



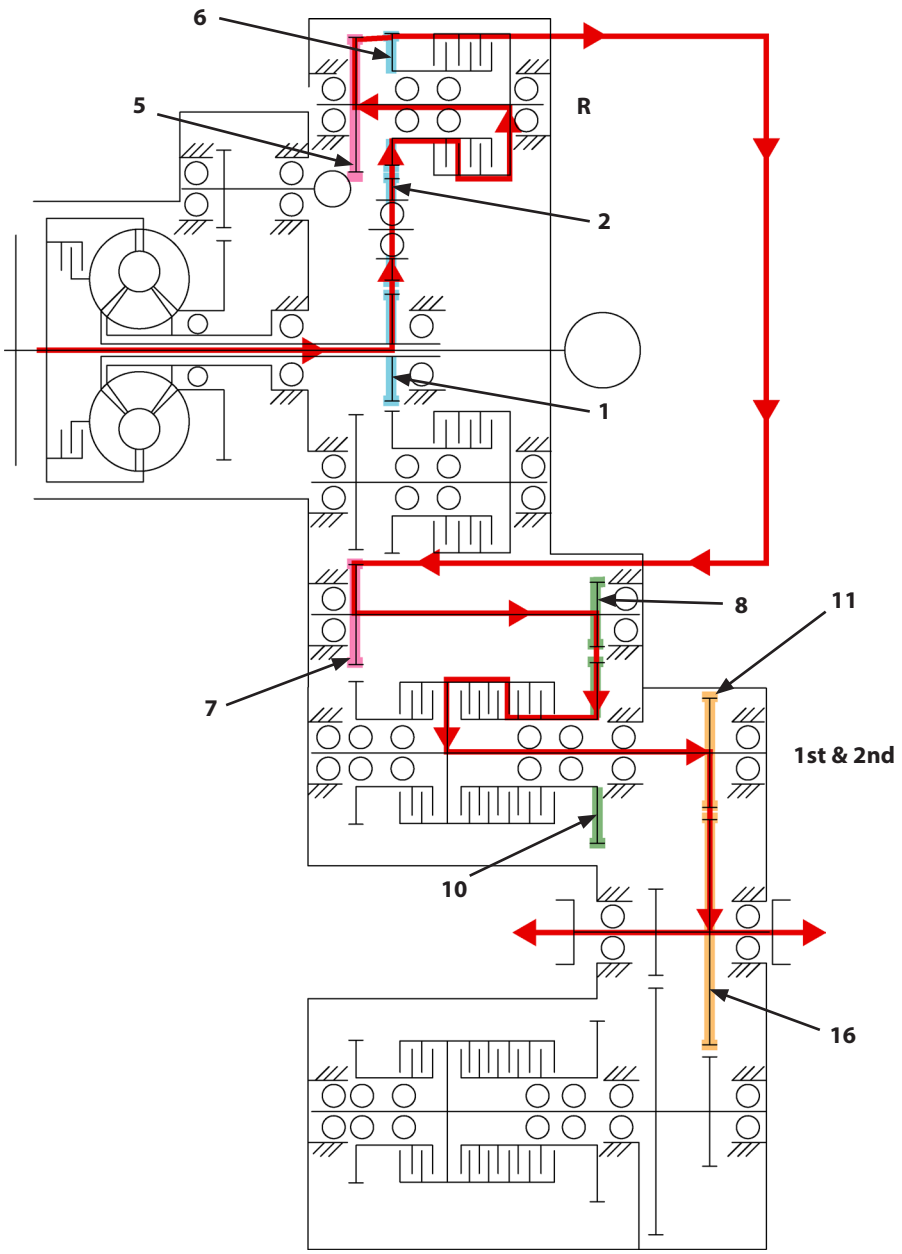
90Z7BTE03-08-01

a- First Propeller Shaft Side
b- Main Pump Side
c- Second Propeller Shaft Side
d- Third Propeller Shaft Side
1- Torque Converter
2- Transmission



