



HYDRAULICS

CREATING
VALUE

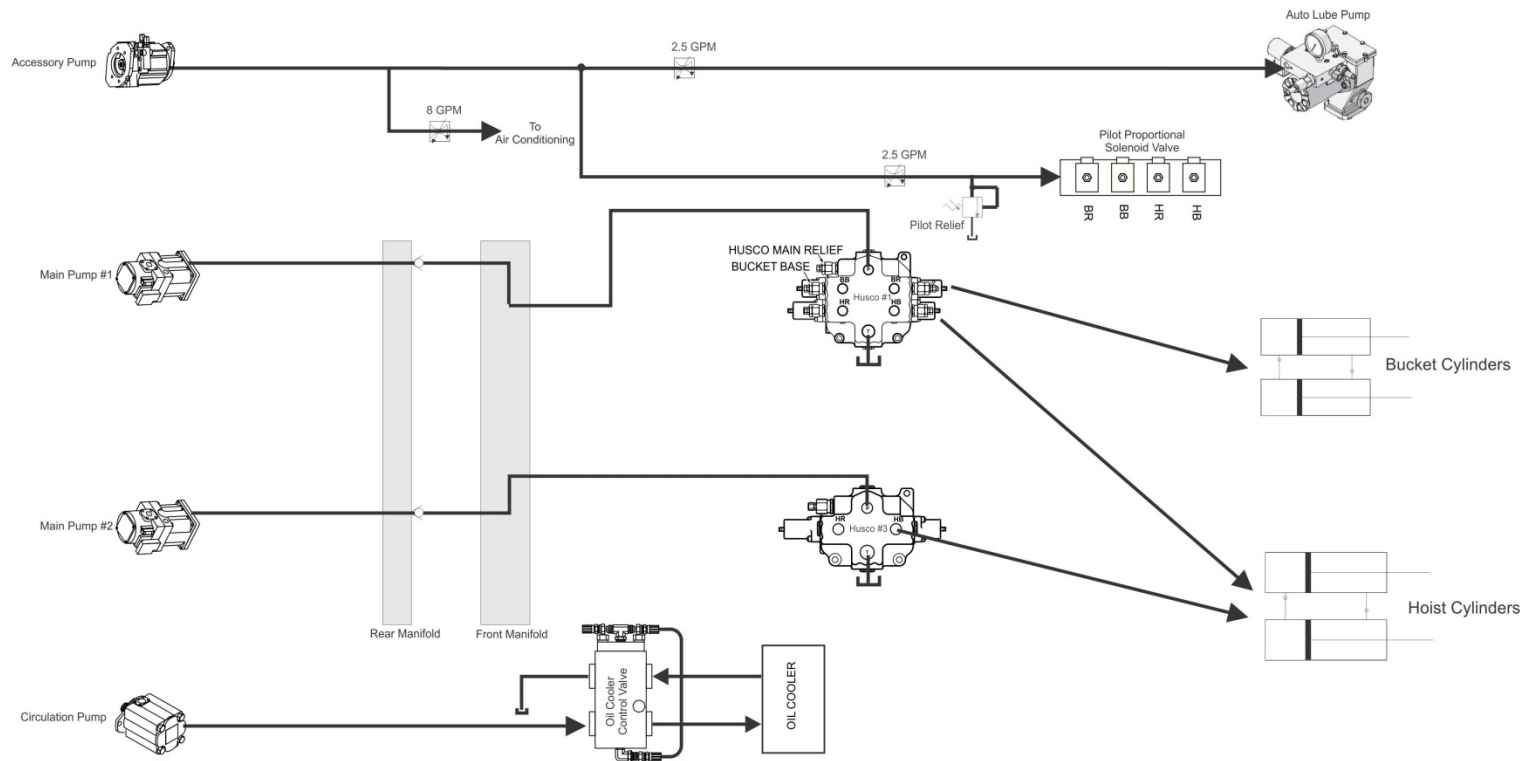
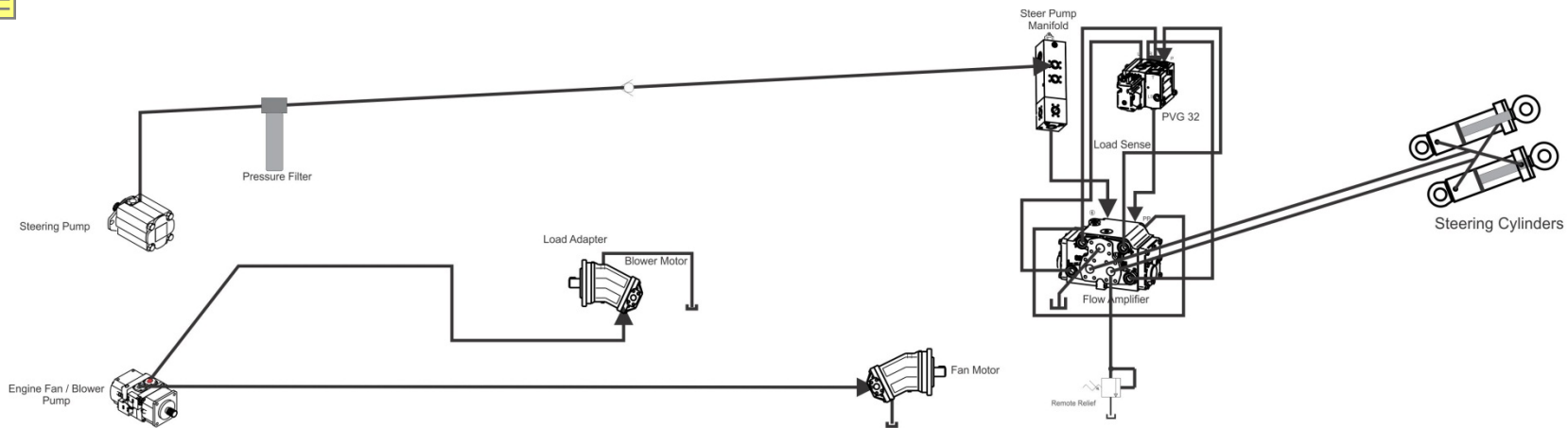
JOYGLOBAL

HYDRAULICS

HYDRAULICS

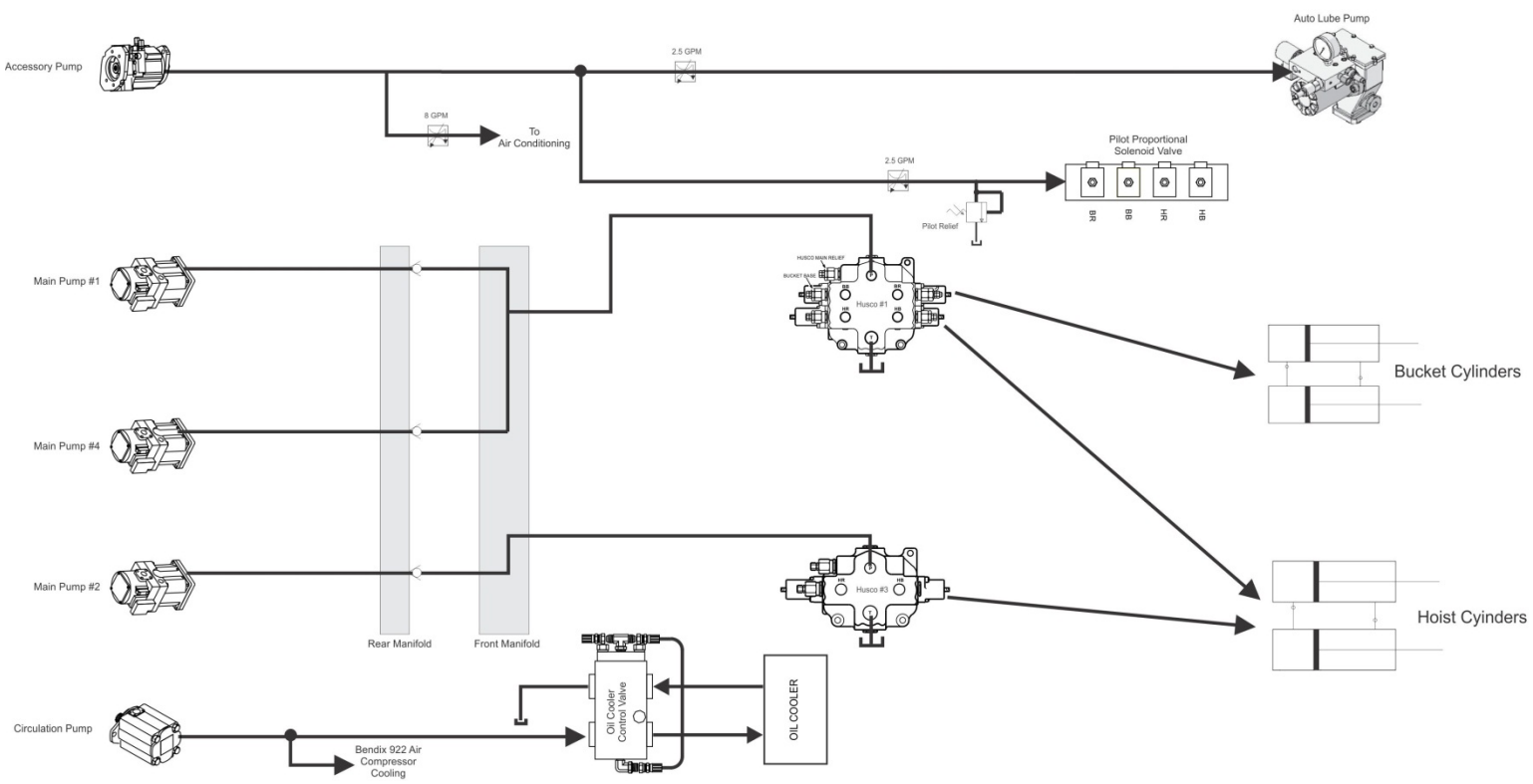
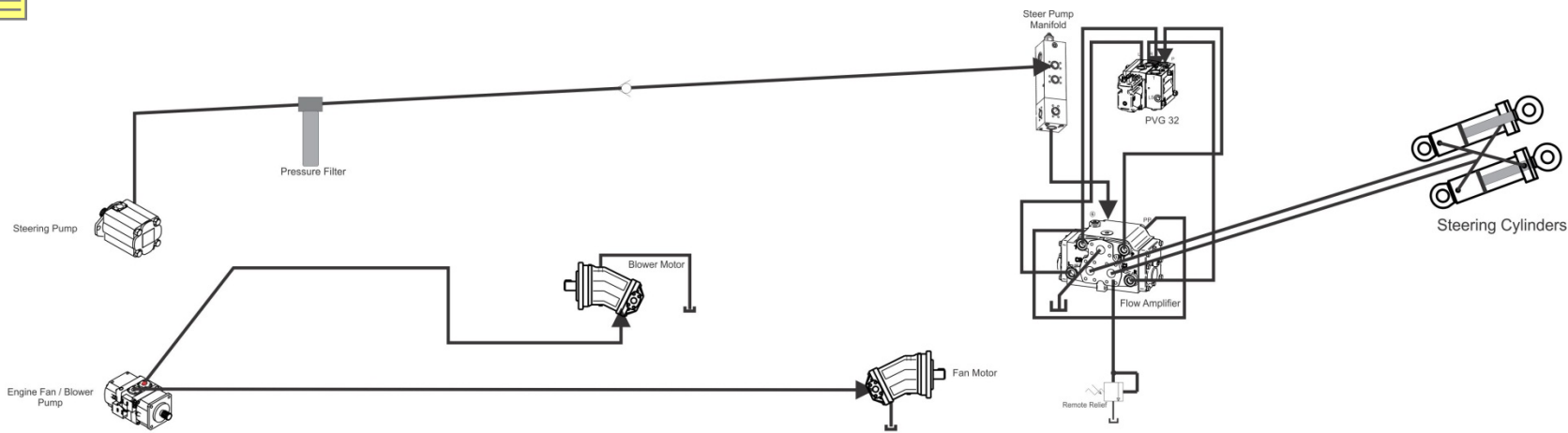
- Theory of Operation
- Component Descriptions
- Circuit Descriptions
- Settings and Adjustments
- Troubleshooting
- Removal and Installation

THEORY OF OPERATION



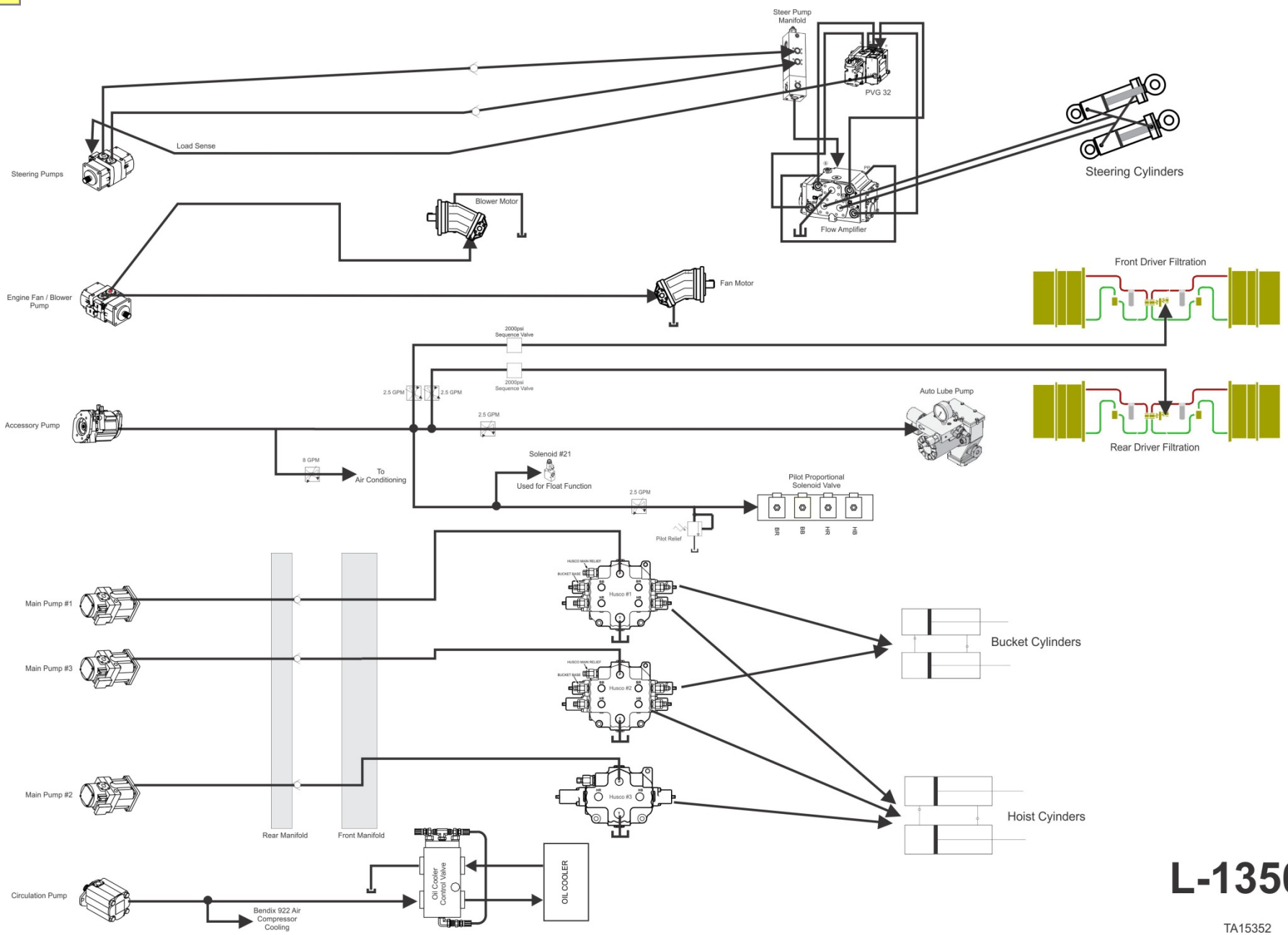
L-950

TA15352A



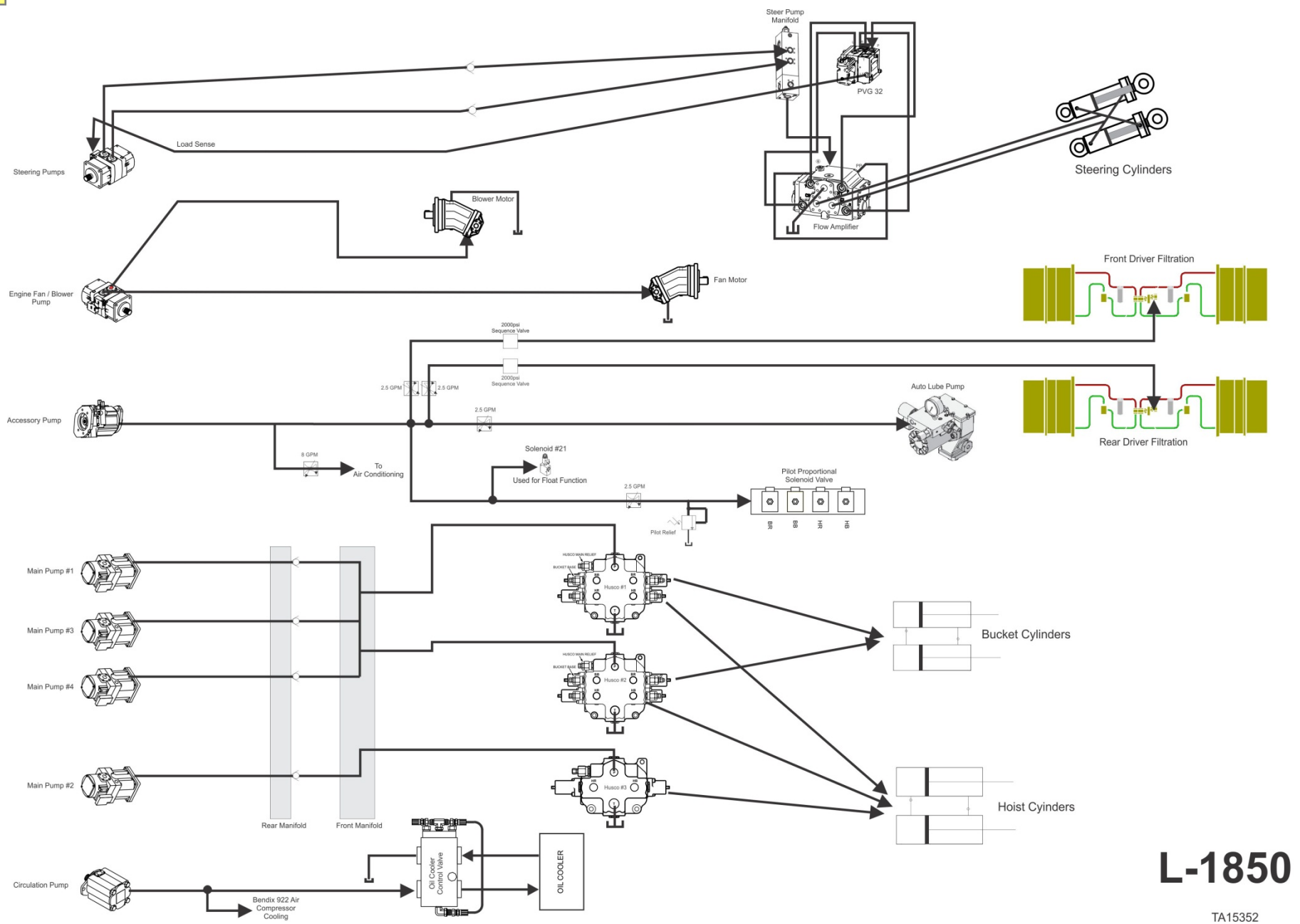
L-1150

TA15352



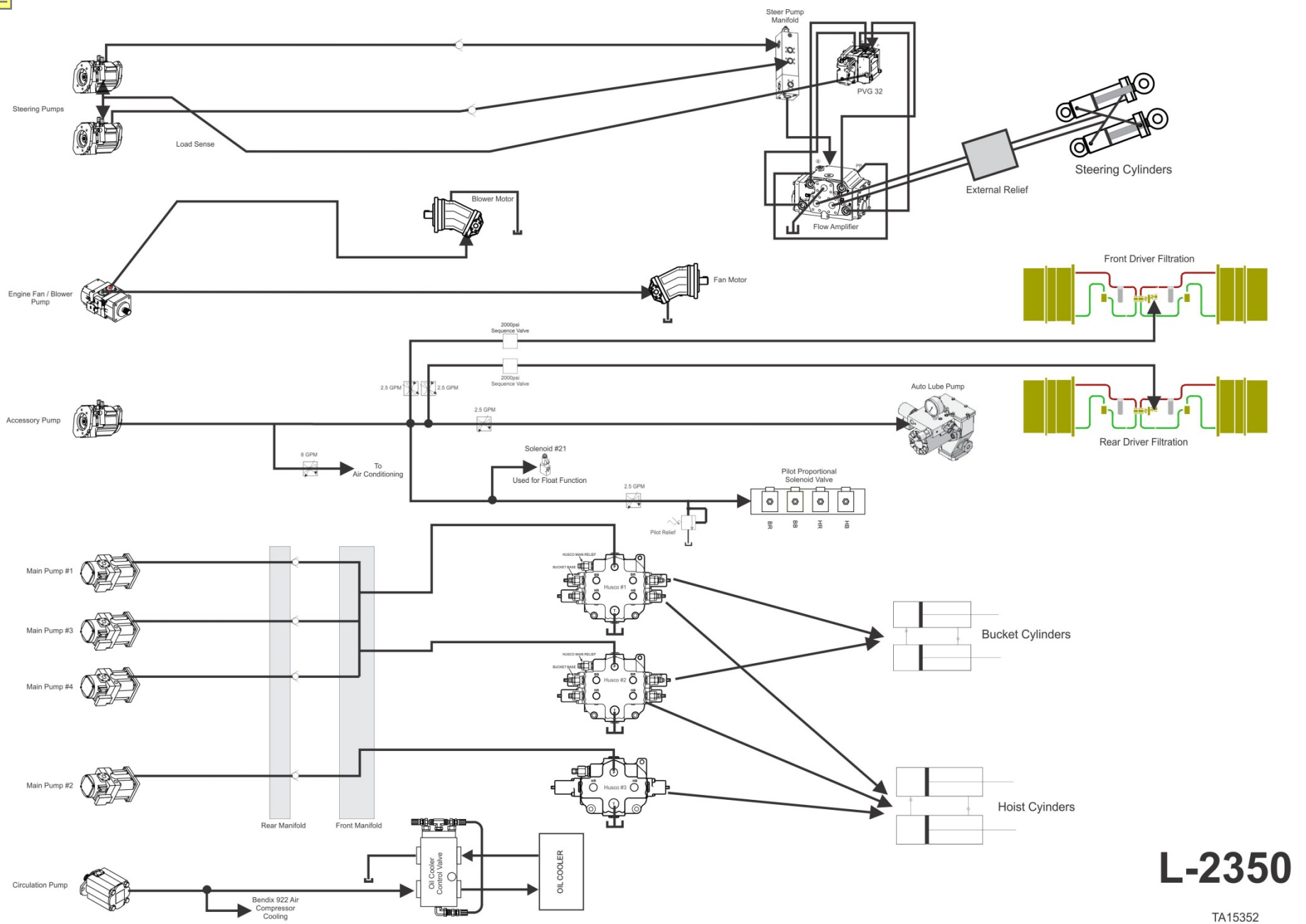
L-1350

TA15352



L-1850

TA15352



L-2350

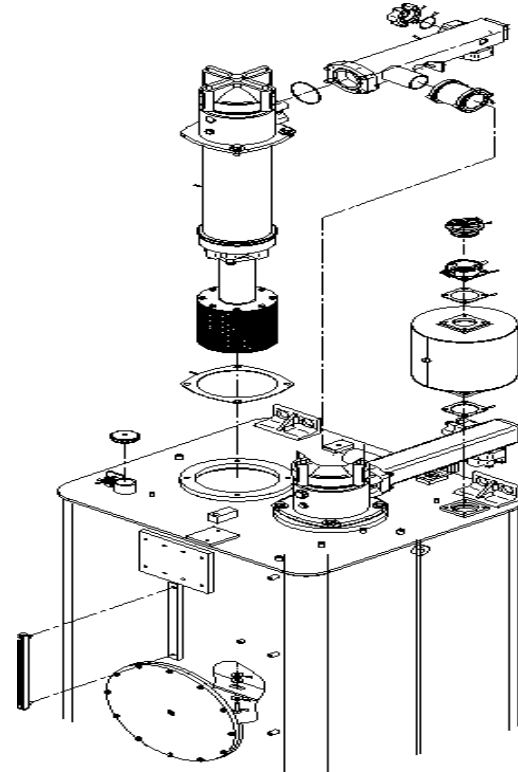
TA15352

COMPONENT DESCRIPTIONS

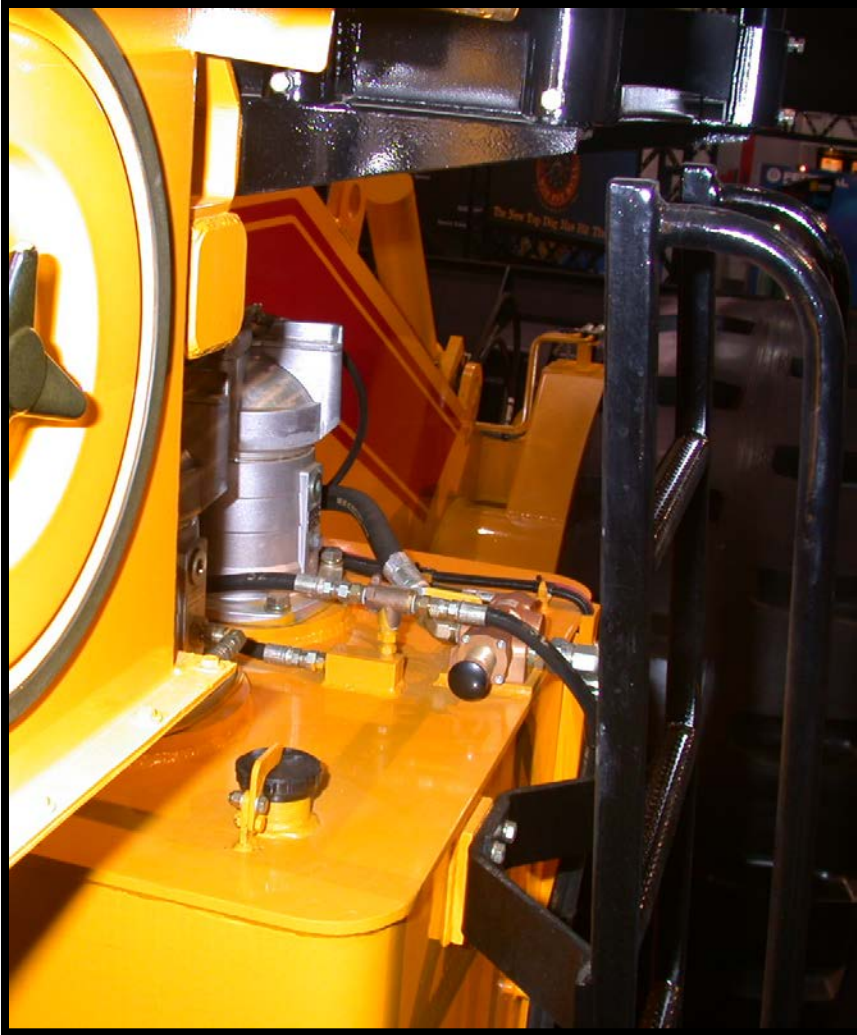
COMPONENT DESCRIPTIONS

- Hydraulic Tank**
- Pumps**
- Gearbox**
- Main Hoist and Bucket Control Valves [Husco]**
- Multi-Port Distribution Manifolds**
- Current Pilot System**
- Steering Main Valves**
- Motors**
- Driver Oil Filtration System**
- Oil Cooler Control Valves**
- Auxiliary Oil Cooler (Optional) Fan Speed Control**
- Cylinders**
- Warnings and Cautions**

