PART NO. TODCY90-EN-00

HITACHI

Reliable solutions

Technical Manual
Operational Principle

ZX
240-5A
240LC-5A
250H-5A
250LCH-5A
250K-5A
250LCK-5A
Hydraulic Excavator

Service Manual consists of the following separate Part No.

Technical Manual (Operational Principle)	: Vol. No.TODCY90-EN
Technical Manual (Troubleshooting)	: Vol. No.TTDCY90-EN
Workshop Manual	: Vol. No.WDCY90-EN
Engine Manual	: Vol. No.ETDCY-EN, EWDCY-EN

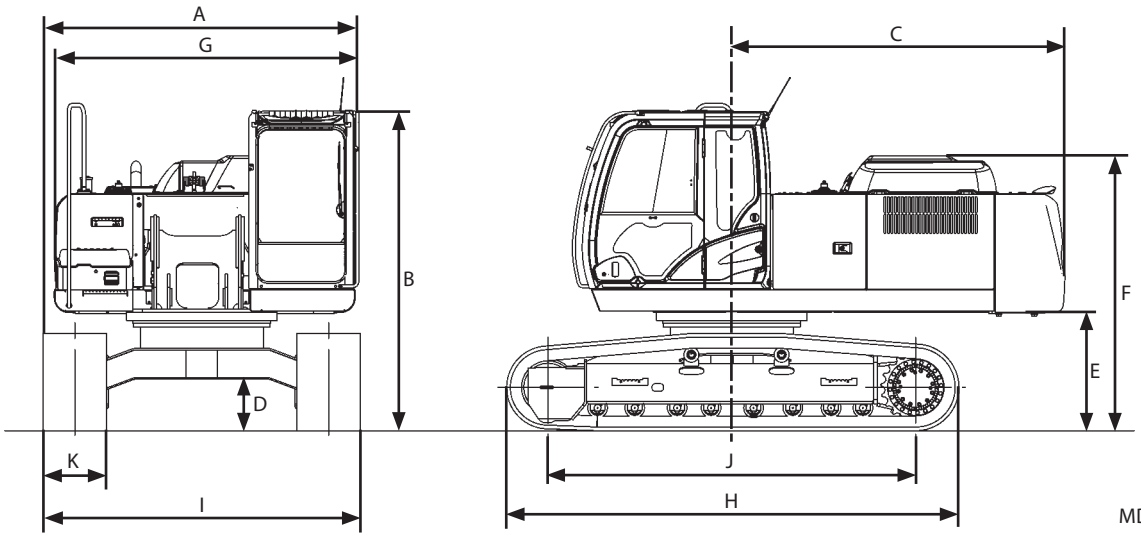
ZX240-5A • 240LC-5A • 250H-5A • 250LCH-5A • 250K-5A • 250LCK-5A HYDRAULIC EXCAVATOR TECHNICAL MANUAL OPERATIONAL PRINCIPLE TODCY90-EN-00

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

PRINTED IN JAPAN (K) 2016, 03

Specifications

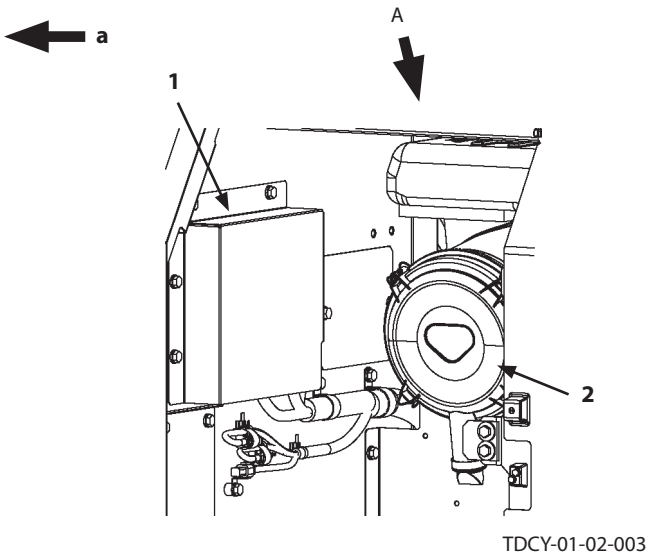
ZX240-5A, 240LC-5A



Model	ZX240-5A	ZX240LC-5A
Type of Front-End Attachment	2.96 m (9 ft 9 in) Arm	
Bucket Capacity (Heaped)	PCSA 1.00 m^3 (1.3 yd^3), CECE 0.90 m^3	
Operating Weight	23600 kg (52100 lb)	24300 kg (53600 lb)
Base Machine Weight	18000 kg (39700 lb)	18600 kg (41100 lb)
Engine	Isuzu GH-4HK1XKSA-01 127 kW/2000 min^{-1} (173 PS/2000 rpm)	
A : Overall Width (Excluding back mirrors)	2990 mm (9 ft 10 in)	3190 mm (10 ft 6 in)
B : Cab Height	3010 mm (9 ft 11 in)	
C : Rear End Swing Radius	3140 mm (10 ft 4 in)	
D : Minimum Ground Clearance	*460 mm (18 in)	
E : Counterweight Clearance	*1080 mm (3 ft 7 in)	
F : Engine Cover Height	*2560 mm (8 ft 5 in)	
G : Overall Width of Upperstructure	2870 mm (9 ft 5 in)	
H : Undercarriage Length	4260 mm (14 ft)	4640 mm (15 ft 3 in)
I : Undercarriage Width	2990 mm (9 ft 10 in)	3190 mm (10 ft 6 in)
J : Sprocket Center to Idler Center	3460 mm (11 ft 5 in)	3850 mm (12 ft 8 in)
K : Track Shoe Width	600 mm (24 in) (Grouser shoe)	
Ground Pressure	52 kPa (0.53 kgf/cm^2, 7.5 psi)	48 kPa (0.49 kgf/cm^2, 7.0 psi)
Swing Speed	12.3 min^{-1} (rpm)	
Travel Speed (fast/slow)	5.5/3.4 km/h (3.4/2.1 mph)	
Gradeability	35 ° ($\tan\theta = 0.70$)	

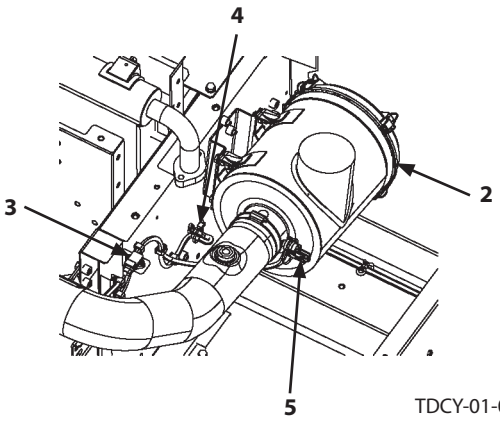
*NOTE: * The dimensions do not include the height of the shoe lug.*

Electrical System (Around Air Cleaner)



TDCY-01-02-003

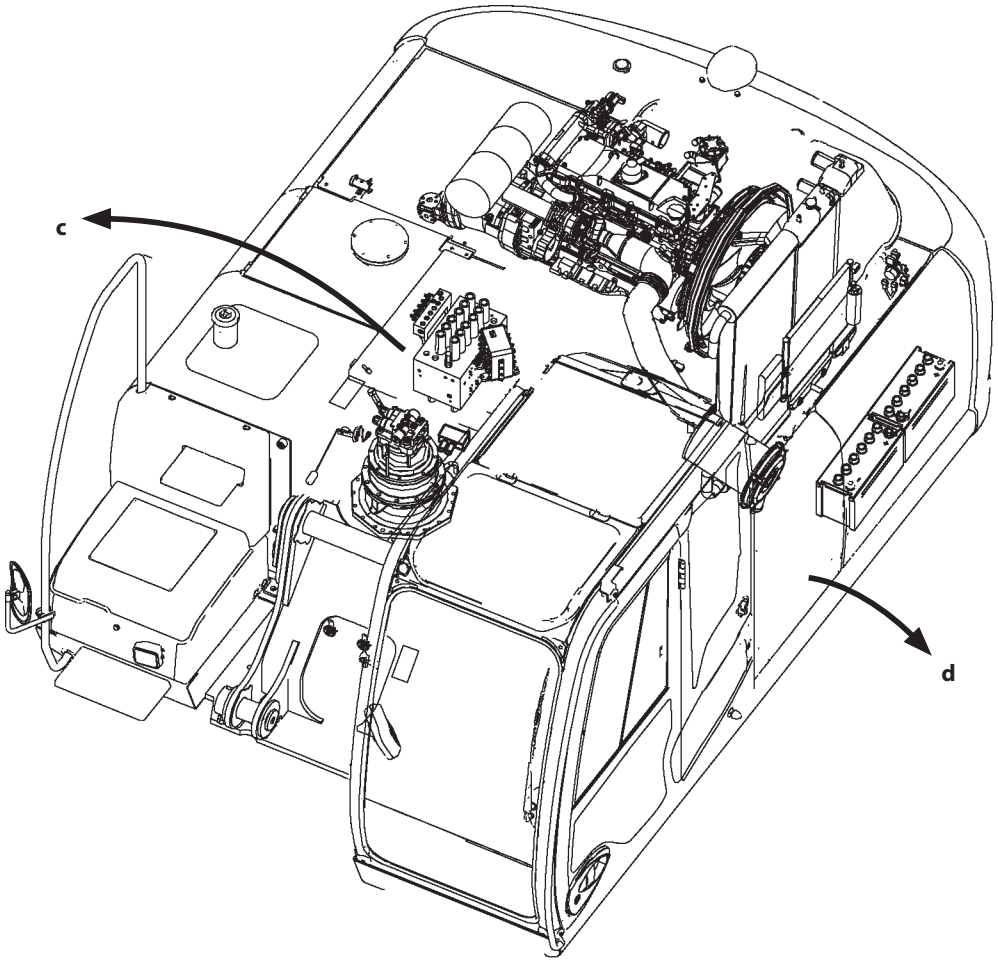
View A



TDCY-01-02-004

a- Machine Front

1- ECM (Engine Controller)
2- Air Cleaner
3- Atmospheric Pressure Sensor
4- Intake-Air Temperature Sensor
5- Air Cleaner Restriction Switch

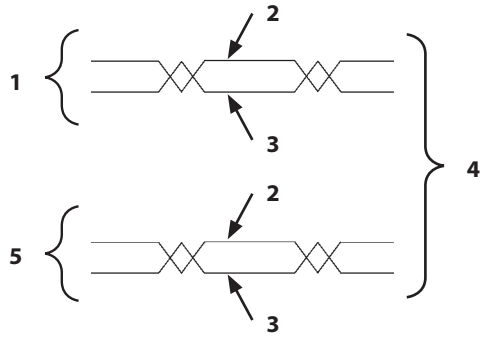


TDAA-01-02-020

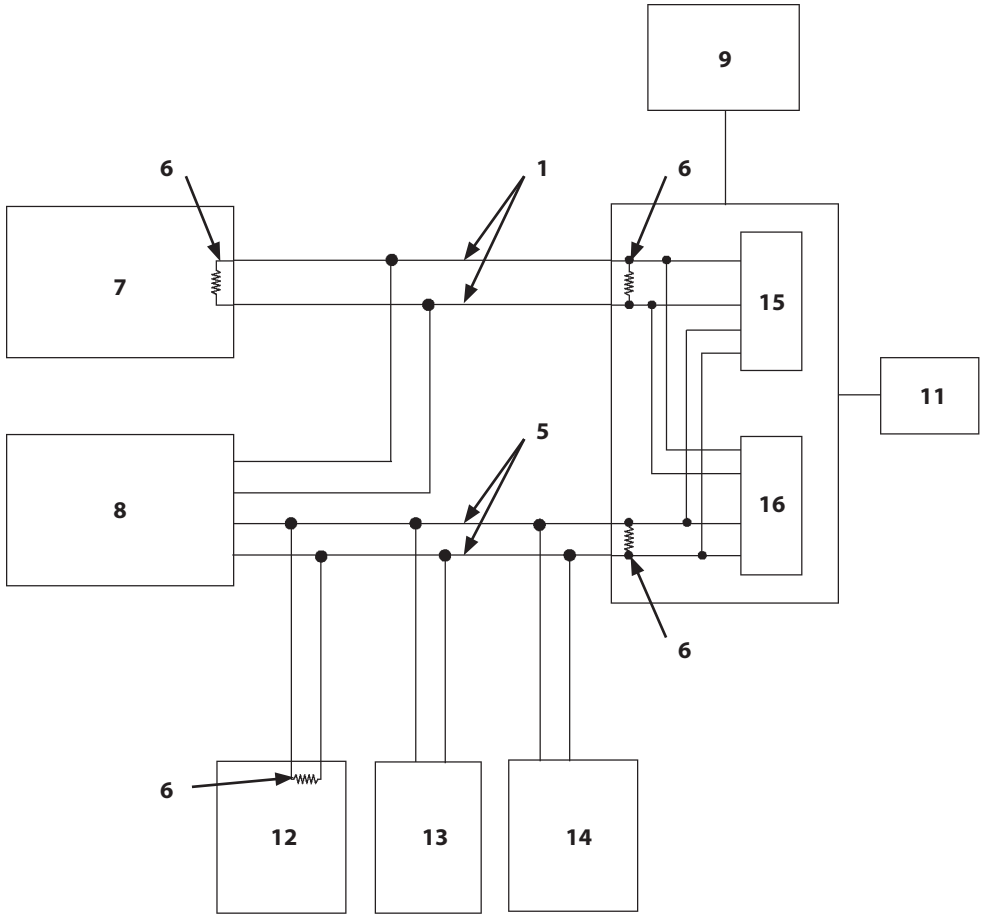
c- Control Valve Upper Side, Lower Side (Refer to T1-2-17.)

d- Utility Compartment (Refer to T1-2-18.)

SWING DEVICE	Type	Two-Stage Reduction Planetary Gear
	Reduction Gear Ratio	21.75
SWING MOTOR	Type	Swash-Plate Type, Fixed Displacement Axial Plunger Motor
	Theoretical Displacement	129.2 cm^3/rev (7.9 in^3/rev)
VALVE UNIT	Type	Non Counterbalance Valve Type
	Relief Set Pressure	32.4 MPa (330 kgf/cm^2, 4710 psi) at 180 L/min
SWING PARKING BRAKE	Type	Wet-Type Spring Set Hydraulic Released Multi-Disc Brake
	Release Pressure	1.9 to 2.8 MPa (20 to 28 kgf/cm^2, 284 to 410 psi)
TRAVEL DEVICE	Type	Three-Stage Reduction Planetary Gear
	Reduction Gear Ratio	64.863
TRAVEL MOTOR	Type	Swash-Plate Type Variable Displacement Axial Plunger Motor
	Theoretical Displacement (Fast/Slow)	75.7/122.5 cm^3/rev (4.6/7.5 in^3/rev)
TRAVEL BRAKE VALVE	Type	Counterbalance Valve Type
	Relief Set Pressure	34.8 MPa (355 kgf/cm^2, 5050 psi) at 56 L/min
TRAVEL PARKING BRAKE	Type	Wet-Type Spring Set Hydraulic Released Multi-Disc Brake
	Release Starting Pressure	0.97±0.07 MPa (9.9 kgf/cm^2±0.7 kgf/cm^2, 141±10 psi)

