

PART NO. TOLAB50-EN-00

HITACHI

Reliable solutions

Technical Manual

Operational Principle

ZX

140W-6

Wheeled Excavator

ZX140W-6 WHEELED EXCAVATOR TECHNICAL MANUAL OPERATIONAL PRINCIPLE

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

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

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TOLAB50-EN-00

Service Manual consists of the following separate Part No.

Technical Manual (Operational Principle)	: Vol. No.TOLAB50-EN
Technical Manual (Troubleshooting)	: Vol. No.TTLAB50-EN
Workshop Manual	: Vol. No.WLAB50-EN
Engine Manual	: Vol. No.ETLAB50-EN, EWLAB50-EN

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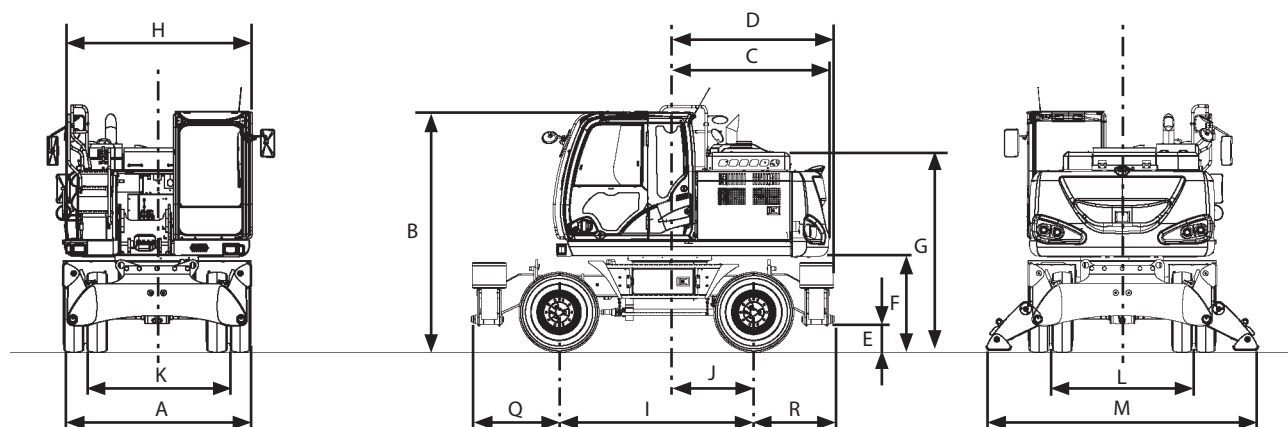
SYMBOL AND ABBREVIATION

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.

SECTION 1 GENERAL

Group 1 Specifications

Specifications ZX140W-6 (Front Outrigger Rear Outrigger)



MLAB-12-005

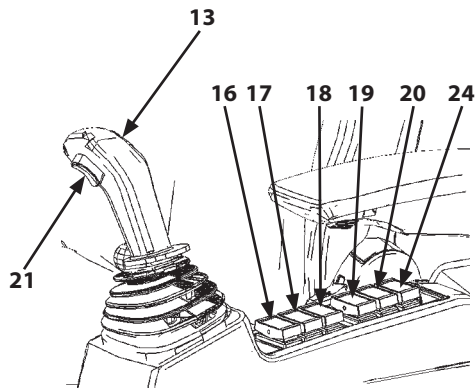
Type of Front-End Attachment		Monoblock Boom	2-Piece Boom
Type of Arm	–	2.52 m	2.52 m
Bucket Capacity (Heaped)		PCSA 0.50 m ³ , CECE 0.45 m ³	
Operating Weight	kg	16400	16800
Base Machine Weight	kg	14000	14000
Engine		DEUTZ TCD 4.1L4	
Engine Power	SAE J1349 net ISO 9249 net EEC 80/1269 net	100 kW/2000 min ⁻¹ (136 PS/2000 rpm)	
A: Overall Width (Excluding Rearview Mirrors)	mm	2490	
B: Cab Height	mm	3130	
C: Rear End Swing Radius	mm	2120	
D: Rear End Length	mm	2160	
E: Minimum Ground Clearance	mm	320	
F: Counterweight Clearance	mm	1215	
G: Engine Cover Height	mm	2710	
H: Overall Width of Upperstructure	mm	2480	
I: Wheelbase	mm	2550	
J: Swing-center to Rear Axle	mm	1100	
K: Front Wheel Tread	mm	1875	
L: Rear Wheel Tread	mm	1875	
M: Outrigger Spread	mm	3380	
N: Max. Raising Height	mm	–	
O: Max. Digging Depth	mm	–	
P: Blade Height	mm	–	
Q: Front Axle to Front of Chassis	mm	1150	
R: Rear Axle to Rear of Chassis	mm	1060	
Tire Size	–	10.00-20 14PR	
Swing Speed	min ⁻¹ (rpm)	11.9	
Travel Speed (Fast/Slow/Creeper) *	km/h	35/8.6/2.2	
Gradeability	Degree (%)	35 (70)	

 NOTE: * The specification not matching the local regulation is excluded.

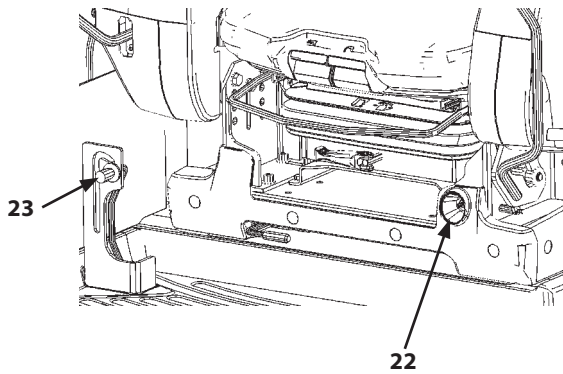
SECTION 1 GENERAL

Group 2 Component Layout

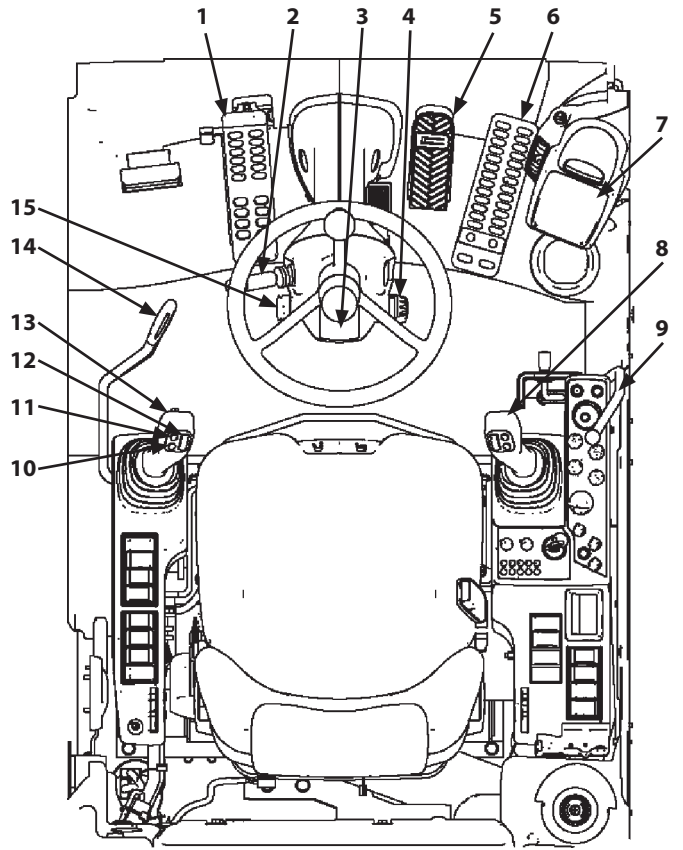
Electrical System (Cab)



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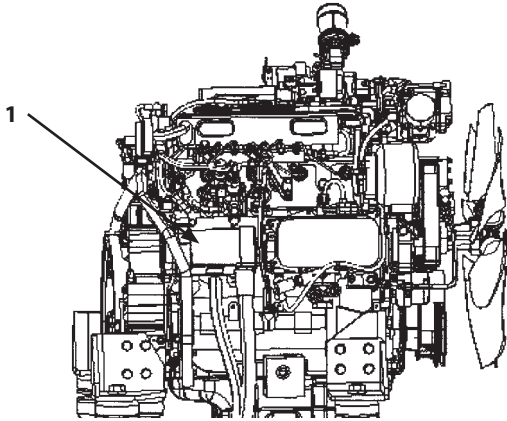
- | | | | |
|--|--|---|---|
| 1- Auxiliary/Positioning Pedal (Option) | 4- Brake Switch | 13- Left Control Lever | 20- Blade/Outrigger Left-Right Selection Switch |
| 2- Combination Switch | 5- Brake Pedal | 14- Pilot Shut-Off Lever | 21- FNR Switch |
| · Turn Signal Switch | 6- Accelerator Pedal | 15- Horn Switch | 22- Engine Stop Switch |
| · Light Switch | 7- Monitor | 16- Electrical Control Main Switch (Option) | 23- Swing Lock Lever |
| · Dimmer Switch | 8- Right Control Lever | 17- Hazard Switch | 24- Seat Heater Switch |
| · Passing Switch | 9- Blade/Outrigger Lever | 18- Blade/Outrigger Selection Switch | |
| 3- Components Related with Column Display (Refer to T1-2-9.) | 10- Horn Switch | 19- Blade/Outrigger Front-Rear Selection Switch | |
| | 11- Auxiliary/Positioning Pedal Selection Switch | | |
| | 12- Attachment Switch (Option) | | |

SECTION 1 GENERAL

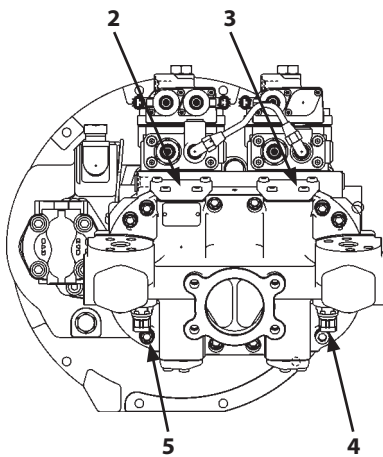
Group 2 Component Layout

Pump Device

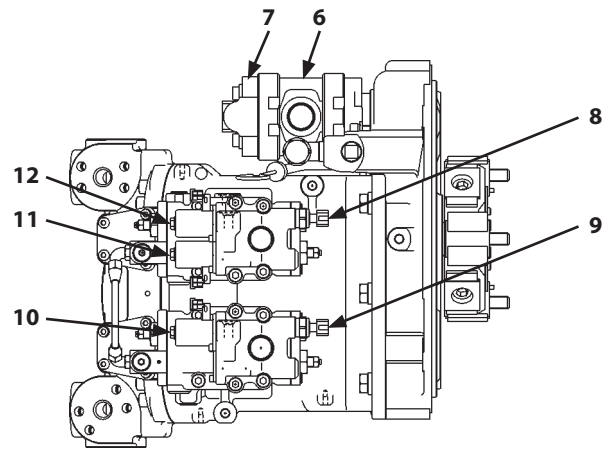
Engine (Front Side)



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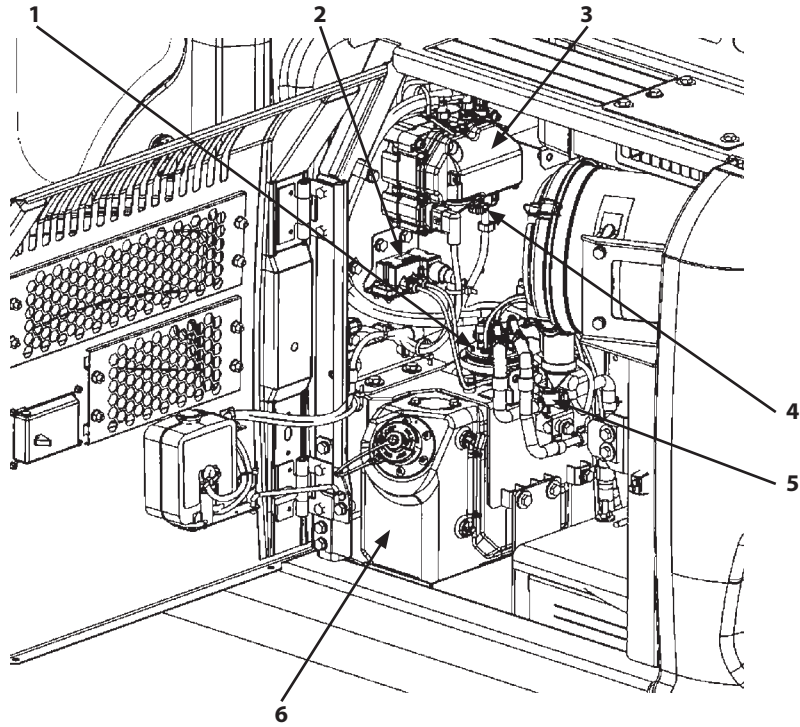
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|---------------------------------------|--------------------------------------|--|
| 1- Pilot Pump | 6- Steering Pump | 10- Maximum Pump 1 Flow Rate
Limit Control Solenoid Valve |
| 2- Pump 2 | 7- Assist Pump (Option) | 11- Torque Control Solenoid Valve |
| 3- Pump 1 | 8- Pump 2 Control Pressure
Sensor | 12- Maximum Pump 2 Flow Rate
Limit Control Solenoid Valve |
| 4- Pump 1 Delivery Pressure
Sensor | 9- Pump 1 Control Pressure
Sensor | |
| 5- Pump 2 Delivery Pressure
Sensor | | |

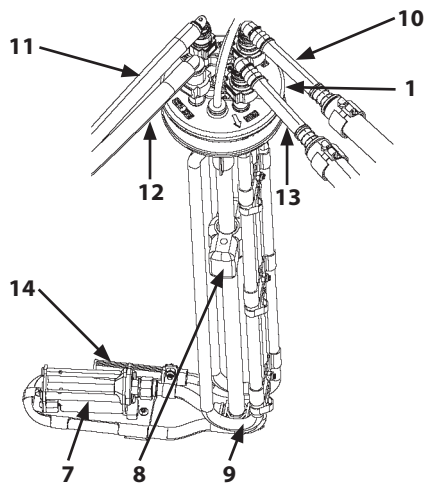
SECTION 1 GENERAL

Group 2 Component Layout

Around DEF Tank



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|----------------------------------|--------------------------------|--------------------------------------|
| 1- DEF Sensor Unit | 6- DEF Tank | 11- DEF Hose (For Suction) |
| 2- DEF Sensor Unit Controller | 7- DEF Quality Sensor | 12- DEF Hose (Returning to DEF Tank) |
| 3- DEF Supply Module | 8- DEF Tank Level Sensor | 13- Coolant Hose (To Engine) |
| 4- DEF Supply Module Main Filter | 9- DEF Tank Temperature Sensor | 14- Filter |
| 5- Coolant Control Valve | 10- Coolant Hose (From Engine) | |

SECTION 1 GENERAL
Group 3 Component Specifications

SWING DEVICE	Type	Two-Stage Reduction Planetary Gear
	Reduction Gear Ratio	16.155
SWING MOTOR	Type	Swash-Plate Type, Fixed Displacement Axial Plunger Motor
	Theoretical Displacement	72.0 cm ³ /rev
VALVE UNIT	Type	Non Counterbalance Valve Type
	Relief Set-Pressure	32.3 MPa at 105 L/min
SWING PARKING BRAKE	Type	Wet-Type Spring Set Hydraulic Released Multi-Disc Brake
	Release Pressure	1.72 MPa
TRAVEL MOTOR	Type	Bent-Axis Type Variable Displacement Axial Plunger Motor
	Maximum Flow (Theoretical Value) (Fast/Slow)	54.8/140 cm ³ /rev (Travel Speed 35 km/h Spec. Machine) 94.5/140 cm ³ /rev (Travel Speed 20 km/h Spec. Machine)
TRAVEL BRAKE VALVE	Type	Counterbalance Valve Type
	Relief Set-Pressure	42 MPa
TRANSMISSION	Type	2-Axis Planetary Gear Reduction
	Reduction Gear Ratio	Fast: 1.19 Slow: 4.87


SECTION 2 SYSTEM

Group 1 Controller

Outline

The following controllers are provided in this machine in order to control the function. Each controller excluding the communication controller communicates by using the CAN circuit and sends or receives the required signal.

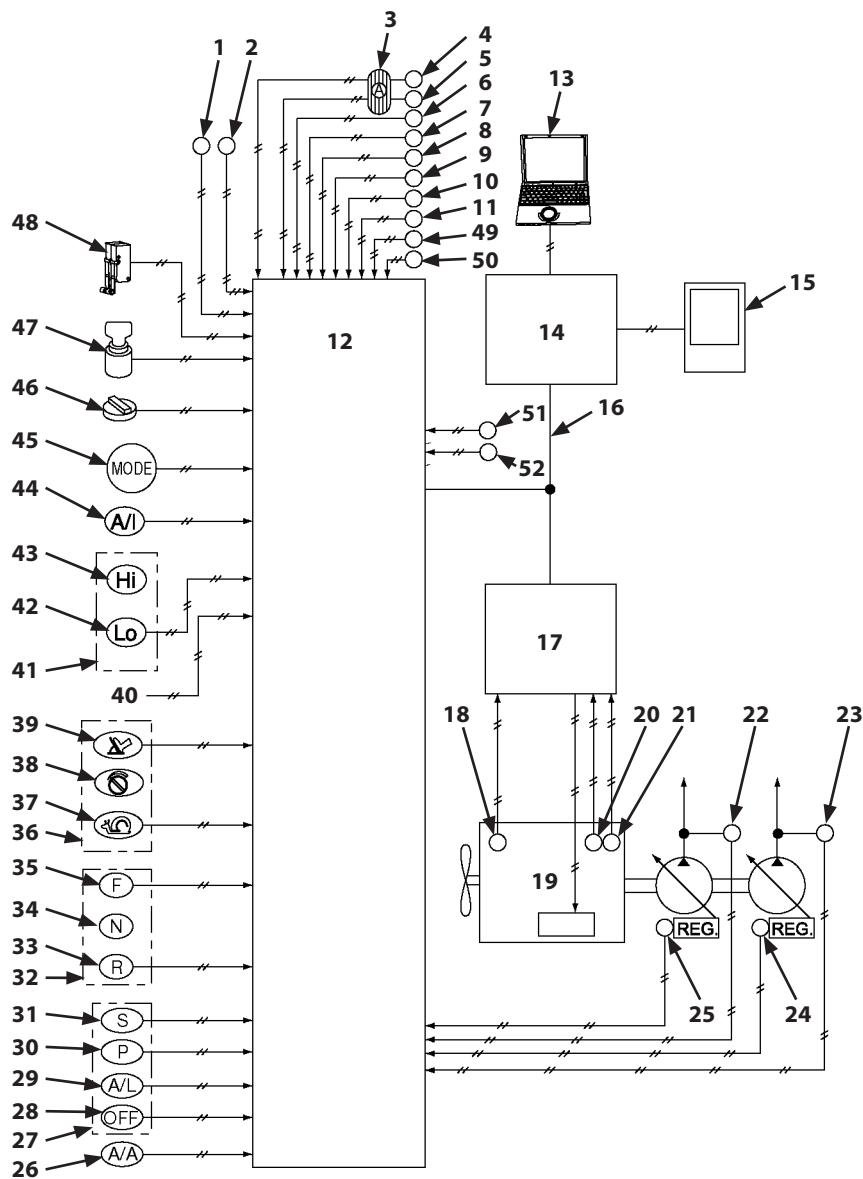
Controller	Control	Explanation of Control
MC1	MC1 controls the engine, pumps, and valves.	T2-2
MC2	MC2 controls the valves and other devices.	T2-2
ECM	ECM controls the actual engine speed, amount of urea water injection, and other engine functions.	T2-3
Monitor Controller	The monitor controller displays the operating information and alarms on the monitor.	T5-2
Wiper/Light Controller	The wiper/light controller controls the wipers, work lights, and other devices.	T2-5
Air Conditioner Controller	The air conditioner controller controls the air conditioner.	T2-5, T5-7
Radio Controller	The radio controller controls the radio.	T2-5
Communication Controller	The communication controller sends email and operating information.	T5-3

 **NOTE:** Refer to the corresponding group for details of each controller control.

SECTION 2 SYSTEM

Group 2 Control System

Engine Control System Layout

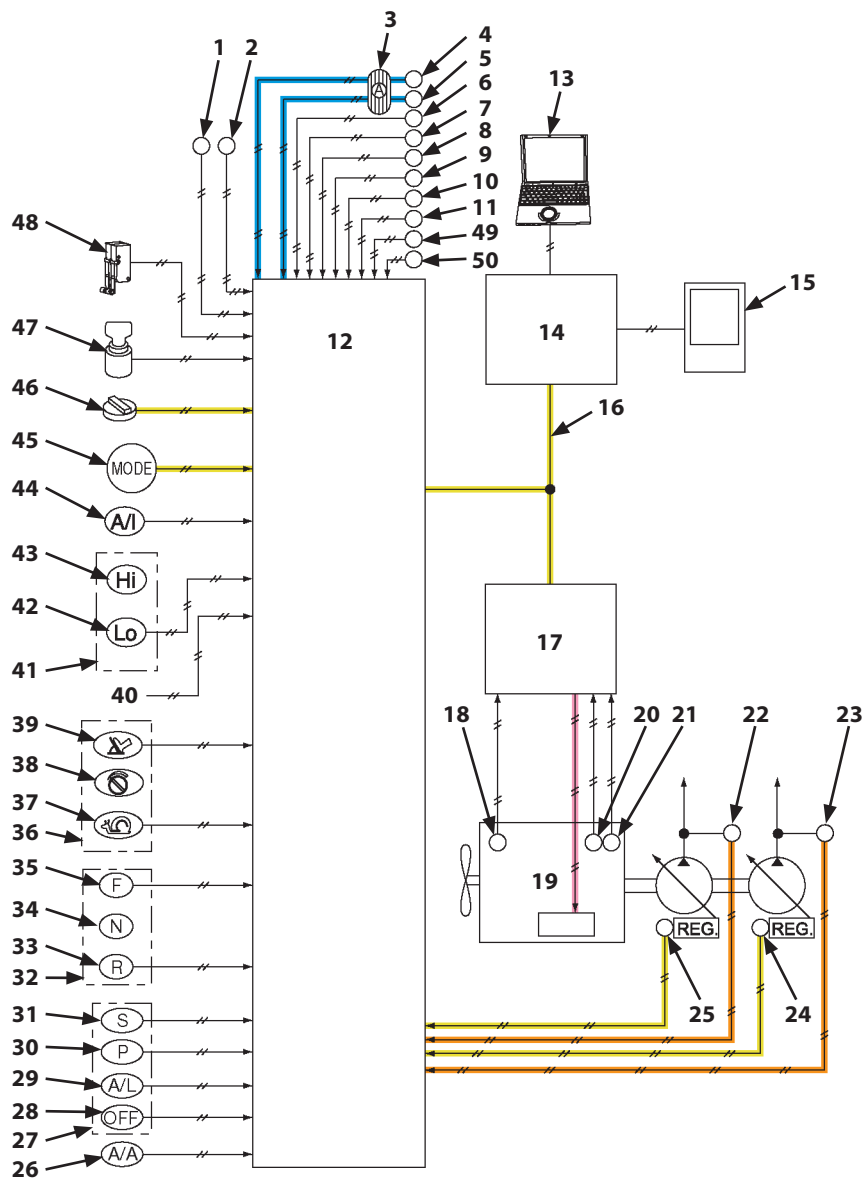


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|---------------------------------------|-------------------------------------|--|---------------------------------------|
| 1- Hydraulic Oil Temperature Sensor 1 | 12- MC1 | 25- Pump 2 Control Pressure Sensor | 39- Pedal Mode Position |
| 2- Travel N Sensor | 13- MPDr. | 26- Auto Axle Lock Switch | 40- Auto Shut-Down Signal |
| 3- Accelerator Pedal | 14- Monitor Controller | 27- Brake Switch | 41- Travel Mode Switch |
| 4- Pressure Sensor (Travel Forward) | 15- Monitor | 28- OFF Position | 42- Slow Speed Position |
| 5- Pressure Sensor (Travel Reverse) | 16- CAN | 29- Axle Lock Position | 43- Fast Speed Position |
| 6- Pressure Sensor (Boom Raise) | 17- ECM | 30- Parking Brake Position | 44- Auto-Idle Switch |
| 7- Pressure Sensor (Arm Roll-In) | 18- Coolant Temperature Sensor | 31- Work Brake Position | 45- Power Mode Switch |
| 8- Pressure Sensor (Front Attachment) | 19- Engine | 32- FNR Switch | 46- Engine Control Dial |
| 9- Pressure Sensor (Swing) | 20- Cam Angle Sensor | 33- Reverse Position | 47- Key Switch |
| 10- Pressure Sensor (Auxiliary (OP)) | 21- Crank Speed Sensor | 34- Neutral Position | 48- Pilot Shut-Off Switch |
| 11- Pressure Sensor (Arm Roll-Out) | 22- Pump 2 Delivery Pressure Sensor | 35- Forward Position | 49- Pressure Sensor (Bucket Roll-In) |
| | 23- Pump 1 Delivery Pressure Sensor | 36- Engine Speed Control Mode Selection Switch | 50- Pressure Sensor (Bucket Roll-Out) |
| | 24- Pump 1 Control Pressure Sensor | 37- Creeper Mode Position | 51- Brake Pressure Sensor |
| | | 38- Dial Mode Position | 52- Work Brake Release Switch |

SECTION 2 SYSTEM

Group 2 Control System

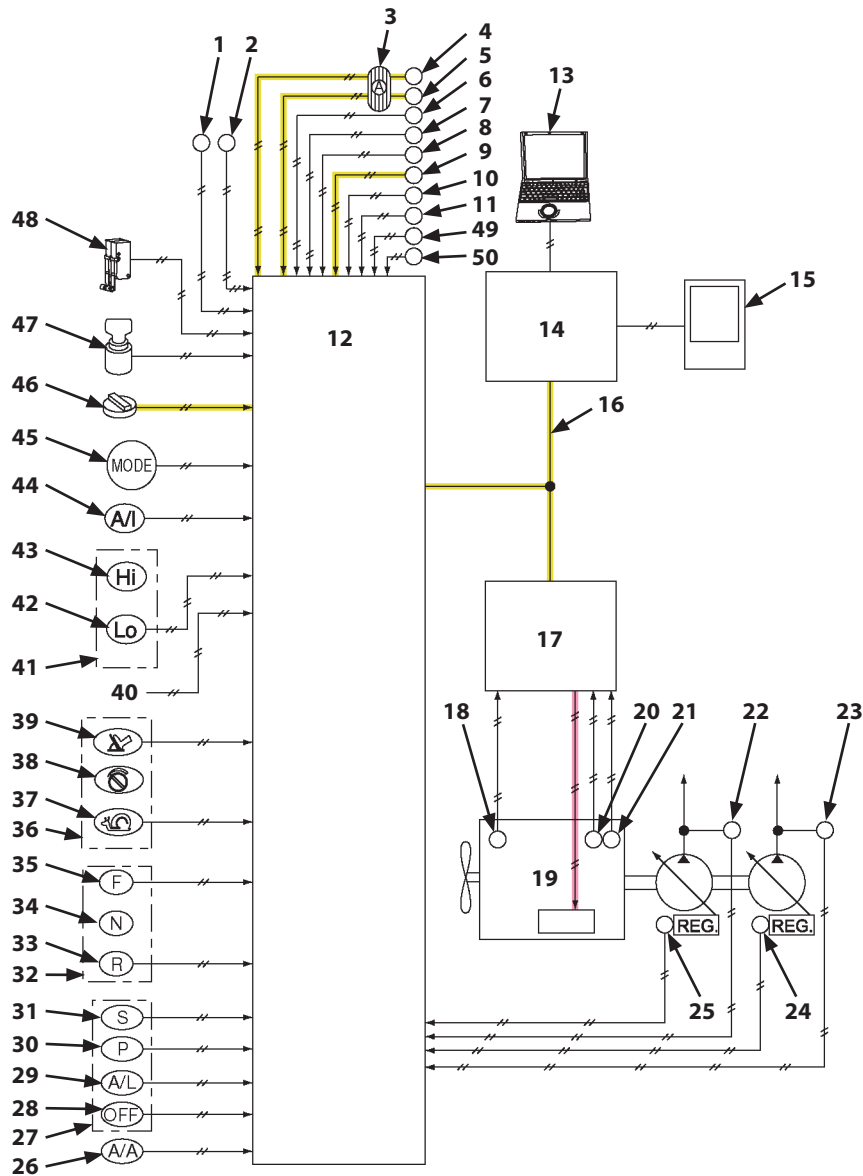


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|---------------------------------------|-------------------------------------|--|---------------------------------------|
| 1- Hydraulic Oil Temperature Sensor 1 | 12- MC1 | 25- Pump 2 Control Pressure Sensor | 39- Pedal Mode Position |
| 2- Travel N Sensor | 13- MPDr. | 26- Auto Axle Lock Switch | 40- Auto Shut-Down Signal |
| 3- Accelerator Pedal | 14- Monitor Controller | 27- Brake Switch | 41- Travel Mode Switch |
| 4- Pressure Sensor (Travel Forward) | 15- Monitor | 28- OFF Position | 42- Slow Speed Position |
| 5- Pressure Sensor (Travel Reverse) | 16- CAN | 29- Axle Lock Position | 43- Fast Speed Position |
| 6- Pressure Sensor (Boom Raise) | 17- ECM | 30- Parking Brake Position | 44- Auto-Idle Switch |
| 7- Pressure Sensor (Arm Roll-In) | 18- Coolant Temperature Sensor | 31- Work Brake Position | 45- Power Mode Switch |
| 8- Pressure Sensor (Front Attachment) | 19- Engine | 32- FNR Switch | 46- Engine Control Dial |
| 9- Pressure Sensor (Swing) | 20- Cam Angle Sensor | 33- Reverse Position | 47- Key Switch |
| 10- Pressure Sensor (Auxiliary) (OP) | 21- Crank Speed Sensor | 34- Neutral Position | 48- Pilot Shut-Off Switch |
| 11- Pressure Sensor (Arm Roll-Out) | 22- Pump 2 Delivery Pressure Sensor | 35- Forward Position | 49- Pressure Sensor (Bucket Roll-In) |
| | 23- Pump 1 Delivery Pressure Sensor | 36- Engine Speed Control Mode Selection Switch | 50- Pressure Sensor (Bucket Roll-Out) |
| | 24- Pump 1 Control Pressure Sensor | 37- Creeper Mode Position | |
| | | 38- Dial Mode Position | |

