Eaton®
Inline Self-Level Valves

Catalog 11-503
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Model 39055
Self-Level Valve

Eaton 15 GPM Inline Self-Level Valve

(Cylinder Extending Only)

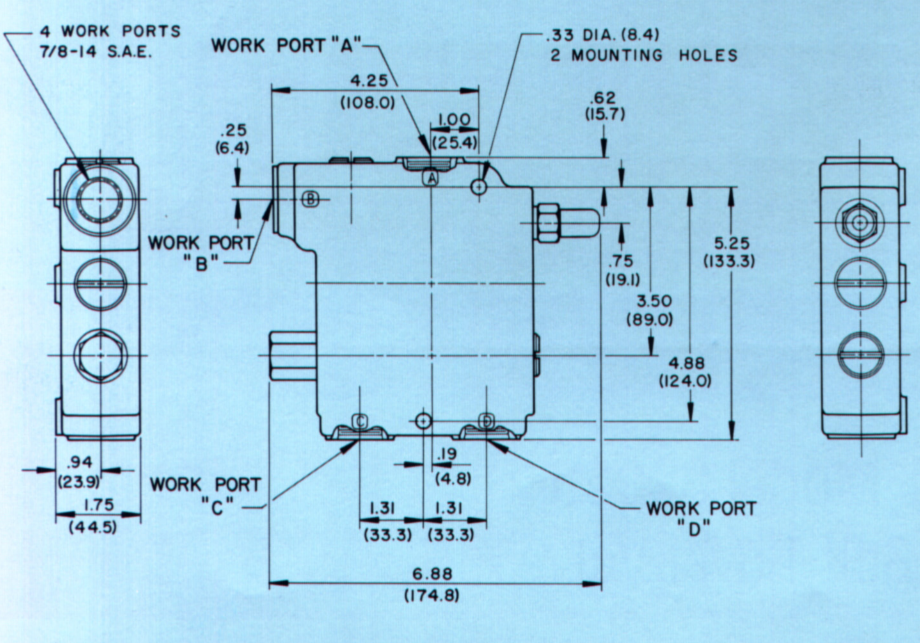
Standard Features

- 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

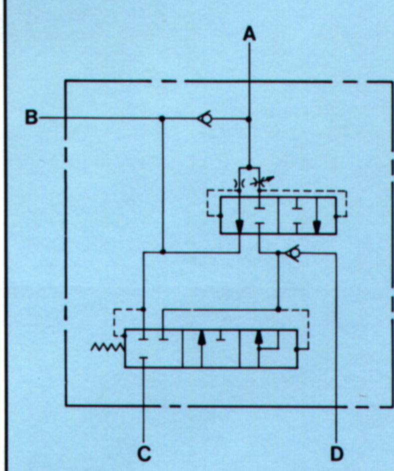
Specifications

Assembly Order Number	**39055-DAQ**
Circuit Design	**Inline Self-Level**
Inlet Flow Rate	**15 GPM [56.8 L/min.]**
Rated Pressure	**3000 PSI [207 bar]**
Maximum Pressure	**4000 PSI [276 bar]**
Standard Flow Divider Setting, Port D	**60%**
Standard Flow Divider Setting, Port B	**40%**
Flow Divider Setting, Port D	**Adjustable from 0% to 75%**
Flow Divider Setting, Port B	**Proportional from 25% to 100%**
Max. Pressure Drop From Port A to Port B With 6.5 GPM [24.6 L/min.] Inlet With Adjustable orifice Closed	**150 PSI [10 bar]**
Maximum System Temperature	**225° F. [107° C.]**

Dimensions



Symbol



Inline Self-Level Valve Operation

The Inline Self-Level Valve is designed to be used in open center, closed center and load sensing systems and may be used with parallel or series circuit valves.

When connected into an open center, closed center or load sensing system using 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 employs a series circuit valve, the boom spool must be upstream from the bucket spool for the self-level to function properly. If the boom spool is downstream from the bucket spool, the following will happen:

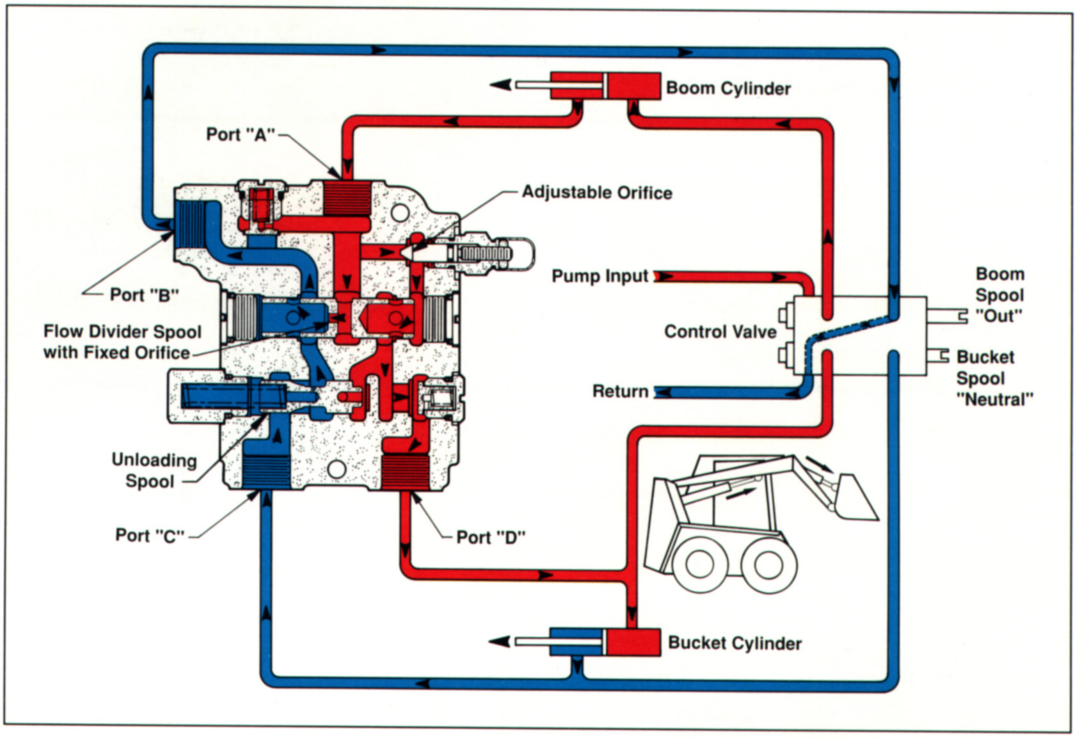
- While raising and leveling the boom and dumping or curling the bucket, both functions will stall.
- While lowering the boom, the bucket will function normally.
- Both the boom and bucket will function normally when operated individually.

