

Danfoss
Dual Self-Level Valve

No. 11-511
July 2023

Model 39055-FAZ
Dual Self-Level Valve



Danfoss

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Danfoss 20 GPM Dual Self-Level Valve



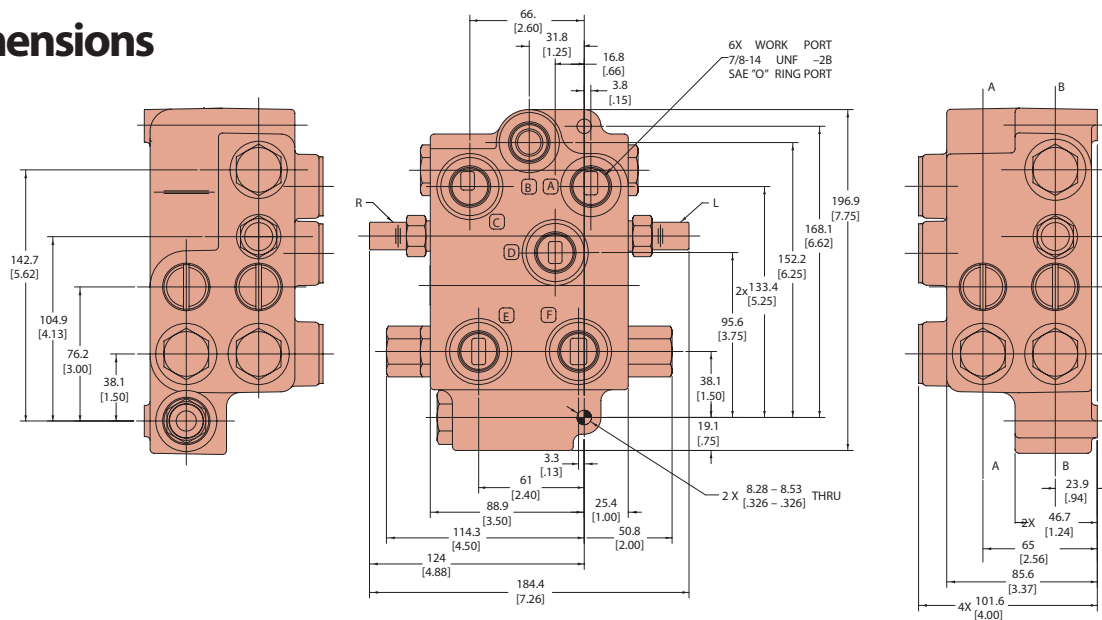
Standard Features

- Cast Iron Body
- Cored Internal Passages
- Spools are precision Ground and Induction Hardened
- Connects Into Open Center, Closed Center and Load Sensing Systems
- Can be used with Parallel or Series Circuit Valves
- Externally Adjustable Flow Division

Specifications

Assembly Order Number	39055-FAZ
Circuit Design:	Dual Self-Level Valve
Inlet Flow Rate:	76 l/min. [20 GPM]
Rated Pressure:	240 bar [3500 PSI]
Maximum Pressure:	275 bar [4000 PSI]
Port Functions:	A Port: Boom Cylinder Head End - Boom Raise B Port: Control Valve - Boom Raise C Port: Boom Cylinder Rod End - Boom Lower D Port: Control Valve - Boom Lower E Port: Bucket Cylinder Head End/Control Valve - Bucket Dump F Port: Bucket Cylinder Rod End/Control Valve - Bucket Curl
Flow Divider Settings:	Raise - Port E = 60% Port D = 40% Lower - Port F = 30% Port B = 70%
Pressure Drop:	Port C to D -14 bar [200 psi] at 30 l/min [8 gal/min] with adjustment orifice "R" closed Port A to B -14 bar [200 psi] at 57 l/min [15 gal/min] with adjustment orifice "L" closed
Relief Valve Setting:	Port C Setting = 52 bar [750 psi] maximum at 38 l/min [10 gal/min] Port A Setting = none (plugged)

Dimensions



Dual Self-Level Valve

Key Features:

- ✓ Increases operator productivity
- ✓ Repeatable automatic self-leveling in both directions—raise and lower
- ✓ Compact package
- ✓ Fewer hydraulic connections than other methods of dual self-level control
- ✓ Low internal leakage
- ✓ In-line design for flexibility and aftermarket add-on applications
- ✓ Specifically designed for skid steer loaders, agricultural tractor loaders and small wheel loaders
- ✓ Exceptional value

Applications:

- ✓ Skid Steer Loaders
- ✓ Agricultural Tractor Loaders
- ✓ Small Wheel Loaders

Production Options:

- ✓ Flow divider setting for application customization
- ✓ Relief valve setting
- ✓ Solenoid bypass valving

Dual Self-Level Valve Operation

The Dual Self-Level valve is designed to be used in open center, closed center and load sensing systems. In addition, it may be used with parallel or series circuit valves.

When connected to a parallel circuit valve, the system is capable of self-leveling or operating boom and bucket individually. When the self-level valve is installed in a system that used a series circuit valve, the boom spool must be upstream from the bucket spool for the leveling valve to function properly.

