PART NO. TONEE-EN-00

HITACHI

Reliable solutions

Technical Manual
Operational Principle

ZW 220-5B
Wheel Loader

Service Manual consists of the following separate Part No.

Technical Manual (Operational Principle)	: Vol. No.TONEE-EN
Technical Manual (Troubleshooting)	: Vol. No.TTNEE-EN
Workshop Manual	: Vol. No.WNEE-EN

Hitachi Construction Machinery Co., Ltd.

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

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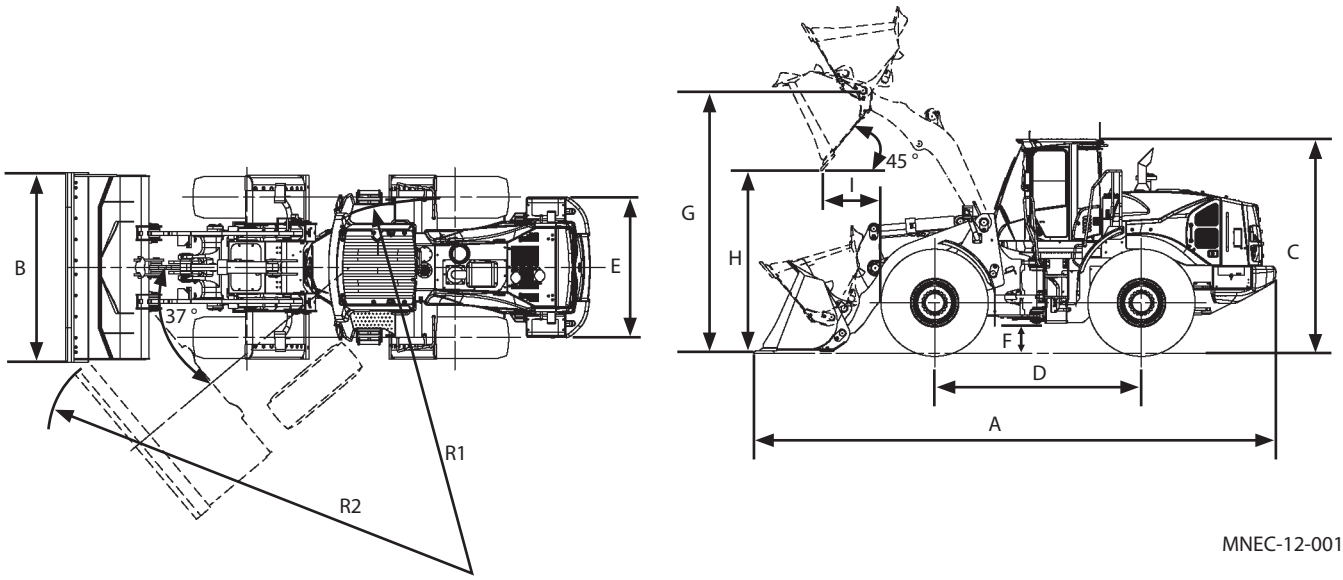
ZW220-5B WHEEL LOADER TECHNICAL MANUAL OPERATIONAL PRINCIPLE

TONEE-EN-00

Specifications



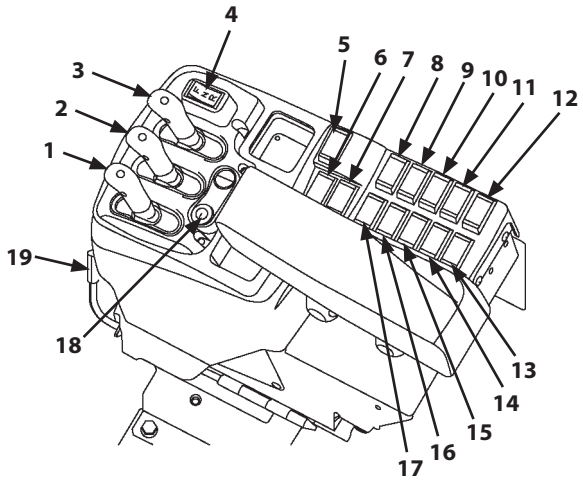
MNEC-12-001

Model	-	ZW220-5B
Bucket Capacity: heaped	m^3	3.3
Operating Weight	kg	17830
Static Tipping Load (Straight)	kg	13010
Engine	-	CUMMINS QSB6.7
A: Overall Length	mm	8220
B: Overall Width (Bucket)	mm	2910
C: Overall Height	mm	3370
D: Wheel Base	mm	3300
E: Tread (front and rear tires)	mm	2160
F: Ground Clearance	mm	450
G: Bucket Hinge Height	mm	4080
H: Dumping Clearance (45 °)	mm	2900
I: Dumping Reach (45 °)	mm	1110
R1: Minimum Rotation Radius	mm	6010
R2: Minimum Rotation Radius	mm	6940
Travel Speed Forward/Reverse (at Power mode)	km/h	36.0 (36.0)/24.9 (26.2)
Transmission Speeds (F/R)	-	5/3
Articulation Angle (Left/Right) deg	(°)	37
Tire Size	-	23.5 R25 (L3)

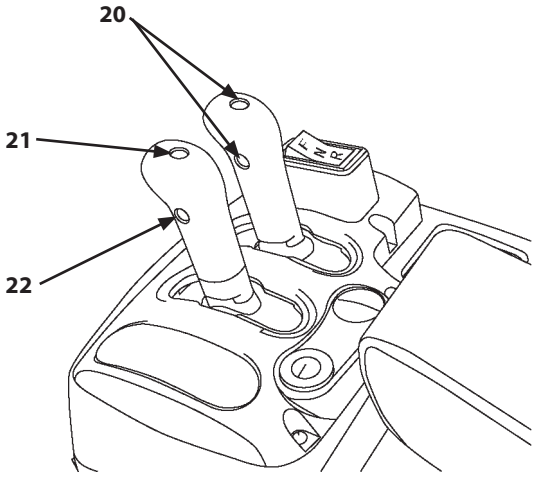
NOTE: These specifications are subject to change without notice.

Right Console

Fingertip Control Lever Type

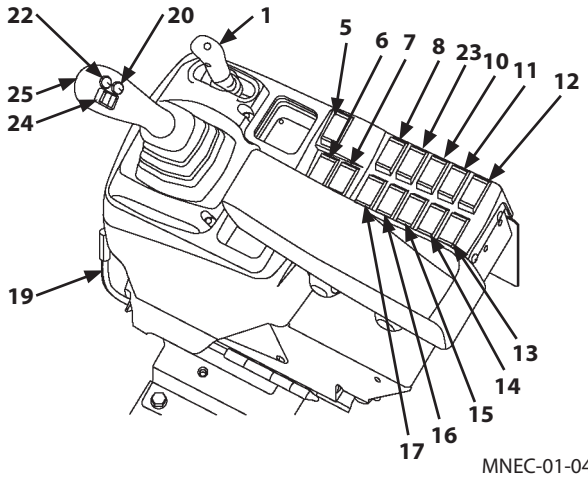


MNEC-01-041



MNEC-01-042

Multi-Function Joystick Lever Type



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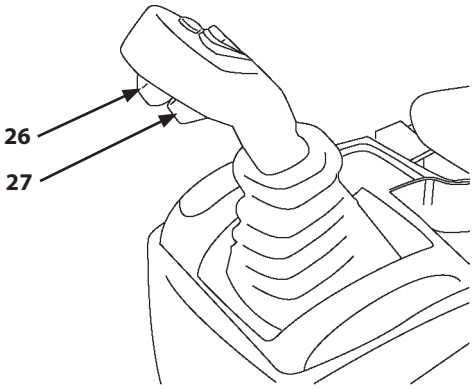
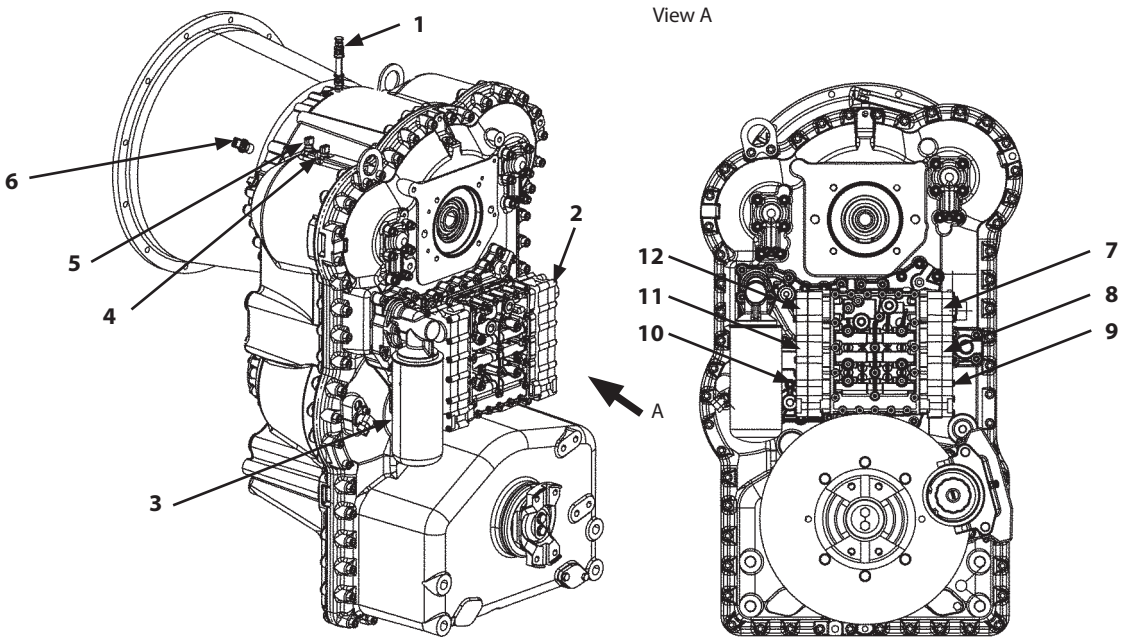


MNEC-01-044

1- Auxiliary Control Lever (Optional)
2- Bucket Control Lever
3- Lift Arm Control Lever
4- Forward/Reverse Switch (Optional)
5- Front Control Lever Lock Switch
6- Clutch Cut Position Switch
7- Travel Mode Selector Switch
8- Power Mode Switch
9- Forward/Reverse Selector Switch (Optional)
10- Fan Reverse Rotation Switch
11- Auxiliary
12- Hydraulic Coupler Switch (Optional)
13- Emergency Steering Operation Check Switch (Optional)
14- Muffler Filter Switch
15- Auxiliary
16- 1st Speed Fixed Switch
17- Ride Control Switch (Optional)
18- Hold Switch
19- Right Console Slide Lever
20- DSS (Down Shift Switch)
21- Horn Switch
22- Quick Power Switch
23- Forward/Reverse Selector Switch
24- Forward/Reverse Switch
25- Multi-Function Joystick Lever
26- Hold Switch (Under the Lever)
27- Horn Button (Under the Lever)

Drive Unit



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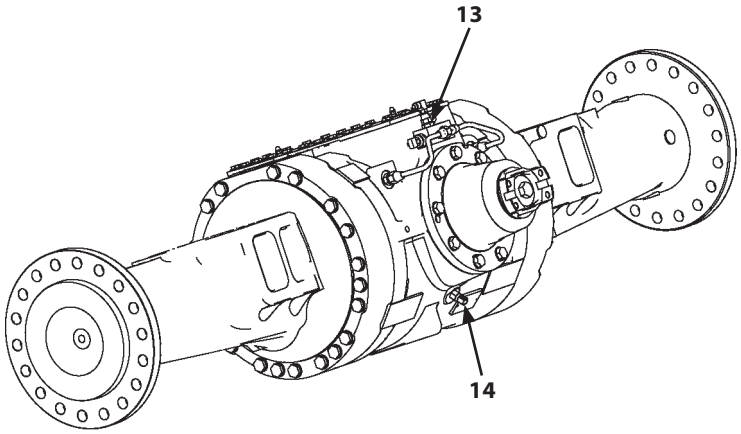
Front Axle



TNEE-01-02-018

1- Breather
2- Transmission Control Valve
3- Transmission Oil Filter
4- Torque Converter Output Speed Sensor
5- Transmission Intermediate Shaft Sensor
6- Torque Converter Input Speed Sensor
7- Proportional Solenoid Valve Y1 (For Fast-Speed Forward Clutch)
8- Proportional Solenoid Valve Y2 (For Reverse Clutch)
9- Proportional Solenoid Valve Y3 (For 1st Speed Clutch)
10- Proportional Solenoid Valve Y4 (For 3rd Speed Clutch)
11- Proportional Solenoid Valve Y5 (For Slow-Speed Forward Clutch)
12- Proportional Solenoid Valve Y6 (For 2nd Speed Clutch)
13- Pressure Sensor (Brake Secondary Pressure)
14- Axle Oil Tempereture Sensor

Hydraulic Component

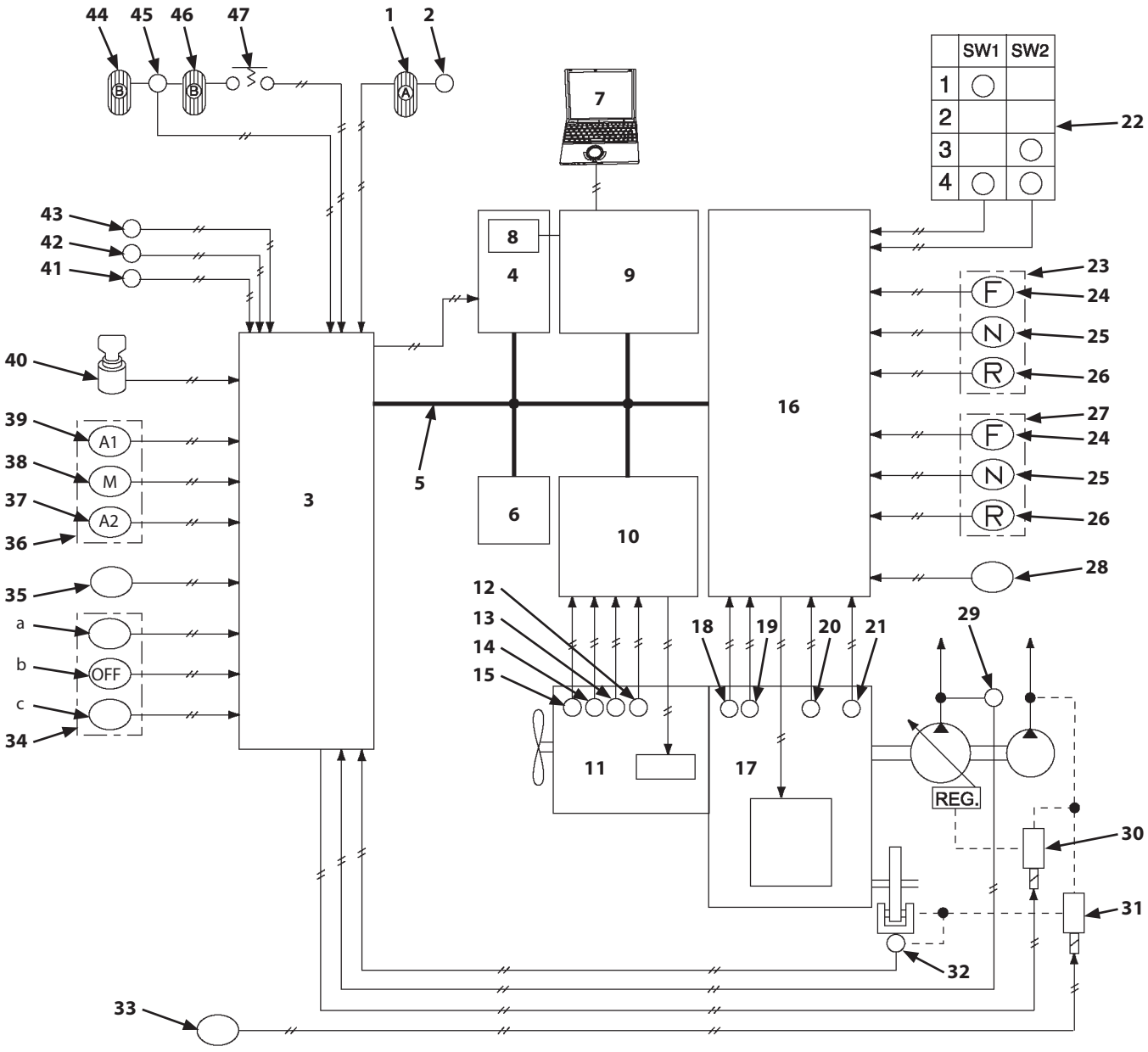
PUMP DEVICE	Drive Gear Ratio	Main Pump: 1, Pilot Pump: 1
MAIN PUMP	Type	Variable Displacement Swash Plate Tandem Plunger Pump
	Theoretical Displacement	125 cm^3/rev (7.6 in^3/rev)
	Rated Pressure	27.4 MPa (280 kgf/cm^2, 3975 psi)
REGULATOR	Type	Hydraulic Pressure Operated Type
PILOT PUMP	Type	Fixed Displacement Type Gear Pump
	Model	HY/ZFS 11/16.8
	Theoretical Displacement	16.8 cm^3/rev (1.0 in^3/rev)
CONTROL VALVE	Type	Pilot Pressure Operated Type (2-Spools)
	Main Relief Set-Pressure	27.4 MPa (280 kgf/cm^2, 3975 psi) at 210 L/min (55.4 US gpm)
	Overload Relief Set-Pressure	34.3 MPa (350 kgf/cm^2, 4975 psi) at 50 L/min (13.2 US gpm) (Lift Arm)
		30.4 MPa (310 kgf/cm^2, 4410 psi) at 50 L/min (13.2 US gpm) (Bucket)