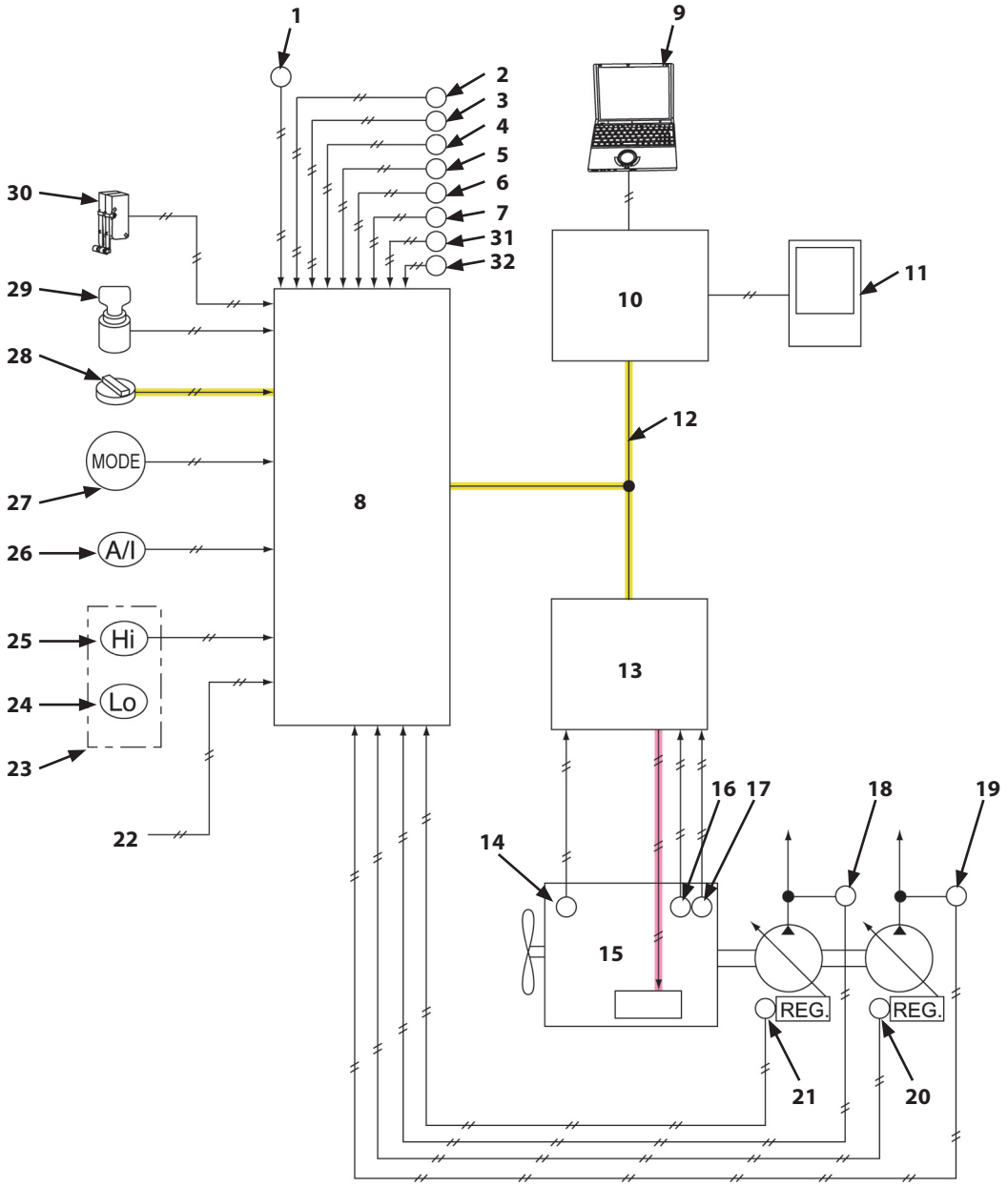


TDAA-02-05-001



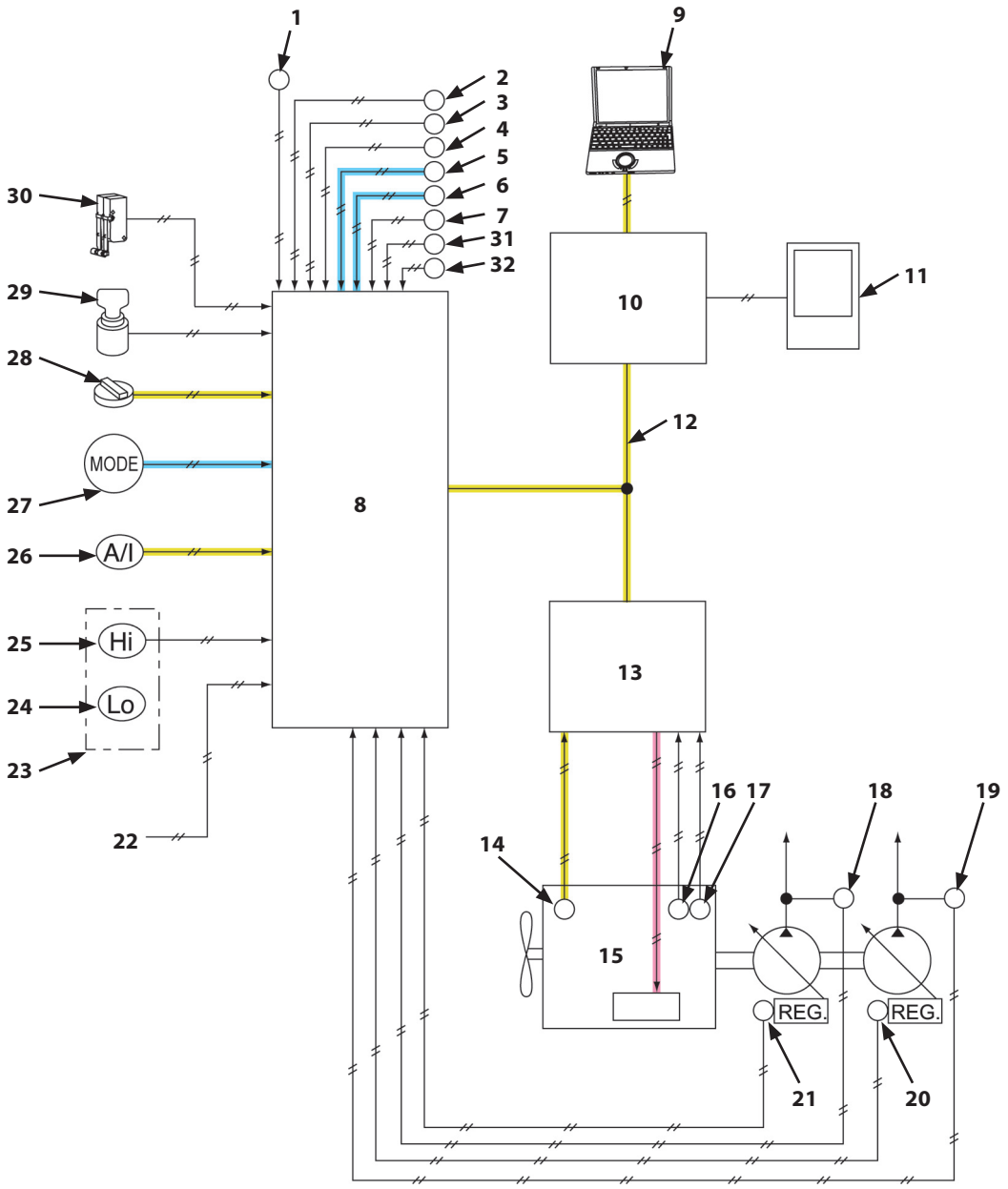
TDBC-02-01-001

1- CAN 0
2- CAN-H (High)
3- CAN-L (Low)
4- CAN Bus
5- CAN 1
6- Termination Resistor (120 Ω)
7- ECM (Engine Controller)
8- MC (Main Controller)
9- Communication Controller
10- Monitor Controller
11- MPDr.
12- Wiper / Light Controller
13- Radio Controller
14- Air Conditioner Controller
15- Monitor Control Unit
16- Information Control Unit



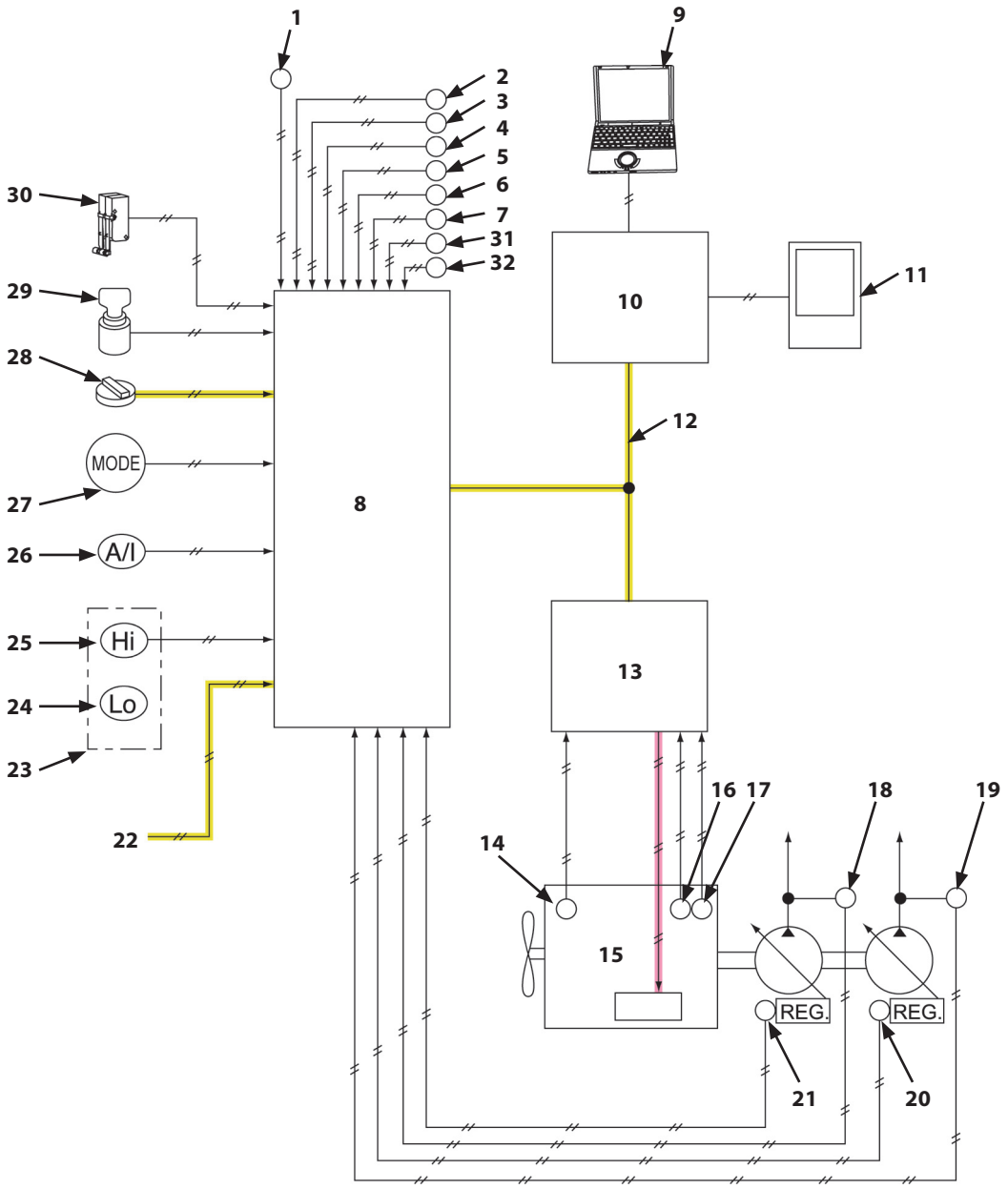
TDCY-02-02-003

1- Hydraulic Oil Temperature Sensor
2- Pressure Sensor (Boom Raise)
3- Pressure Sensor (Arm Roll-In)
4- Pressure Sensor (Swing)
5- Pressure Sensor (Travel)
6- Pressure Sensor (Front Attachment)
7- Pressure Sensor (Auxiliary) (OP)
8- MC
9- MPDr.
10- Monitor Controller
11- Monitor
12- CAN
13- ECM
14- Coolant Temperature Sensor
15- Engine
16- Cam Angle Sensor
17- Crank Speed Sensor
18- Pump 2 Delivery Pressure Sensor
19- Pump 1 Delivery Pressure Sensor
20- Pump 1 Control Pressure Sensor
21- Pump 2 Control Pressure Sensor
22- Auto Shut-Down Signal
23- Travel Mode Switch
24- Slow Speed Position
25- Fast Speed Position
26- Auto-Idle Switch
27- Power Mode Switch
28- Engine Control Dial
29- Key Switch
30- Pilot Shut-Off Switch
31- Pressure Sensor (Bucket Roll-In)
32- Pressure Sensor (Arm Roll-Out)



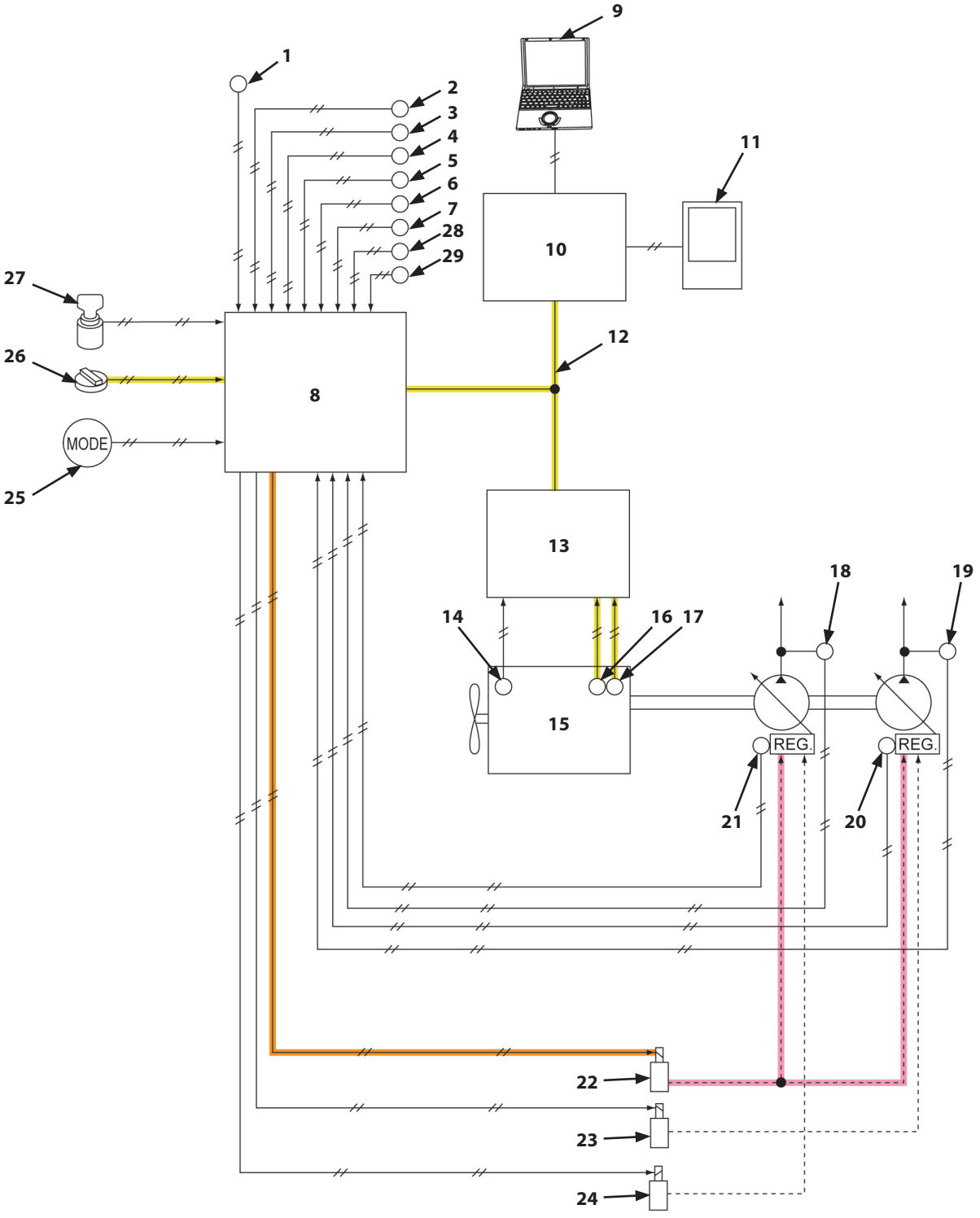
TDCY-02-02-008

1- Hydraulic Oil Temperature Sensor
2- Pressure Sensor (Boom Raise)
3- Pressure Sensor (Arm Roll-In)
4- Pressure Sensor (Swing)
5- Pressure Sensor (Travel)
6- Pressure Sensor (Front Attachment)
7- Pressure Sensor (Auxiliary) (OP)
8- MC
9- MPDr.
10- Monitor Controller
11- Monitor
12- CAN
13- ECM
14- Coolant Temperature Sensor
15- Engine
16- Cam Angle Sensor
17- Crank Speed Sensor
18- Pump 2 Delivery Pressure Sensor
19- Pump 1 Delivery Pressure Sensor
20- Pump 1 Control Pressure Sensor
21- Pump 2 Control Pressure Sensor
22- Auto Shut-Down Signal
23- Travel Mode Switch
24- Slow Speed Position
25- Fast Speed Position
26- Auto-Idle Switch
27- Power Mode Switch
28- Engine Control Dial
29- Key Switch
30- Pilot Shut-Off Switch
31- Pressure Sensor (Bucket Roll-In)
32- Pressure Sensor (Arm Roll-Out)