SECTION 2 SYSTEM

Group 2 Control System



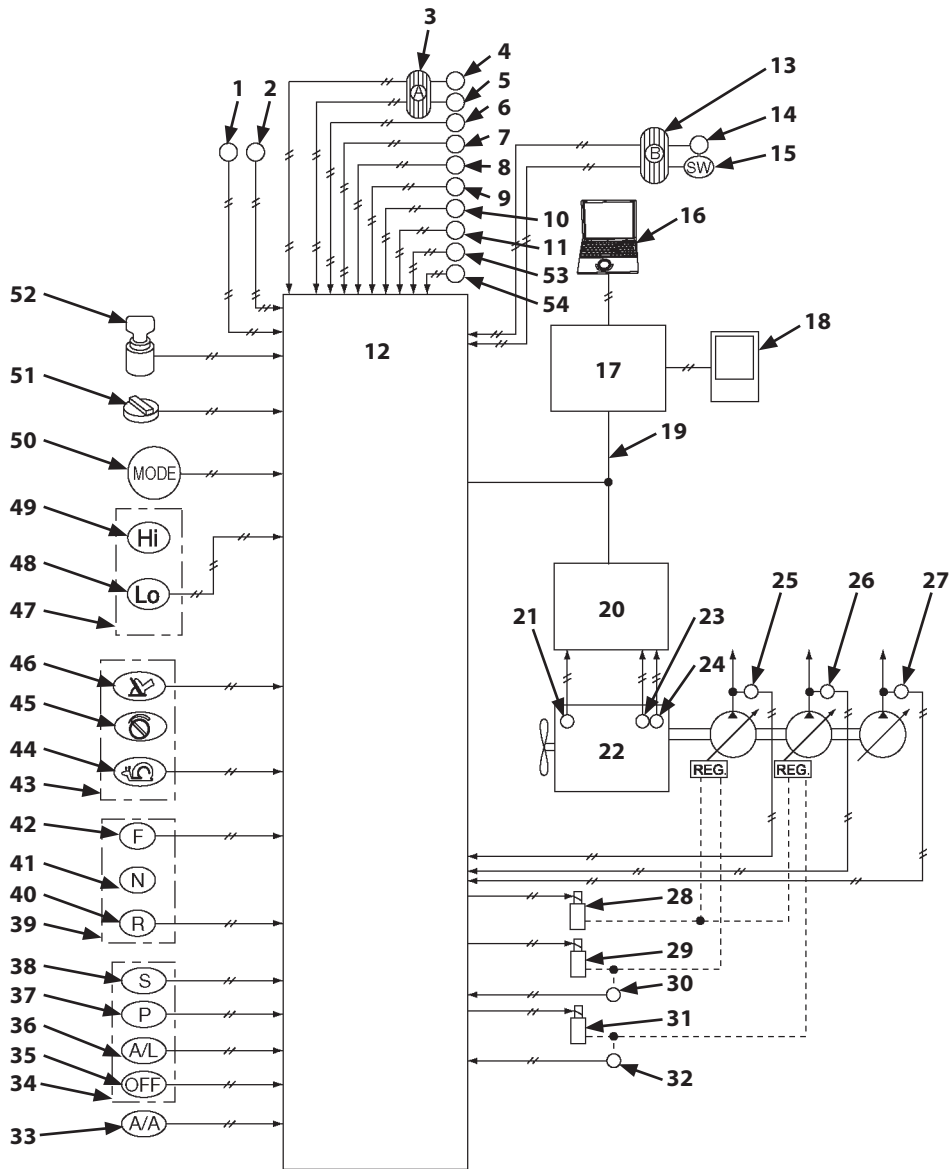
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|---------------------------------------|-------------------------------------|--|---------------------------------------|
| 1- Hydraulic Oil Temperature Sensor 1 | 12- MC1 | 25- Pump 2 Control Pressure Sensor | 39- Pedal Mode Position |
| 2- Travel N Sensor | 13- MPDr. | 26- Auto Axle Lock Switch | 40- Auto Shut-Down Signal |
| 3- Accelerator Pedal | 14- Monitor Controller | 27- Brake Switch | 41- Travel Mode Switch |
| 4- Pressure Sensor (Travel Forward) | 15- Monitor | 28- OFF Position | 42- Slow Speed Position |
| 5- Pressure Sensor (Travel Reverse) | 16- CAN | 29- Axle Lock Position | 43- Fast Speed Position |
| 6- Pressure Sensor (Boom Raise) | 17- ECM | 30- Parking Brake Position | 44- Auto-Idle Switch |
| 7- Pressure Sensor (Arm Roll-In) | 18- Coolant Temperature Sensor | 31- Work Brake Position | 45- Power Mode Switch |
| 8- Pressure Sensor (Front Attachment) | 19- Engine | 32- FNR Switch | 46- Engine Control Dial |
| 9- Pressure Sensor (Swing) | 20- Cam Angle Sensor | 33- Reverse Position | 47- Key Switch |
| 10- Pressure Sensor (Auxiliary) (OP) | 21- Crank Speed Sensor | 34- Neutral Position | 48- Pilot Shut-Off Switch |
| 11- Pressure Sensor (Arm Roll-Out) | 22- Pump 2 Delivery Pressure Sensor | 35- Forward Position | 49- Pressure Sensor (Bucket Roll-In) |
| | 23- Pump 1 Delivery Pressure Sensor | 36- Engine Speed Control Mode Selection Switch | 50- Pressure Sensor (Bucket Roll-Out) |
| | 24- Pump 1 Control Pressure Sensor | 37- Creeper Mode Position | |
| | | 38- Dial Mode Position | |

SECTION 2 SYSTEM

Group 2 Control System

Pump Control System Layout

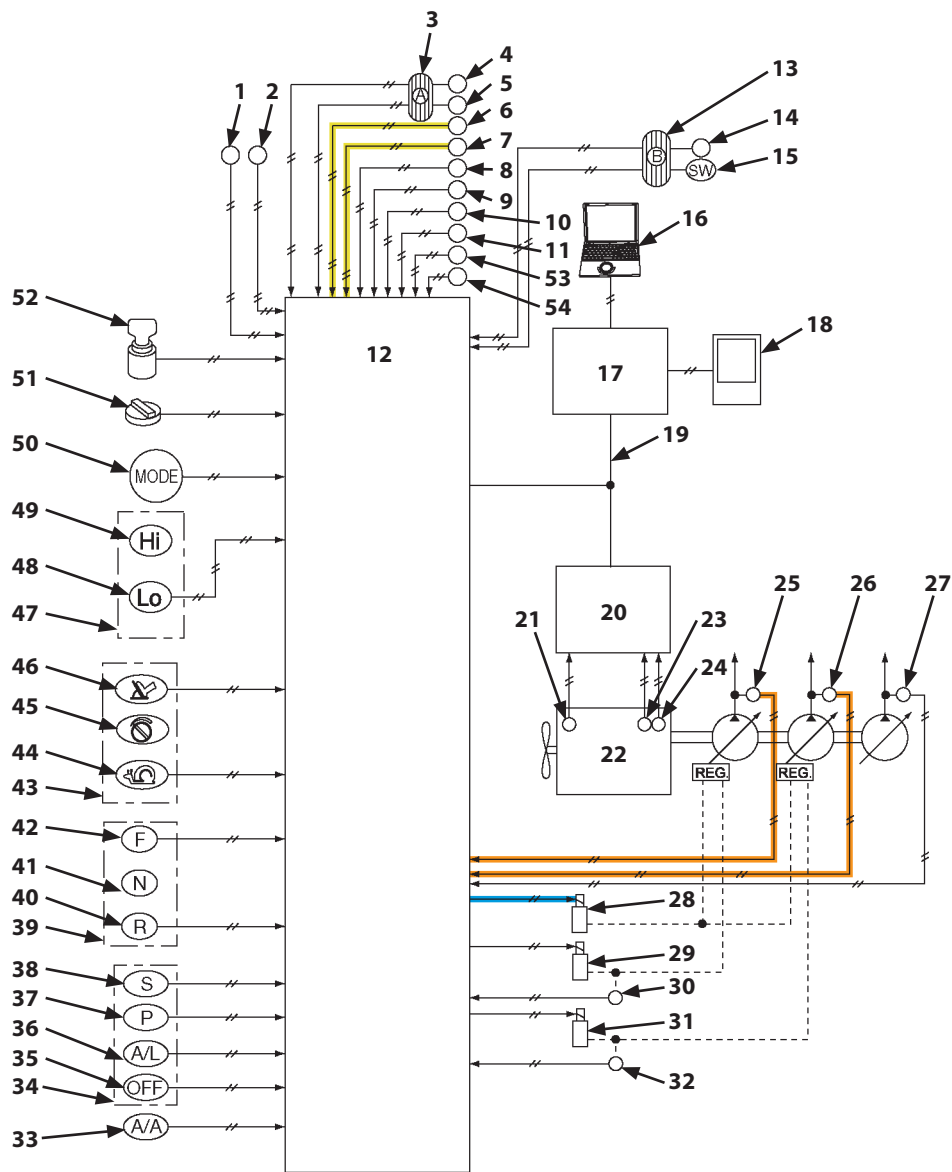


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|---------------------------------------|--|---|--|
| 1- Hydraulic Oil Temperature Sensor 1 | 14- Brake Pressure Sensor | 29- Maximum Pump 2 Flow Rate Limit Control Solenoid Valve | 43- Engine Speed Control Mode Selection Switch |
| 2- Travel N Sensor | 15- Work Brake Release Switch | 30- Pump 2 Control Pressure Sensor | 44- Creeper Mode Position |
| 3- Accelerator Pedal | 16- MPDr. | 31- Maximum Pump 1 Flow Rate Limit Control Solenoid Valve | 45- Dial Mode Position |
| 4- Pressure Sensor (Travel Forward) | 17- Monitor Controller | 32- Pump 1 Control Pressure Sensor | 46- Pedal Mode Position |
| 5- Pressure Sensor (Travel Reverse) | 18- Monitor | 33- Auto Axle Lock Switch | 47- Travel Mode Switch |
| 6- Pressure Sensor (Boom Raise) | 19- CAN | 34- Brake Switch | 48- Slow Speed Position |
| 7- Pressure Sensor (Arm Roll-In) | 20- ECM | 35- OFF Position | 49- Fast Speed Position |
| 8- Pressure Sensor (Front Attachment) | 21- Coolant Temperature Sensor | 36- Axle Lock Position | 50- Power Mode Switch |
| 9- Pressure Sensor (Swing) | 22- Engine | 37- Parking Brake Position | 51- Engine Control Dial |
| 10- Pressure Sensor (Auxiliary (OP)) | 23- Cam Angle Sensor | 38- Work Brake Position | 52- Key Switch |
| 11- Pressure Sensor (Arm Roll-Out) | 24- Crank Speed Sensor | 39- FNR Switch | 53- Pressure Sensor (Bucket Roll-In) |
| 12- MC1 | 25- Pump 2 Delivery Pressure Sensor | 40- Reverse Position | 54- Pressure Sensor (Bucket Roll-Out) |
| 13- Brake Pedal | 26- Pump 1 Delivery Pressure Sensor | 41- Neutral Position | |
| | 27- Steering Pump Delivery Pressure Sensor | 42- Forward Position | |
| | 28- Torque Control Solenoid Valve | | |

SECTION 2 SYSTEM

Group 2 Control System

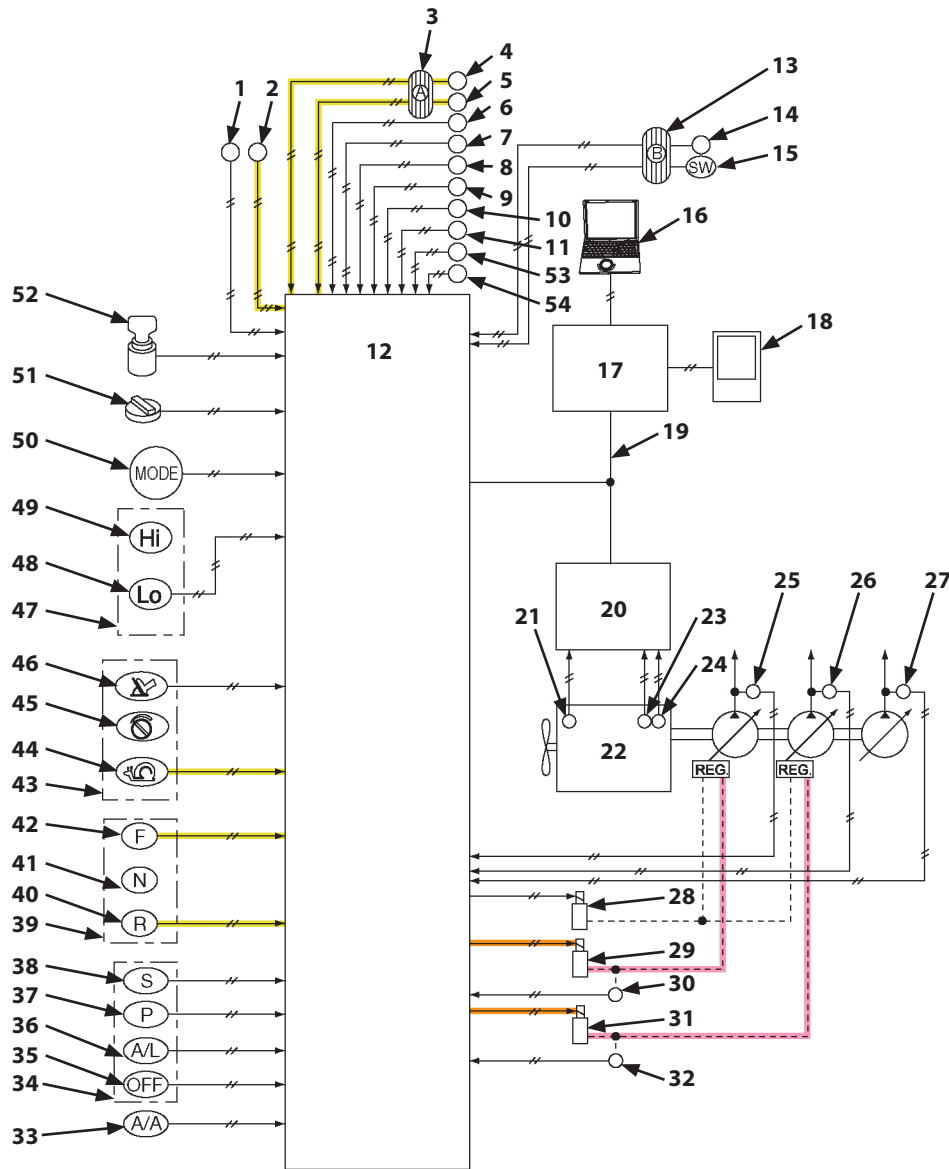


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|---------------------------------------|--|---|--|
| 1- Hydraulic Oil Temperature Sensor 1 | 14- Brake Pressure Sensor | 29- Maximum Pump 2 Flow Rate Limit Control Solenoid Valve | 43- Engine Speed Control Mode Selection Switch |
| 2- Travel N Sensor | 15- Work Brake Release Switch | 30- Pump 2 Control Pressure Sensor | 44- Creeper Mode Position |
| 3- Accelerator Pedal | 16- MPDr. | 31- Maximum Pump 1 Flow Rate Limit Control Solenoid Valve | 45- Dial Mode Position |
| 4- Pressure Sensor (Travel Forward) | 17- Monitor Controller | 32- Pump 1 Control Pressure Sensor | 46- Pedal Mode Position |
| 5- Pressure Sensor (Travel Reverse) | 18- Monitor | | 47- Travel Mode Switch |
| 6- Pressure Sensor (Boom Raise) | 19- CAN | | 48- Slow Speed Position |
| 7- Pressure Sensor (Arm Roll-In) | 20- ECM | | 49- Fast Speed Position |
| 8- Pressure Sensor (Front Attachment) | 21- Coolant Temperature Sensor | | 50- Power Mode Switch |
| 9- Pressure Sensor (Swing) | 22- Engine | | 51- Engine Control Dial |
| 10- Pressure Sensor (Auxiliary (OP)) | 23- Cam Angle Sensor | | 52- Key Switch |
| 11- Pressure Sensor (Arm Roll-Out) | 24- Crank Speed Sensor | | 53- Pressure Sensor (Bucket Roll-In) |
| 12- MC1 | 25- Pump 2 Delivery Pressure Sensor | | 54- Pressure Sensor (Bucket Roll-Out) |
| 13- Brake Pedal | 26- Pump 1 Delivery Pressure Sensor | | |
| | 27- Steering Pump Delivery Pressure Sensor | | |
| | 28- Torque Control Solenoid Valve | | |
| | 33- Auto Axle Lock Switch | | |
| | 34- Brake Switch | | |
| | 35- OFF Position | | |
| | 36- Axle Lock Position | | |
| | 37- Parking Brake Position | | |
| | 38- Work Brake Position | | |
| | 39- FNR Switch | | |
| | 40- Reverse Position | | |
| | 41- Neutral Position | | |
| | 42- Forward Position | | |

SECTION 2 SYSTEM

Group 2 Control System



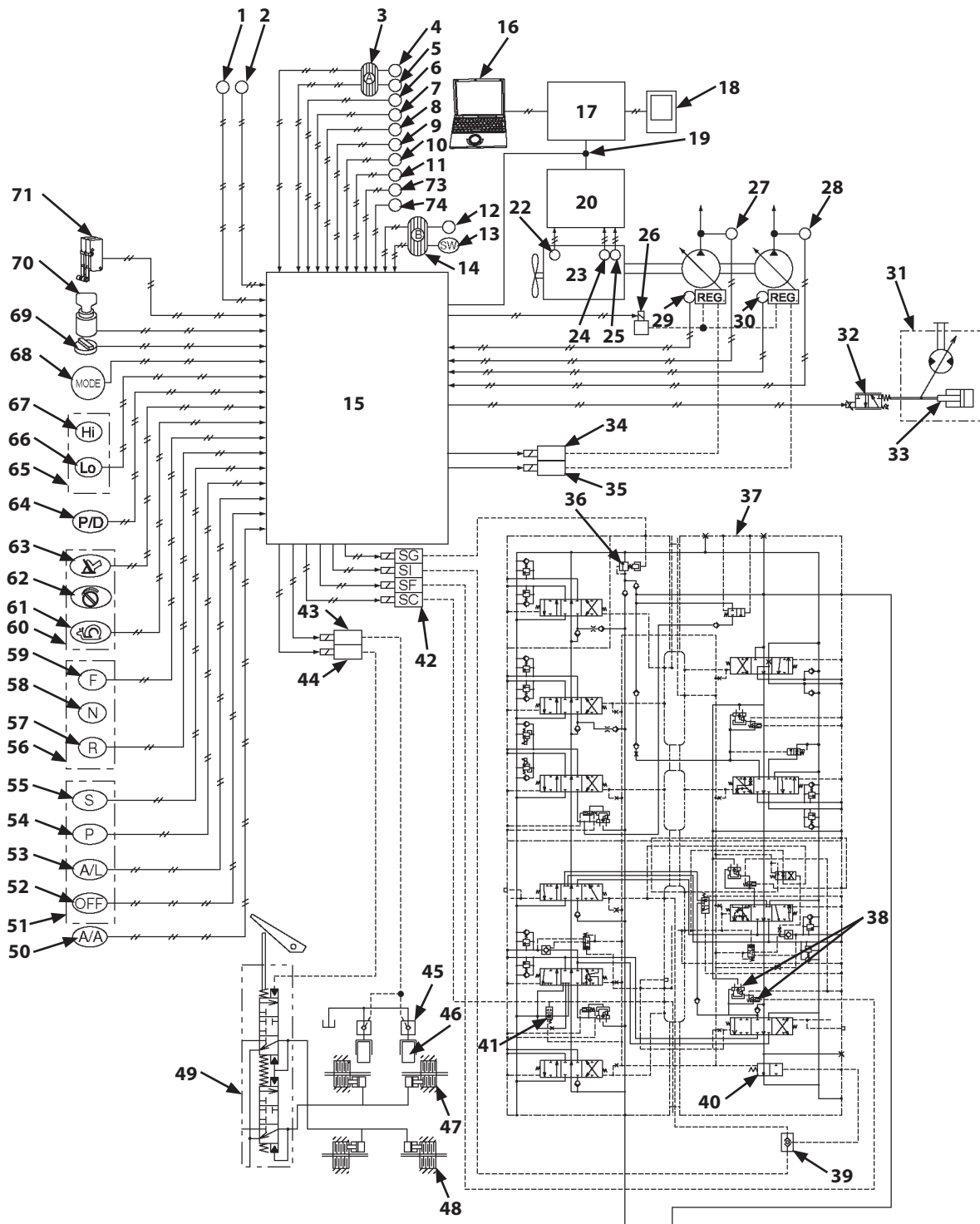
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|---------------------------------------|--|---|--|
| 1- Hydraulic Oil Temperature Sensor 1 | 14- Brake Pressure Sensor | 29- Maximum Pump 2 Flow Rate Limit Control Solenoid Valve | 43- Engine Speed Control Mode Selection Switch |
| 2- Travel N Sensor | 15- Work Brake Release Switch | 30- Pump 2 Control Pressure Sensor | 44- Creeper Mode Position |
| 3- Accelerator Pedal | 16- MPDr. | 31- Maximum Pump 1 Flow Rate Limit Control Solenoid Valve | 45- Dial Mode Position |
| 4- Pressure Sensor (Travel Forward) | 17- Monitor Controller | 32- Pump 1 Control Pressure Sensor | 46- Pedal Mode Position |
| 5- Pressure Sensor (Travel Reverse) | 18- Monitor | | 47- Travel Mode Switch |
| 6- Pressure Sensor (Boom Raise) | 19- CAN | 20- ECM | 48- Slow Speed Position |
| 7- Pressure Sensor (Arm Roll-In) | 20- ECM | 21- Coolant Temperature Sensor | 49- Fast Speed Position |
| 8- Pressure Sensor (Front Attachment) | 21- Coolant Temperature Sensor | 22- Engine | 50- Power Mode Switch |
| 9- Pressure Sensor (Swing) | 22- Engine | 23- Cam Angle Sensor | 51- Engine Control Dial |
| 10- Pressure Sensor (Auxiliary (OP)) | 23- Cam Angle Sensor | 24- Crank Speed Sensor | 52- Key Switch |
| 11- Pressure Sensor (Arm Roll-Out) | 24- Crank Speed Sensor | 25- Pump 2 Delivery Pressure Sensor | 53- Pressure Sensor (Bucket Roll-In) |
| 12- MC1 | 25- Pump 2 Delivery Pressure Sensor | 26- Pump 1 Delivery Pressure Sensor | 54- Pressure Sensor (Bucket Roll-Out) |
| 13- Brake Pedal | 26- Pump 1 Delivery Pressure Sensor | 27- Steering Pump Delivery Pressure Sensor | |
| | 27- Steering Pump Delivery Pressure Sensor | 28- Torque Control Solenoid Valve | |
| | 28- Torque Control Solenoid Valve | | |
| | | 40- Reverse Position | |
| | | 41- Neutral Position | |
| | | 42- Forward Position | |

SECTION 2 SYSTEM

Group 2 Control System

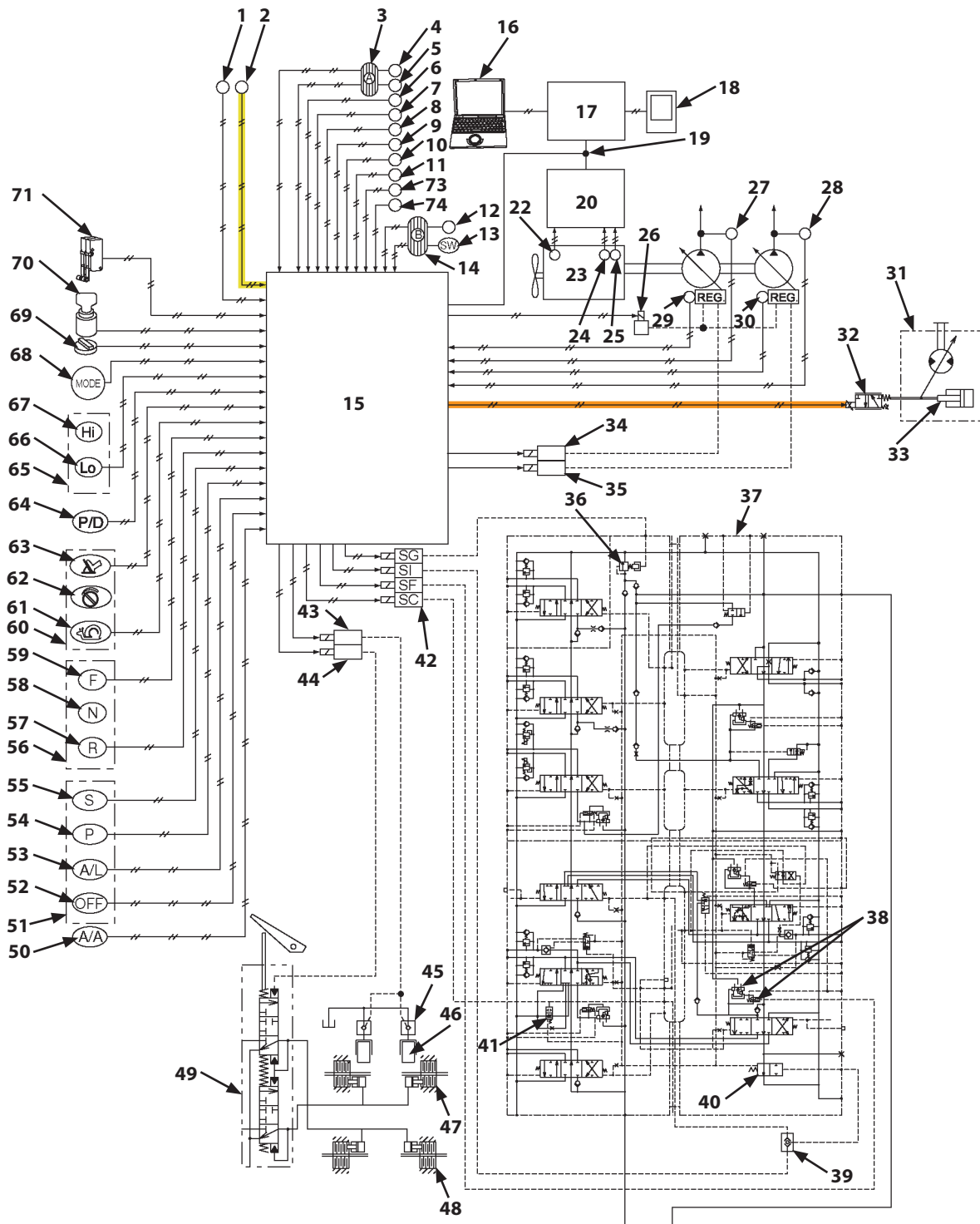
Valve Control (Standard) System Layout



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SECTION 2 SYSTEM

Group 2 Control System

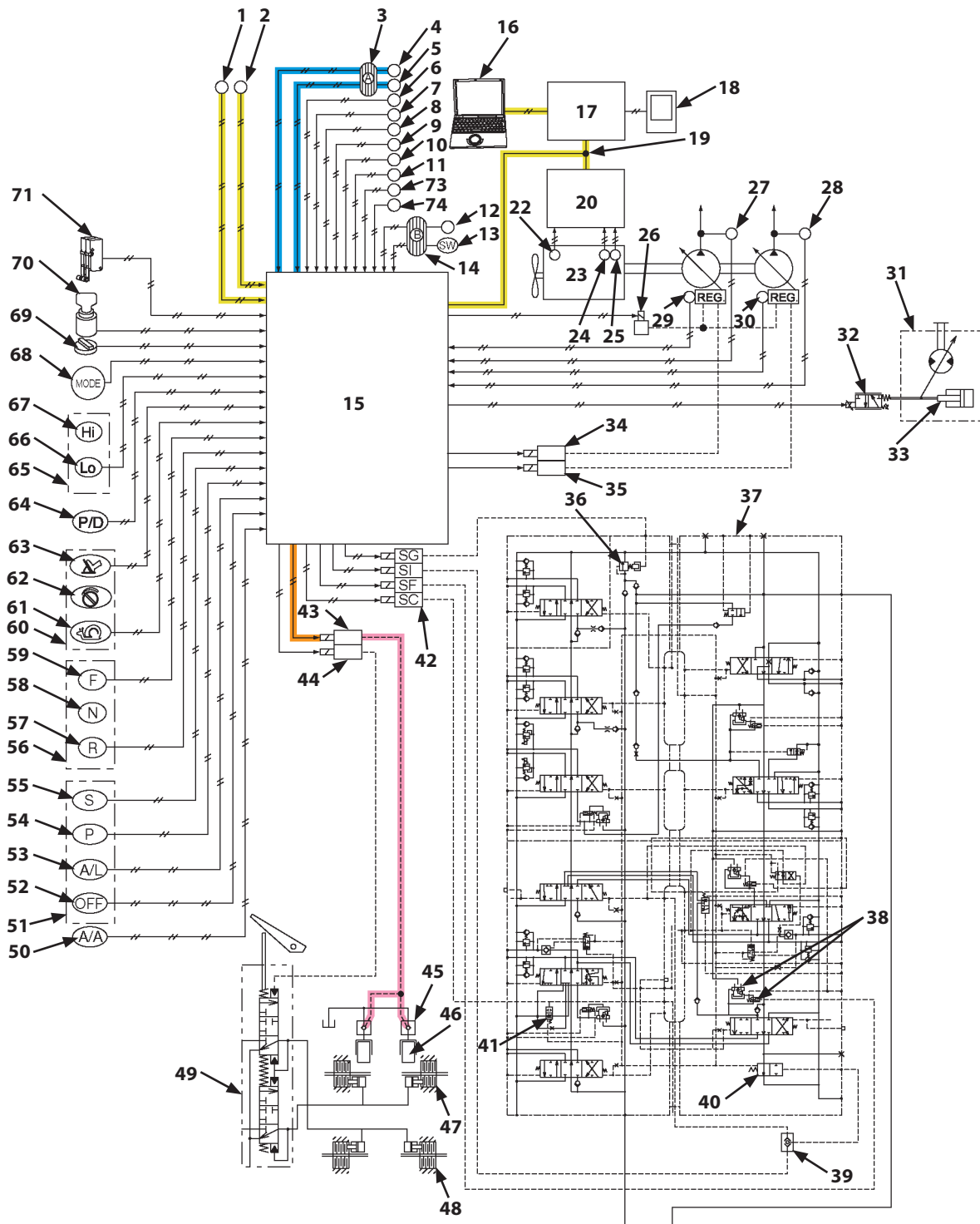


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- | | |
|--------------------|-------------------------------|
| 2- Travel N Sensor | 32- Travel Motor Displacement |
| 15- MC1 | Angle Control Solenoid Valve |
| 31- Travel Motor | 33- Servo Piston |