SECTION 2

SYSTEM

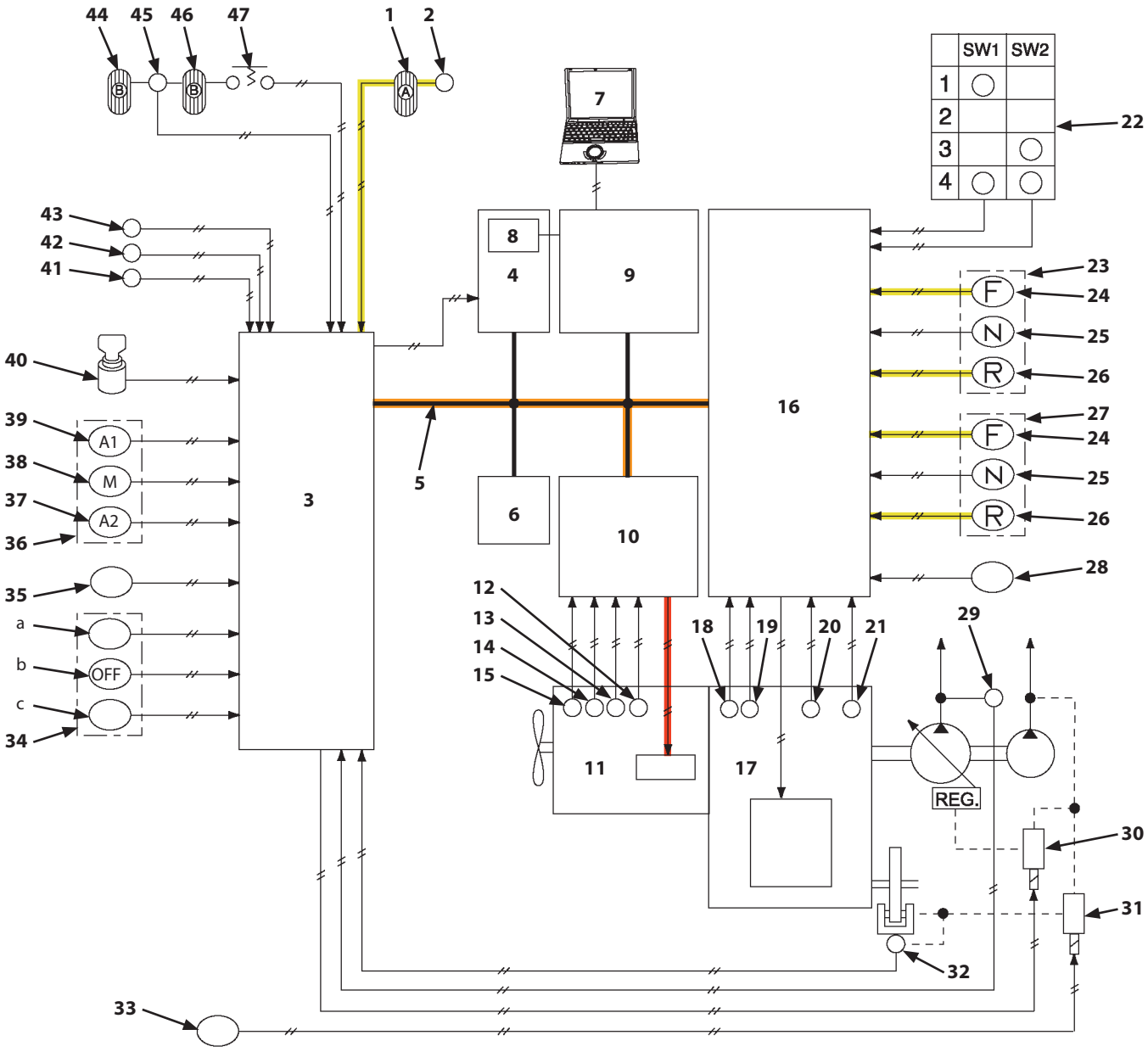
CONTENTS

Engine Control System Layout



a- Brake Pedal Depressing Amount: Lightly
b- OFF
c- Brake Pedal Depressing Amount: Fully

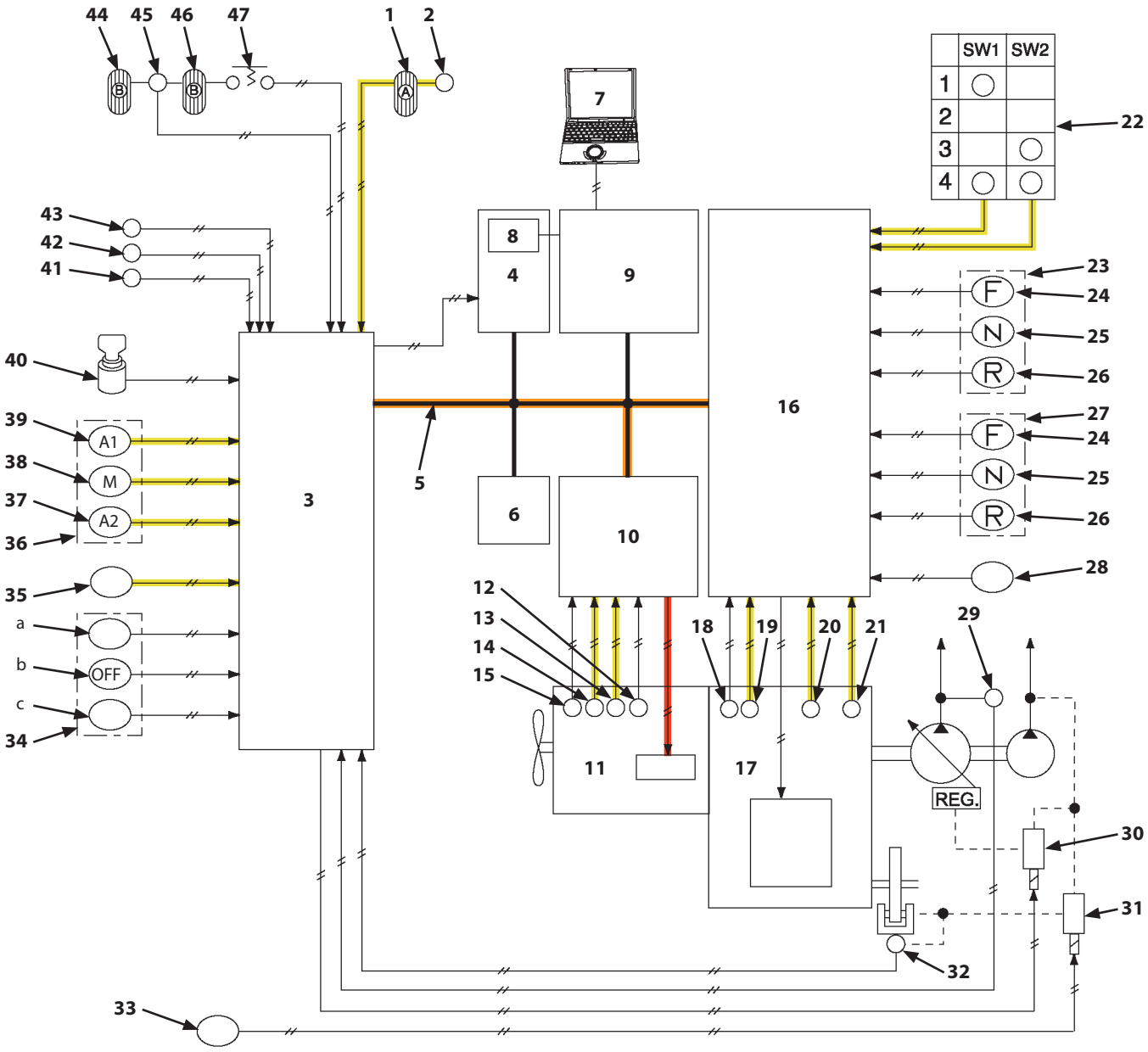
1- Accelerator Pedal
2- Accelerator Pedal Sensor
3- MC
4- Column Display Controller
5- CAN
6- Air Conditioner Controller
7- MPDr.
8- Monitor
9- Monitor Controller
10- ECM
11- Engine
12- Boost Temperature Sensor
13- Crank Revolution Sensor
14- Cam Angle Sensor
15- Coolant Temperature Sensor
16- TCU
17- Transmission
18- Torque Converter Oil Temperature Sensor
19- Torque Converter Input Speed Sensor
20- Torque Converter Output Speed Sensor
21- Vehicle Speed Sensor
22- Shift Switch
23- Forward/Reverse Lever
24- Forward Position
25- Neutral Position
26- Reverse Position
27- Forward/Reverse Switch (Optional)
28- Forward/Reverse Selector Switch (Optional)
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- Clutch Cut Position Switch
35- Power Mode Switch
36- Travel Mode Selector Switch
37- AUTO 2 Mode
38- Manual Mode
39- AUTO 1 Mode
40- Key Switch
41- Hydraulic Oil Temperature Sensor
42- Pressure Sensor (Lift Arm Raise)
43- Pressure Sensor (Bucket Tilt)
44- Brake Pedal (Left)
45- Pressure Sensor (Brake Secondary Pressure)
46- Brake Pedal (Right)
47- Brake Pedal (Right) Switch



TNED-02-02-008

a- Brake Pedal Depressing Amount: Lightly
b- OFF
c- Brake Pedal Depressing Amount: Fully

1- Accelerator Pedal
2- Accelerator Pedal Sensor
3- MC
4- Column Display Controller
5- CAN
6- Air Conditioner Controller
7- MPDr.
8- Monitor
9- Monitor Controller
10- ECM
11- Engine
12- Boost Temperature Sensor
13- Crank Revolution Sensor
14- Cam Angle Sensor
15- Coolant Temperature Sensor
16- TCU
17- Transmission
18- Torque Converter Oil Temperature Sensor
19- Torque Converter Input Speed Sensor
20- Torque Converter Output Speed Sensor
21- Vehicle Speed Sensor
22- Shift Switch
23- Forward/Reverse Lever
24- Forward Position
25- Neutral Position
26- Reverse Position
27- Forward/Reverse Switch (Optional)
28- Forward/Reverse Selector Switch (Optional)
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- Clutch Cut Position Switch
35- Power Mode Switch
36- Travel Mode Selector Switch
37- AUTO 2 Mode
38- Manual Mode
39- AUTO 1 Mode
40- Key Switch
41- Hydraulic Oil Temperature Sensor
42- Pressure Sensor (Lift Arm Raise)
43- Pressure Sensor (Bucket Tilt)
44- Brake Pedal (Left)
45- Pressure Sensor (Brake Secondary Pressure)
46- Brake Pedal (Right)
47- Brake Pedal (Right) Switch



TNED-02-02-019

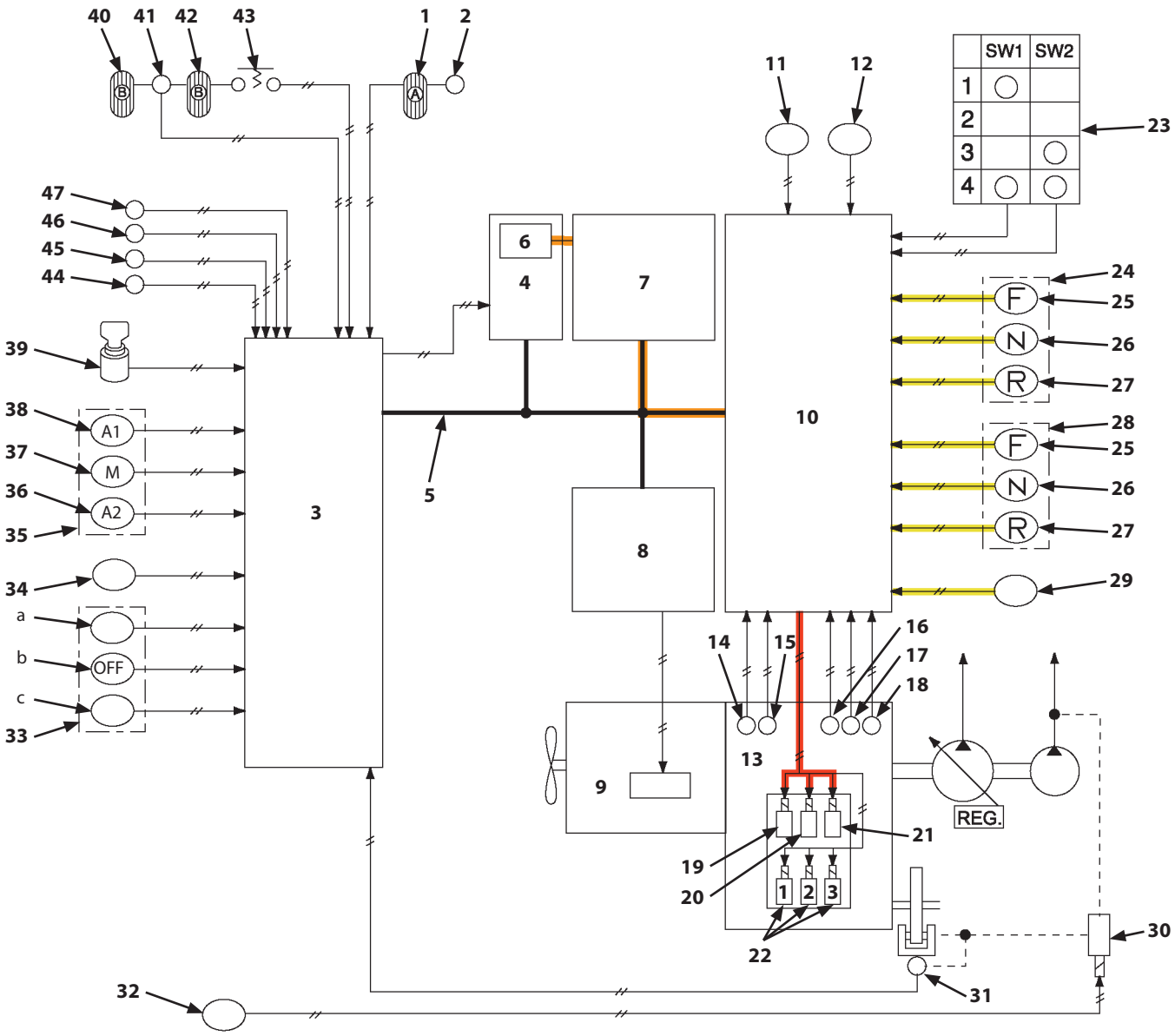
a- Brake Pedal Depressing Amount: Lightly
b- OFF
c- Brake Pedal Depressing Amount: Fully

1- Accelerator Pedal
2- Accelerator Pedal Sensor
3- MC
4- Column Display Controller
5- CAN
6- Air Conditioner Controller
7- MPDr.
8- Monitor
9- Monitor Controller
10- ECM
11- Engine
12- Boost Temperature Sensor
13- Crank Revolution Sensor
14- Cam Angle Sensor
15- Coolant Temperature Sensor
16- TCU
17- Transmission
18- Torque Converter Oil Temperature Sensor
19- Torque Converter Input Speed Sensor
20- Torque Converter Output Speed Sensor
21- Vehicle Speed Sensor
22- Shift Switch
23- Forward/Reverse Lever
24- Forward Position
25- Neutral Position
26- Reverse Position
27- Forward/Reverse Switch (Optional)
28- Forward/Reverse Selector Switch (Optional)
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- Clutch Cut Position Switch
35- Power Mode Switch
36- Travel Mode Selector Switch
37- AUTO 2 Mode
38- Manual Mode
39- AUTO 1 Mode
40- Key Switch
41- Hydraulic Oil Temperature Sensor
42- Pressure Sensor (Lift Arm Raise)
43- Pressure Sensor (Bucket Tilt)
44- Brake Pedal (Left)
45- Pressure Sensor (Brake Secondary Pressure)
46- Brake Pedal (Right)
47- Brake Pedal (Right) Switch

Pump Control

The pump control consists of the followings.

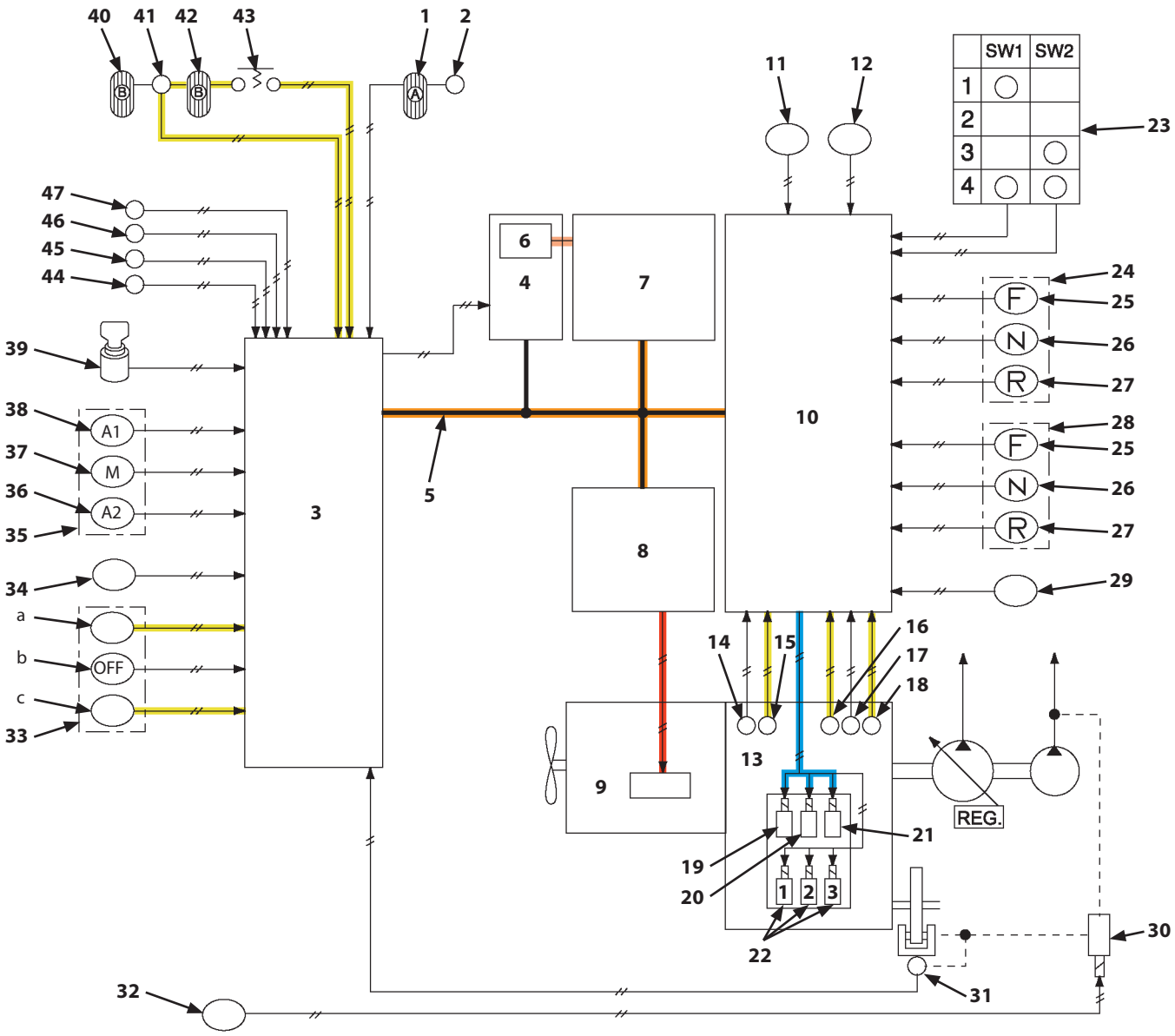
- Base Torque Control
- Torque Decrease Control While Digging



TNEE-02-02-029

a- Brake Pedal Depressing Amount: Lightly
b- OFF
c- Brake Pedal Depressing Amount: Fully

1- Accelerator Pedal
2- Accelerator Pedal Sensor
3- MC
4- Column Display Controller
5- CAN
6- Monitor
7- Monitor Controller
8- ECM
9- Engine
10- TCU
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- Transmission Intermediate Shaft Speed Sensor
18- Vehicle Speed Sensor
19- Slow-Speed Forward Clutch Solenoid Valve (Y5)
20- Fast-Speed Forward Clutch Solenoid Valve (Y1)
21- Reverse Clutch Solenoid Valve (Y2)
22- Speed Shift Solenoid Valve (1 (Y3), 2 (Y6), 3 (Y4))
23- Shift Switch
24- Forward/Reverse Lever
25- Forward Position
26- Neutral Position
27- Reverse Position
28- Forward/Reverse Switch (Optional)
29- Forward/Reverse Selector Switch (Optional)
30- Parking Brake Solenoid Valve
31- Pressure Sensor (Parking Brake)
32- Parking Brake Switch
33- Clutch Cut Position Switch
34- Power Mode 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)
47- First Speed Fixed Switch