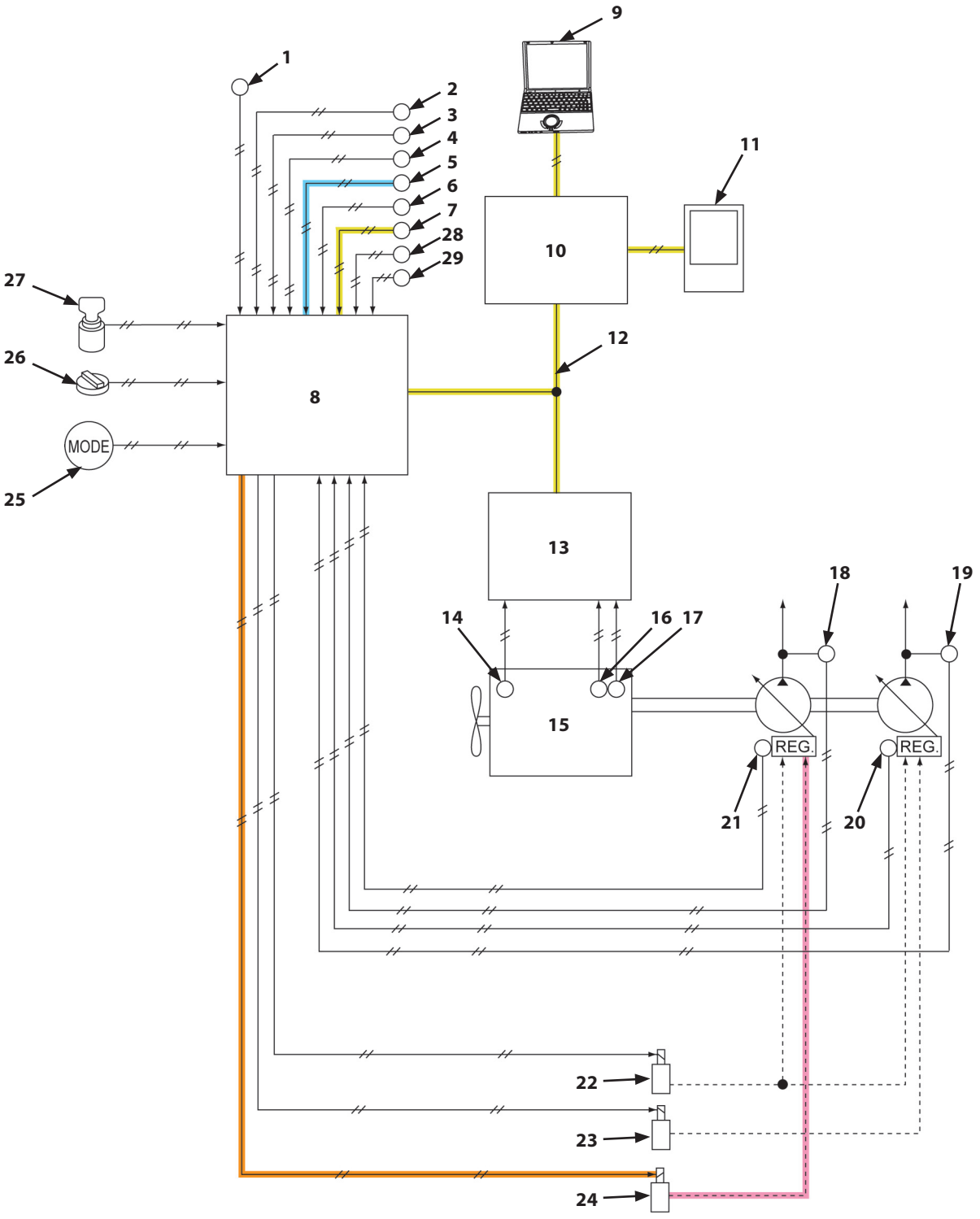
TDCY-02-02-013

1- Hydraulic Oil Temperature Sensor
2- Pressure Sensor (Boom Raise)
3- Pressure Sensor (Arm Roll-In)
4- Pressure Sensor (Swing)
5- Pressure Sensor (Travel)
6- Pressure Sensor (Front Attachment)
7- Pressure Sensor (Auxiliary) (OP)
8- MC
9- MPDr.
10- Monitor Controller
11- Monitor
12- CAN
13- ECM
14- Coolant Temperature Sensor
15- Engine
16- Cam Angle Sensor
17- Crank Speed Sensor
18- Pump 2 Delivery Pressure Sensor
19- Pump 1 Delivery Pressure Sensor
20- Pump 1 Control Pressure Sensor
21- Pump 2 Control Pressure Sensor
22- Auto Shut-Down Signal
23- Travel Mode Switch
24- Slow Speed Position
25- Fast Speed Position
26- Auto-Idle Switch
27- Power Mode Switch
28- Engine Control Dial
29- Key Switch
30- Pilot Shut-Off Switch
31- Pressure Sensor (Bucket Roll-In)
32- Pressure Sensor (Arm Roll-Out)



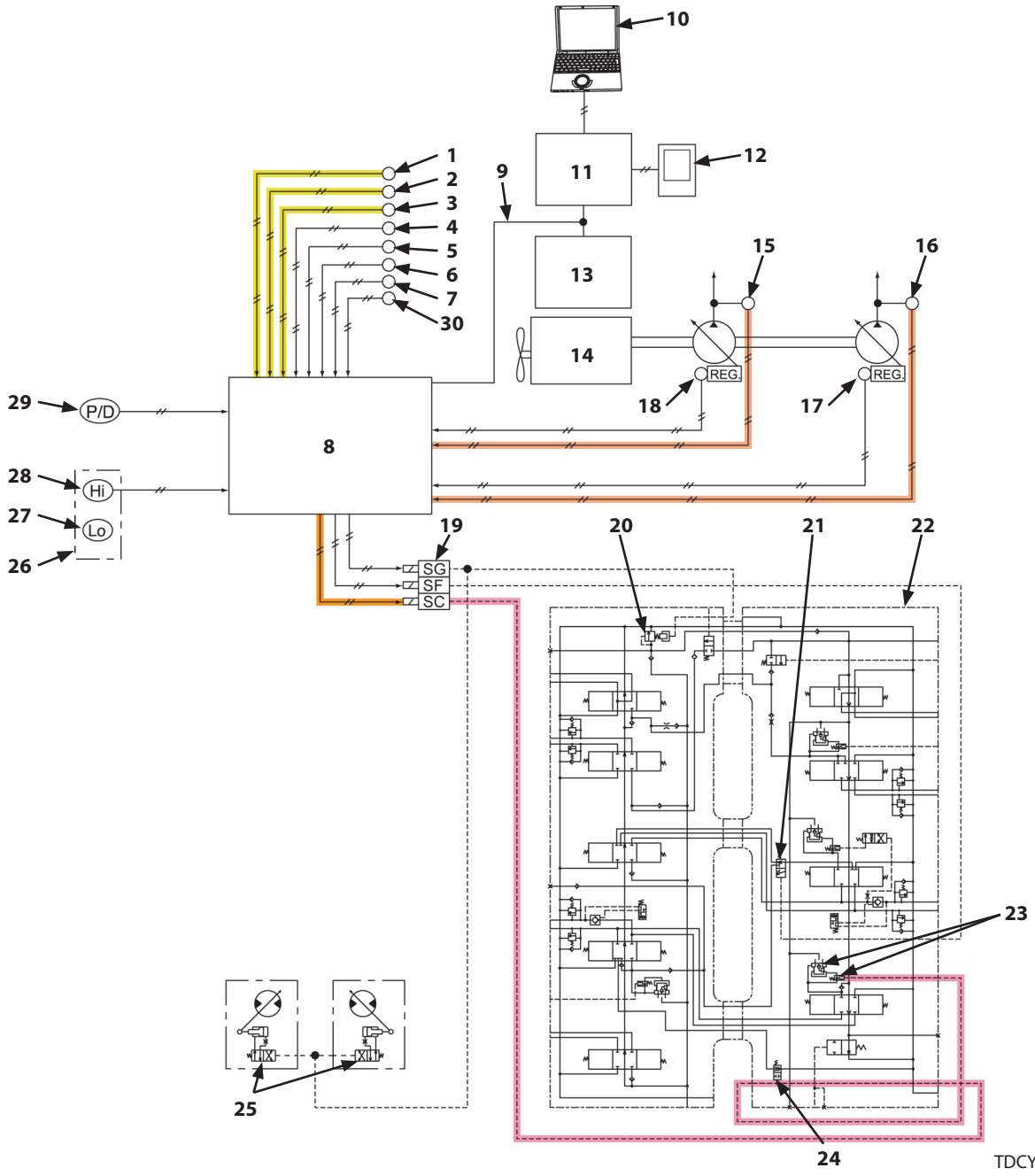
TDCY-02-02-018

1- Hydraulic Oil Temperature Sensor
2- Pressure Sensor (Boom Raise)
3- Pressure Sensor (Arm Roll-In)
4- Pressure Sensor (Swing)
5- Pressure Sensor (Travel)
6- Pressure Sensor (Front Attachment)
7- Pressure Sensor (Auxiliary) (OP)
8- MC
9- MPDr.
10- Monitor Controller
11- Monitor
12- CAN
13- ECM
14- Coolant Temperature Sensor
15- Engine
16- Cam Angle Sensor
17- Crank Speed Sensor
18- Pump 2 Delivery Pressure Sensor
19- Pump 1 Delivery Pressure Sensor
20- Pump 1 Control Pressure Sensor
21- Pump 2 Control Pressure Sensor
22- Torque Control Solenoid Valve
23- Maximum Pump 1 Flow Rate Limit Control Solenoid Valve (OP)
24- Maximum Pump 2 Flow Rate Limit Control Solenoid Valve
25- Power Mode Switch
26- Engine Control Dial
27- Key Switch
28- Pressure Sensor (Bucket Roll-In)
29- Pressure Sensor (Arm Roll-Out)



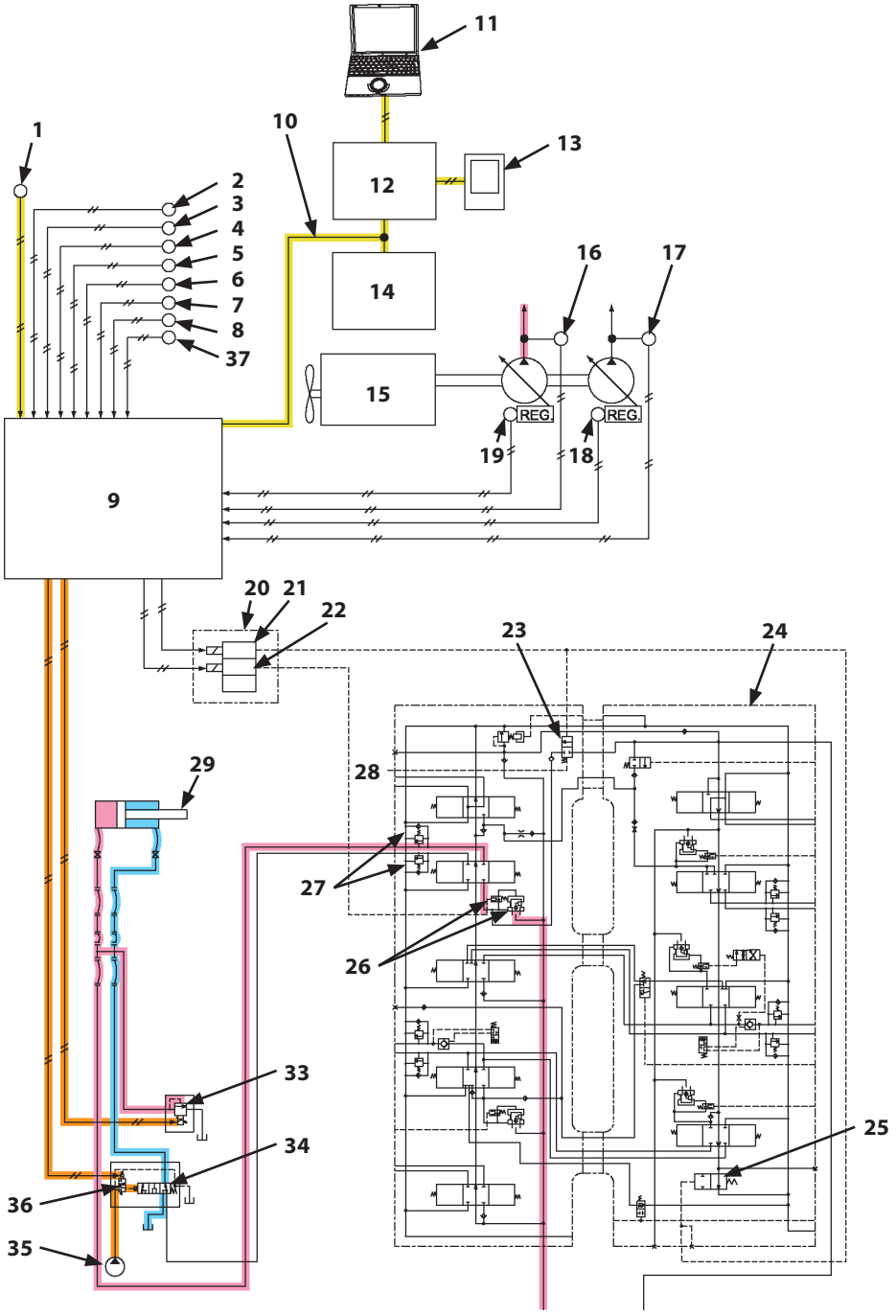
TDCY-02-02-023

1- Hydraulic Oil Temperature Sensor
2- Pressure Sensor (Boom Raise)
3- Pressure Sensor (Arm Roll-In)
4- Pressure Sensor (Swing)
5- Pressure Sensor (Travel)
6- Pressure Sensor (Front Attachment)
7- Pressure Sensor (Auxiliary) (OP)
8- MC
9- MPDr.
10- Monitor Controller
11- Monitor
12- CAN
13- ECM
14- Coolant Temperature Sensor
15- Engine
16- Cam Angle Sensor
17- Crank Speed Sensor
18- Pump 2 Delivery Pressure Sensor
19- Pump 1 Delivery Pressure Sensor
20- Pump 1 Control Pressure Sensor
21- Pump 2 Control Pressure Sensor
22- Torque Control Solenoid Valve
23- Maximum Pump 1 Flow Rate Limit Control Solenoid Valve (OP)
24- Maximum Pump 2 Flow Rate Limit Control Solenoid Valve
25- Power Mode Switch
26- Engine Control Dial
27- Key Switch
28- Pressure Sensor (Bucket Roll-In)
29- Pressure Sensor (Arm Roll-Out)



TDCY-02-02-028

1- Pressure Sensor (Boom Raise)
2- Pressure Sensor (Arm Roll-In)
3- Pressure Sensor (Swing)
4- Pressure Sensor (Travel)
5- Pressure Sensor (Front Attachment)
6- Pressure Sensor (Auxiliary) (OP)
7- Pressure Sensor (Arm Roll-Out)
8- MC
9- CAN
10- MPDr.
11- Monitor Controller
12- Monitor
13- ECM
14- Engine
15- Pump 2 Delivery Pressure Sensor
16- Pump 1 Delivery Pressure Sensor
17- Pump 1 Control Pressure Sensor
18- Pump 2 Control Pressure Sensor
19- 3-Spool Solenoid Valve Unit
20- Main Relief Valve
21- Digging Regenerative Valve
22- Control Valve
23- Arm 2 Flow Rate Control Valve
24- Arm Regenerative Valve
25- Travel Motor Displacement Angle Control Valve
26- Travel Mode Switch
27- Slow Speed Position
28- Fast Speed Position
29- Power Digging Switch
30- Pressure Sensor (Bucket Roll-In)



TDCX-02-02-004

1- Hydraulic Oil Temperature Sensor
2- Pressure Sensor (Boom Raise)
3- Pressure Sensor (Arm Roll-In)
4- Pressure Sensor (Swing)
5- Pressure Sensor (Travel)
6- Pressure Sensor (Front Attachment)
7- Pressure Sensor (Auxiliary) (OP)
8- Pressure Sensor (Arm Roll-Out)
9- MC
10- CAN
11- MPDr.
12- Monitor Controller
13- Monitor
14- ECM
15- Engine
16- Pump 2 Delivery Pressure Sensor
17- Pump 1 Delivery Pressure Sensor
18- Pump 1 Control Pressure Sensor
19- Pump 2 Control Pressure Sensor
20- Auxiliary Control Solenoid Valve Unit (OP)
21- Auxiliary Flow Combiner Control Solenoid Valve
22- Auxiliary Flow Rate Control Solenoid Valve
23- Auxiliary Flow Combiner Valve
24- Control Valve
25- Bypass Shut-Out Valve
26- Auxiliary Flow Rate Control Valve
27- Overload Relief Valve (Auxiliary)
28- Pilot Pressure of Boom, Arm, Bucket, or Travel (Right)
29- Attachment (OP)
33- Breaker Relief Solenoid Valve (OP)
34- Selector Valve (OP)
35- Pilot Pump
36- Selector Valve Control Solenoid Valve (OP)
37- Pressure Sensor (Bucket Roll-In)

Overload Alarm Control (Only Machines with Optional Parts Equipped)

Purpose:
The overload alarm control sounds the buzzer and displays the overload alarm when boom raise operation such as suspending is overloaded.