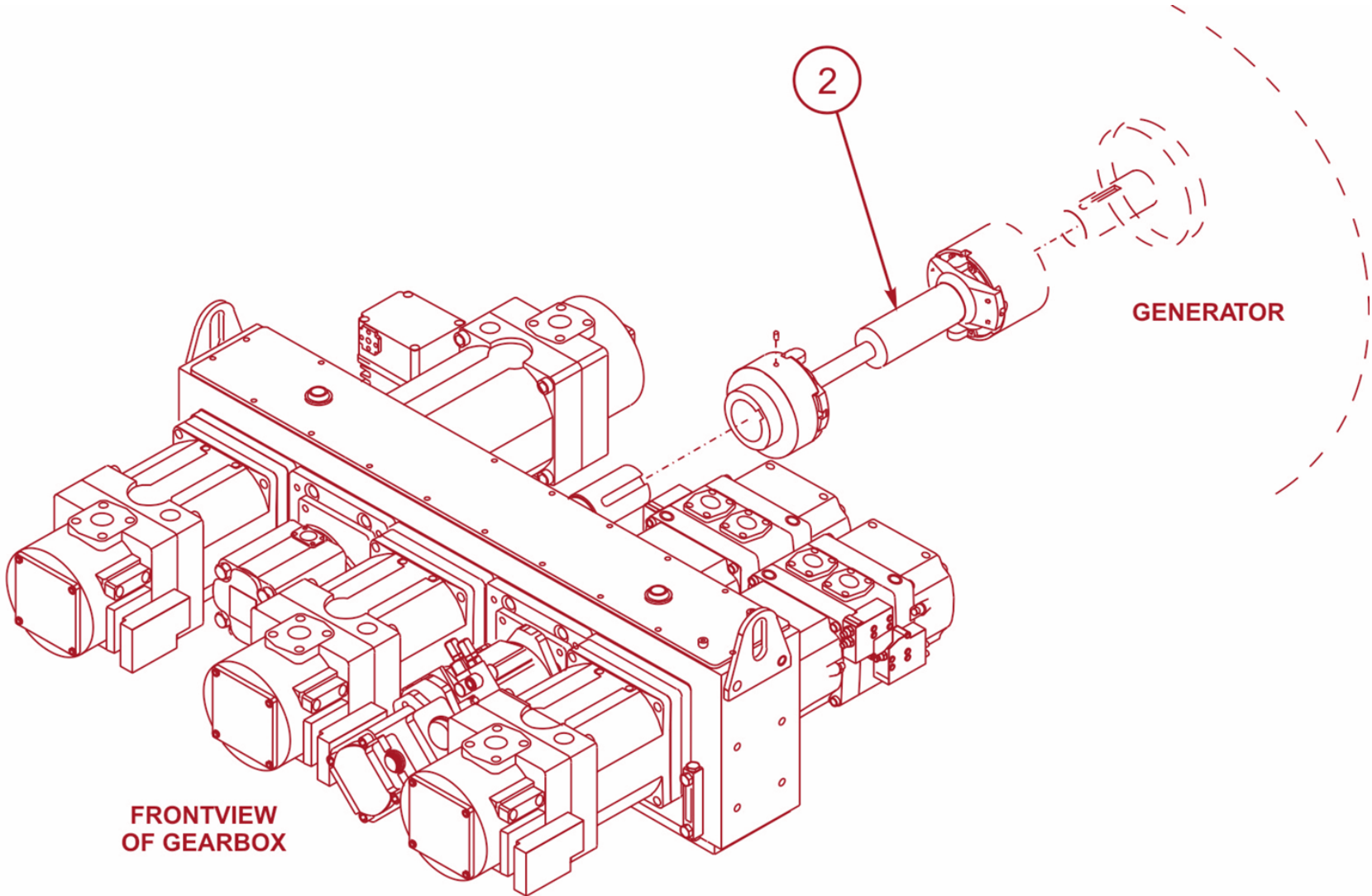
HYDRAULIC TANK



HYDRAULIC TANK



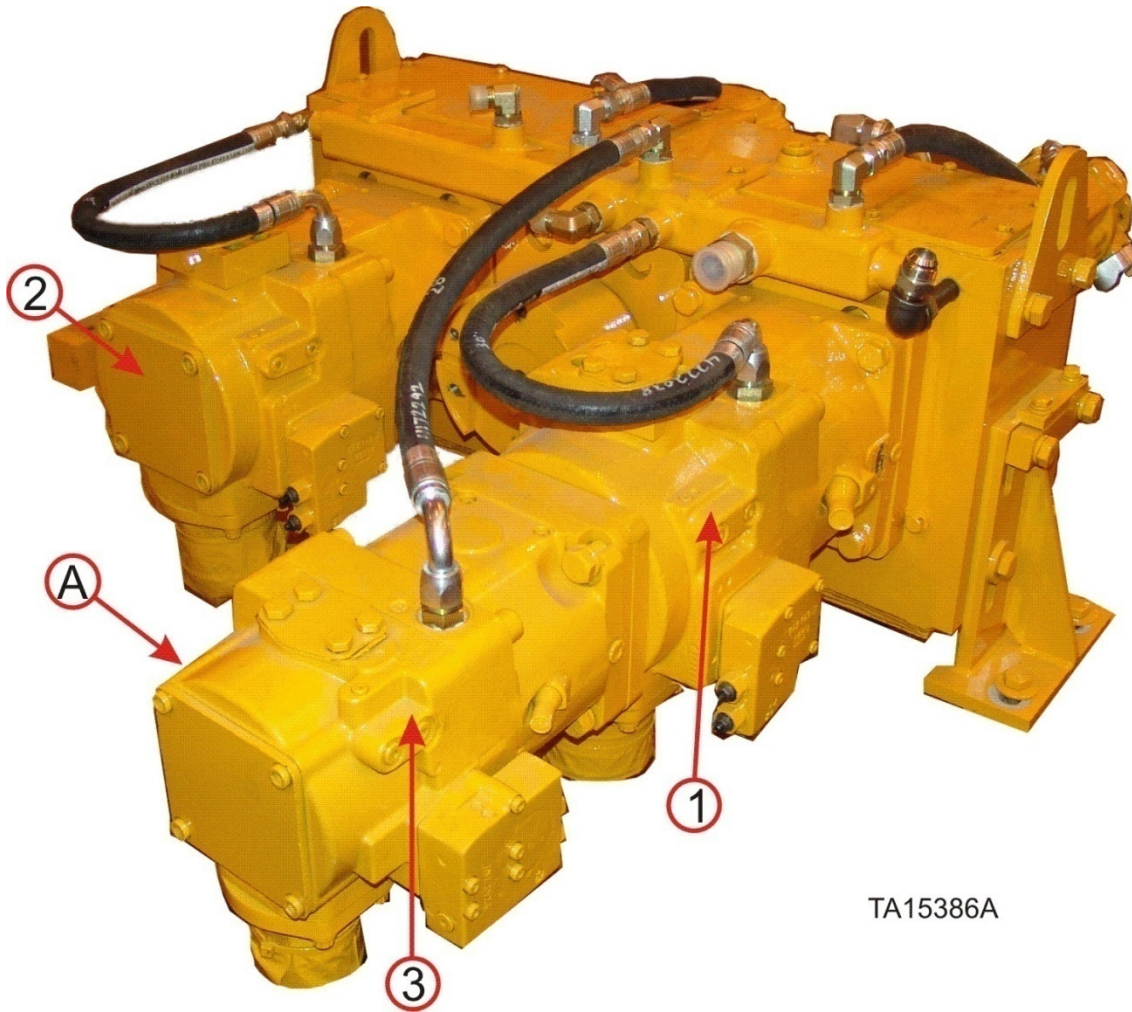
TYPICAL GEARBOX



FRONTVIEW
OF GEARBOX

GEARBOX

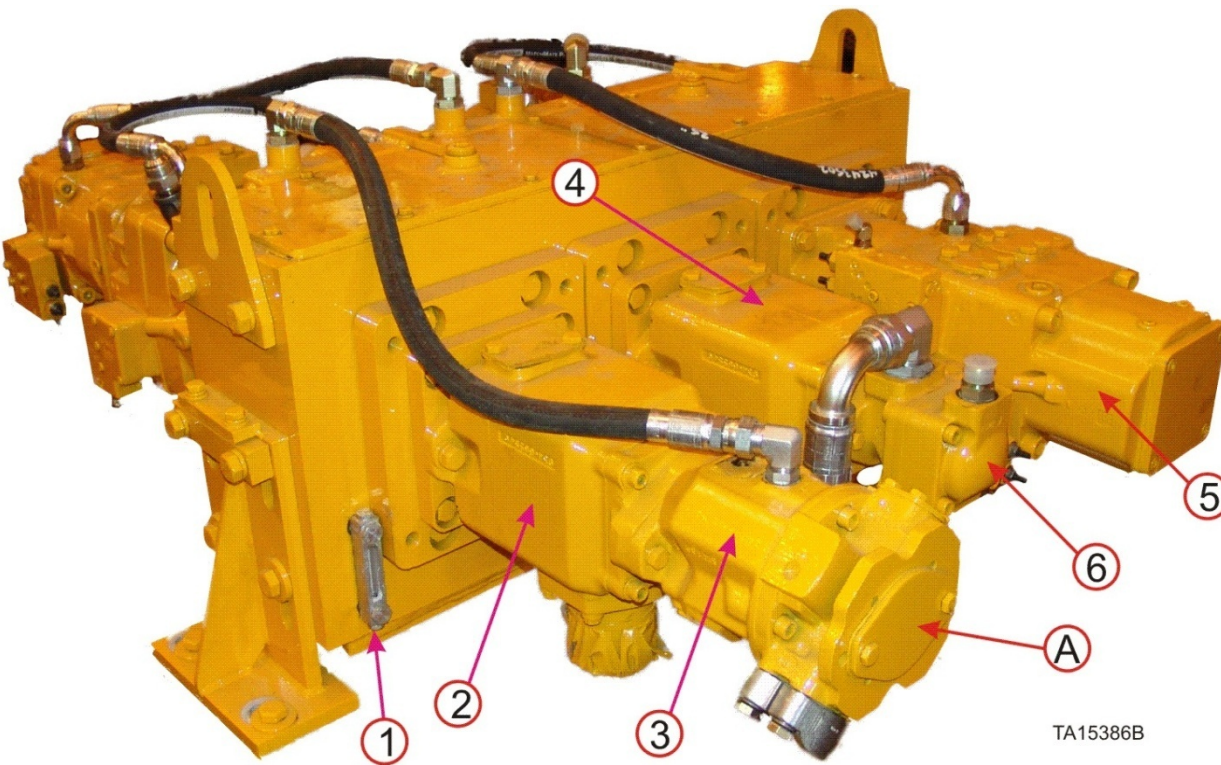
- 1. Main Pump #A
- 2. Main Pump #FHP
- 3. Main Pump #B
- A. Not present on L-950



TA15386A

L-1150

GEARBOX

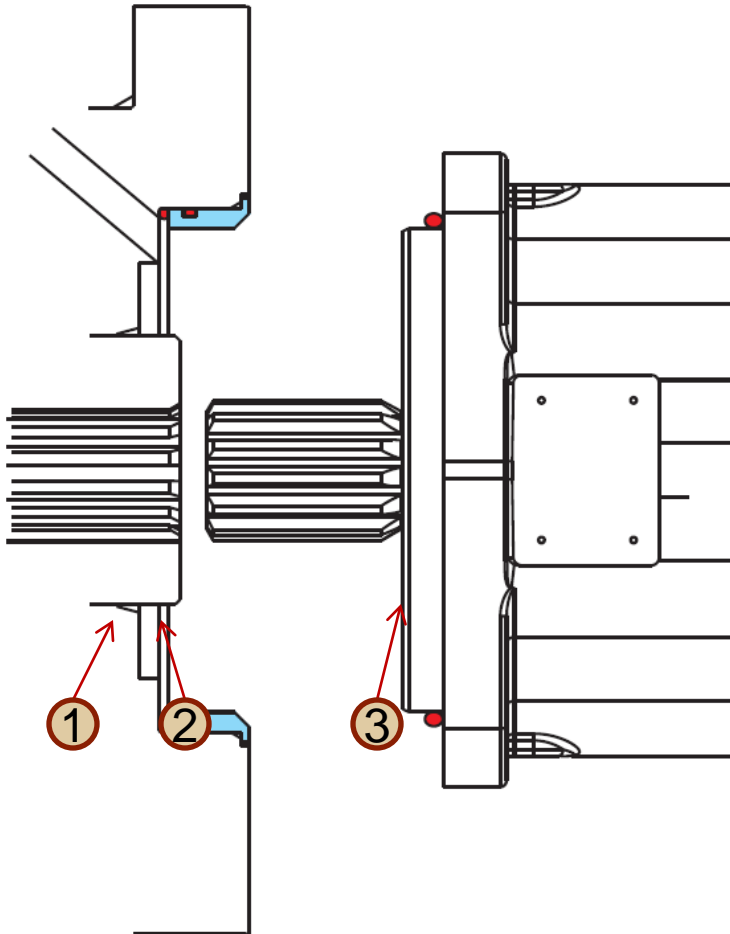


TA15386B

1. Level sight glass (one on each side)
2. Steer Pump
3. Accessory Pump
4. Circulation Pump
5. Tandem Blower/Fan Pump
6. HPD Gearbox Lube Pump
- A. This plate removed when optional auxiliary hydraulic oil cooler pump is installed here.

L-1150

GEARBOX ADAPTER

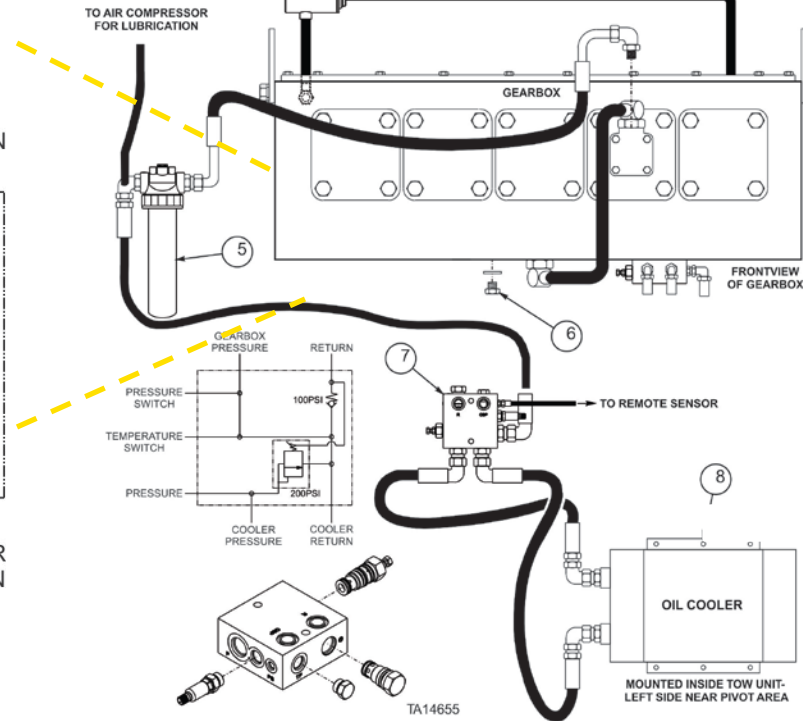
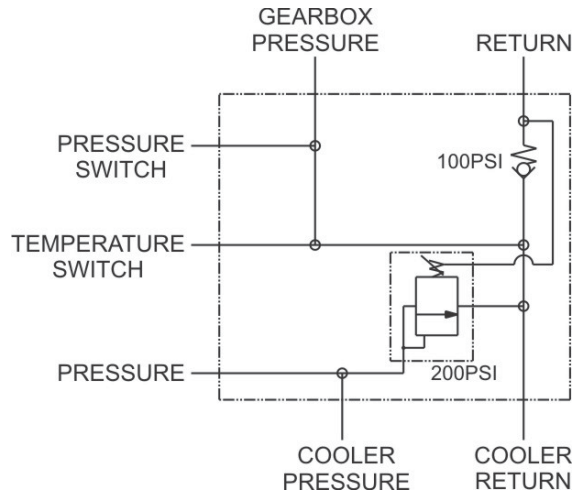
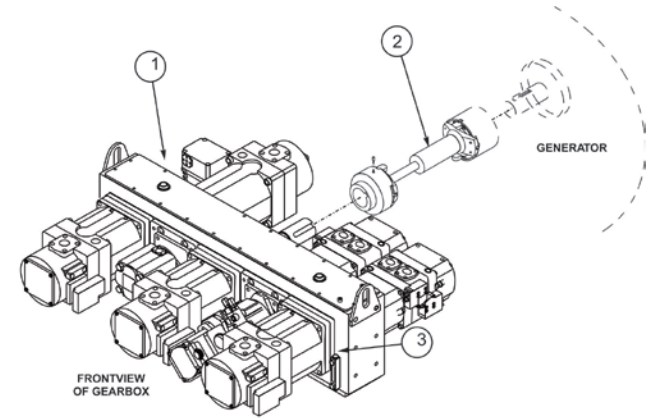


1. Spacer O-ring
2. Pump Adapter for Tandem Pump
3. Pump Housing O-ring

GEARBOX MONITORING

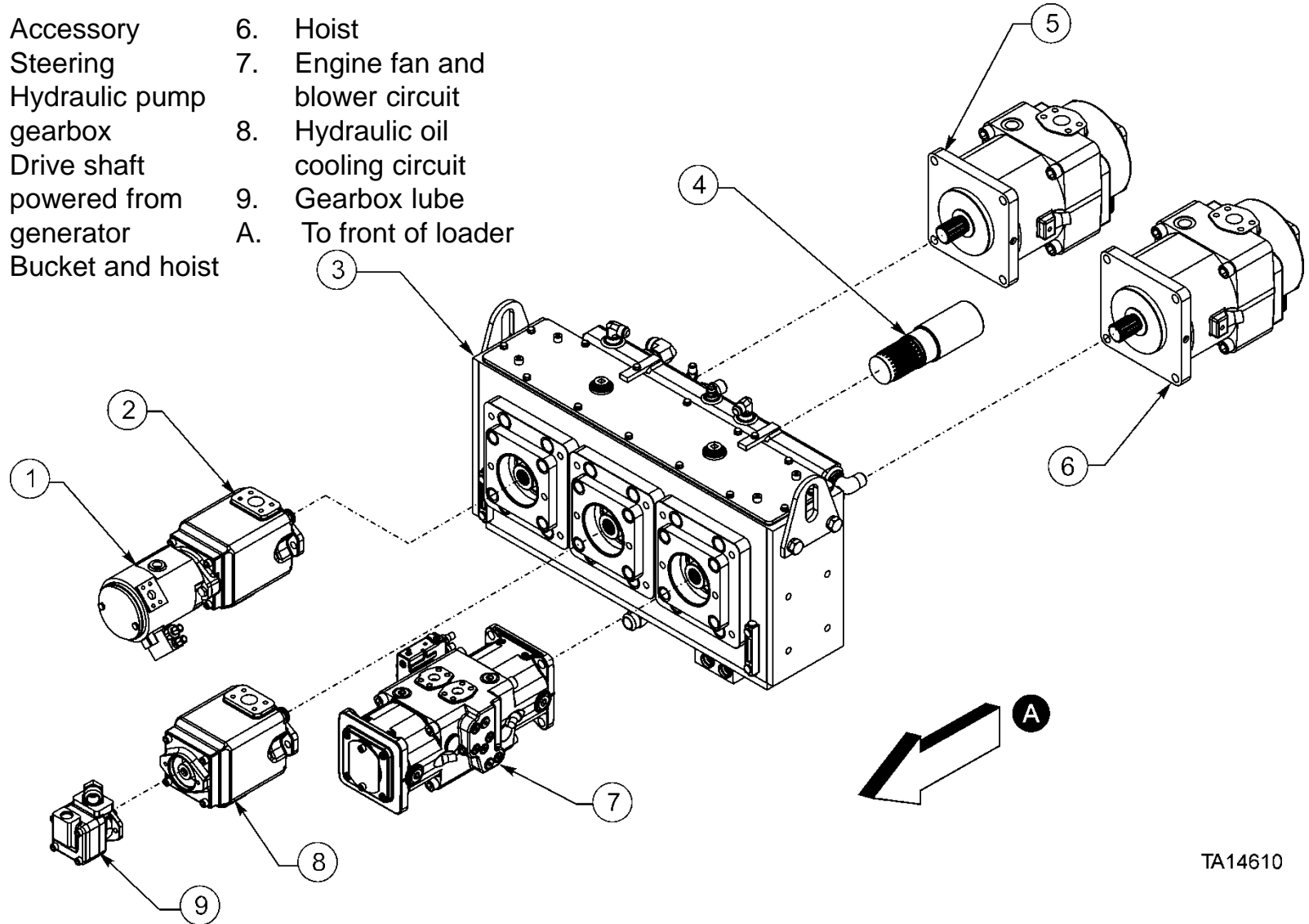


- 1) Pump Drive Transmission
- 2) Driveshaft
- 3) Sight glass
- 4) Breather
- 5) Filter
- 6) Drain Plug
- 7) Oil Cooler Control Valve
- 8) Oil Cooler
- 9) Strainer



PUMP ARRANGEMENT L-950

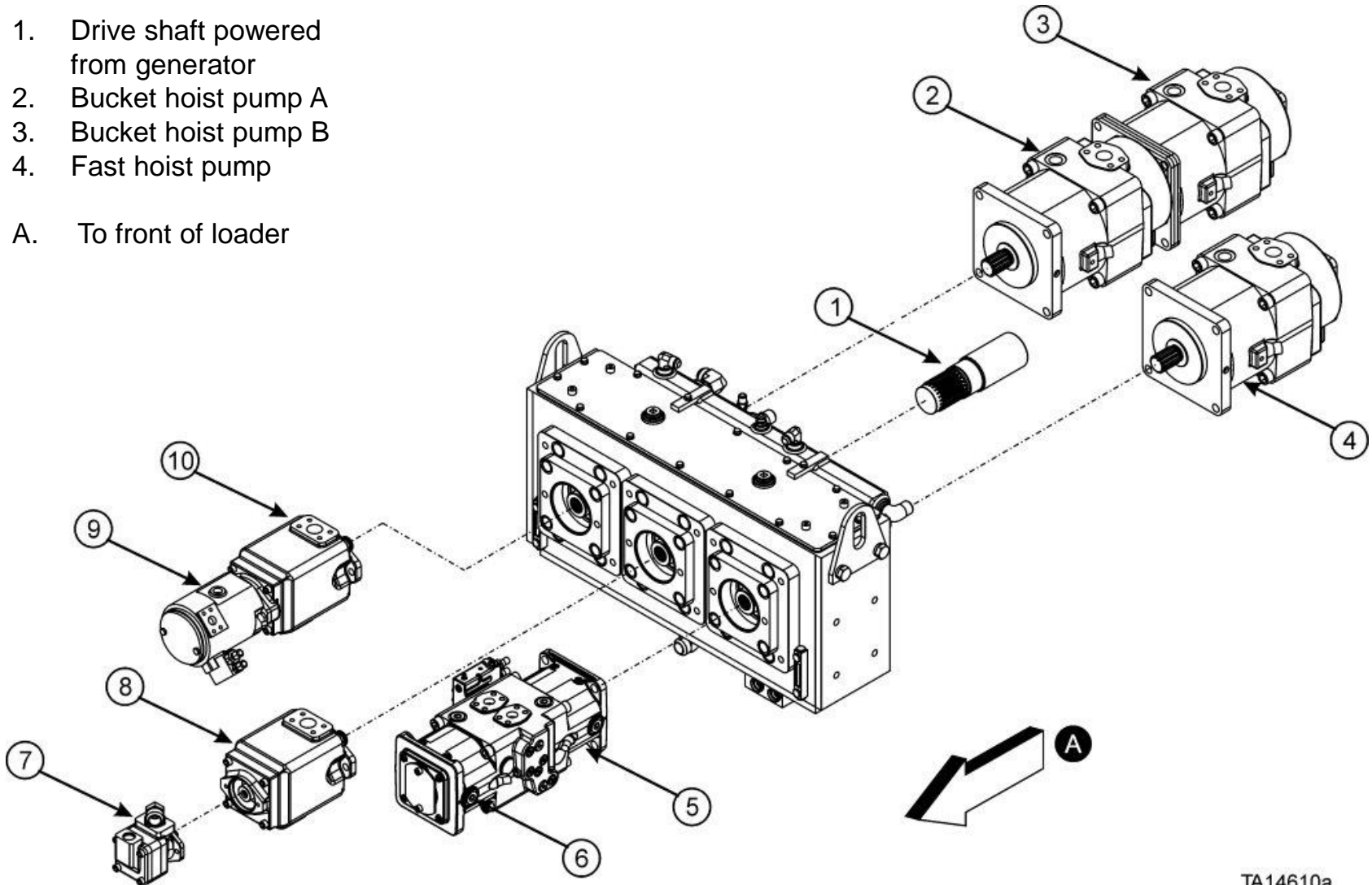
1. Accessory
2. Steering
3. Hydraulic pump gearbox
4. Drive shaft powered from generator
5. Bucket and hoist
6. Hoist
7. Engine fan and blower circuit
8. Hydraulic oil cooling circuit
9. Gearbox lube
- A. To front of loader



TA14610

PUMP ARRANGEMENT L-1150

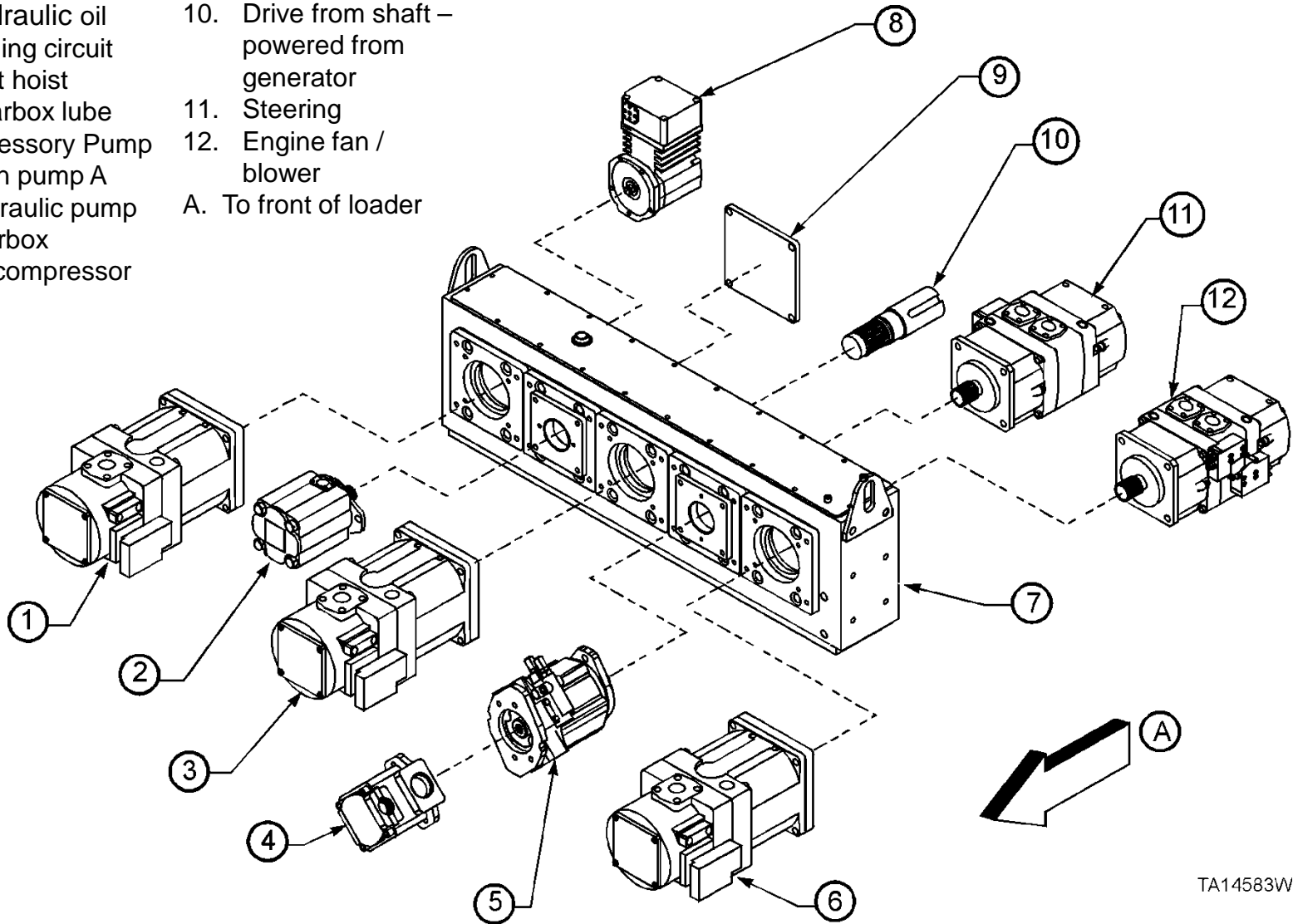
1. Drive shaft powered from generator
 2. Bucket hoist pump A
 3. Bucket hoist pump B
 4. Fast hoist pump
- A. To front of loader



TA14610a

PUMP ARRANGEMENT L-1350

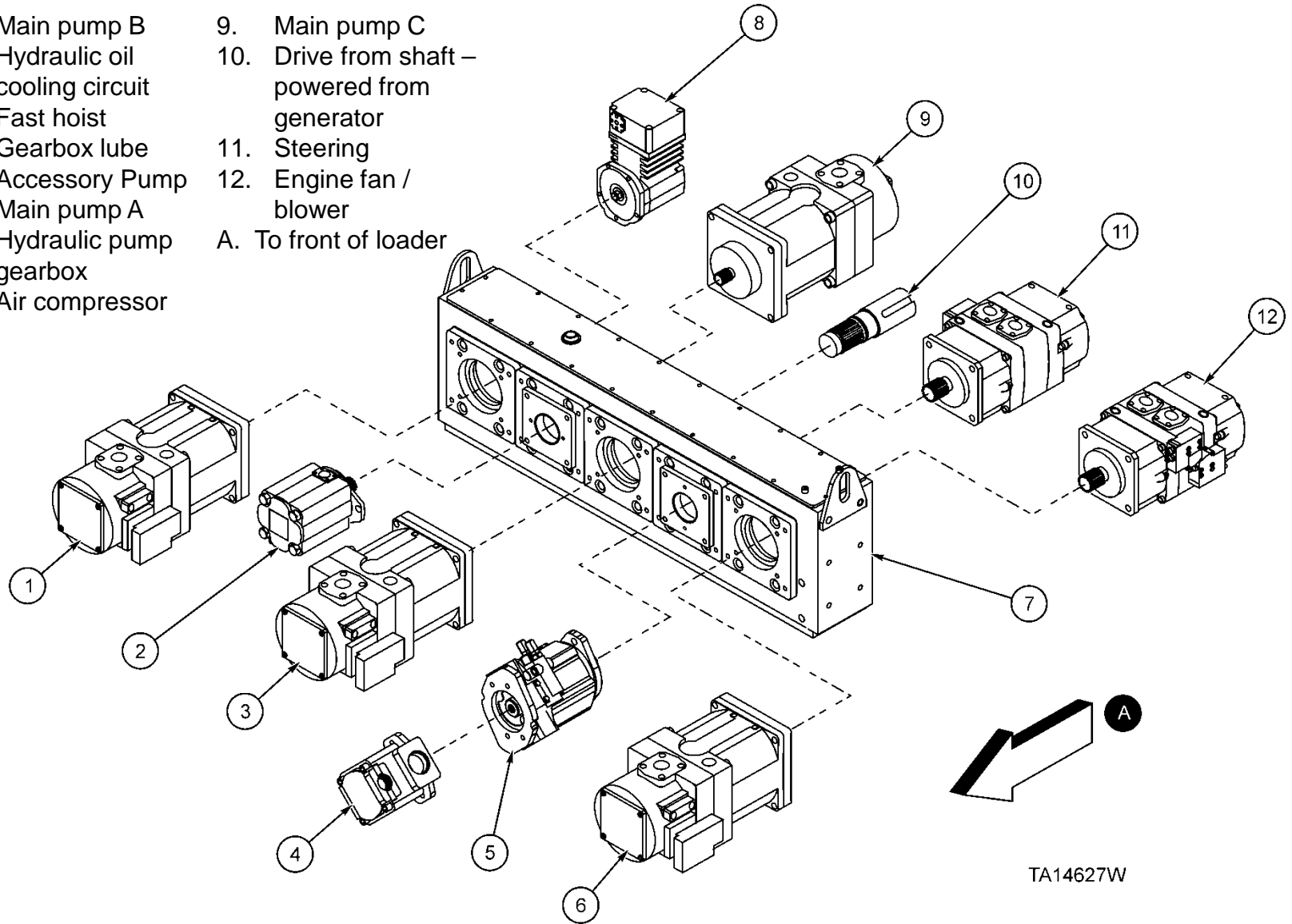
- | | |
|----------------------------------|---|
| 1. Main pump B | 9. Cover plate |
| 2. Hydraulic oil cooling circuit | 10. Drive from shaft – powered from generator |
| 3. Fast hoist | 11. Steering |
| 4. Gearbox lube | 12. Engine fan / blower |
| 5. Accessory Pump | A. To front of loader |
| 6. Main pump A | |
| 7. Hydraulic pump gearbox | |
| 8. Air compressor | |



TA14583W

PUMP ARRANGEMENT L-1850

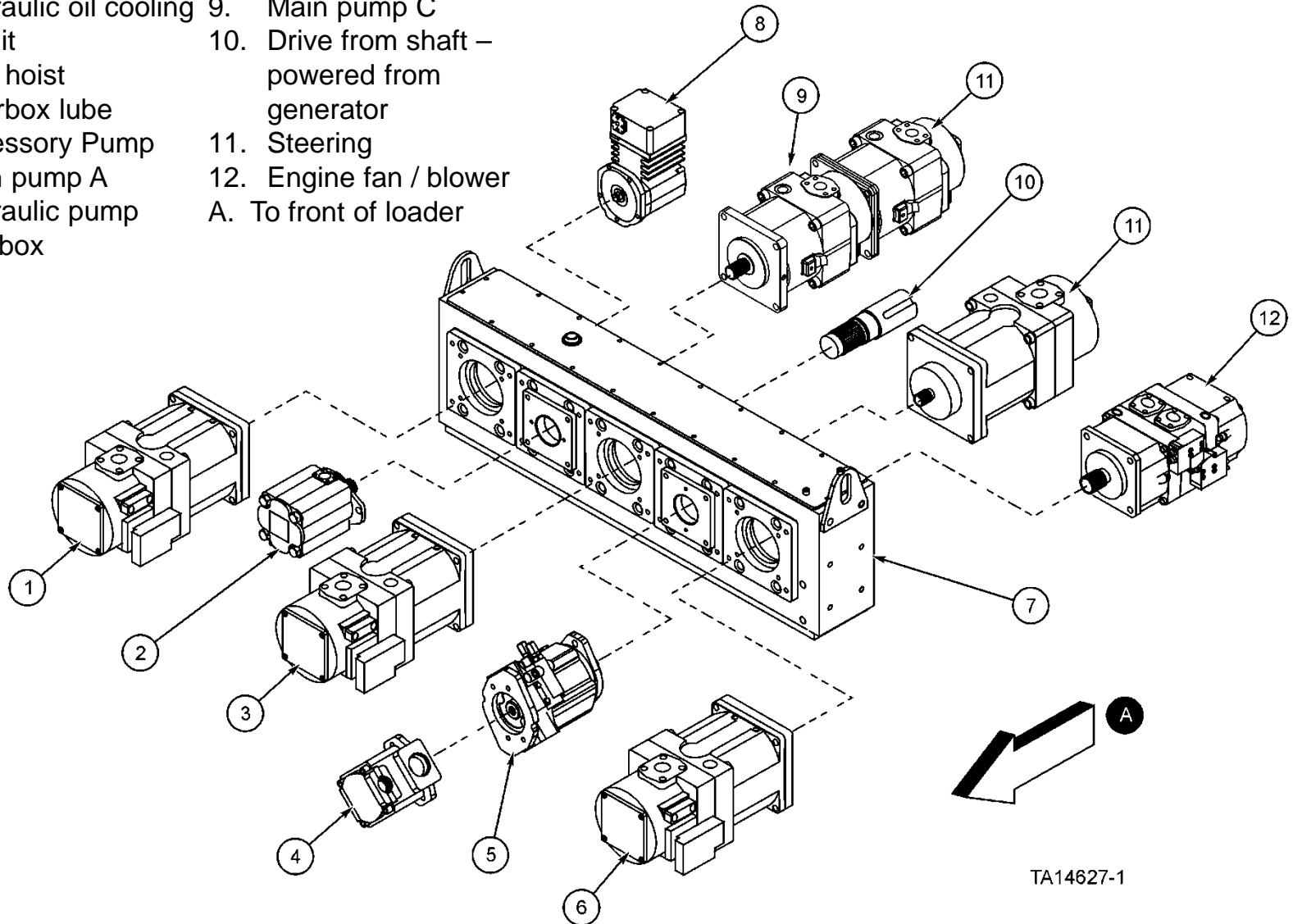
- 1. Main pump B
- 2. Hydraulic oil cooling circuit
- 3. Fast hoist
- 4. Gearbox lube
- 5. Accessory Pump
- 6. Main pump A
- 7. Hydraulic pump gearbox
- 8. Air compressor
- 9. Main pump C
- 10. Drive from shaft – powered from generator
- 11. Steering
- 12. Engine fan / blower
- A. To front of loader