90Z7BTE03-08-06

1- Input Gear
2- Turbine Shaft
3- F-Gear
4- F Hub Gear
5- R-Gear
6- R Hub Gear
7- Idler Gear (for F/R Gear)
8- Idler Gear (for Speed Gear)
9- 2nd Range Hub Gear
10- 1st Range Hub Gear
11- Low-Range Gear
12- 4th Range Hub Gear
13- 3rd Range Hub Gear
14- High-Range Gear
15- Output Gear (for High-Range Gear)
16- Output Gear (for Low-Range Gear)



90Z7B-03-08-11

Gear Connection Drawing: Reverse First Speed

1- Input Gear
2- Reverse Idler Gear
5- R Gear
6- R Hub Gear
7- Idler Gear
8- Idler Gear
10- 1st Range Hub Gear
11- Low Range Gear
16- Output Gear

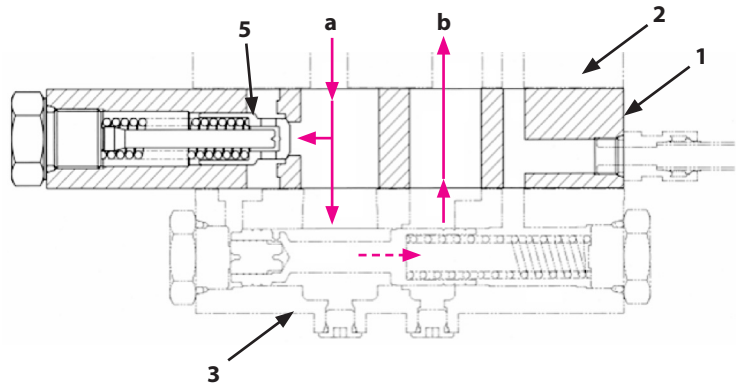
Safety Valve Operation

Pressurized oil from the charging pump 1 (a) flows through transmission case (2) and check valve (5) to regulator valve (3).

The poppet of check valve (5) is usually pressed to the valve body by the spring force, and closes the oil path to transmission case (2), and total amount of supplied oil is sent to torque converter (b).

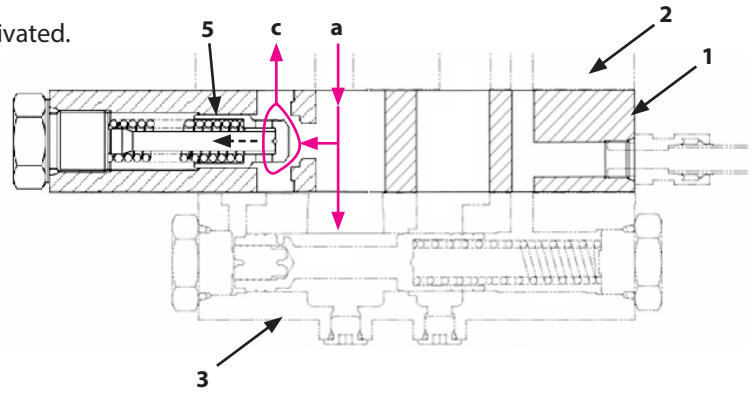
When safety valve (1) is activated due to the rapid increase of oil pressure above the spring force, the poppet is moved to the left and opens the oil path to transmission case (2). This drains pressurized oil (c) to transmission case (2) and lowers the pressure, thus protects the filter.

- Normal Operation



90Z7-03-08-09

- When safety valve is activated.



90Z7-03-08-10

a- From Charging Pump
b- To Torque Converter
c- To Transmission Case

1- Safety Valve Assy
2- Transmission Case
3- Regulator Valve
5- Check Valve

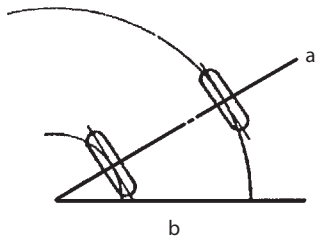
Purpose of Differential

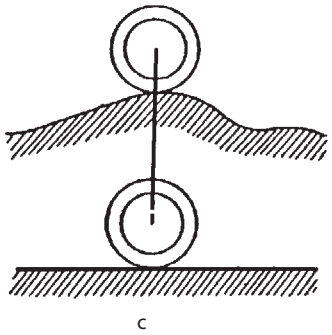
1. When the machine is steered, the inner wheel turns with a smaller radius, so the outer wheel needs to rotate faster for smooth steering.