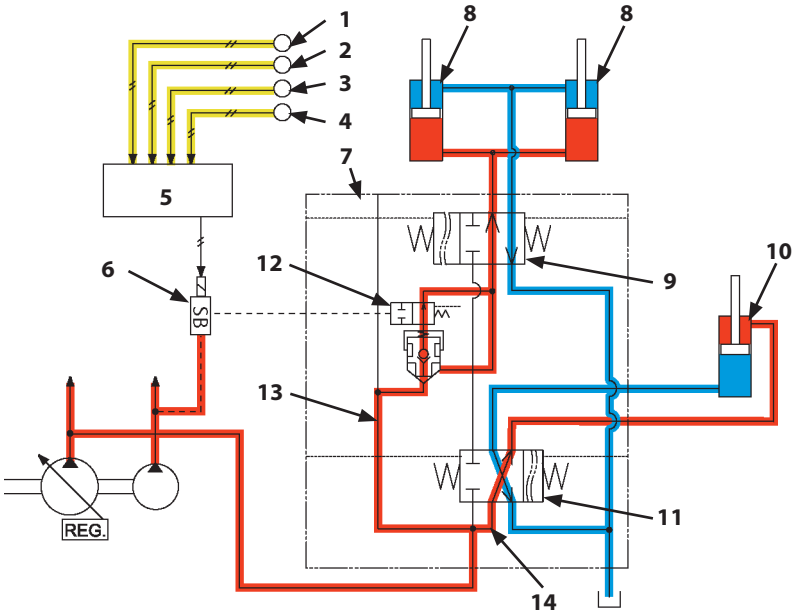


TNEE-02-02-034

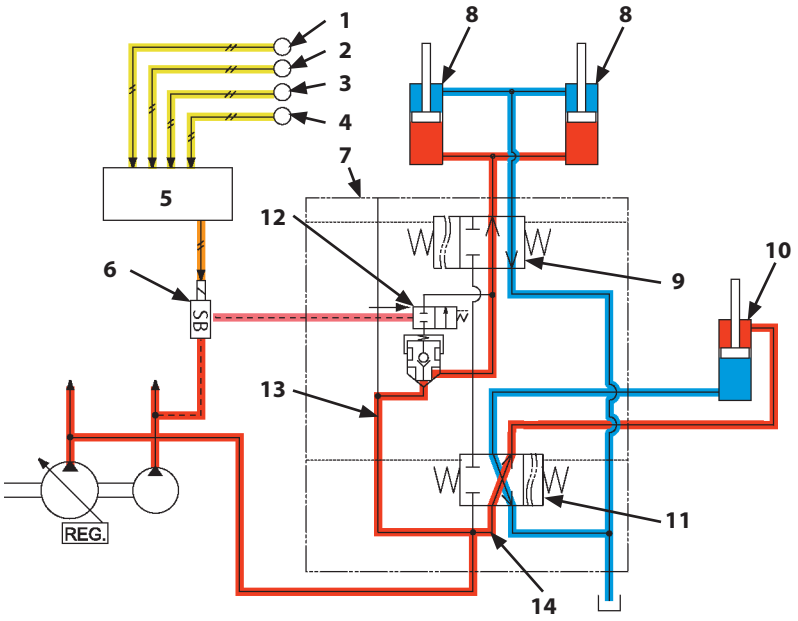
a- Brake Pedal Depressing Amount: Lightly
b- OFF
c- Brake Pedal Depressing Amount: Fully

1- Accelerator Pedal
2- Accelerator Pedal Sensor
3- MC
4- Column Display Controller
5- CAN
6- Monitor
7- Monitor Controller
8- ECM
9- Engine
10- TCU
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- Transmission Intermediate Shaft Speed Sensor
18- Vehicle Speed Sensor
19- Slow-Speed Forward Clutch Solenoid Valve (Y5)
20- Fast-Speed Forward Clutch Solenoid Valve (Y1)
21- Reverse Clutch Solenoid Valve (Y2)
22- Speed Shift Solenoid Valve (1 (Y3), 2 (Y6), 3 (Y4))
23- Shift Switch
24- Forward/Reverse Lever
25- Forward Position
26- Neutral Position
27- Reverse Position
28- Forward/Reverse Switch (Optional)
29- Forward/Reverse Selector Switch (Optional)
30- Parking Brake Solenoid Valve
31- Pressure Sensor (Parking Brake)
32- Parking Brake Switch
33- Clutch Cut Position Switch
34- Power Mode 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)
47- First Speed Fixed Switch

When deactivated:

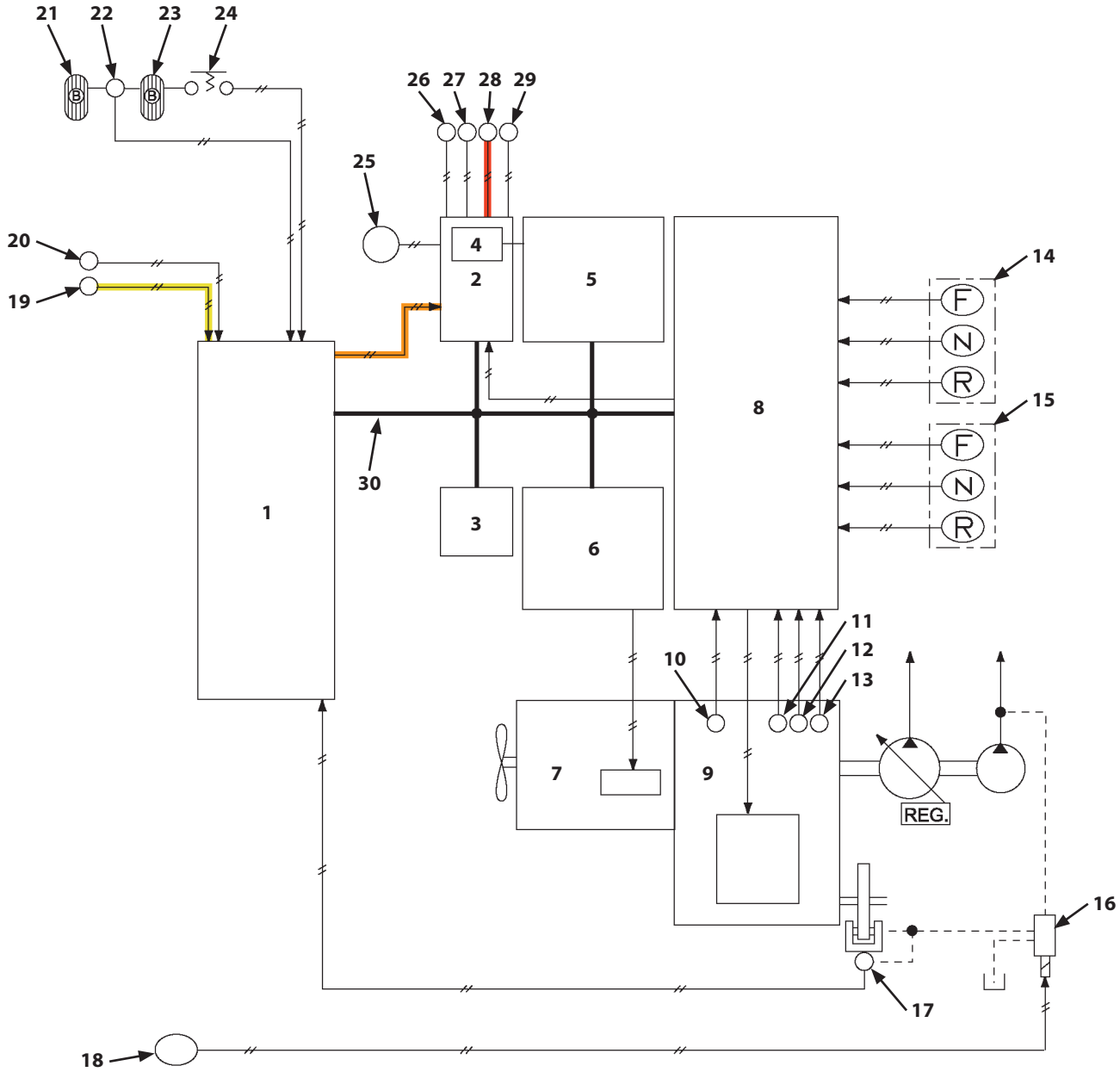


When operated:



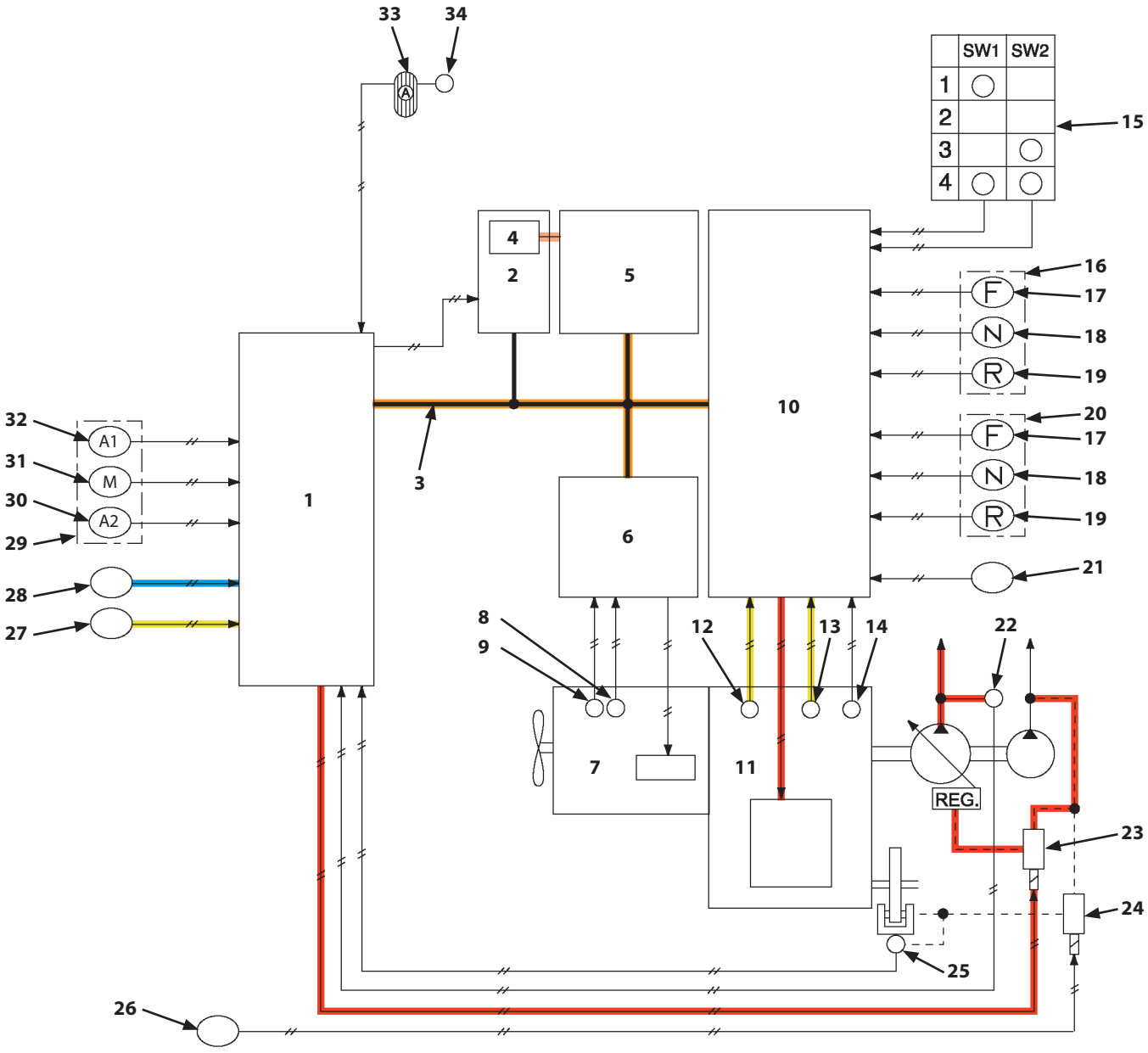
TNED-02-02-051

1- Lift Arm Angle Sensor
2- Pressure Sensor (Lift Arm Raise)
3- Pressure Sensor (Bucket Tilt)
4- Pressure Sensor (Bucket Dump)
5- MC
6- 3-Spool Solenoid Valve Unit (SB)
7- Control Valve
8- Lift Arm Cylinder
9- Lift Arm Spool
10- Bucket Cylinder
11- Bucket Spool
12- Selector Valve
13- Parallel Circuit
14- Tandem Circuit



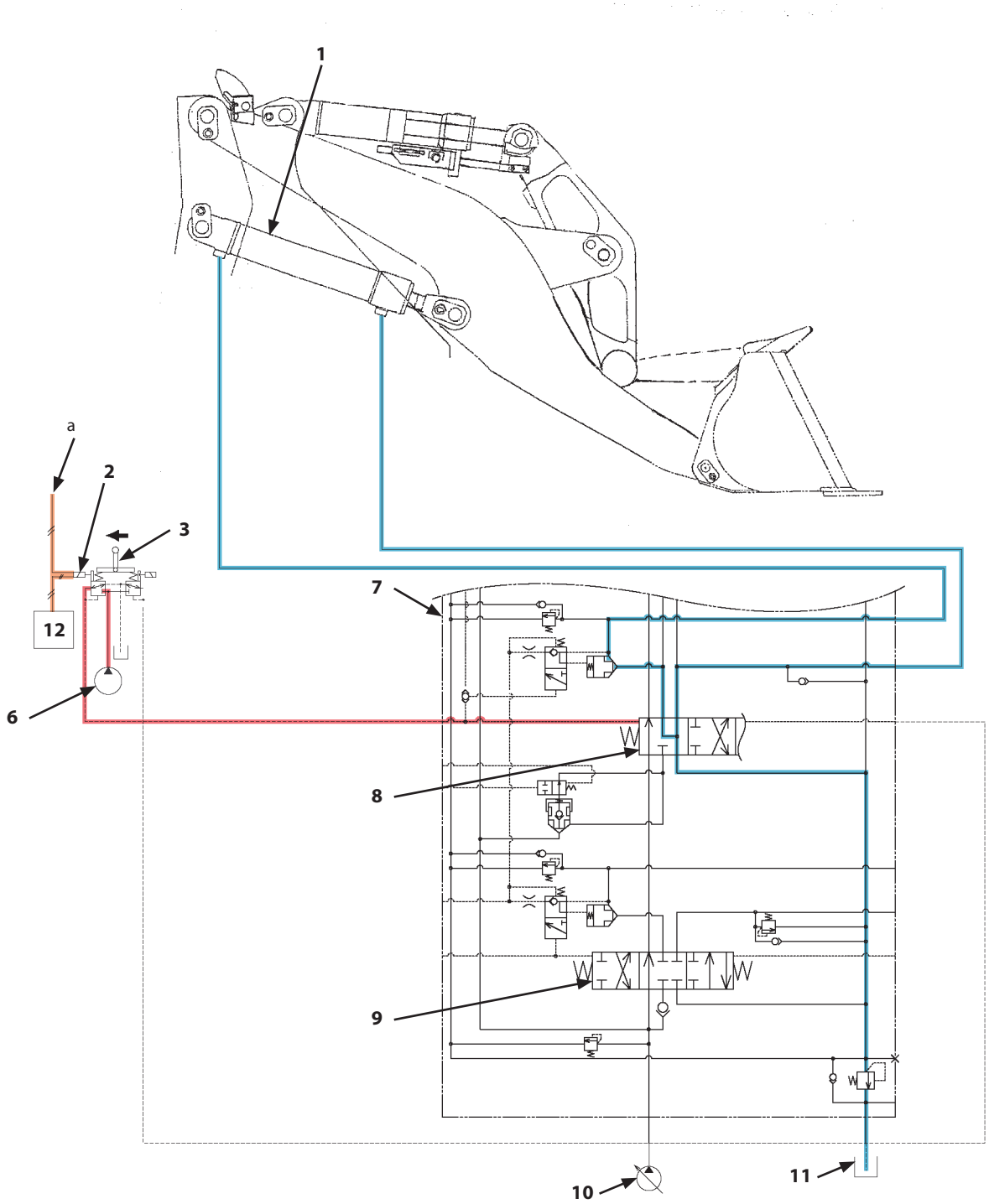
TNED-02-02-038

1- MC
2- Column Display Controller
3- Air Conditioner Controller
4- Monitor
5- Monitor Controller
6- ECM
7- Engine
8- TCU
9- Transmission
10- Torque Converter Input Speed Sensor
11- Torque Converter Output Speed Sensor
12- Transmission Intermediate Shaft Speed Sensor
13- Vehicle Speed Sensor
14- Forward/Reverse Lever
15- Forward/Reverse Switch (Optional)
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- Buzzer
26- Transmission Warning Indicator
27- Parking Brake Indicator
28- Brake Oil Low Pressure Indicator
29- Low Steering Oil Pressure Indicator
30- CAN



TNED-02-02-048

1- MC
2- Column Display Controller
3- CAN
4- Monitor
5- Monitor Controller
6- ECM
7- Engine
8- Crank Revolution Sensor
9- Cam Angle Sensor
10- TCU
11- Transmission
12- Torque Converter Input Speed Sensor
13- Torque Converter Output Speed Sensor
14- Vehicle Speed Sensor
15- Shift Switch
16- Forward/Reverse Lever
17- Forward Position
18- Neutral Position
19- Reverse Position
20- Forward/Reverse Switch (Optional)
21- Forward/Reverse Selector Switch (Optional)
22- Pump Delivery Pressure Sensor
23- Torque Control Solenoid Valve
24- Parking Brake Solenoid Valve
25- Pressure Sensor (Parking Brake)
26- Parking Brake Switch
27- Quick Power Switch
28- Power Mode Switch
29- Travel Mode Selector Switch
30- AUTO 2 Mode
31- Manual Mode
32- AUTO 1 Mode
33- Accelerator Pedal
34- Accelerator Pedal Sensor

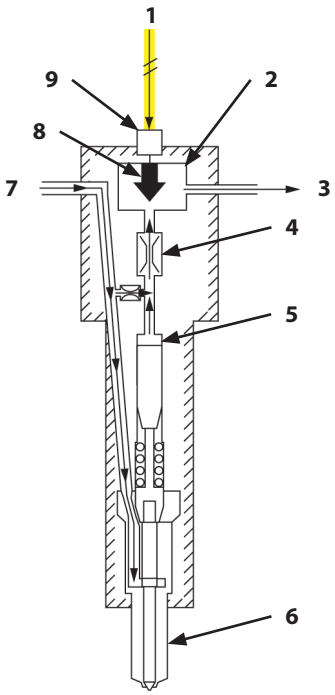


TNED-02-02-061

a- From Fuse Box B (Fuse #16)