TA14627W

PUMP ARRANGEMENT L-2350

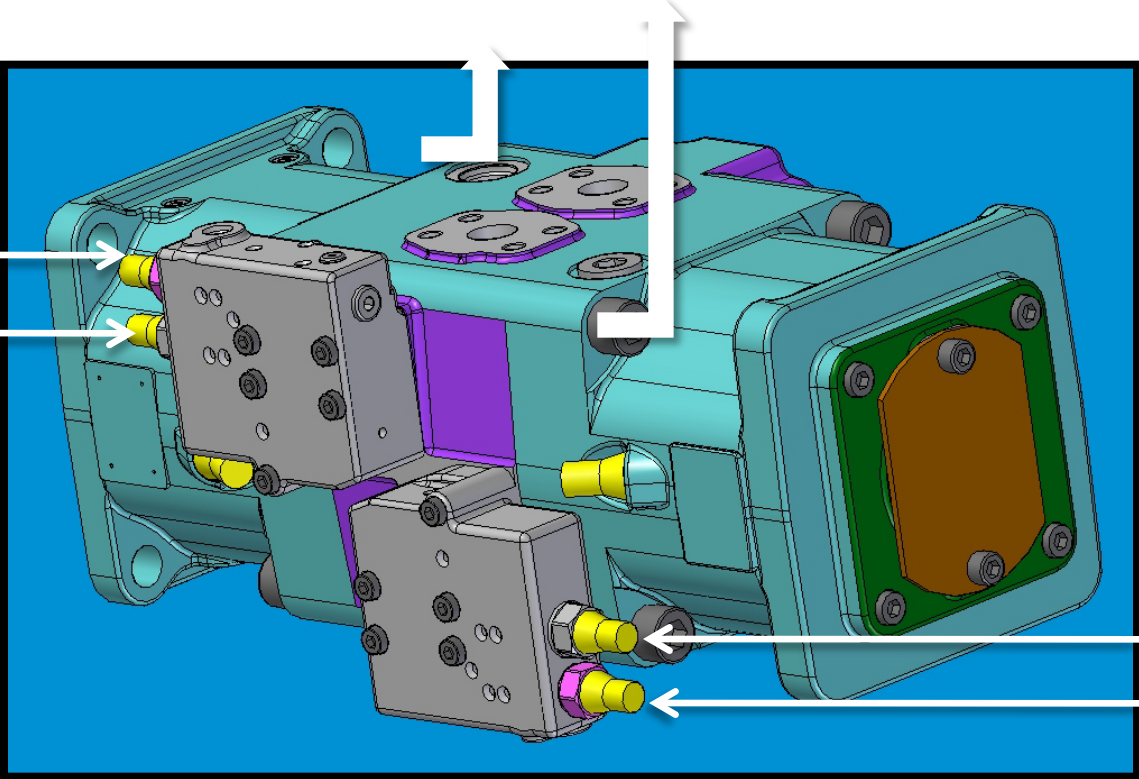
- | | |
|----------------------------------|---|
| 1. Main pump B | 8. Air compressor |
| 2. Hydraulic oil cooling circuit | 9. Main pump C |
| 3. Fast hoist | 10. Drive from shaft – powered from generator |
| 4. Gearbox lube | 11. Steering |
| 5. Accessory Pump | 12. Engine fan / blower |
| 6. Main pump A | A. To front of loader |
| 7. Hydraulic pump gearbox | |



TA14627-1

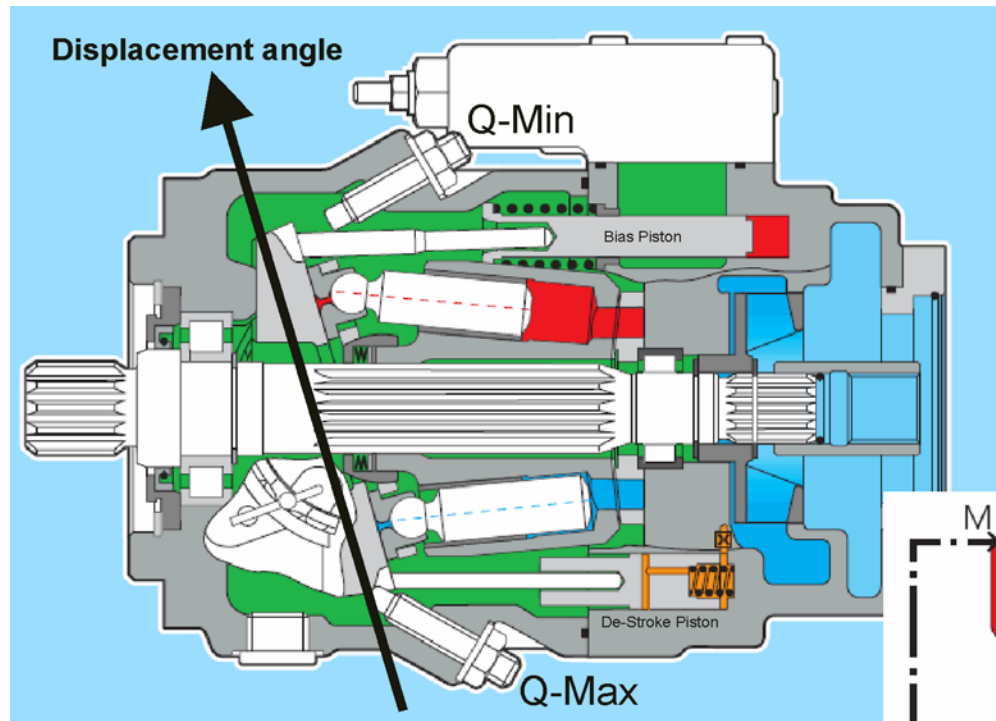
TANDEM PUMP

Stand-by
[Flow]
Compensator

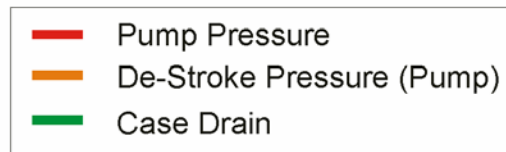


Compensator
Stand-by
[Flow]

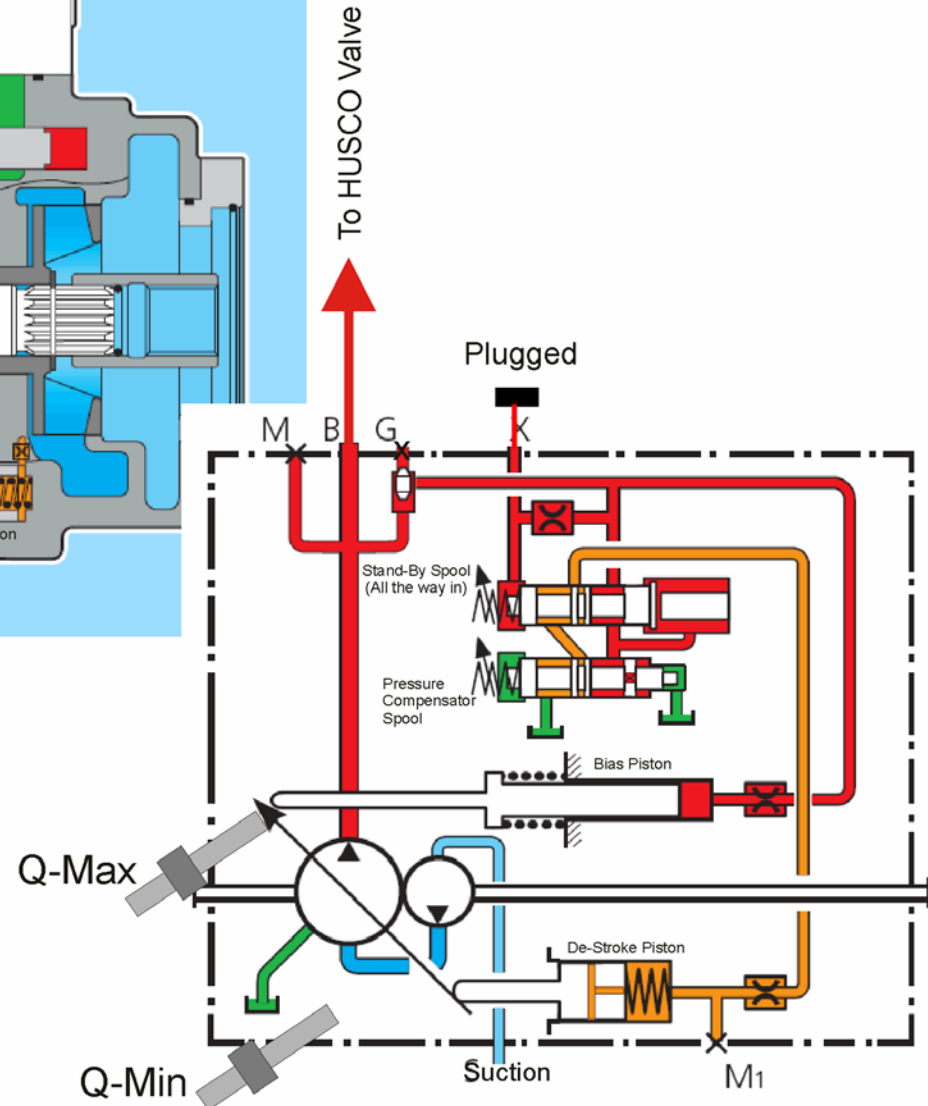
HOIST/BUCKET PUMP



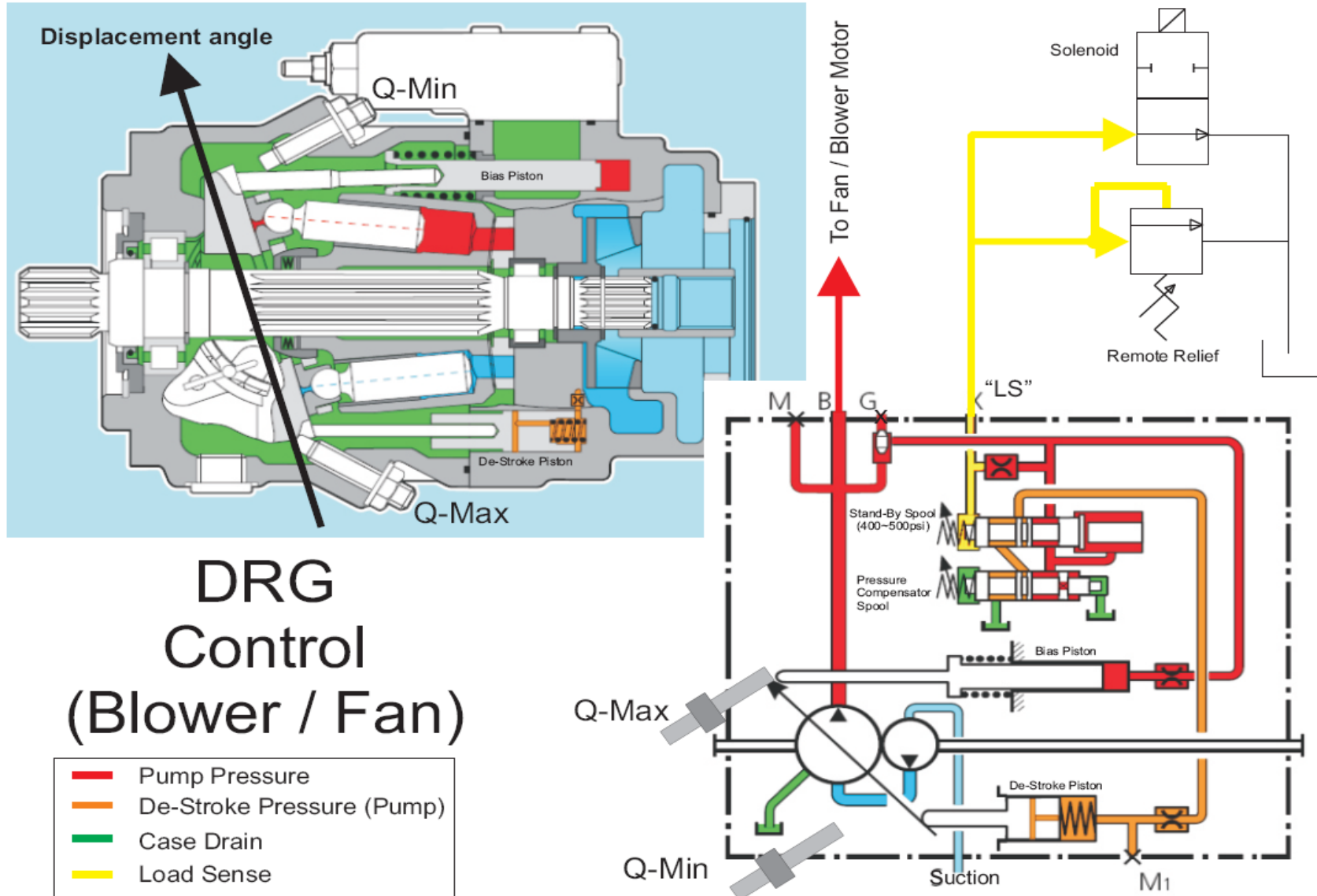
DRG Control (Hoist / Bucket)



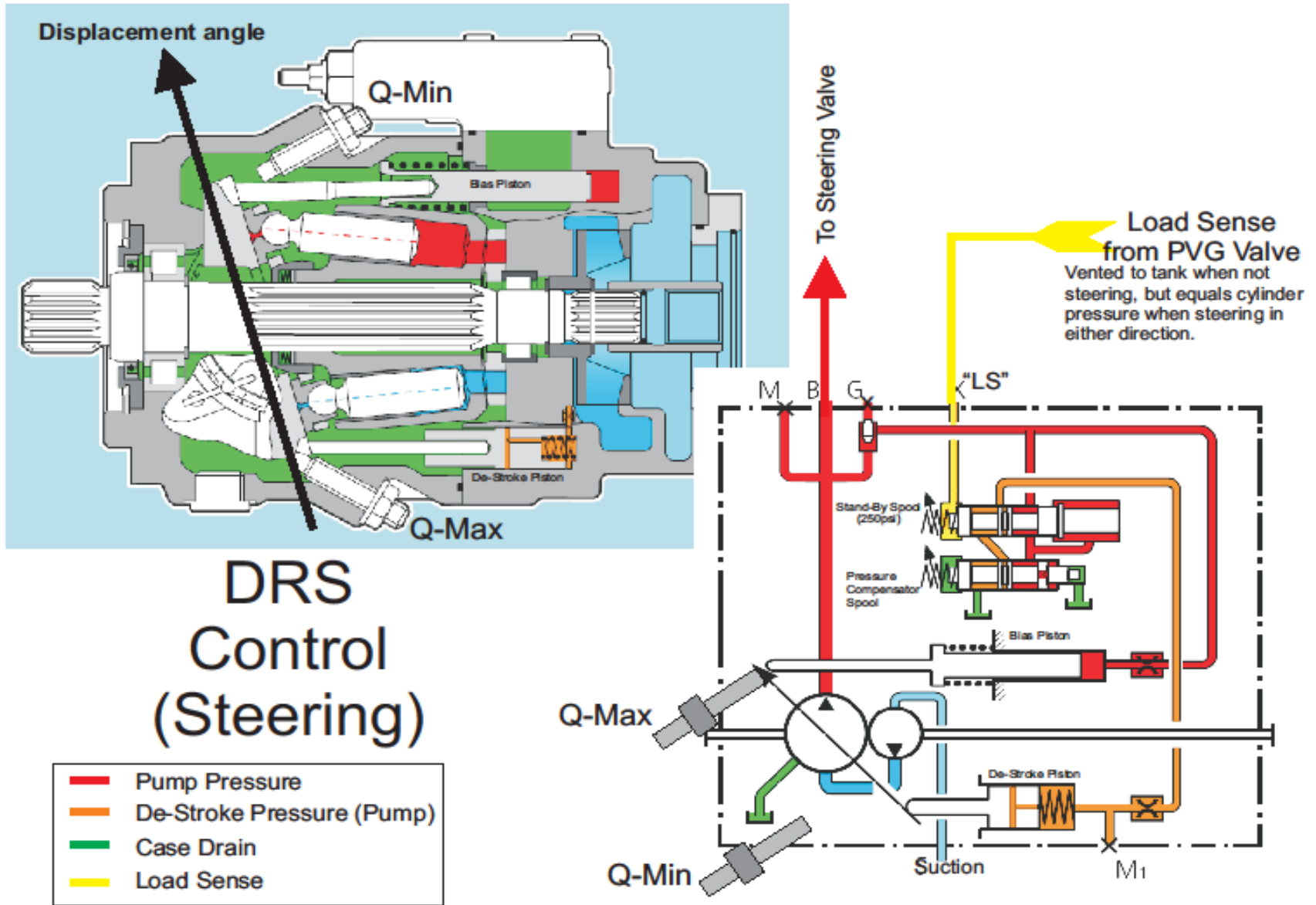
TA15327-1



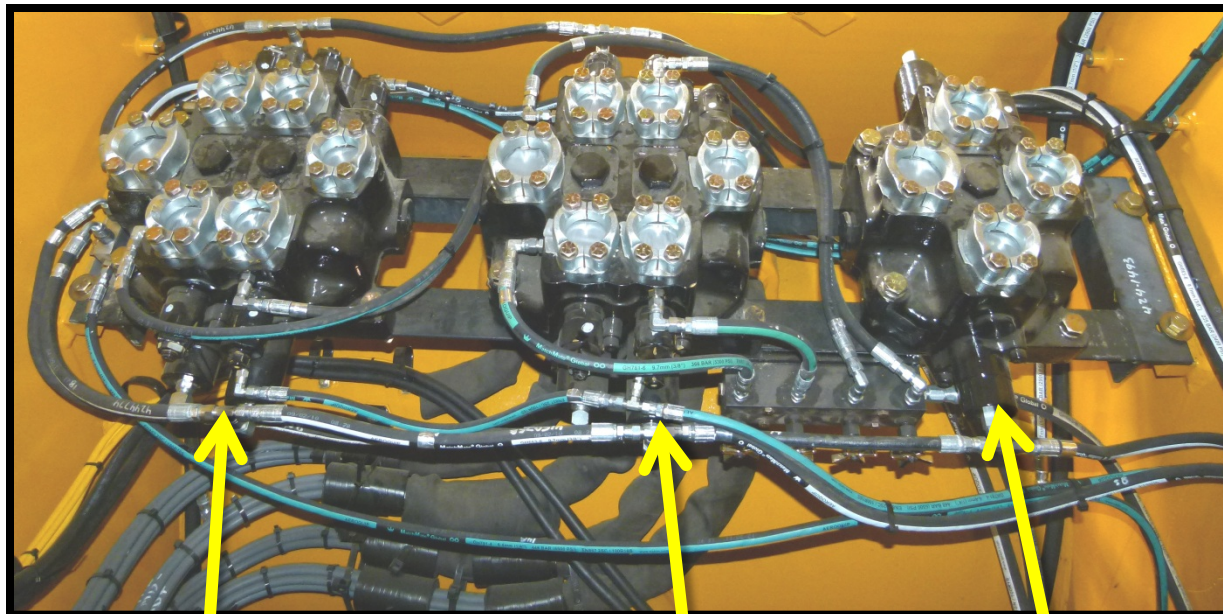
BLOWER/FAN PUMP



STEERING PUMP



L-1350/L-1850/L-2350 HOIST AND BUCKET CONTROL VALVES (HUSCO)

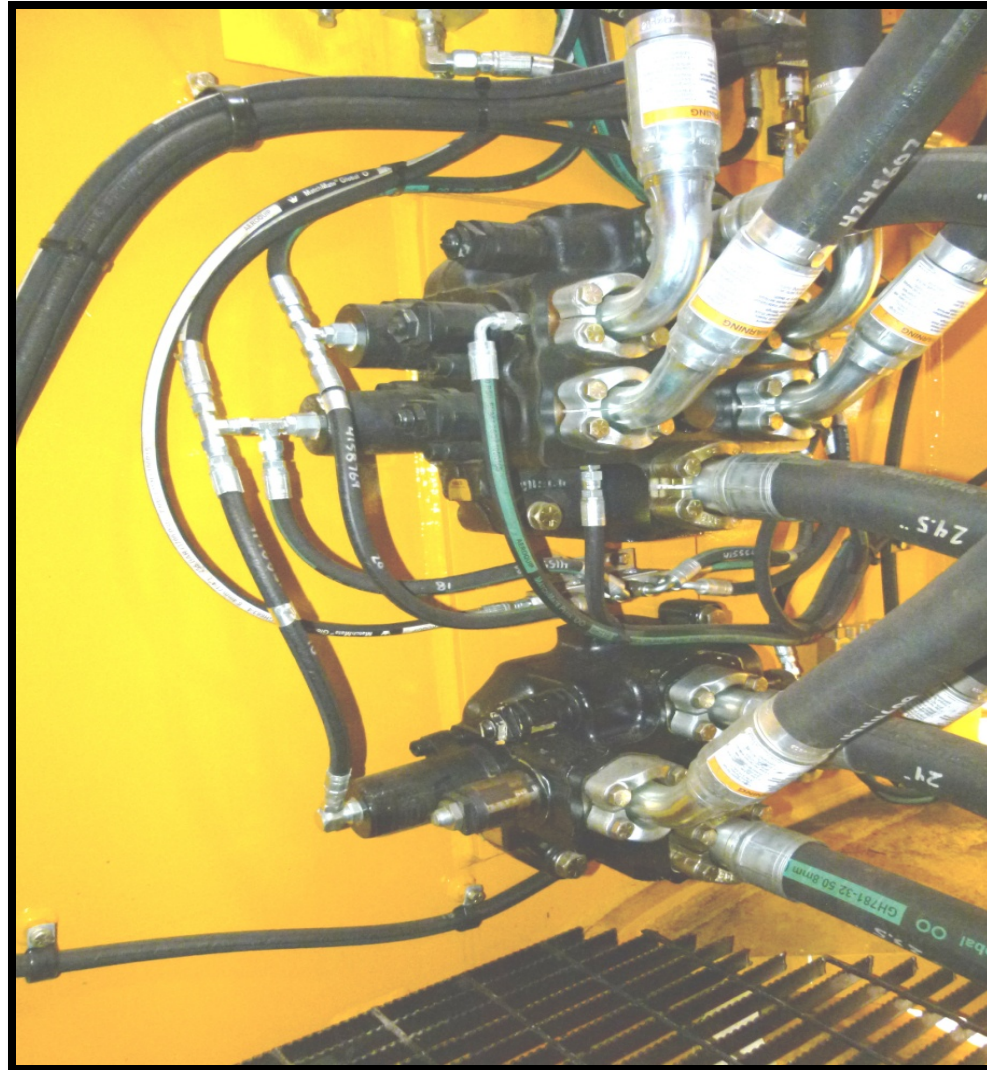


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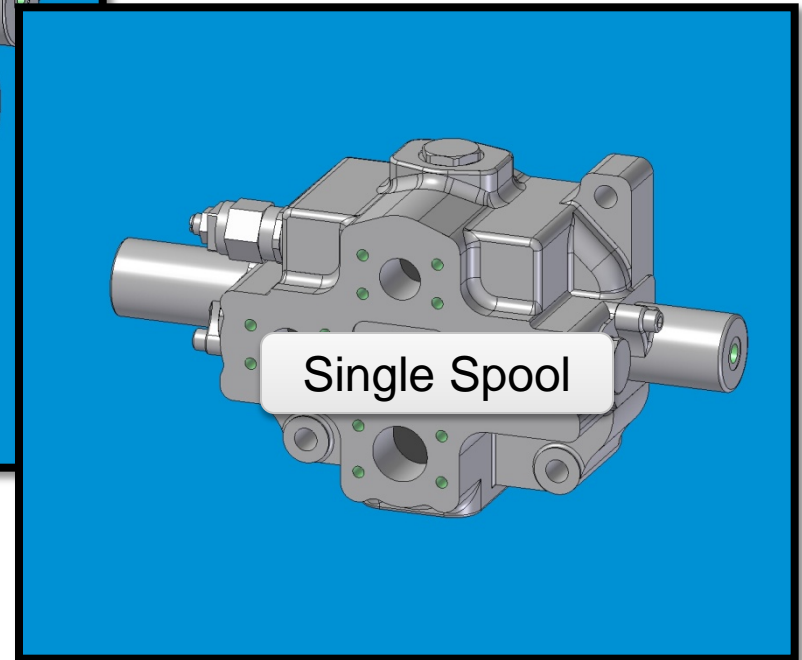
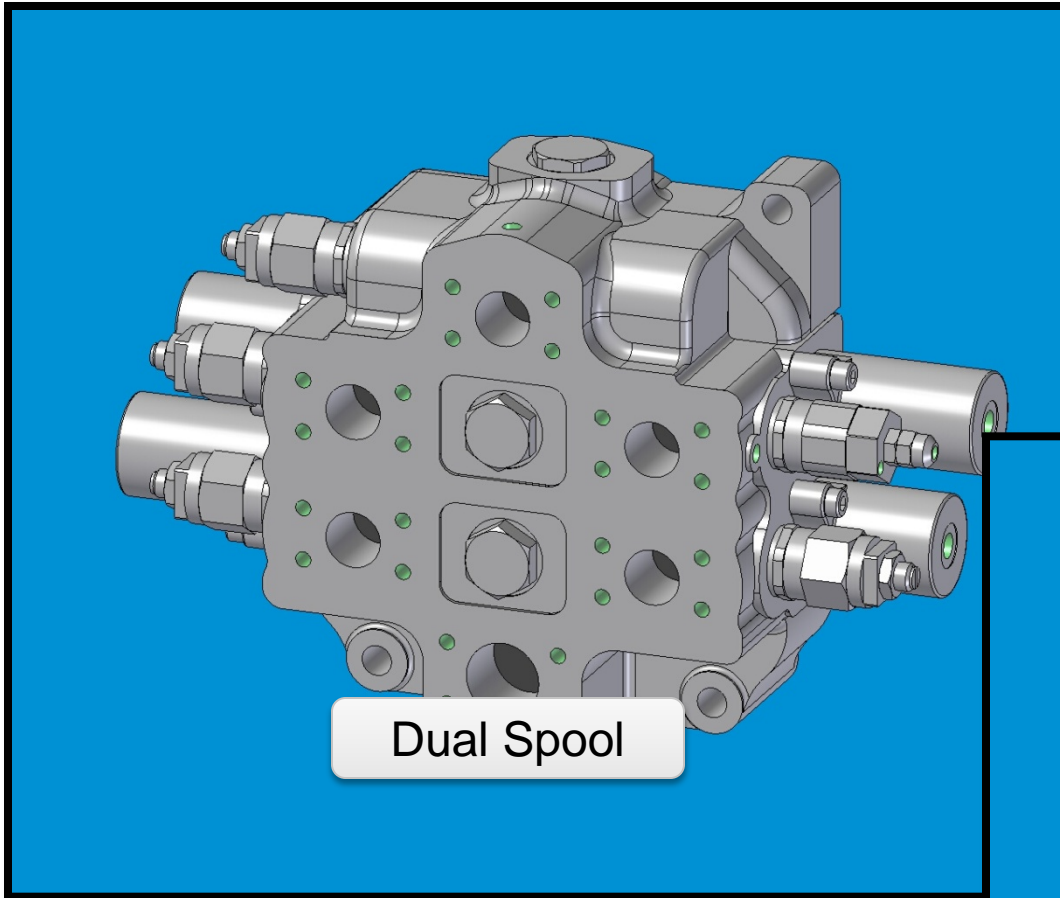
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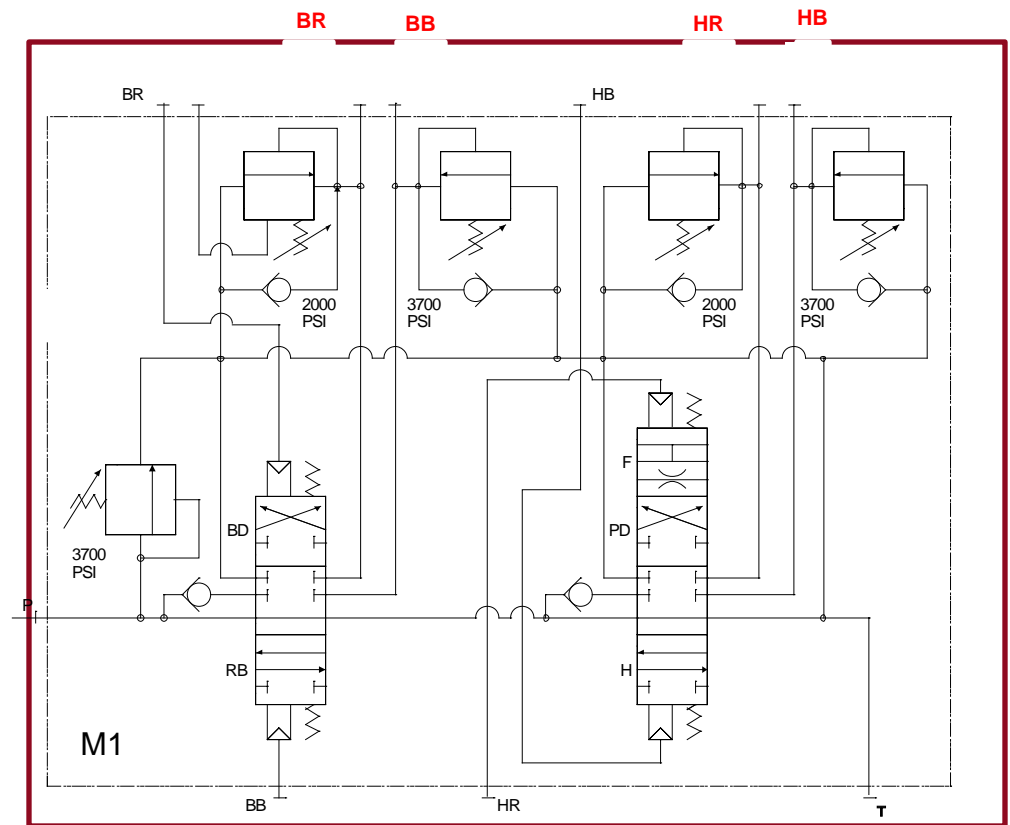
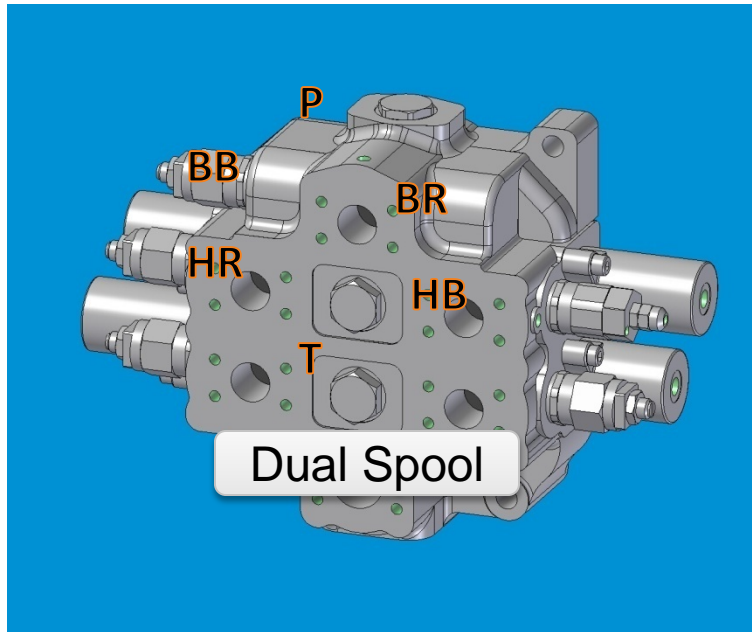
L-950/L-1150 HOIST AND BUCKET CONTROL VALVES (HUSCO)