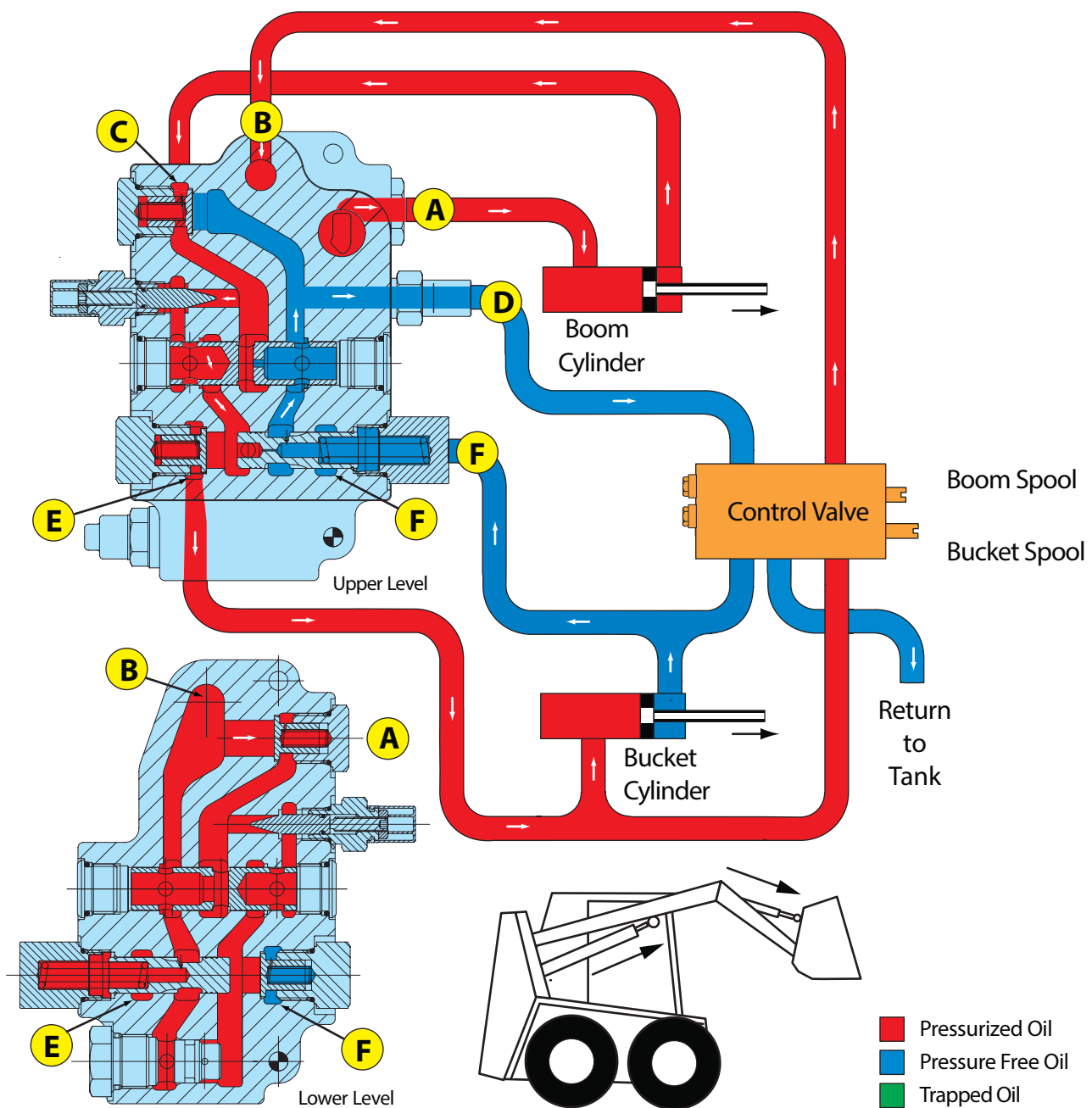
Loader control valve metering and timing are important in maintaining good boom and bucket control in both conventional and self-leveling systems. Cavitation of the boom cylinder is possible, in the boom lower mode, if “inlet to workport” metering lags behind “workport to return” metering. If this is allowed, the bucket will hesitate during its next cycle while the rod end of the boom cylinder fills with oil.

Danfoss produces control valves with precise metering that enhances the dual self-level valve operation. In addition, Danfoss offers boom/bucket design assistance to optimize attachment leveling using Danfoss valves. Let us assist you in solving your application problem.