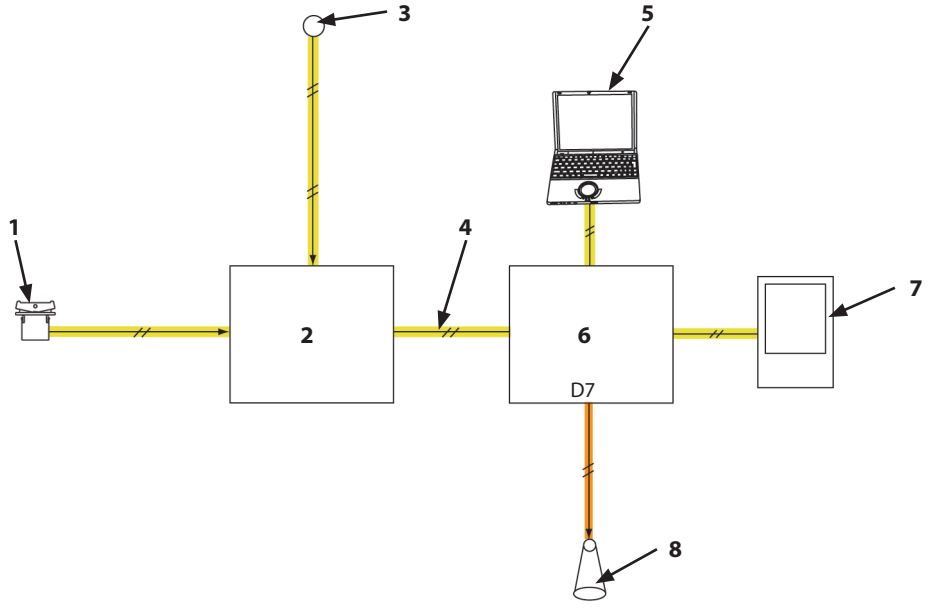
Operation:

1. When all following conditions exist, MC (2) sends the signal to monitor controller (6).
2. As long as receiving the signal from MC (2), monitor controller (6) connects terminal #D7 to the ground inside.
3. Monitor controller (6) sounds buzzer (8) and displays the overload alarm on monitor (7).

Condition:

- Overload alarm: Enable
- Boom bottom pressure sensor (3): Outputting signal beyond the specified pressure
- Overload alarm switch (1): ON

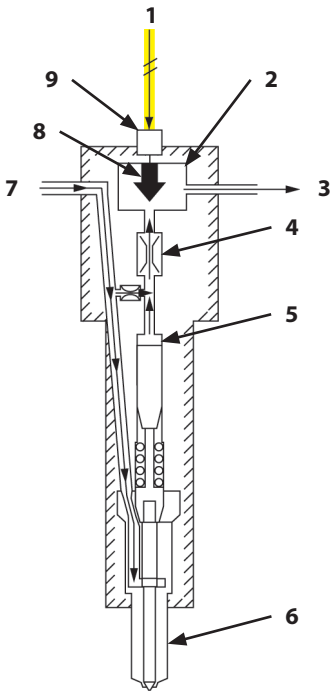
NOTE: "Tipping Threshold Boom CYL Bottom Pressure (EN Load Alarm)" (The alarm pressure setting of load) in MC (2) can be adjusted by MPDr. (5).



TDAA-02-02-013

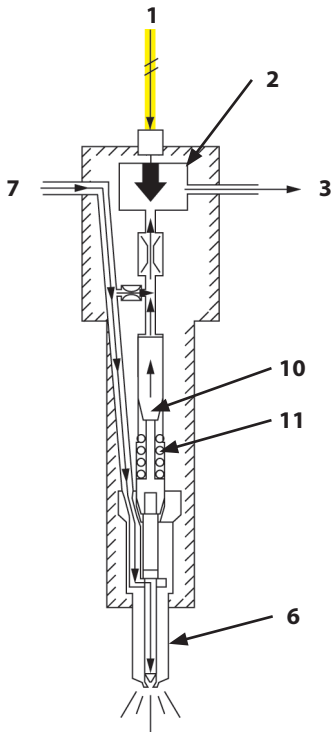
1- Overload Alarm Switch (OP)
2- MC
3- Boom Bottom Pressure Sensor (OP)
4- CAN
5- MPDr.
6- Monitor Controller
7- Monitor
8- Buzzer