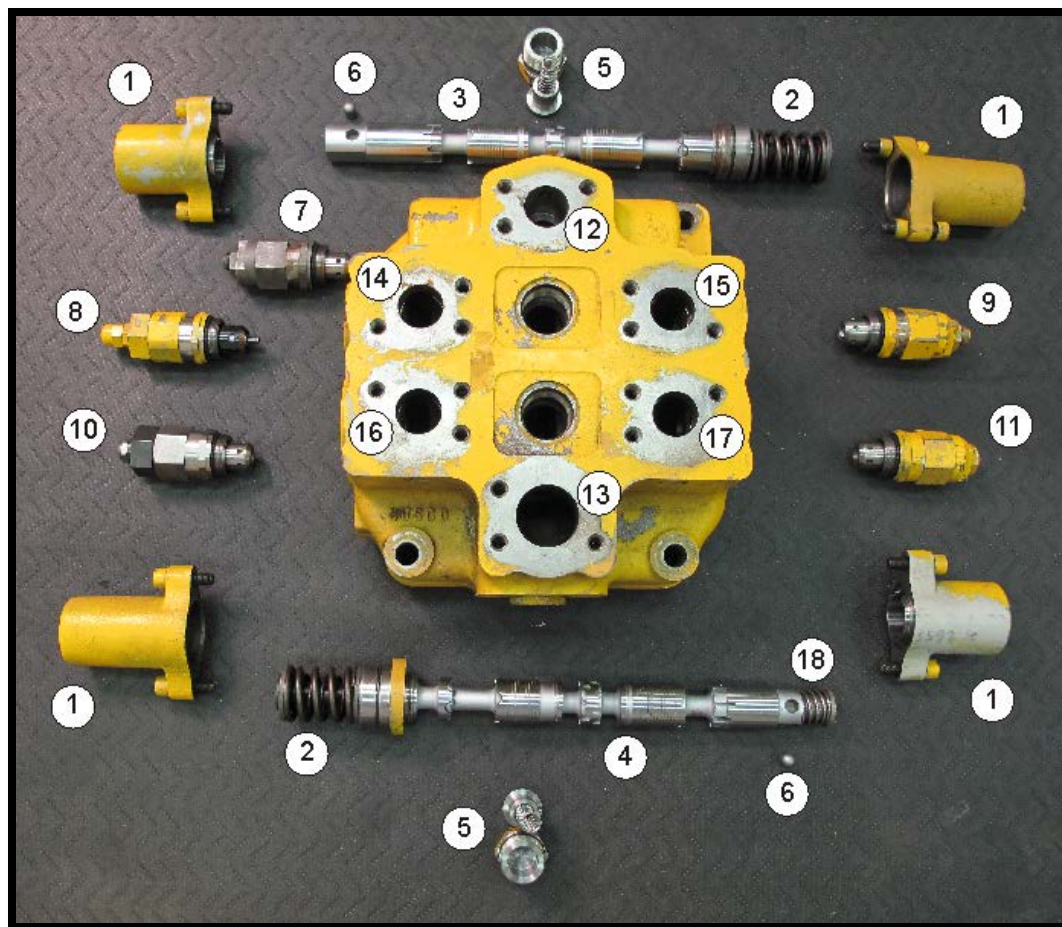
MAIN HOIST AND BUCKET CONTROL VALVES (HUSCO)



DUAL SPOOL VALVE (HUSCO)



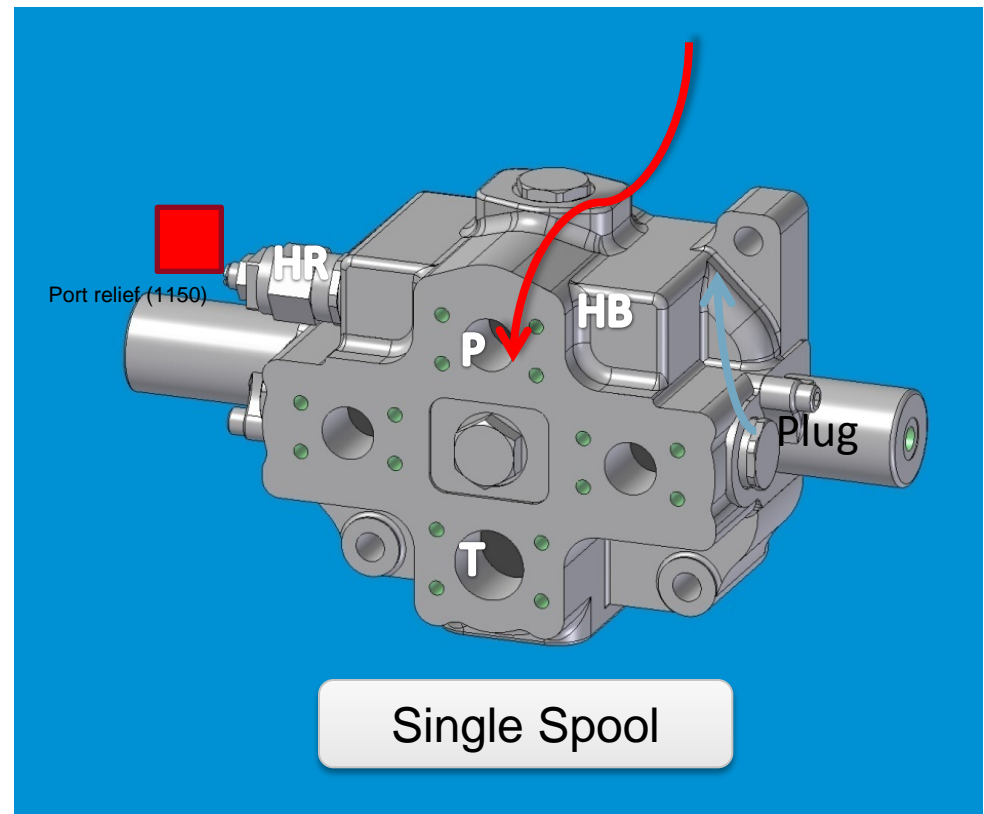
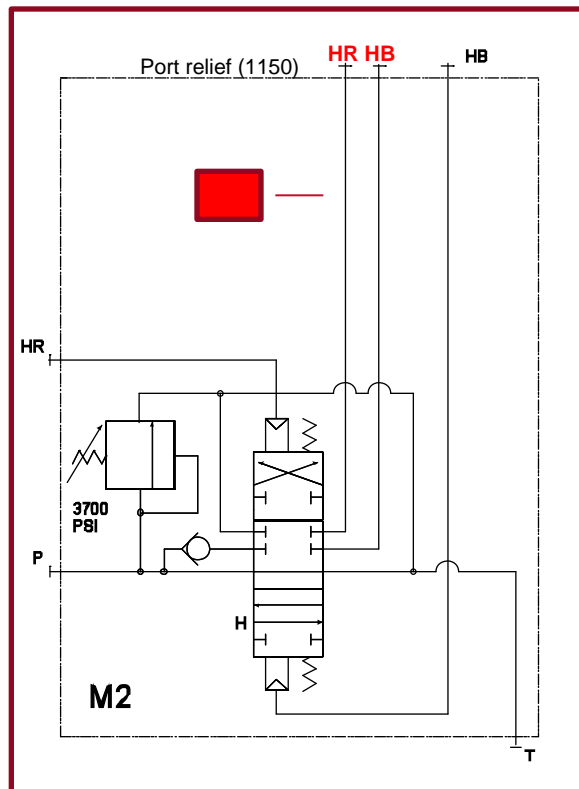
DUAL SPOOL HUSCO VALVE



1. End Cap
2. Centering Spring
3. Bucket Spool
4. Hoist Spool
5. Load Check Valve
6. Anti-Rotation Pin
7. Main Relief
8. Bucket Relief
9. Bucket Relief – Vented
10. Hoist Rod Relief
11. Hoist Base Relief
12. Inlet
13. Return
14. Bucket Base
15. Bucket Rod
16. Hoist Rod
17. Hoist Base
18. Float Spring

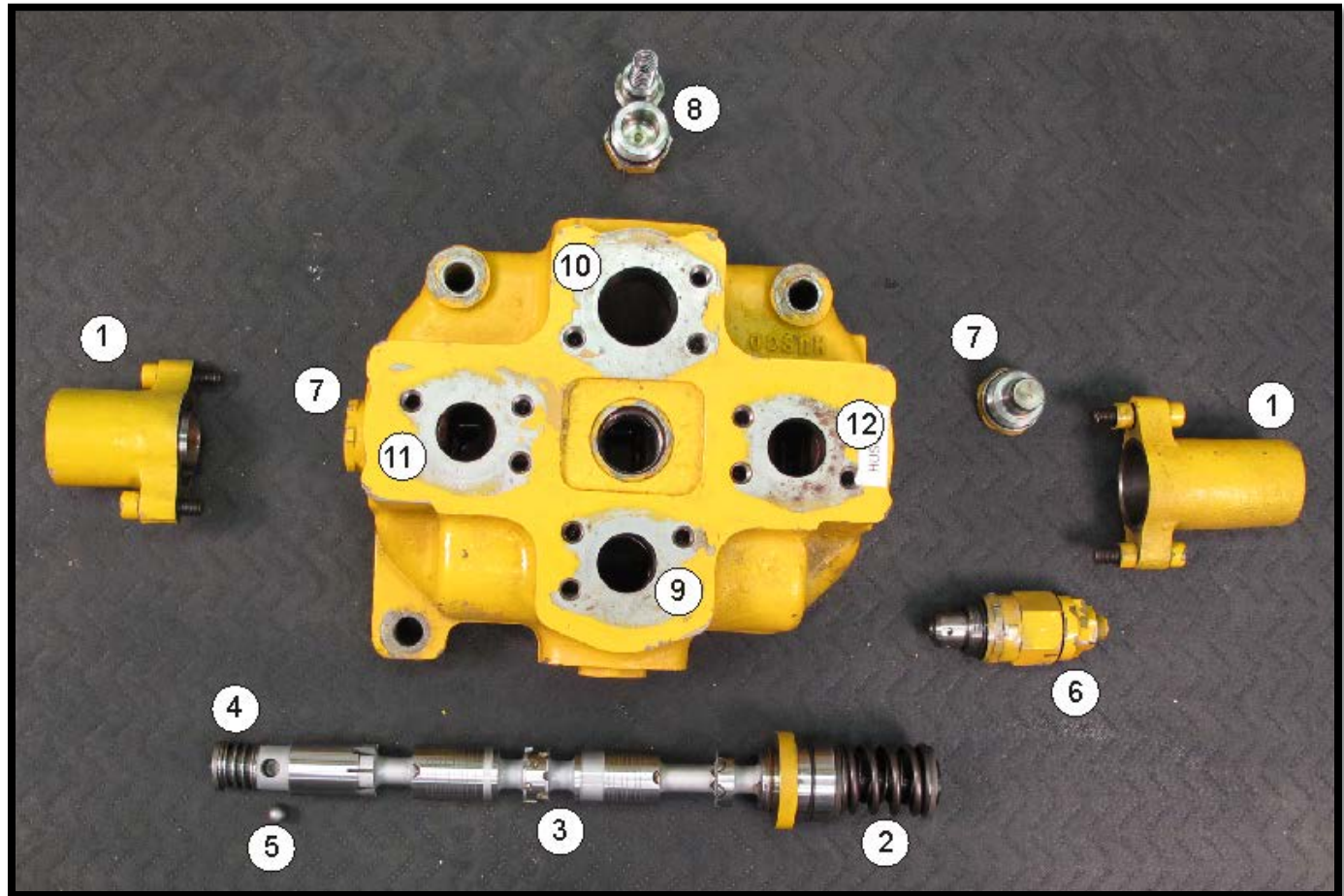
SINGLE SPOOL HUSCO VALVE

Load-check Valve



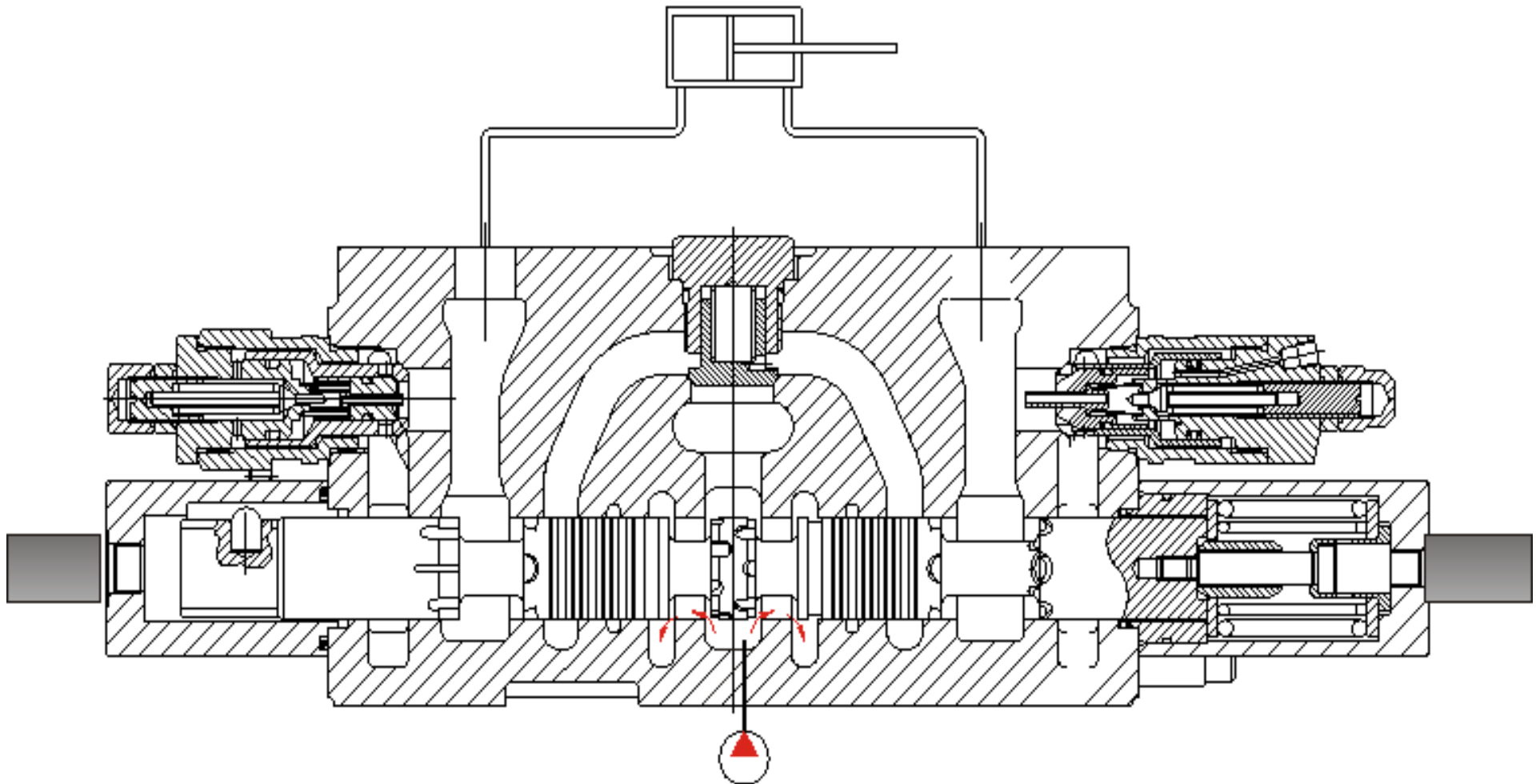
SINGLE SPOOL HUSCO VALVE

1. End Cap
2. Centering Spring
3. Hoist Spool
4. Float Spring [L-950 & L-1150]
5. Anti-Rotation Pin
6. Main Relief
7. Plug [Circuit Relief]
8. Load Check Valve
9. Inlet
10. Return
11. Hoist Base
12. Hoist Rod