Dual Self-Level Valve

Self-Leveling Raise

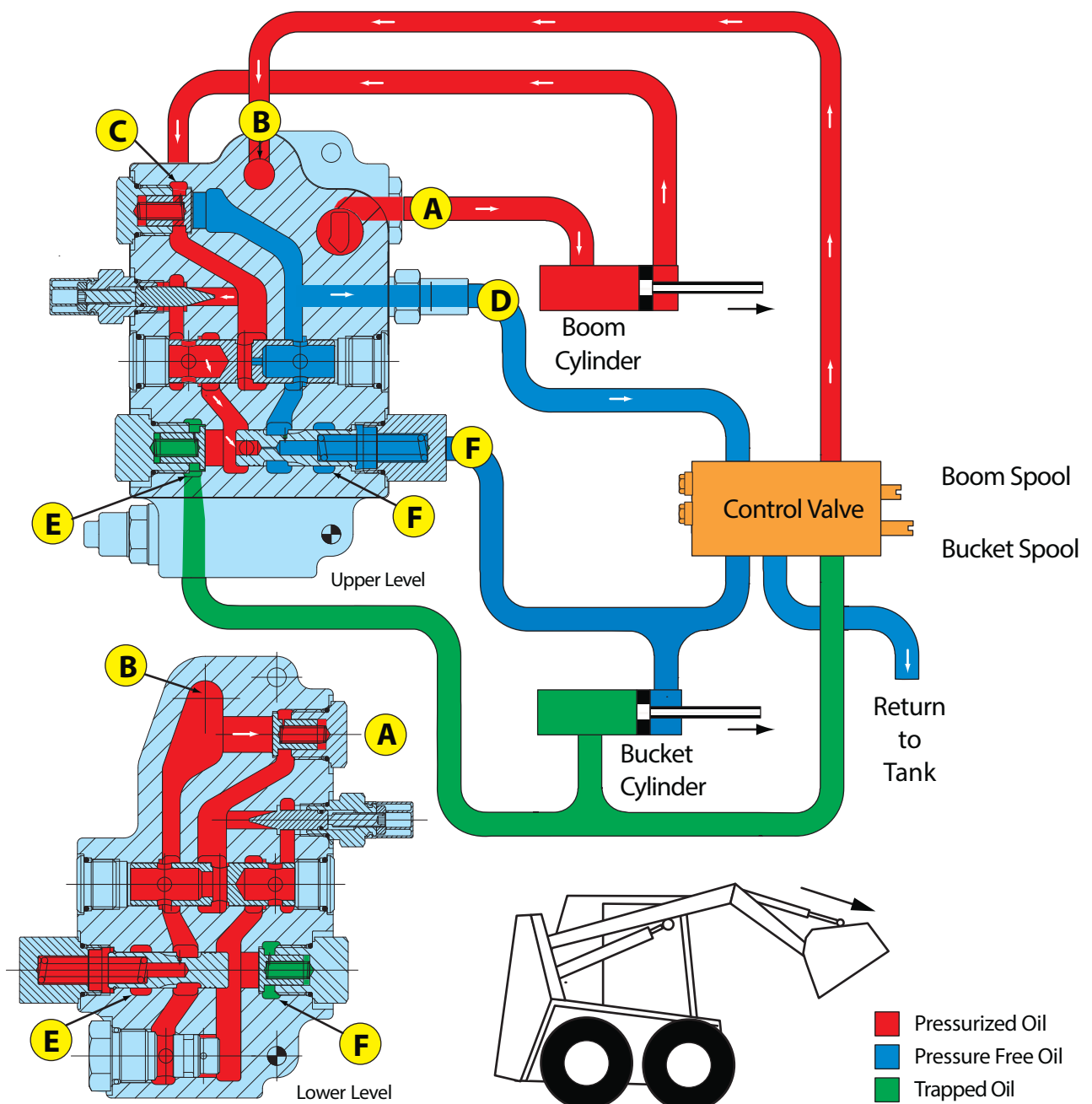
With the bucket spool in “neutral” and the boom spool in the raise position, flow from the control valve enters B port of the dual level valve and out A port of the dual level valve to the head port of the boom cylinder. As the boom cylinder extends, flow from the rod port is directed to port “C” of the dual level valve. Flow entering port “C” is able to pass through the adjustable orifice in the flow divider spool. The proportion of the flow split is determined by the size of the adjustable orifice. Part of the flow is directed out E port to the head port of the bucket cylinder. The remaining flow passes through “D” port back to the control valve to tank. The bucket cylinder will extend when pressure at port E shifts the unload spool to allow flow from the rod end of the bucket cylinder to flow into port F, across the unload spool and out D port to tank.