1. Two-way valve: ON



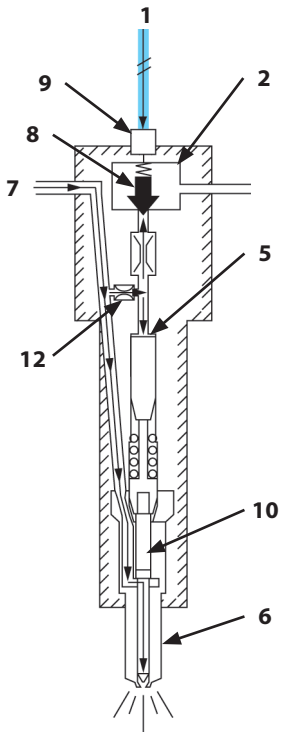
TDAA-02-03-014

2. Injection Start



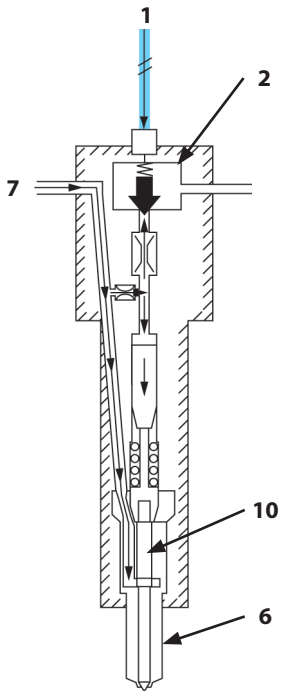
TDAA-02-03-015

3. Two-way valve: OFF



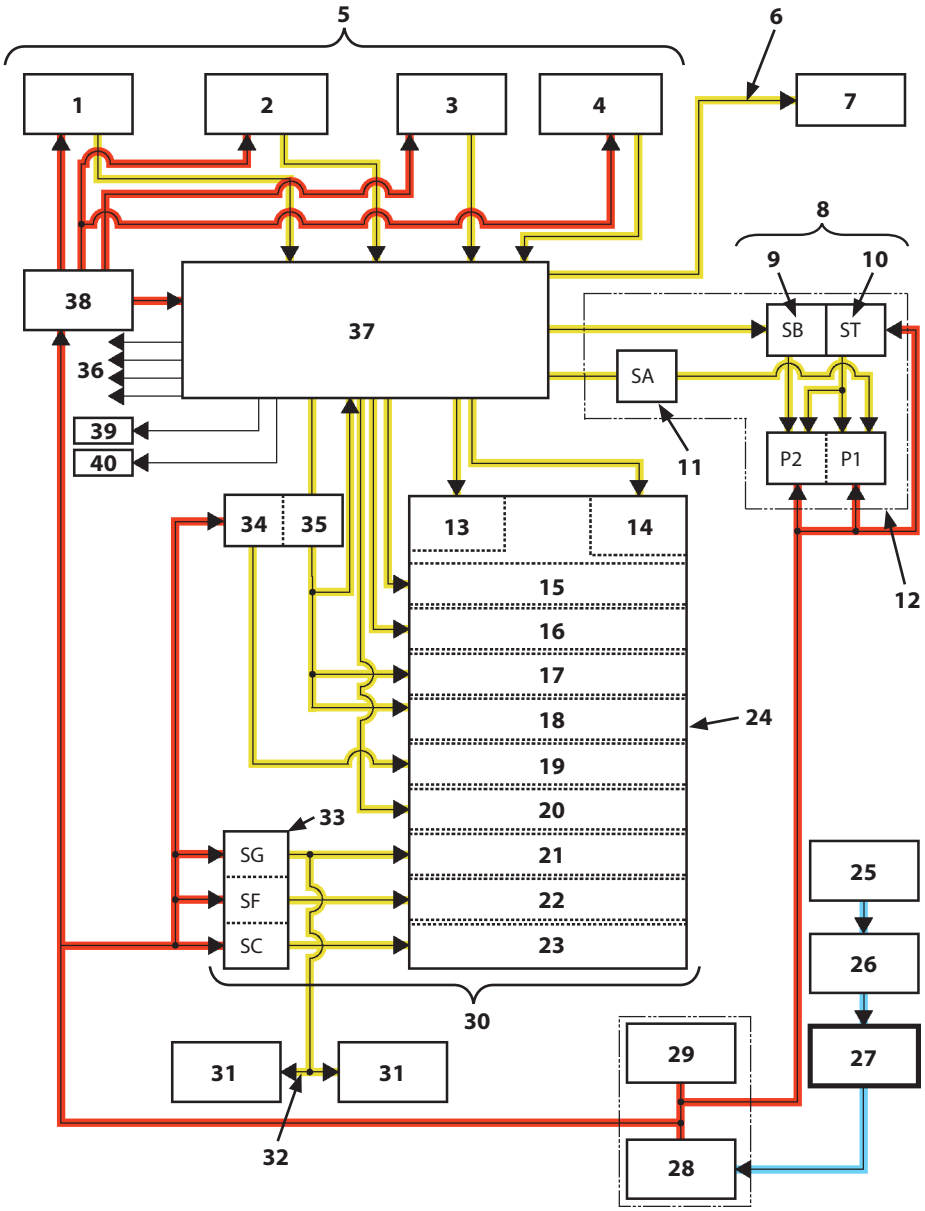
TDAA-02-03-016

4. Injection Stop



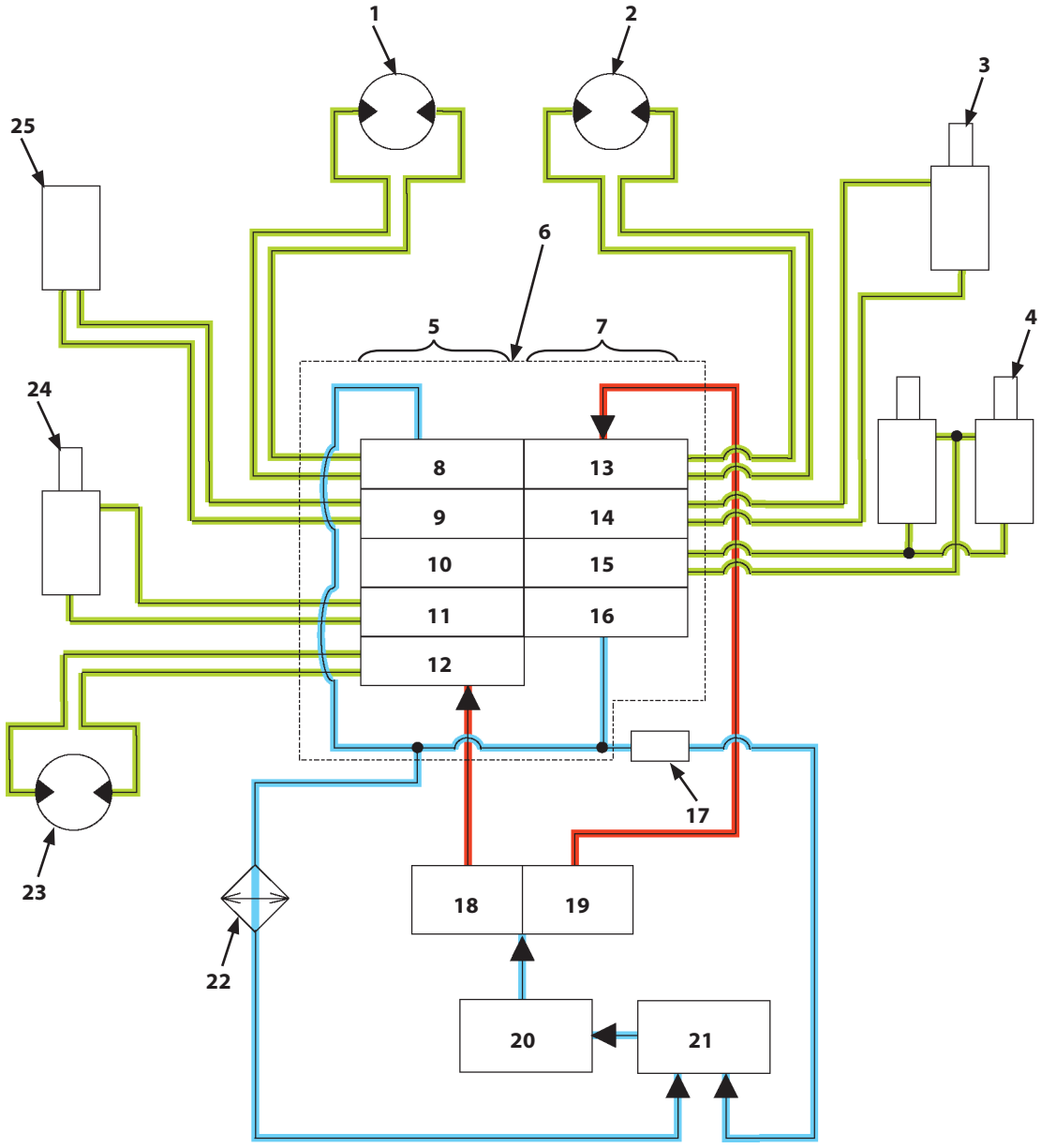
TDAA-02-03-017

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



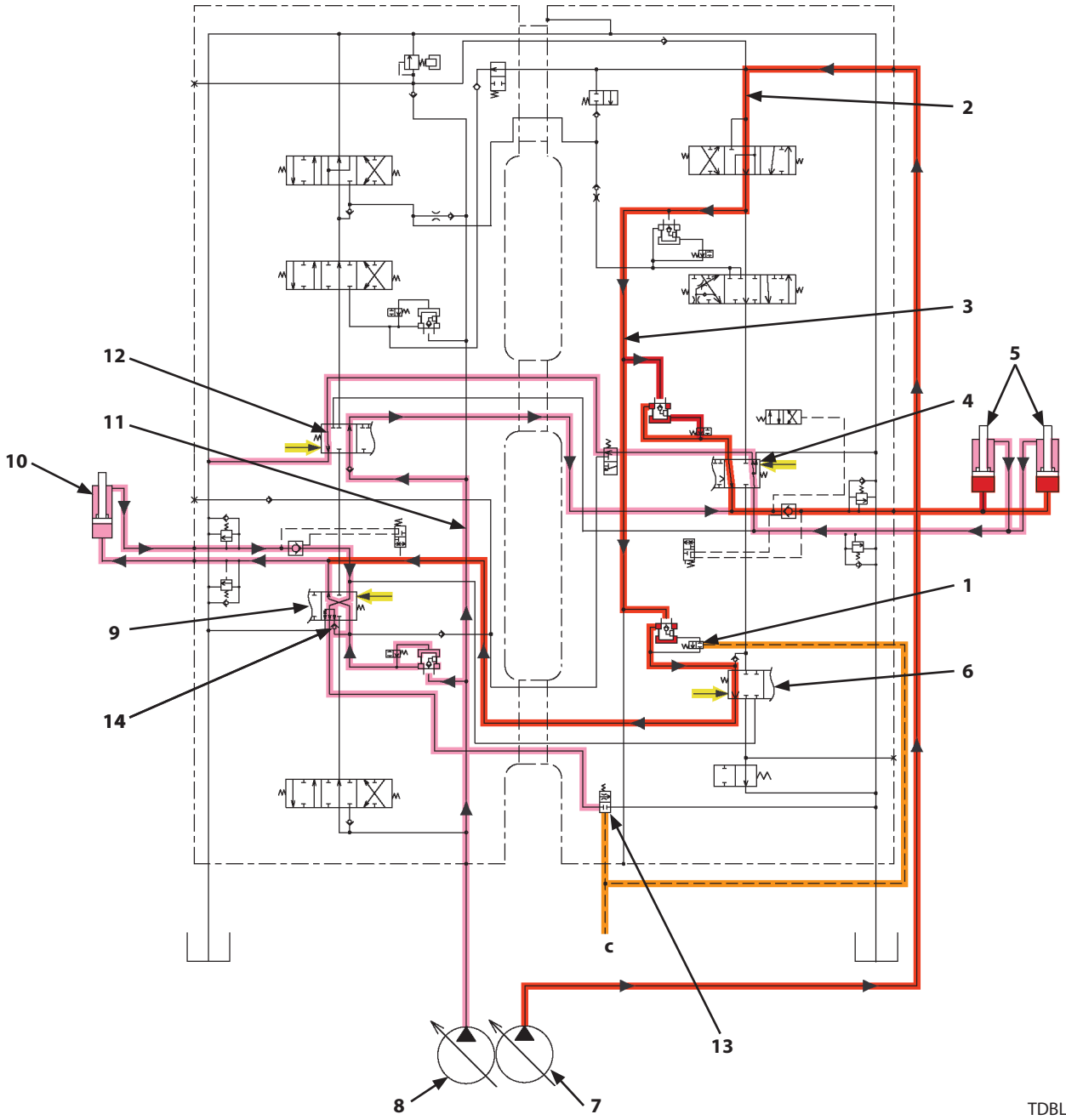
TDCX-02-04-001

1- Travel Pilot Valve
2- Pilot Valve (Left)
3- Pilot Valve (Right)
4- Auxiliary Pilot Valve
5- Operation Control Circuit
6- Swing Parking Brake Release Circuit
7- Swing Motor
8- Pump Control Circuit
9- Maximum Pump 2 Flow Rate Limit Control Solenoid Valve
10- Torque Control Solenoid Valve
11- Maximum Pump 1 Flow Rate Limit Control Solenoid Valve (OP)
12- Regulator
13- Flow Combiner Valve
14- Bucket Flow Rate Control Valve
15- Boom Anti-Drift Valve
16- Arm Anti-Drift Valve
17- Auxiliary Flow Combiner Valve
18- Bypass Shut-Out Valve
19- Auxiliary Flow Rate Control Valve
20- Arm 1 Flow Rate Control Valve
21- Main Relief Valve
22- Digging Regenerative Valve
23- Arm Regenerative Valve, Arm 2 Flow Rate Control Valve
24- Control Valve
25- Hydraulic Oil Tank
26- Suction Filter
27- Pilot Pump
28- Pilot Filter
29- Pilot Relief Valve
30- Valve Control Circuit
31- Travel Motor
32- Travel Motor Displacement Angle Control Circuit
33- 3-Spool Solenoid Valve Unit
34- Auxiliary Flow Rate Control Solenoid Valve (OP)
35- Auxiliary Flow Combiner Control Solenoid Valve (OP)
36- To Control Valve Spool
37- Signal Control Valve
38- Pilot Shut-Off Solenoid Valve
39- Hose Rupture Valve (Arm) (OP)
40- Hose Rupture Valve (Boom) (OP)



TDCD-02-04-006

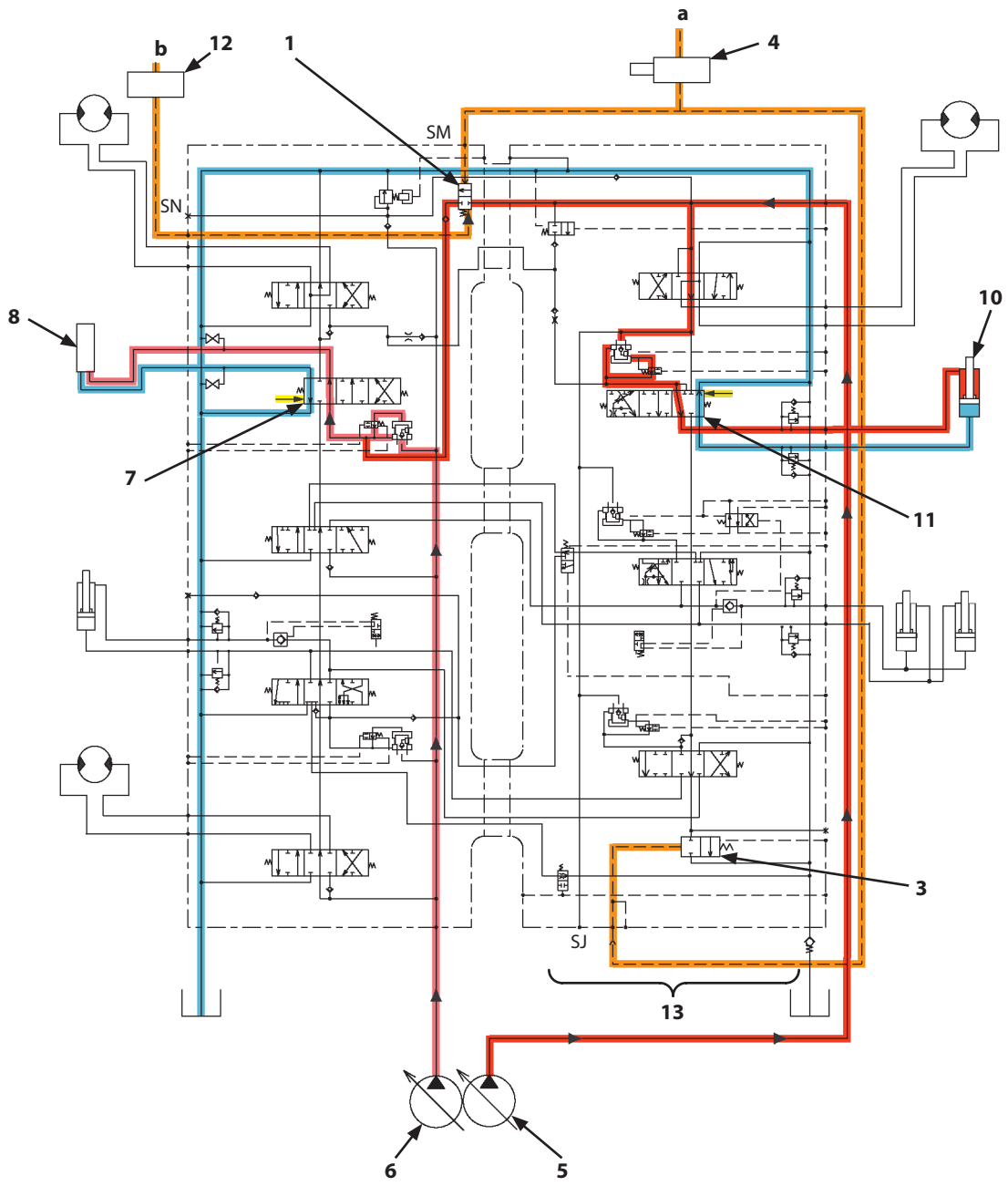
1- Travel Motor (Left)
2- Travel Motor (Right)
3- Bucket Cylinder
4- Boom Cylinder
5- 5-Spool Side
6- Control Valve
7- 4-Spool Side
8- Travel (Left) Spool
9- Auxiliary Spool
10- Boom 2 Spool
11- Arm 1 Spool
12- Swing Spool
13- Travel (Right) Spool
14- Bucket Spool
15- Boom 1 Spool
16- Arm 2 Spool
17- Bypass Check Valve
18- Pump 2
19- Pump 1
20- Suction Filter
21- Hydraulic Oil Tank
22- Oil Cooler
23- Swing Motor
24- Arm Cylinder
25- Attachments



TDBL-02-04-005

c- Pilot Pressure from 3-Spool Solenoid Valve Unit (SC)

1- Arm 2 Flow Rate Control Valve
2- Neutral Circuit (Pump 1)
3- Parallel Circuit (Pump 1)
4- Boom 1 Spool
5- Boom Cylinder
6- Arm 2 Spool
7- Pump 1
8- Pump 2
9- Arm 1 Spool
10- Arm Cylinder
11- Parallel Circuit (Pump 2)
12- Boom 2 Spool
13- Arm Regenerative Valve
14- Check Valve



TDCX-02-04-005

NOTE: The illustration shows during auxiliary (open)/ bucket roll-out operation.

a- Attachment Pilot Pressure

b- Pilot Pressure from Signal Control Valve

1- Auxiliary Flow Combiner Control Valve

3- Bypass Shut-Out Valve

4 - Auxiliary Flow Combiner Control Solenoid Valve

5 - Pump 1

6 - Pump 2

7 - Auxiliary Spool

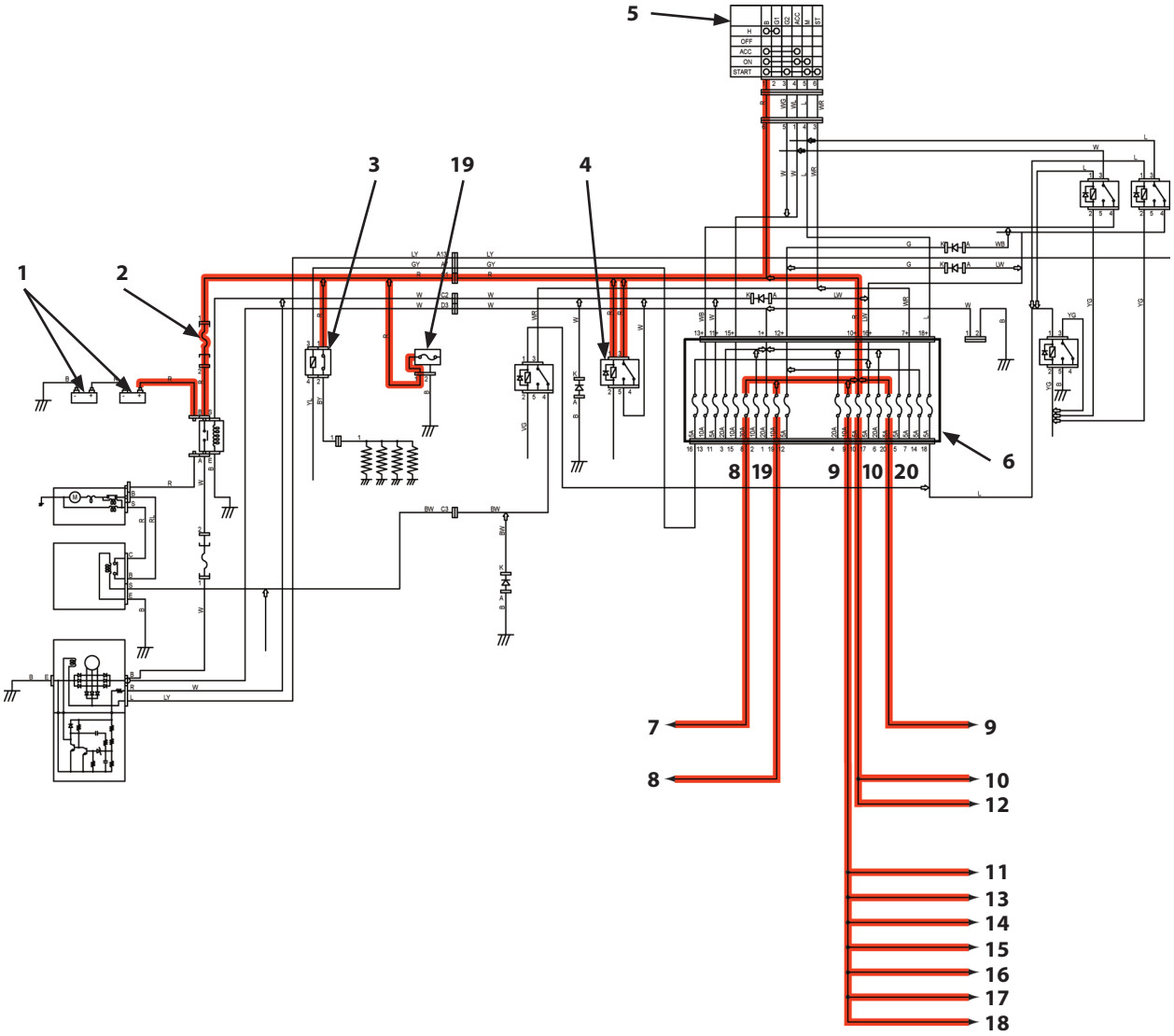
8 - Attachment

10 - Bucket Cylinder

11 - Bucket Spool

12- Reducing Valve

13- 4-Spool Side

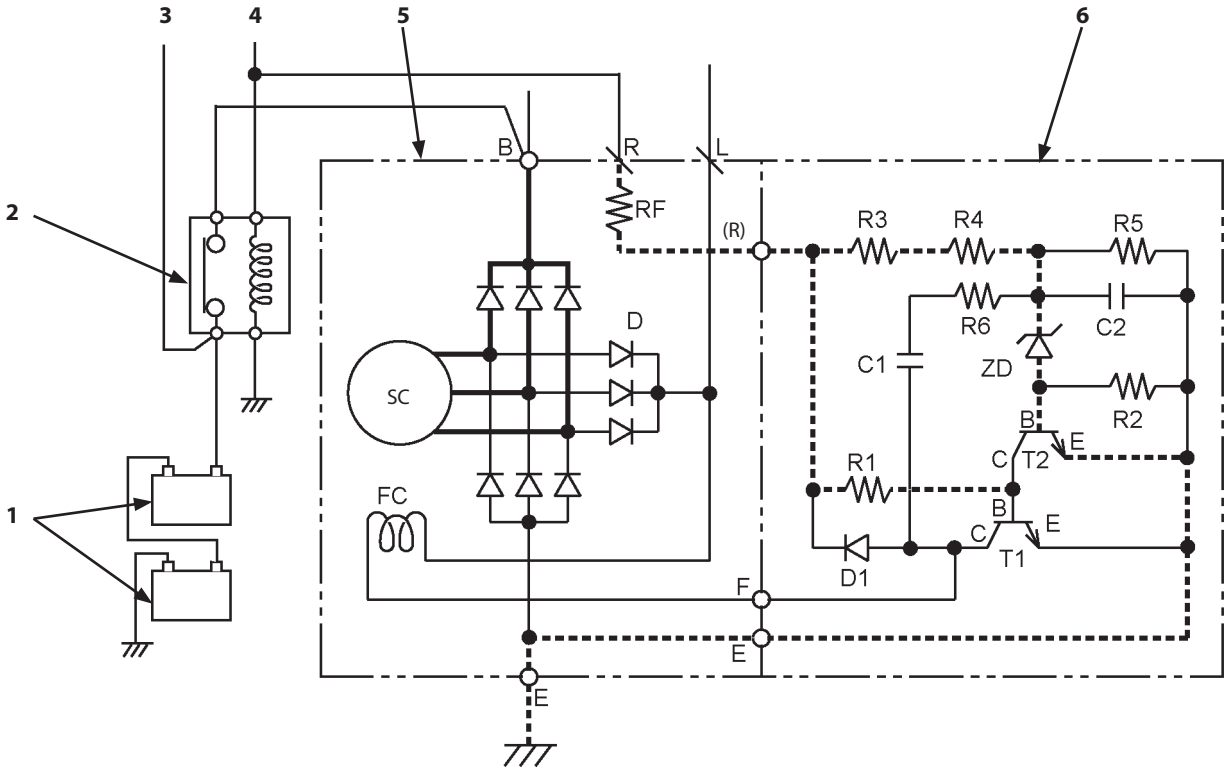


TDBL-02-05-001

1- Battery
2- Fusible Link
3- Glow Plug Relay (Power)
4- Load Dump Relay
5- Key Switch
6- Fuse Box
7- ECM Main Relay (Power)
8- Horn Relay (Power)
9- For Option
10- MC (Power)
11- GSM (Power)
12- Wiper/Light Controller (Power)
13- Monitor Controller (Backup power)
14- Switch Panel
15- Cab Light
16- Radio (Backup Power)
17- Security Horn (Power)
18- Security Horn Relay (Power)
19- Automatic Fueling Pump (OP)

Regulator (6) Operation

- When the generating voltage increases more than the set voltage of Zener diode ZD, the current flows to base B of transistor T2 and collector C is connected to emitter E.
- Current flowing to base B of transistor T1 disappears due to the transistor T2 operation so that transistor T1 is turned OFF.
- No current flows to filed coil FC and the generating voltage at stator coil SC decreases.
- When the generating voltage decreases lower than the set voltage of Zener diode ZD, transistor T2 is turned OFF and transistor T1 is turned ON again.
- Current flows to field coil FC and the generating voltage at stator coil SC increases.
  The above operation is repeated so that the alternator (5) generating voltage is kept constant.