SECTION 2 SYSTEM

Group 2 Control System

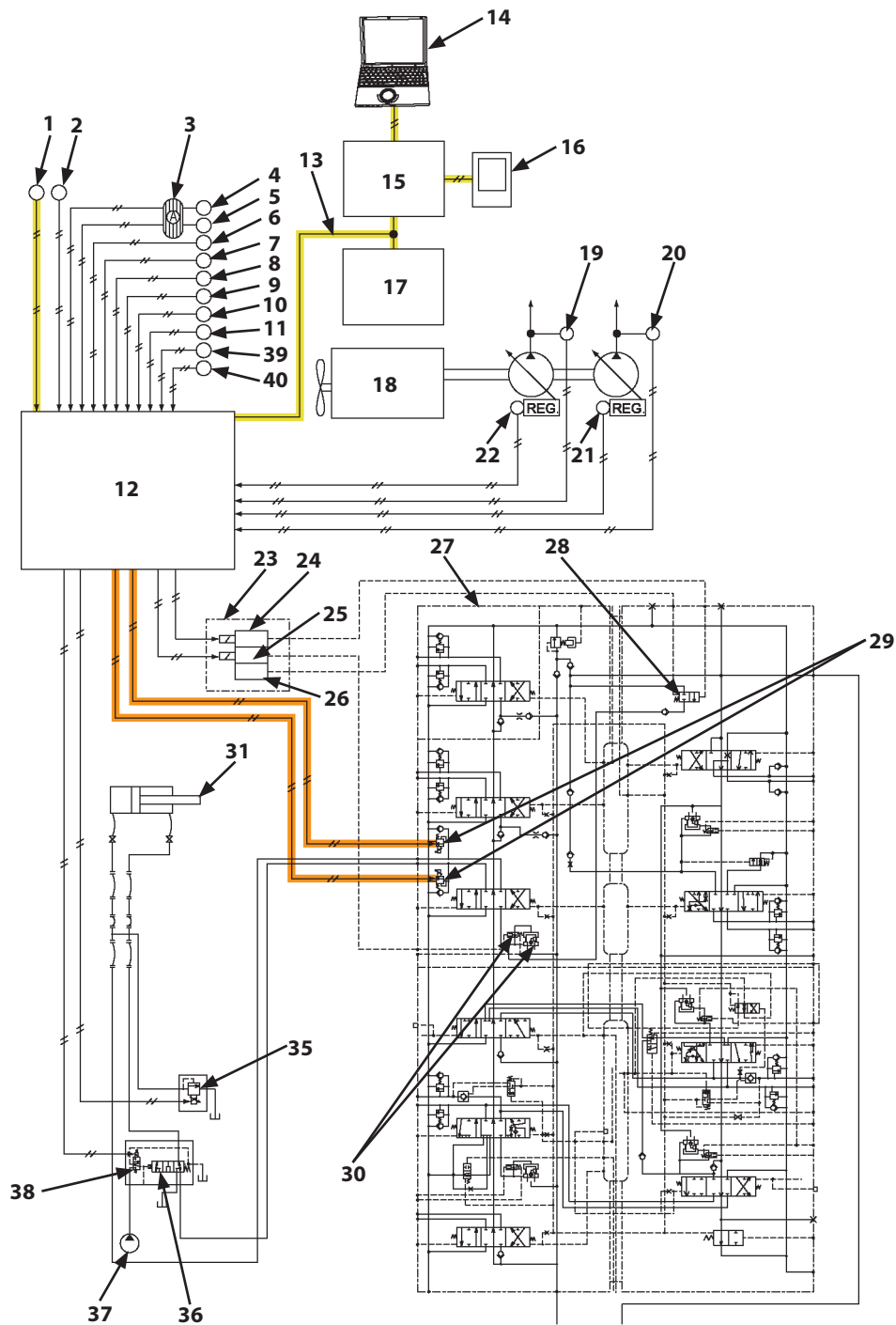


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|-------------------------------------|-------------------------------------|------------------------------|---------------------------|
| 2- Travel N Sensor | 5- Pressure Sensor (Travel Reverse) | 19- CAN | 50- Auto Axle Lock Switch |
| 3- Accelerator Pedal | 15- MC1 | 43- Axle Lock Solenoid Valve | 51- Brake Switch |
| 4- Pressure Sensor (Travel Forward) | 16- MPDr. | 45- Operate Check Valve | 52- OFF Position |
| | | 46- Axle Lock Cylinder | |

SECTION 2 SYSTEM

Group 2 Control System

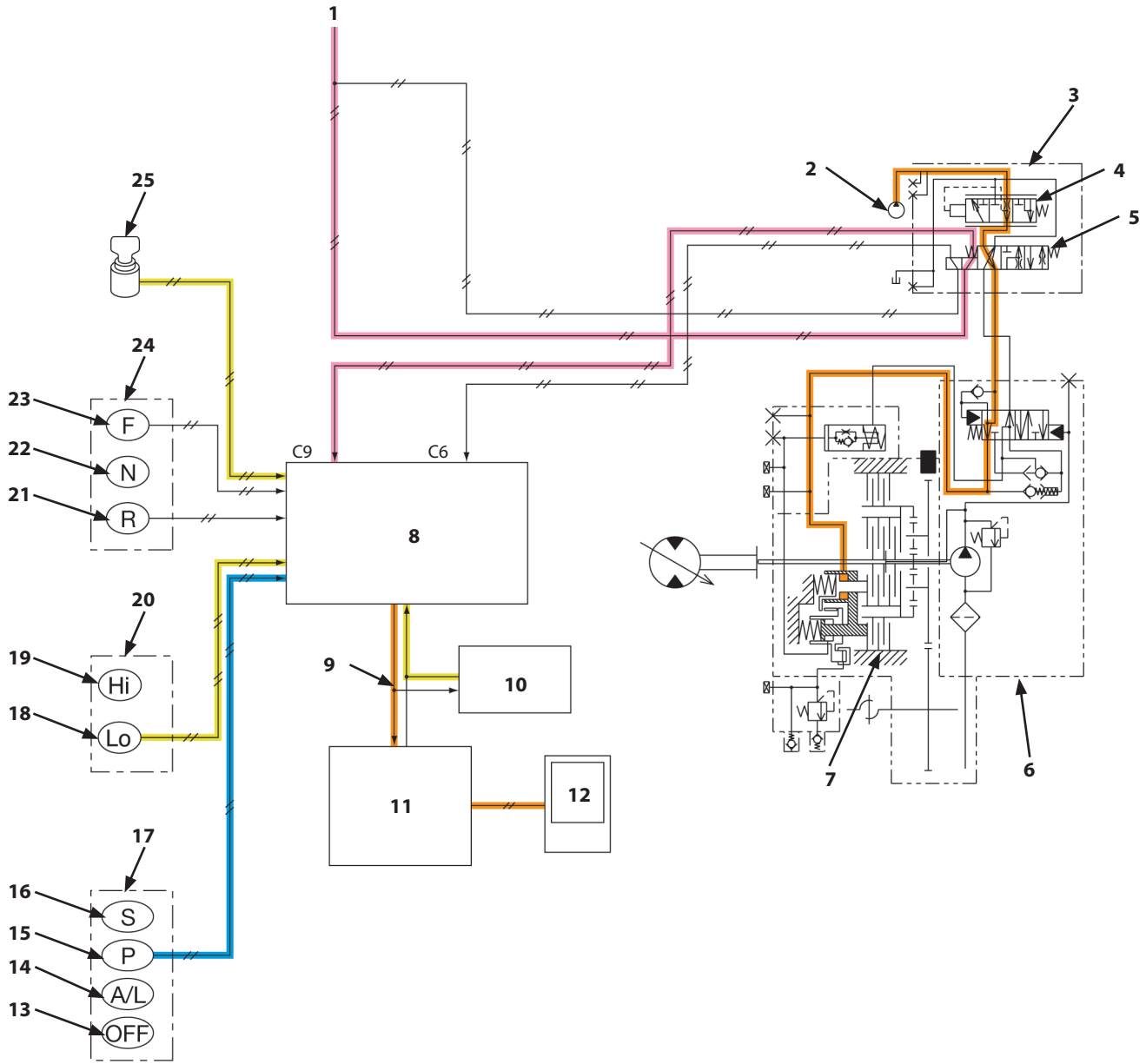


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|---------------------------------------|--------------------------------------|--|---|
| 1- Hydraulic Oil Temperature Sensor | 10- Pressure Sensor (Auxiliary) (OP) | 21- Pump 1 Control Pressure Sensor | 29- Overload Relief Valve (Auxiliary 1) |
| 2- Travel N Sensor | 11- Pressure Sensor (Arm Roll-Out) | 22- Pump 2 Control Pressure Sensor | 30- Auxiliary Flow Rate Control Valve |
| 3- Accelerator Pedal | 12- MC1 | 23- Auxiliary Control Solenoid Valve Unit | 31- Attachment |
| 4- Pressure Sensor (Travel Forward) | 13- CAN | 24- Auxiliary Flow Combiner Control Solenoid Valve | 35- Breaker Relief Solenoid Valve |
| 5- Pressure Sensor (Travel Reverse) | 14- MPDR | 25- Auxiliary Flow Rate Control Solenoid Valve | 36- Selector Valve |
| 6- Pressure Sensor (Boom Raise) | 15- Monitor Controller | 26- Reducing Valve | 37- Pilot Pump |
| 7- Pressure Sensor (Arm Roll-In) | 16- Monitor | 27- Control Valve | 38- Selector Valve Control Solenoid Valve |
| 8- Pressure Sensor (Front Attachment) | 17- ECM | 28- Auxiliary Flow Combiner Valve | 39- Pressure Sensor (Bucket Roll-In) |
| 9- Pressure Sensor (Swing) | 18- Engine | | 40- Pressure Sensor (Bucket Roll-Out) |
| | 19- Pump 2 Delivery Pressure Sensor | | |
| | 20- Pump 1 Delivery Pressure Sensor | | |

SECTION 2 SYSTEM

Group 2 Control System

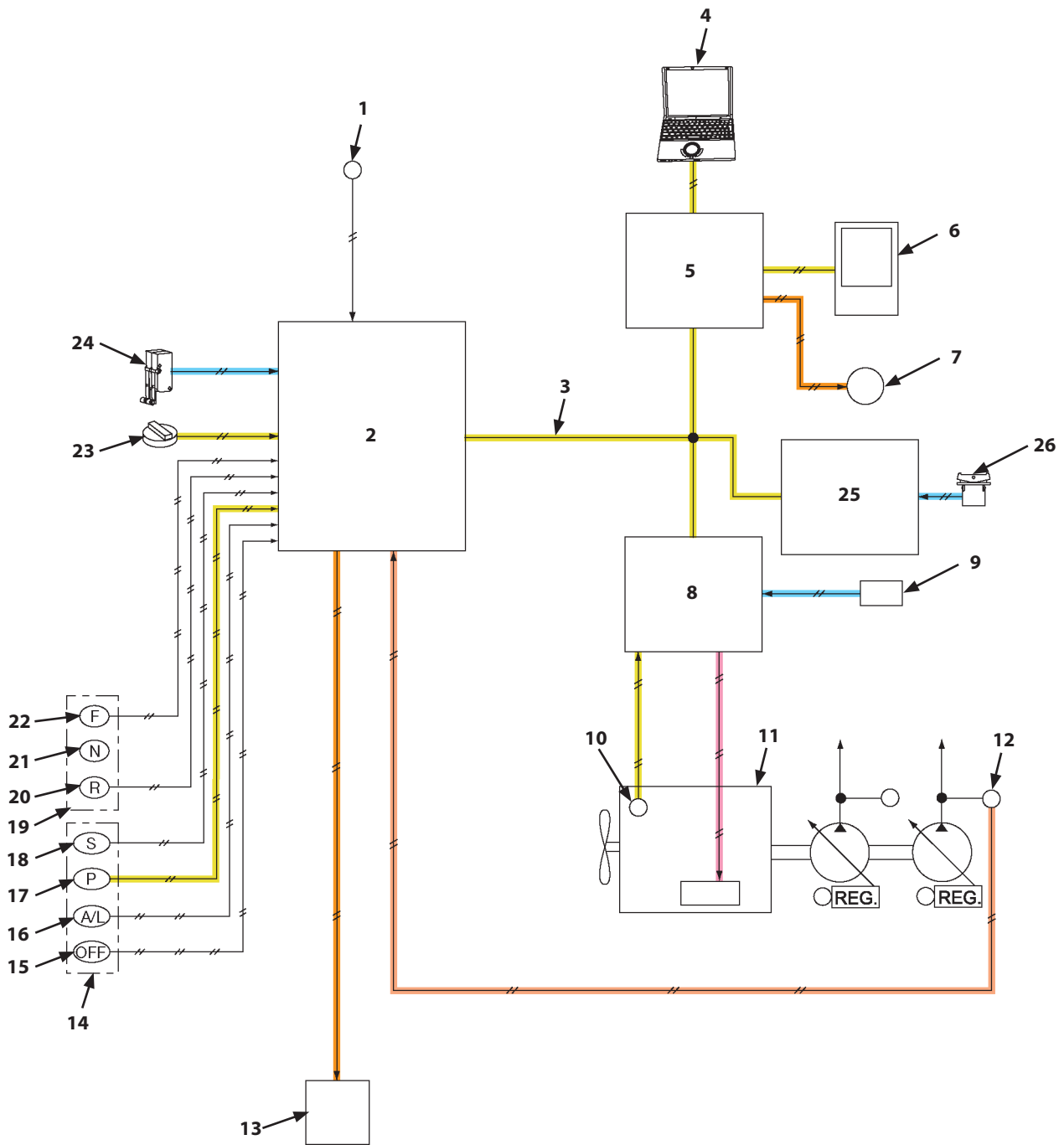


TLAA-02-02-404

- | | | | |
|--|------------------------|----------------------------|------------------------|
| 1- From Fuse #28 | 6- Transmission | 13- OFF Position | 20- Travel Mode Switch |
| 2- Pilot Pump | 7- Disc Brake | 14- Axle Lock Position | 21- Reverse Position |
| 3- Transmission Control Solenoid Valve | 8- MC1 | 15- Parking Brake Position | 22- Neutral Position |
| 4- Reducing Valve | 9- CAN | 16- Work Brake Position | 23- Forward Position |
| 5- Travel Mode Selector Solenoid Valve | 10- ECM | 17- Brake Switch | 24- FNR Switch |
| | 11- Monitor Controller | 18- Slow Speed Position | 25- Key Switch |
| | 12- Monitor | 19- Fast Speed Position | |

SECTION 2 SYSTEM

Group 2 Control System

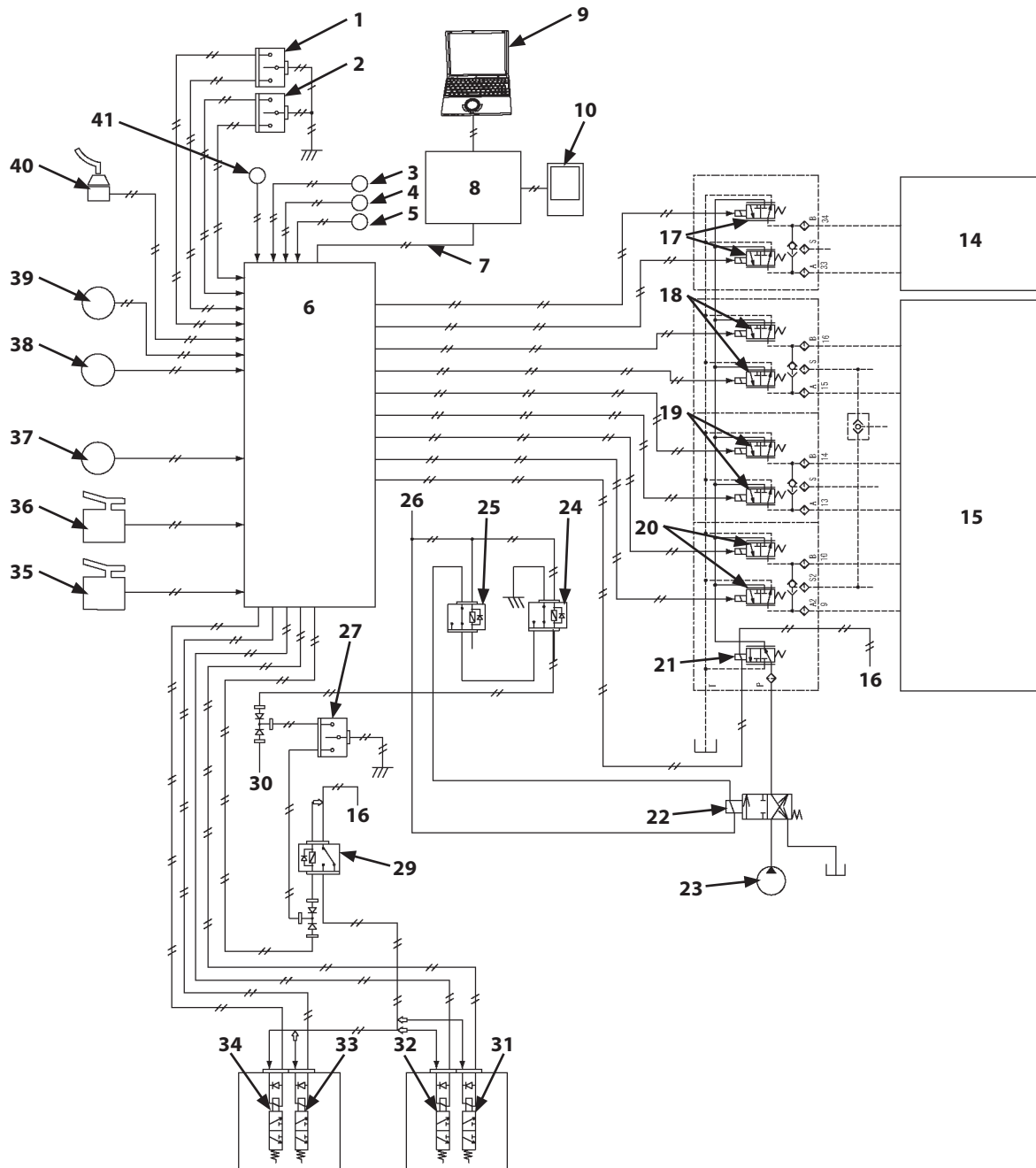


TLBE-02-02-408

- | | | | |
|-------------------------------------|-------------------------------------|----------------------------|---------------------------|
| 1- Hydraulic Oil Temperature Sensor | 7- Buzzer | 13- Auto Shut-Down Relay | 20- Reverse Position |
| 2- MC1 | 8- ECM | 14- Brake Switch | 21- Neutral Position |
| 3- CAN | 9- Manual Regeneration Switch | 15- OFF Position | 22- Forward Position |
| 4- MPDR. | 10- Coolant Temperature Sensor | 16- Axle Lock Position | 23- Engine Control Dial |
| 5- Monitor Controller | 11- Engine | 17- Parking Brake Position | 24- Pilot Shut-Off Switch |
| 6- Monitor | 12- Pump 1 Delivery Pressure Sensor | 18- Work Brake Position | 25- MC2 |
| | | 19- FNR Switch | 26- Overload Alarm Switch |

SECTION 2 SYSTEM

Group 2 Control System

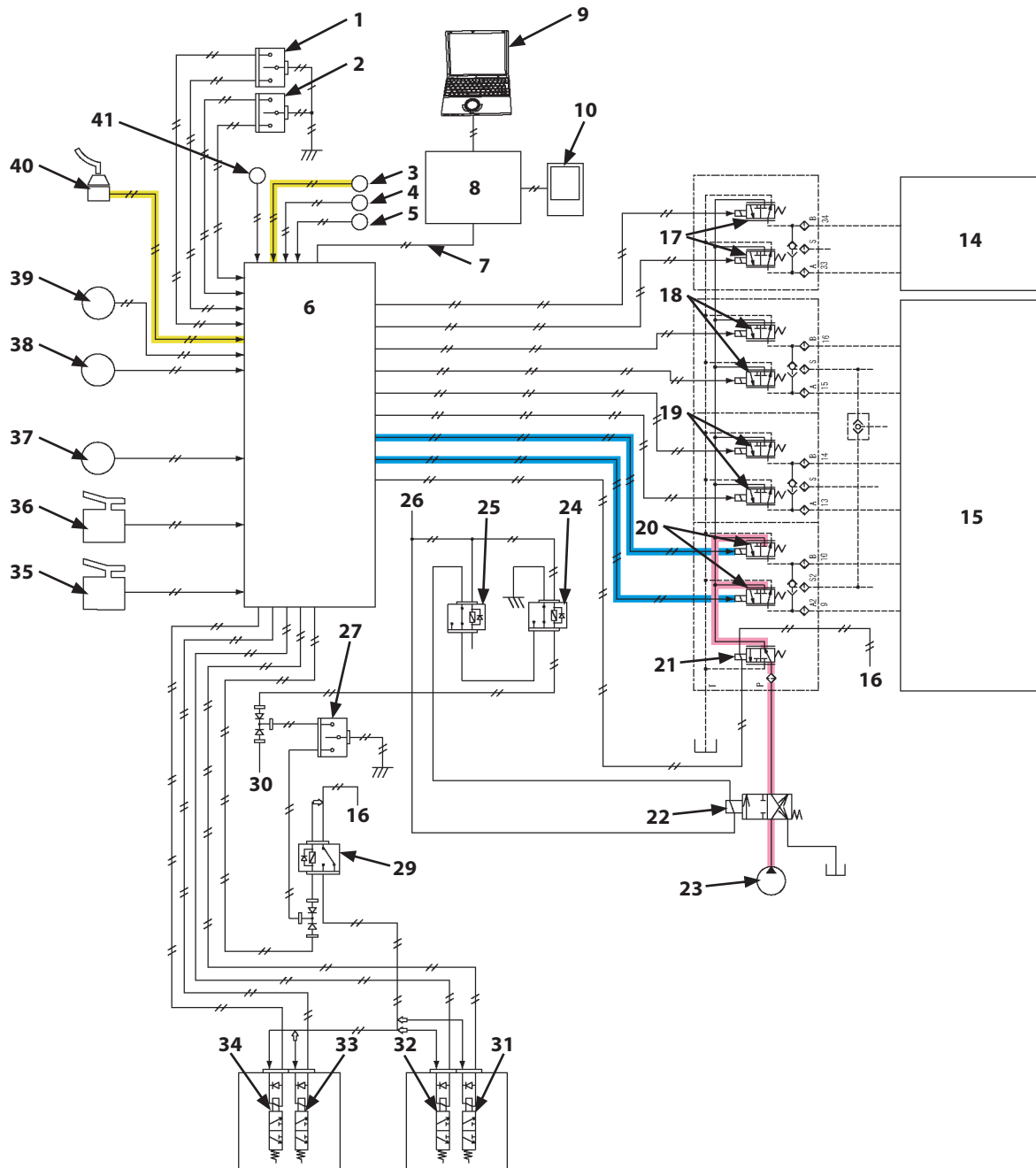


TLBE-02-02-501

- | | | | |
|--|------------------------------------|---|--|
| 1- Outrigger Left-Right Selection Switch | 10- Monitor | 24- Security Relay | 33- Outrigger Solenoid Valve (Front-Left) |
| 2- Outrigger Front-Rear Selection Switch | 14- Assist Control Valve | 25- Pilot Shut-Off Relay | 34- Outrigger Solenoid Valve (Front-Right) |
| 3- Pressure Sensor (Blade/Outrigger) | 15- Control Valve | 26- From Fuse #4 | 35- Auxiliary Pedal |
| 4- Pressure Sensor (Positioning) | 16- From Fuse #29 | 27- Blade/Outrigger Selector Switch | 36- Positioning Pedal |
| 5- Pressure Sensor (Assist) | 17- Assist Solenoid Valve | 29- Blade/Outrigger Relay | 37- Attachment Selection Switch |
| 6- MC2 | 18- Positioning Solenoid Valve | 30- To MC1 | 38- Assist Switch 2 (OP) |
| 7- CAN | 19- Auxiliary Solenoid Valve | 31- Outrigger Solenoid Valve (Rear-Left) | 39- Assist Switch (OP) |
| 8- Monitor Controller | 20- Blade/Outrigger Solenoid Valve | 32- Outrigger Solenoid Valve (Rear-Right) | 40- Blade/Outrigger Lever |
| 9- MPDr. | 21- Pilot Cut-Off Solenoid Valve | | 41- Pressure Sensor (Auxiliary) |
| | 22- Pilot Shut-Off Solenoid Valve | | |
| | 23- Pilot Pump | | |

SECTION 2 SYSTEM

Group 2 Control System

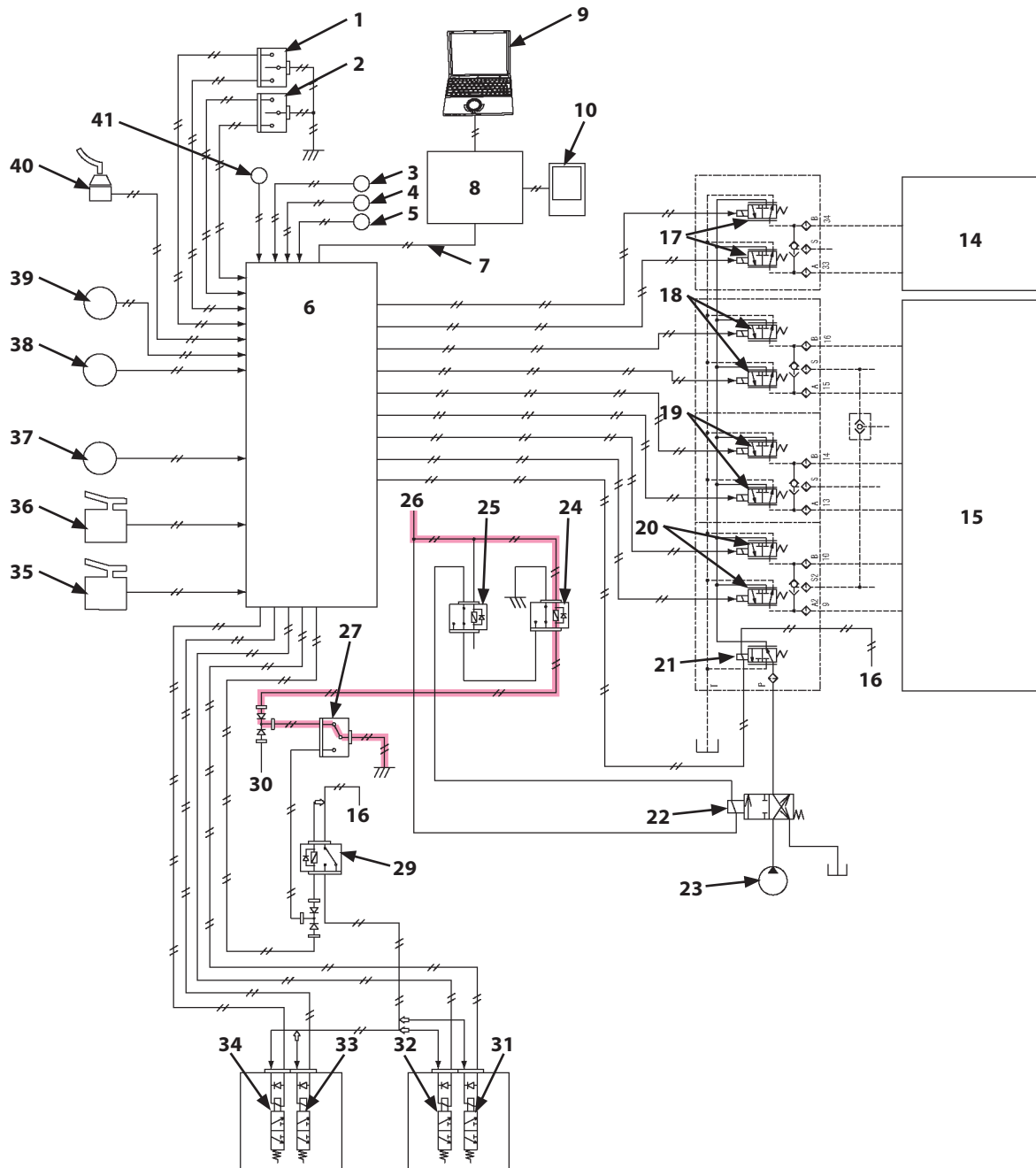


TLBE-02-02-510

- | | | | |
|--|------------------------------------|---|--|
| 1- Outrigger Left-Right Selection Switch | 10- Monitor | 24- Security Relay | 33- Outrigger Solenoid Valve (Front-Left) |
| 2- Outrigger Front-Rear Selection Switch | 14- Assist Control Valve | 25- Pilot Shut-Off Relay | 34- Outrigger Solenoid Valve (Front-Right) |
| 3- Pressure Sensor (Blade/Outrigger) | 15- Control Valve | 26- From Fuse #4 | 35- Auxiliary Pedal |
| 4- Pressure Sensor (Positioning) | 16- From Fuse #29 | 27- Blade/Outrigger Selector Switch | 36- Positioning Pedal |
| 5- Pressure Sensor (Assist) | 17- Assist Solenoid Valve | 29- Blade/Outrigger Relay | 37- Attachment Selection Switch |
| 6- MC2 | 18- Positioning Solenoid Valve | 30- To MC1 | 38- Assist Switch 2 (OP) |
| 7- CAN | 19- Auxiliary Solenoid Valve | 31- Outrigger Solenoid Valve (Rear-Left) | 39- Assist Switch 1 (OP) |
| 8- Monitor Controller | 20- Blade/Outrigger Solenoid Valve | 32- Outrigger Solenoid Valve (Rear-Right) | 40- Blade/Outrigger Lever |
| 9- MPR | 21- Pilot Cut-Off Solenoid Valve | | 41- Pressure Sensor (Auxiliary) |
| | 22- Pilot Shut-Off Solenoid Valve | | |
| | 23- Pilot Pump | | |