Dual Self-Level Valve

Raise with Bucket Cylinder Extended

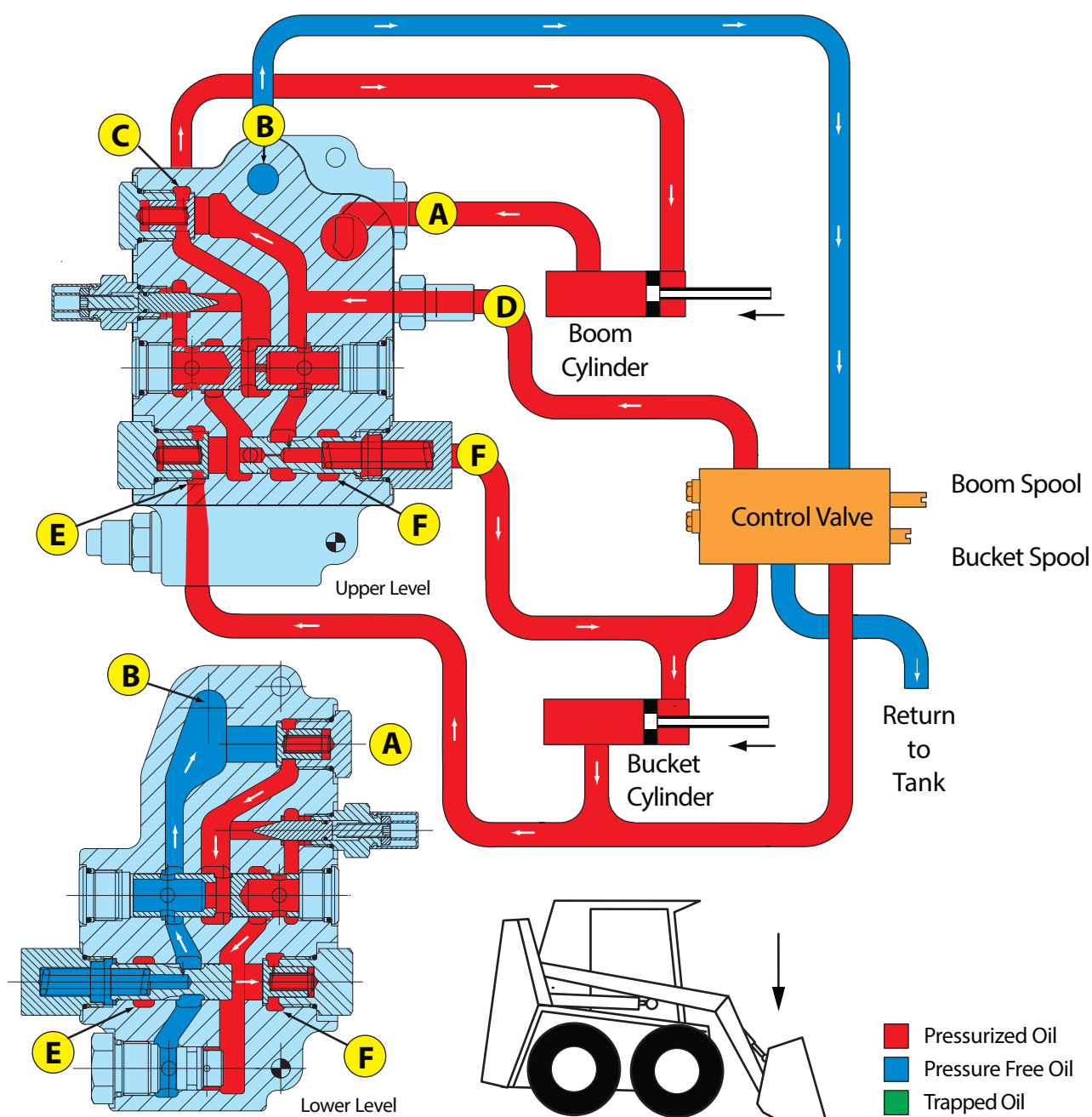
This flow chart shows that the boom will continue to raise when the bucket cylinder is fully extended. Oil exiting the boom cylinder that normally flows out port E to the bucket cylinder is allowed to flow through the unload spool integral relief, out D port to tank. The relief valve opens at relatively low pressure with little effect on boom lift capacity. The same relief feature allows the operator to dump the bucket while raising the boom without stalling the boom cylinder.