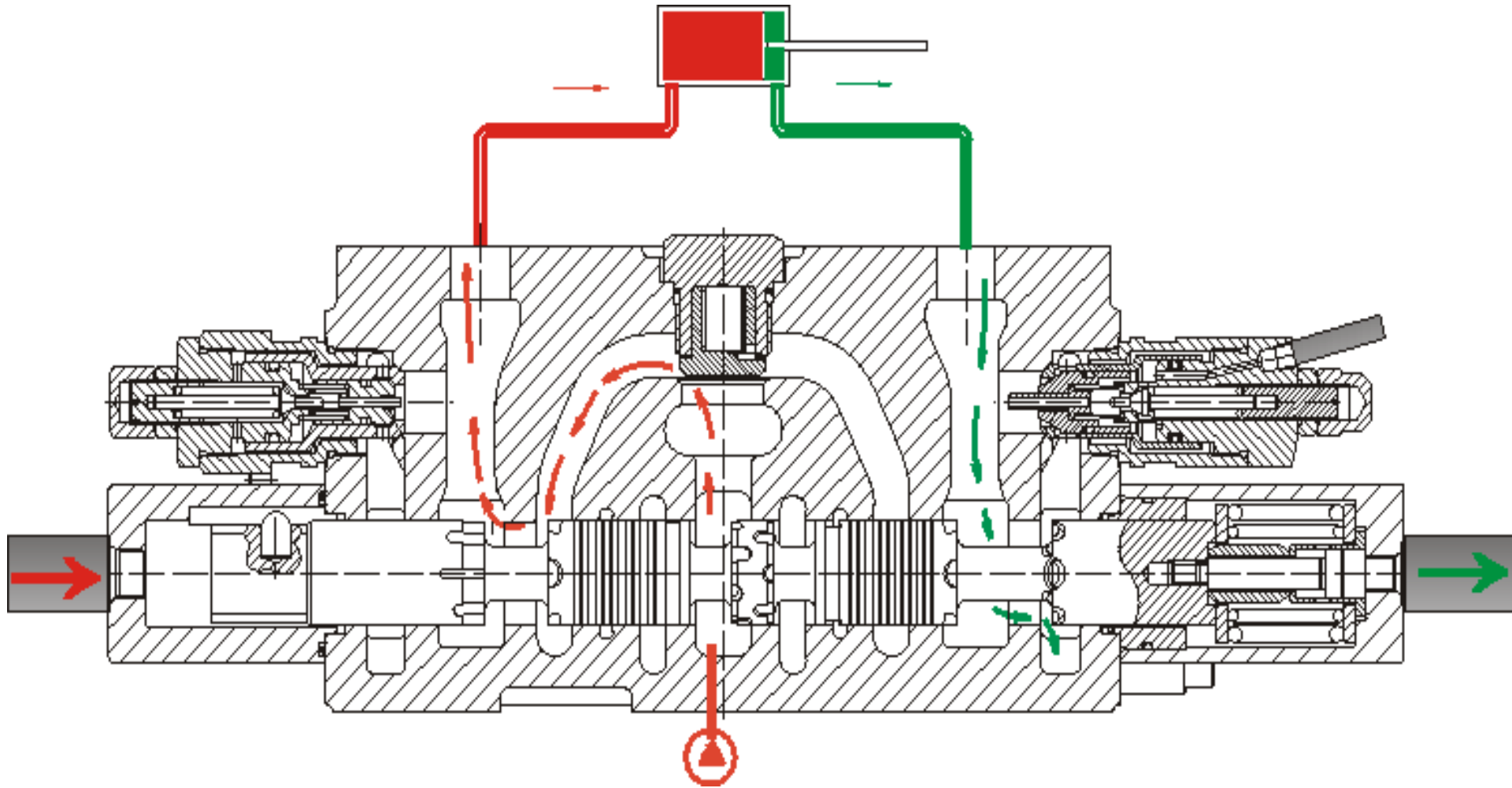


BUCKET NEUTRAL

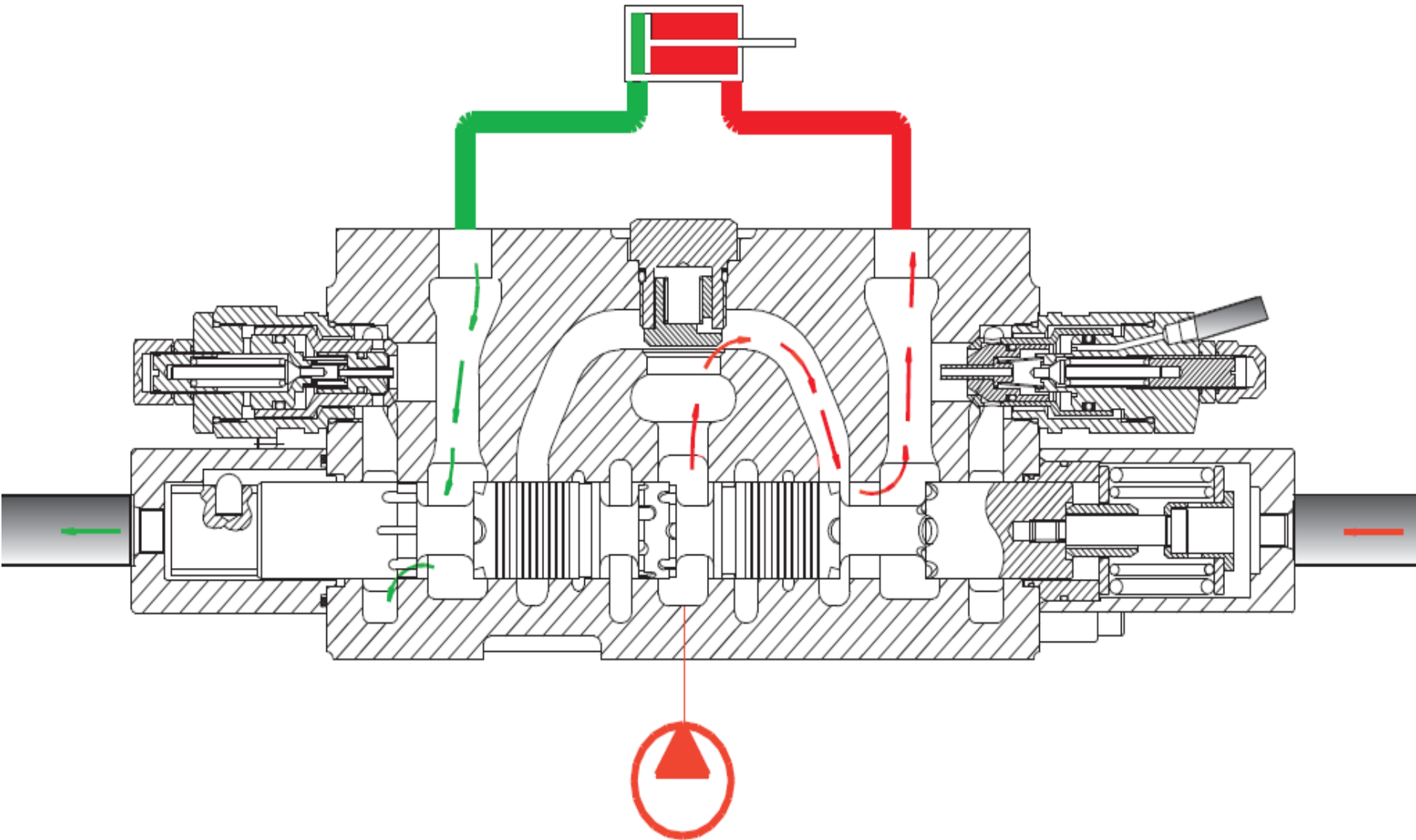
BUCKET



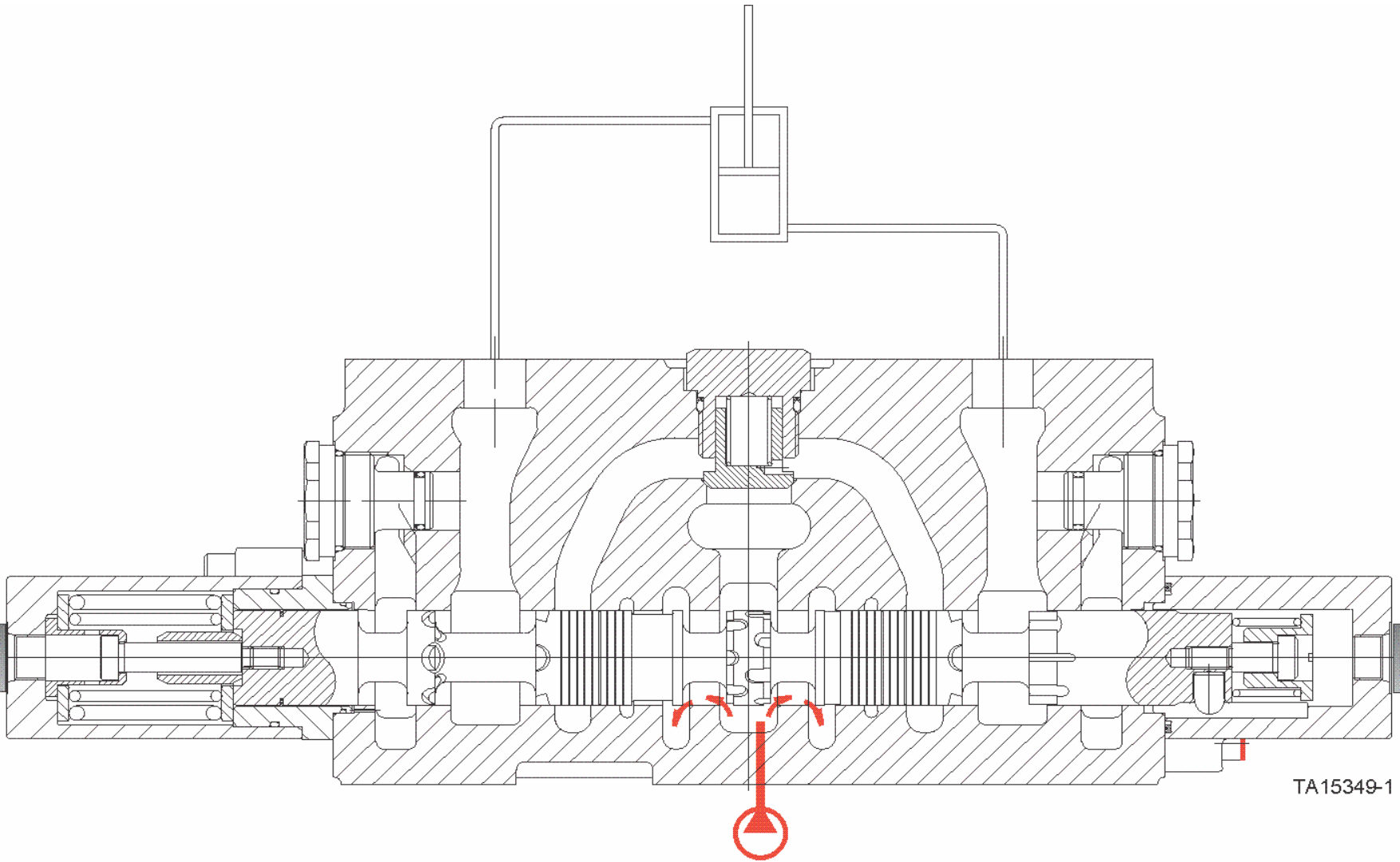
BUCKET ROLLBACK



BUCKET DUMP

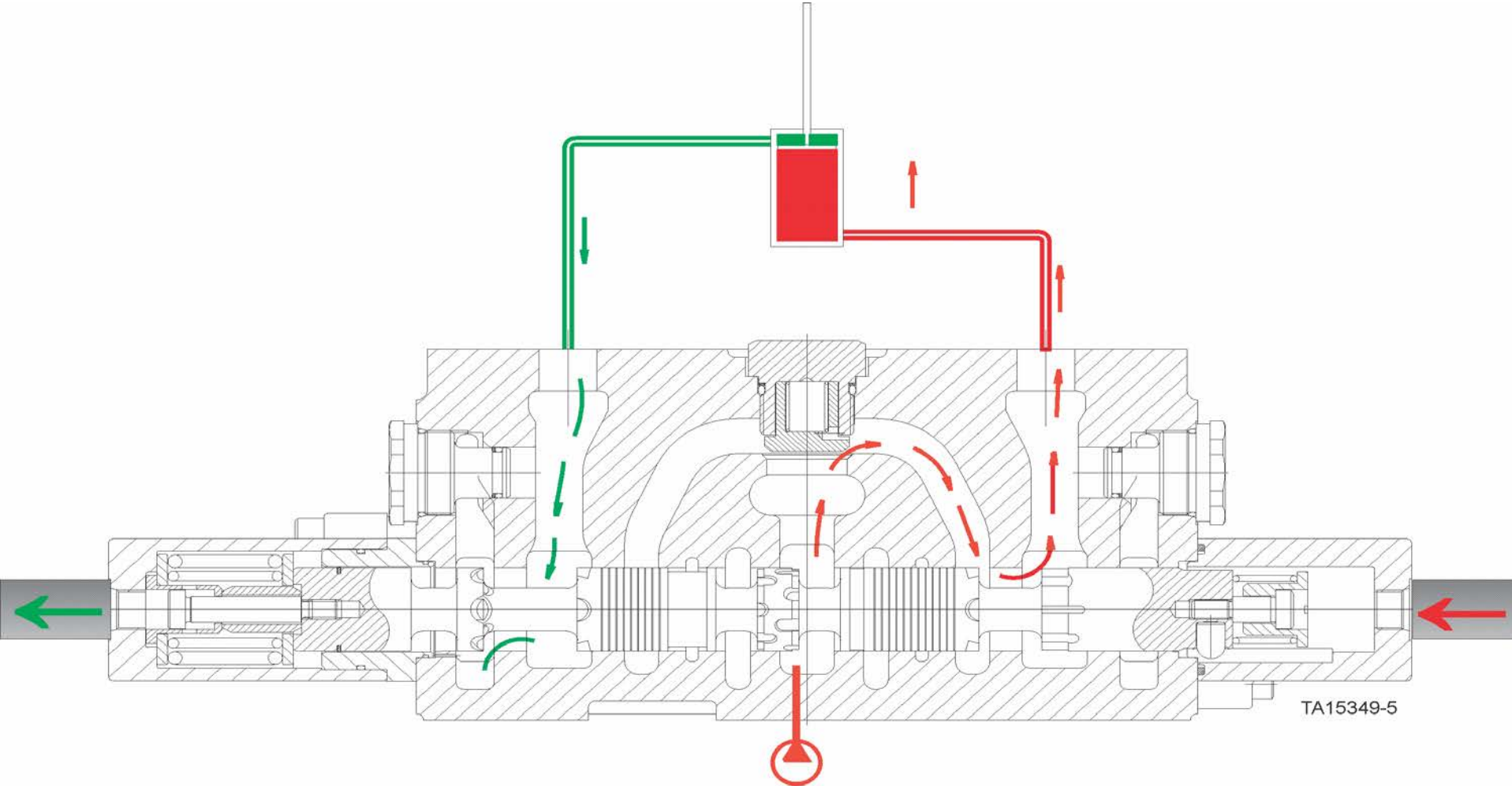


HOIST NEUTRAL



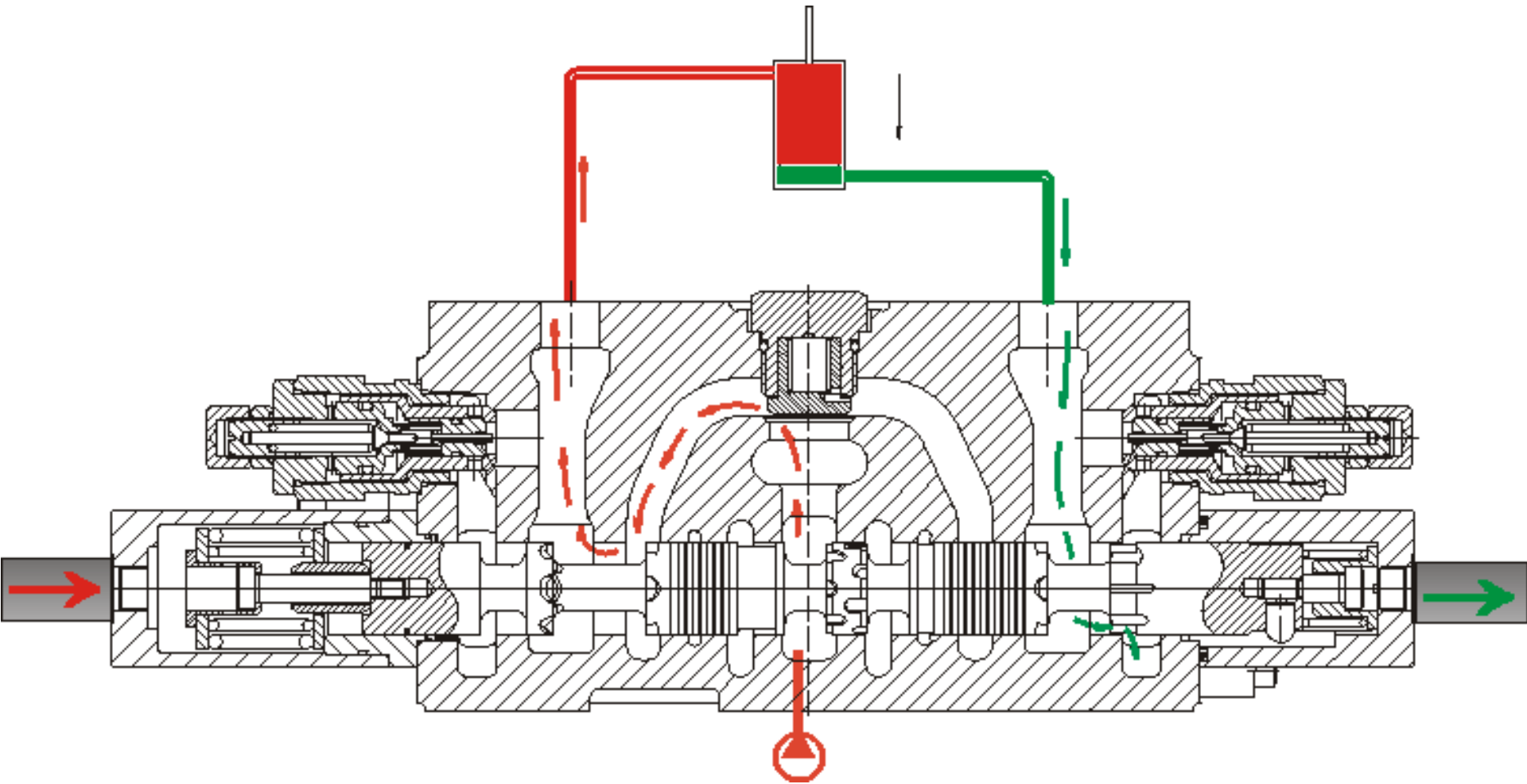
TA15349-1

HOIST UP

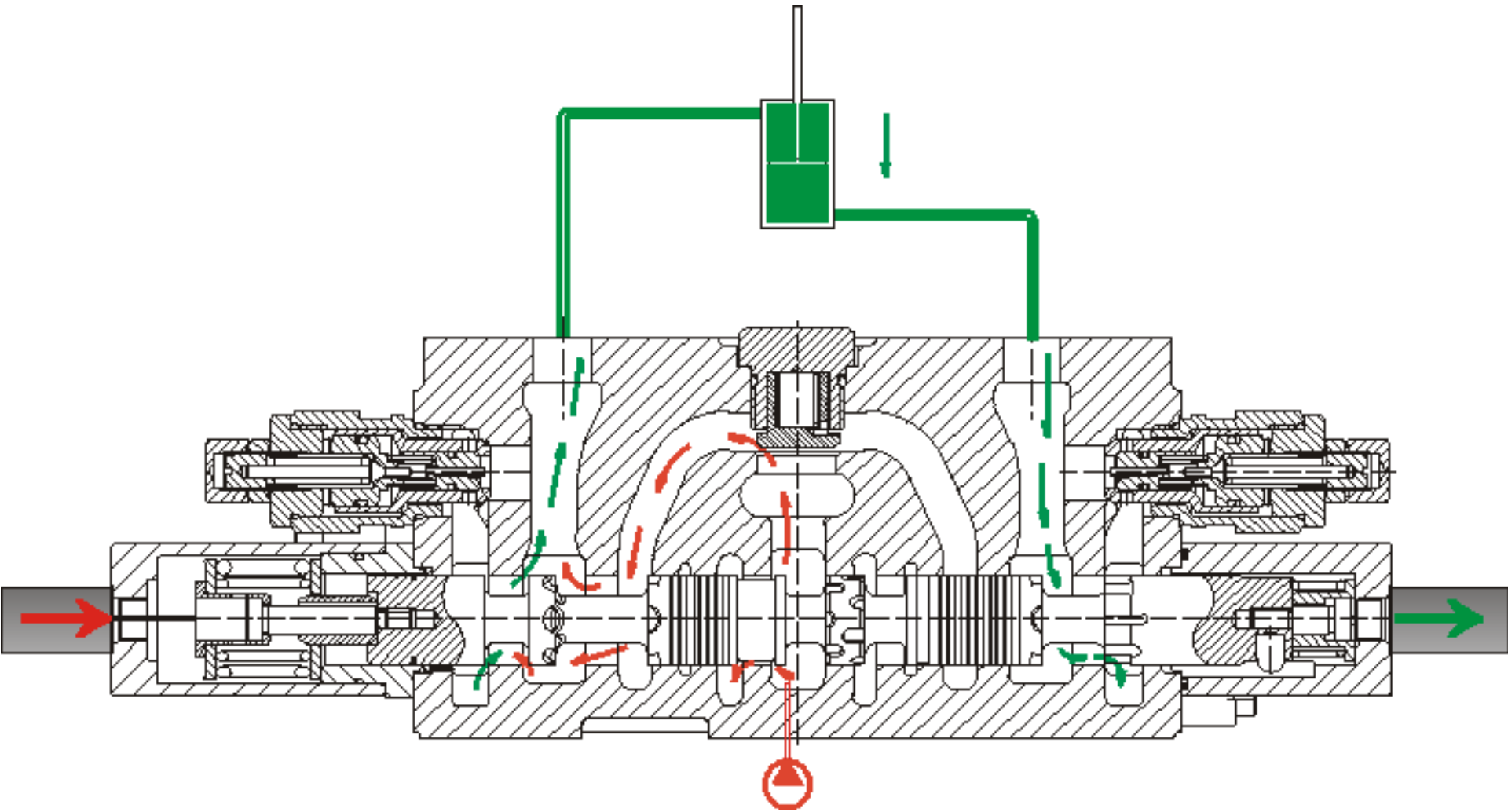


Hoist

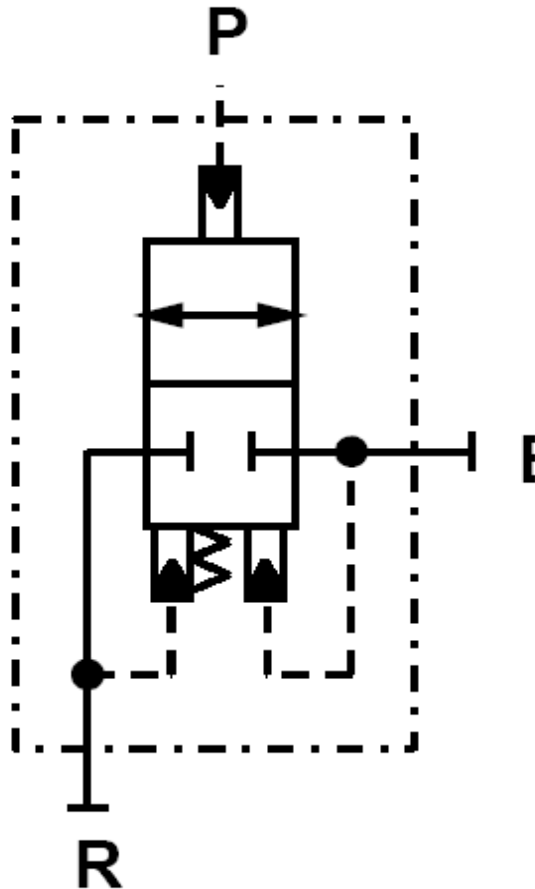
POWER DOWN



FLOAT (RETURN TO DIG)

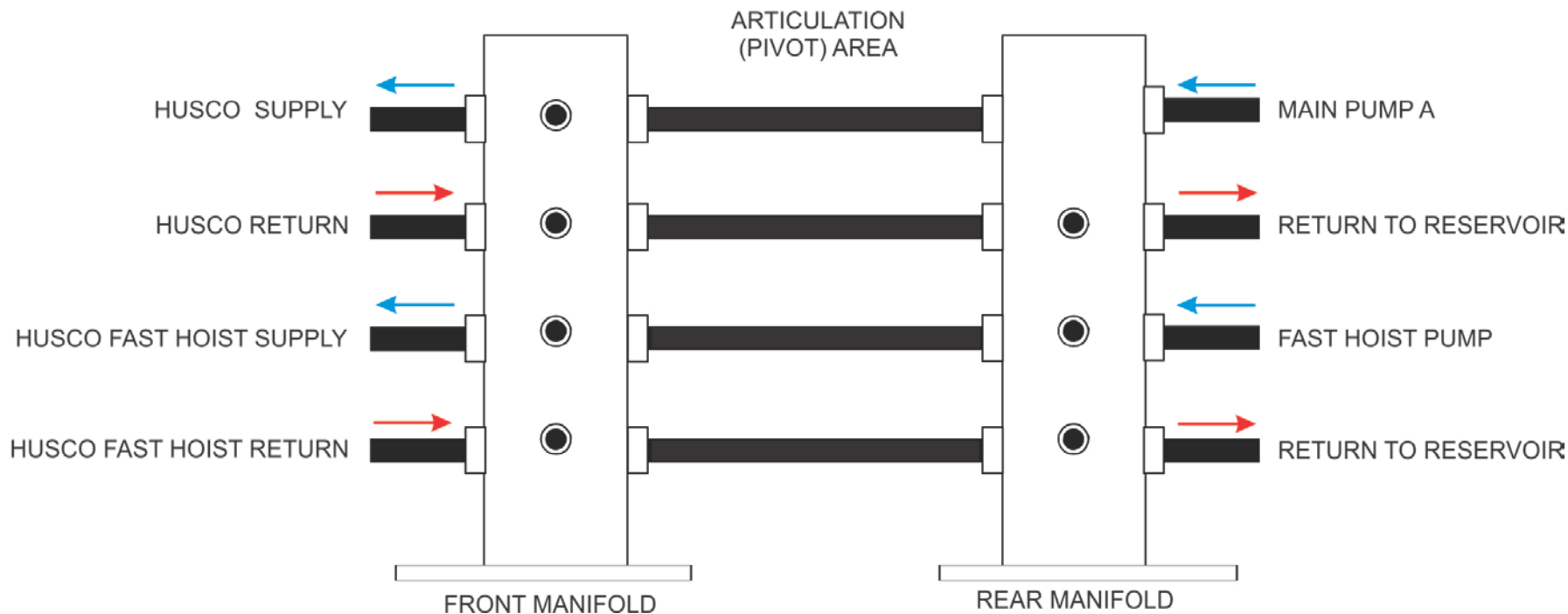


FLOAT VALVES

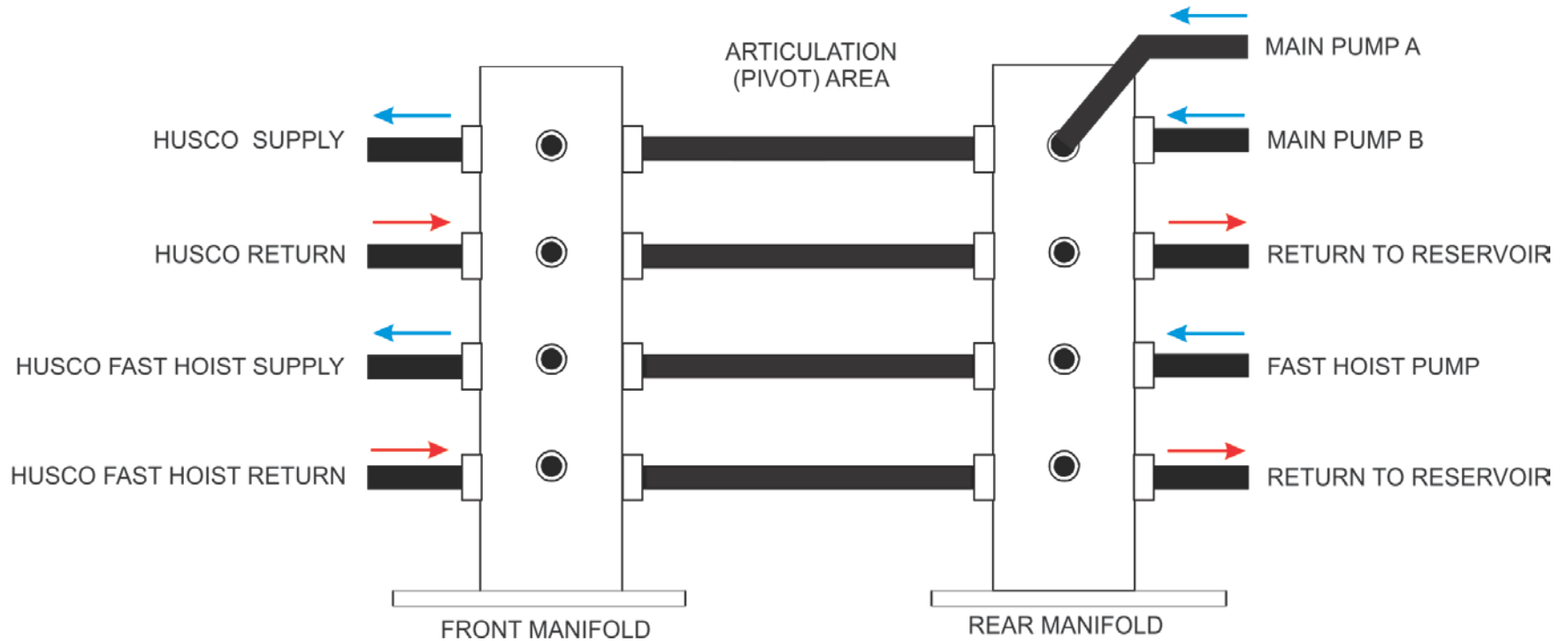




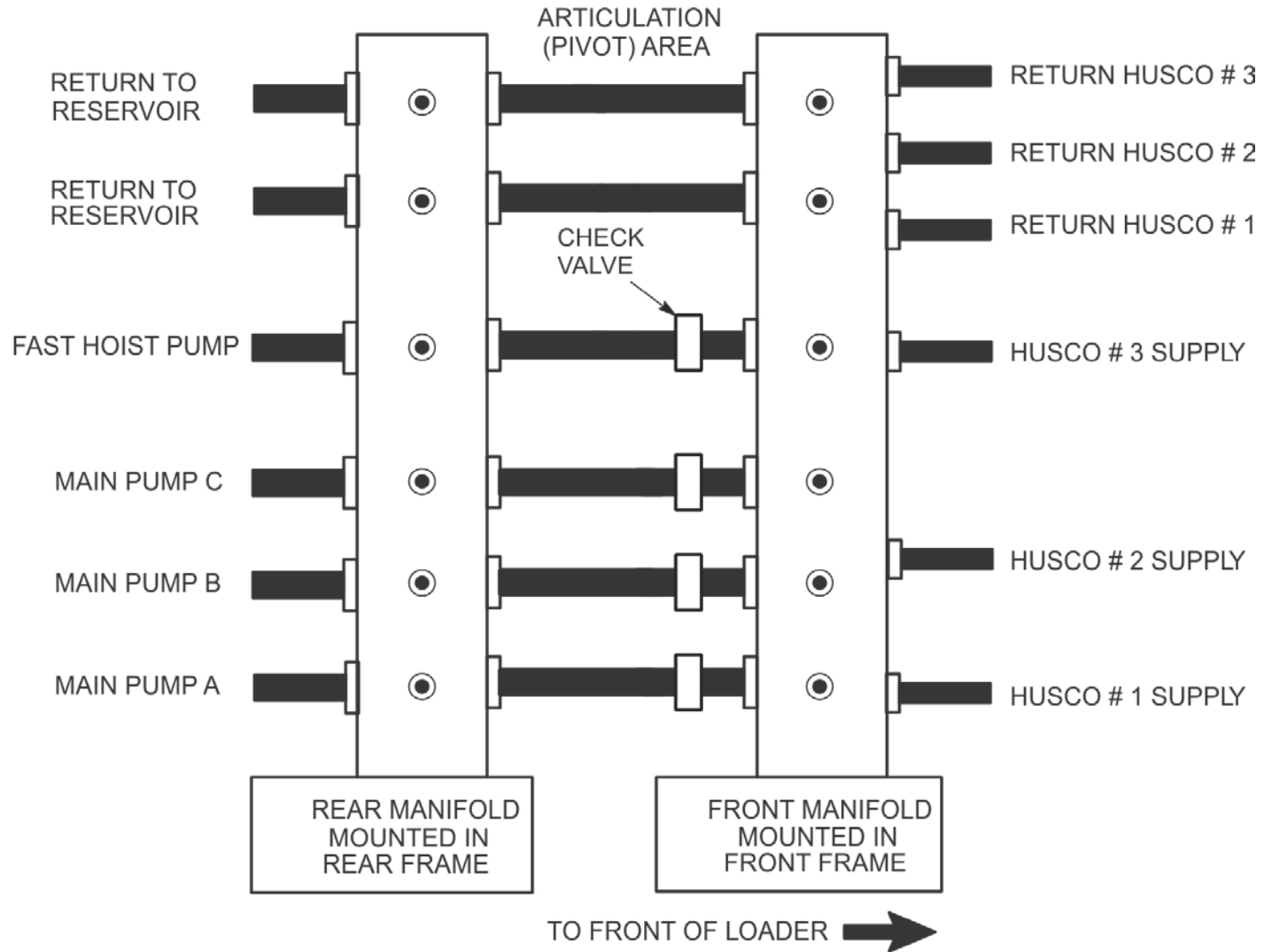
MULTI-PORT DISTRIBUTION MANIFOLDS L-950



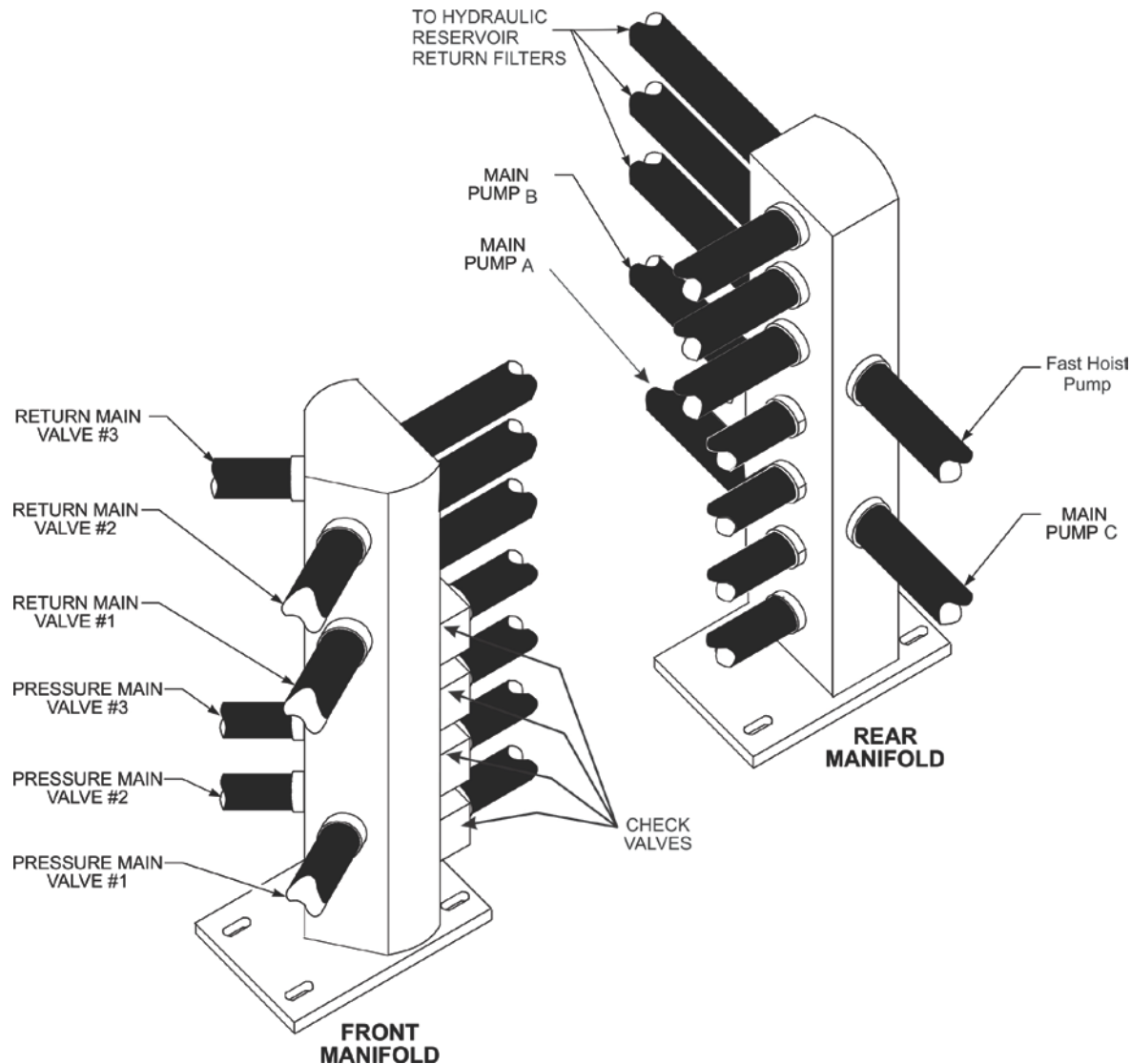
MULTI-PORT DISTRIBUTION MANIFOLDS L-1150



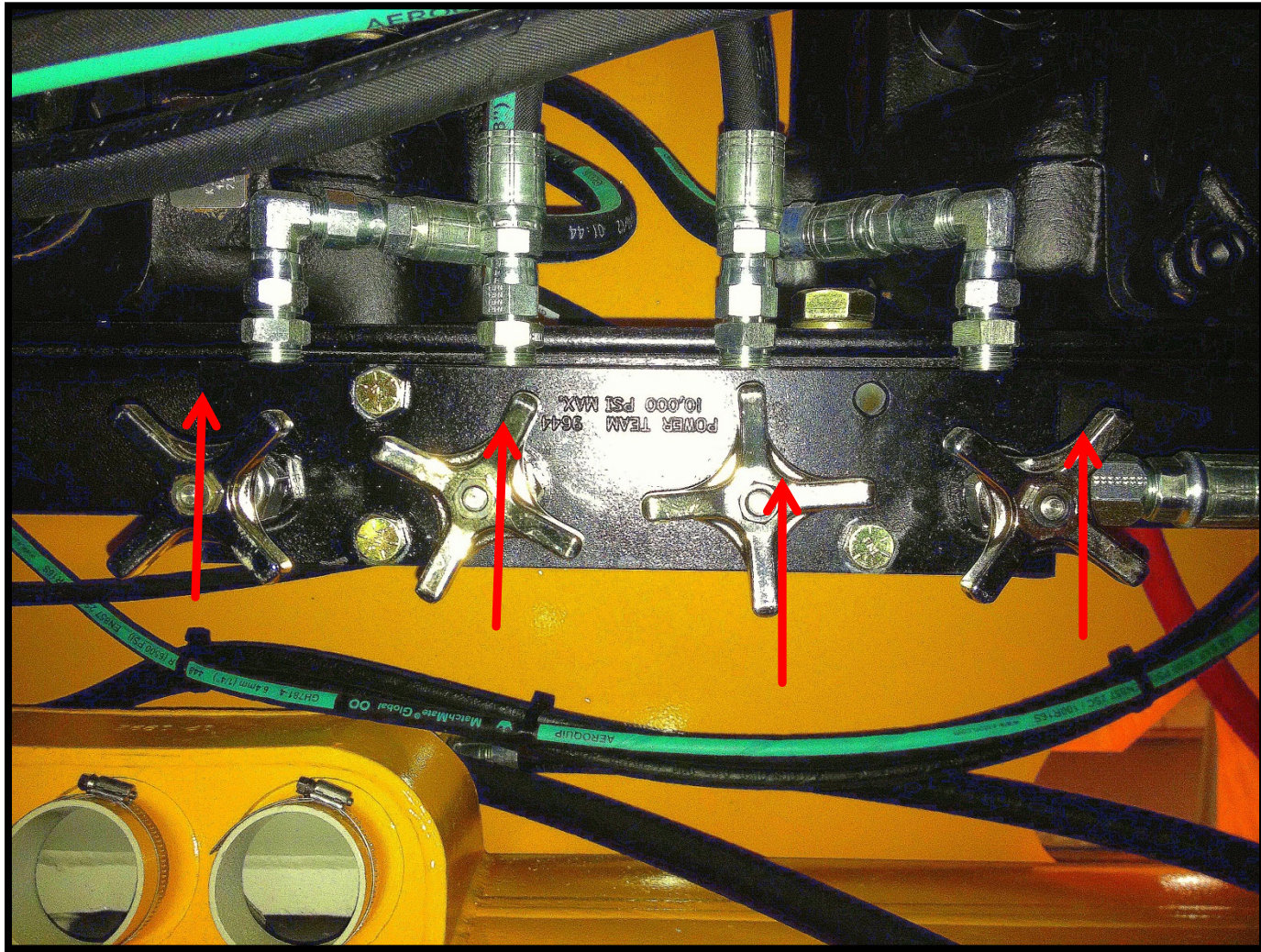
MULTI-PORT DISTRIBUTION MANIFOLDS L-1350/L-1850



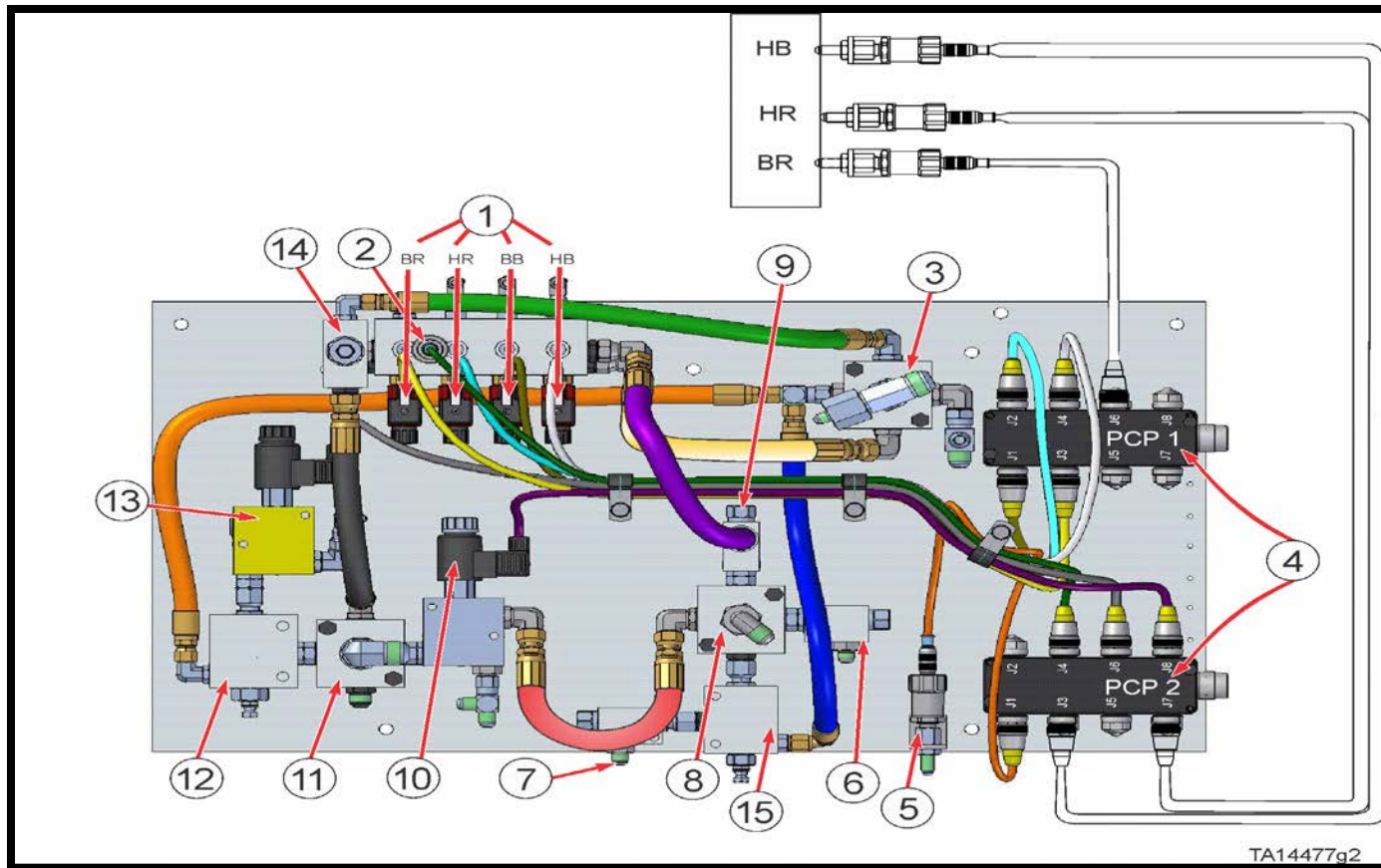
MULTI-PORT DISTRIBUTION MANIFOLDS L-2350



MANUAL BLEED VALVES

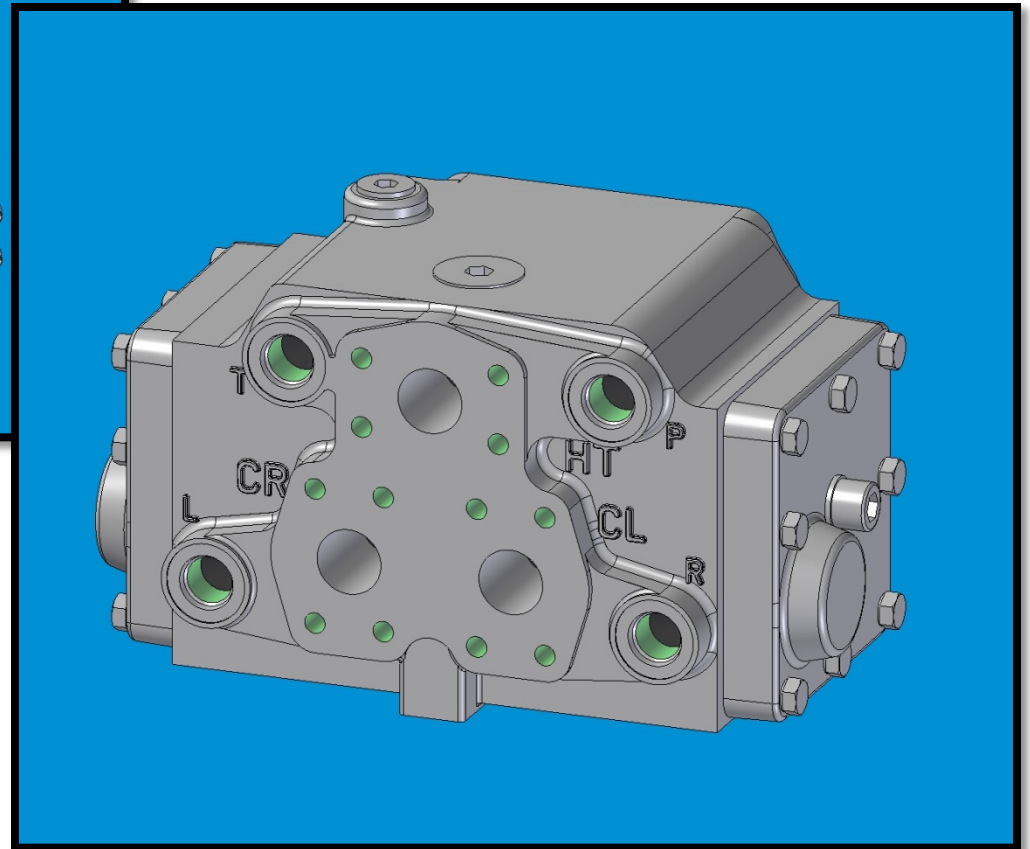
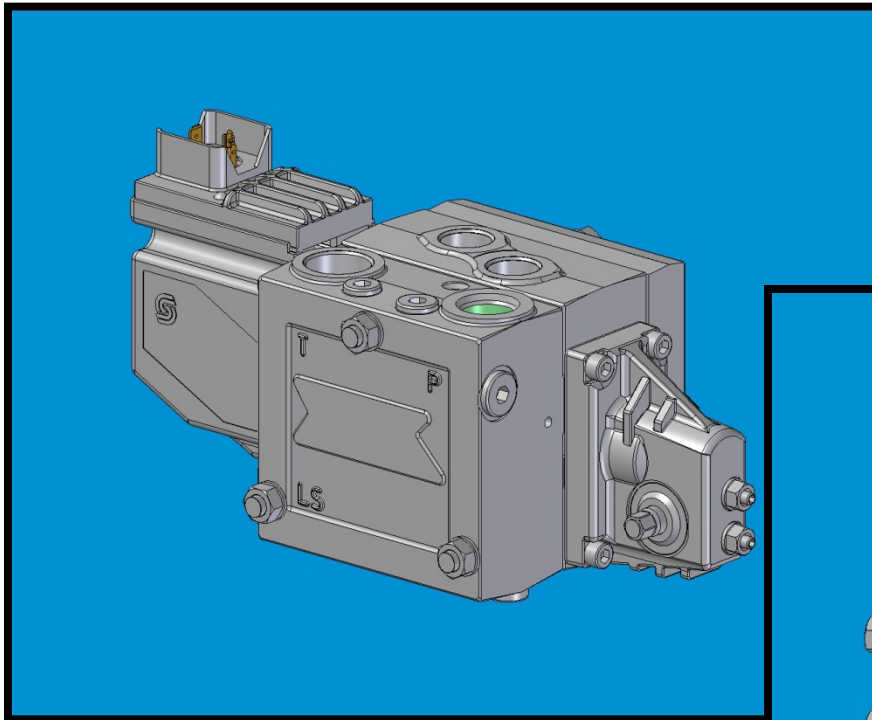