SECTION 2 SYSTEM

Group 2 Control System

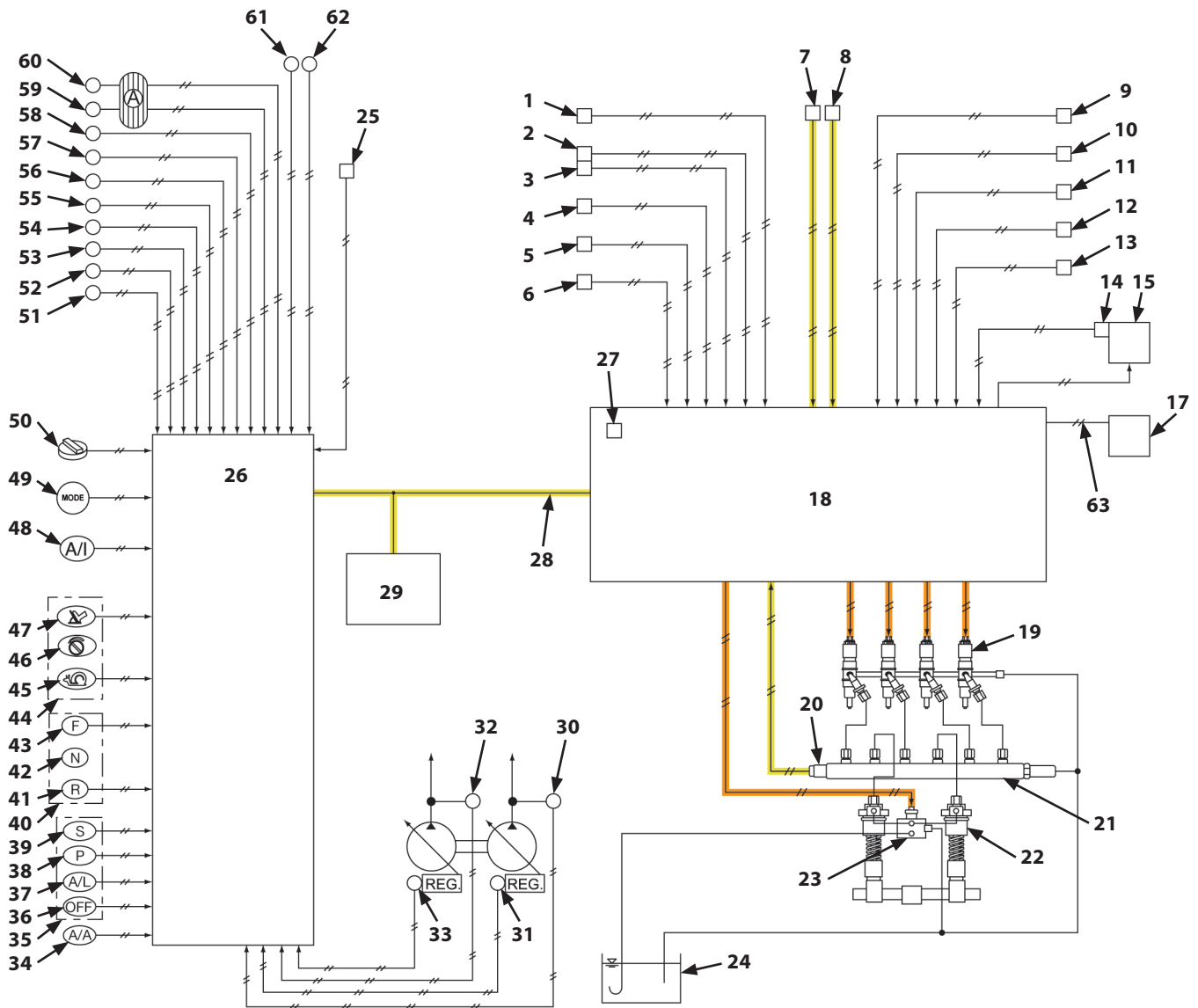


TLBE-02-02-509

- | | | | |
|--|------------------------------------|---|--|
| 1- Outrigger Left-Right Selection Switch | 10- Monitor | 24- Security Relay | 33- Outrigger Solenoid Valve (Front-Left) |
| 2- Outrigger Front-Rear Selection Switch | 14- Assist Control Valve | 25- Pilot Shut-Off Relay | 34- Outrigger Solenoid Valve (Front-Right) |
| 3- Pressure Sensor (Blade/Outrigger) | 15- Control Valve | 26- From Fuse #4 | 35- Auxiliary Pedal |
| 4- Pressure Sensor (Positioning) | 16- From Fuse #29 | 27- Blade/Outrigger Selector Switch | 36- Positioning Pedal |
| 5- Pressure Sensor (Assist) | 17- Assist Solenoid Valve | 29- Blade/Outrigger Relay | 37- Attachment Selection Switch |
| 6- MC2 | 18- Positioning Solenoid Valve | 30- To MC1 | 38- Assist Switch 2 (OP) |
| 7- CAN | 19- Auxiliary Solenoid Valve | 31- Outrigger Solenoid Valve (Rear-Left) | 39- Assist Switch 1 (OP) |
| 8- Monitor Controller | 20- Blade/Outrigger Solenoid Valve | 32- Outrigger Solenoid Valve (Rear-Right) | 40- Blade/Outrigger Lever |
| 9- MPDr. | 21- Pilot Cut-Off Solenoid Valve | | 41- Pressure Sensor (Auxiliary) |
| | 22- Pilot Shut-Off Solenoid Valve | | |
| | 23- Pilot Pump | | |

SECTION 2 SYSTEM

Group 3 Engine System

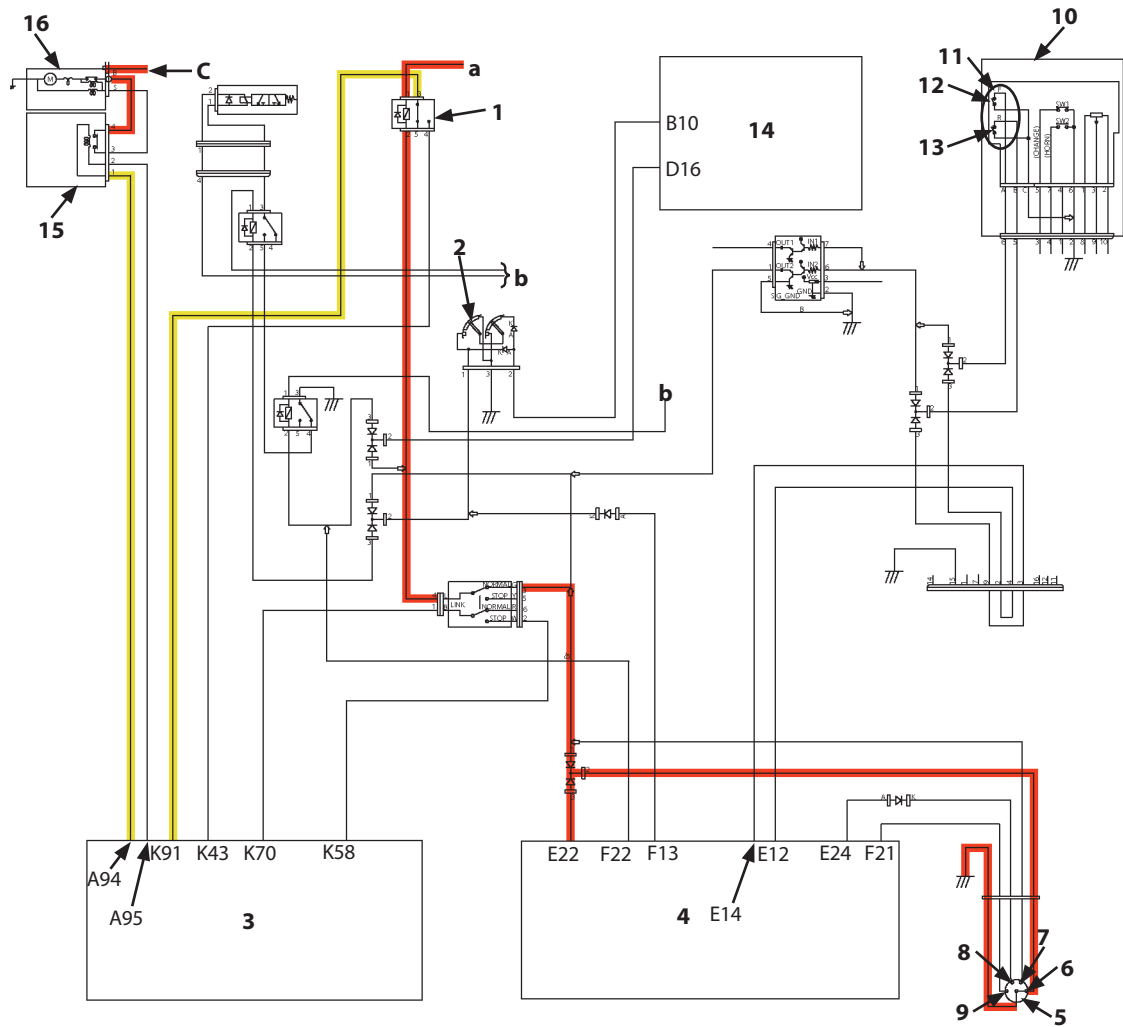


TLAB-02-03-004

- | | | | |
|--------------------------------------|---|--|---|
| 1- Coolant Temperature Sensor | 21- Common Rail | 36- OFF Position | 53- Pressure Sensor (Arm Roll-Out) (OP) |
| 2- Boost Pressure Sensor | 22- High-Pressure Pump | 37- Axle Lock Position | 54- Pressure Sensor (Auxiliary) (OP) |
| 3- Boost Temperature Sensor | 23- FCU | 38- Parking Brake Position | 55- Pressure Sensor (Swing) |
| 4- Engine Oil Pressure Sensor | 24- Fuel Tank | 39- Work Brake Operating Position | 56- Pressure Sensor (Front Attachment) |
| 5- Fuel Low Pressure Sensor | 25- Engine Oil Level Switch | 40- FNR Switch | 57- Pressure Sensor (Arm Roll-In) |
| 6- Exhaust Pressure Sensor | 26- MC1 | 41- Reverse Position | 58- Pressure Sensor (Boom Raise) |
| 7- Crank Speed Sensor | 27- Atmospheric Pressure Sensor (Inside of ECM) | 42- Neutral Position | 59- Pressure Sensor (Travel Reverse) |
| 8- Cam Angle Sensor | 28- CANO | 43- Forward Position | 60- Pressure Sensor (Travel Forward) |
| 9- Intake-Air Temperature Sensor | 29- Monitor Controller | 44- Engine Speed Control Mode Selection Switch | 61- Travel N Sensor |
| 10- Coolant Level Switch | 30- Pump 1 Delivery Pressure Sensor | 45- Creeper Mode Position | 62- Hydraulic Oil Temperature Sensor 1 |
| 11- Water Sediment Switch | 31- Pump 1 Control Pressure Sensor | 46- Dial Mode Position | 63- Local-CAN |
| 12- EGR Differential Pressure Sensor | 32- Pump 2 Delivery Pressure Sensor | 47- Pedal Mode Position | |
| 13- EGR Temperature Sensor | 33- Pump 2 Control Pressure Sensor | 48- Auto-Idle Switch | |
| 14- Intake Throttle Position Sensor | 34- Auto Axle Lock Switch | 49- Power Mode Switch | |
| 15- Intake Throttle | 35- Brake Switch | 50- Engine Control Dial | |
| 17- EGR Controller | | 51- Pressure Sensor (Bucket Roll-In) | |
| 18- ECM | | 52- Pressure Sensor (Bucket Roll-Out) | |
| 19- Injector | | | |
| 20- Common Rail Pressure Sensor | | | |

SECTION 2 SYSTEM

Group 3 Engine System



TLAB-02-03-011

a- Current from fuse #18

b- Current from fuse #4

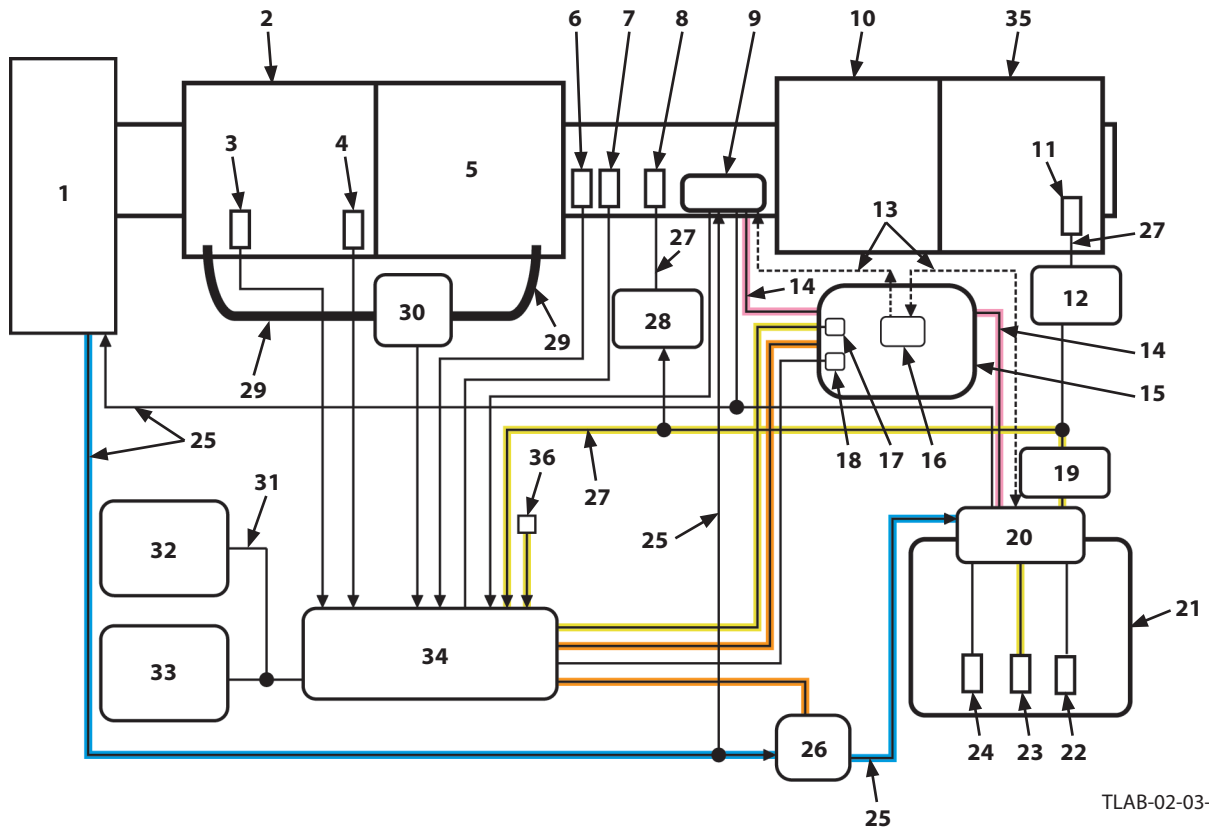
c- Current from battery relay

- | | | | |
|--------------------------|---------------------------|------------------------|------------------------|
| 1- Neutral Relay | 5- Brake Switch | 9- Work Brake Position | 13- Reverse Position |
| 2- Pilot Shut-Off Switch | 6- OFF Position | 10- Control Lever (L) | 14- Monitor Controller |
| 3- ECM | 7- Axle Lock Position | 11- FNR Switch | 15- Starter Relay |
| 4- MC1 | 8- Parking Brake Position | 12- Forward Position | 16- Starter Motor |

NOTE: The circuit diagram above shows the circuit when the brake switch (5) is in the OFF position (6).

SECTION 2 SYSTEM

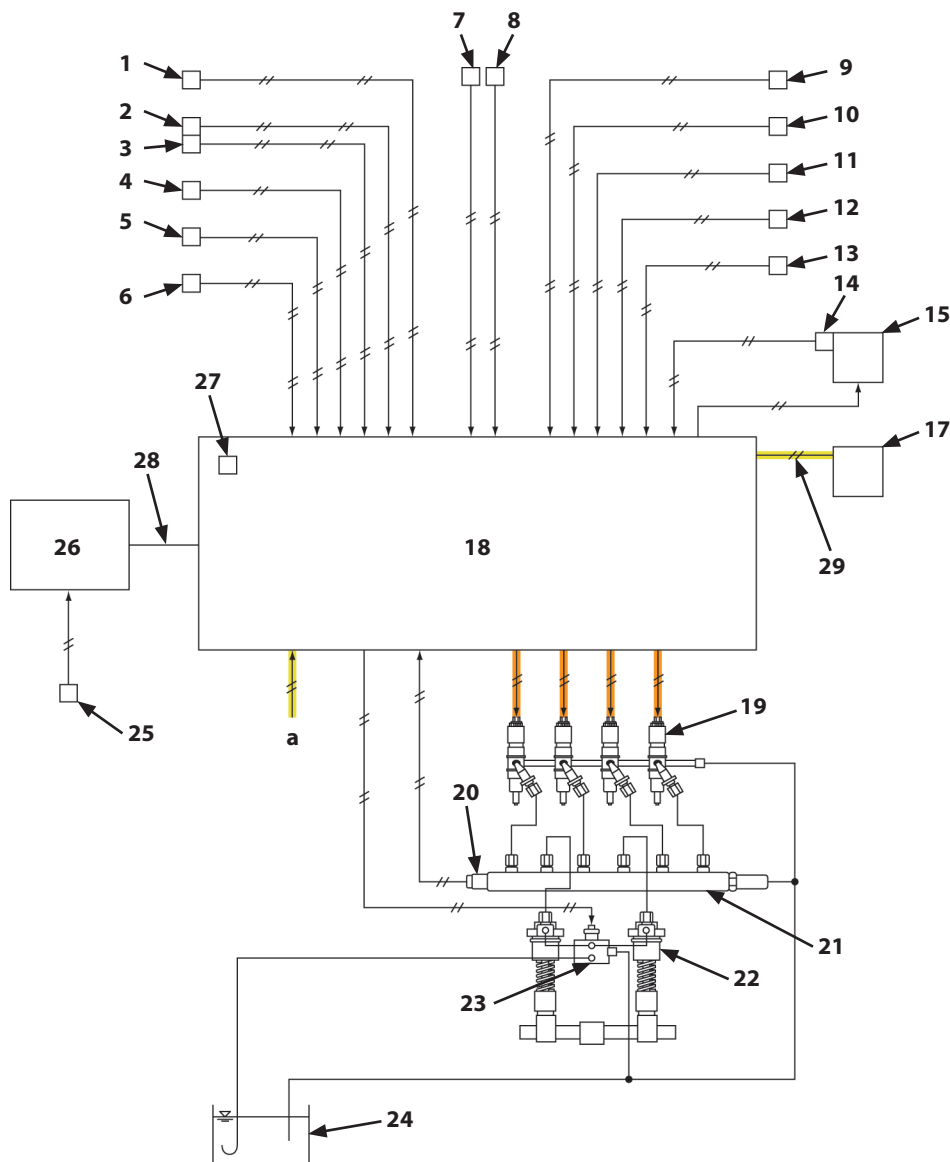
Group 3 Engine System



- | | | | |
|--|---|---|---------------------------------------|
| 1- Engine | 9- Dosing Module | 19- DEF Sensor Unit Controller | 30- Differential Pressure Sensor |
| 2- DOC (Diesel Oxidation Catalyst) 1 | 10- SCR Catalyst | 20- DEF Sensor Unit | 31- CAN0 |
| 3- DOC Inlet Exhaust Temperature Sensor | 11- Downstream NOx Sensor (Sensor Part) | 21- DEF Tank | 32- Monitor Controller |
| 4- DOC Outlet Exhaust Temperature Sensor | 12- Downstream NOx Sensor (Controller Part) | 22- DEF Tank Level Sensor | 33- MC1 |
| 5- Filter (CSF) | 13- DEF Piping | 23- DEF Temperature Sensor | 34- ECM |
| 6- SCR Exhaust Temperature Sensor | 14- Heating Wire | 24- DEF Quality Sensor | 35- DOC (Diesel Oxidation Catalyst) 2 |
| 7- SCR Pressure Sensor | 15- DEF Supply Module | 25- Coolant Piping | 36- Intake-Air Temperature Sensor |
| 8- Upstream NOx Sensor (Sensor Part) | 16- Reverting Valve | 26- Coolant Control Valve | |
| | 17- DEF Supply Module Temperature Sensor | 27- Local-CAN | |
| | 18- DEF Pressure Sensor | 28- Upstream NOx Sensor (Controller Part) | |
| | | 29- Differential Pressure Sensor Hose | |

SECTION 2 SYSTEM

Group 3 Engine System



TLAB-02-03-109

a- Urea SCR System Signal

- | | | | |
|-------------------------------|--------------------------------------|---------------------------------|---|
| 1- Coolant Temperature Sensor | 9- Intake-Air Temperature Sensor | 17- EGR Controller | 25- Engine Oil Level Switch |
| 2- Boost Pressure Sensor | 10- Coolant Level Switch | 18- ECM | 26- MC1 |
| 3- Boost Temperature Sensor | 11- Water Sediment Switch | 19- Injector | 27- Atmospheric Pressure Sensor (Inside of ECM) |
| 4- Engine Oil Pressure Sensor | 12- EGR Differential Pressure Sensor | 20- Common Rail Pressure Sensor | 28- CAN0 |
| 5- Fuel Low Pressure Sensor | 13- EGR Temperature Sensor | 21- Common Rail | 29- Local-CAN |
| 6- Exhaust Pressure Sensor | 14- Intake Throttle Position Sensor | 22- High-Pressure Pump | |
| 7- Crank Speed Sensor | 15- Intake Throttle | 23- FCU | |
| 8- Cam Angle Sensor | | 24- Fuel Tank | |

SECTION 2 SYSTEM

Group 4 Hydraulic System

Outline

The hydraulic system mainly consists of the pilot circuit, steering circuit, main circuit, and breaker/pulverizer/crusher circuit.

Pilot Circuit:

Supplied from	Related Device	Supplied to
Pilot Pump	Pilot Valve	Operation Control Circuit
	Solenoid Valve (Electric Lever)	
	Pump Regulator	Pump Control Circuit
	4-Spool Solenoid Valve Unit	
	Pump 1 Flow Rate Control Solenoid Valve	Valve Control Circuit
	Pump 2 Flow Rate Control Solenoid Valve	
	Auxiliary Flow Combiner Control Solenoid Valve	
	Auxiliary Flow Rate Control Solenoid Valve	
	Axle Lock Solenoid Valve	
	Signal Control Valve	Travel Mode Selection Control Circuit
	Reducing Valve	Swing Parking Brake Release Circuit
	Accumulator Charging Valve	Axle Lock Release Circuit
	Brake Valve	Work Brake Circuit
Blade/Outrigger Solenoid Valve	Service Brake Circuit	
	Blade/Outrigger Control Circuit	

Steering Circuit:

Supplied from	Related Device	Supplied to
Steering Pump	Steering Valve	Steering Cylinder

Main Circuit:

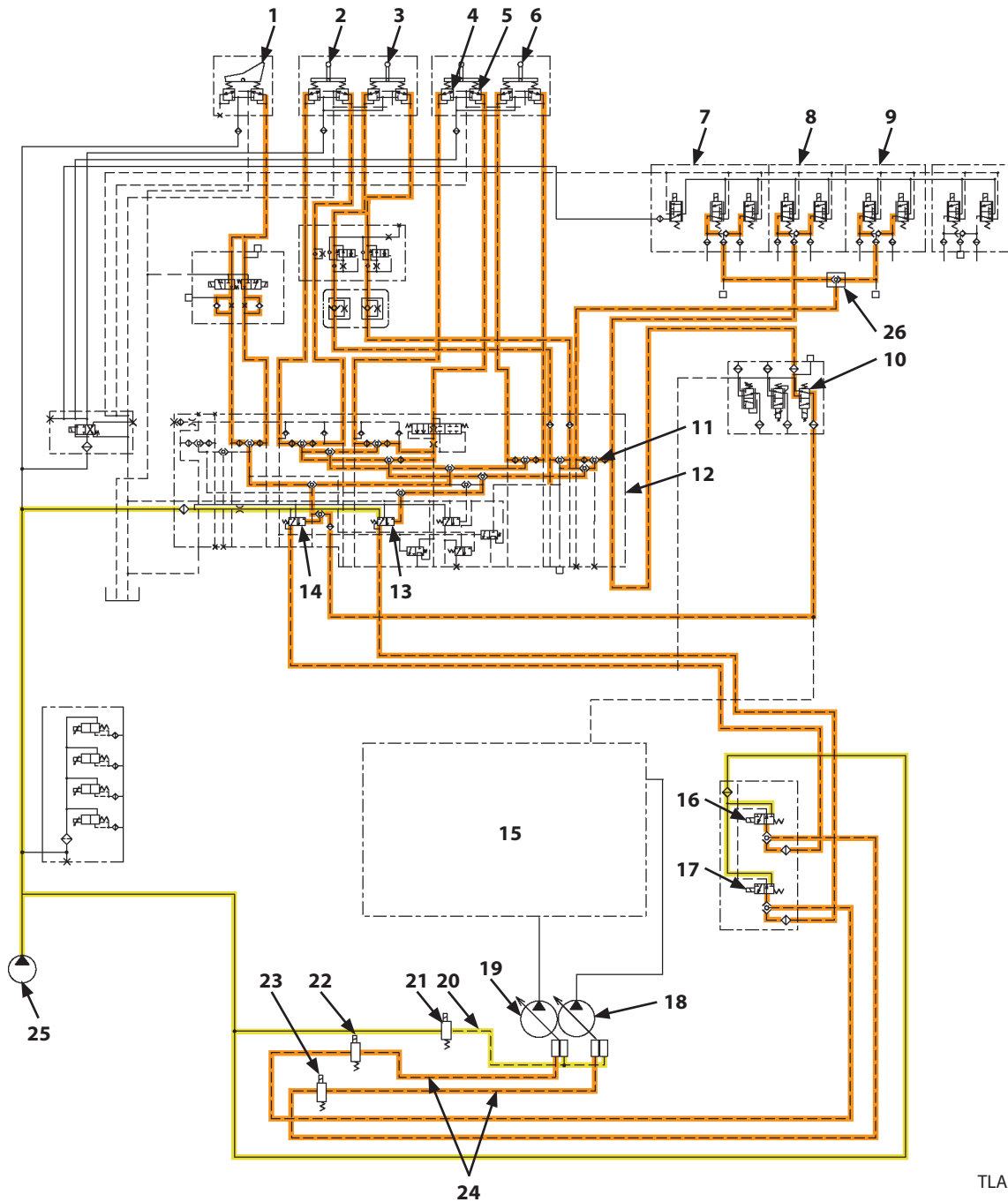
Supplied from	Related Device	Supplied to
Main Pump	Control Valve	Motor Cylinder

Breaker/Pulverizer/Crusher Circuit (Option):

Supplied from	Related Device	Supplied to
Pilot Pump	Pilot Valve	Valve Control Circuit
	Solenoid Valve (Electric Lever)	Auxiliary Flow Combiner Circuit
	Auxiliary Flow Combiner Control Solenoid Valve	Auxiliary Flow Rate Control Circuit
	Auxiliary Flow Rate Control Solenoid Valve	
	Reducing Valve	
	Selector Valve Control Solenoid Valve	
	Selector Valve	Selector Valve Control Circuit
Main Pump	Control Valve	Attachment Breaker Relief Control Valve Control Circuit

SECTION 2 SYSTEM

Group 4 Hydraulic System




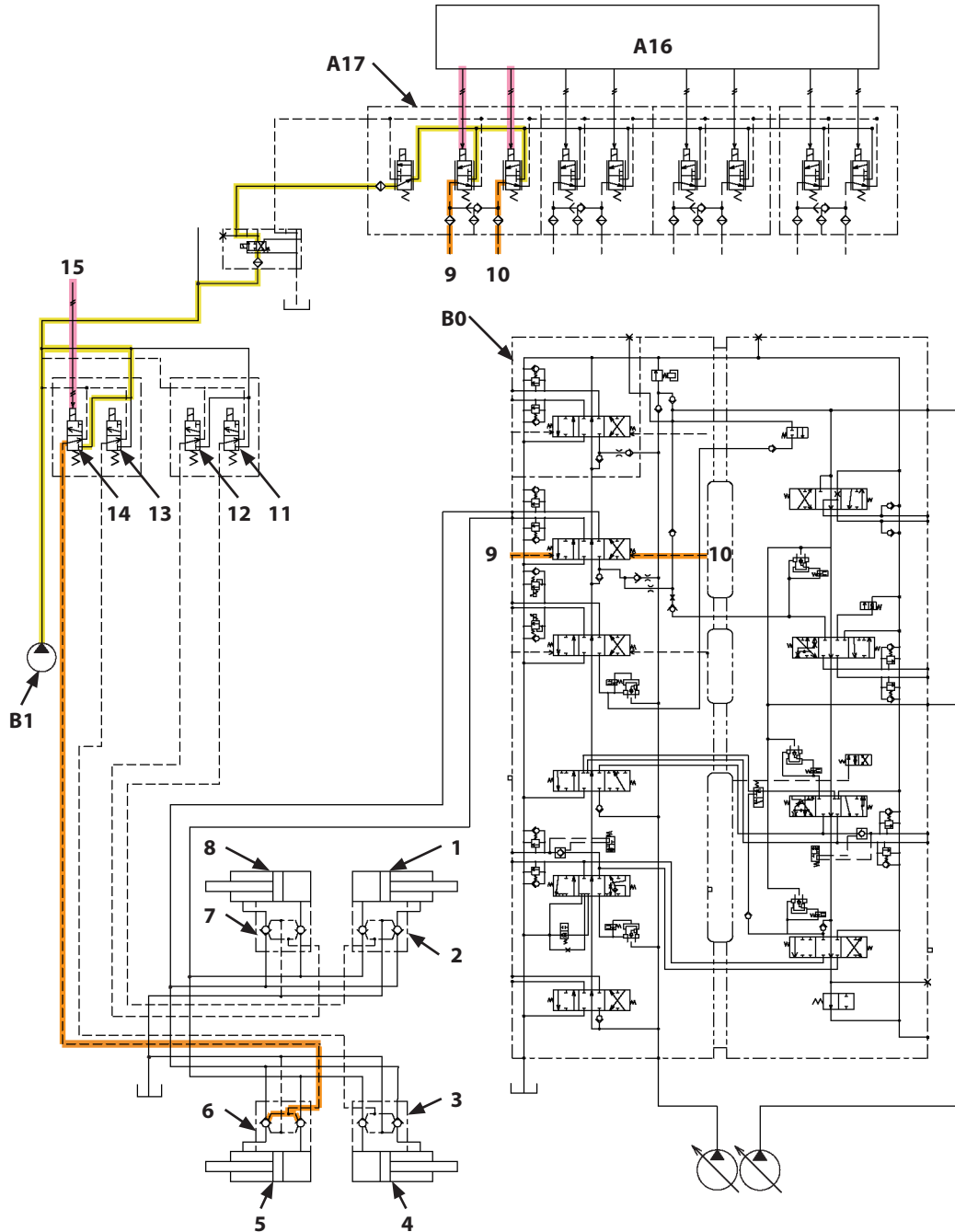
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- | | | | |
|-----------------------------------|--|---|---|
| 1- Travel | 9- Positioning Solenoid Valve | 15- Control Valve | 22- Maximum Pump 2 Flow Rate Limit Control Solenoid Valve |
| 2- Arm | 10- Auxiliary Flow Combiner Control Solenoid Valve | 16- Pump 1 Flow Rate Control Solenoid Valve | 23- Maximum Pump 1 Flow Rate Limit Control Solenoid Valve |
| 3- Swing | 11- Shuttle Valve | 17- Pump 2 Flow Rate Control Solenoid Valve | 24- Pump Control Pressure Pi |
| 4- Boom Lower | 12- Signal Control Valve | 18- Pump 1 | 25- Pilot Pump |
| 5- Boom Raise | 13- Pump 2 Flow Rate Control Valve | 19- Pump 2 | 26- Shuttle Valve |
| 6- Bucket | 14- Pump 1 Flow Rate Control Valve | 20- Torque Control Pressure Ppc | |
| 7- Blade/Outrigger Solenoid Valve | | 21- Torque Control Solenoid Valve | |
| 8- Auxiliary Solenoid Valve | | | |

SECTION 2 SYSTEM

Group 4 Hydraulic System

 **NOTE:** The illustration shows the operation when the outrigger left-right selection switch is set in the right and the outrigger front-rear selection switch is set in the front.