Dual Self-Level Valve

Self-Leveling Boom Lowering

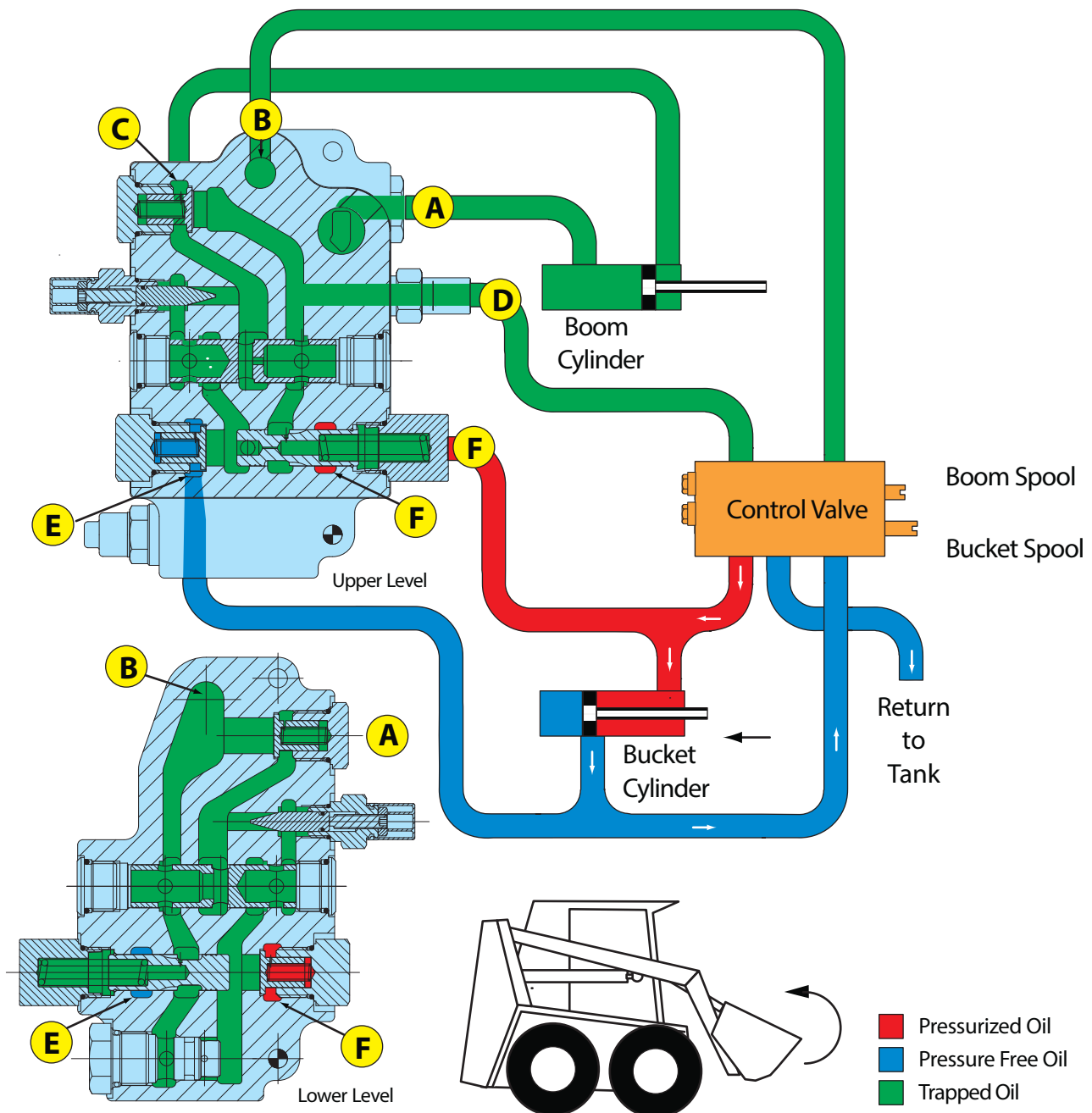
With the bucket spool in “neutral” and the boom spool in the lower position, flow from the control valve enters D port of the dual level valve and out C port of the dual level valve to the rod end port of the boom cylinder. As the boom cylinder retracts, flow from the head port is directed to port “A” of the dual level valve. Flow entering port “A” is able to pass through the adjustable orifice in the flow divider spool. The proportion of the flow split is determined by the size of the adjustable orifice. Part of the flow is directed out F port to the rod end port of the bucket cylinder. The remaining flow passes through “B” port back to the control valve to tank. The bucket cylinder will retract when pressure at port F shifts the unload spool to allow flow from the head end of the bucket cylinder to flow into port E, across the unload spool and out B port to tank.