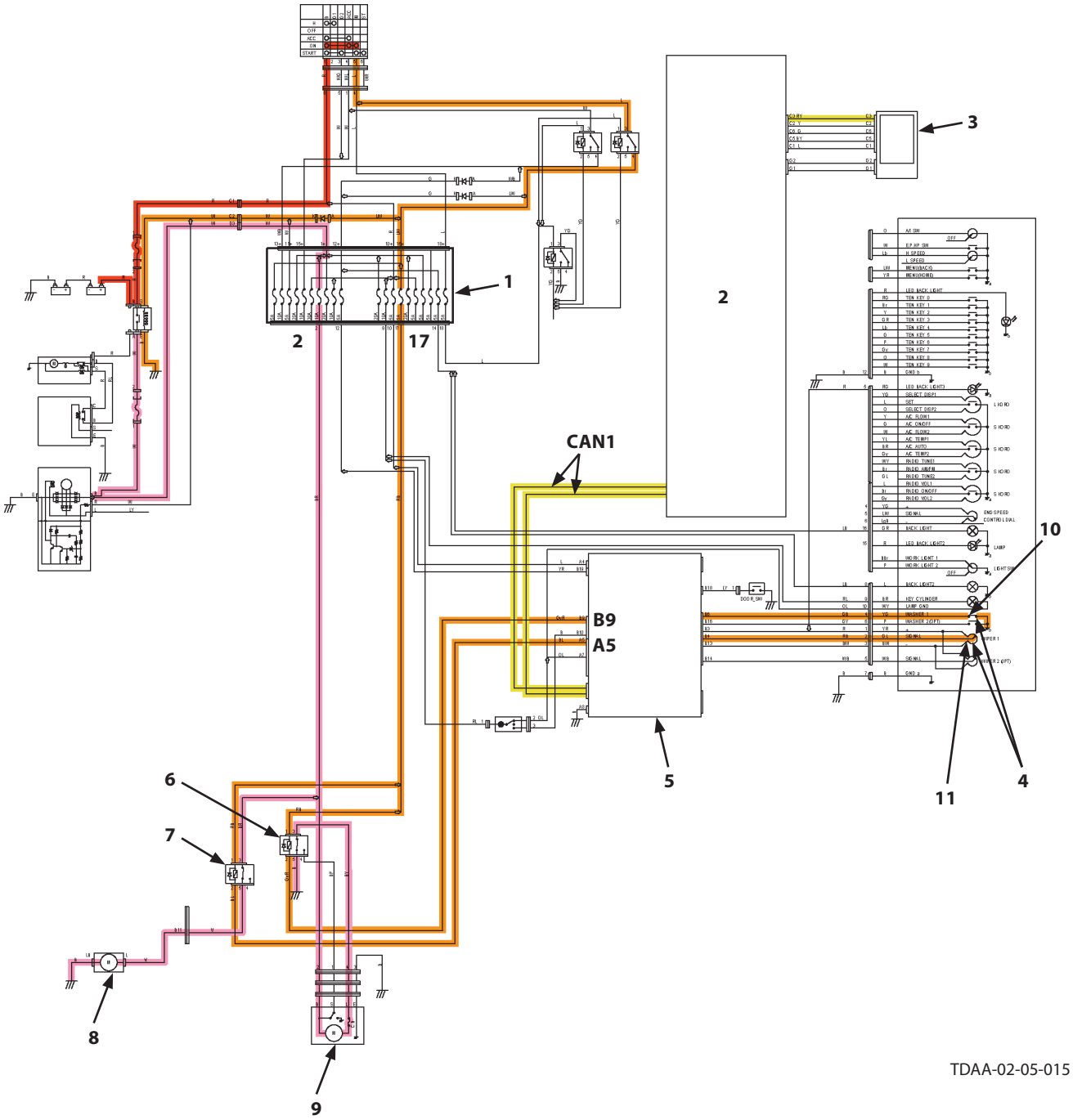
TDAA-02-05-003

1- Battery
2- Battery Relay
3- To Key Switch Terminal B
4- From Key Switch Terminal M
5- Alternator
6- Regulator

Monitor Circuit

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

- Security Circuit:
  This circuit disconnects the current for engine starting from the key switch according to the signals from the external alarm system or monitor controller. This circuit turns the pilot shut-off solenoid valve OFF and disconnects the pilot circuit. This circuit sounds the security horn at this time.
  (Monitor Controller, Security Relay, Security Horn Relay)
- Radio Circuit:
  This circuit operates the radio.
  (Monitor Controller, Switch Panel, Radio)
- Air Conditioner Circuit:
  This circuit operates the air conditioner.
  (Monitor Controller, Switch Panel, Air Conditioner Unit)

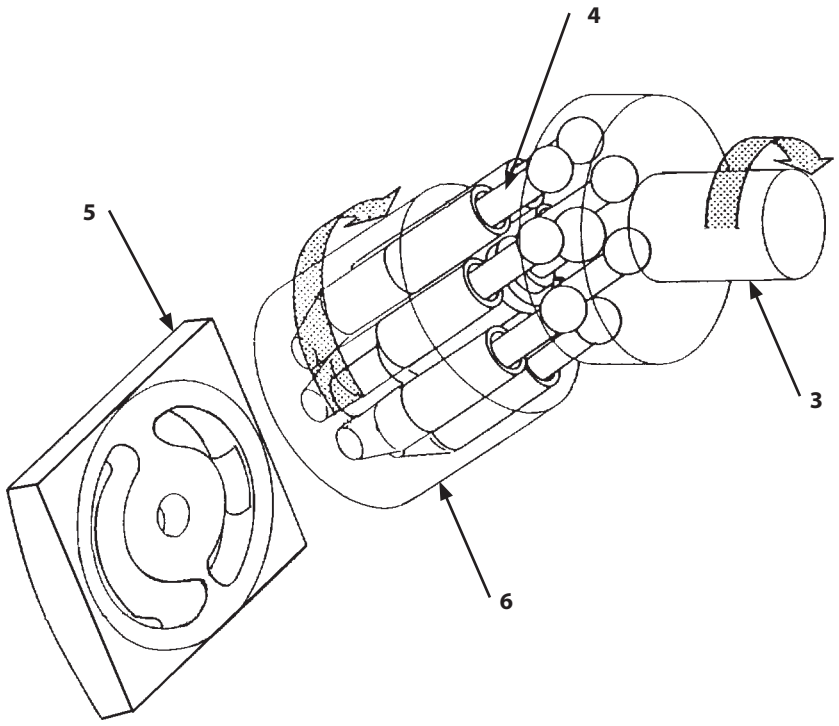


TDAA-02-05-015

1- Fuse Box
2- Monitor Controller
3- Monitor
4- Wiper/Washer Switch
5- Wiper/Light Controller
6- Wiper Relay
7- Washer Relay
8- Washer Motor
9- Wiper Motor
10- For Washer
11- For Wiper

Operational Principle

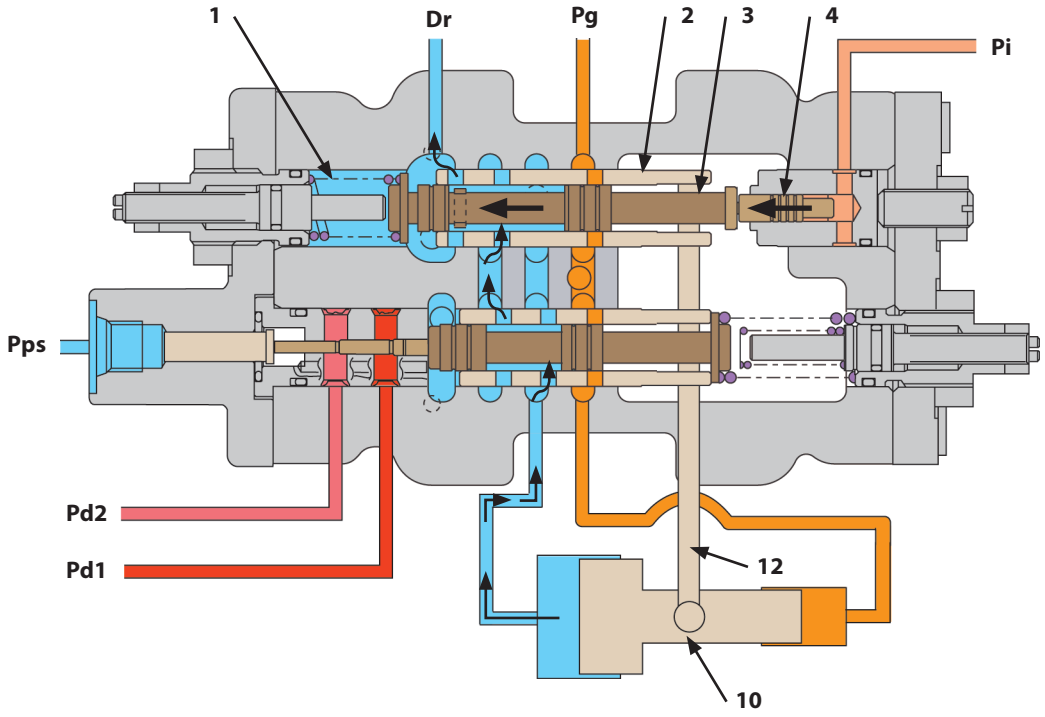
The engine torque is transferred to shaft (3) and seven plungers (4), and causes cylinder block (6) to rotate while sliding on the valve plate (5) surface.
Plunger (4) reciprocates in the cylinder block (6) bore and alternately hydraulic oil is drawn and delivered.



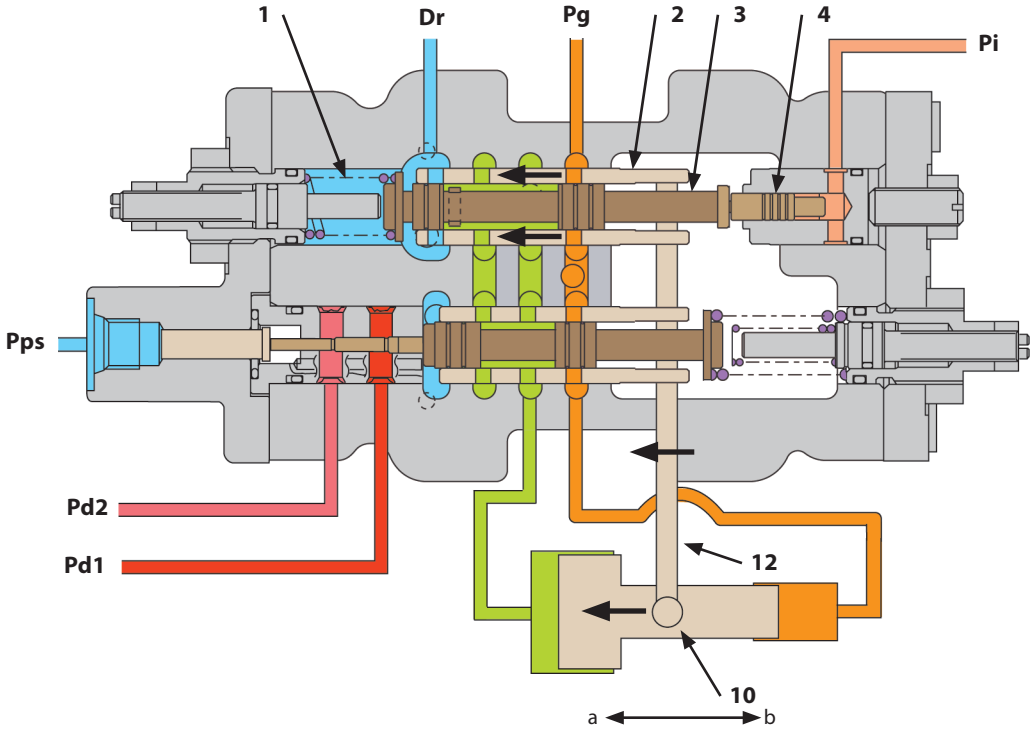
T105-02-03-002

3- Shaft
4- Plunger
5- Valve Plate
6- Cylinder Block

NOTE: The illustration shows the pump 2 regulator.



TPPP-03-01-016



TPPP-03-01-017

Pd1- Pump 1 Delivery Pressure
Pd2- Pump 2 Delivery Pressure

Dr- Returning to Hydraulic Oil Tank

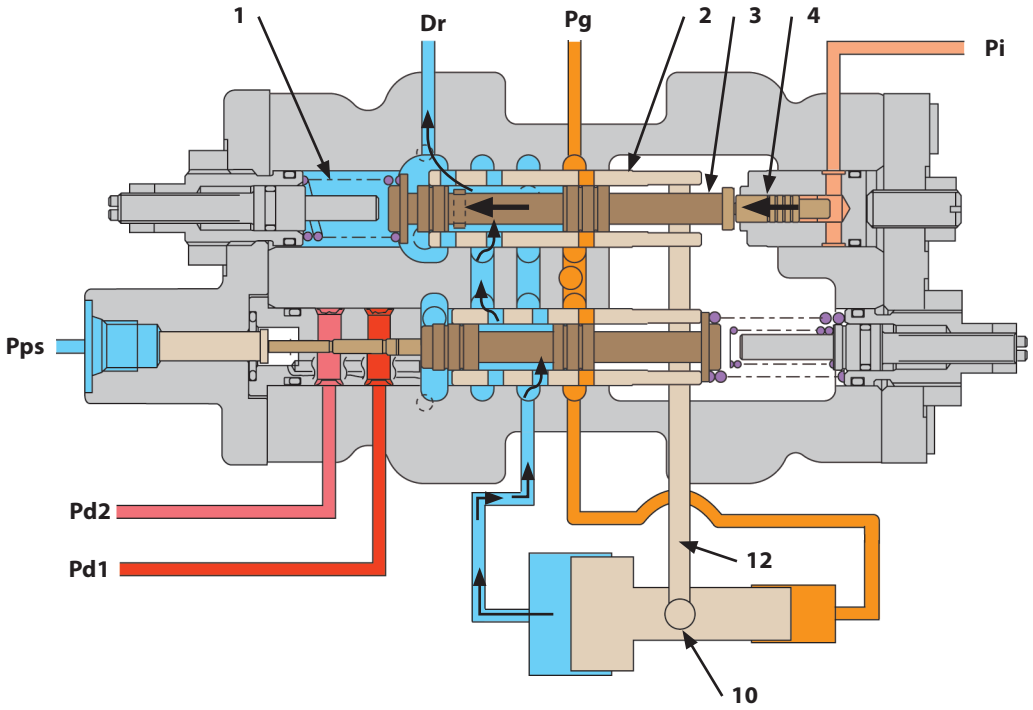
Pi- Pump Control Pressure
Pps- Torque Control Pressure

Pg- Primary Pilot Pressure (From Pilot Pump)