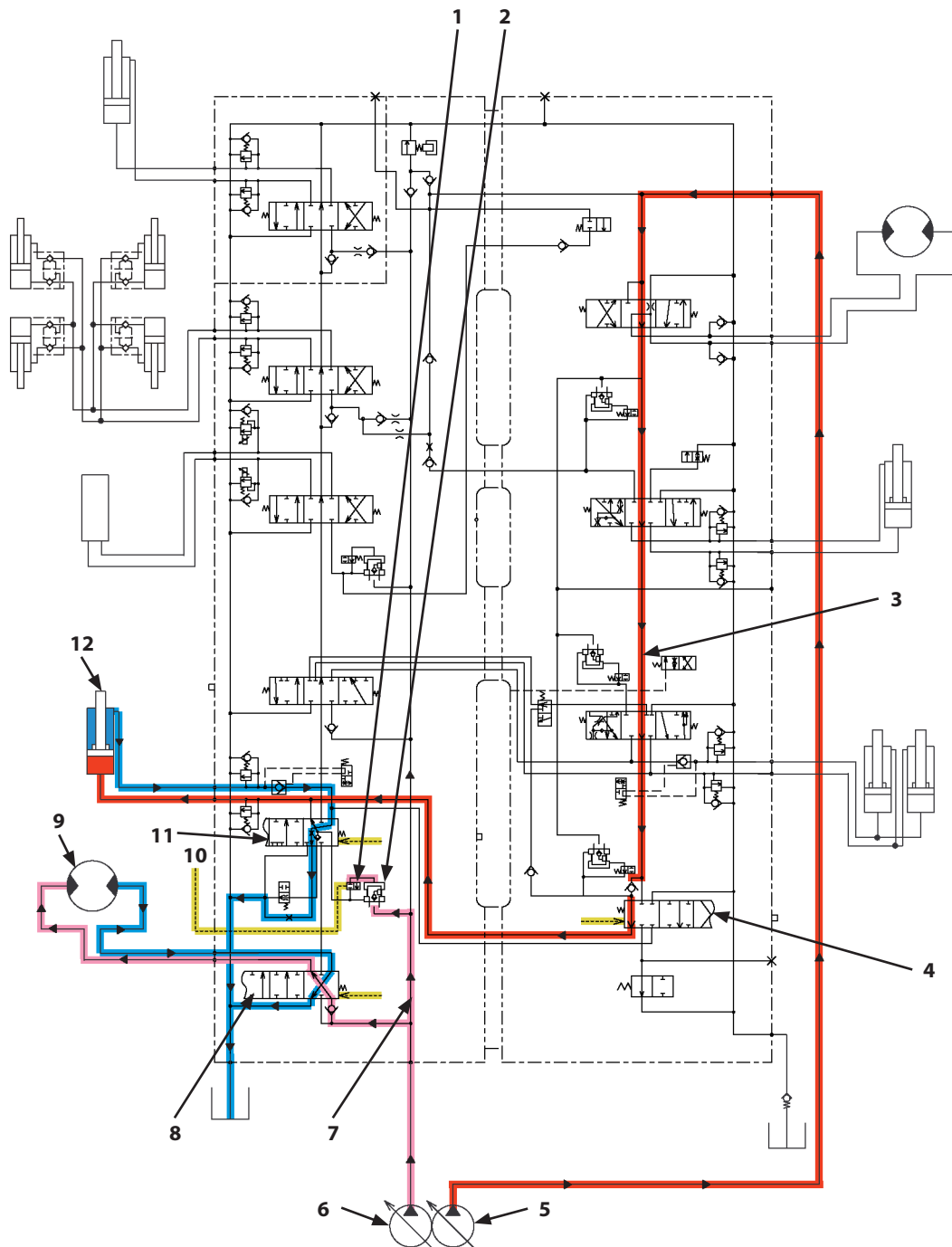


TLBE-02-04-006

- | | | | |
|--|---|--|---|
| 1- Blade/Outrigger Cylinder (Rear-Left) | 5- Blade/Outrigger Cylinder (Front-Right) | 9- Blade/Outrigger Raise | 14- Blade/Outrigger Cylinder Solenoid Valve (Front-Right) |
| 2- Operate Check Valve (Rear-Left) | 6- Operate Check Valve (Front-Right) | 10- Blade/Outrigger Lower | 15- Selection Signal of Outrigger Solenoid Valve |
| 3- Operate Check Valve (Front-Left) | 7- Operate Check Valve (Rear-Right) | 11- Blade/Outrigger Cylinder Solenoid Valve (Rear-Left) | |
| 4- Blade/Outrigger Cylinder (Front-Left) | 8- Blade/Outrigger Cylinder (Rear-Right) | 12- Blade/Outrigger Cylinder Solenoid Valve (Rear-Right) | |
| | | 13- Blade/Outrigger Cylinder Solenoid Valve (Front-Left) | |
| A16- MC2 | A17- Blade/Outrigger Solenoid Valve | B1- Pilot Pump | |
| B0- Control Valve | | | |

SECTION 2 SYSTEM

Group 4 Hydraulic System

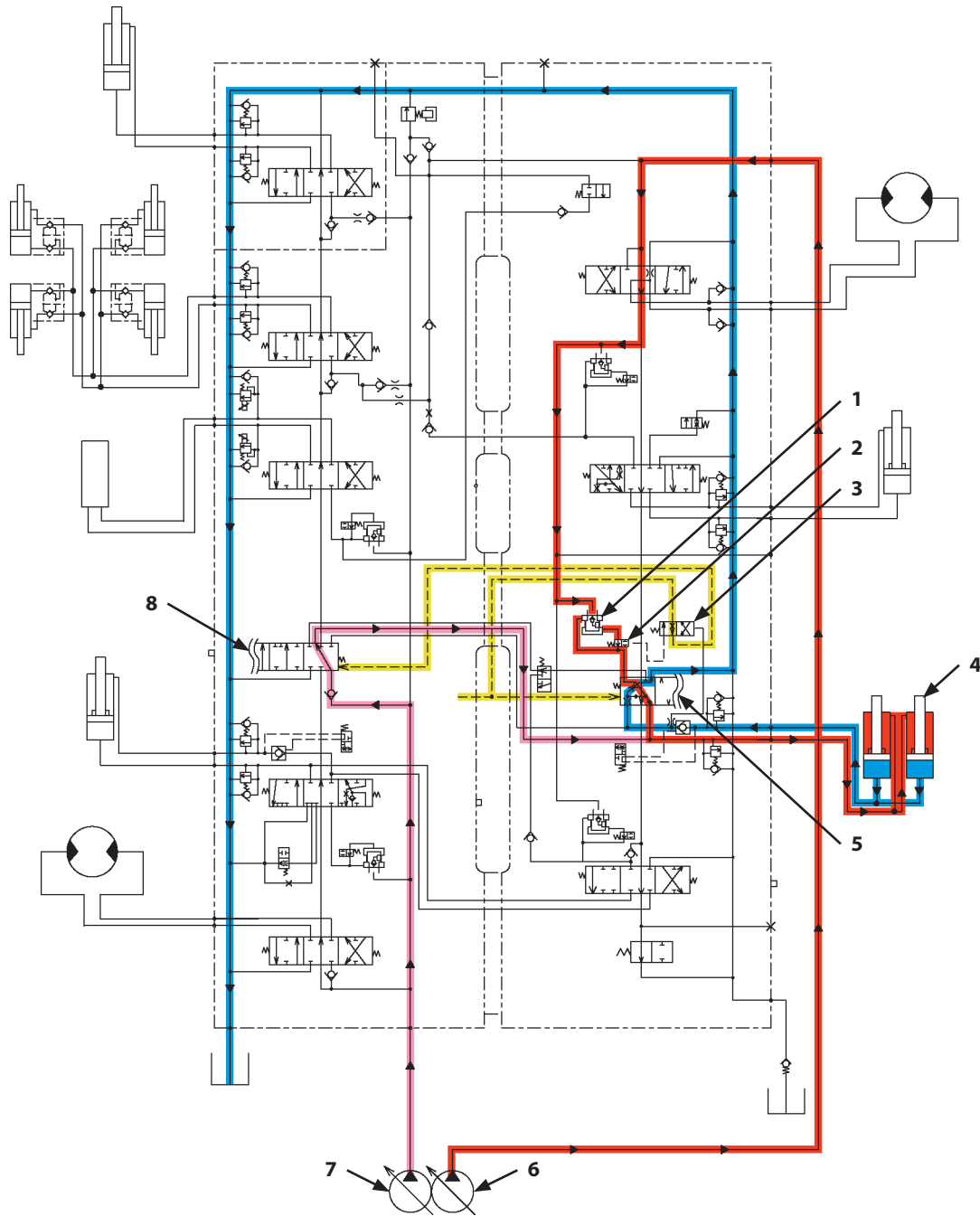


TLBE-02-04-009

- | | | | |
|---|-----------------------------|------------------------------|------------------|
| 1- Arm 1 Flow Rate Control Valve (Selector Valve) | 3- Neutral Circuit (Pump 1) | 7- Parallel Circuit (Pump 2) | 11- Arm 1 Spool |
| 2- Arm 1 Flow Rate Control Valve (Poppet Valve) | 4- Arm 2 Spool | 8- Swing Spool | 12- Arm Cylinder |
| | 5- Pump 1 | 9- Swing Motor | |
| | 6- Pump 2 | 10- Swing Pilot Pressure | |

SECTION 2 SYSTEM

Group 4 Hydraulic System



- | | | |
|--|----------------------------------|-----------------|
| 1- Boom Flow Rate Control Valve (Poppet Valve) | 3- Boom Lower Meter-In Cut Valve | 6- Pump 1 |
| 2- Boom Flow Rate Control Valve (Selector Valve) | 4- Boom Cylinder | 7- Pump 2 |
| | 5- Boom 1 Spool | 8- Boom 2 Spool |

TLBE-02-04-014

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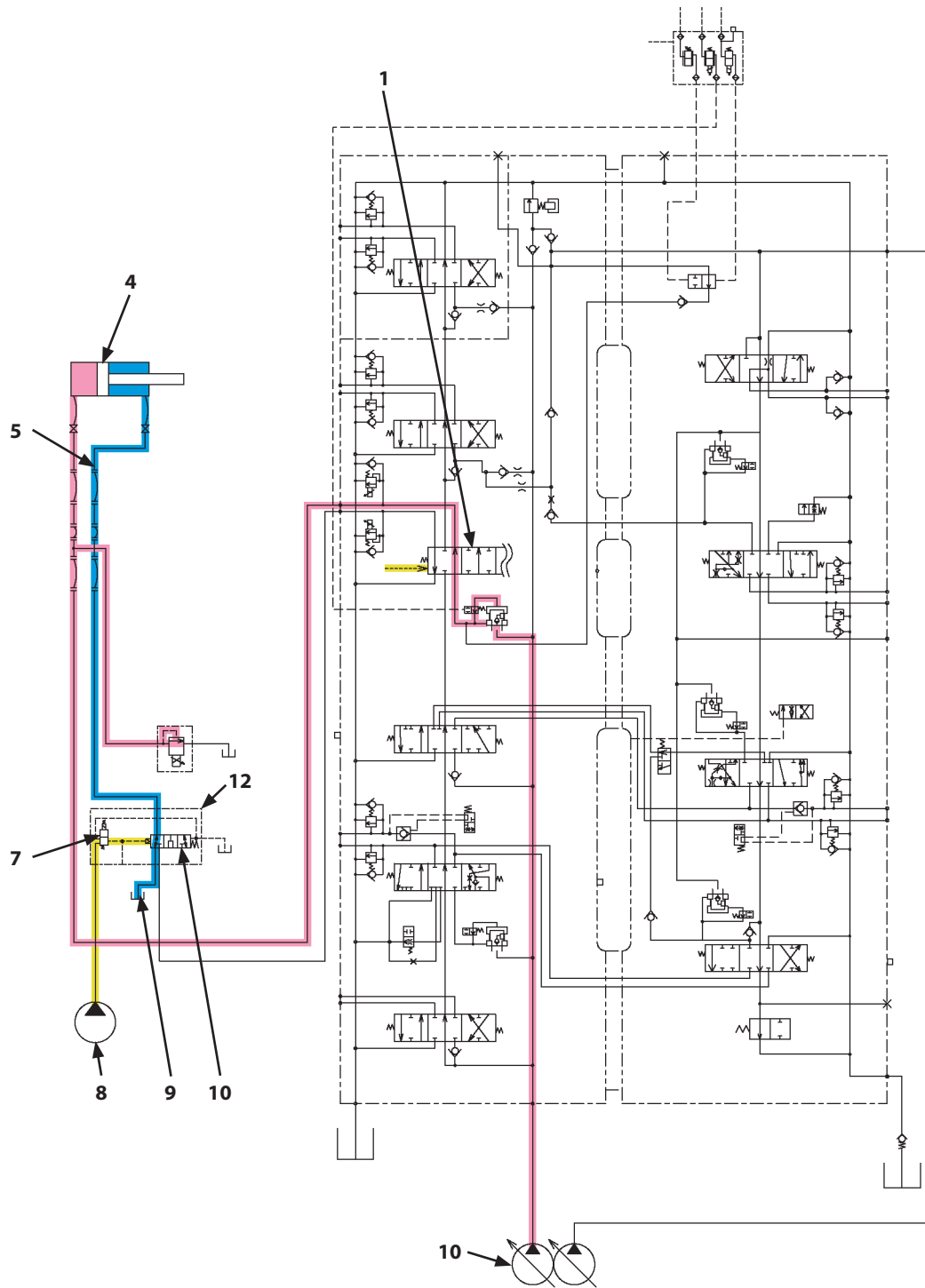


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SECTION 2 SYSTEM

Group 4 Hydraulic System

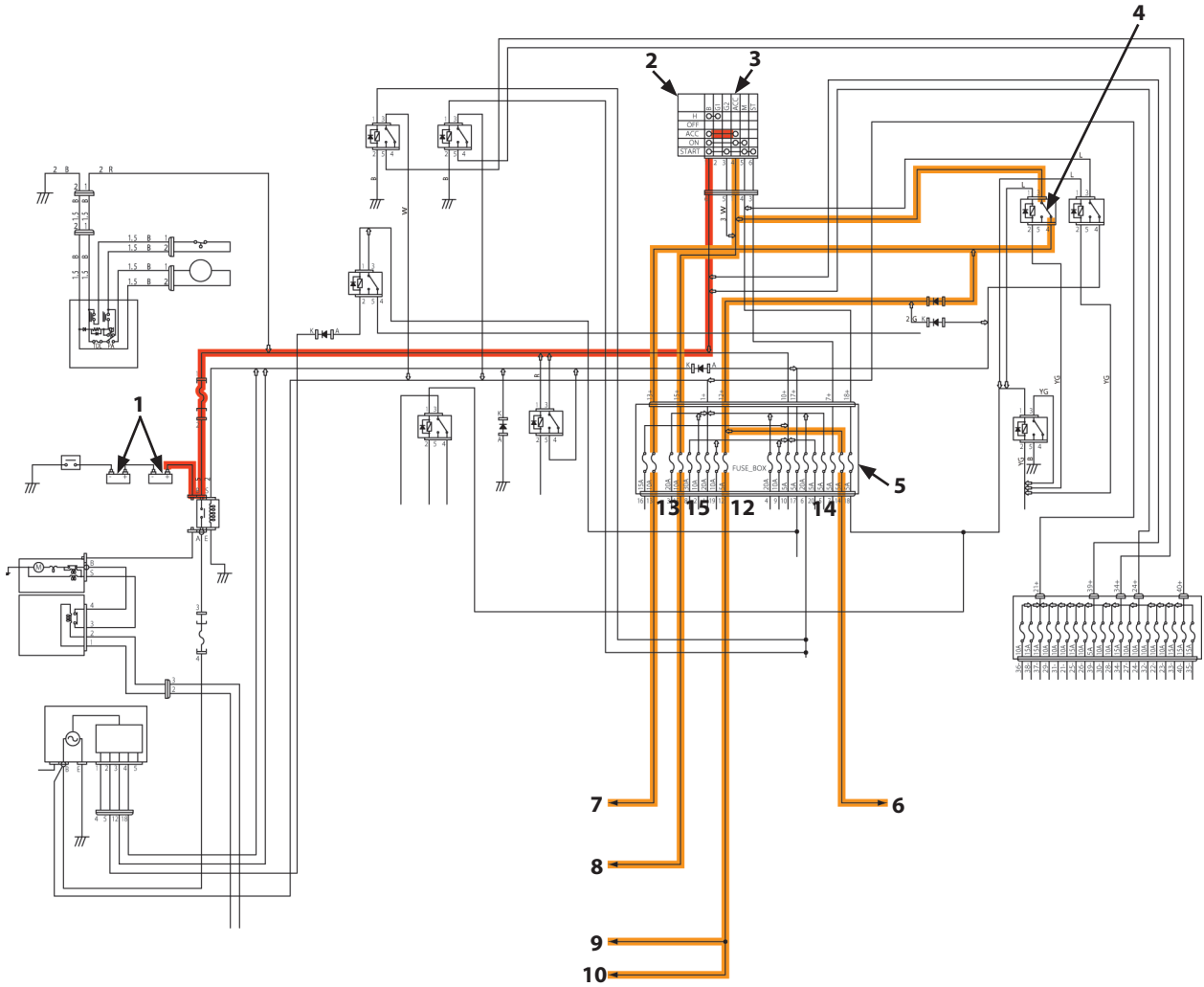


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- | | | | |
|----------------------|--|-----------------------|------------------------------------|
| 1- Auxiliary 1 Spool | 7- Selector Valve Control Solenoid Valve | 9- Hydraulic Oil Tank | 12- Selector Valve Selection Valve |
| 4- Breaker | 8- Pilot Pump | 10- Selector Valve | |
| 5- Return Circuit | | 11- Pump 2 | |

SECTION 2 SYSTEM

Group 5 Electrical System

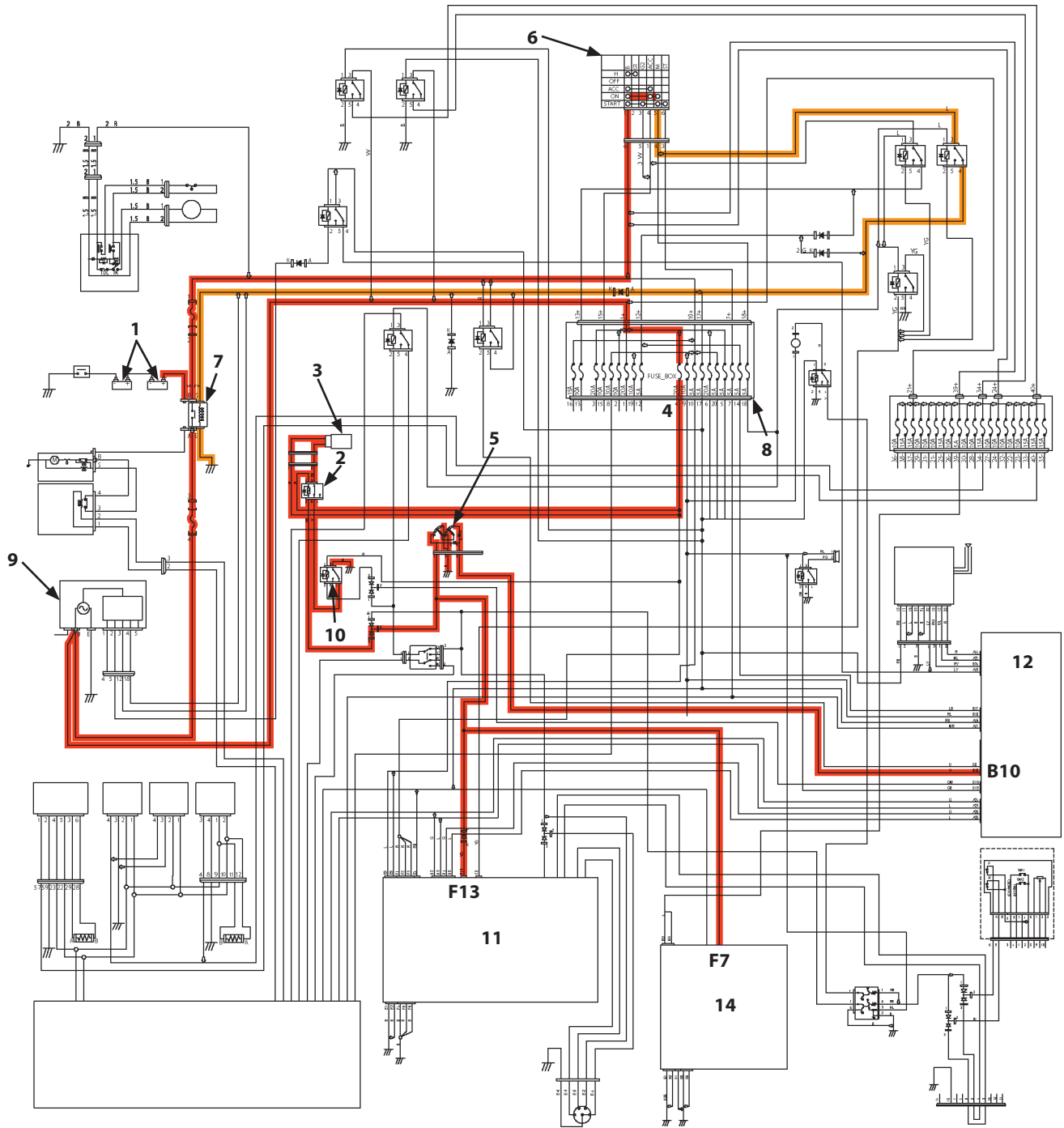


TLAB-02-05-003

- | | | | |
|-----------------|-----------------------|---------------------------|-----------|
| 1- Battery | 4- ACC Cut Relay | 7- Cigar Lighter | 10- Radio |
| 2- Key Switch | 5- Fuse Box 1 | 8- Auxiliary | |
| 3- Terminal ACC | 6- Monitor Controller | 9- Wiper/Light Controller | |

SECTION 2 SYSTEM

Group 5 Electrical System

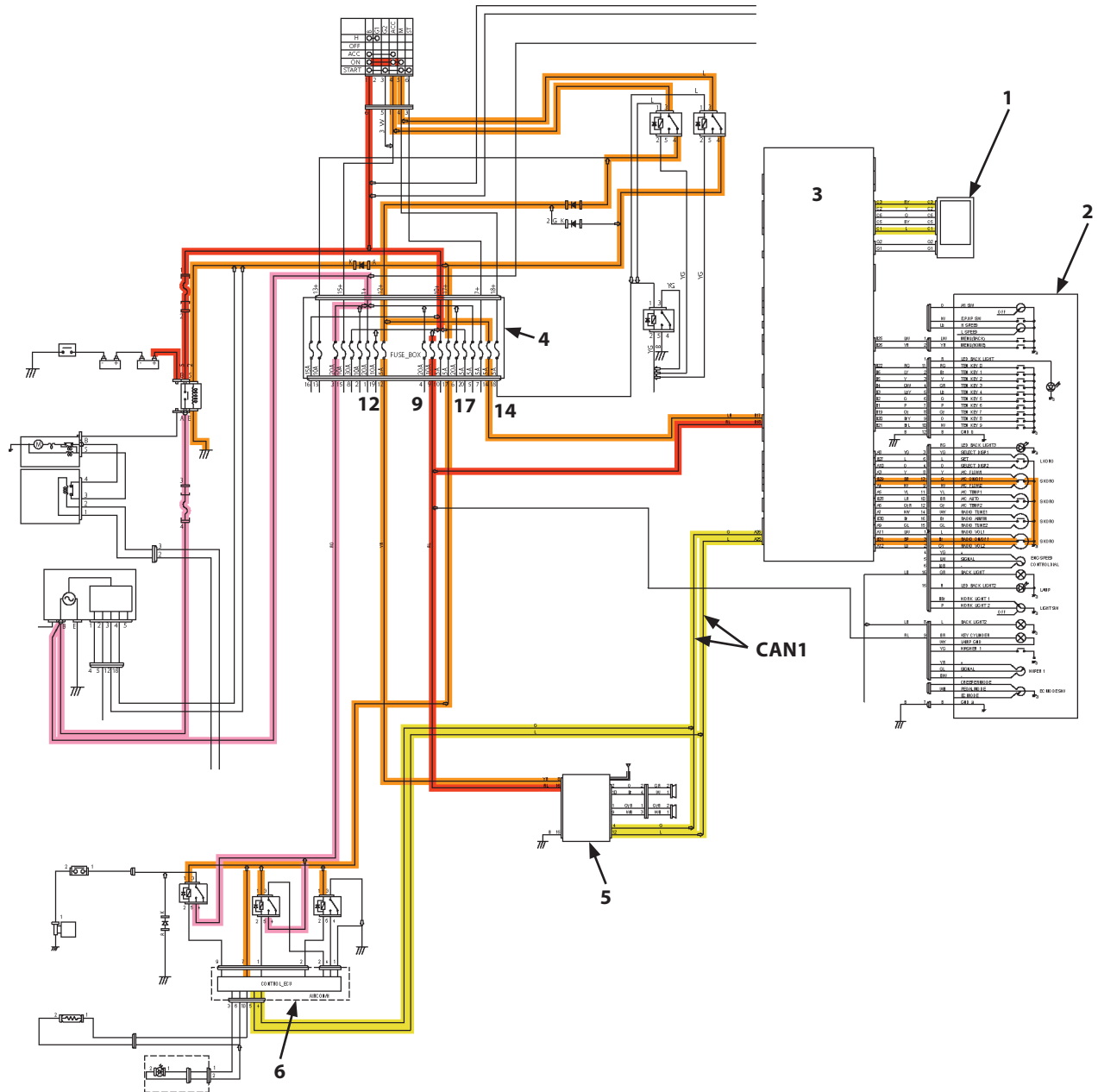


TLAB-02-05-007

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|----------------------------------|---|--------------------|------------------------|
| 1- Battery | 5- Pilot Shut-Off Switch (Pilot Shut-Off Lever) | 8- Fuse Box 1 | 12- Monitor Controller |
| 2- Pilot Shut-Off Relay | 6- Key Switch | 9- Alternator | 14- MC2 |
| 3- Pilot Shut-Off Solenoid Valve | 7- Battery Relay | 10- Security Relay | |
| | | 11- MC1 | |

SECTION 2 SYSTEM

Group 5 Electrical System

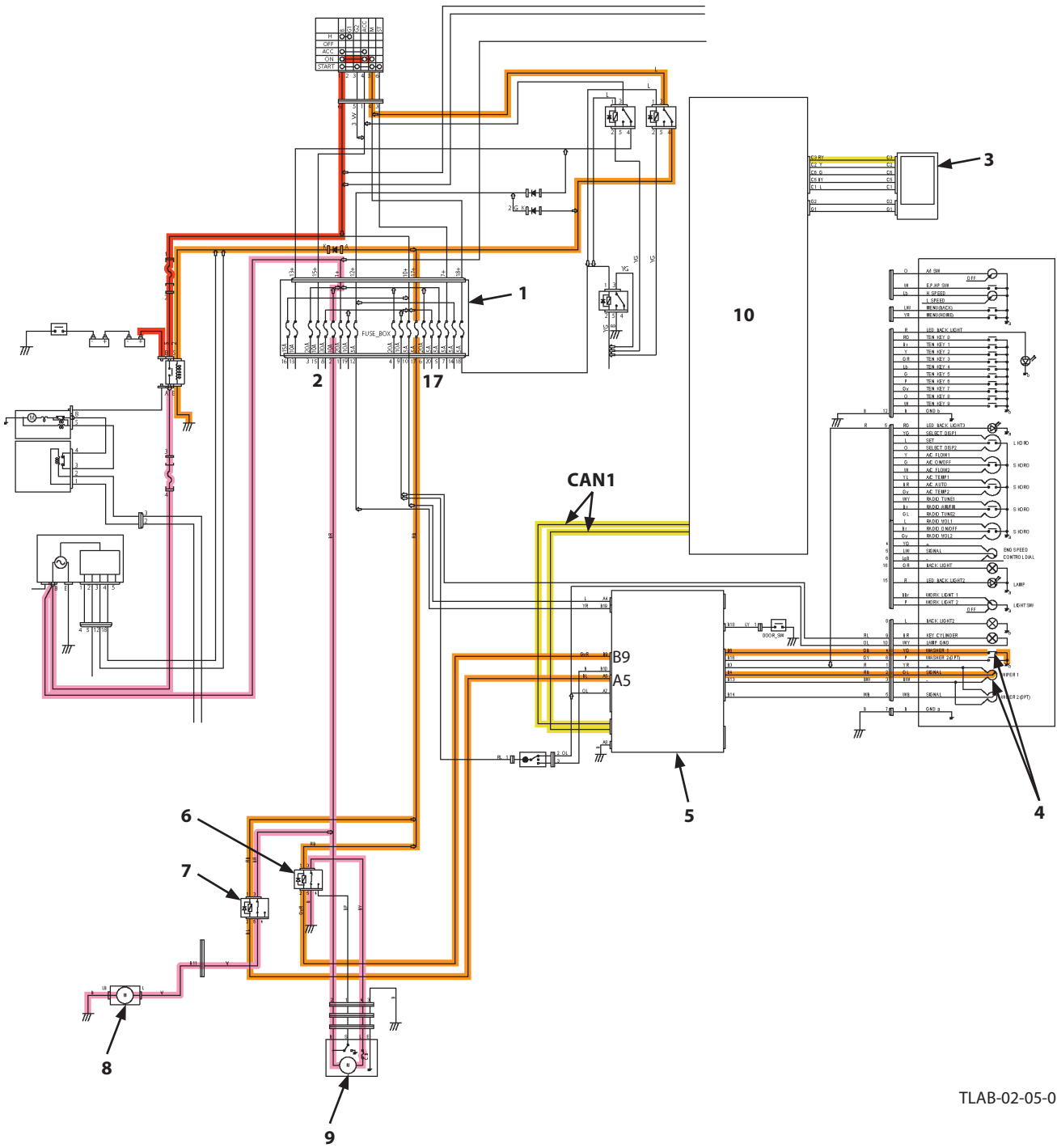


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- | | | |
|-----------------|-----------------------|-------------------------|
| 1- Monitor | 3- Monitor Controller | 5- Radio |
| 2- Switch Panel | 4- Fuse Box 1 | 6- Air Conditioner Unit |