Dual Self-Level Valve

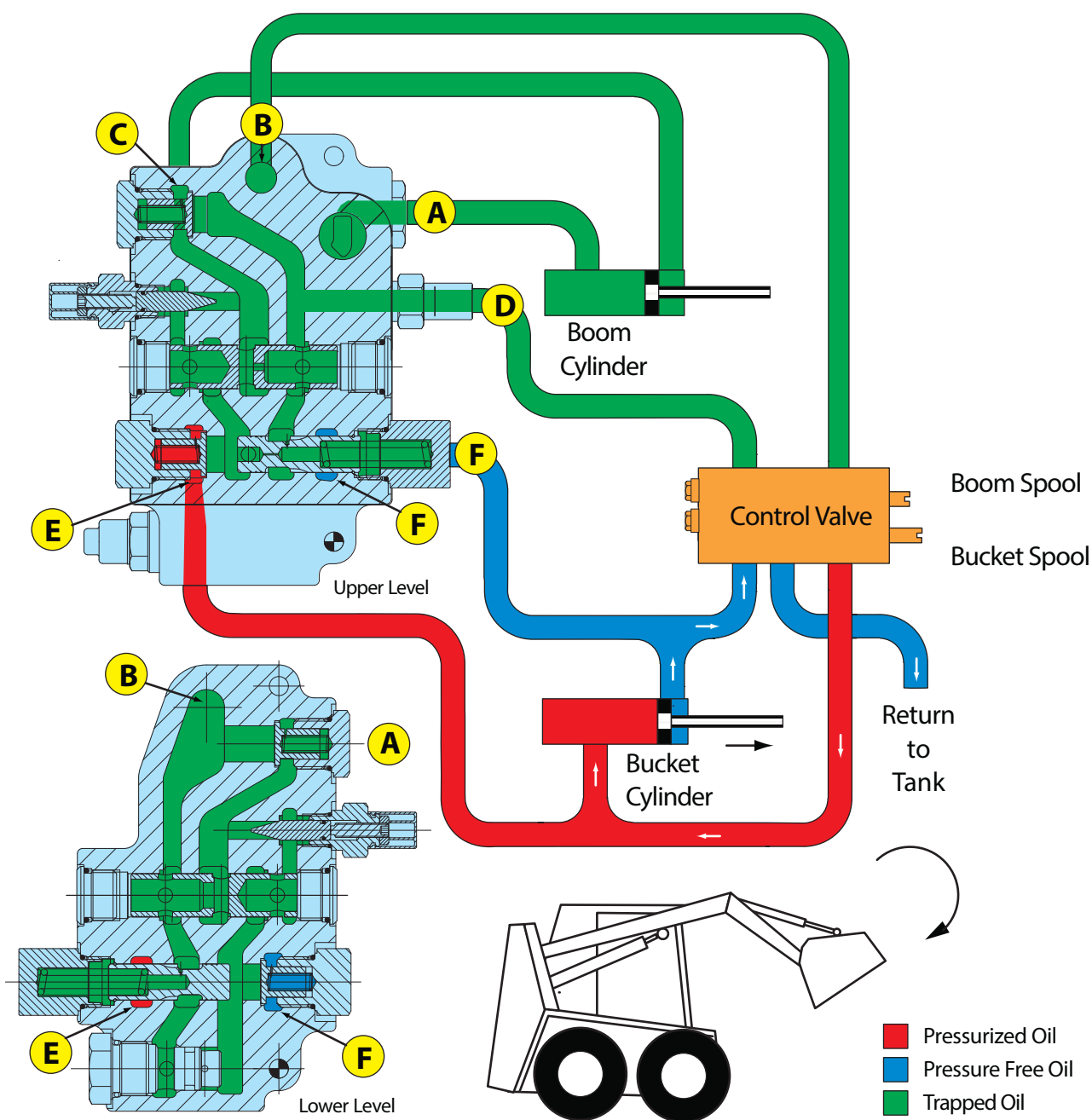
Bucket Cylinder Curl Only

With the bucket spool shifted to the curl position, oil flow is directed to the rod port of the bucket cylinder and into port F of the level valve where flow is blocked by an unload spool and check valve. Exhaust oil from the head end of the bucket cylinder is directed back to tank through the control valve while flow into port E is blocked by an unload spool and check valve.