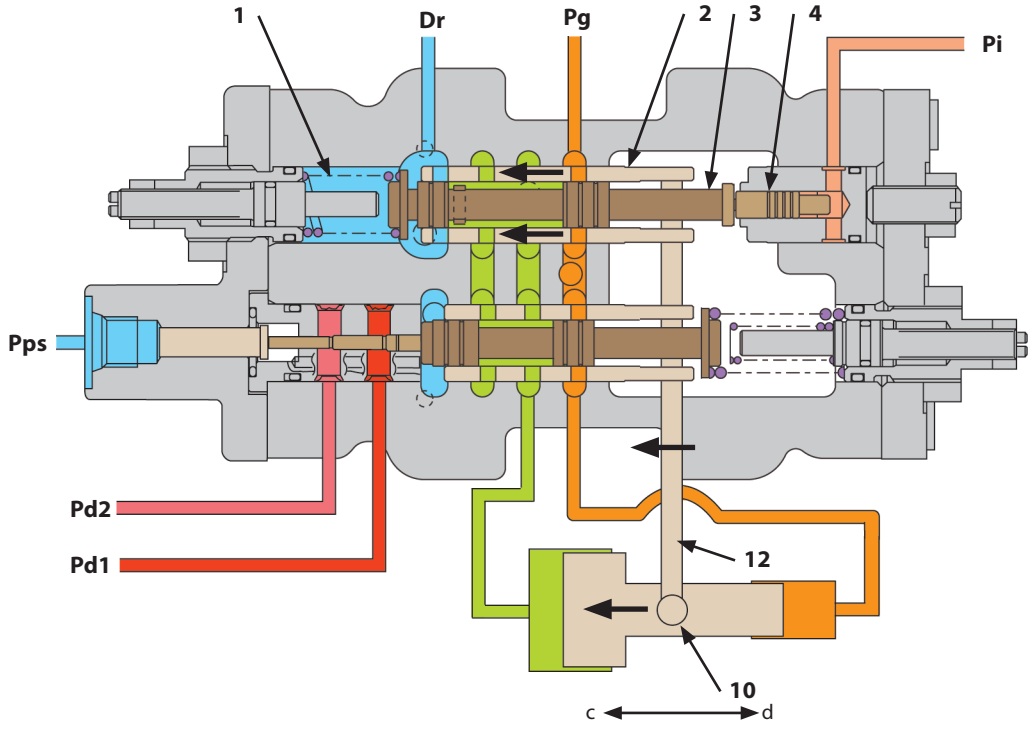
1- Spring
2- Sleeve A

3- Spool A
4- Piston

10- Servo Piston
12- Link



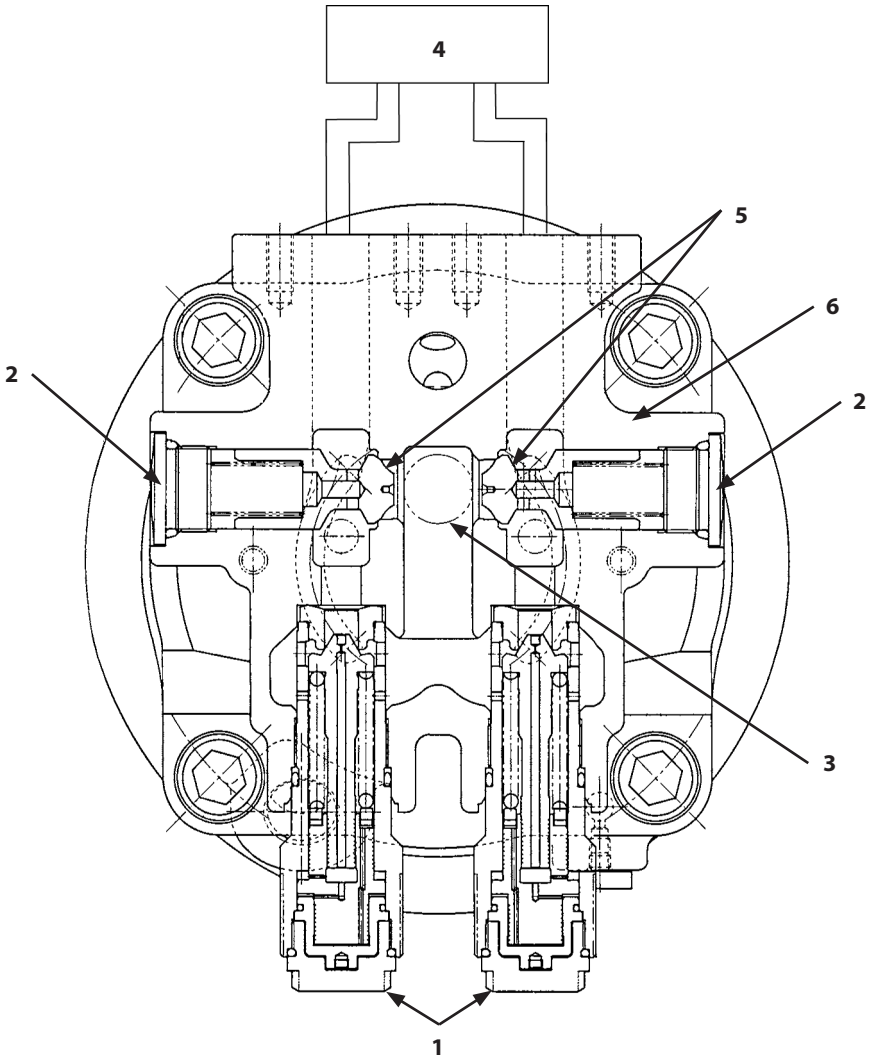
TPPP-03-01-024



TPPP-03-01-025

Pd1- Pump 1 Delivery Pressure
Pd2- Pump 2 Delivery Pressure
Dr- Returning to Hydraulic Oil Tank
Pi- Pump Control Pressure Regulated by Maximum Pump 2 Flow Rate Limit Control Solenoid Valve
Pps- Torque Control Pressure
Pg- Primary Pilot Pressure (From Pilot Pump)

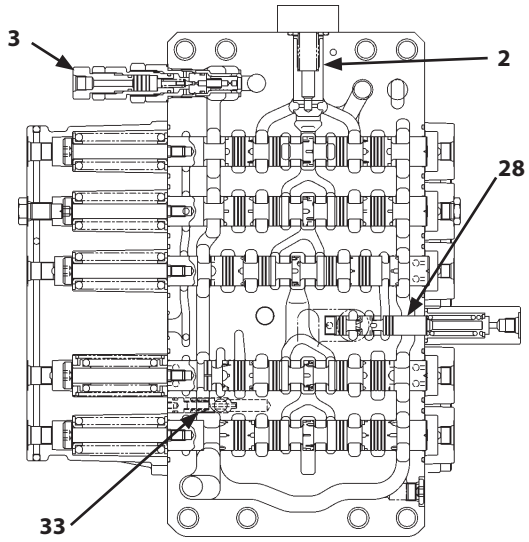
1- Spring
2- Sleeve A
3- Spool A
4- Piston
10- Servo Piston
12- Link



TDCD-03-02-001

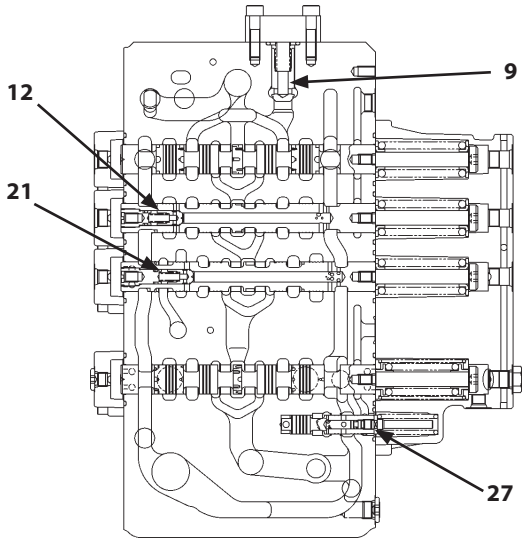
1- Relief Valve
2- Make-Up Valve
3- Port M
4- Control Valve
5- Poppet
6- Valve Unit

Section A-A



T1V1-03-03-001

Section B-B

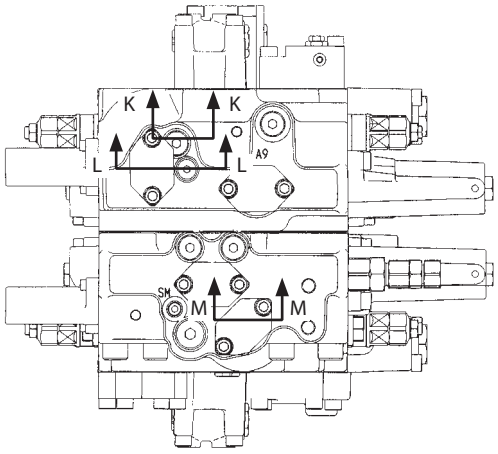


T1V1-03-03-002

a- Machine Upper Side

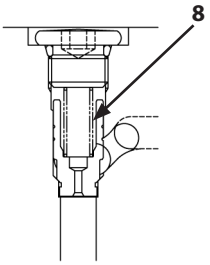
c- Machine Lower Side

1- Load Check Valve (Travel (Left) Parallel Circuit)
2- Check Valve (Main Relief Circuit)
3- Main Relief Valves
4- Check Valve (Auxiliary Flow Combiner Circuit)
5- Auxiliary Flow Combiner Valve
6- Check Valve (Flow Combiner Circuit)
7- Flow Combiner Valve
8- Load Check Valve (Orifice) (Bucket)
9- Check Valve (Main Relief Circuit)
10- Bucket Flow Rate Control Valve (Poppet Valve)
11- Bucket Flow Rate Control Valve (Selector Valve)
12- Bucket Regenerative Valve
13- Overload Relief Valve (Bucket: Rod Side)
14- Overload Relief Valve (Bucket: Bottom Side)
15- Boom Flow Rate Control Valve (Poppet Valve)
16- Boom Lower Meter-In Cut Valve
17- Boom Flow Rate Control Valve (Selector Valve)
18- Overload Relief Valve (Boom: Bottom Side)
19- Boom Anti-Drift Valve (Check Valve)
20- Overload Relief Valve (Boom: Rod Side)
21- Boom Regenerative Valve
22- Boom Anti-Drift Valve (Selector Valve)
23- Arm 2 Flow Rate Control Valve (Selector Valve)
24- Load Check Valve (Arm 2 Tandem Circuit)
25- Bypass Shut-Out Valve
26- Arm 2 Flow Rate Control Valve (Poppet Valve)
27- Arm Regenerative Valve
28- Digging Regenerative Valve
29- Load Check Valve (Digging Regenerative Circuit)
30- Arm 1 Flow Rate Control Valve (Poppet Valve)
31- Load Check Valve (Swing Circuit)
32- Arm 1 Flow Rate Control Valve (Selector Valve)
33- Load Check Valve (Arm Regenerative Circuit)
34- Arm Anti-Drift Valve (Selector Valve)
35- Overload Relief Valve (Arm: Bottom Side)
36- Arm Anti-Drift Valve (Check Valve)
37- Overload Relief Valve (Arm: Rod Side)
38- Check Valve (Digging Regenerative Circuit)
39- Load Check Valve (Boom 2 Parallel Circuit)
40- Auxiliary Flow Rate Control Valve (Poppet Valve)
41- Auxiliary Flow Rate Control Valve (Selector Valve)
42- Load Check Valve (Travel (Left) Tandem Circuit)

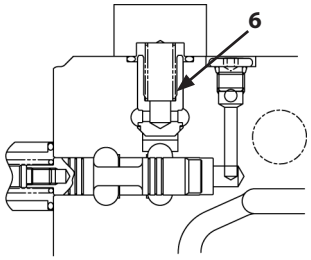


T1V1-03-03-027

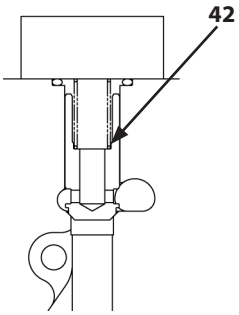
Section K-K



Section L-L



Section M-M

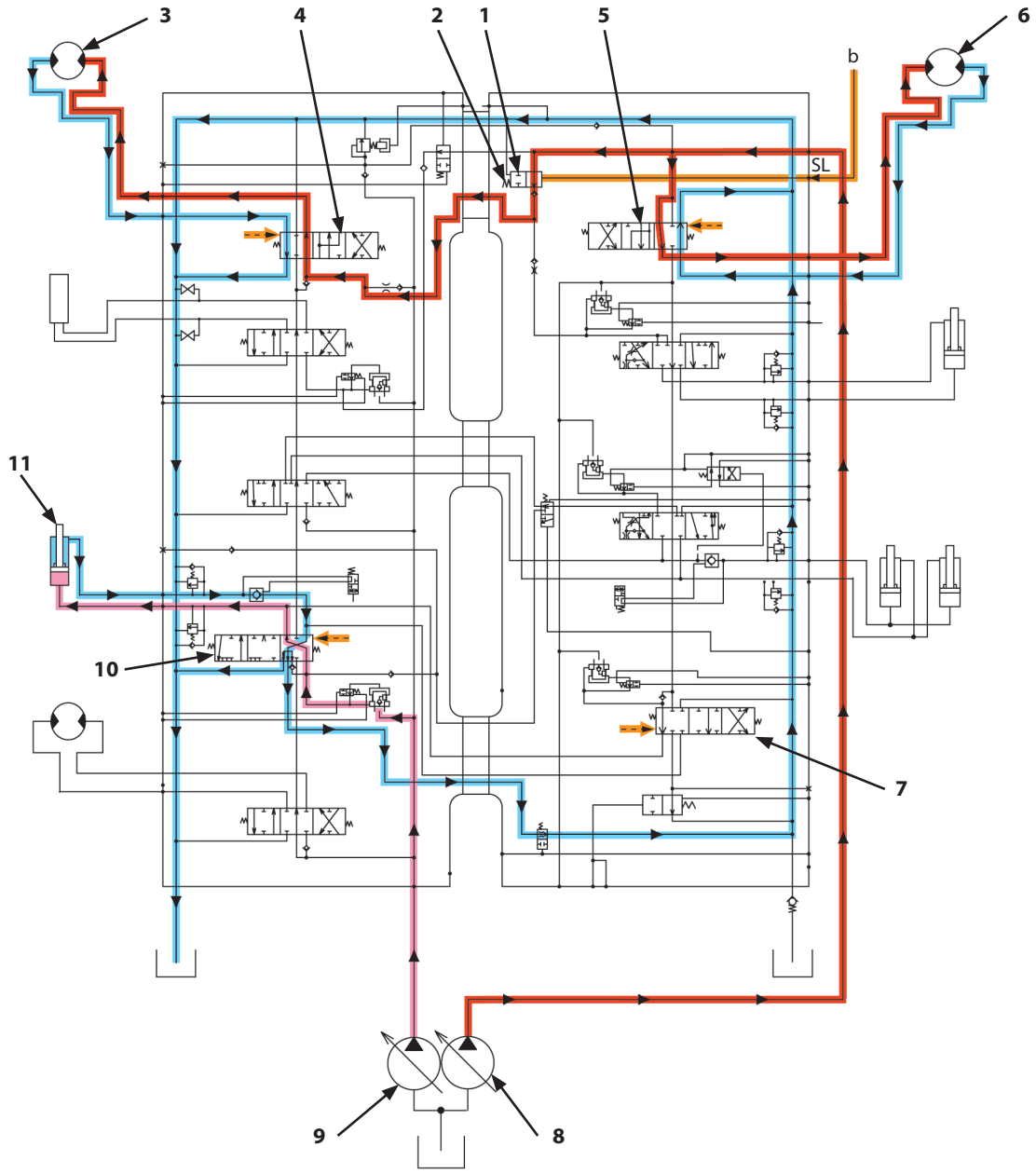


TDCD-03-03-030

a- Machine Upper Side

e- Machine Lower Side

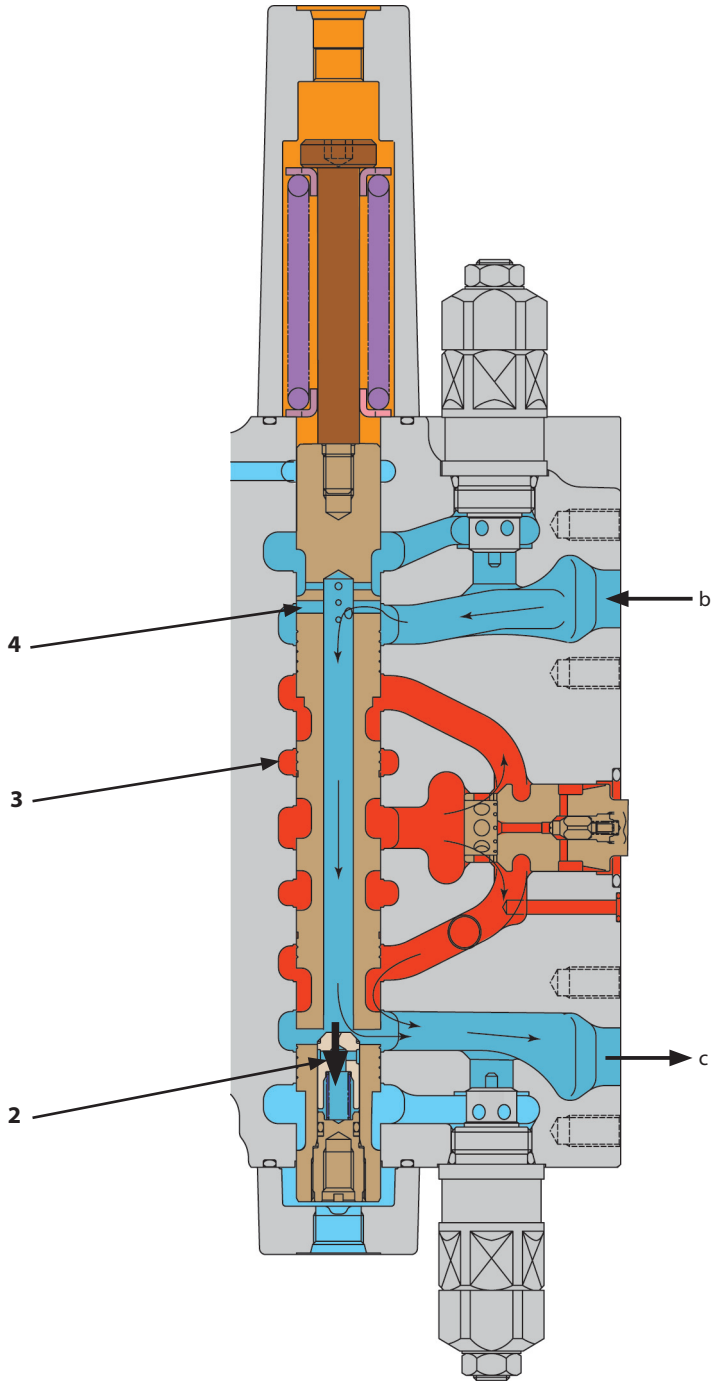
1- Load Check Valve (Travel (Left) Parallel Circuit)
2- Check Valve (Main Relief Circuit)
3- Main Relief Valves
4- Check Valve (Auxiliary Flow Combiner Circuit)
5- Auxiliary Flow Combiner Valve
6- Check Valve (Flow Combiner Circuit)
7- Flow Combiner Valve
8- Load Check Valve (Orifice) (Bucket)
9- Check Valve (Main Relief Circuit)
10- Bucket Flow Rate Control Valve (Poppet Valve)
11- Bucket Flow Rate Control Valve (Selector Valve)
12- Bucket Regenerative Valve
13- Overload Relief Valve (Bucket: Rod Side)
14- Overload Relief Valve (Bucket: Bottom Side)
15- Boom Flow Rate Control Valve (Poppet Valve)
16- Boom Lower Meter-In Cut Valve
17- Boom Flow Rate Control Valve (Selector Valve)
18- Overload Relief Valve (Boom: Bottom Side)
19- Boom Anti-Drift Valve (Check Valve)
20- Overload Relief Valve (Boom: Rod Side)
21- Boom Regenerative Valve
22- Boom Anti-Drift Valve (Selector Valve)
23- Arm 2 Flow Rate Control Valve (Selector Valve)
24- Load Check Valve (Arm 2 Tandem Circuit)
25- Bypass Shut-Out Valve
26- Arm 2 Flow Rate Control Valve (Poppet Valve)
27- Arm Regenerative Valve
28- Digging Regenerative Valve
29- Load Check Valve (Digging Regenerative Circuit)
30- Arm 1 Flow Rate Control Valve (Poppet Valve)
31- Load Check Valve (Swing Circuit)
32- Arm 1 Flow Rate Control Valve (Selector Valve)
33- Load Check Valve (Arm Regenerative Circuit)
34- Arm Anti-Drift Valve (Selector Valve)
35- Overload Relief Valve (Arm: Bottom Side)
36- Arm Anti-Drift Valve (Check Valve)
37- Overload Relief Valve (Arm: Rod Side)
38- Check Valve (Digging Regenerative Circuit)
39- Load Check Valve (Boom 2 Parallel Circuit)
40- Auxiliary Flow Rate Control Valve (Poppet Valve)
41- Auxiliary Flow Rate Control Valve (Selector Valve)
42- Load Check Valve (Travel (Left) Tandem Circuit)