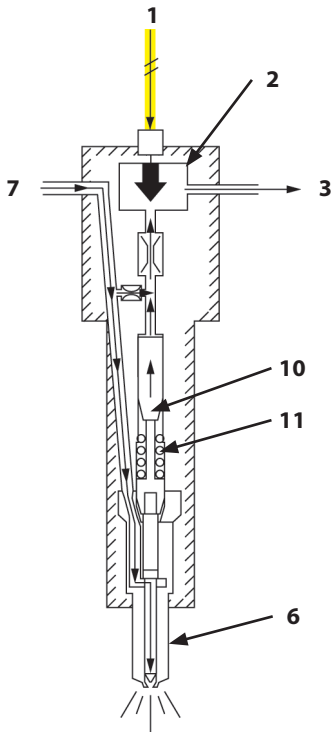
1- Lift Arm Cylinder
2- Coil on Lift Arm Lower Side
3- Pilot Valve (Lift Arm Control Lever)
6- Pilot Pump
7- Control Valve
8- Lift Arm Spool
9- Bucket Spool
10- Main Pump
11- Hydraulic Oil Tank
12- MC

1. Two-way valve: ON



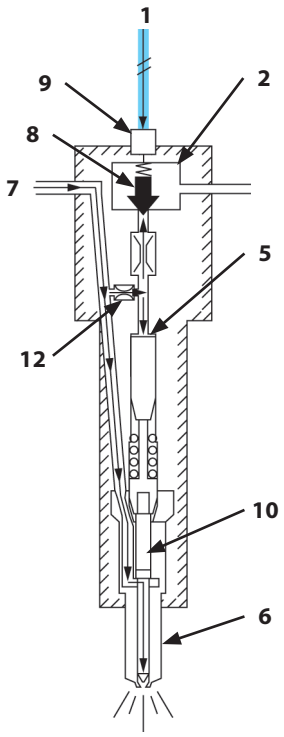
TDAA-02-03-014

2. Injection Start



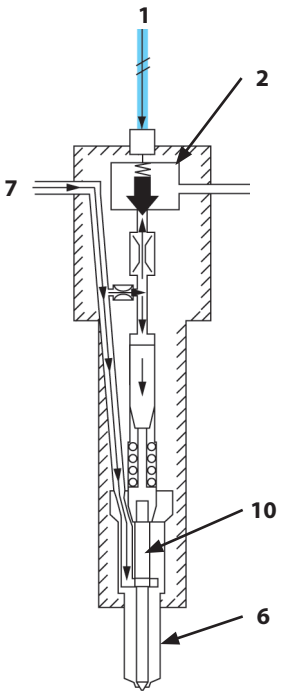
TDAA-02-03-015

3. Two-way valve: OFF



TDAA-02-03-016

4. Injection Stop

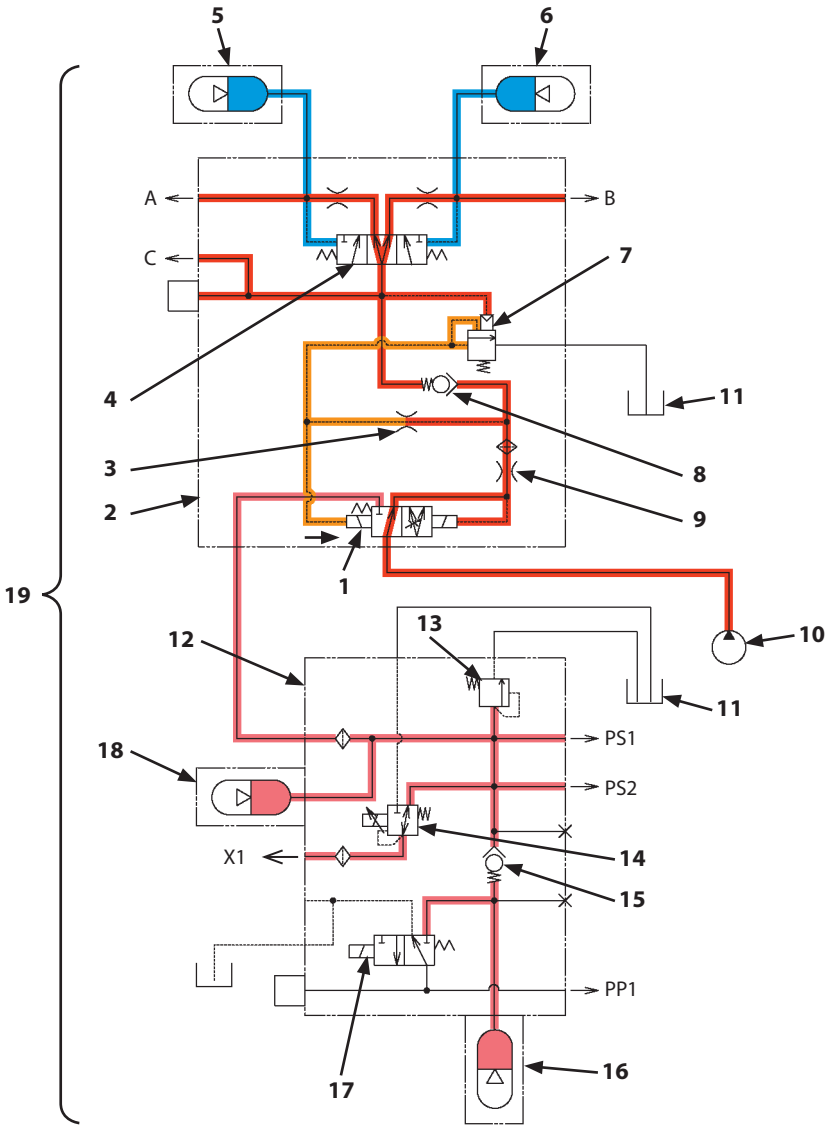


TDAA-02-03-017

1- From ECM
2- Two-Way Valve
3- Returning to Fuel Tank
4- Orifice A
5- Control Chamber
6- Nozzle
7- From Common Rail
8- Valve
9- Electromagnetic Coil
10- Hydraulic Piston
11- Spring
12- Orifice B

Variable Turbocharger Control

Purpose:
The variable turbocharger (VGS) changes the nozzle opening in turbine housing according to the engine speed and engine load and adjusts the inlet area of turbo. Therefore, the rotation speed of turbine is changed and the supercharging pressure is controlled to the best pressure. Consequently, a turbo effect can be obtained by supercharging the pressure efficiently even if the engine speed is at slow idle speed.



TNED-02-04-031

A- To Service Brake Circuit (Front)
B- To Service Brake Circuit (Rear)
c- To Parking Brake Circuit

PS1- To Steering Operation Control Circuit
PS2- To Pump Control Circuit, 3-Spool Solenoid Valve Unit

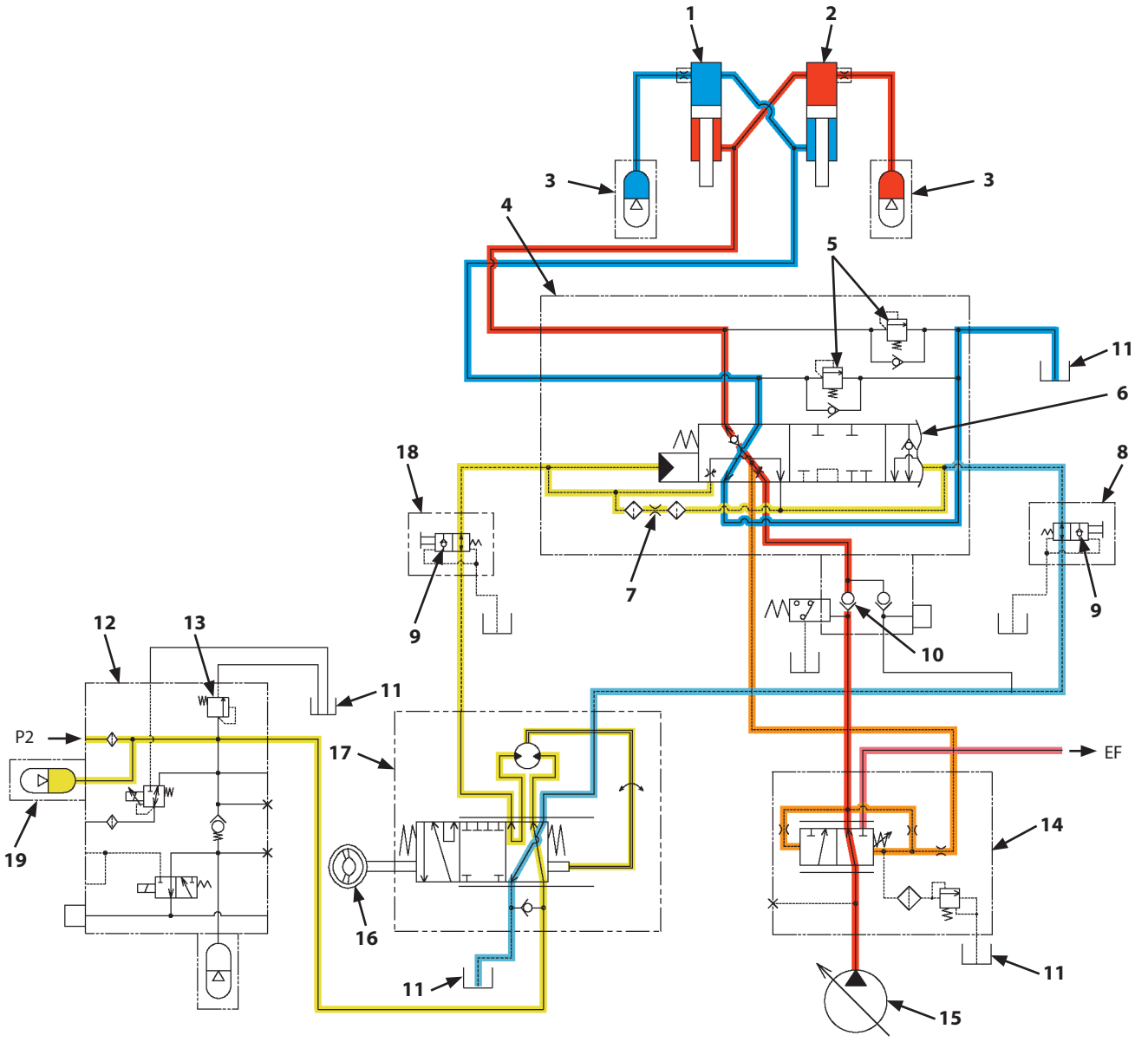
PP1- To Lift Arm, Bucket Operation Control Circuit
X1- To Pump Control Circuit

1- Priority Valve (brake)
2- Brake Charge Valve
3- Orifice
4- Shuttle Valve
5- Service Brake Accumulator (Front)
6- ServiceBrakeAccumulator(Rear)

7- Charge Relief Valve
8- Check Valve
9- Orifice
10- Pilot Pump
11- Hydraulic Oil Tank
12- Manifold Valve
13- Pilot Relief Valve

14- Torque Control Solenoid Valve
15- Check Valve
16- Pilot Accumulator (Front Attachment)
17- Front Control Lever Lock Solenoid Valve
18- Pilot Accumulator (Steering)

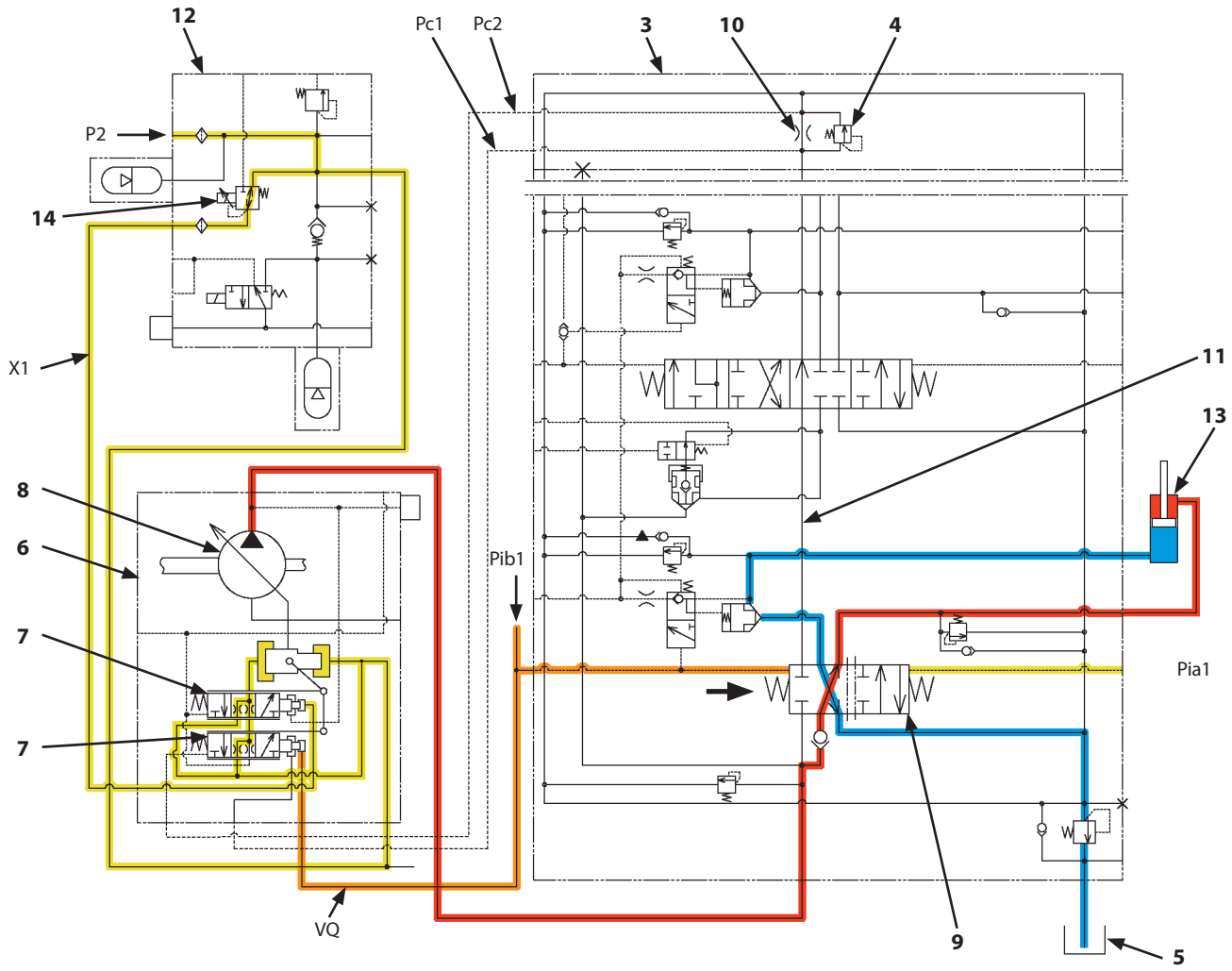
19- Charging Circuit



TNED-02-04-023

P2- From Brake Charge Valve (Pilot Pressure Oil)
EF- To Control Valve

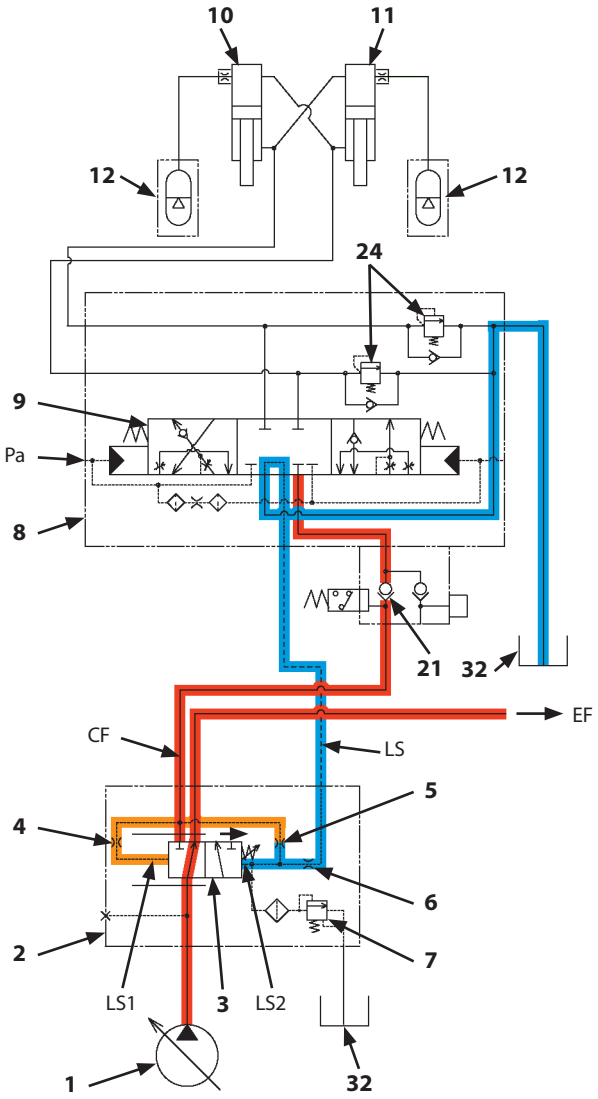
1- Steering Cylinder (Left)
2- Steering Cylinder (Right)
3- Steering Accumulator
4- Steering Valve
5- Overload Relief Valve
6- Steering Spool
7- Orifice
8- Stop Valve (Right)
9- Check Valve
10- Check Valve
11- Hydraulic Oil Tank
12- Manifold Valve
13- Pilot Relief Valve
14- Priority Valve
15- Main Pump
16- Steering Wheel
17- Steering Pilot Valve
18- Stop Valve (Left)
19- Pilot Accumulator (Steering)



TNED-02-04-024

P2- From Brake Charge Valve (Pilot Pressure Oil)
VQ- Pump Control Pressure
X1- Torque Control Pressure
Pia1- Bucket Tilt Pilot Pressure
Pib1- Bucket Dump Pilot Pressure
Pc2- Pump Control Pressure
Pc1- Pump Control Pressure