SECTION 2 SYSTEM

Group 5 Electrical System

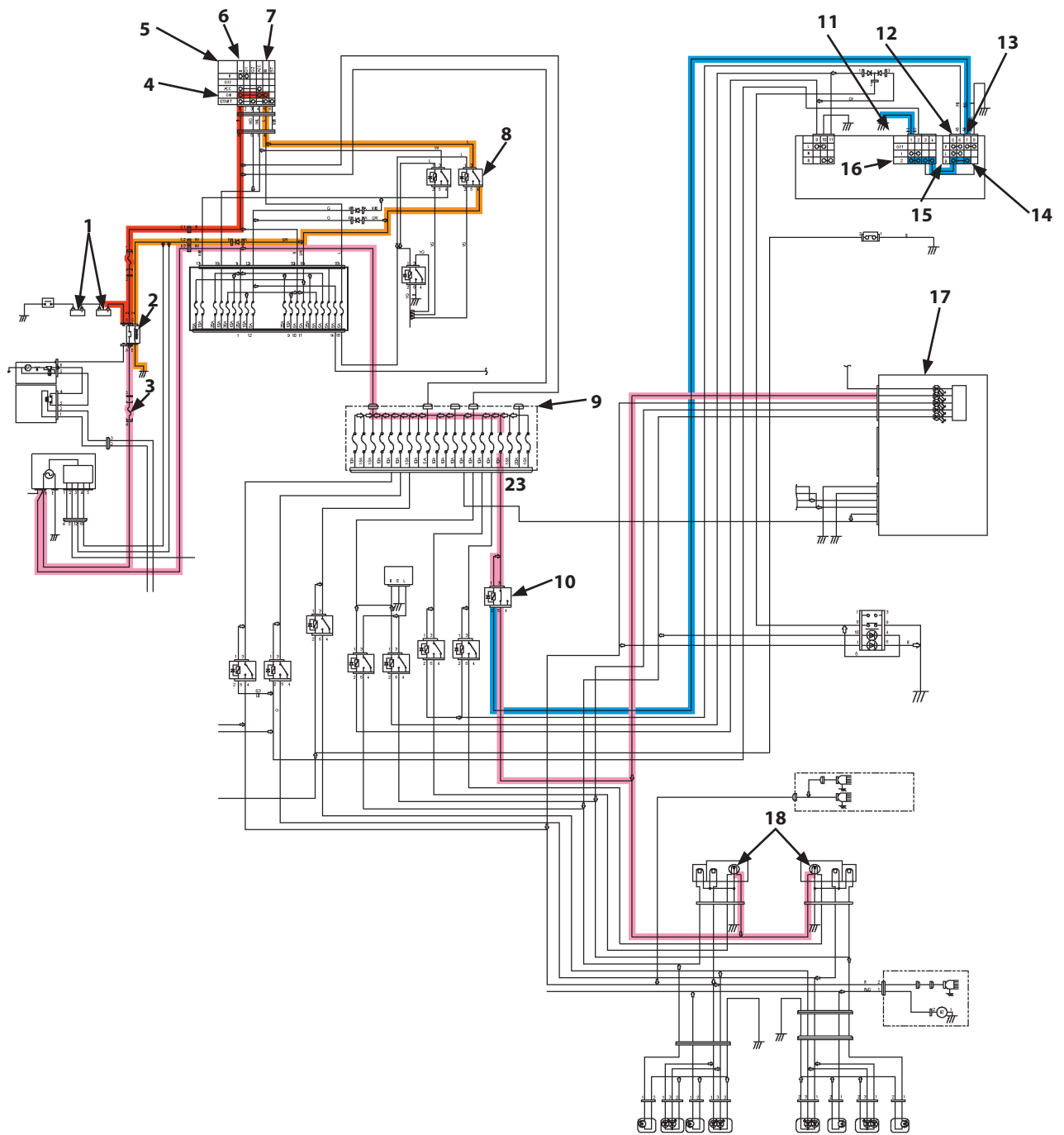


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- | | | |
|------------------------|---------------------------|------------------------|
| 1- Fuse Box 1 | 5- Wiper/Light Controller | 8- Washer Motor |
| 3- Monitor | 6- Wiper Relay | 9- Wiper Motor |
| 4- Wiper/Washer Switch | 7- Washer Relay |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

SECTION 2 SYSTEM

Group 5 Electrical System

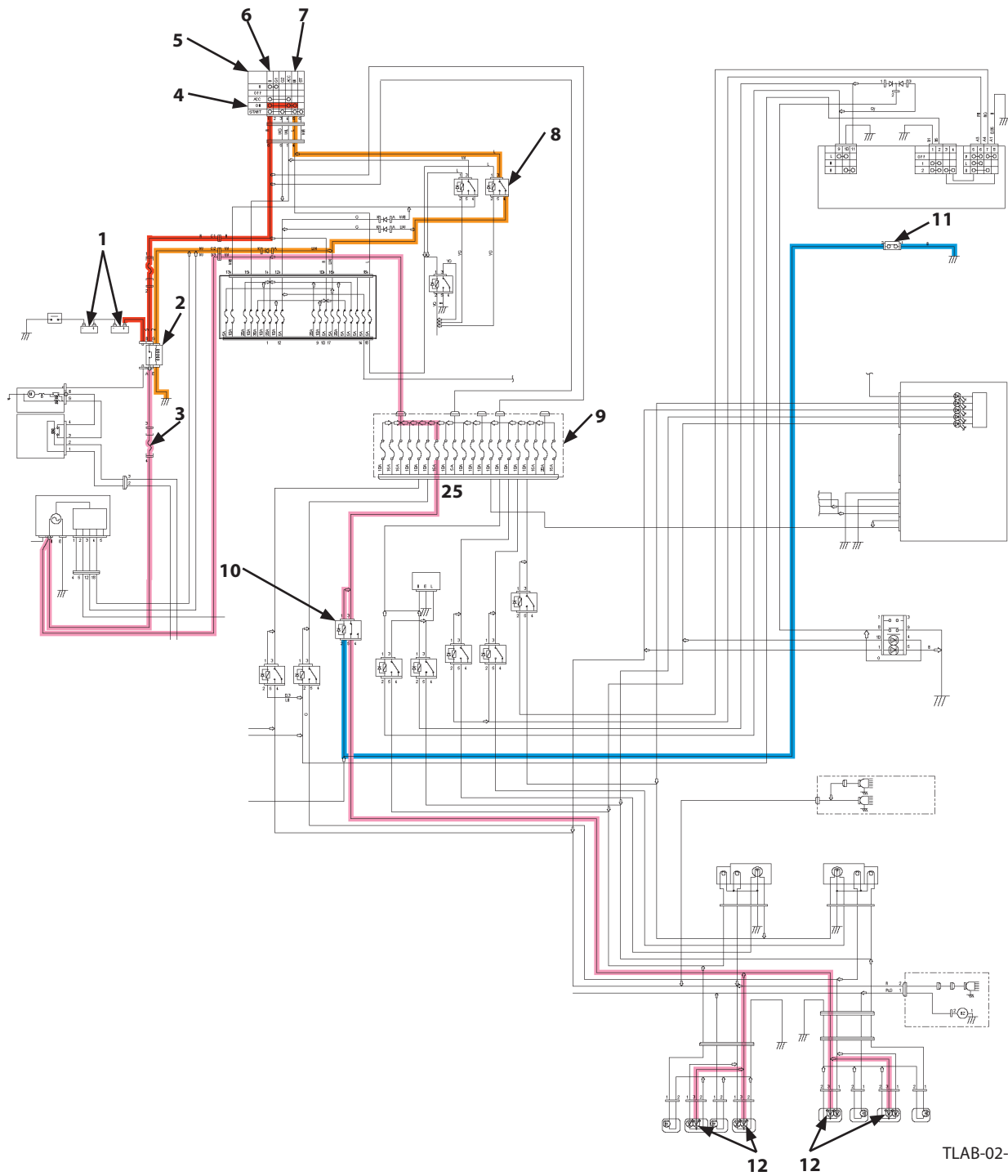


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- | | | | |
|-------------------------|----------------------------|------------------------|--------------------|
| 1- Battery | 6- Terminal B | 11- Light Switch | 16- 2 Position |
| 2- Battery Relay | 7- Terminal M | 12- Terminal #5 | 17- Column Display |
| 3- Fusible Link (100 A) | 8- Key Switch ON Cut Relay | 13- Terminal #7 | 18- High Beam |
| 4- ON Position | 9- Fuse Box 2 | 14- Dimmer Switch | |
| 5- Key Switch | 10- High Beam Relay | 15- High Beam Position | |

SECTION 2 SYSTEM

Group 5 Electrical System



TLAB-02-05-024

- | | | | |
|-------------------------|----------------|----------------------------|------------------------|
| 1- Battery | 4- ON Position | 7- Terminal M | 10- Brake Light Relay |
| 2- Battery Relay | 5- Key Switch | 8- Key Switch ON Cut Relay | 11- Brake Light Switch |
| 3- Fusible Link (100 A) | 6- Terminal B | 9- Fuse Box 2 | 12- Brake Light |

SECTION 3

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Pump 1 Flow Rate Control Valve, Pump 2 Flow Rate Control Valve	T3-9-14
Arm 1 Flow Rate Control Valve Control Spool, Bucket Flow Rate Control Valve Control Spool, Swing Parking Brake Release Spool	T3-9-16

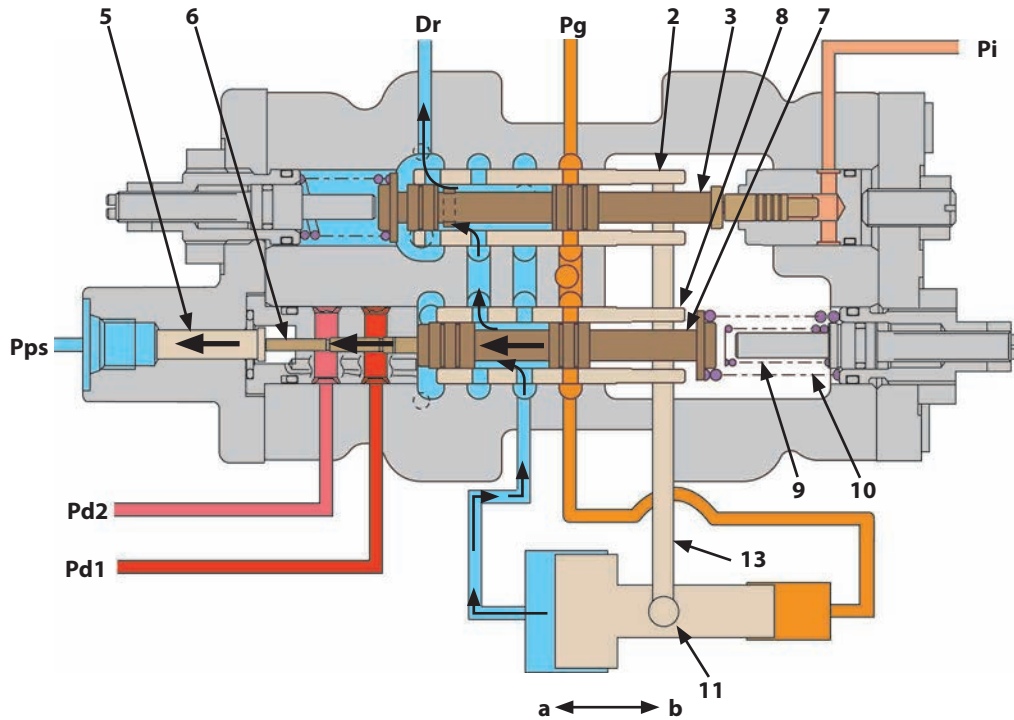
Group 10 Steering Valve

Outline	T3-10-1
Structure	T3-10-4
Operation.....	T3-10-5
Overload Relief Valve.....	T3-10-10
Make-Up Valve	T3-10-10
Relief Valve	T3-10-12

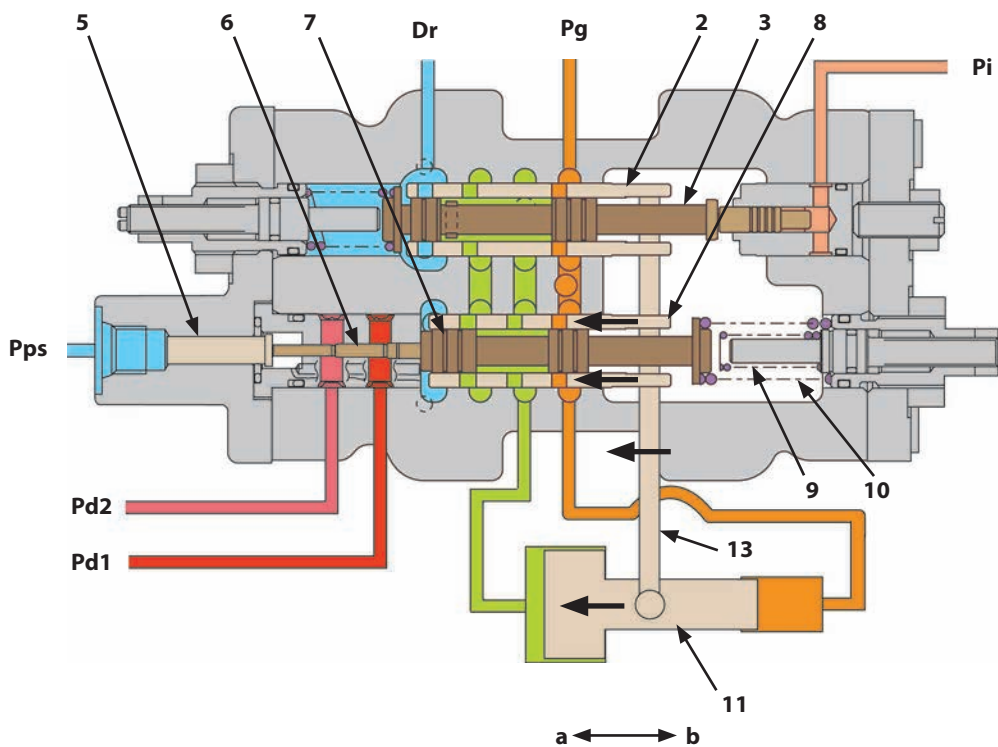
SECTION 3 COMPONENT OPERATION

Group 1 Pump Device

 NOTE: The figure shows the pump 2 regulator.



TPPP-03-01-020



TDAA-03-01-008

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)

a- Displacement Angle Increase
b- Displacement Angle Decrease

2- Sleeve A
3- Spool A
5- Load Piston 1

6- Load Piston 2
7- Spool B
8- Sleeve B

9- Inner Spring
10- Outer Spring

11- Servo Piston
13- Link

SECTION 3 COMPONENT OPERATION

Group 2 Swing Device

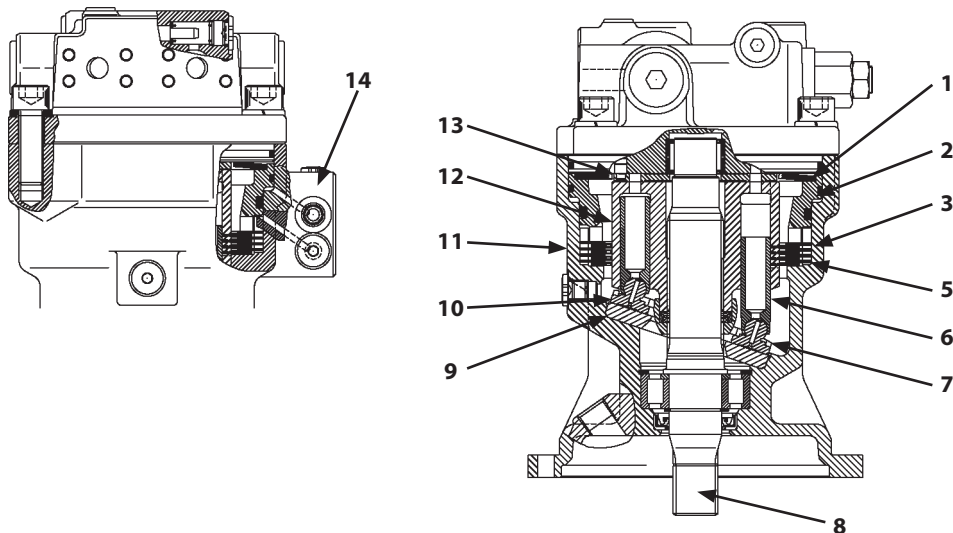
Swing Motor

The swing motor consists of swash plate (9), rotor (12), plungers (6), valve plate (13), housing (11), and swing parking brake (spring (1), brake piston (2), plates (3), friction plates (5), and swing parking brake selection valve (14)).

Shaft (8) is joined to the rotor (12) by a spline joint. Plungers (6) are inserted into rotor (12).

When pressure oil is supplied from the pump, plungers (6) are pushed. As swash plate (9) is inclined, shoes (10) on the end of plungers (6) slide and swash plate (9), and rotor (12) rotates.

The end of shaft (8) is splined to the first stage sun gear in the swing reduction gear. Therefore, the rotation of shaft (8) is transmitted to the swing reduction gear.



TCEB-03-02-002

1- Spring
2- Brake Piston
3- Plate
5- Friction Plate

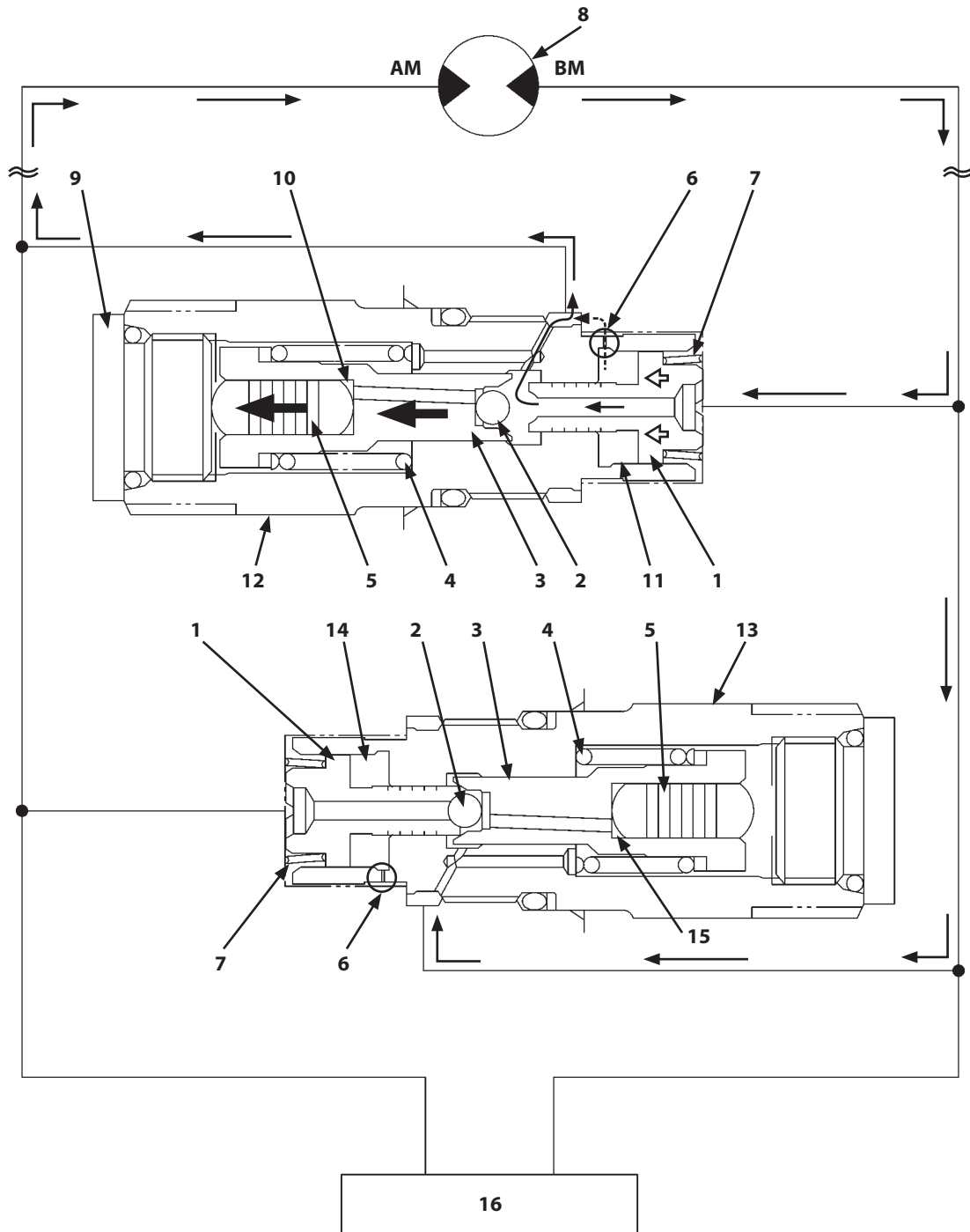
6- Plunger
7- Retainer
8- Shaft
9- Swash Plate

10- Shoe
11- Housing
12- Rotor
13- Valve Plate

14- Swing Parking Brake Selection Valve

SECTION 3 COMPONENT OPERATION

Group 2 Swing Device



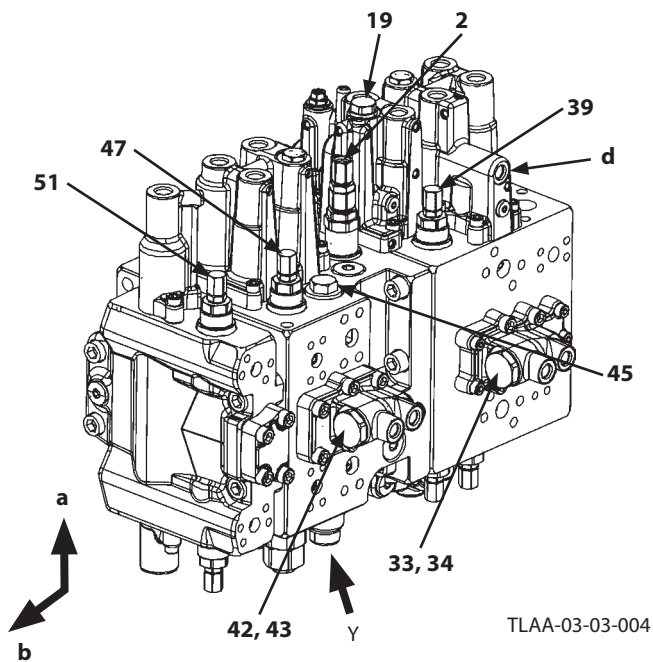
T1V1-03-02-014

- | | | | |
|------------|-------------------------------------|-------------------------------------|-------------------------------------|
| 1- Poppet | 7- Spring | 11- Chamber M (Combination Valve A) | 15- Chamber N (Combination Valve B) |
| 2- Ball | 8- Swing Motor | 12- Combination Valve A | 16- Control Valve |
| 3- Plunger | 9- Plug | 13- Combination Valve B | |
| 4- Spring | 10- Chamber N (Combination Valve A) | 14- Chamber M (Combination Valve B) | |
| 5- Piston | | | |
| 6- Orifice | | | |

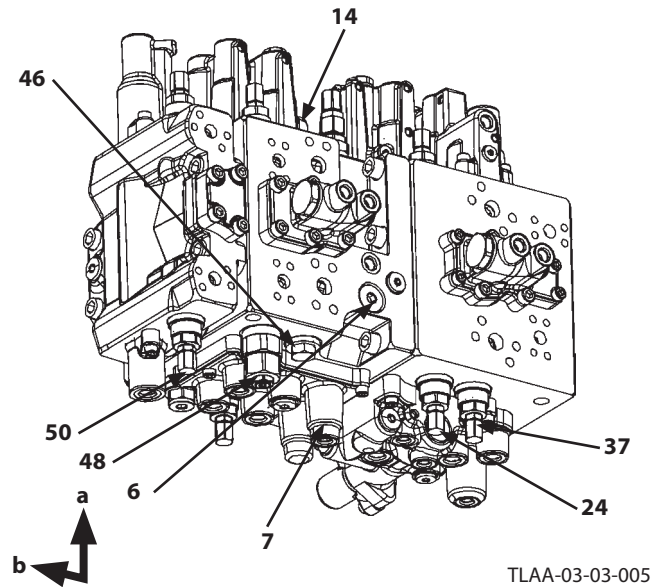
SECTION 3 COMPONENT OPERATION

Group 3 Control Valve

B Side



View from Y



a- Machine Top
b- Machine Front

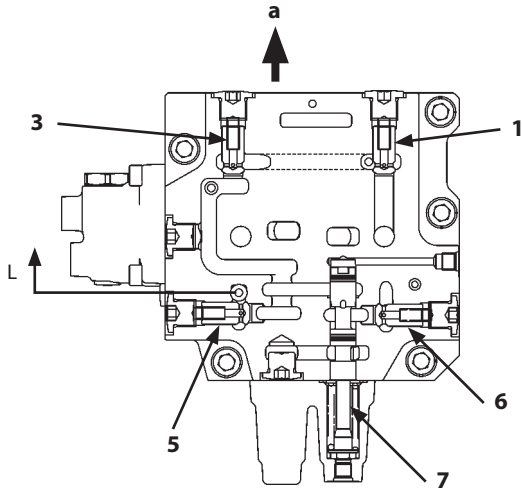
d- Arm Roll-In Pressure Sensor
Connecting Position

- | | | | |
|--|--|--|---|
| 1- Check Valve (Main Relief Circuit) | 15- Bucket Regenerative Valve | 29- Arm 2 Flow Rate Control Valve (Poppet Valve) | 42- Auxiliary Flow Rate Control Valve (Poppet Valve) |
| 2- Main Relief Valve | 16- Overload Relief Valve (Bucket: Rod Side) | 30- Load Check Valve (Digging Regenerative Circuit) (Unused) | 43- Auxiliary Flow Rate Control Valve (Selector Valve) |
| 3- Check Valve (Main Relief Circuit) | 17- Overload Relief Valve (Bucket: Bottom Side) | 31- Digging Regenerative Valve (Unused) | 44- Overload Relief Valve (Auxiliary) |
| 4- Load Check Valve (Positioning/Auxiliary 2 Parallel Circuit) | 18- Boom Flow Rate Control Valve (Poppet Valve) | 32- Load Check Valve (Swing Tandem Circuit) | 45- Overload Relief Valve (Auxiliary) |
| 5- Load Check Valve (Bucket, Blade/Outrigger Parallel Circuit) | 19- Boom Lower Meter-In Cut Valve | 33- Arm 1 Flow Rate Control Valve (Poppet Valve) | 46- Load Check Valve (Blade/Outrigger Tandem Circuit) |
| 6- Check Valve (Auxiliary Flow Combiner Circuit) | 20- Boom Flow Rate Control Valve (Selector Valve) | 34- Arm 1 Flow Rate Control Valve (Selector Valve) | 47- Overload Relief Valve (Blade/Outrigger: Bottom Side) |
| 7- Auxiliary Flow Combiner Valve | 21- Boom Regenerative Valve | 35- Arm Regenerative Valve | 48- Overload Relief Valve (Blade/Outrigger: Rod Side) |
| 8- Load Check Valve (Blade/Outrigger Parallel Circuit) | 22- Overload Relief Valve (Boom: Bottom Side) | 36- Arm Regenerative Valve (Arm 1 Spool) | 49- Load Check Valve (Positioning/Auxiliary 2 Tandem Circuit) |
| 9- Load Check Valve (Orifice) (Bucket) | 23- Boom Anti-Drift Valve (Check Valve) | 37- Overload Relief Valve (Arm: Bottom Side) | 50- Overload Relief Valve (Positioning/Auxiliary 2) |
| 10- Make-Up Valve (Travel (Reverse) Side) | 24- Overload Relief Valve (Boom: Rod Side) | 38- Arm Rod Anti-Drift Valve (Check Valve) | 51- Overload Relief Valve (Positioning/Auxiliary 2) |
| 11- Make-Up Valve (Travel (Forward) Side) | 25- Boom Anti-Drift Valve (Selector Valve) | 39- Overload Relief Valve (Arm: Rod Side) | 52- Pump 1 |
| 12- Bucket Flow Rate Control Valve (Poppet Valve) | 26- Load Check Valve (Arm 2 Tandem Circuit) | 40- Arm Rod Anti-Drift Valve (Selector Valve) | 53- Pump 2 |
| 13- Bucket Flow Rate Control Valve (Selector Valve) | 27- Bypass Shut-Out Valve | 41- Load Check Valve (Boom 2 Parallel Circuit) | |
| 14- Bucket Regeneration Cut Valve | 28- Arm 2 Flow Rate Control Valve (Selector Valve) | | |