TDCD-03-03-029

b - Pilot Pressure from Flow Combiner Valve Control Spool

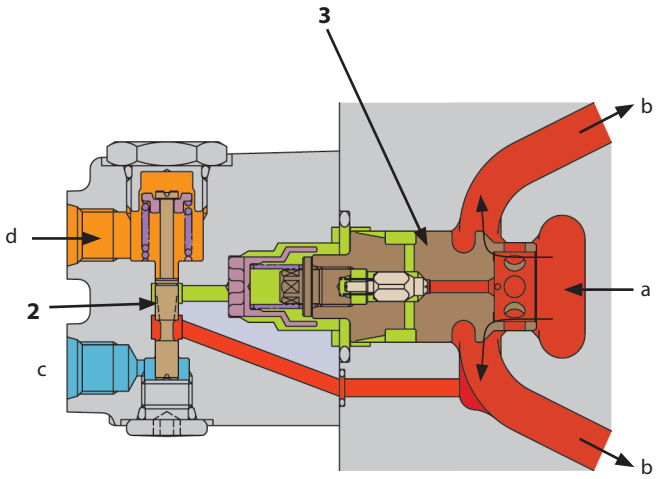
1- Spool (Flow Combiner Valve)
2- Spring
3- Travel Motor (Left)
4- Travel (Left) Spool
5- Travel (Right) Spool
6- Travel Motor (Right)
7- Arm 2 Spool
8- Pump 1
9- Pump 2
10- Arm 1 Spool
11- Arm Cylinder



TDCD-03-03-005

b - Returning Oil from Cylinder (1) Rod Side
c - Pressure Oil to Cylinder (1) Bottom Side
2 - Check Valve
3 - Bucket Spool
4 - Hole

During Flow Rate Control Operation



TDCD-03-03-015

a - Pressure Oil from Pump 2
b - To Arm 1 Spool
c - To Hydraulic Oil Tank
d - Pilot Pressure from Signal Control Valve
2 - Selector Valve
3 - Poppet Valve

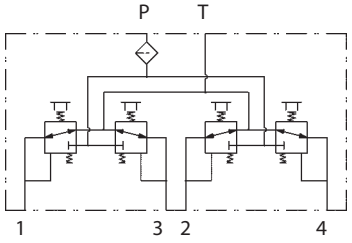
Outline

The pilot valve controls pilot pressure oil in order to move the spool in the control valve.
The pilot valve outputs pressure according to the control lever stroke by PPC (Pressure Proportional Control Valve) function and moves the spool in the control valve.
The 4-port pilot valves for front attachment / swing and for travel are standard.
The 2-port pilot valve is for auxiliary (optional).

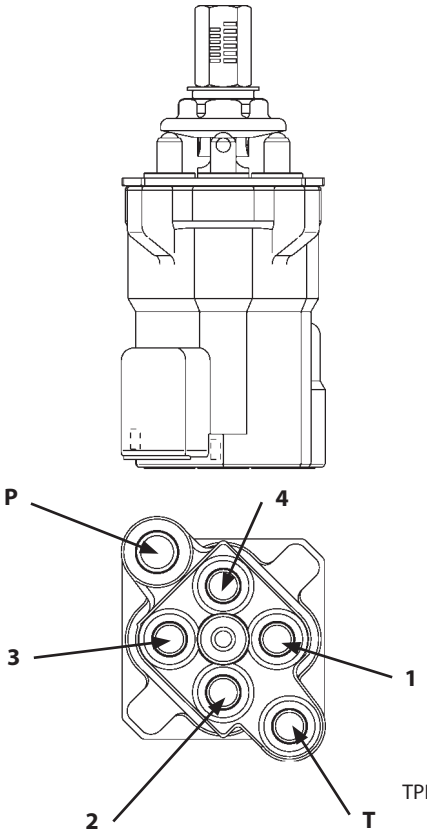
- Front Attachment / Swing Pilot Valve

	Port No.	ISO Control Pattern	Hitachi Pattern
Right	1	Bucket Roll-Out	←
	2	Boom Lower	←
	3	Bucket Roll-In	←
	4	Boom Raise	←
Left	1	Swing (Right)	Arm Roll-In
	2	Arm Roll- Out	Swing (Right)
	3	Swing (Left)	Arm Roll- Out
	4	Arm Roll-In	Swing (Left)

Hydraulic Symbol



TPPP-03-04-002



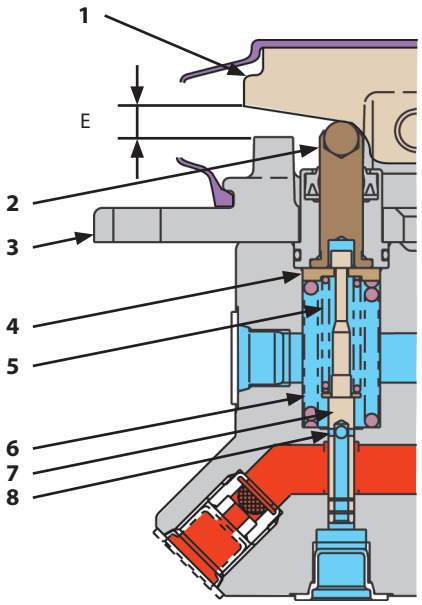
TPPP-03-04-001

P- Port P (Pressure Oil from Pilot Pump)
T- Port T (To Hydraulic Oil Tank)

Operation (Auxiliary Pilot Valve)

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 (E) of cam (1).

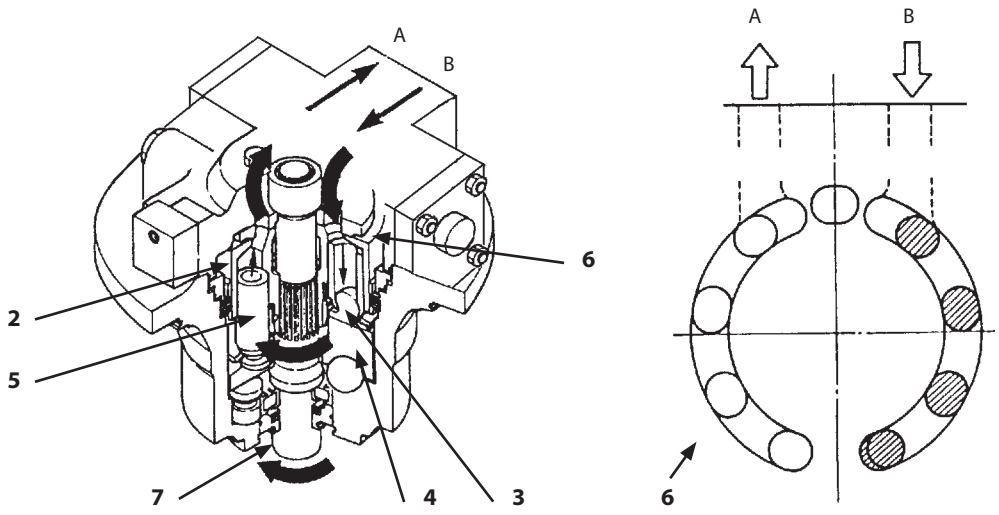


TDAA-03-04-001

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

Operation

1. Pressure oil flows to port B in valve plate (6), enters one side in rotor (2), and pushes plunger (5).
2. This force and inclination of swash plate (4) make shoe (3) slide on swash plate (4) in order to rotate rotor (2) and output shaft (7).
3. As rotor (2) rotates, when plungers (5) reach port A, pressure oil is returned to the hydraulic oil tank.
4. Whether forward travel or reverse travel depends on whether pressure oil is supplied to port A or port B.



T183-03-05-009

A- Port A (Pressure oil from main pump or returning oil to hydraulic oil tank)

B- Port B (Pressure oil from main pump or returning oil to hydraulic oil tank)

2- Rotor

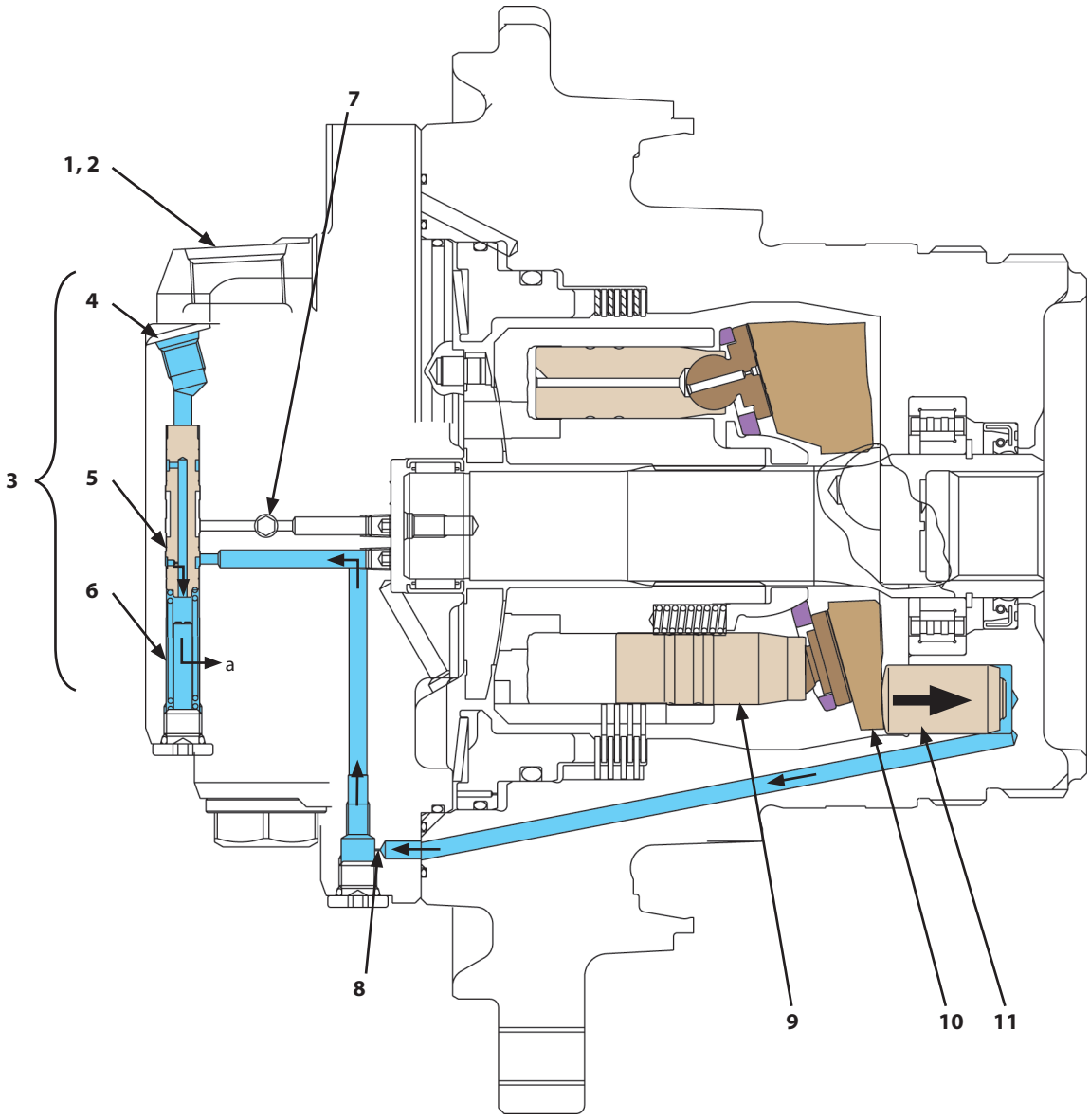
3- Shoe

4- Swash Plate

5- Plunger

6- Valve Plate

7- Output Shaft



TDAA-03-05-006

a- To Drain

1- Motor Port BM
2- Motor Port AM
3- Travel Motor Displacement Angle Control Valve
4- Pilot Port
5- Spool
6- Spring
7- Piston Control Shuttle Valve
8- Orifice (for slow / fast speed)
9- Plunger
10- Swash Plate
11- Piston

Shuttle Valve

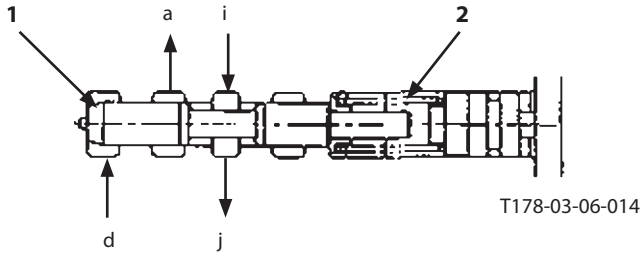
The shuttle valve selects pilot pressure used to perform each operation and routes pilot pressure to the corresponding control valves and/or control spools. The spools corresponding to each operation are as follows:

	Pump 1 Flow Rate Control Valve	Pump 2 Flow Rate Control Valve	Bucket Flow Rate Control Valve Control Spool	Flow Combiner Valve Control Spool	Swing Parking Brake Release Spool	Arm 1 Flow Rate Control Valve Control Spool
Boom Raise	○	○	-	-	○	-
Boom Lower	○	-	-	-	○	-
Arm Roll-Out	○	○	-	-	○	-
Arm Roll-In	○	○	○	-	○	○
Bucket Roll-In	○	-	-	-	○	-
Bucket Roll-Out	○	-	-	-	○	-
Swing (Right)	-	○	-	-	○	-
Swing (Left)	-	○	-	-	○	-
Travel (Right)	○	-	-	○	-	-
Travel (Left)	-	○	-	-	-	-
Auxiliary	*○	○	-	-	○	-

*NOTE: *: As for the machine with attachment (pulverizers 1 to 5 and crushers 1 to 5) equipped, the pump 1 flow rate control valve is operated by pressure from the auxiliary pilot valve.*

- The arm 1 flow rate control valve control spool is shifted by arm roll-in pilot pressure and supplies swing pilot pressure to the arm 1 flow rate control valve in control valve.

Arm 1 Flow Rate Control Valve Control Spool:



a- To Hydraulic Oil Tank
d- Arm Roll-In Pilot Pressure
i- Swing Pilot Pressure
j- To Arm 1 Flow Rate Control Valve
1- Spool
2- Spring