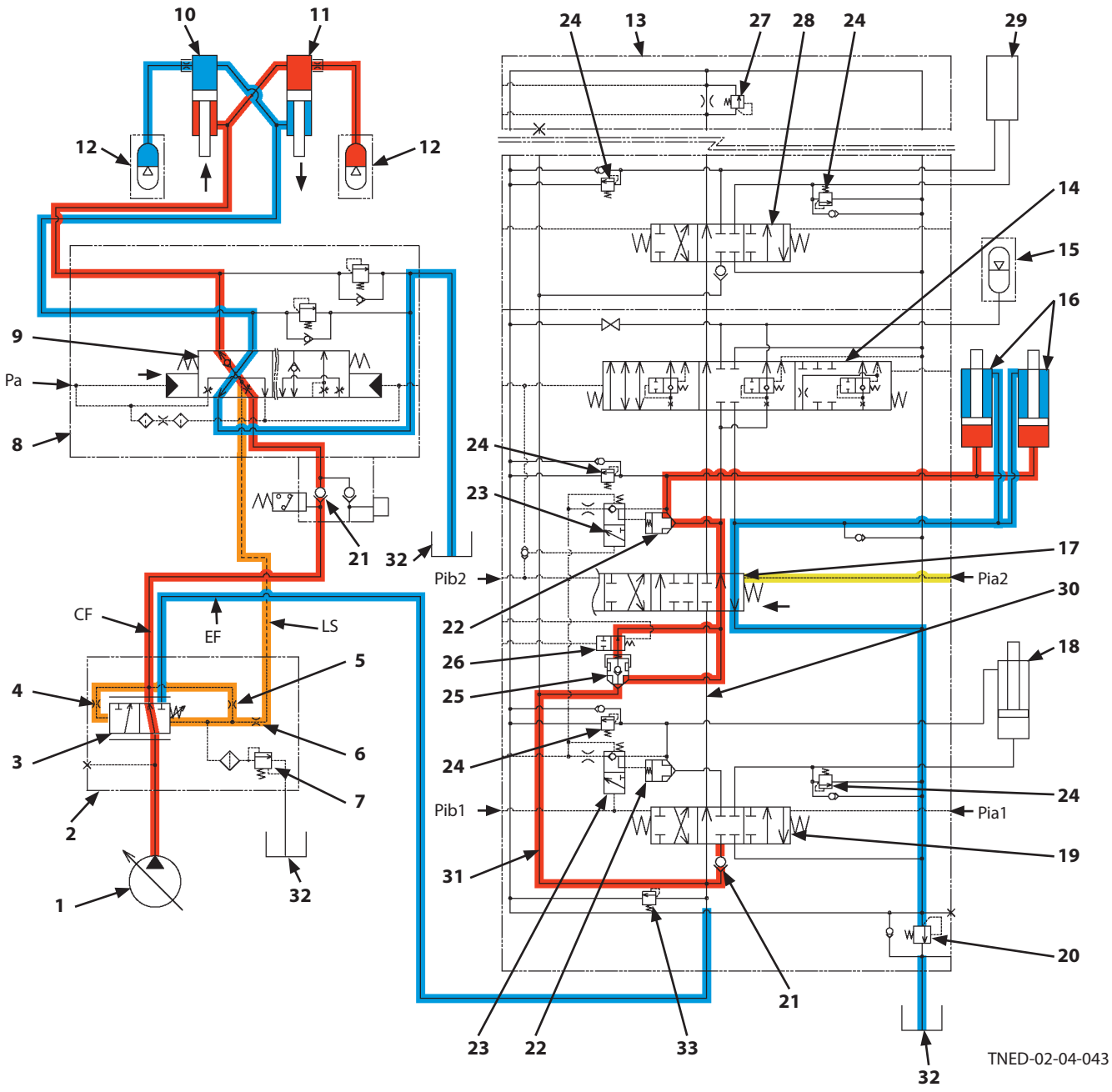
3- Control Valve
4- Pump Control Valve
5- Hydraulic Oil Tank
6- Pump Device
7- Regulator
8- Main Pump
9- Bucket Spool
10- Orifice
11- Neutral Circuit
12- Manifold Valve
13- Bucket Cylinder
14- Torque Control Solenoid Valve



TNED-02-04-040

CF- To Steering Valve
LS1- Port
LS- Pressure Oil to Operate Priority Valve
LS2- Port
EF- To Control Valve
Pa- Steering (Left) (Pilot Pressure Oil)

1- Main Pump
2- Priority Valve
3- Priority Spool
4- Orifice
5- Orifice
6- Orifice
7- Main Relief Valve (Steering)
8- Steering Valve
9- Steering Spool
10- Steering Cylinder (Left)
11- Steering Cylinder (Right)
12- Steering Accumulator
21- Check Valve
24- Overload Relief Valve
32- Hydraulic Oil Tank



CF- To Steering Cylinder

LS- Pressure to Operate Priority Valve

EF- To Control Valve

Pa- Steering (Right) (Pilot Pressure Oil)

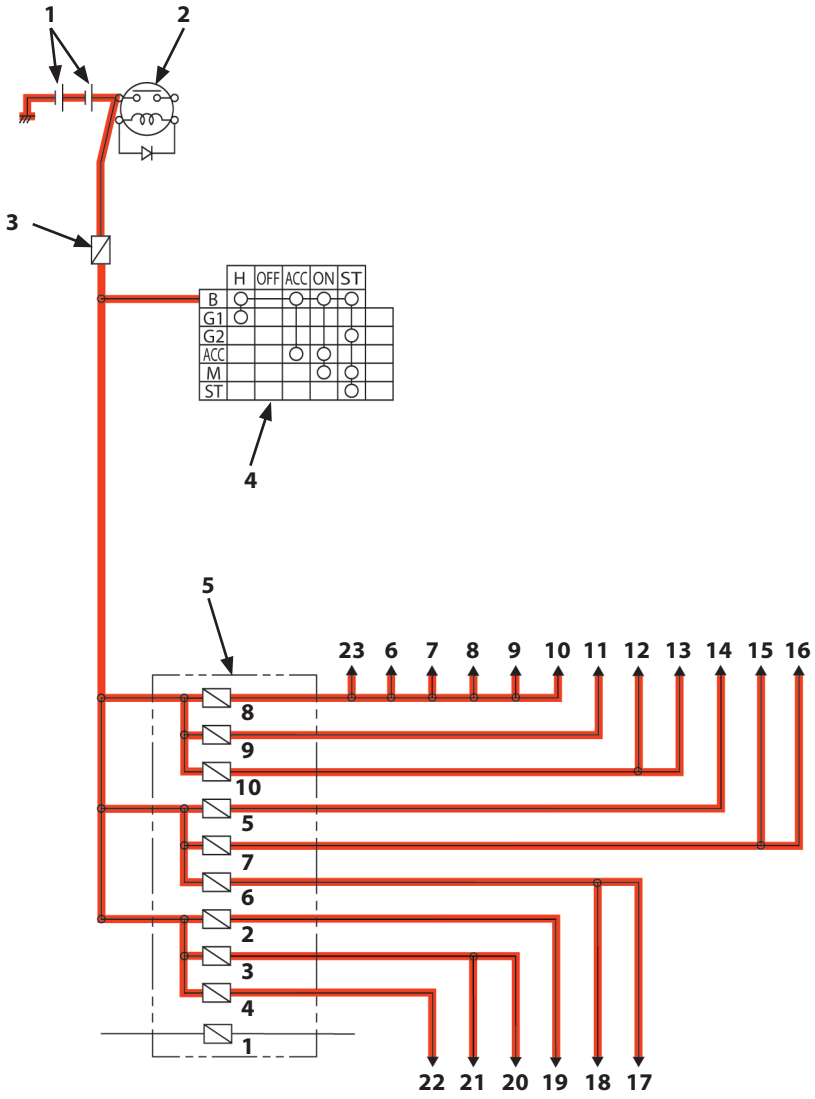
Pia1- Bucket Tilt (Pilot Pressure Oil)

Pib1- Bucket Dump (Pilot Pressure Oil)

Pia2- Lift Arm Raise (Pilot Pressure Oil)

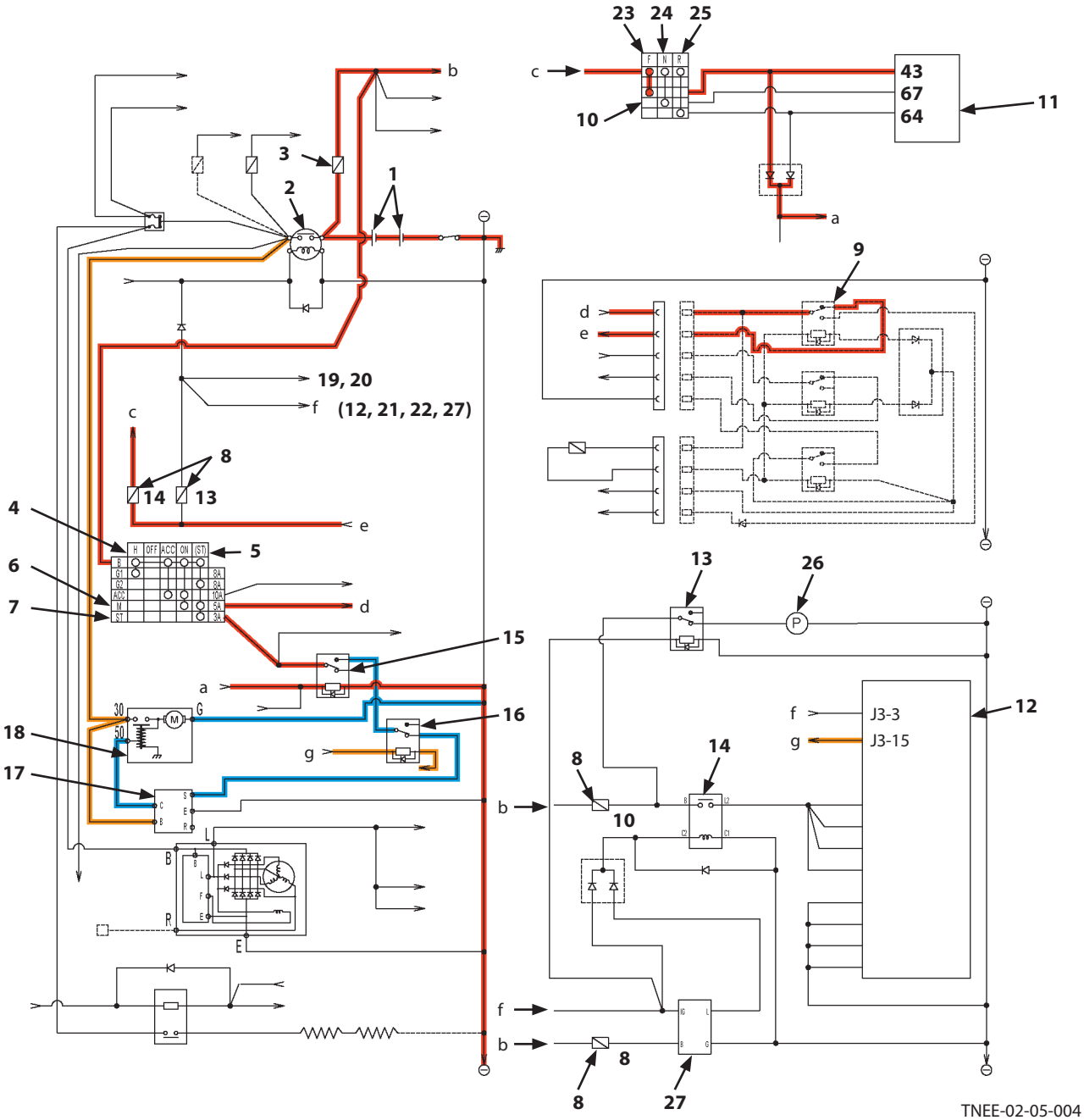
Pib2- Lift Arm Lower (Pilot Pressure Oil)

1- Main Pump
2- Priority Valve
3- Priority Spool
4- Orifice
5- Orifice
6- Orifice
7- Main Relief Valve (Steering)
8- Steering Valve
9- Steering Spool
10- Steering Cylinder (Left)
11- Steering Cylinder (Right)
12- Steering Accumulator
13- Control Valve
14- Ride Control Spool
15- Ride Control Accumulator
16- Lift Arm Cylinder
17- Lift Arm Spool
18- Bucket Cylinder
19- Bucket Spool
20- Low-Pressure Relief Valve
21- Check Valve
22- Anti-Drift Valve
23- Anti-Drift Valve (Selector Valve)
24- Overload Relief Valve
25- Lift Arm Flow Rate Control Valve
26- Lift Arm Flow Rate Control Valve (Selector Valve)
27- Pump Control Valve
28- Auxiliary Spool (OPT)
29- Attachments (OPT)
30- Neutral Circuit
31- Parallel Circuit
32- Hydraulic Oil Tank
33- Main Relief valve (Front Attachment)



TNEE-02-05-001

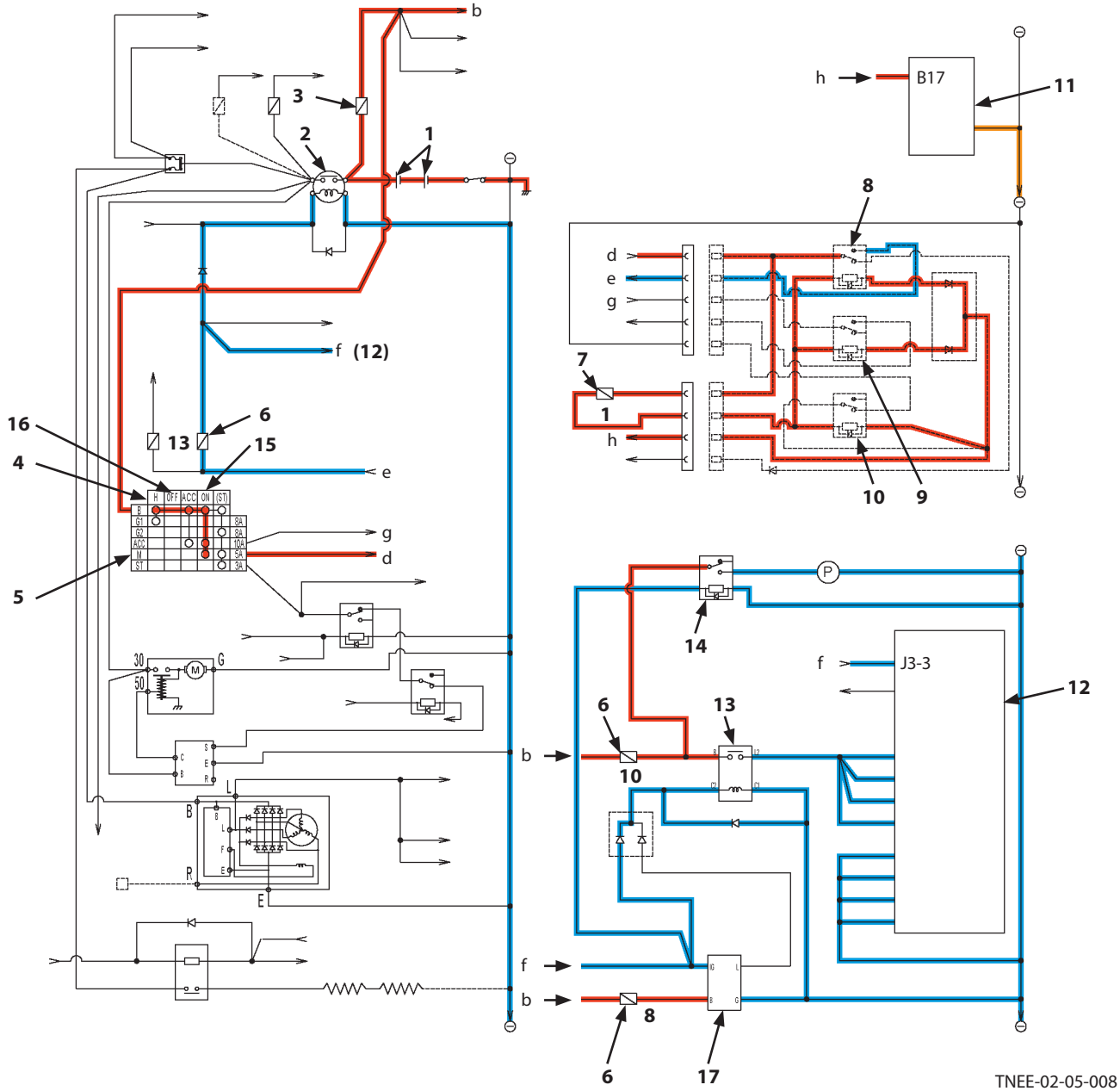
1- Battery
2- Battery Relay
3- Fusible Link A
4- Key Switch
5- Fuse Box B
6- Load Dump Relay
7- MC (Power)
8- Monitor Controller (Power)
9- Column Display Controller (Power)
10- Communication Terminal (Power)
11- TCU (Power)
12- ECM (Power)
13- Fuel Pump (Power)
14- Auxiliary (Power)
15- Flasher Relay
16- Hazard Light Switch
17- Horn (Power)
18- Horn Switch (Power)
19- Light Switch
20- Cab Light
21- Radio (Backup Power)
22- Auxiliary (Power)
23- Timer



TNEE-02-05-004

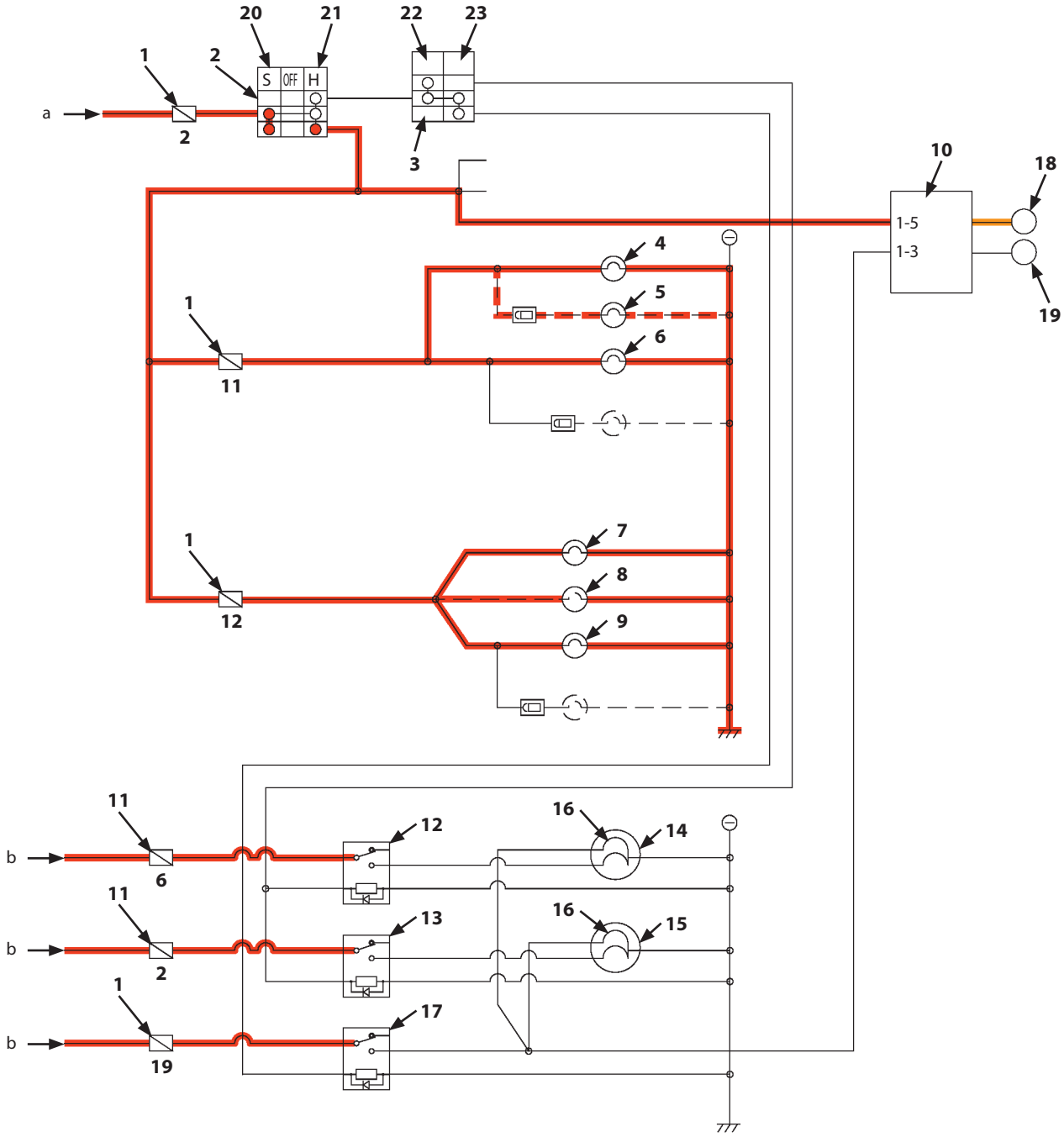
1- Battery
2- Battery Relay
3- Fusible Link A (65A)
4- Key Switch
5- START Position
6- Terminal M
7- Terminal ST
8- Fuse Box B
9- Key Switch ON Cut Relay (Optional)
10- Forward/Reverse Lever
11- TCU
12- ECM
13- Fuel Pump Relay
14- ECM Main Relay
15- Neutral Relay
16- Starter Cut Relay
17- Starter Relay 1
18- Starter
19- Column Display Controller
20- Monitor Controller
21- Communication Terminal
22- MC
23- Forward (F) Position
24- Neutral (N) Position
25- Reverse (R) Position
26- Fuel Pump
27- Timer

NOTE: Illustration shows the circuit which the auto shut-down circuit (optional) is equipped for.