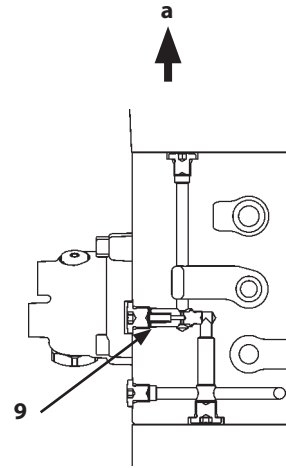
SECTION 3 COMPONENT OPERATION

Group 3 Control Valve

Section G-G



Section L



TLAA-03-03-014

TLAA-03-03-101

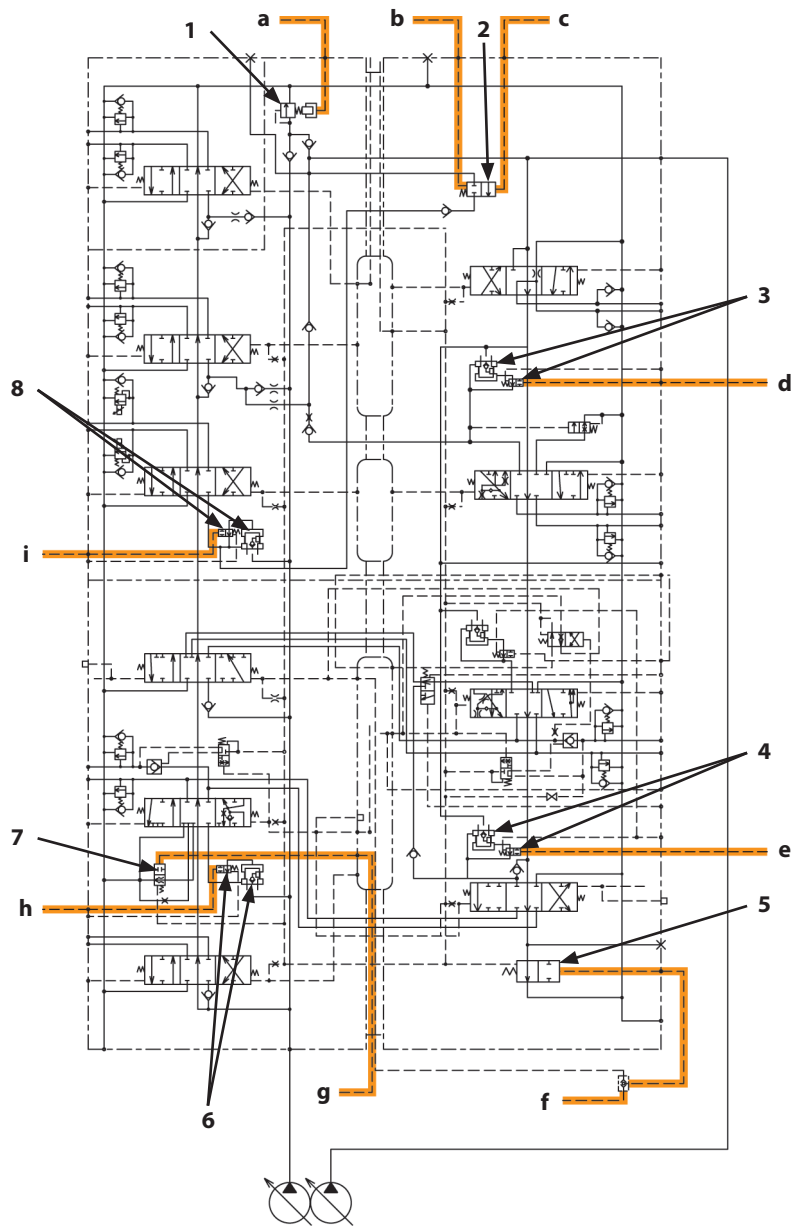
a- Machine Top

- | | | | |
|--|--|--|---|
| 1- Check Valve (Main Relief Circuit) | 15- Bucket Regenerative Valve | 29- Arm 2 Flow Rate Control Valve (Poppet Valve) | 42- Auxiliary Flow Rate Control Valve (Poppet Valve) |
| 2- Main Relief Valve | 16- Overload Relief Valve (Bucket: Rod Side) | 30- Load Check Valve (Digging Regenerative Circuit) (Unused) | 43- Auxiliary Flow Rate Control Valve (Selector Valve) |
| 3- Check Valve (Main Relief Circuit) | 17- Overload Relief Valve (Bucket: Bottom Side) | 31- Digging Regenerative Valve (Unused) | 44- Overload Relief Valve (Auxiliary) |
| 4- Load Check Valve (Positioning/Auxiliary 2 Parallel Circuit) | 18- Boom Flow Rate Control Valve (Poppet Valve) | 32- Load Check Valve (Swing Tandem Circuit) | 45- Overload Relief Valve (Auxiliary) |
| 5- Load Check Valve (Bucket, Blade/Outrigger Parallel Circuit) | 19- Boom Lower Meter-In Cut Valve | 33- Arm 1 Flow Rate Control Valve (Poppet Valve) | 46- Load Check Valve (Blade/Outrigger Tandem Circuit) |
| 6- Check Valve (Auxiliary Flow Combiner Circuit) | 20- Boom Flow Rate Control Valve (Selector Valve) | 34- Arm 1 Flow Rate Control Valve (Selector Valve) | 47- Overload Relief Valve (Blade/Outrigger: Bottom Side) |
| 7- Auxiliary Flow Combiner Valve | 21- Boom Regenerative Valve | 35- Arm Regenerative Valve | 48- Overload Relief Valve (Blade/Outrigger: Rod Side) |
| 8- Load Check Valve (Blade/Outrigger Parallel Circuit) | 22- Overload Relief Valve (Boom: Bottom Side) | 36- Arm Regenerative Valve (Arm 1 Spool) | 49- Load Check Valve (Positioning/Auxiliary 2 Tandem Circuit) |
| 9- Load Check Valve (Orifice) (Bucket) | 23- Boom Anti-Drift Valve (Check Valve) | 37- Overload Relief Valve (Arm: Bottom Side) | 50- Overload Relief Valve (Positioning/Auxiliary 2) |
| 10- Make-Up Valve (Travel (Reverse) Side) | 24- Overload Relief Valve (Boom: Rod Side) | 38- Arm Rod Anti-Drift Valve (Check Valve) | 51- Overload Relief Valve (Positioning/Auxiliary 2) |
| 11- Make-Up Valve (Travel (Forward) Side) | 25- Boom Anti-Drift Valve (Selector Valve) | 39- Overload Relief Valve (Arm: Rod Side) | 52- Pump 1 |
| 12- Bucket Flow Rate Control Valve (Poppet Valve) | 26- Load Check Valve (Arm 2 Tandem Circuit) | 40- Arm Rod Anti-Drift Valve (Selector Valve) | 53- Pump 2 |
| 13- Bucket Flow Rate Control Valve (Selector Valve) | 27- Bypass Shut-Out Valve | 41- Load Check Valve (Boom 2 Parallel Circuit) | |
| 14- Bucket Regeneration Cut Valve | 28- Arm 2 Flow Rate Control Valve (Selector Valve) | | |

SECTION 3 COMPONENT OPERATION

Group 3 Control Valve

External Pilot Pressure Circuit



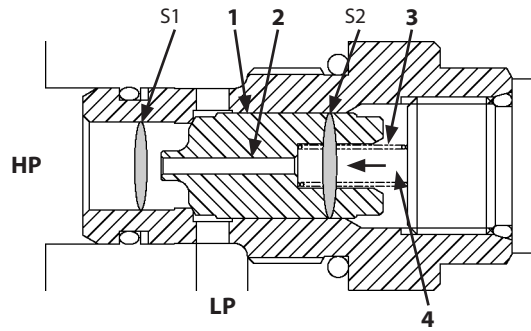
TLBE-03-03-004

- | | | | |
|--|---|--|--|
| a- Pilot Pressure from 4-Spool Solenoid Valve Unit (SG) | d- Pilot Pressure from Bucket Flow Rate Control Valve Control Spool in Signal Control Valve | f- Pilot Pressure from 4-Spool Solenoid Valve Unit (SI) | i- Pilot Pressure from Auxiliary Flow Rate Control Solenoid Valve (Option) |
| b- Pilot Pressure from Reducing Valve (Option) | e- Pilot Pressure from 4-Spool Solenoid Valve Unit (SF) | g- Pilot Pressure from 4-Spool Solenoid Valve Unit (SC) | |
| c- Pilot Pressure from Auxiliary Flow Combiner Control Solenoid Valve (Option) | | h- Pilot Pressure from Arm 1 Flow Rate Control Valve Control Spool in Signal Control Valve | |
| 1- Main Relief Valve | 4- Arm 2 Flow Rate Control Valve | 7- Arm Regenerative Valve | |
| 2- Auxiliary Flow Combiner Valve | 5- Bypass Shut-Out Valve | 8- Auxiliary Flow Rate Control Valve | |
| 3- Bucket Flow Rate Control Valve | 6- Arm 1 Flow Rate Control Valve | | |

SECTION 3 COMPONENT OPERATION

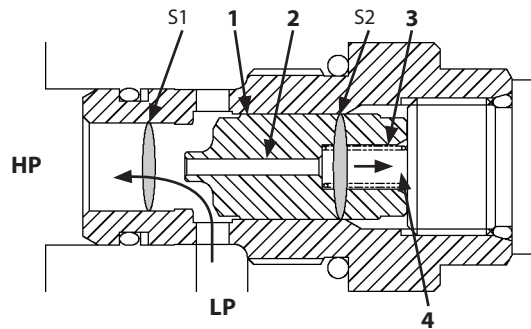
Group 3 Control Valve

During Normal Operation:



TLBE-03-03-008

During Make-Up Operation:



TLBE-03-03-009

HP- Actuator Circuit

LP- Hydraulic Oil Tank

1- Poppet

2- Passage

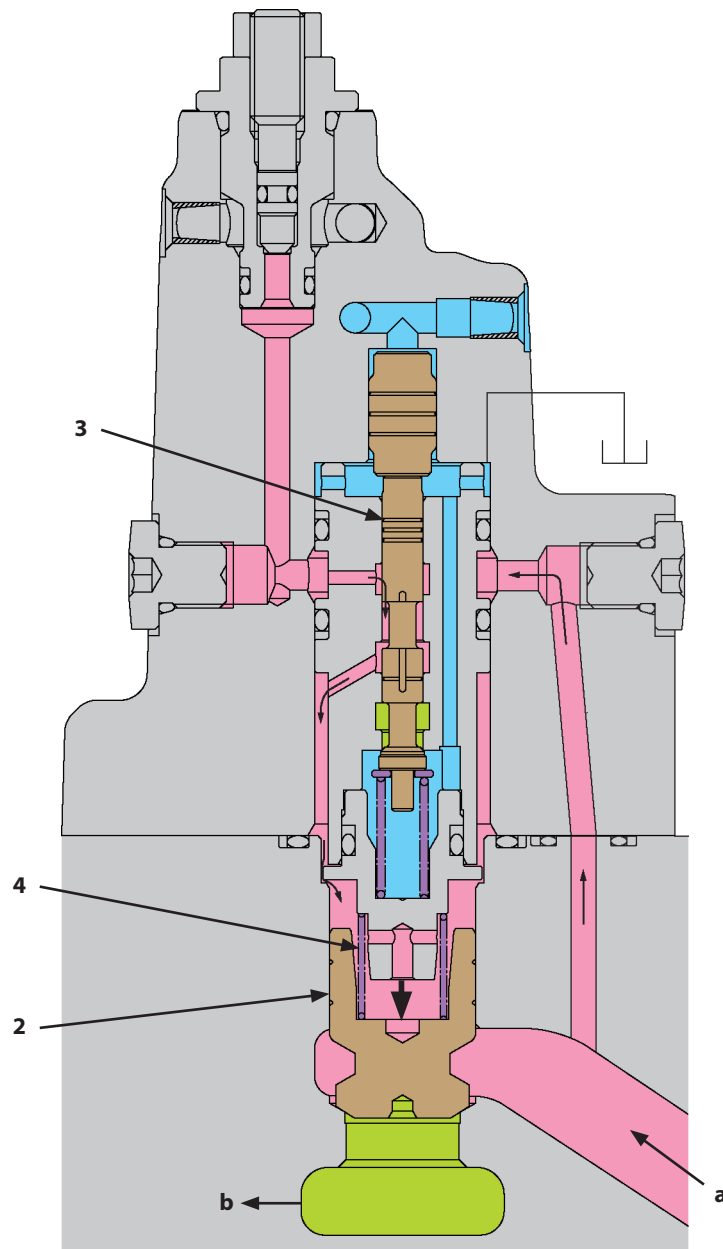
3- Spring

4- Spring Chamber

SECTION 3 COMPONENT OPERATION

Group 3 Control Valve

Holding Operation:



TDAD-03-03-037

a- Returning Oil from Cylinder (1) (Boom Cylinder: Bottom Side, Arm Cylinder: Rod Side) b- To Main Spool

2- Check Valve

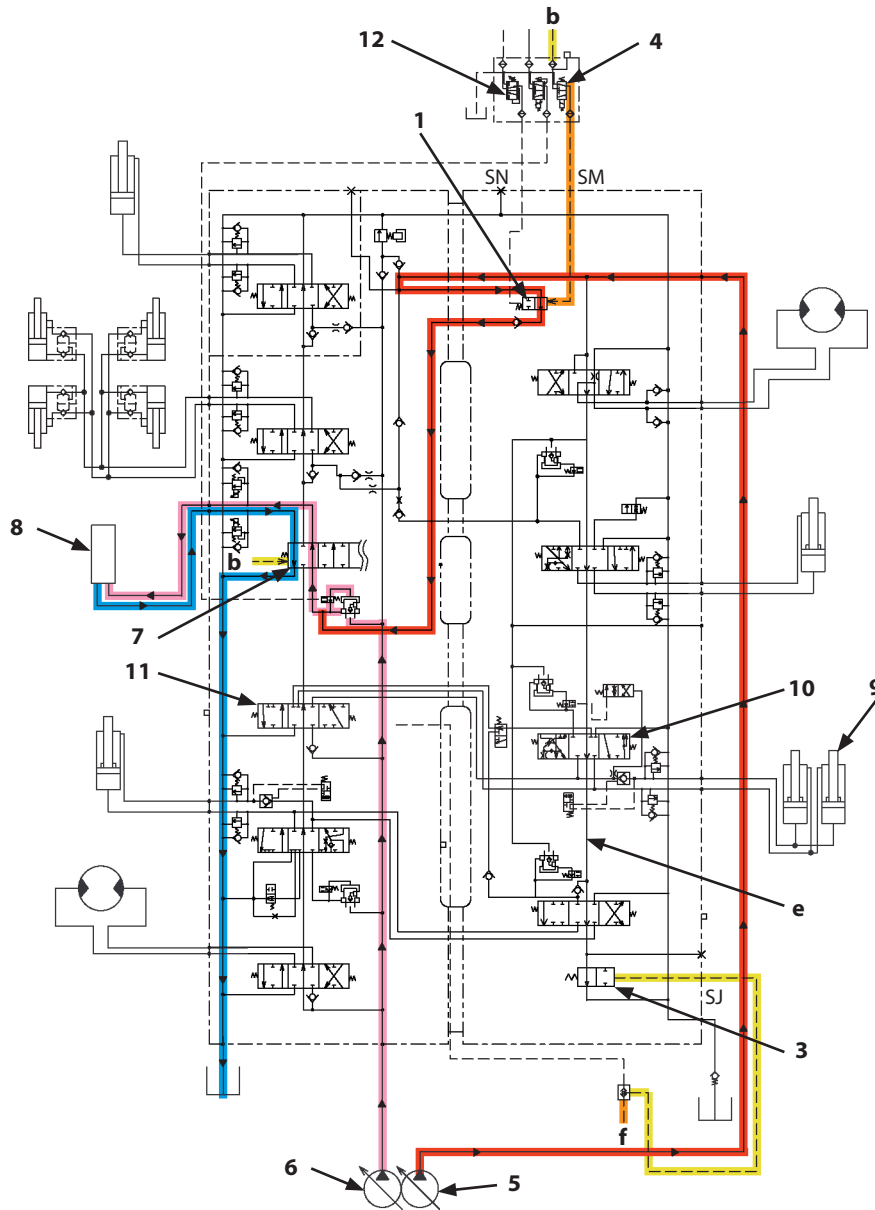
3- Control Valve

4- Spring

SECTION 3 COMPONENT OPERATION

Group 3 Control Valve

 NOTE: The figure shows attachment operation.



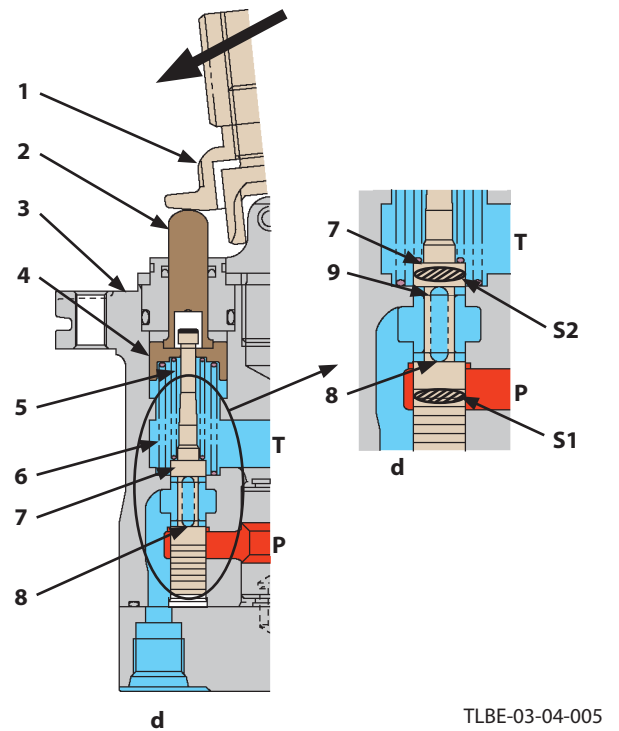
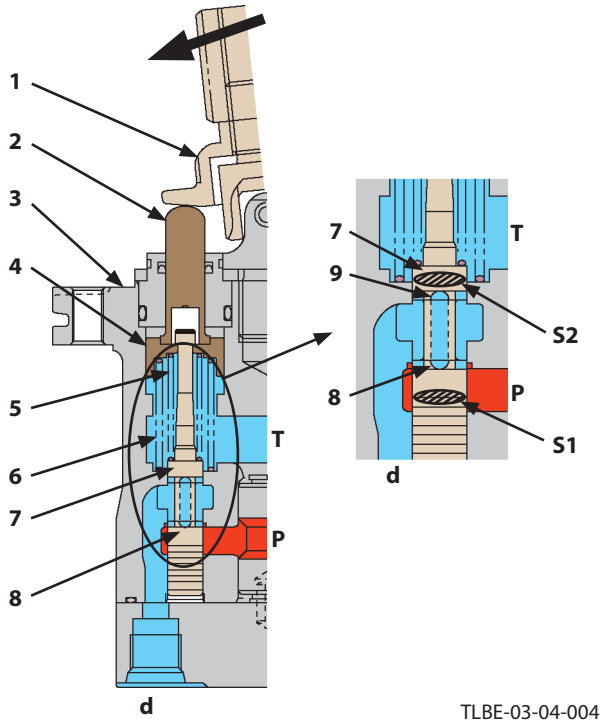
TLBE-03-03-006

- | | | | |
|----|---------------------------------------|-----|--|
| b- | Attachment Pilot Pressure | f- | Pilot Pressure from 4-Spool Solenoid Valve Unit (SI) |
| e- | Neutral Circuit in 4-Spool Side | | |
| 1- | Spool (Auxiliary Flow Combiner Valve) | 4- | Auxiliary Flow Combiner Control Solenoid Valve |
| 3- | Spool (Bypass Shut-Out Valve) | 5- | Pump 1 |
| | | 6- | Pump 2 |
| | | 7- | Auxiliary Spool |
| | | 8- | Attachment |
| | | 9- | Boom Cylinder |
| | | 10- | Boom 1 Spool |
| | | 11- | Boom 2 Spool |
| | | 12- | Pressure Reducing Valve |

SECTION 3 COMPONENT OPERATION

Group 4 Pilot Valve

Front Attachment/
Swing Pilot Valve



P- Port P
T- Port T

1- Cam
2- Pusher
3- Casing

d- Output Port
S1- Pressure Receiving Area S1

4- Spring Guide
5- Balance Spring
6- Return Spring

S2- Pressure Receiving Area S2

7- Spool
8- Notch
9- Notch

SECTION 3 COMPONENT OPERATION

Group 5 Electric Lever

Outline

Each electric lever outputs a signal to MC2 (main controller 2) according to the amount of lever operation. MC2 activates the solenoid valves for each operation according to the amount of lever operation. Consequently, pressure oil from the pilot pump flows to the spool ends in control valve and moves the spools. The electric levers include levers for auxiliary, blade/outrigger, assist (option) and positioning (2-piece boom specifications only).

- Auxiliary Electric Lever

Port No.	
1	-
2	-

- Blade/Outrigger Electric Lever

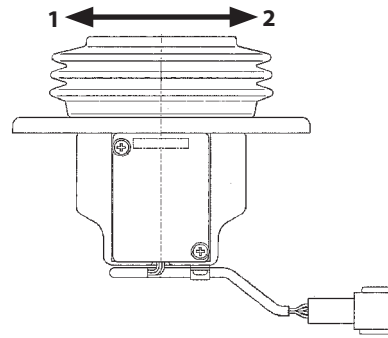
Port No.	
1	Blade/Outrigger Raise
2	Blade/Outrigger Lower

- Assist Electric Lever

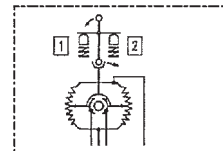
Port No.	
1	Assist
2	Assist

- Positioning Electric Lever

Port No.	
1	Positioning Raise
2	Positioning Lower



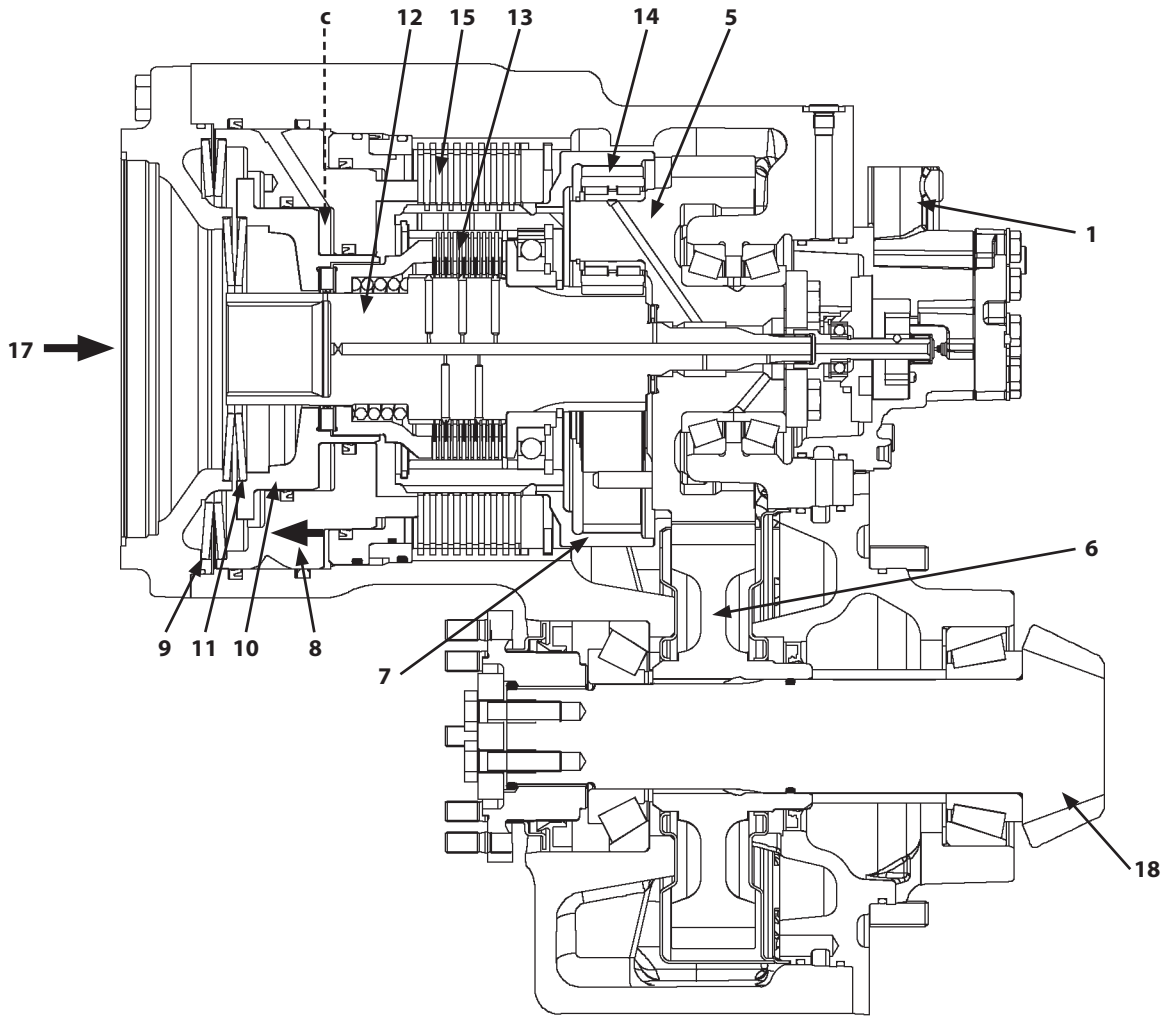
T1MG-03-09-018



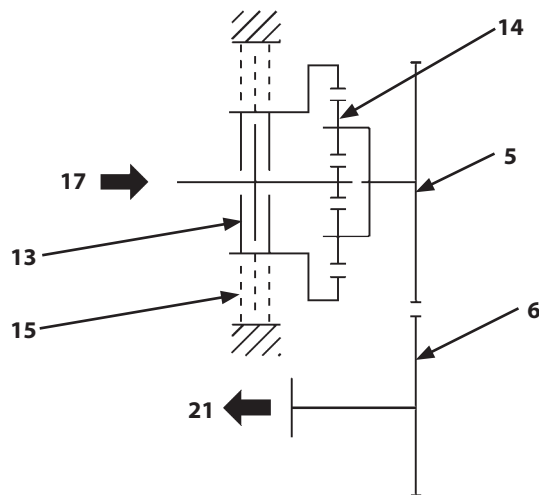
T1MG-03-09-012

SECTION 3 COMPONENT OPERATION

Group 6 Transmission



TLBE-03-06-001



TCDB-03-05-002

c- Pressure Oil

1- Gearshift Piston

5- Carrier

6- Final Gear

7- Ring Gear

8- Brake Piston

9- Disc Spring

10- Clutch Piston

11- Disc Spring

12- Shaft

13- Disc Clutch

14- Planetary Gear

15- Disc Brake

16- Accumulator

17- Travel Motor

18- Pinion Shaft

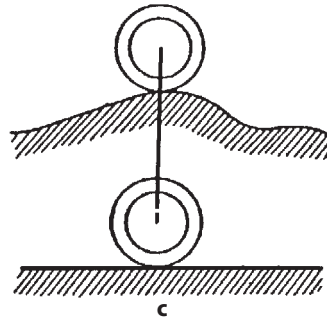
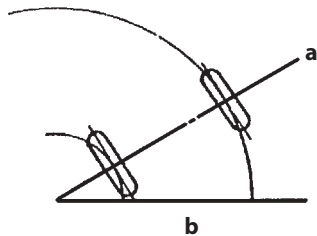
21- Propeller Shaft

SECTION 3 COMPONENT OPERATION

Group 7 Axle

Function

- Purpose of Differential Gear
1. When the machine is steered, the wheels travel along circles that have their centers on a line extended from the rear wheel drive shaft. Therefore, the outer wheel must rotate faster than the inner wheel.
 2. Let's study the case when the rear wheels are driven by a propeller shaft with gears directly attached via an axle having no differential gear.
 3. In this case, both outer and inner wheels rotate at the same speed. When the machine is steered, the outer wheel must move faster than the inner wheel, and as a result sliding between the tire and road surface and premature wearing of the tire occur. In addition, torsional torque is applied to the axle, preventing the stable transmission of driving force.
 4. When a differential gear is installed, the outer wheel can rotate at a different speed from that of the inner wheel so that the problem as mentioned above does not occur.



T202-03-05-005

a- Extension Line of Rear Wheel Drive Shaft

b- When the Machine is Steered:

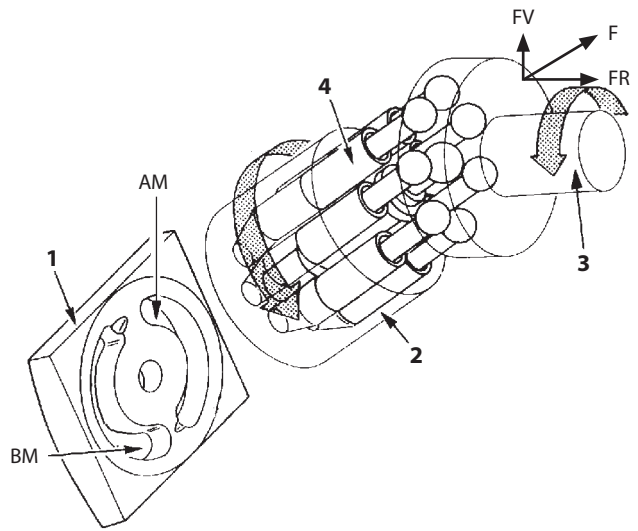
c- When the Machine Travels on an Uneven Road Surface:

SECTION 3 COMPONENT OPERATION

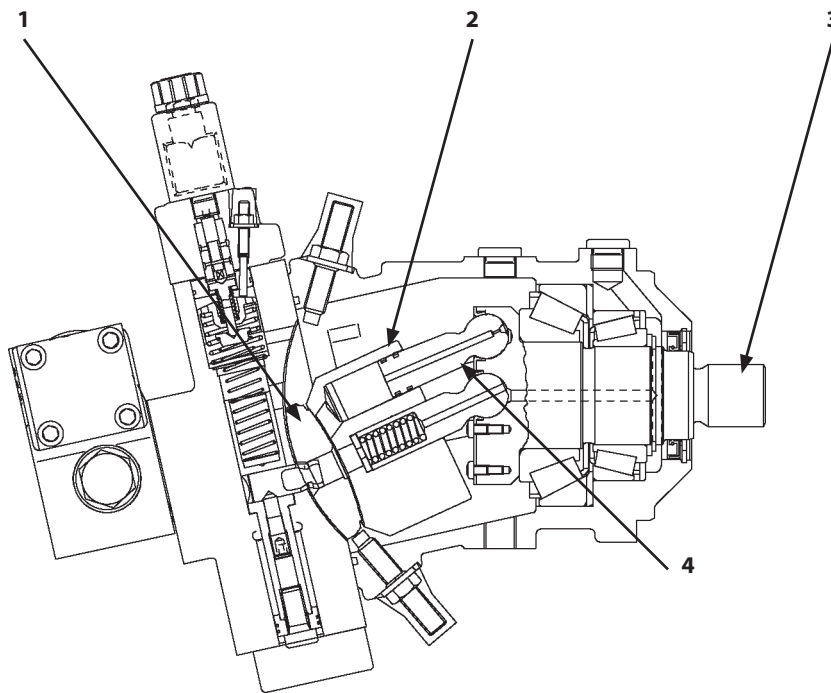
Group 8 Travel Motor

Rotor Section

The rotor section consists of valve plate (1), rotor (2), drive shaft (3), and plungers (4). When pressure oil is routed to port BM on valve plate (1), pressure oil flows into the half side of rotor (2) and plungers (4) are pushed. The component force (FV) of plunger pushing force (F) rotates drive shaft (3). As drive shaft (3) rotates, rotor (2) is also rotated. Then, when plunger (4) is rotated up to port AM in sequence, pressure oil in rotor (2) is returned to the hydraulic oil tank. Pressure oil is delivered to either port BM or port AM and shifts the rotation direction of the motor.