2. Suppose driving the rear wheel by directly installing the gear to the propeller shaft with a shaft having no differential.

3. In this case, the outer wheel and the inner wheel rotate at the same rate. Therefore, when the machine is steered, the outer wheel cannot rotate more than the inner wheel. Consequently, axle strain, tire scuffing and wear takes place. In addition, due to axle shaft torsional stress and unstable transmission of drive force take place.

4. On the other hand, with a differential installed, the inner and the outer wheels can rotate at different speeds, and the problem mentioned above is eliminated.





T202-03-05-005

a- Extension Line of Rear Wheel Centers b- While Turning the Machine c- Traveling on Rough Surfaces

SECTION 3 COMPONENT OPERATION

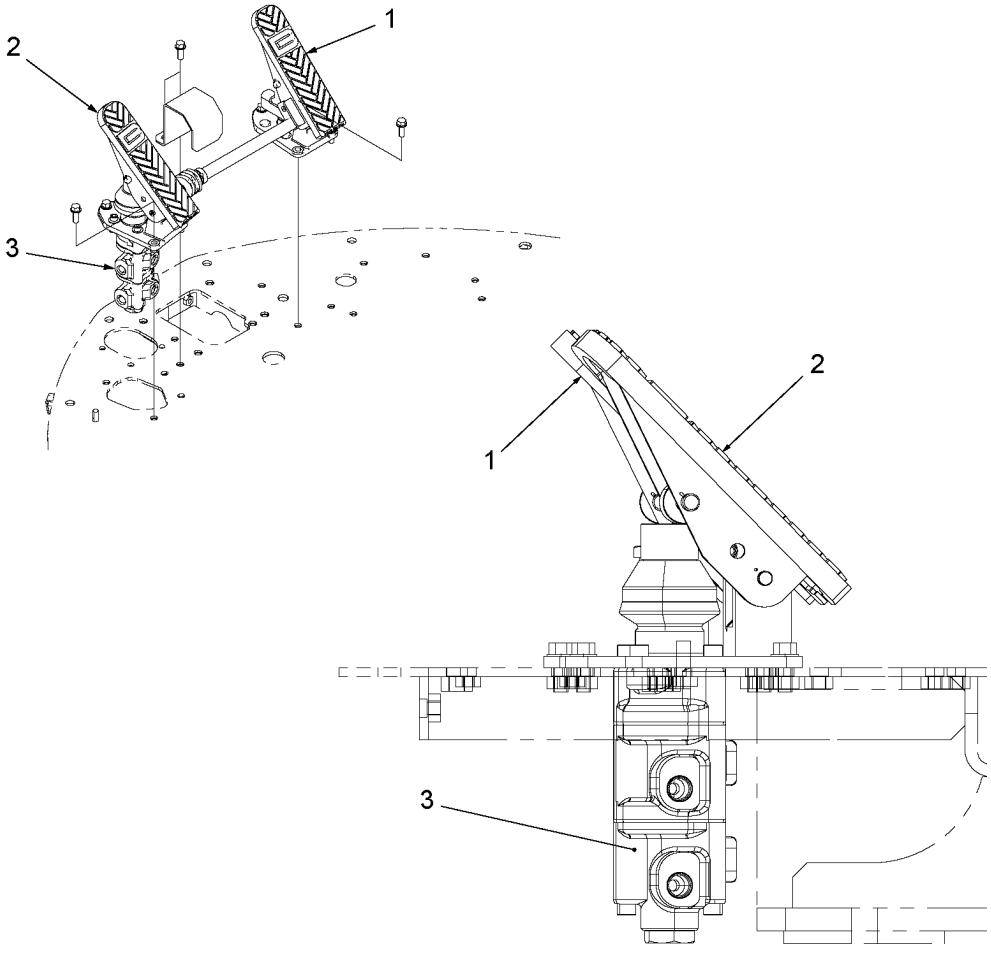
Group 10 Brake Valve

Outline

Brake valve (3) supplies brake pressure in proportion to the position of brake pedals (1, 2).
The oil is supplied to the front and rear axle service brakes.
(Refer to SYSTEM / Hydraulic System.)