TNEE-02-05-008

1- Battery
2- Battery Relay
3- Fusible Link A
4- Key Switch
5- Terminal M
6- Fuse Box B
7- Fuse Box A
8- Key Switch ON Cut Relay (Optional)
9- ACC Cut Relay (Optional)
10- Auto Shut-Down Relay (Optional)
11- MC
12- ECM
13- ECM Main Relay
14- Fuel Pump Relay
15- ON Position
16- OFF Position
17- Timer

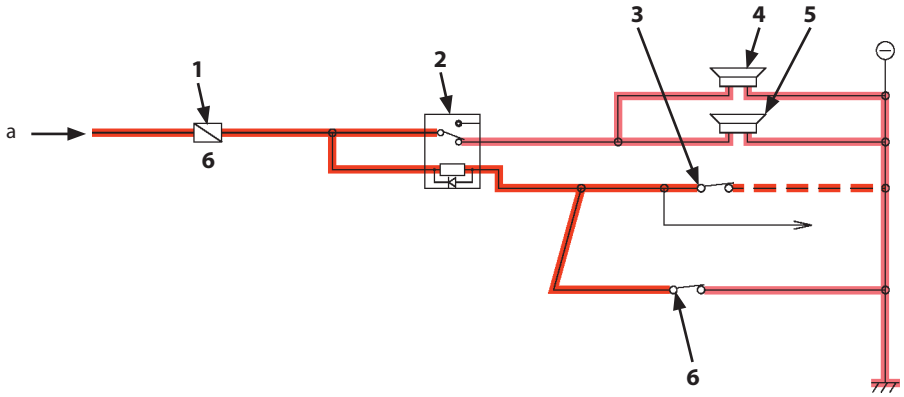


TNED-02-05-011

a- From Battery

b- From Battery Relay

1- Fuse Box B
2- Light Switch
3- Dimmer Switch
4- Tail Light (Left)
5- Unused
6- Clearance Light (Right)
7- Tail Light (Right)
8- License Light (OP)
9- Clearance Light (Left)
10- Column Display Controller
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



TNED-02-05-016

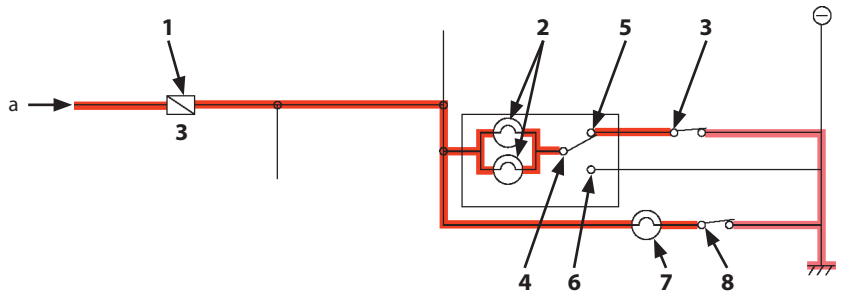
a- From Battery

1- Fuse Box B
2- Horn Relay
3- Horn Switch
4- Horn (HIGH)
5- Horn (LOW)
6- Horn Switch (Side)

Accessory Circuit

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

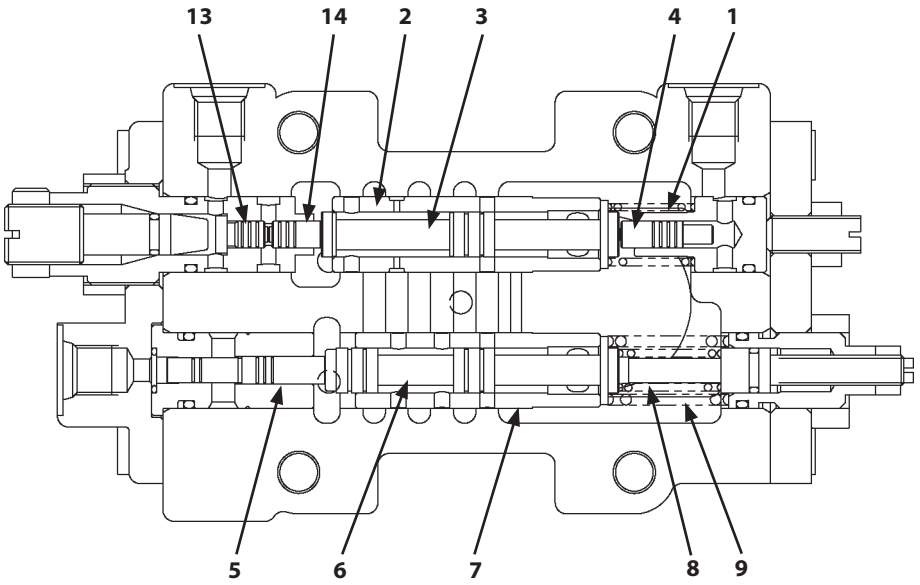
- Work Light Circuit:
  Turns on the work light.
  (Work Light Switch, Work Light Relay)
- Wiper Circuit:
  Operates the intermittent operation of wiper and the washer.
  (Column Display Controller, Wiper/Washer Switch, Wiper Relay, Washer Relay)
- Cab Light Circuit:
  Turns on/off the cab light by shifting the switch or by opening/closing the door.



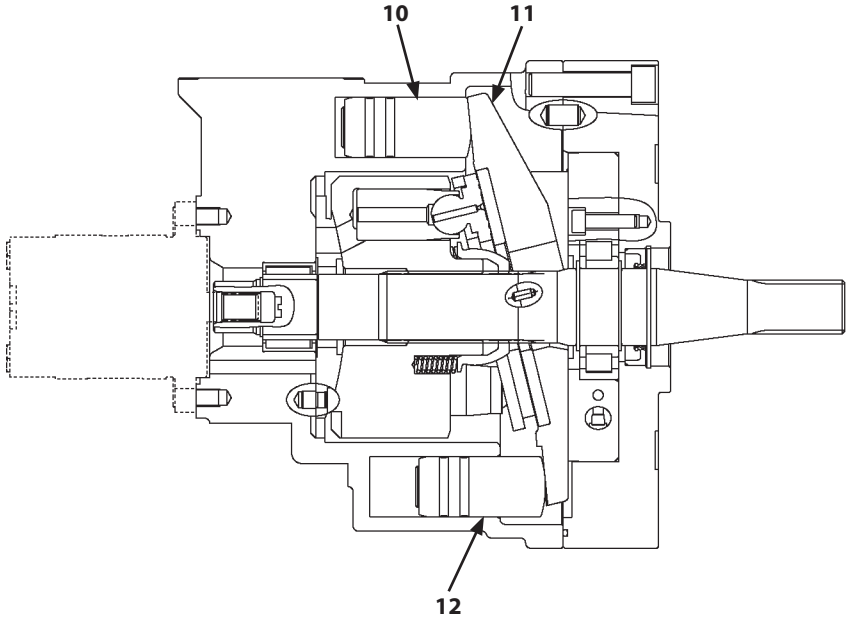
TNED-02-05-025

a- From Battery

1- Fuse Box B
2- Cab Light
3- Door Open/Close Switch
4- Cab Light Switch
5- Door Interlocking Position
6- ON Position
7- Rear Cab Light
8- Rear Cab Light Switch

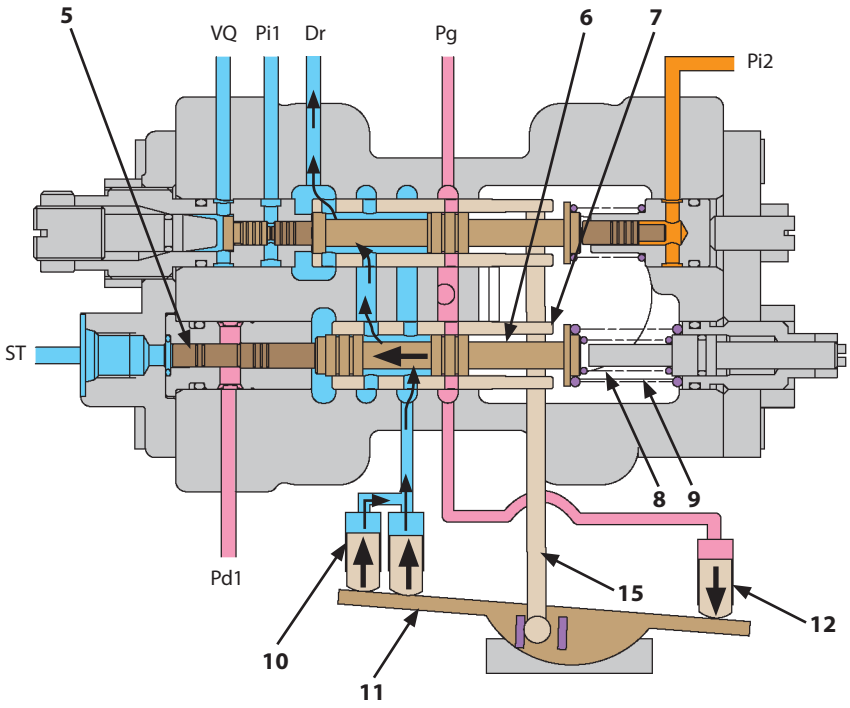


TNED-03-01-025

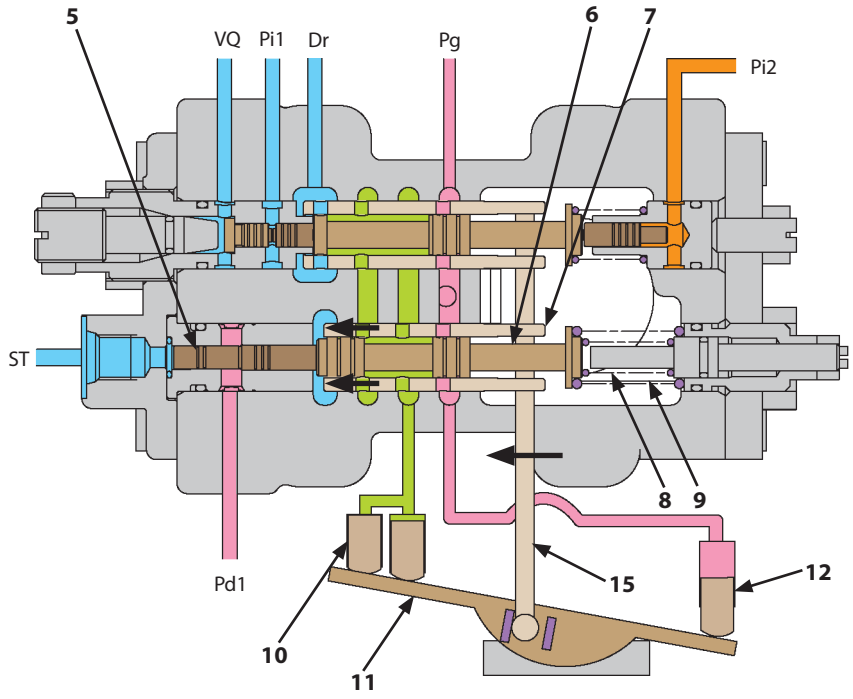


TNED-03-01-024

1- Spring
2- Sleeve 1
3- Spool 1
4- Piston
5- Load Piston
6- Spool 2
7- Sleeve 2
8- Inner Spring
9- Outer Spring
10- Servo Piston 1 (2 Used)
11- Swash Plate
12- Servo Piston 2
13- Piston 2
14- Piston 1



TNED-03-01-017



TNED-03-01-018

Pd1- Own Pump Delivery Pressure
ST- Torque Control Pressure

5- Load Piston
6- Spool 2
7- Sleeve 2

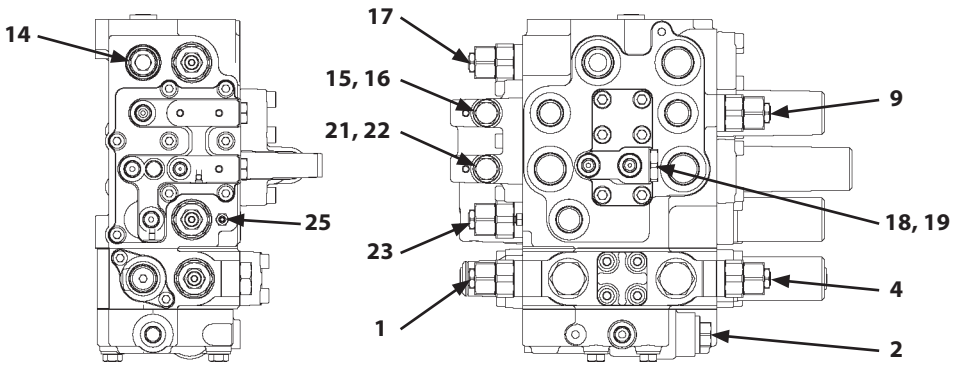
Dr- Returning to Hydraulic Oil Tank
Pi1- Pump Control Pressure 1

8- Inner Spring
9- Outer Spring
10- Servo Piston 1

Pi2- Pump Control Pressure 2
Pg- Primary Pilot Pressure (From Pilot Pump)

11- Swash Plate
12- Servo Piston 2
15- Feedback Lever Link

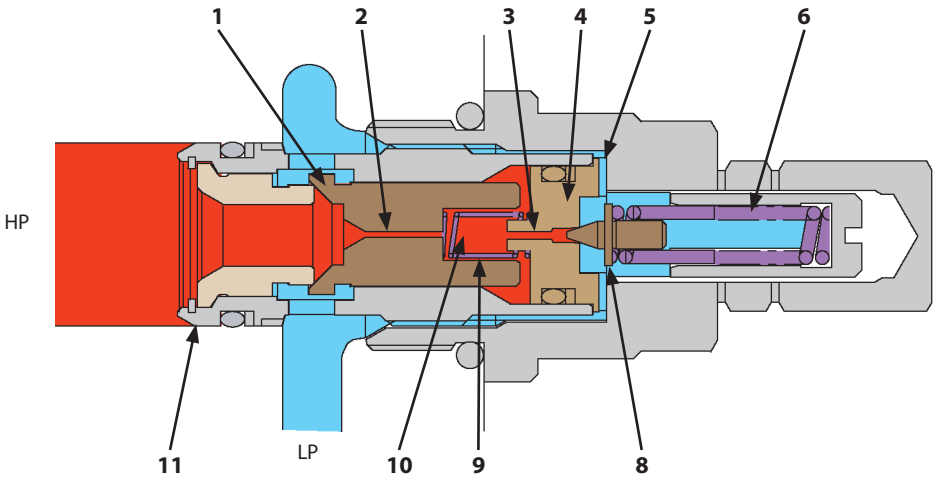
VQ- Bucket Dump Pilot Pressure



TNED-03-02-002

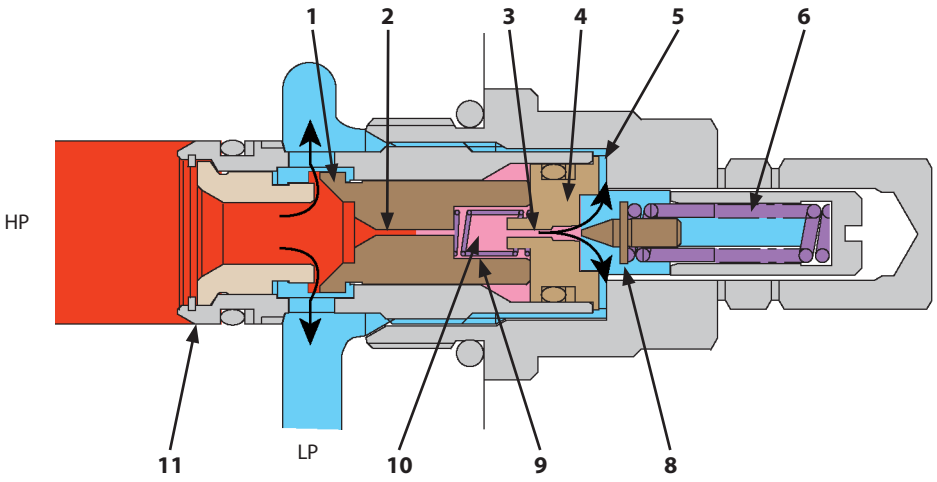
1- Auxiliary Overload Relief Valve
2- Pump Control Valve
3- Auxiliary Spool
4- Auxiliary Overload Relief Valve
5- Load Check Valve (Auxiliary Parallel Circuit)
6- Ride Control Spool
7- Make-Up Valve (Lift Arm: Rod Side)
8- Lift Arm Spool
9- Overload Relief Valve (Bucket: Rod Side)
10- Low-Pressure Relief Valve
11- Make-Up Valve
12- Bucket Spool
13- Load Check Valve (Bucket Tandem Circuit)
14- Main Relief Valve
15- Bucket Anti-Drift Valve (Check Valve)
16- Bucket Anti-Drift Valve (Selector Valve)
17- Overload Relief Valve (Bucket: Bottom Side)
18- Lift Arm Flow Rate Control Valve (Poppet Valve)
19- Lift Arm Flow Rate Control Valve (Selector Valve)
20- Shuttle Valve
21- Lift Arm Anti-Drift Valve (Selector Valve)
22- Lift Arm Anti-Drift Valve (Check Valve)
23- Overload Relief Valve (Lift Arm: Bottom Side)
24- Charge-Cut Valve
25- Drain Plug

During Normal Operation:



TNED-03-02-013

During Relief Operation:

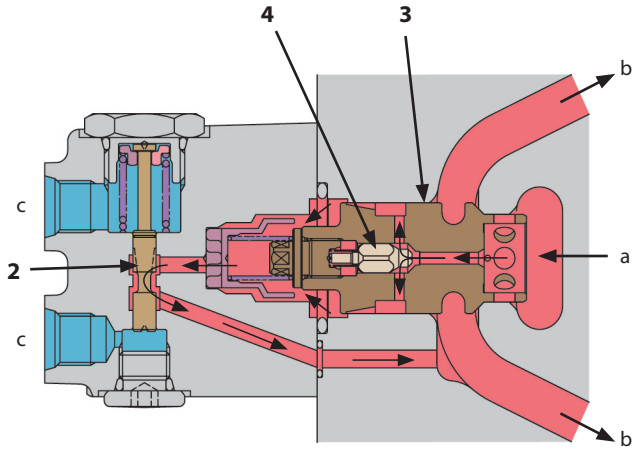


TNED-03-02-014

HP- Main Circuit
LP- Hydraulic Oil Tank

1- Main Poppet
2- Orifice A
3- Orifice B
4- Seat
5- Passage A
6- Spring B
8- Pilot Poppet
9- Spring A
10- Spring Chamber
11- Sleeve