Bucket Cylinder Dump Only

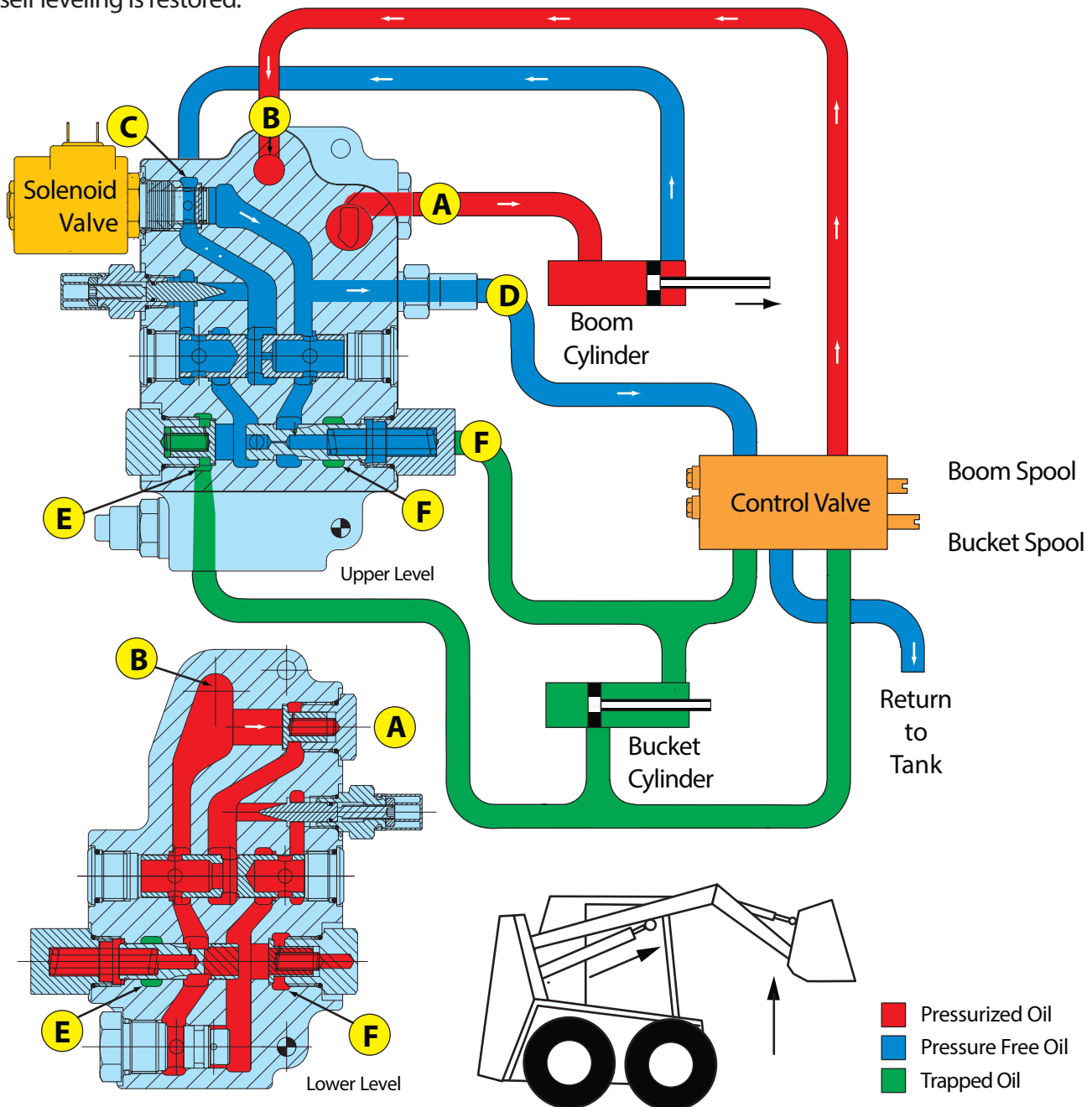
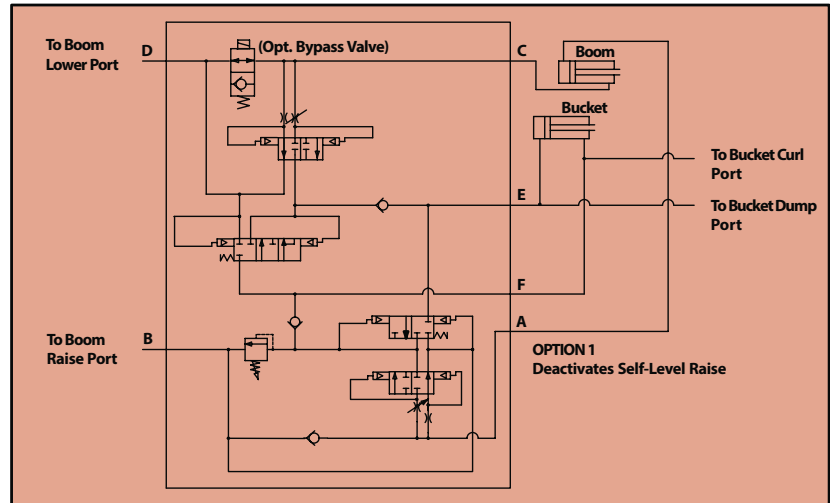
With the bucket spool shifted to the dump, oil flow is directed to the head port of the bucket cylinder and into port E of the level valve where flow is blocked by an unload spool and check valve. Exhaust oil from the rod end of the bucket cylinder is directed back to tank through the control valve while flow into port F is blocked by an unload spool and check valve.