The brake valve consists of two independent systems. When the right side pedal is depressed, the movement of right side pedal is transmitted to the left side pedal by the linkage and brake is applied. But the left side pedal is depressed, only left pedal works.

NOTE: When the declutch position switch is ON, depressing the left side pedal disengages the transmission while applying the service brake. Refer to the Operation and Maintenance Manual for the declutch position switch.



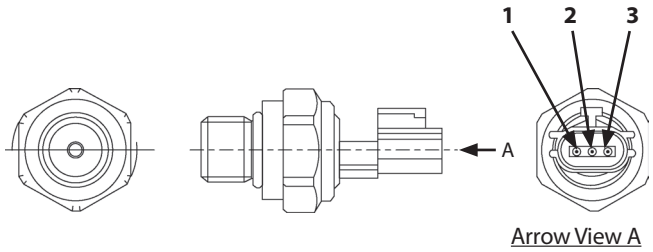
90TNED-03-09-01

1- Brake Pedal
2- Brake and Declutch Pedal
3- Brake Valve

Pressure Sensor (for Declutch)

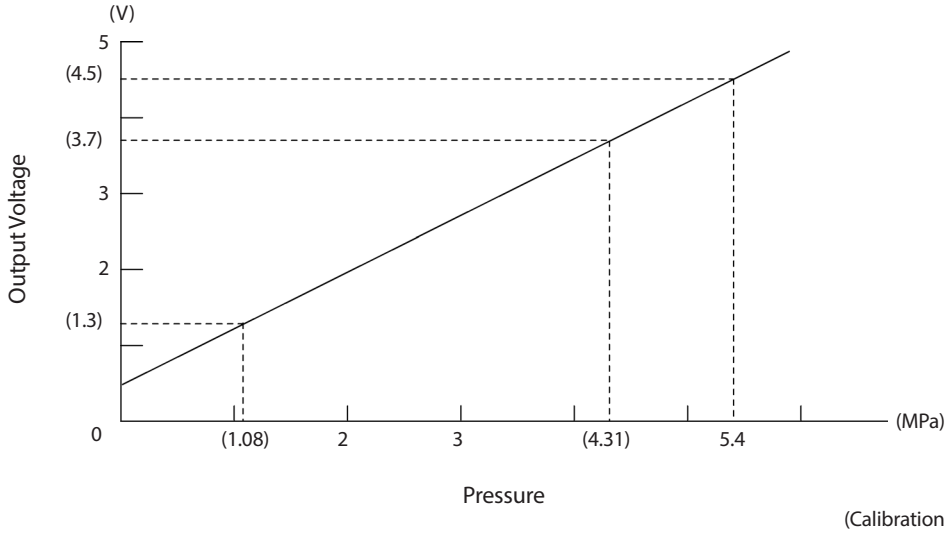
Pressure Sensor Specifications

Rated Voltage	5.0 VDC
Power Consumption	Max. 10 mA
Output Current	Max. 1.5 mA
Operating Pressure	0~5.4 MPa (0~783 PSI)
Withstanding Pressure	Max. 7 MPa (1015 PSI)



1- GND
2- Output (Vout)
3- Power Supply (5V)(Vdd)

35830-60140



K80V2U52004

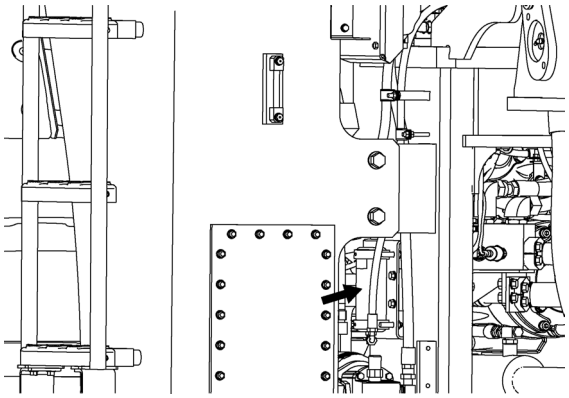
Steering Accumulator

The accumulator is connected to the steering valve LS2 port to absorb the hydraulic pulsation generated in the steering circuit.