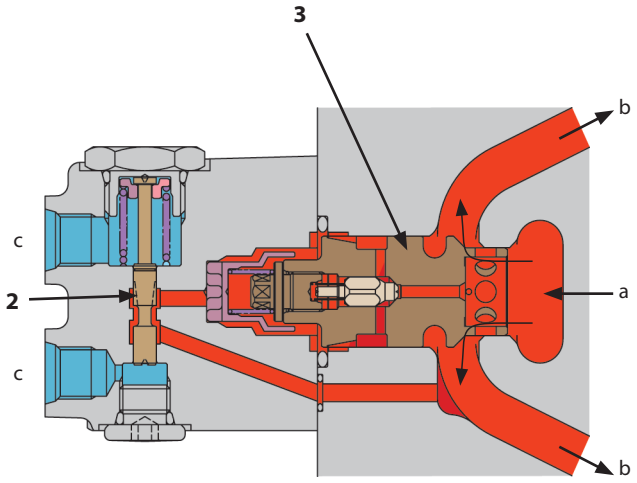
Normal Operation (During Low Load)



TDCD-03-03-013

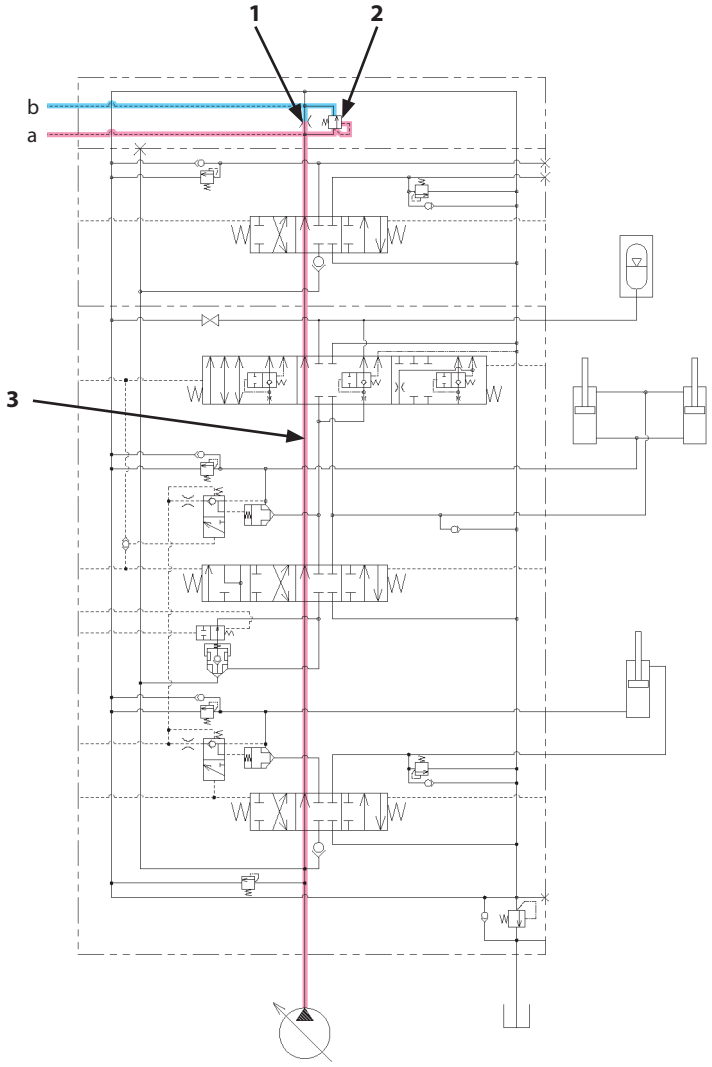
a - Pressure Oil from Pump
b - To Lift Arm Spool
c - To Hydraulic Oil Tank
2 - Selector Valve
3 - Poppet Valve
4 - Check Valve

Normal Operation (During High Load)



TDCD-03-03-014

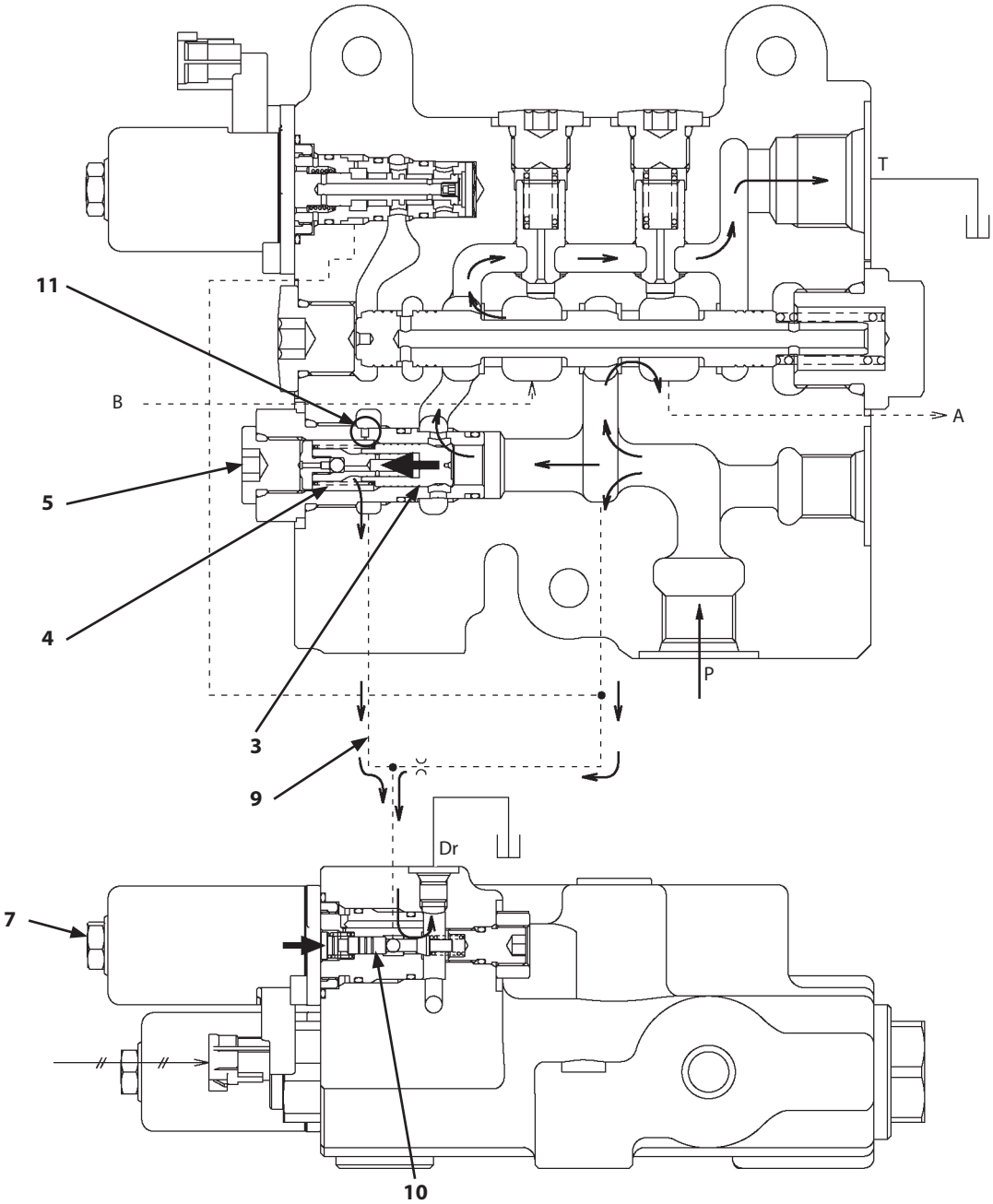
a - Pressure Oil from Pump
b - To Lift Arm Spool
c - To Hydraulic Oil Tank
2 - Selector Valve
3 - Poppet Valve



TNED-03-02-030

a- Pc1 Pressure
b- Pc2 Pressure

1- Orifice
2- Poppet
3- Neutral Circuit

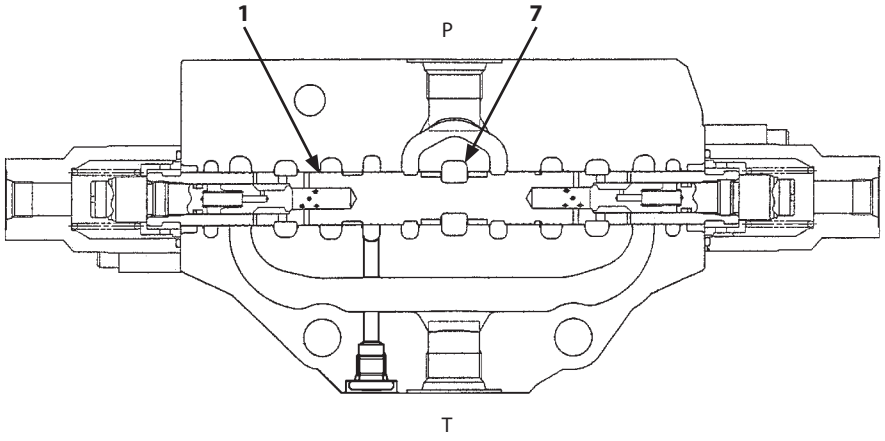


TNED-03-03-007

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

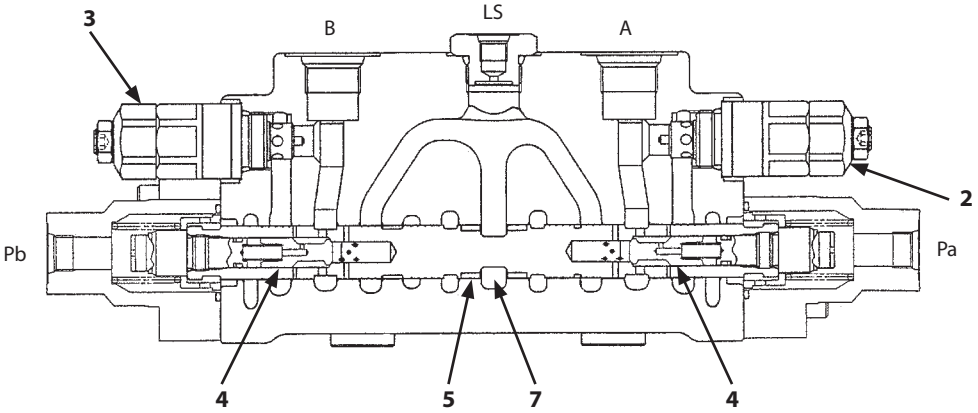
3- Poppet
4- Spring
5- Fan Control Valve
7- Fan Speed Control Solenoid Valve
9- Passage
10- Spool
11- Orifice

Section A-A



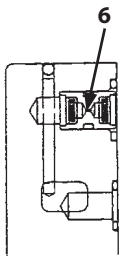
TNED-03-05-003

Section B-B



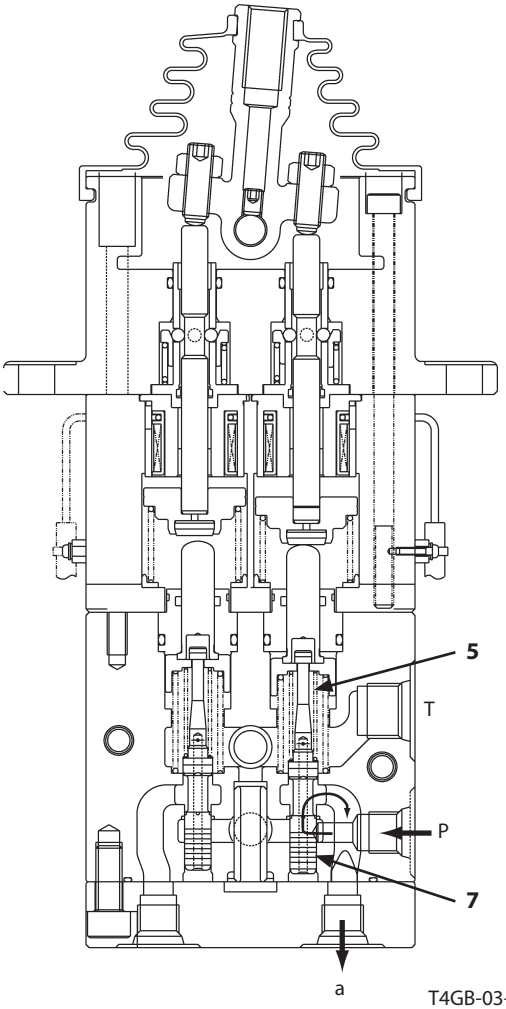
TNED-03-05-004

Section C-C

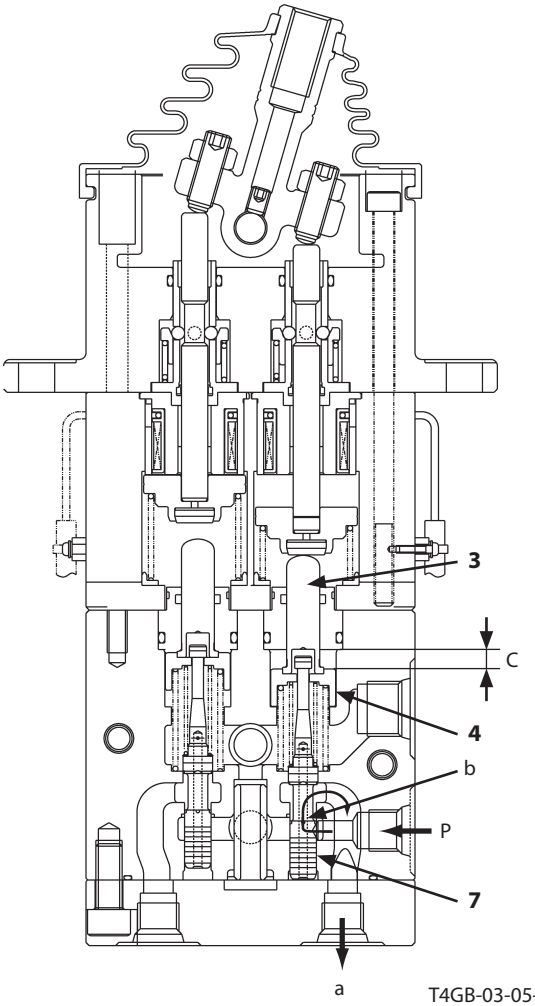


T4GB-03-04-006

1- Spool
2- Overload Relief Valve
3- Overload Relief Valve
4- Load Check Valve
5- Variable Orifice
6- Fixed Orifice
7- Passage A



T4GB-03-05-005



T4GB-03-05-006

P- Port P

T- Port T

a- Output Port

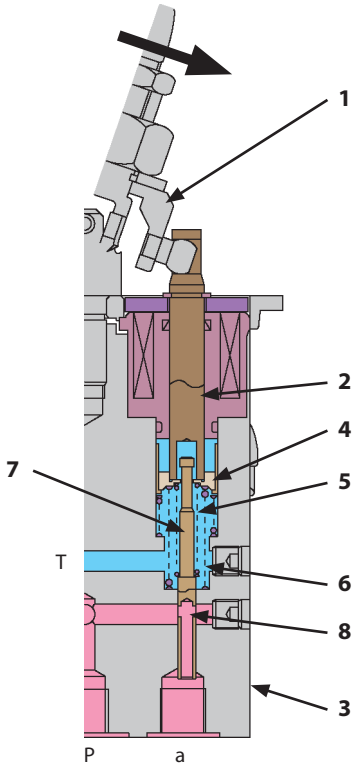
b- Notch Part

3- Pusher

4- Spring Guide

5- Balance Spring

7- Spool



TNED-03-06-007

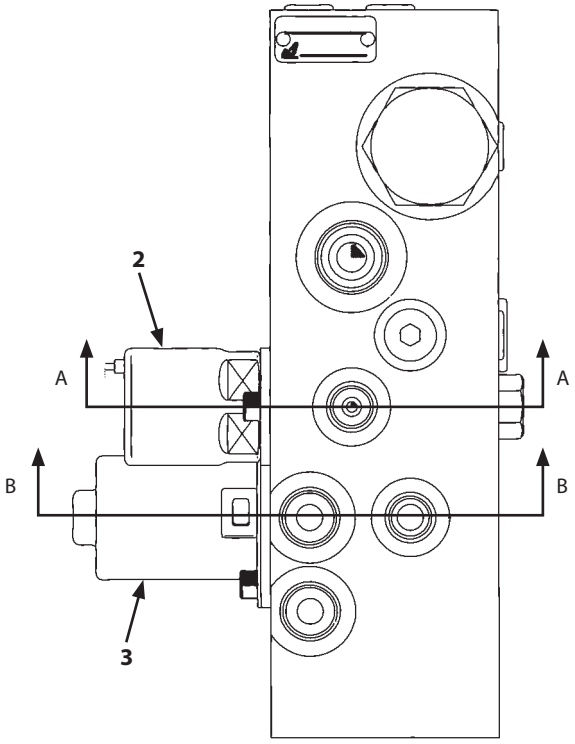
P- Port P
T- Port T
a- Output Port

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

Torque Control Solenoid Valve / Front Control Lever Lock Solenoid Valve

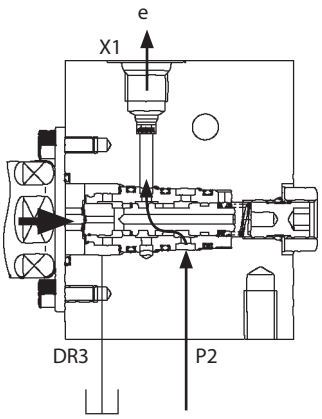
Torque control solenoid valve (2) is shifted by the signals from MC and supplies torque control pressure ST to the pump regulator. Front control lever lock solenoid valve (3) is shifted by the front control lever lock switch and supplies pilot pressure oil to the pilot valve.

NOTE: Refer to COMPONENT OPERATION / Others as for operation of the solenoid valve.