CURRENT PILOT SYSTEM



- | | |
|---|--|
| 1. PILOT PRESSURE TRANSDUCER | 8. FIVE 5 PORT MANIFOLD (SUPPLY) |
| 2. PILOT VALVE ASSEMBLY | 9. PILOT SUPPLY FLOW CONTROL 2.5 gpm (9.46 lpm) |
| 3. FIVE 5 PORT MANIFOLD (LOW TURBULENCE) | 10. SOLENOID VALVE ASSEMBLY FLOAT (SOL. FD) |
| 4. BREAKOUT BOXES TURCK | 11. FIVE 5 PORT MANIFOLD (RETURN) |
| 5. PRESSURE TRANSMITTER 5000 psi (345 bar) LOAD WEIGH | 12. RELIEF VALVE SECONDARY DUMP |
| 6. AUTO LUBE FLOW CONTROL 2.5 gpm (9.46 lpm) | 13. SOLENOID VALVE ASSEMBLY SECONDARY DUMP (SOL. SD) |
| 7. PLANETARY DRIVE FILTRATION FLOW CONTROL 2.5 gpm (9.46 lpm) | 14. RELIEF VALVE PILOT PRESSURE |
| | 15. FRONT DRIVER SEQUENCE VALVE |

STEERING MAIN VALVES

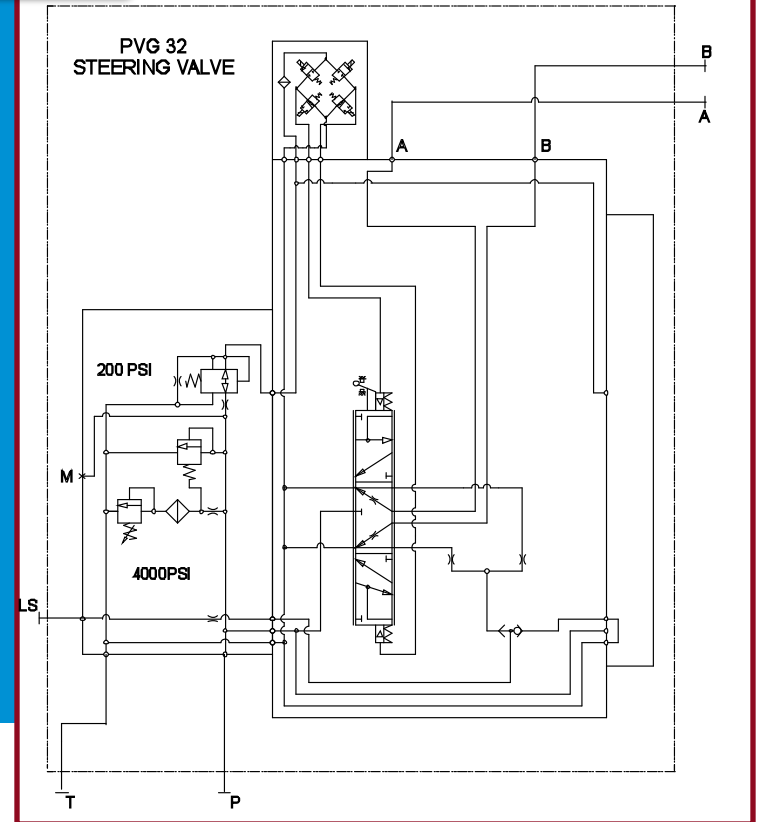


PVG 32

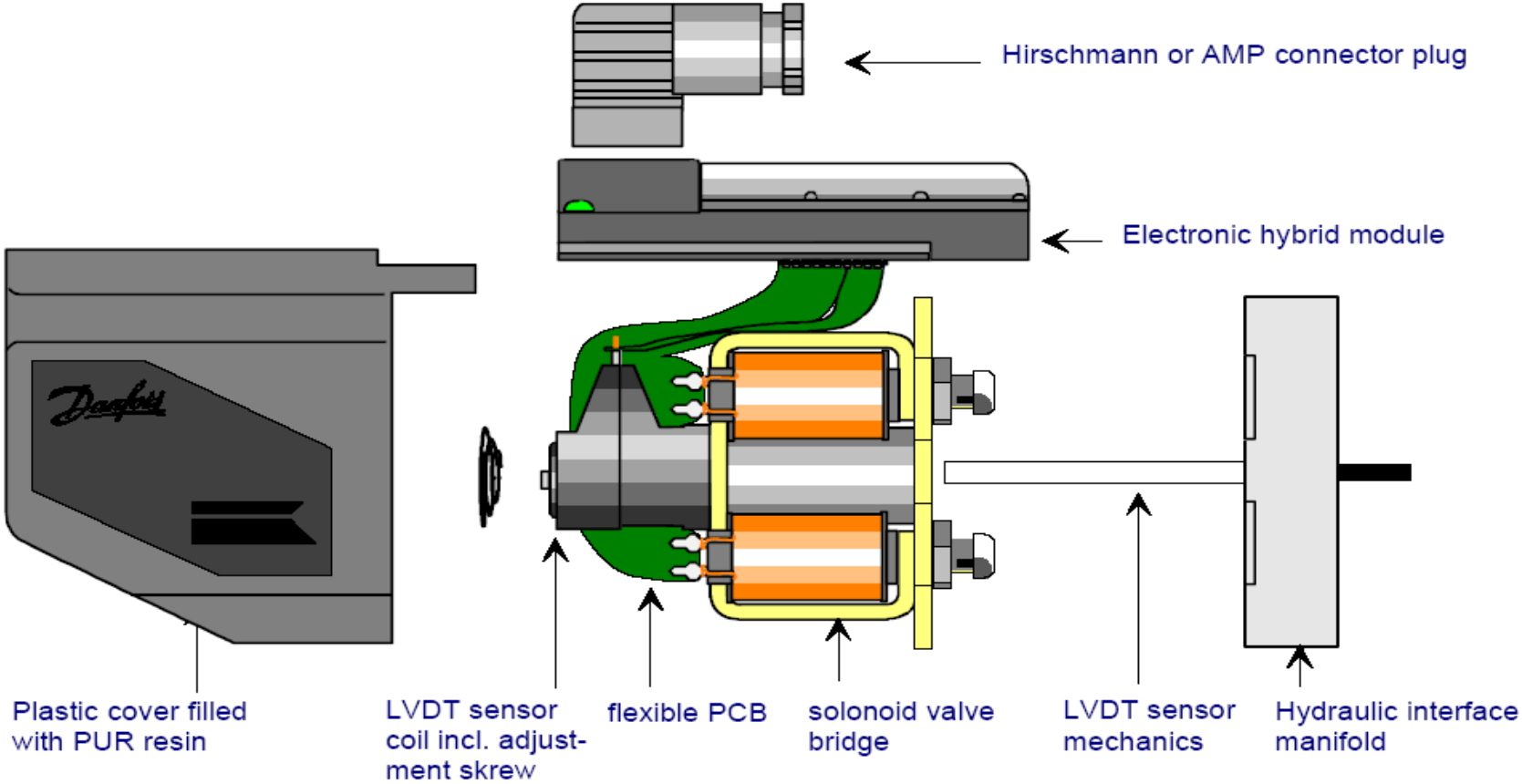
LINCS Electrical Connection
[DIN]

Manual Actuator

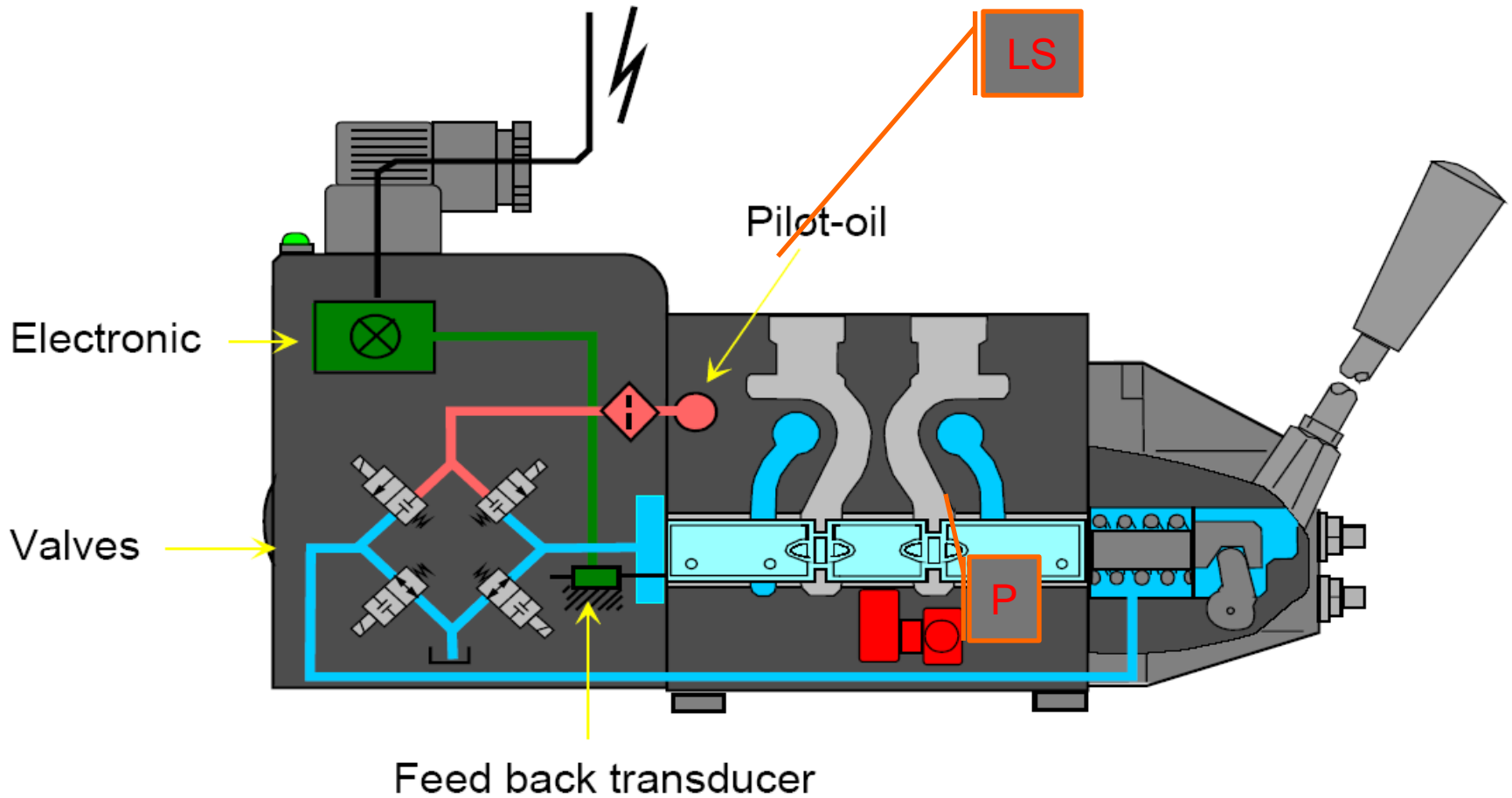
Error LED



COIL COMPONENTS



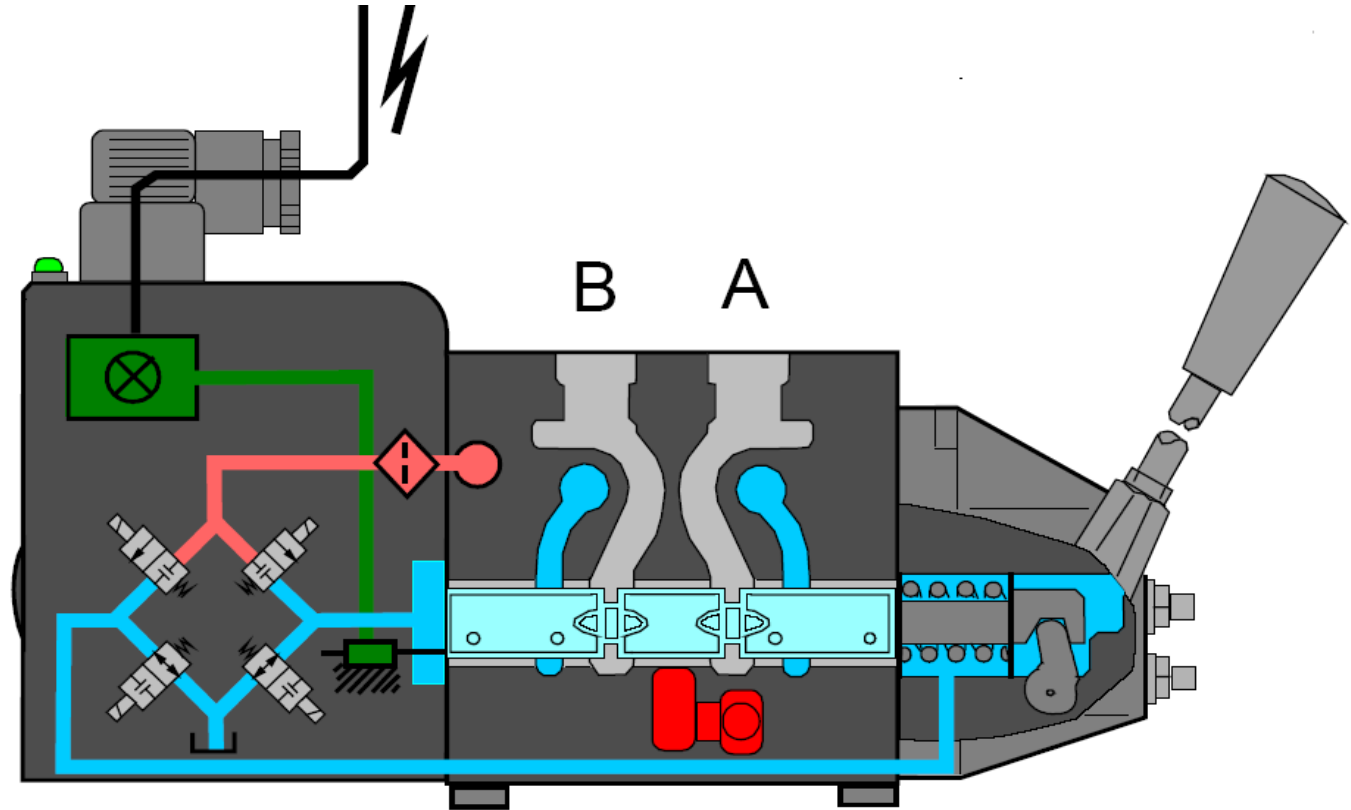
PVG COMPONENTS



OFF/NEUTRAL

Poppet valves vent both sides of spool to tank.

Remove connector to manually move the spool with a 9mm wrench.



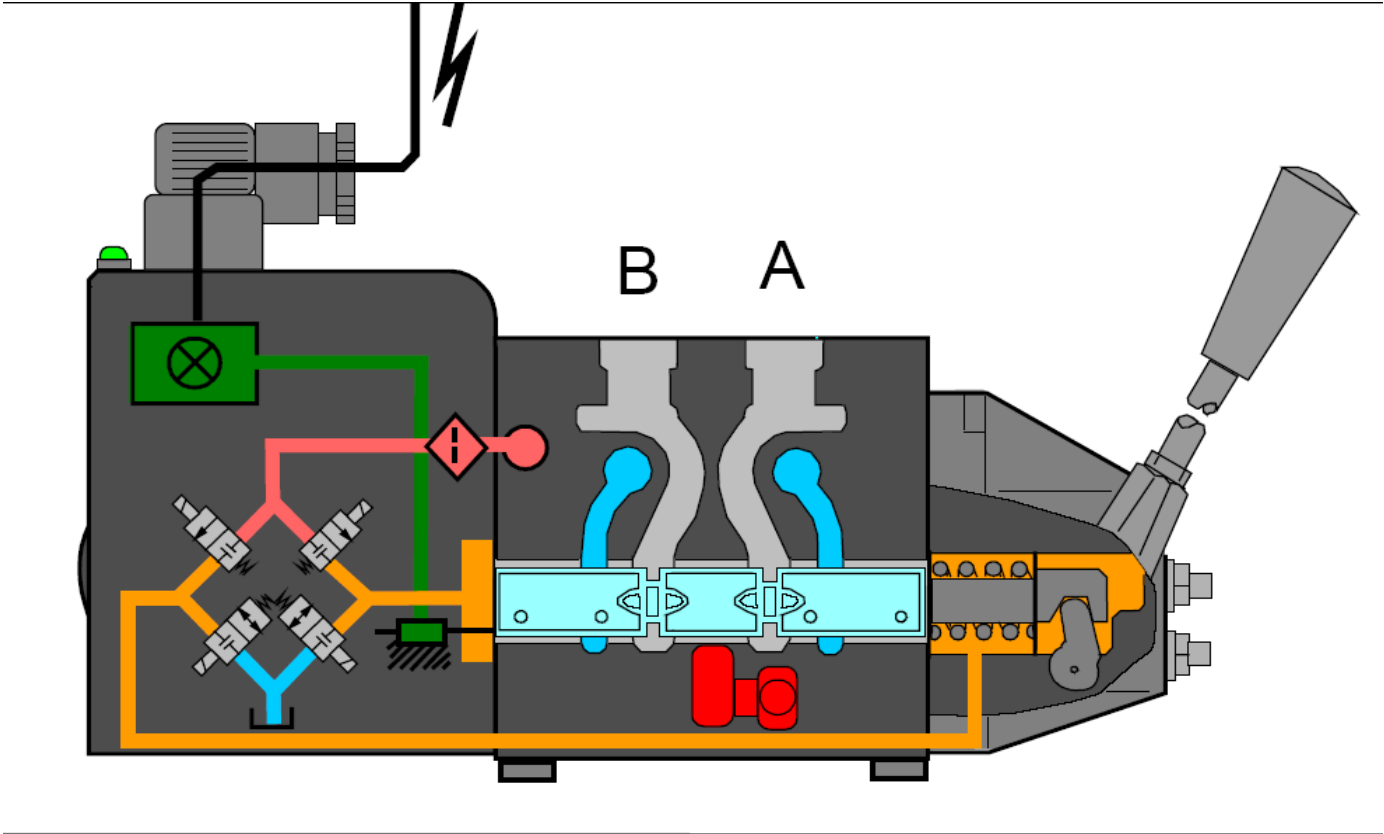
Electrical power disconnected. Spring center to neutral.

ON/NEUTRAL

Signal from Interface Card

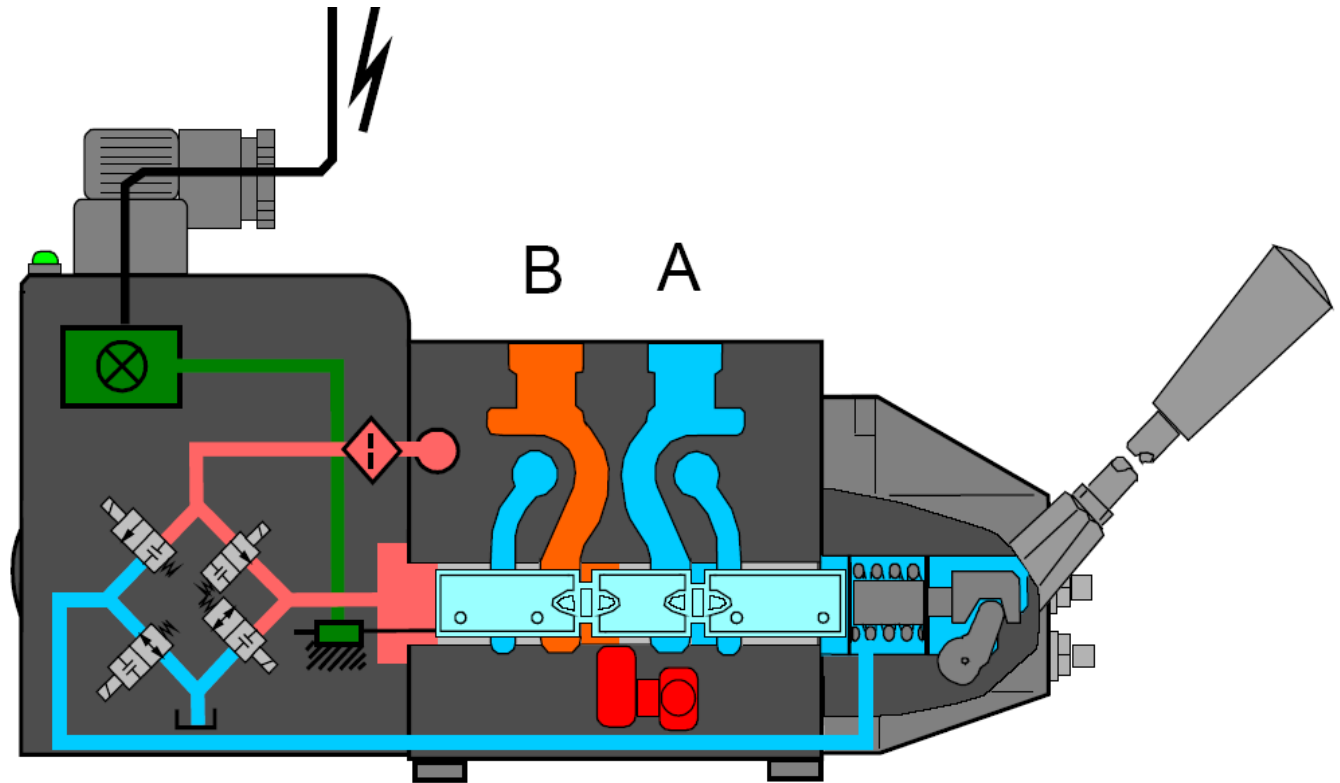
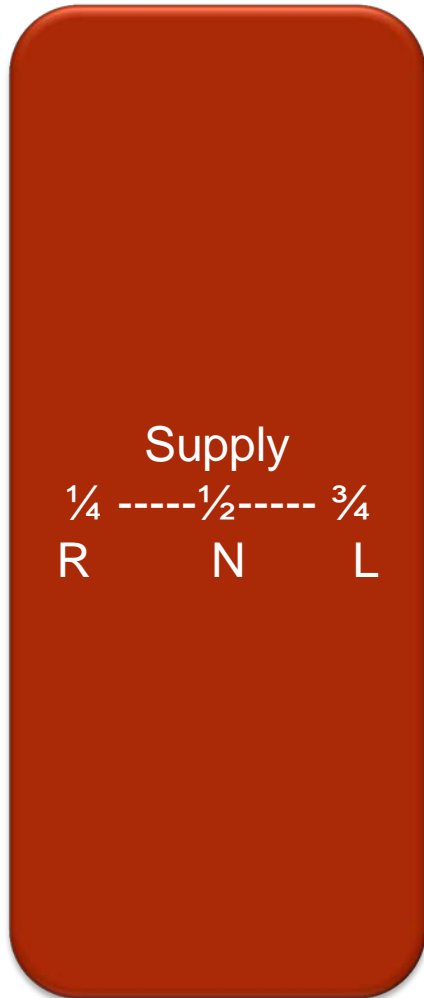
$\frac{1}{4}$ ----- $\frac{1}{2}$ ----- $\frac{3}{4}$

R N L



Electrical power connected. Neutral signal from joystick. Spool held in neutral by pilot pressure.

COMMANDED



As joystick signal requests flow to B port, spool moved in B direction by pilot pressure.

FAULT MONITORING

Input signal monitoring

The input voltage is continuously monitored. The acceptable signal range is between 15% and 85% of the supply voltage. If signal voltage goes outside of this range, the system will switch into an error state.

Transducer supervision

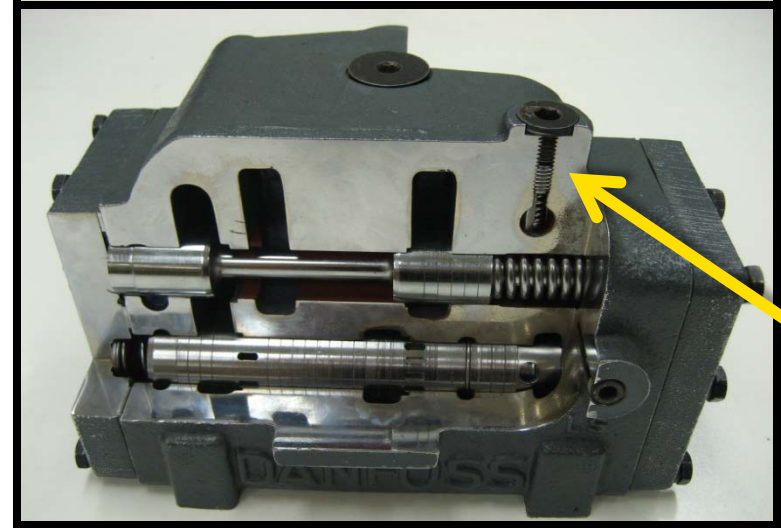
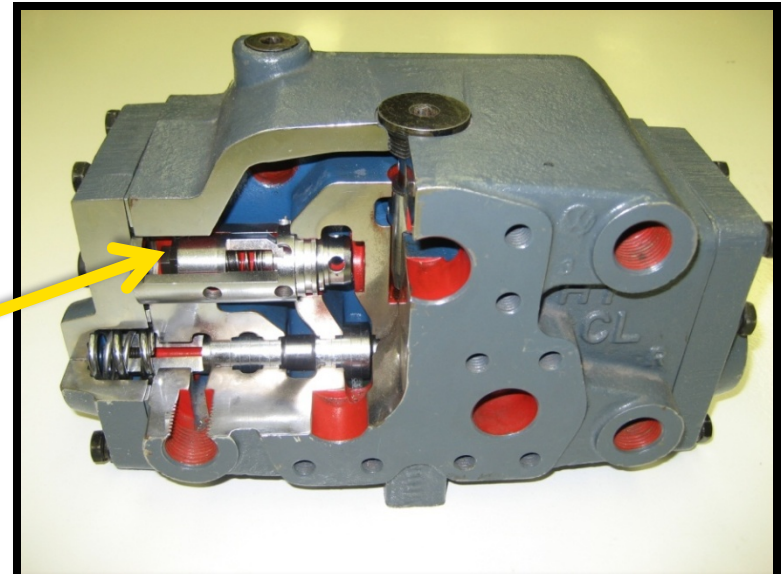
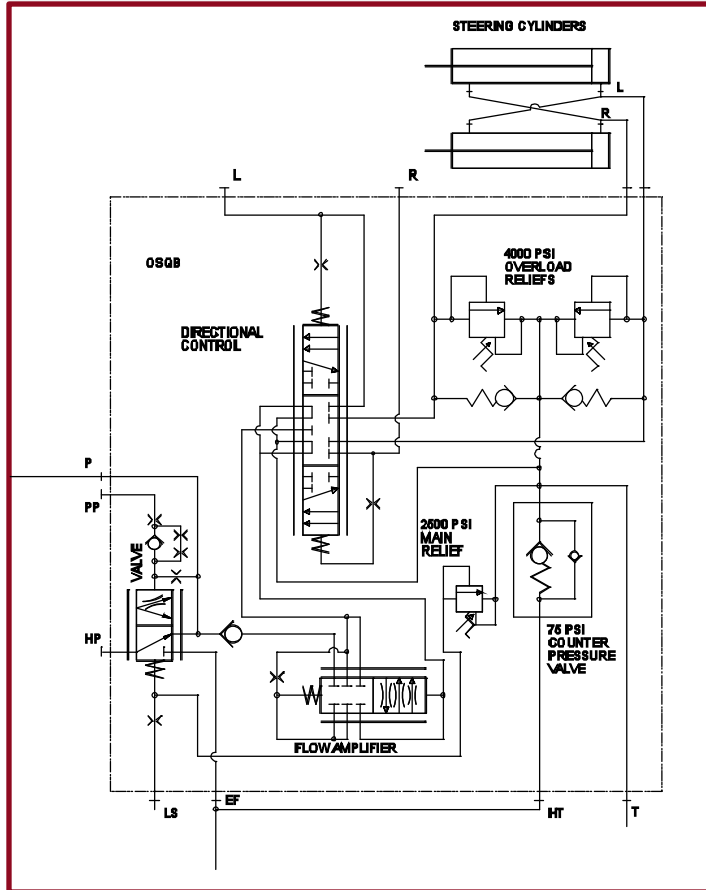
If one of the wires to the LVDT sensor, or inside the sensor, is broken or shorted, the system will switch into an error state.