TLBE-03-08-001



TCJB-03-07-005

1- Valve Plate

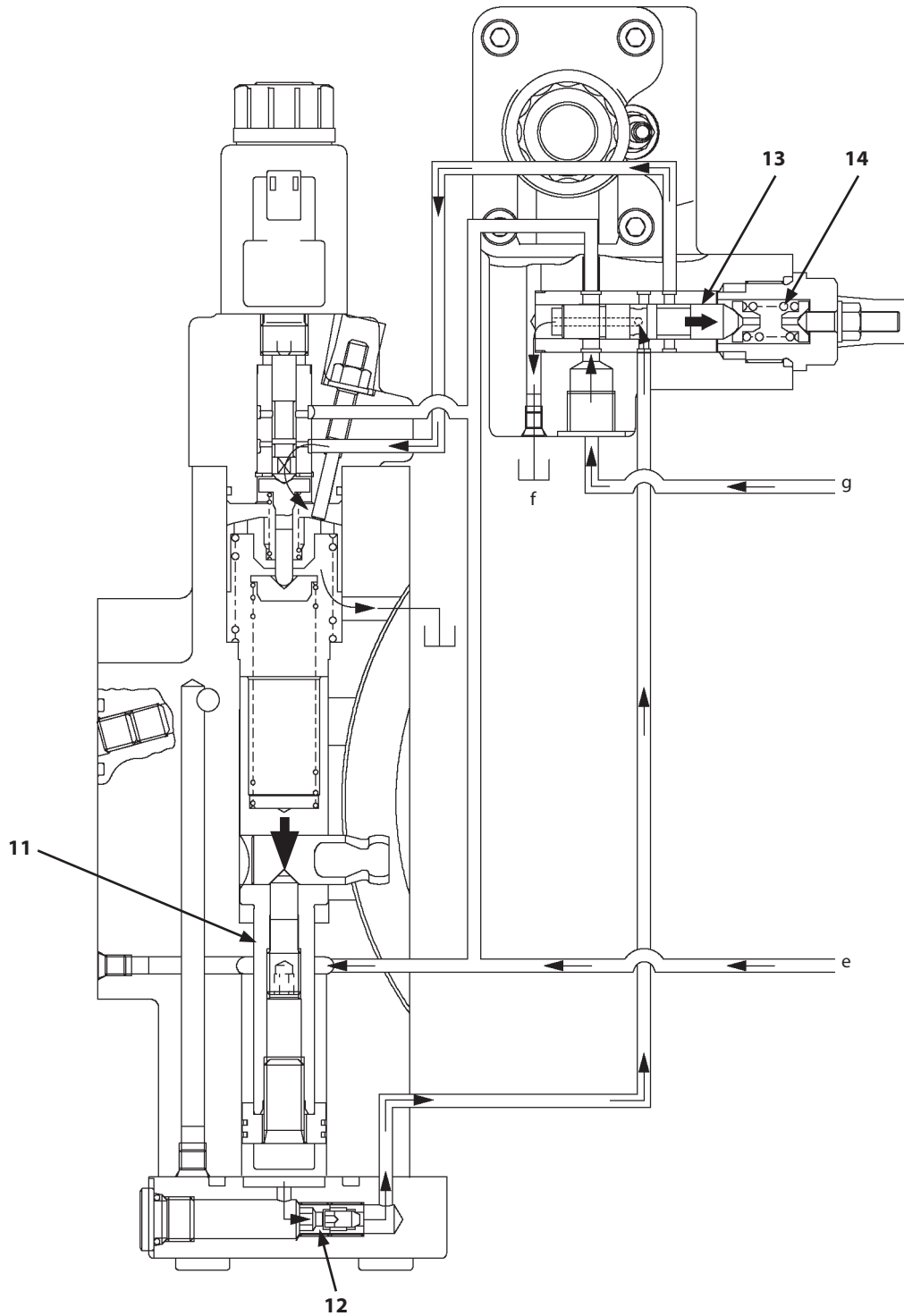
2- Rotor

3- Drive Shaft

4- Plunger

SECTION 3 COMPONENT OPERATION

Group 8 Travel Motor



TCJB-03-07-014

e- Motor Circuit Pressure

f- Hydraulic Oil Tank

g- Motor Driving Oil Pressure

11- Servo Piston

12- Orifice

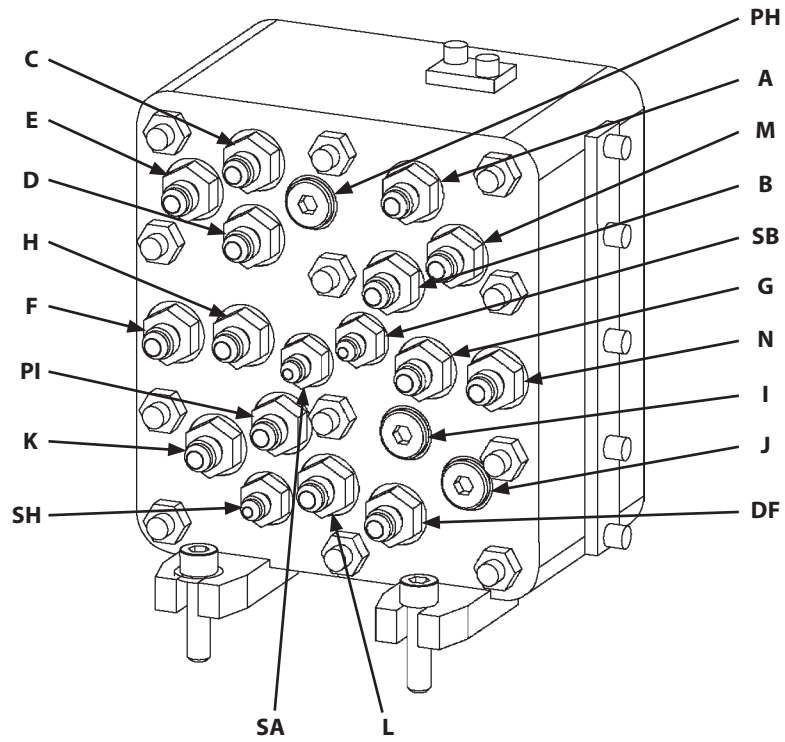
13- Pilot Piston

14- Spring

SECTION 3 COMPONENT OPERATION

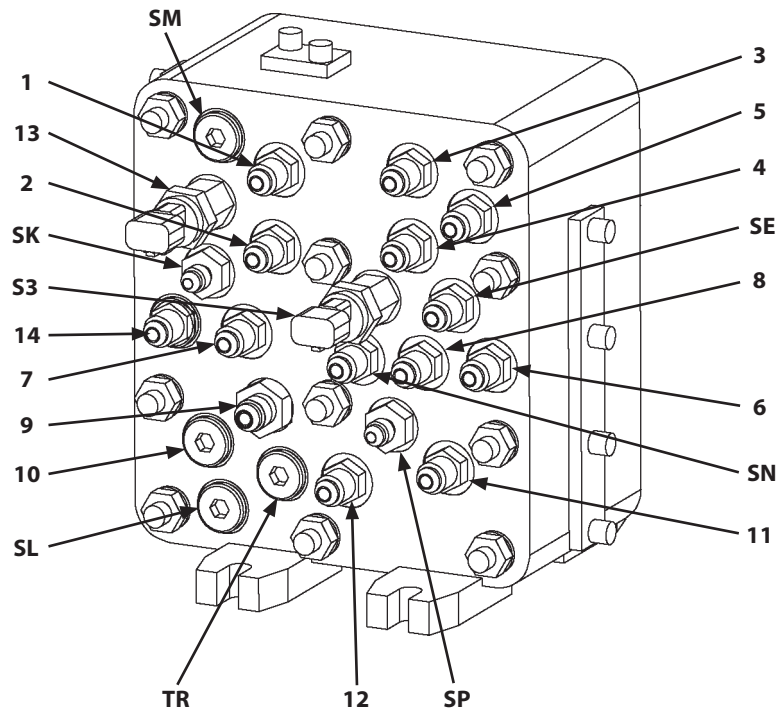
Group 9 Signal Control Valve

Pilot Valve Side



TLBE-03-09-001

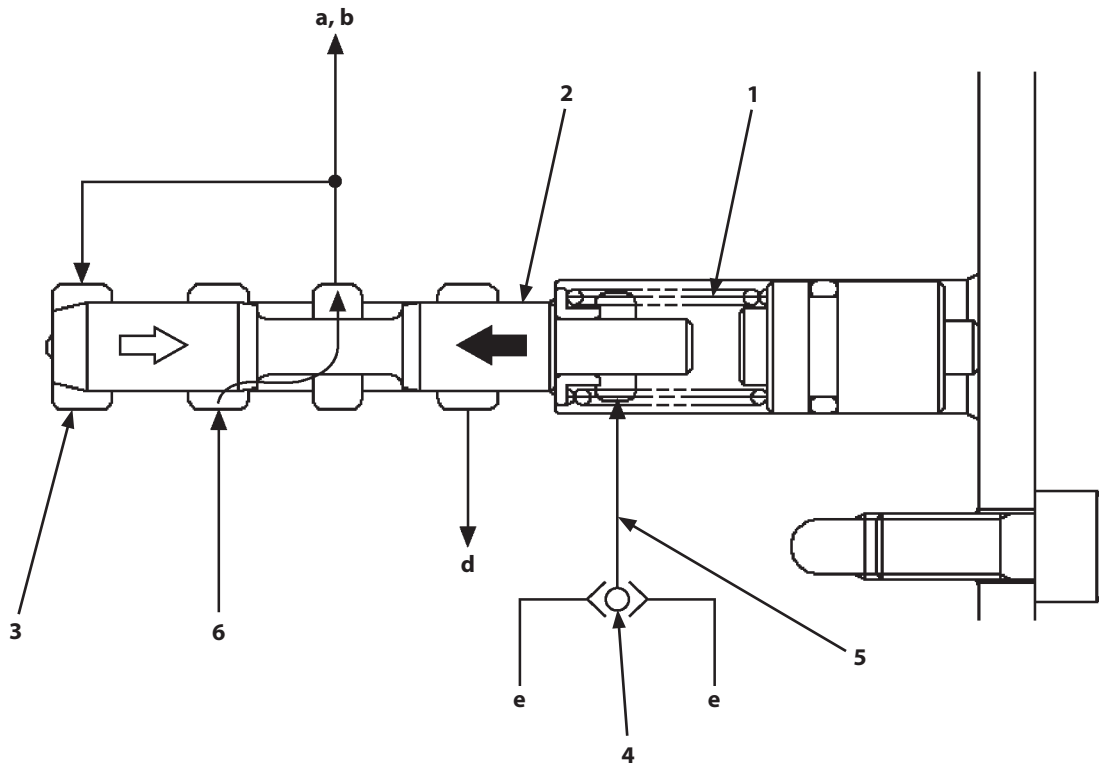
Control Valve Side



TLBE-03-09-002

SECTION 3 COMPONENT OPERATION

Group 9 Signal Control Valve



TDAA-03-06-012

a- To Port SA
b- To Port SB

d- To Hydraulic Oil Tank

e- From Pilot Valve

1- Spring
2- Spool

3- Chamber A
4- Shuttle Valve

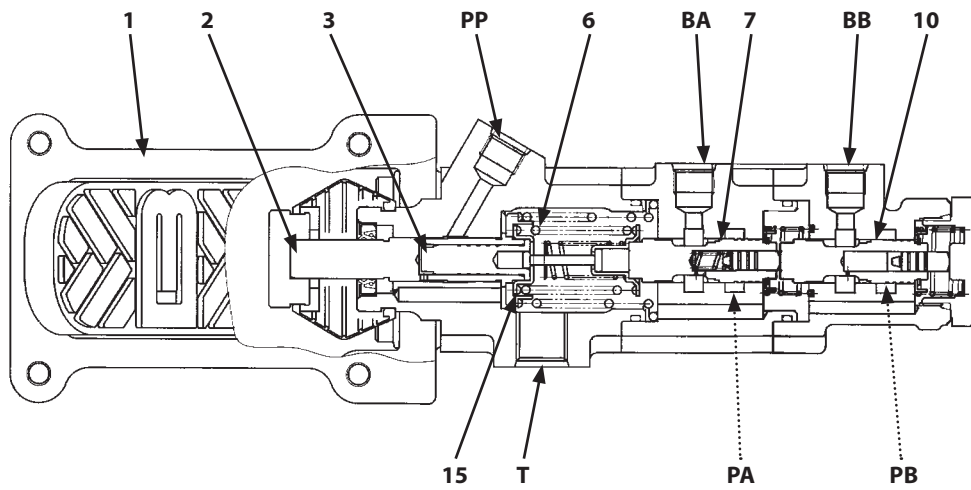
5- Pilot Pressure
6- Primary Pilot Pressure

SECTION 3 COMPONENT OPERATION
Group 10 Steering Valve

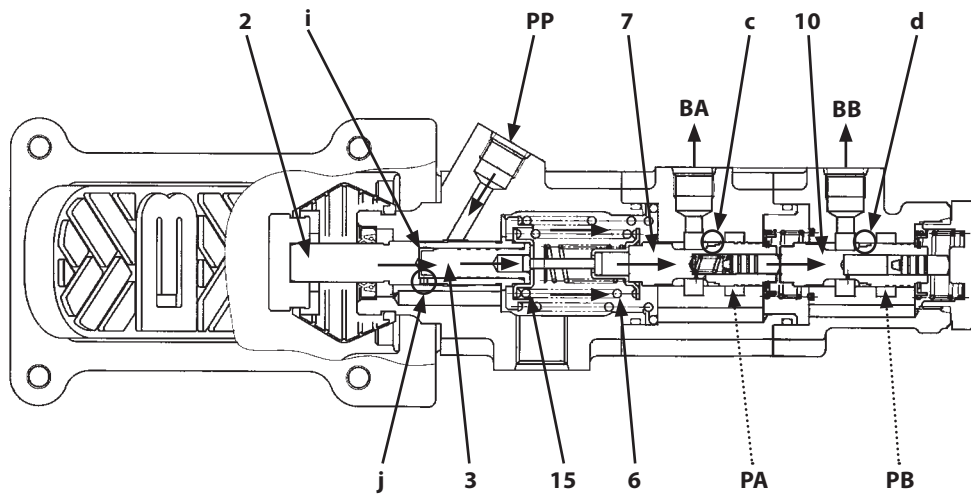
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SECTION 3 COMPONENT OPERATION

Group 11 Brake Valve



T1F3-03-09-002



T1F3-03-09-002

PP- Port PP
PA- Prot PA
i- Pilot Chamber

BA Prot BA
PB- Port PB
j- Hole

BB- Port BB
c- Notch

T- Port T
d- Notch

1- Brake Pedal
2- Push Rod

3- Pilot Piston
6- Balance Spring

7- Spool
10- Spool

15- Retainer

SECTION 3 COMPONENT OPERATION

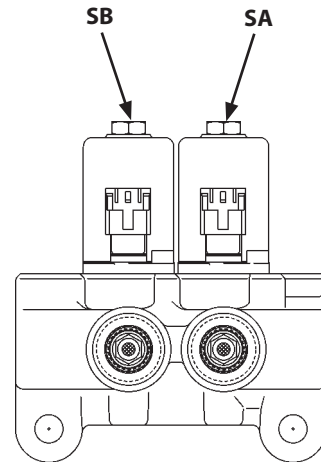
Group 12 Others (Upperstructure)

Pump 1 and Pump 2 Flow Rate Control Solenoid Valve Unit

The pump 1 and pump 2 flow rate control solenoid valve unit controls the pump delivery pressure according to the signal from MC1 (Main Controller 1). (Refer to SYSTEM/Control System.)

The pump 1 and pump 2 flow rate control solenoid valve unit consists of two proportional solenoid valves (SA, SB).

- SA : Controls pump 1 pump control pressure.
- SB : Controls pump 2 pump control pressure.



TLAA-01-02-001


SB- Pump 2 Flow Rate Control Solenoid Valve

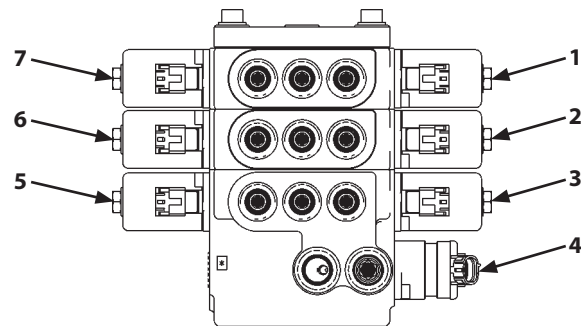
SA- Pump 1 Flow Rate Control Solenoid Valve

7-Spool Solenoid Valve Unit

The 7-spool solenoid valve unit consists of pilot cut-off solenoid valve (4), positioning solenoid valves (1, 7), auxiliary solenoid valves (2, 6), and blade/outrigger solenoid valves (3, 5).

Pilot cut-off solenoid valve (4) is an ON/OFF solenoid valve. The pilot cut-off solenoid valve (4) blocks pilot pressure oil which flows to positioning solenoid valves (1, 7), auxiliary solenoid valves (2, 6), blade/outrigger solenoid valves (3, 5), and assist solenoid valve according to the signal from MC2 (Main Controller 2). Positioning solenoid valves (1, 7), auxiliary solenoid valves (2, 6), and blade/outrigger solenoid valves (3, 5) are proportional solenoid valves. Positioning solenoid valves (1, 7), auxiliary solenoid valves (2, 6), and blade/outrigger solenoid valves (3, 5) shift the positioning, auxiliary, and blade/outrigger spools in the control valve according to the signal from MC2.

 **NOTE:** The positioning solenoid valve (1, 7) unit is installed only in machines with 2-piece boom specifications.

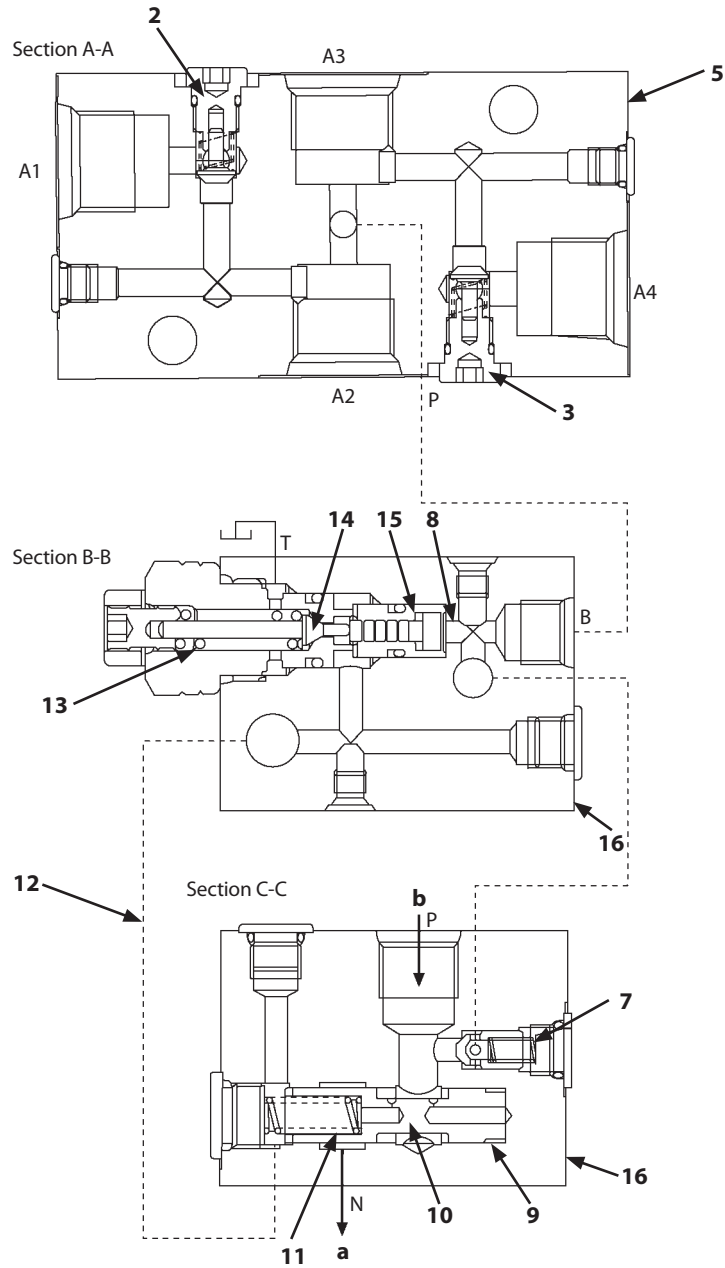


TLAA-03-12-020

- | | |
|-----------------------------------|-----------------------------------|
| 1- Positioning Solenoid Valve | 5- Blade/Outrigger Solenoid Valve |
| 2- Auxiliary Solenoid Valve | 6- Auxiliary Solenoid Valve |
| 3- Blade/Outrigger Solenoid Valve | 7- Positioning Solenoid Valve |
| 4- Pilot Cut-Off Solenoid Valve | |

SECTION 3 COMPONENT OPERATION

Group 12 Others (Upperstructure)



TLAA-03-12-007

a- Primary Pilot Pressure

b- From Pilot Pump

1- Brake Valve

7- Check Valve

13- Spring

2- Check Valve

8- Passage

14- Pilot Piston

3- Check Valve

9- Chamber A

15- Piston

4- Accumulator

10- Spool

16- Accumulator Charging Valve

5- Accumulator Manifold

11- Spring

17- Accumulator

6- Accumulator

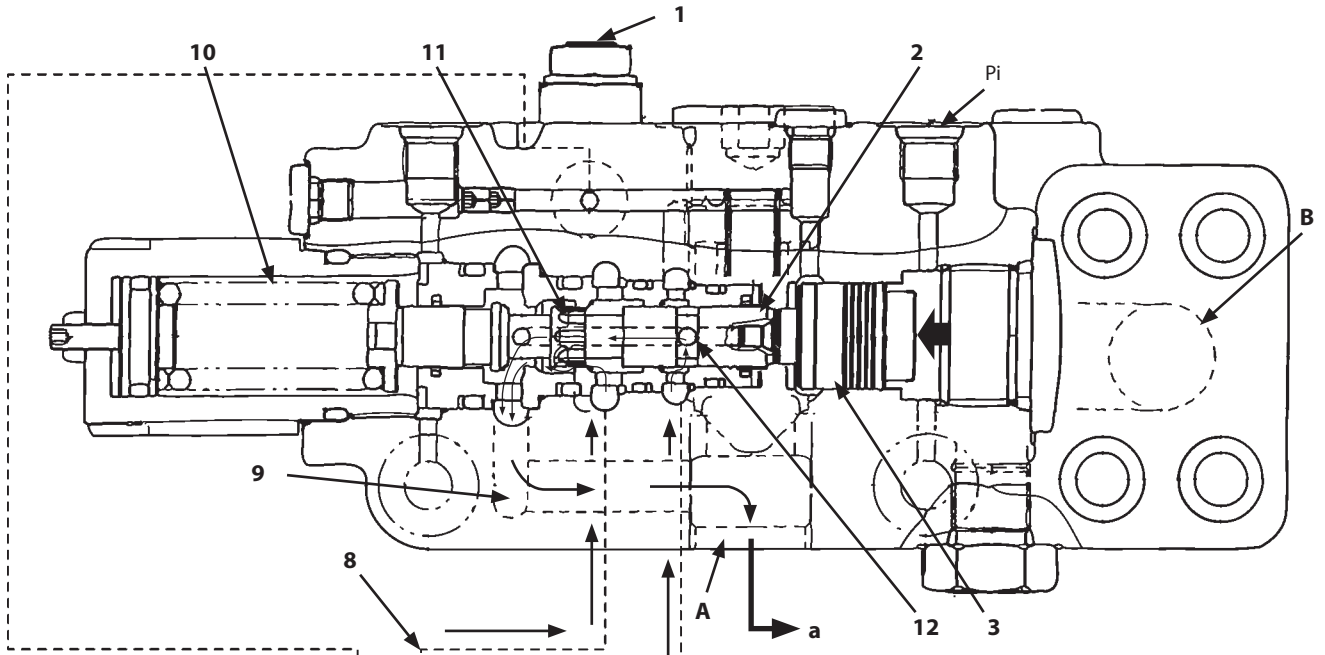
12- Passage

18- Accumulator

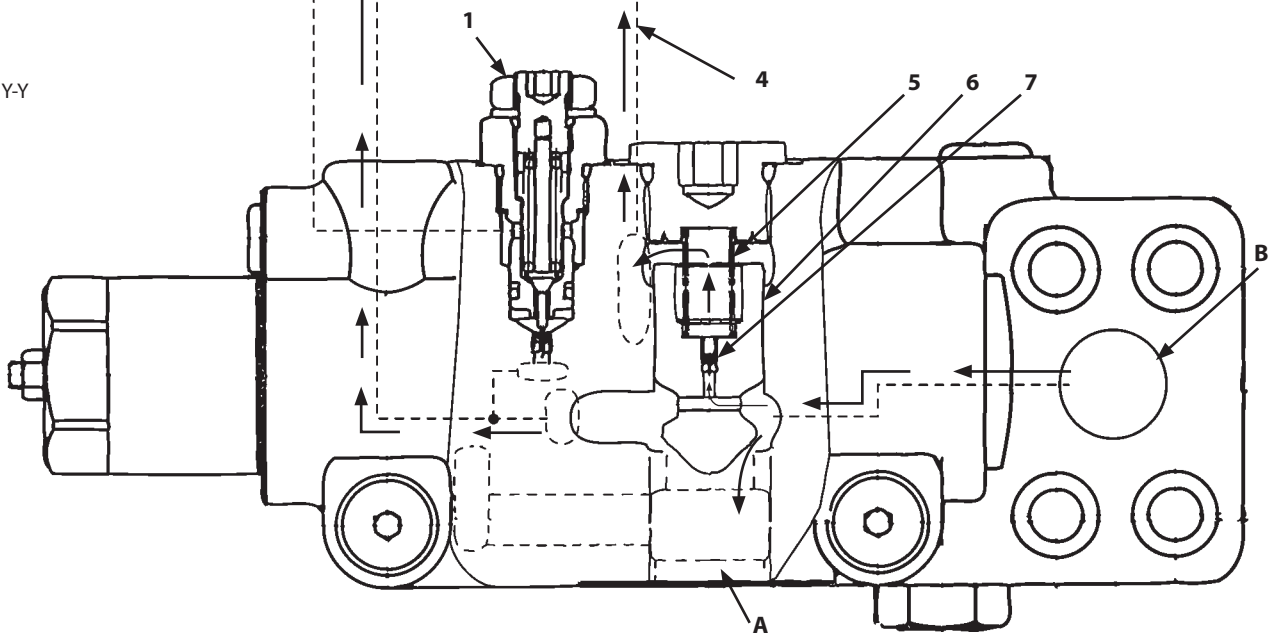
SECTION 3 COMPONENT OPERATION

Group 12 Others (Upperstructure)

Section X-X



Section Y-Y



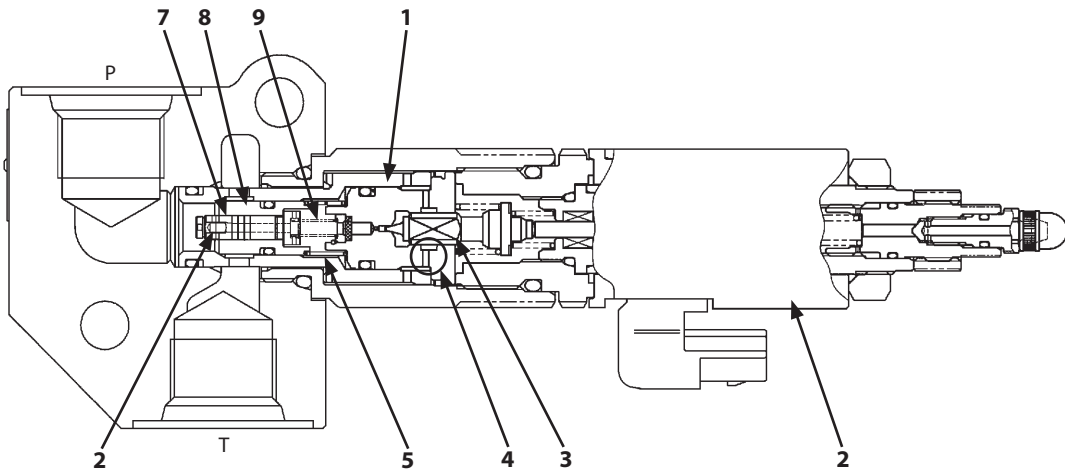
TDA-03-07-010

- | | | |
|-----------|-----------|---------------------------|
| A- Port A | B- Port B | a- To Control Valve Spool |
|-----------|-----------|---------------------------|
-
- | | | | |
|-----------------|--------------|--------------|-------------|
| 1- Relief Valve | 4- Passage C | 7- Orifice | 10- Spring |
| 2- Spool | 5- Spring | 8- Passage E | 11- Orifice |
| 3- Piston | 6- Poppet | 9- Passage D | 12- Hole |

SECTION 3 COMPONENT OPERATION

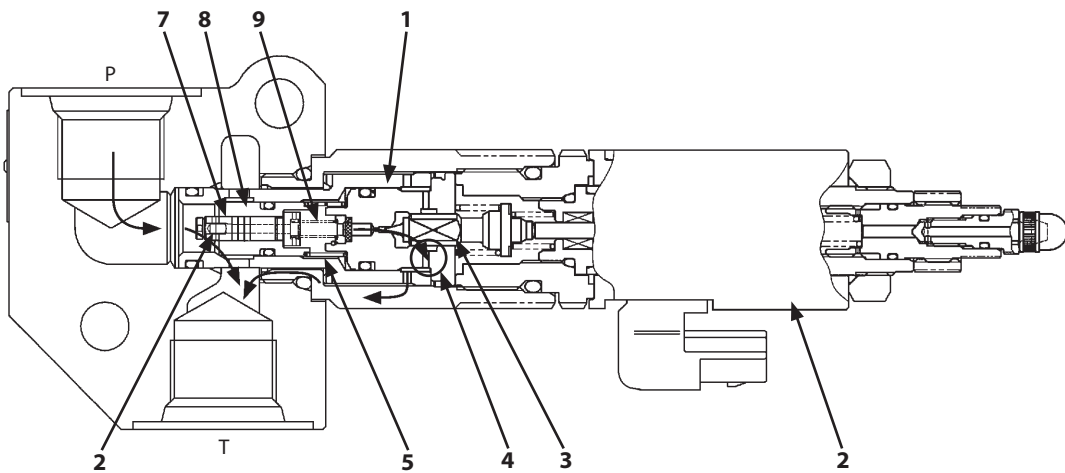
Group 12 Others (Upperstructure)

When Performing Normal Operation:



TLBE-03-12-013

When Performing Relief Operation:



TLBE-03-12-014

- | | | |
|-------------------|--------------|-------------------|
| 1- Main Poppet | 4- Passage A | 7- Piston |
| 2- Solenoid Valve | 5- Spring A | 8- Piston |
| 3- Pilot Poppet | 6- Orifice | 9- Spring Chamber |

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