Dual Self-Level Valve

Raise Boom with Self-Level Deactivated

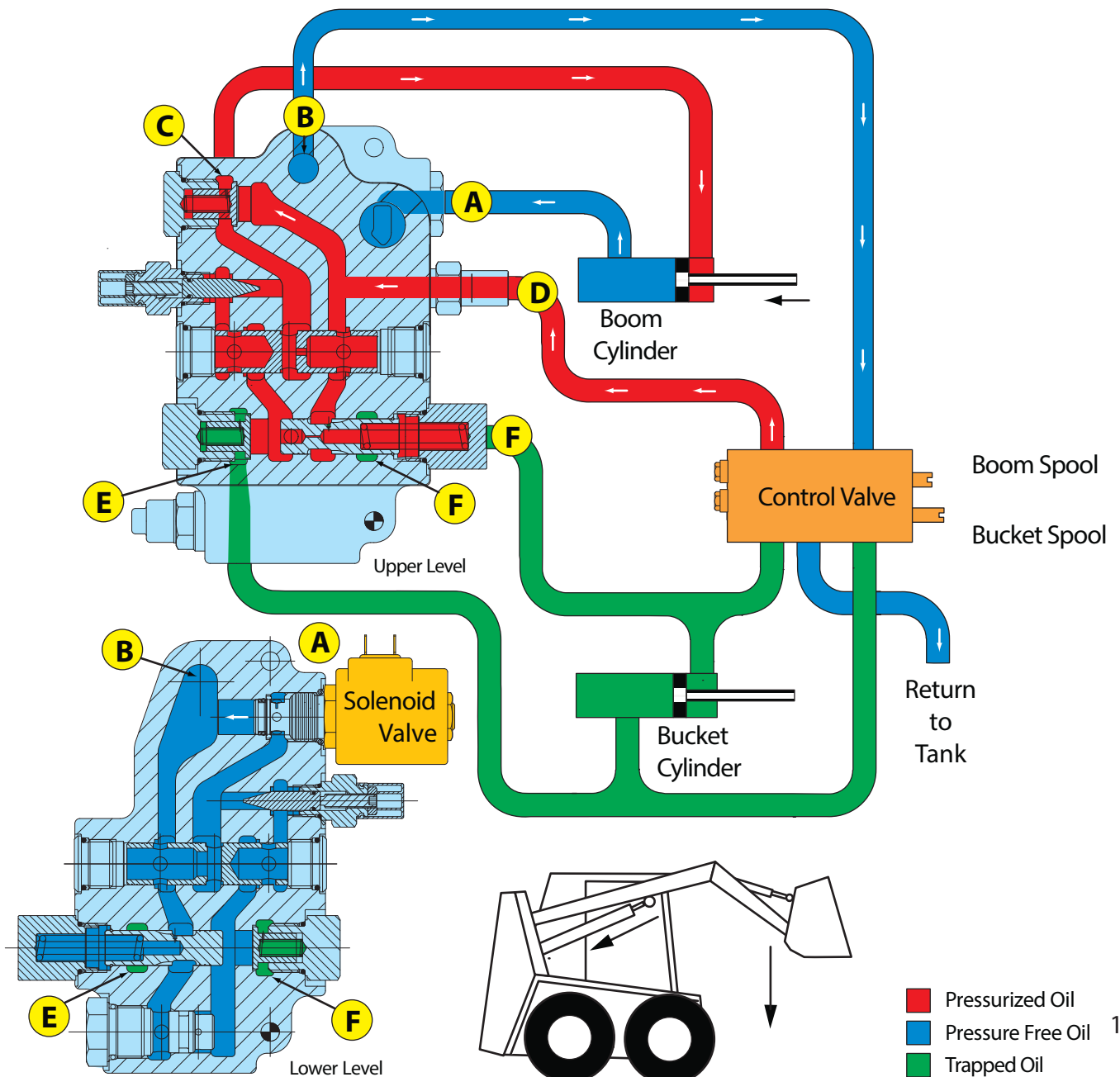
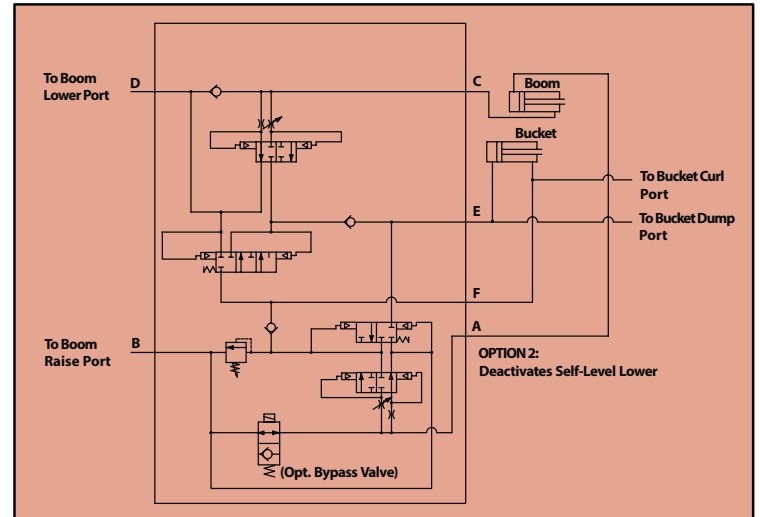
With the solenoid bypass valve plumbed into the position shown, the operator has the option of deactivating the self level raise function. With the solenoid valve energized exhaust oil from the rod end of the boom cylinder enters port C of the level valve, passes through the solenoid valve and flows to tank out port D. The bucket cylinder will not move during this operation. If the solenoid valve is not energized then self leveling is restored.



Dual Self-Level Valve

Lower Boom with Self-Level Deactivated

With the solenoid bypass valve plumbed into the position shown, the operator has the option of deactivating the self level lower function. With the solenoid valve energized exhaust oil from the head end of the boom cylinder enters port A of the level valve, passes through the solenoid valve and flows to tank out port B. The bucket cylinder will not move during this operation. If the solenoid valve is not energized then self leveling is restored.



39055-FAZ Dual Self-Level Flow Divider Worksheet

Required Data:

Boom Cylinder Bore Diameter = G
 Boom Cylinder Rod Diameter = H
 Boom Cylinder Self-Level Stroke = J
 Bucket Cylinder Bore Diameter = K
 Bucket Cylinder Rod Diameter = L
 Bucket Cylinder Stroke
 (Level Raised–Level Lowered) = M
 Main Relief Valve Setting = N

Standard Bucket Geometry

Raise

$$\% \text{ Flow at "E" Port} = \frac{\text{Volume Bucket Cyl. (Head End)}}{\text{Volume Boom Cyl. (Rod End)}}$$

$$\% \text{ Flow at "E" Port} = \frac{(K^2)(M)}{(G^2-H^2)(J)}$$

Lower

$$\% \text{ Flow at "D" Port} = \frac{\text{Volume Bucket Cyl. (Rod End)}}{\text{Volume Boom Cyl. (Head End)}}$$

$$\% \text{ Flow at "F" Port} = \frac{(K^2 - L^2)(M)}{(G^2)(J)}$$

Lower - Relief Setting

$$\text{Port "A" Relief Valve Setting (optional)} = \left(\frac{G^2 - H^2}{G^2} \right) (N)$$

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