Supervision of the closed loop

The spool position must always correspond to the position requested by the input signal. If the spool is 15% farther from neutral (providing more flow) than requested, the system detects an error and will switch into an error state.

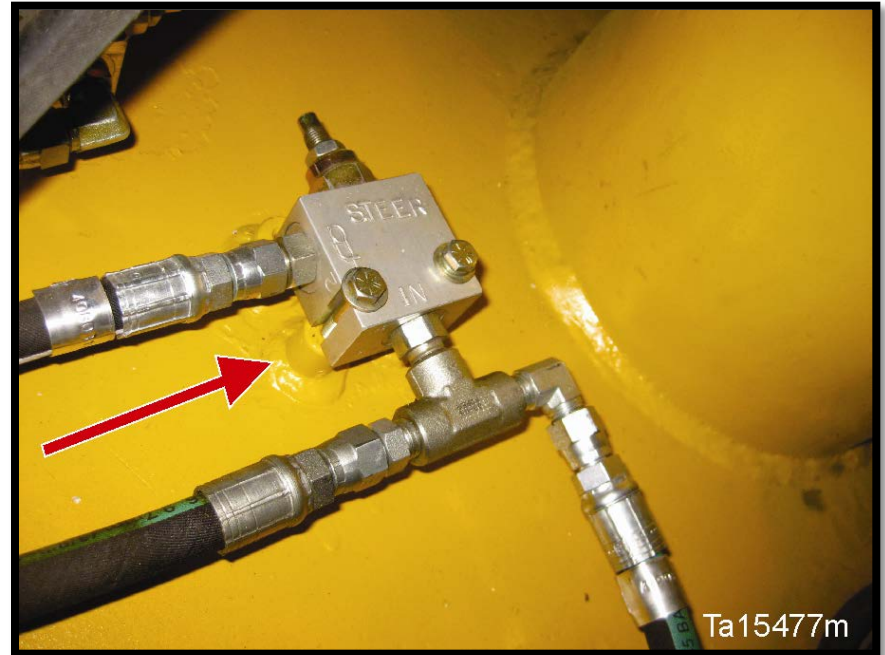
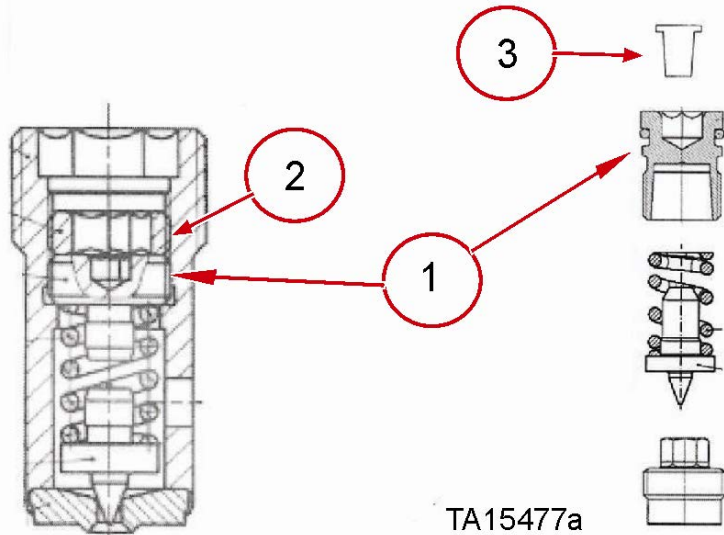
STEERING FLOW AMPLIFIER

Amplification Ratio: 10:1



STEERING MAIN RELIEF

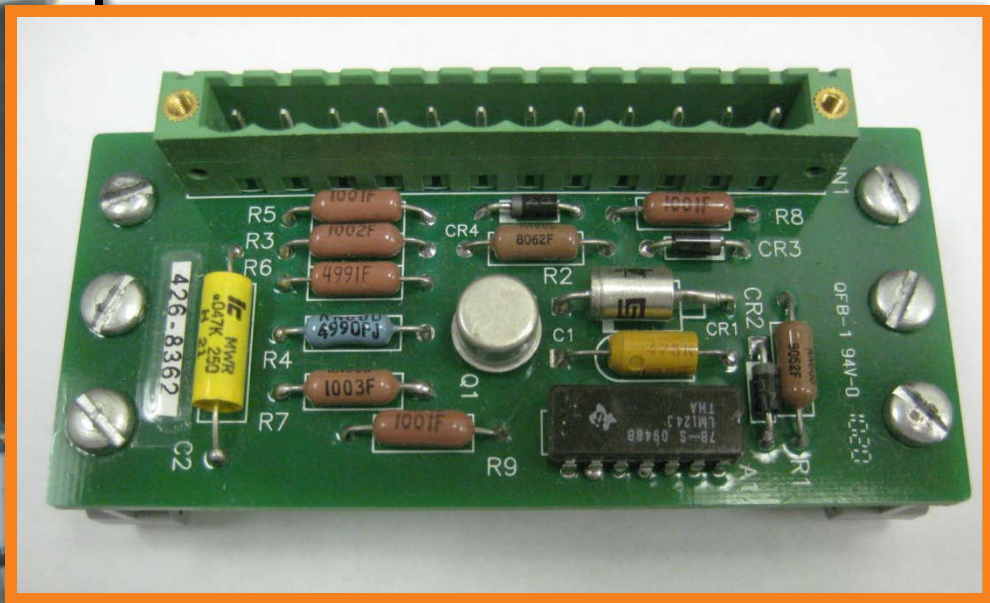
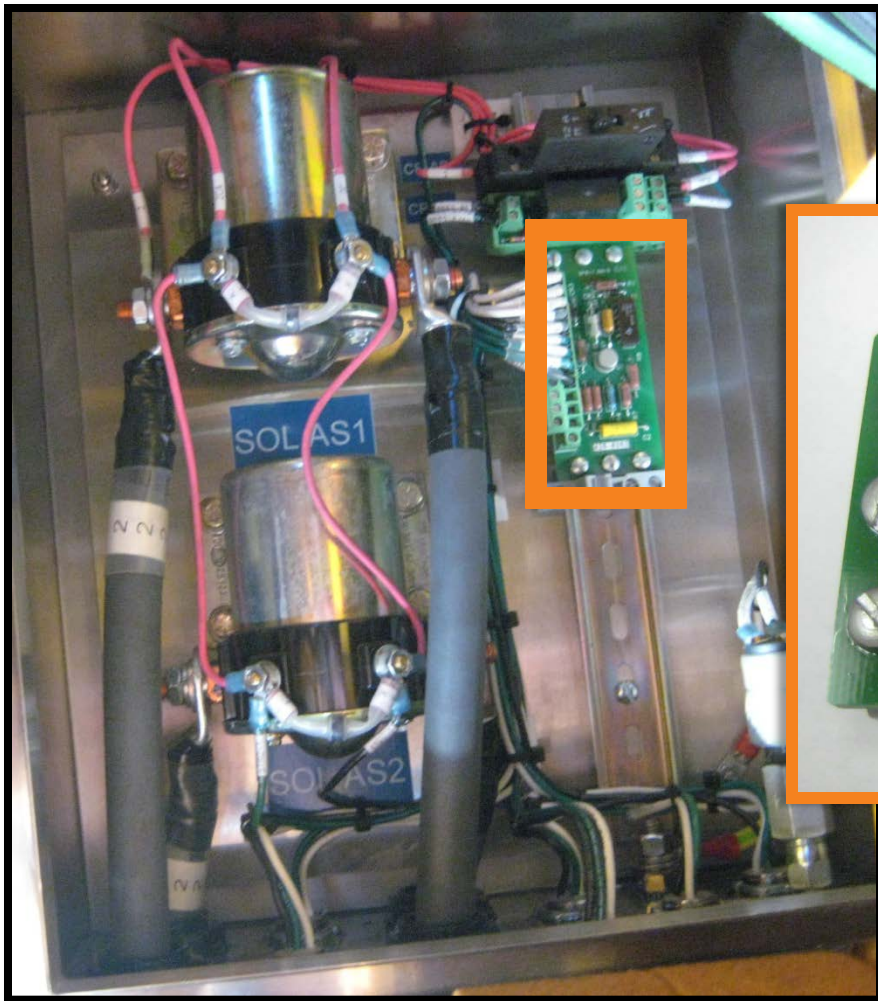
- ❑ Main relief bottomed out
- ❑ L-950 / L-1150 uses vane pump and remote relief
- ❑ L-1350, L-1850, L-2350 pump compensator



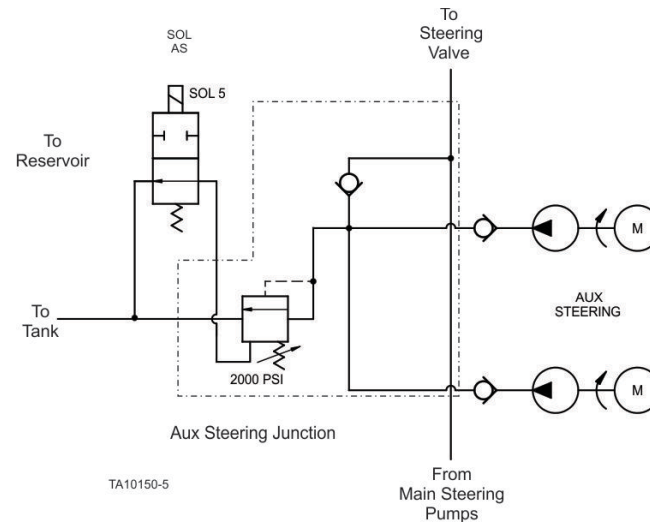
1. Adjustment screw
2. Lock nut
3. Dust cap



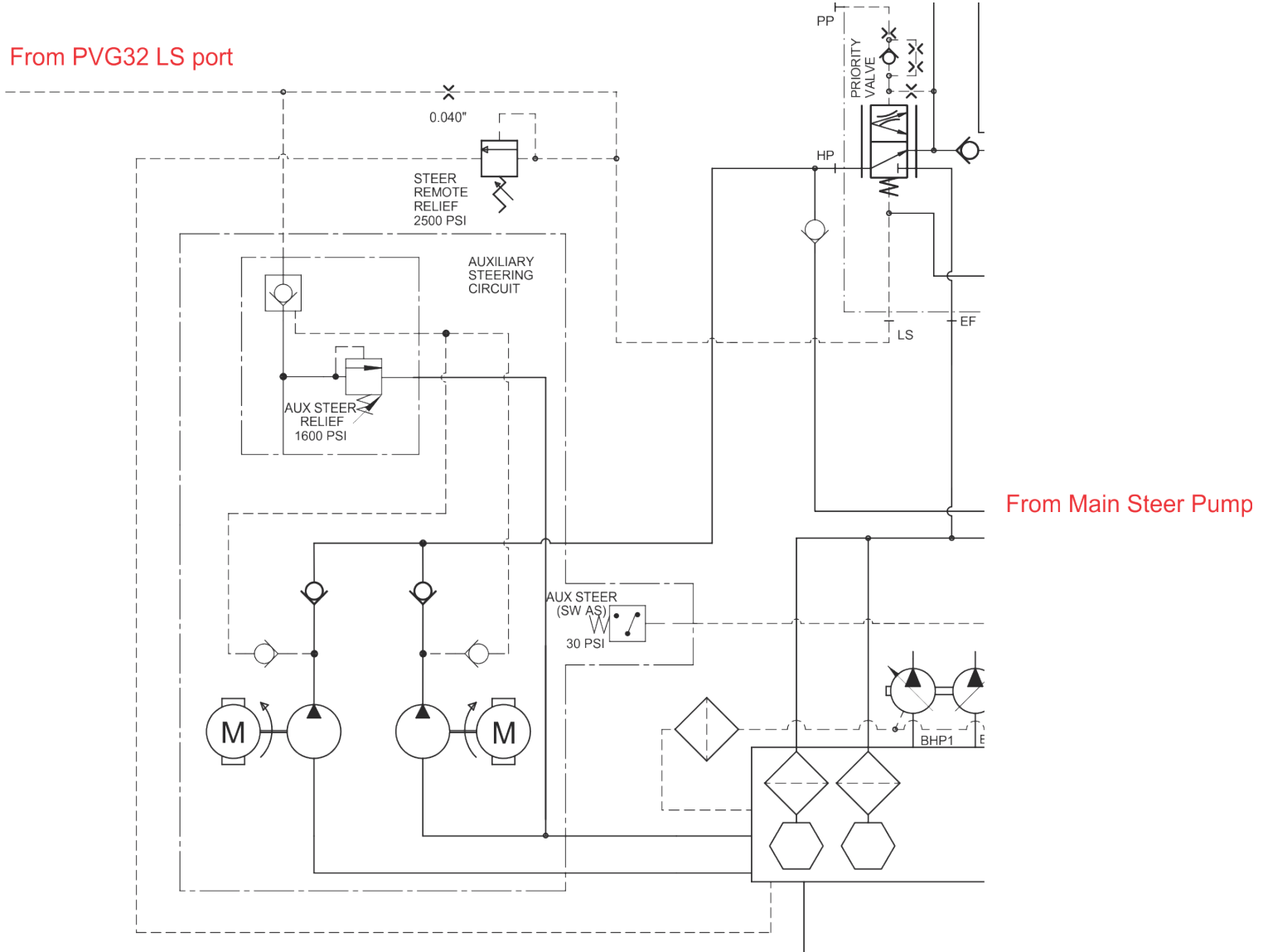
STEERING JUNCTION BOX AND STEERING INTERFACE CARD



AUXILIARY STEERING (PISTON PUMP)



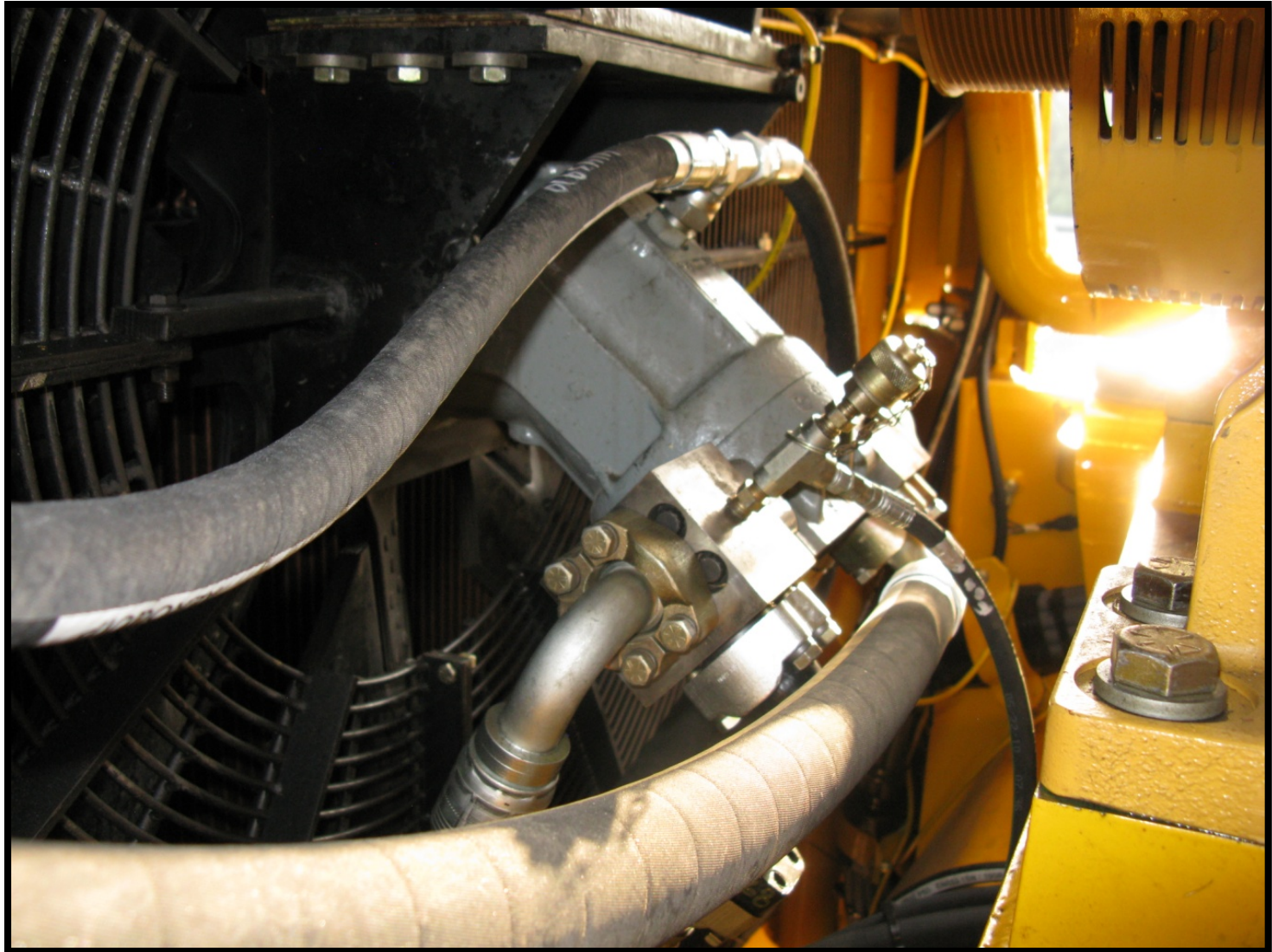
AUXILIARY STEERING (VANE PUMP) L-950 & L-1150



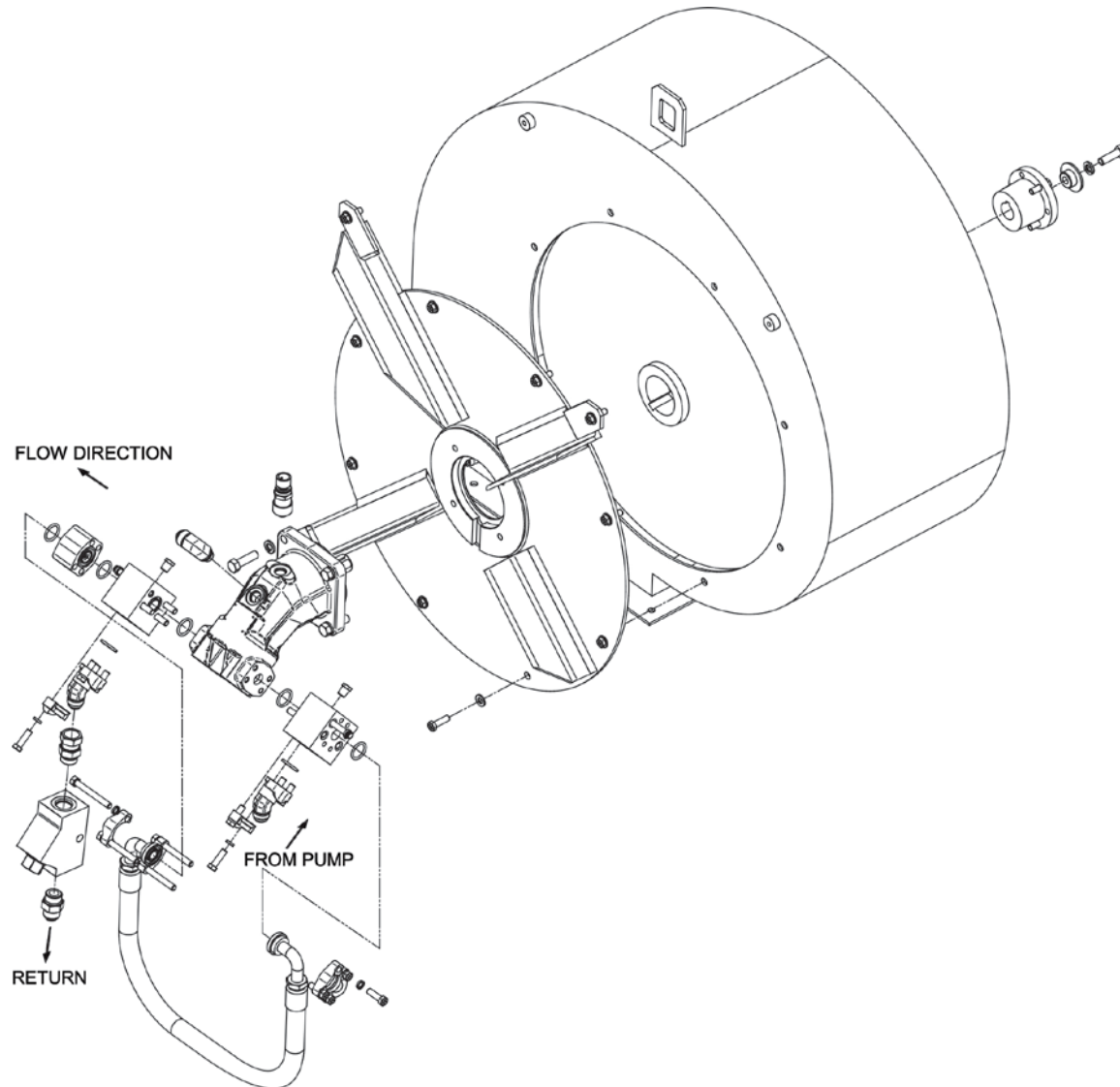
AUXILIARY STEERING



ENGINE FAN MOTOR

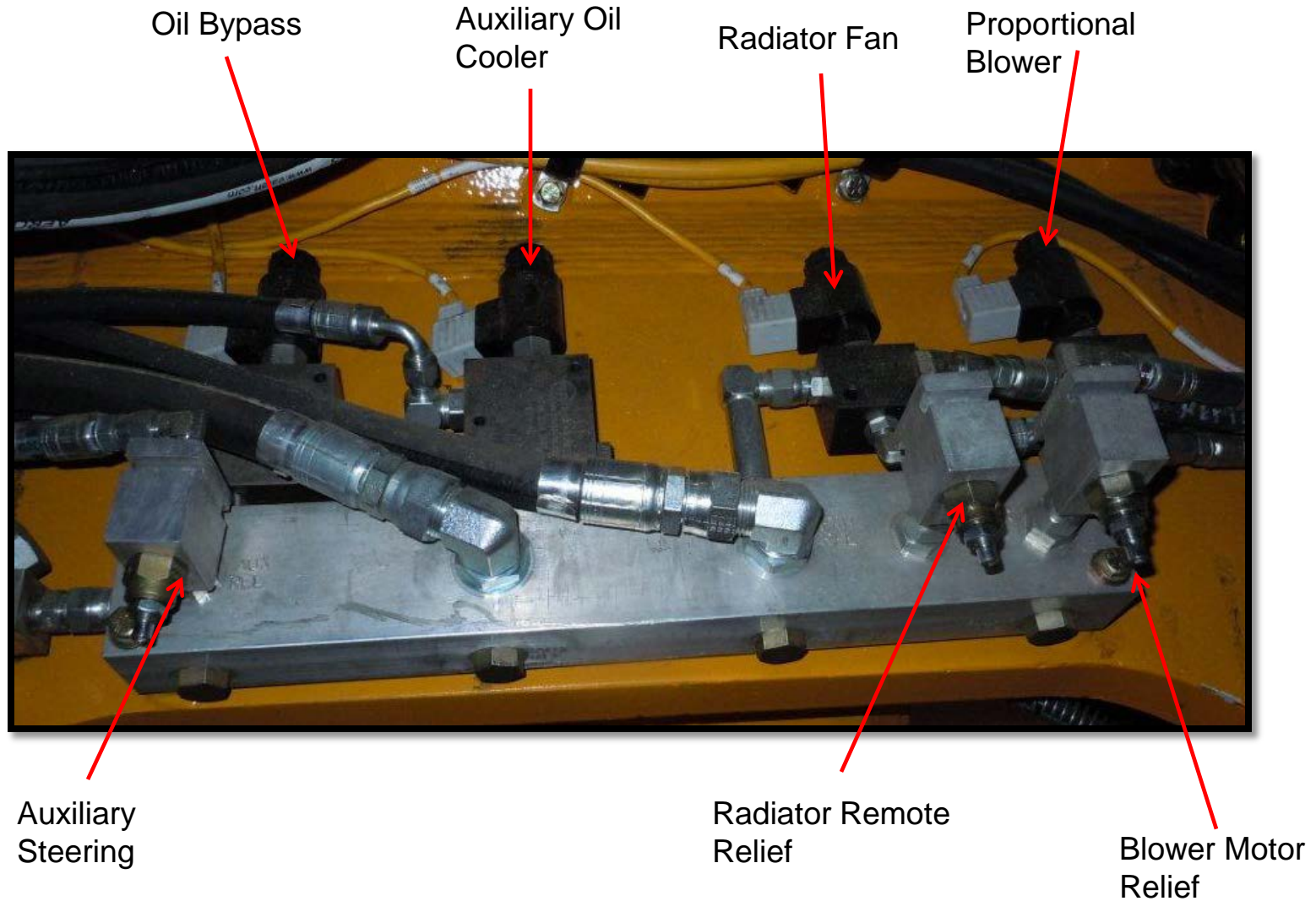


BLOWER MOTOR



1. Oil Reservoir for Load Adapter
2. Supply Inlet
3. 100 PSI Check Valve
4. To Tank

BLOWER/FAN REMOTE RELIEF

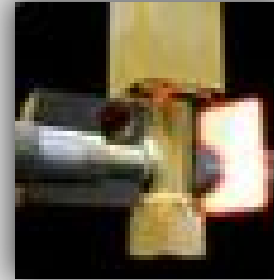




AUTO LUBE

CLICK HERE

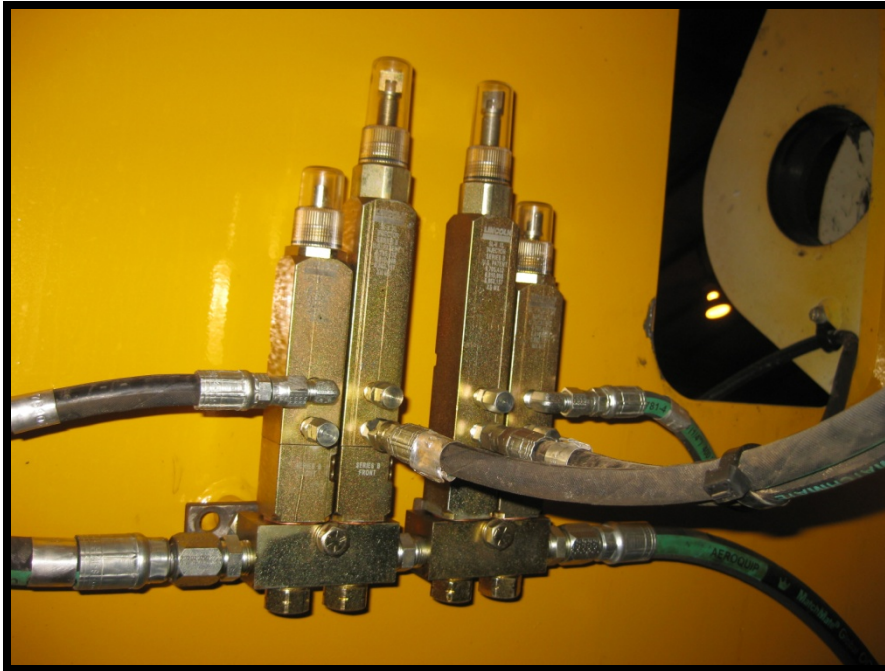
Cutaway Animation –
View the internal features of
the SL-V injector



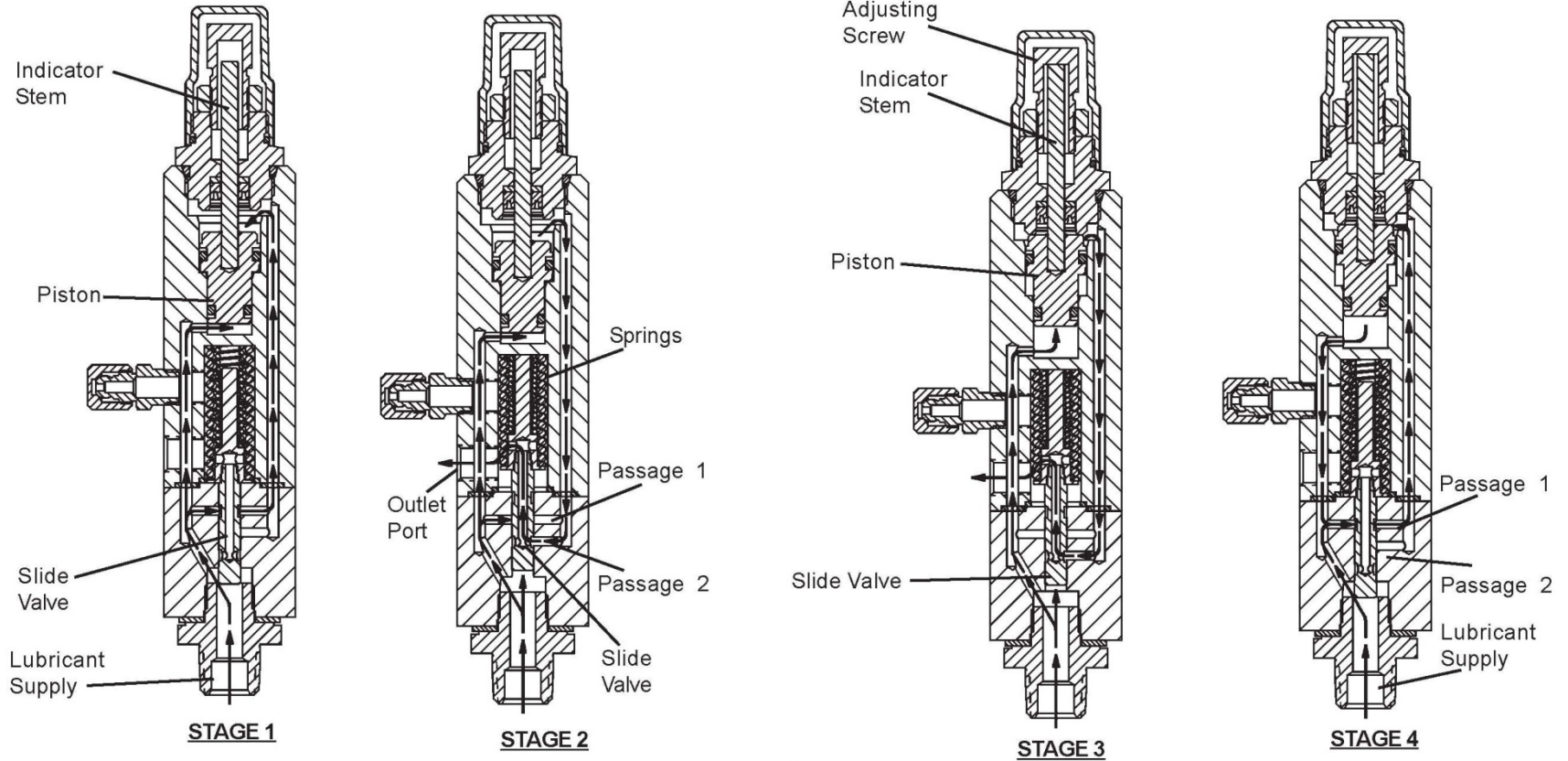
CLICK HERE

Vent Speed Demonstration –
View a demonstration of the
superior venting capability
of the SL-V