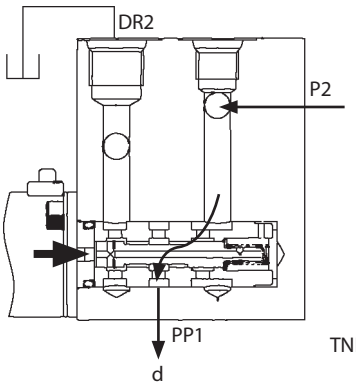
TNED-03-07-008

Section A-A



TNED-03-07-019

Section B-B



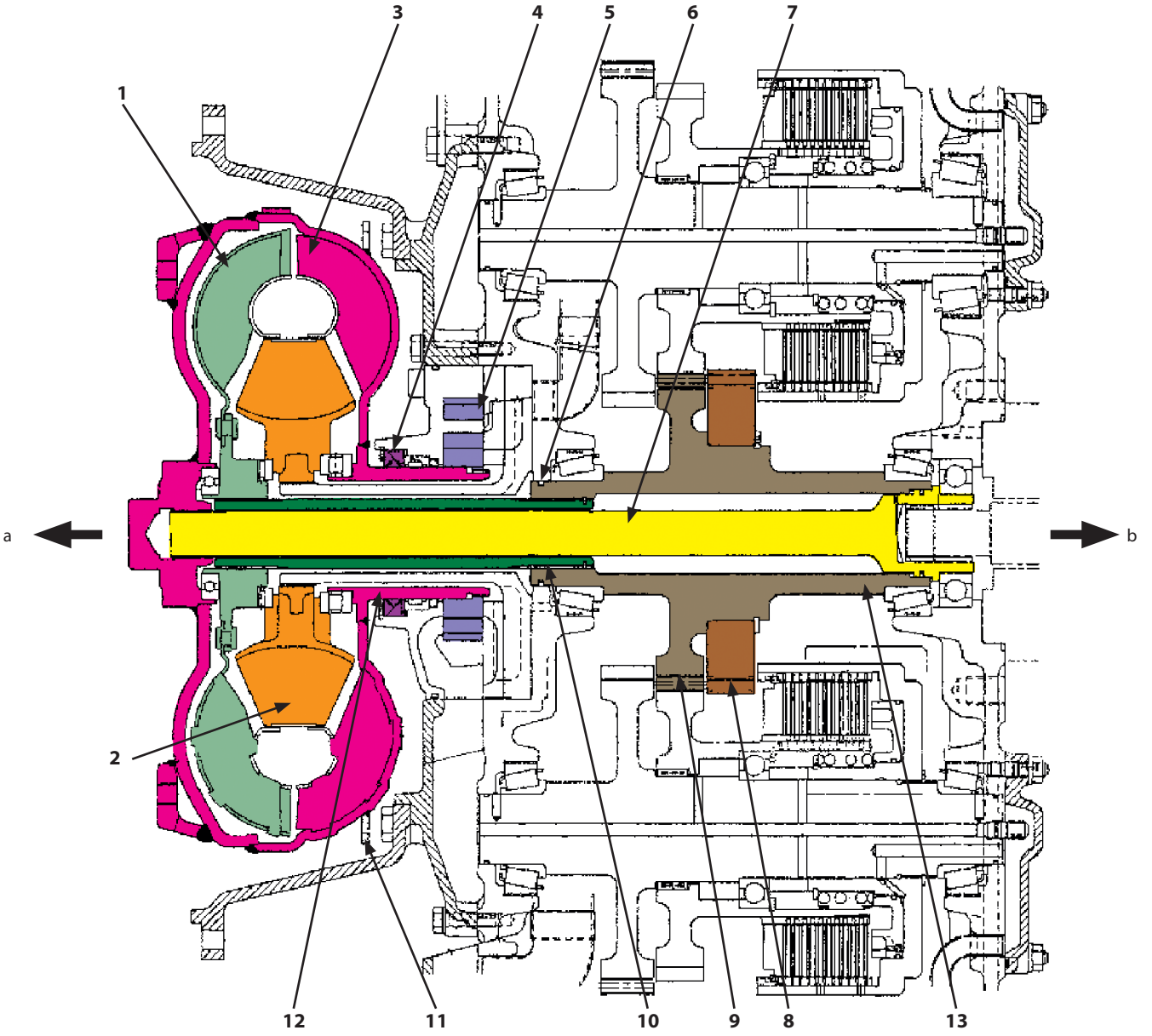
TNED-03-07-020

d- To Pilot Valve

e- To Pump Regulator

2- Torque Control Solenoid Valve

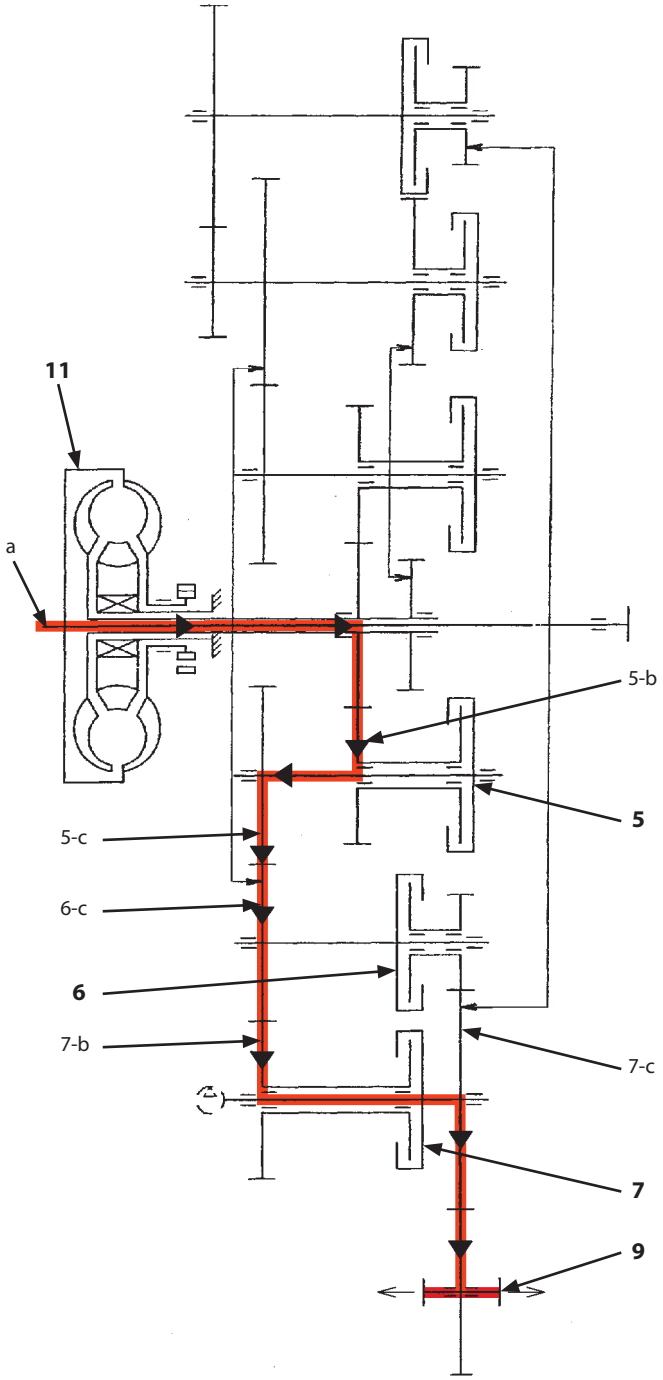
3- Front Control Lever Lock Solenoid Valve



T4GB-03-09-001

a- Engine Side
b- Main Pump Side

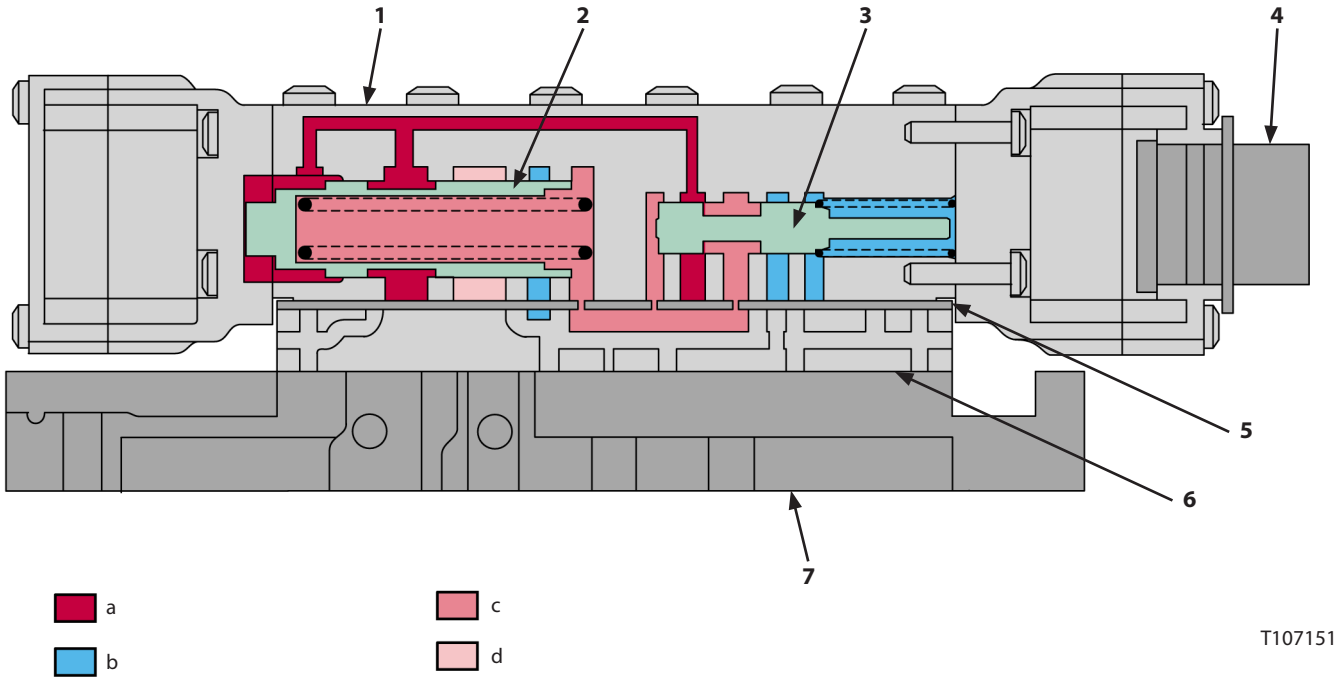
1- Turbine
2- Stator
3- Impeller
4- Oil Seal
5- Transmission Pump
6- Seal Ring
7- Impeller Shaft
8- High-Speed Drive Gear
9- Low-Speed Drive Gear
10- Turbine Shaft
11- Notch Ring
12- Drive Tube
13- Torque Converter Input Shaft



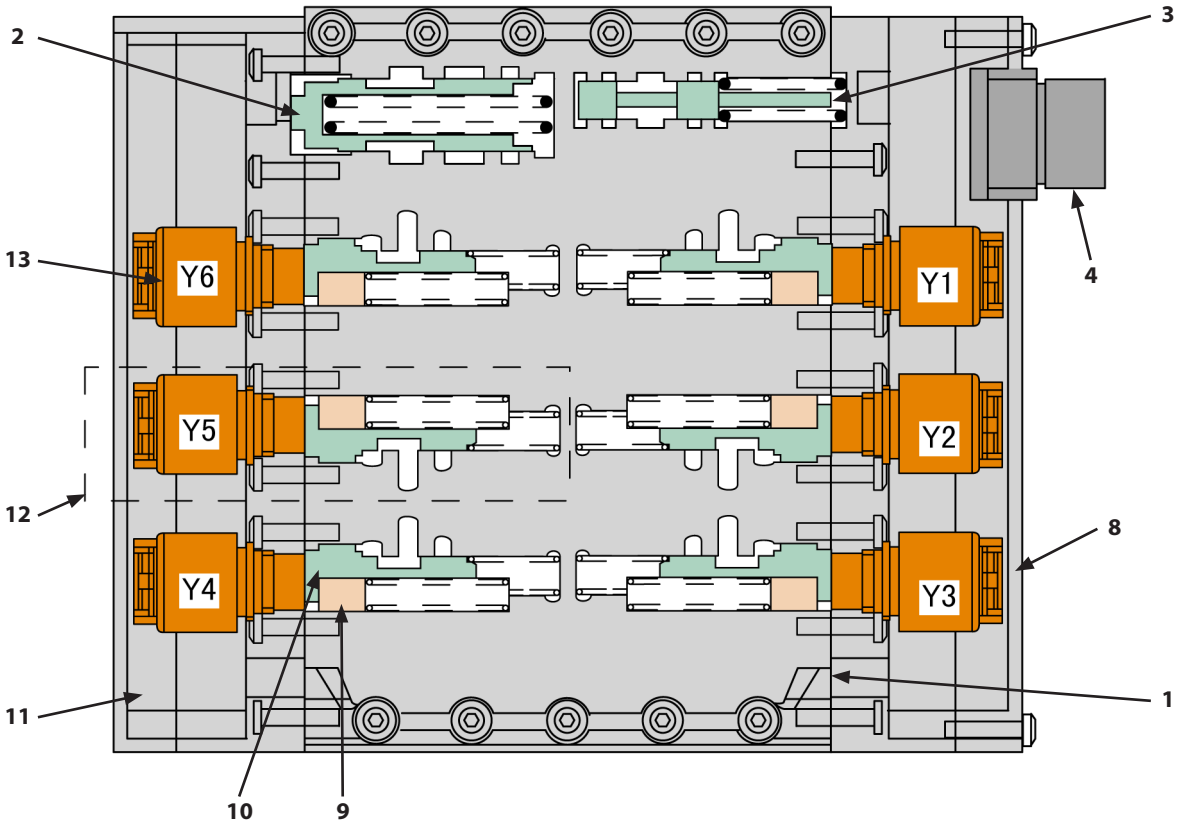
TNEE-03-08-006

a- Input (From Torque Converter)
b- Drive Gear
c- Output Gear

5- Low-Speed Forward Clutch
6- Second Speed Clutch
7- Third Speed Clutch
9- Output Shaft Gear
11- Torque Converter



T107151



T107153

a- System Main Pressure Oil
b- Returning Oil
c- Reduced Pressure Oil
d- Converter Pressure Oil (Return Oil)

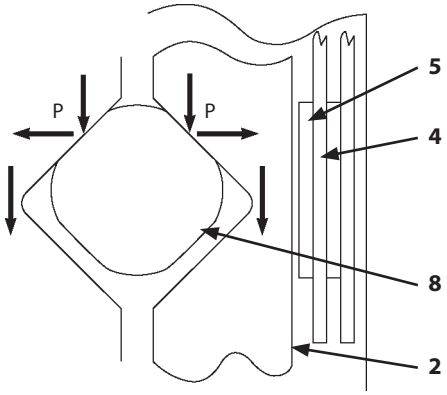
1- Valve Body
2- Pressure Control Valve
3- Pressure Reducing Valve
4- Connector
5- Middle Plate
6- Channel Plate
7- Plate
8- Cover
9- Damper Valve
10- Spool
11- Housing
12- Modulation Circuit
13- Proportional Solenoid Valve

Traveling Straight with the Same Road Resistances to Left and Right Tires

1. As the differential pinion gear and the left and right pinion gears rotate solidly, the drive forces of the left and right tires are the same similarly to the TPD.

Traveling on Soft Roads (Different Road Resistances to Left and Right Tires)

1. Drive force is transmitted to the case, pressure ring (2), and spider (8) through the ring gear.
2. At this time, spider (8) having the cam construction pushes pressure ring (2) toward the case with thrust P.
3. Clutch disc (5) is geared with the case through pressure ring (2).
4. Side gears connected to clutch disc (5) by spline joint rotate solidly with the case, and the left and right side gears rotate at the same speed.
5. Therefore, the left and right axle shafts connected to the side gears by spline joint tend to rotate solidly with the case, and the differential movement restriction works.
6. In case the drive force provided for the skidding tire is larger than the road resistance, part of the torque of the skidding tire is added to the tire contacting the road by the differential movement restriction (because of the same speed of the left and right tires), and the tire contacting the road is provided with more torque.
7. Until the difference of the resistances between the left and right tires exceeds certain value (until the clutch disc begins to slip), the left and right gears solidly rotate at a constant speed.
8. On such soft roads, the drive force increases by 1.5 times the value for the TPD if the LSD is provided.



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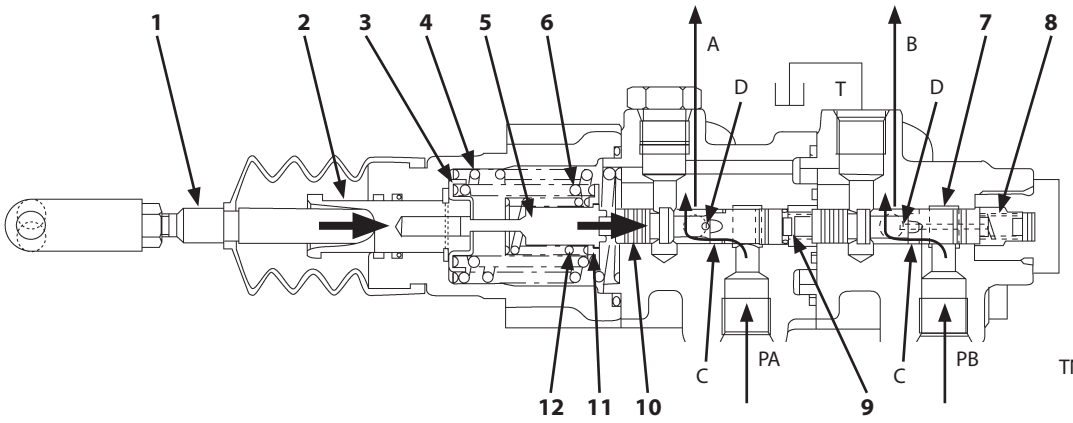
2- Pressure Ring
4- Pressure Plate
5- Clutch Disc
8- Spider



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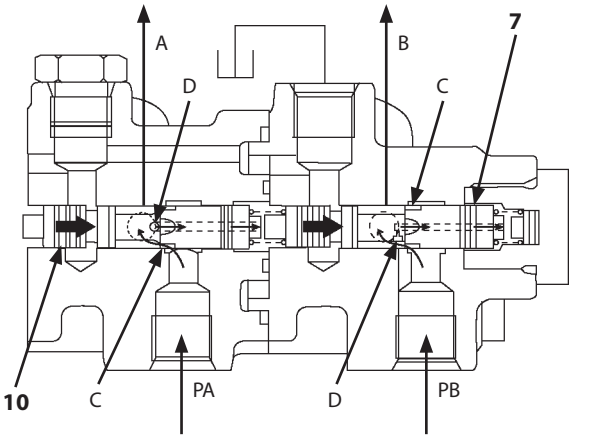

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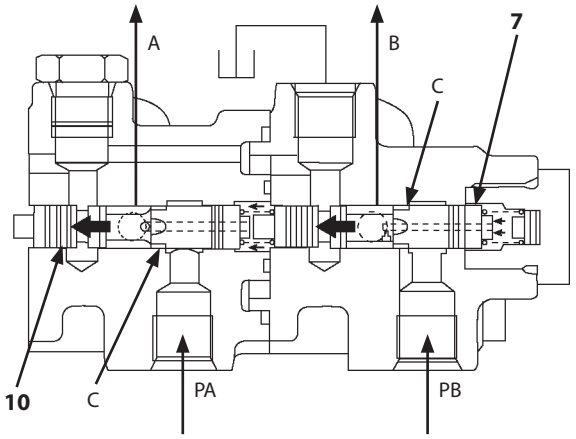

TNED-03-09-010

A- To Front Axle
B- To Rear Axle
T- To Hydraulic Oil Tank
PA- From Charging Block (Port A)
PB- From Charging Block (Port B)

1- Push Rod
2- Piston
3- Retainer
4- Control Spring 1
5- Rod
6- Control Spring 2
7- Spool
8- Spool Return Spring
9- Balance Spring
10- Spool
11- Holder
12- Piston Return Spring