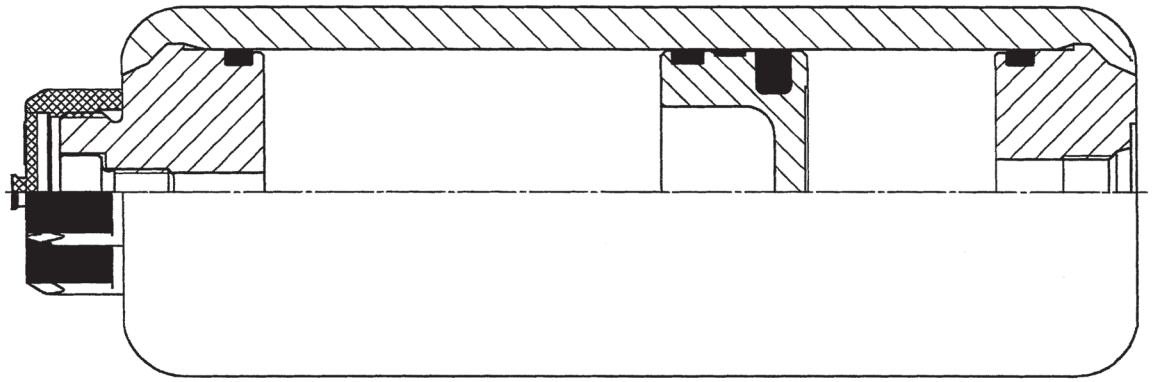
Nitrogen (N_2) gas at 5.0 MPa (710 psi) is charged in the gas chamber.

Steering Accumulator Specifications

Maximum operating pressure	MPa (PSI)	28±0.5 (4061±73)
N_2 gas charging pressure	MPa (PSI)	5.0±0.1 (725±14.5)
N_2 gas capacity	L (in^3)	0.2 (12)



90Z7-7-48-2

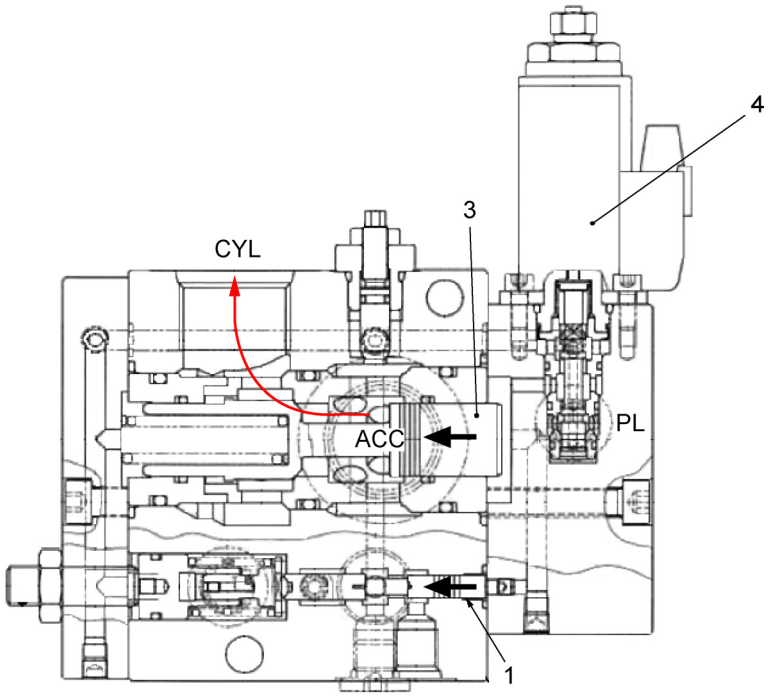


K65DV2J42009

- When Ride Control Is Working

1. When proportional solenoid valve (4) is energized while pressurized oil is being supplied to the PL port, reducing valve spool (1) is shifted to the left and closes the accumulator charging circuit.

2. Switching valve spool (3) moves left, and the passage between the ride control accumulator and the lift arm cylinder is connected. Pressurized oil is supplied to the base end of lift arm cylinder circuit.



90Z7-03-11-05

1- Pressure Reducing Valve Spool
3- Switching Valve Spool
4- Proportional Solenoid Valve

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