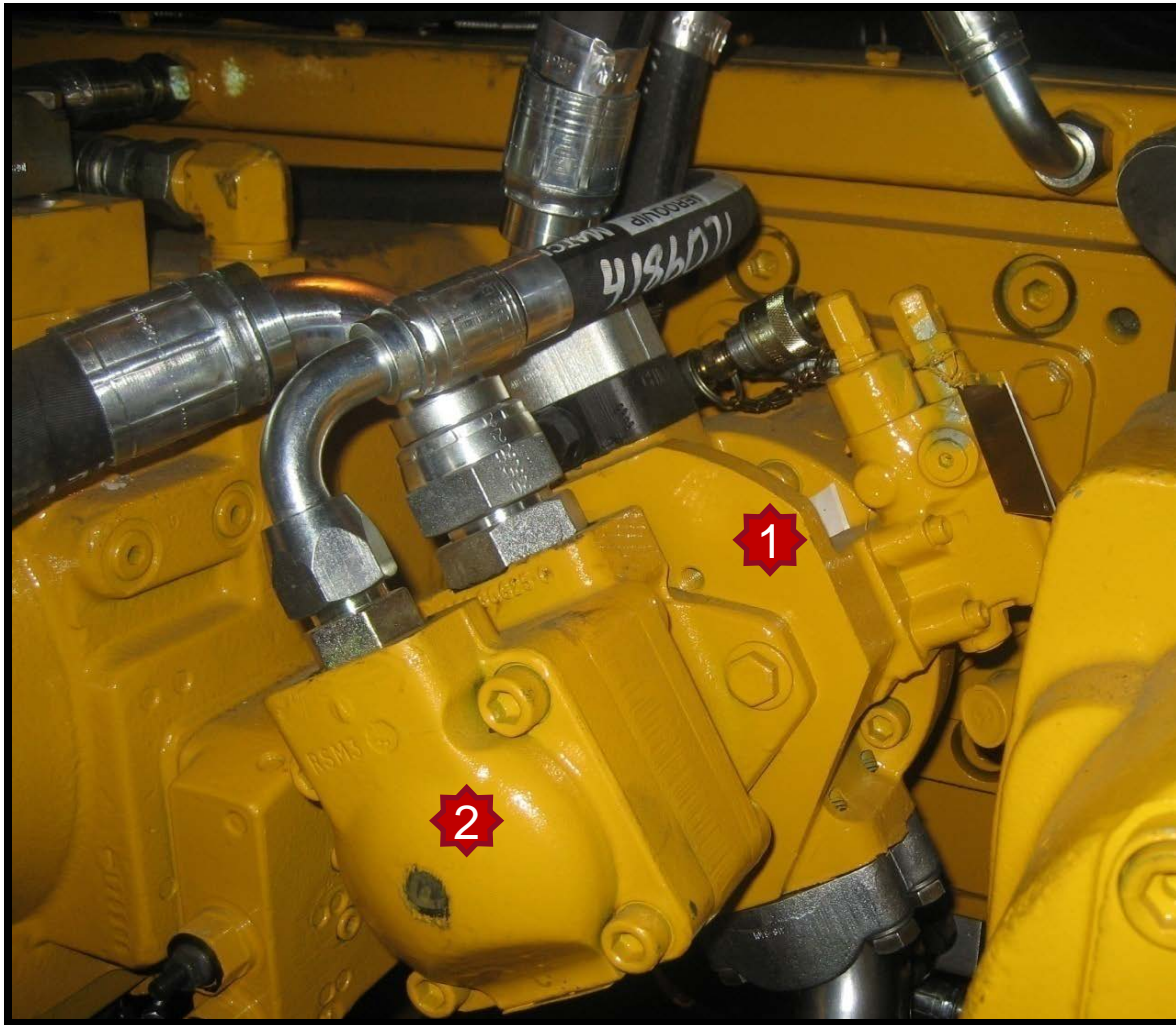
AUTO LUBE



AUTO LUBE

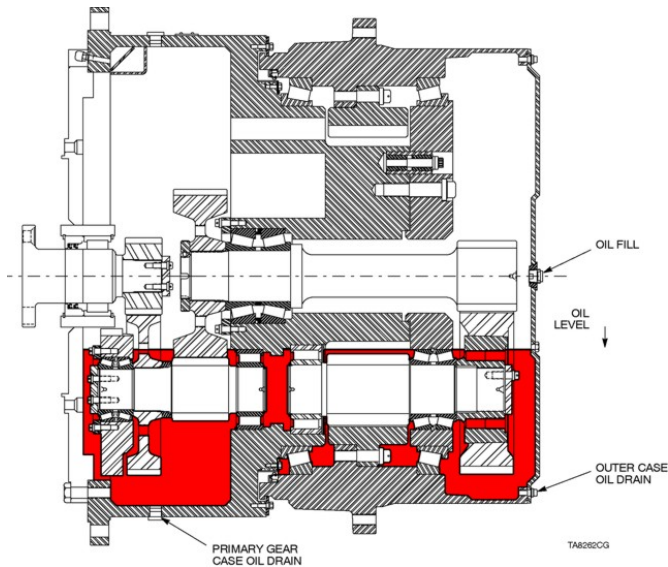
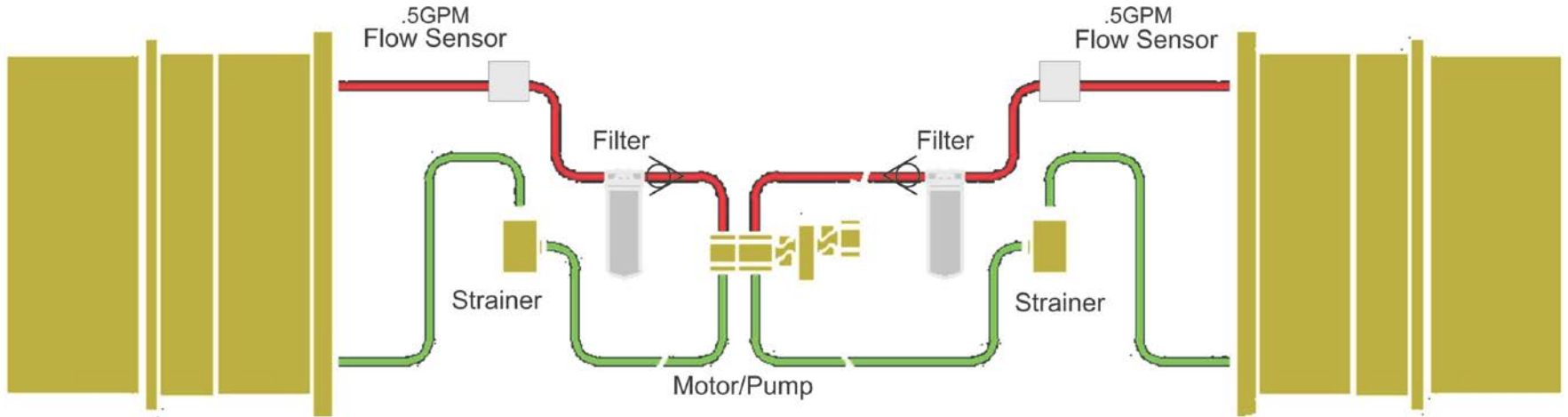


ACCESSORY/GEARBOX LUBE PUMP



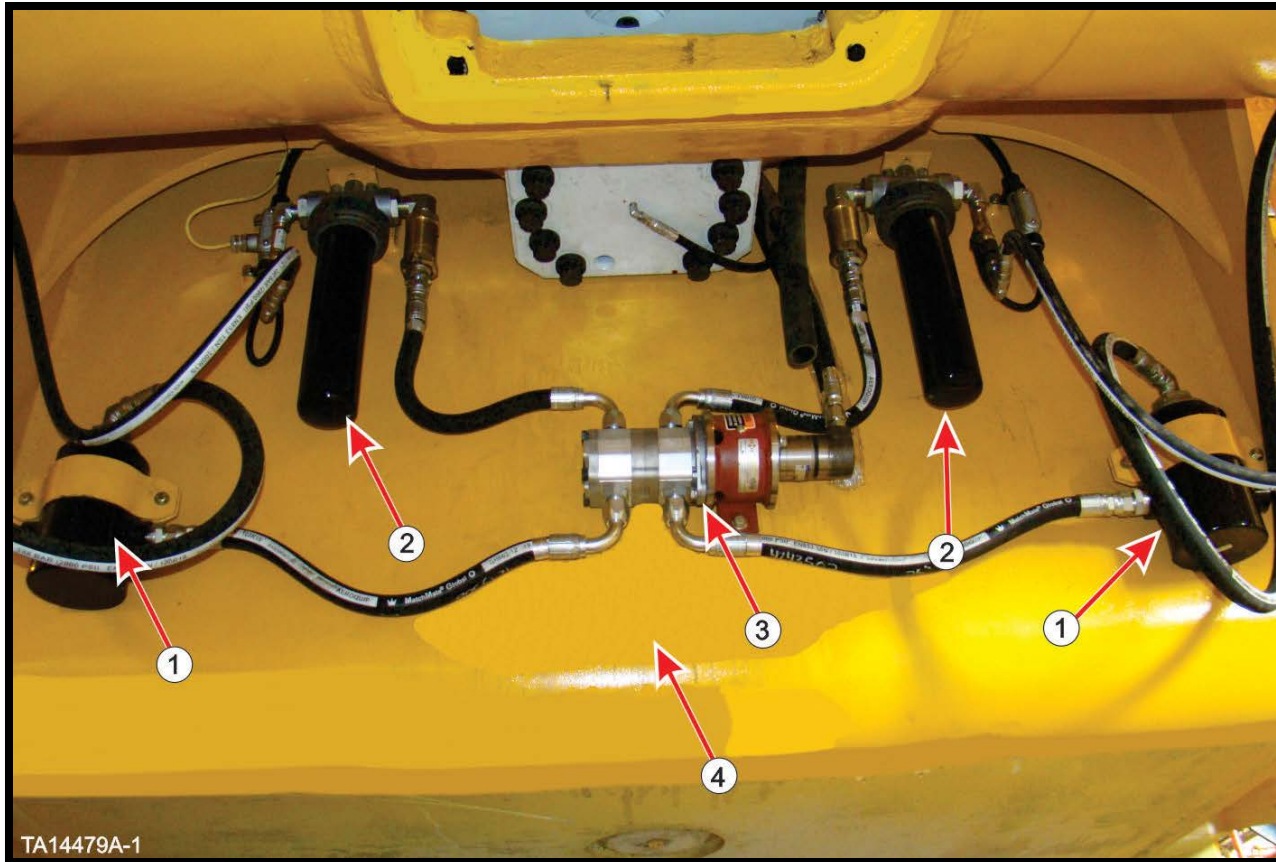
1. Accessory Pump
2. Gearbox Lube Pump

DRIVER FILTRATION



- ❑ 57" Driver
- ❑ 25 gallons each
- ❑ Continuous Filtration
- ❑ Filtered at 10 micron absolute

DRIVER FILTRATION



1. Strainer
(x4, 1 ea driver)
2. Cannister Filter
(x4, 1 ea driver)
3. Pump/Motor
(x2, 1 ea front/rear)
4. Rear Frame
(picture reference only)

DRIVER FILTRATION

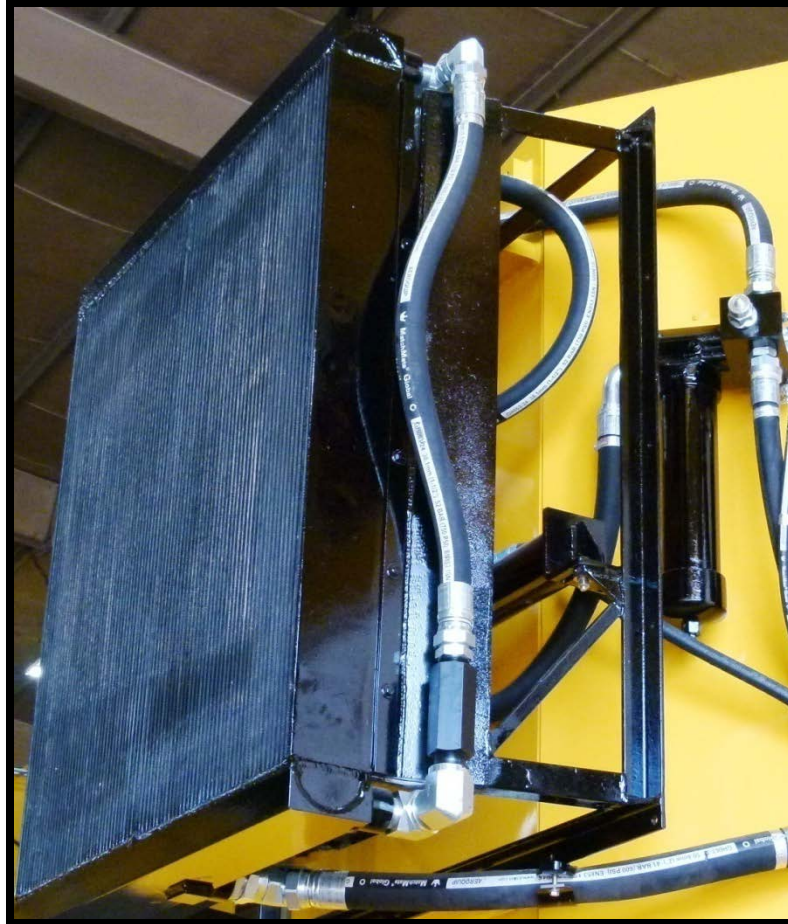
Properties of lubricant must comply with the following table:

Property	Value	
	ISO 220 Grade	ISO 460 Grade
Kinematic Viscosity at 40°C (cSt)	198-242	414-506
Kinematic Viscosity at 100°C, minimum (cSt)	25	45
Viscosity Index, minimum	150	
Pour point, maximum ¹	-36°C	
4-Ball EP Test (ASTM D2783): Weld load (kg) ²	250	
Timken OK Load (lb) ²	60	
FZG Gear Scuffing (ISO 14635-1) Pass Stage	12 or greater	
Copper Corrosion (ASTM D130 – 3 hrs@100°C)	1B	
Foaming (ASTM D892, Sequence I, II, III) maximum values (ml/ml)	5/0, 10/0, 5/0	
Rust protection (ASTM D665 – Method B)	Pass	

¹ Lubricant with higher pour point may be used, provided the pour point is 5°C lower than the minimum ambient temperature.

² Oil manufacturer may report either 4-Ball EP test or Timken OK load. However, if both results are reported, fluid must meet requirements of both tests.

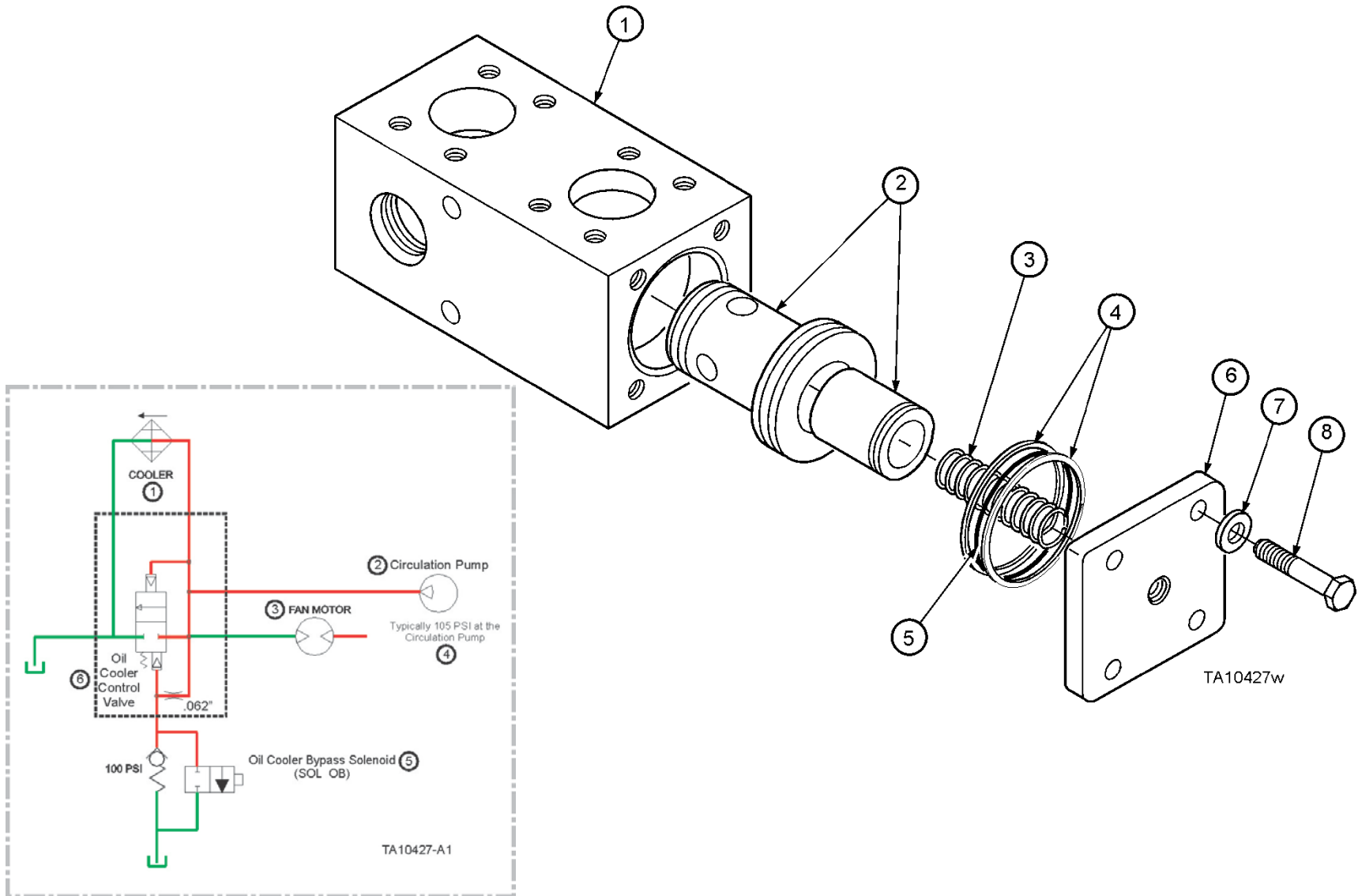
AUXILIARY OIL COOLER (L-1350, L-1850 & L-2350)



AUXILIARY OIL COOLER (L-950 & L-1150)



OIL COOLER CONTROL VALVE



CYLINDERS



CIRCUIT DESCRIPTIONS

HYDRAULIC GRAPHIC SYMBOLS

TYPICAL HYDRAULIC GRAPHIC SYMBOLS

LINES AND LINE FUNCTIONS			
LINE, WORKING		MOTOR, VARIABLE DISPLACEMENT, REVERSIBLE	
LINE, PILOT		CYLINDER - SINGLE ACTING	
LINE, DRAIN		CYLINDER - DOUBLE ACTING DIFFERENTIAL	
CONNECTOR		NON-DIFFERENTIAL	
LINE, FLEXIBLE		VALVES	
LINES JOINING		CHECK	
LINES PASSING		ON-OFF (MANUAL SHUT-OFF)	
DIRECTION OF FLOW		PRESSURE RELIEF	
LINE TO RESERVOIR ABOVE FLUID LEVEL		PRESSURE REDUCING	
LINE TO RESERVOIR BELOW FLUID LEVEL		FLOW CONTROL ADJUSTABLE NON-COMPENSATED	
LINE TO VENTED MANIFOLD		FLOW CONTROL ADJUSTABLE (PRESSURE COMPENSATED)	
PLUG OR PLUGGED CONNECTION		PUMPS	
RESTRICTION, FIXED		SINGLE, FIXED DISPLACEMENT	
RESTRICTION, VARIABLE		SINGLE, VARIABLE DISPLACEMENT	
ACTUATORS		TWO POSITION TWO CONNECTION	
MOTOR, FIXED DISPLACEMENT REVERSIBLE		TWO POSITION THREE CONNECTION	
MOTOR, FIXED DISPLACEMENT NON-REVERSIBLE		TWO POSITION FOUR CONNECTION	
		THREE POSITION FOUR CONNECTION	
		TWO POSITION IN TRANSITION	

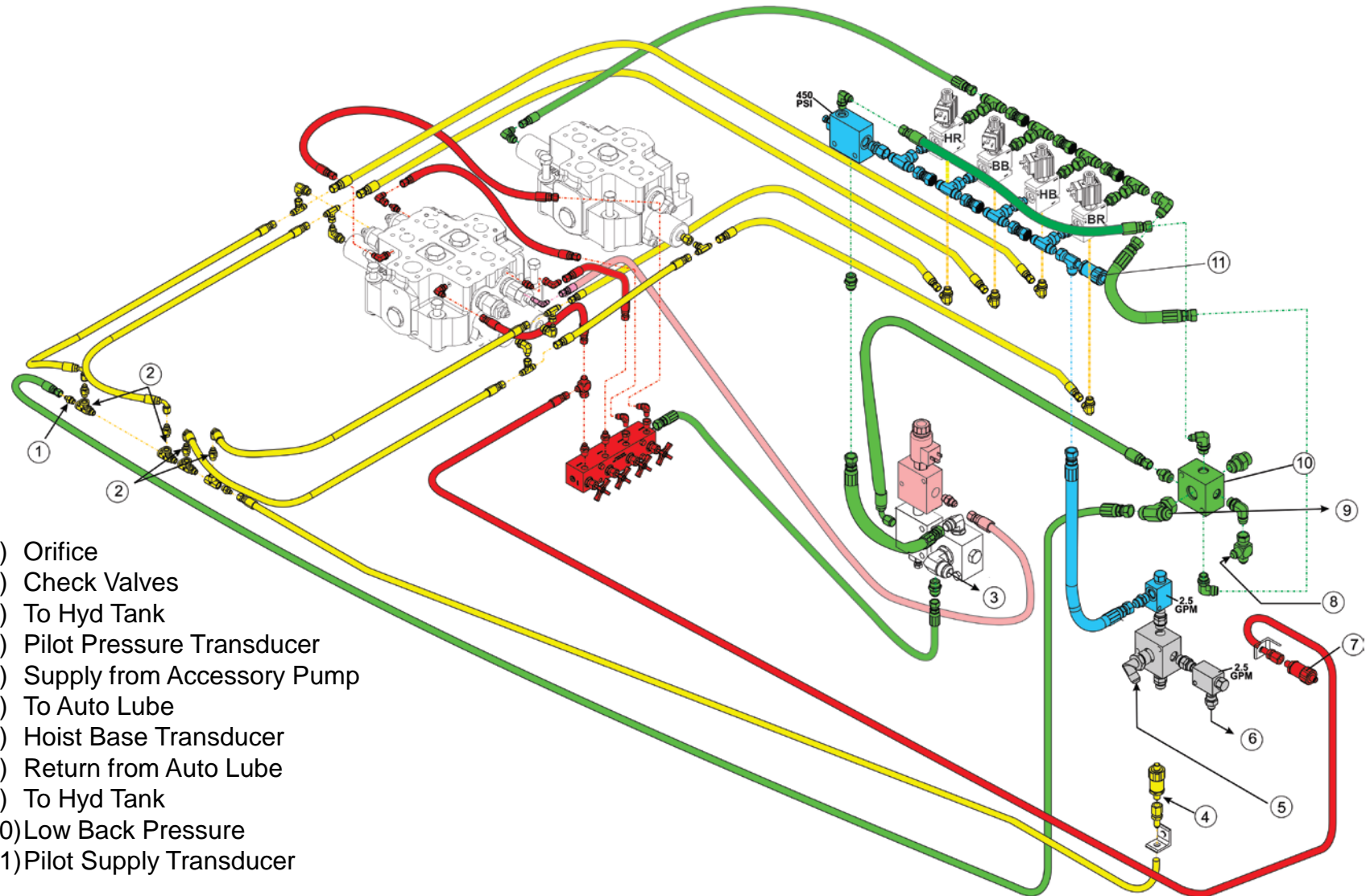
TA11088

Typical Hydraulic Graphic Symbols cont'd.

VALVES		ELECTRICAL SYMBOLS	
VALVES CAPABLE OF INFINITE POSITIONING (HORIZONTAL BARS INDICATE INFINITE POSITIONING ABILITY)		LIMIT SWITCH (LS)	
METHODS OF OPERATION		TOGGLE SWITCH (TGS)	
SPRING		TEMPERATURE SWITCH (TAS)	
MANUAL		CONTROL RELAY (CR)	
PUSH BUTTON		MISCELLANEOUS	
PUSH-PULL LEVER		ROTATING SHAFT	
PEDAL OR TREADLE		ENCLOSURE	
MECHANICAL		RESERVOIR VENTED	
DETENT		RESERVOIR PRESSURIZED	
PRESSURE COMPENSATED		PRESSURE GAUGE	
SOLENOID, SINGLE WINDING		ELECTRIC MOTOR	
REVERSING MOTOR		ACCUMULATOR, SPRING LOADED	
PILOT PRESSURE		ACCUMULATOR, GAS CHARGED	
REMOTE SUPPLY		HEATER	
INTERNAL SUPPLY		COOLER	
		TEMPERATURE CONTROLLER	
		FILTER, STRAINER	

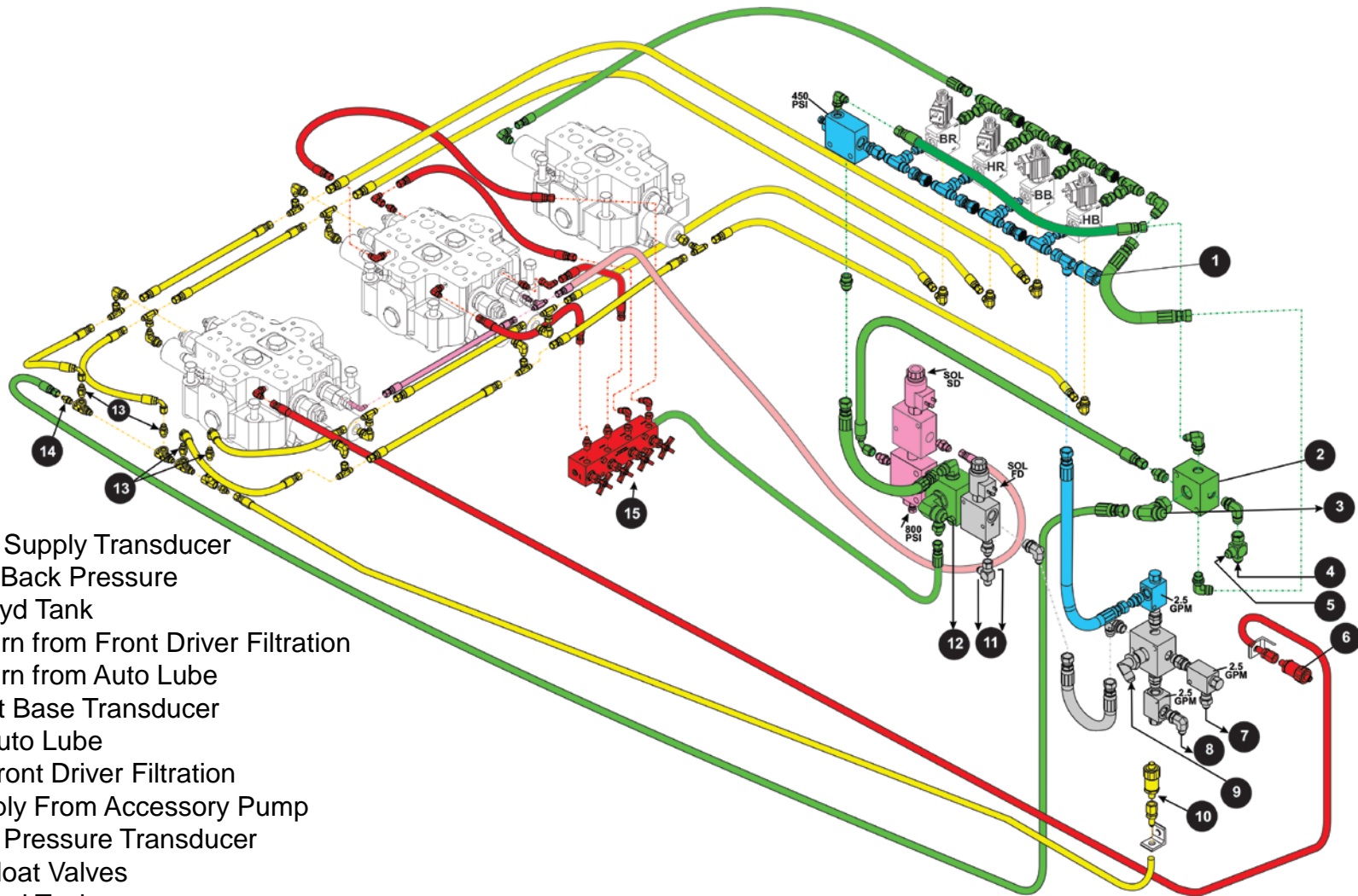
TA11089

CURRENT PILOT CIRCUIT (L-950 & L-1150)



- 1) Orifice
- 2) Check Valves
- 3) To Hyd Tank
- 4) Pilot Pressure Transducer
- 5) Supply from Accessory Pump
- 6) To Auto Lube
- 7) Hoist Base Transducer
- 8) Return from Auto Lube
- 9) To Hyd Tank
- 10) Low Back Pressure
- 11) Pilot Supply Transducer

CURRENT PILOT CIRCUIT (L-1350, L-1850, L-2350)



- 1) Pilot Supply Transducer
- 2) Low Back Pressure
- 3) To Hyd Tank
- 4) Return from Front Driver Filtration
- 5) Return from Auto Lube
- 6) Hoist Base Transducer
- 7) To Auto Lube
- 8) To Front Driver Filtration
- 9) Supply From Accessory Pump
- 10) Pilot Pressure Transducer
- 11) To Float Valves
- 12) To Hyd Tank
- 13) Check Valve
- 14) Orifice

HYDRAULIC FUNCTIONS



L-1150



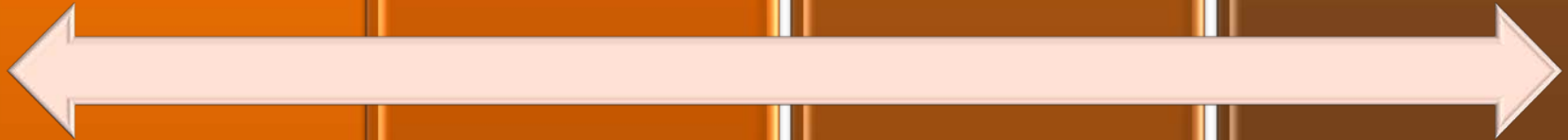
L-1350



L-1850



L-2350



HYDRAULIC SCHEMATICS



L-1150



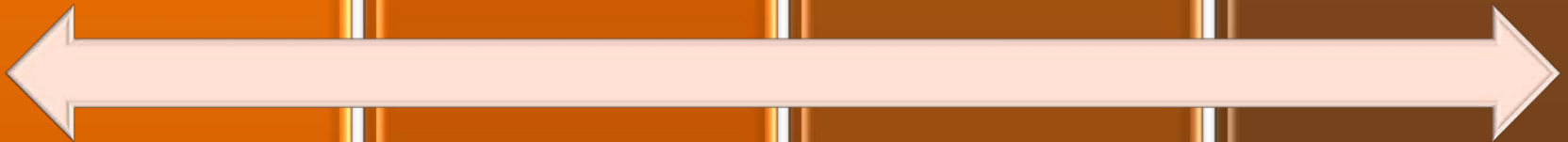
L-1350



L-1850



L-2350



SETTINGS AND ADJUSTMENTS

SETTINGS AND ADJUSTMENTS

50 Series Setting and Adjustment Specifications

TROUBLESHOOTING

REMOVAL AND INSTALLATION