Loader control valve metering and timing are important in maintaining good boom and bucket control in both conventional and self-leveling circuits. 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 to happen, the bucket will hesitate during the next raise cycle while the rod end of the boom cylinder fills with oil. This may be unacceptable to the operator.

The following color schematics and their accompanying explanations explain the operation of the Model 39055 Self-Level valve. Five different operating modes are described: Self-Leveling, Bucket Cylinder Extended, Retracting Boom Cylinder, Extending Bucket Cylinder, and Retracting Bucket Cylinder.

Self-Leveling

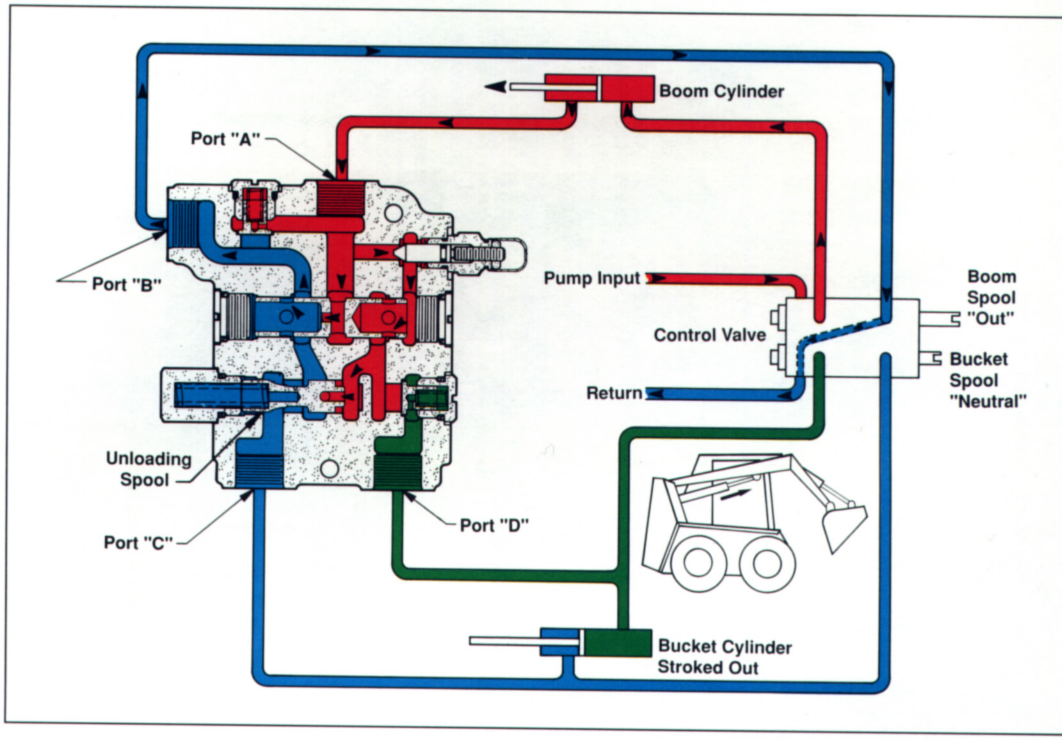
With the bucket spool in "Neutral" and the boom spool pulled "Out", flow from the control valve enters the head port of the boom cylinder. As the boom cylinder extends, flow from the rod port is directed to port "A" on the self-level valve. Flow entering port "A" is able to pass through the adjustable orifice and fixed orifice in the flow divider spool. The proportion of the flow split is determined by size of the adjustable orifice. The remainder of the flow passes through the fixed orifice, out port "B" back to the control valve and returns to tank. The flow that passes through the adjustable orifice flows out port "D" and is teed to the head port of the bucket cylinder. The resistance on the movement of the bucket cylinder creates a pressure high enough to open the unloading spool in the self-level valve. As the bucket cylinder extends the flow from the rod port of the bucket cylinder enters port "C" past the open unloading spool, around the flow divider spool and out port "B" back to the control valve and returns to tank. The purpose of the unloading spool is to prevent the bucket cylinder from dumping during the self-level cycle.



Pressurized Oil **Pressure Free Oil** **Trapped Oil**

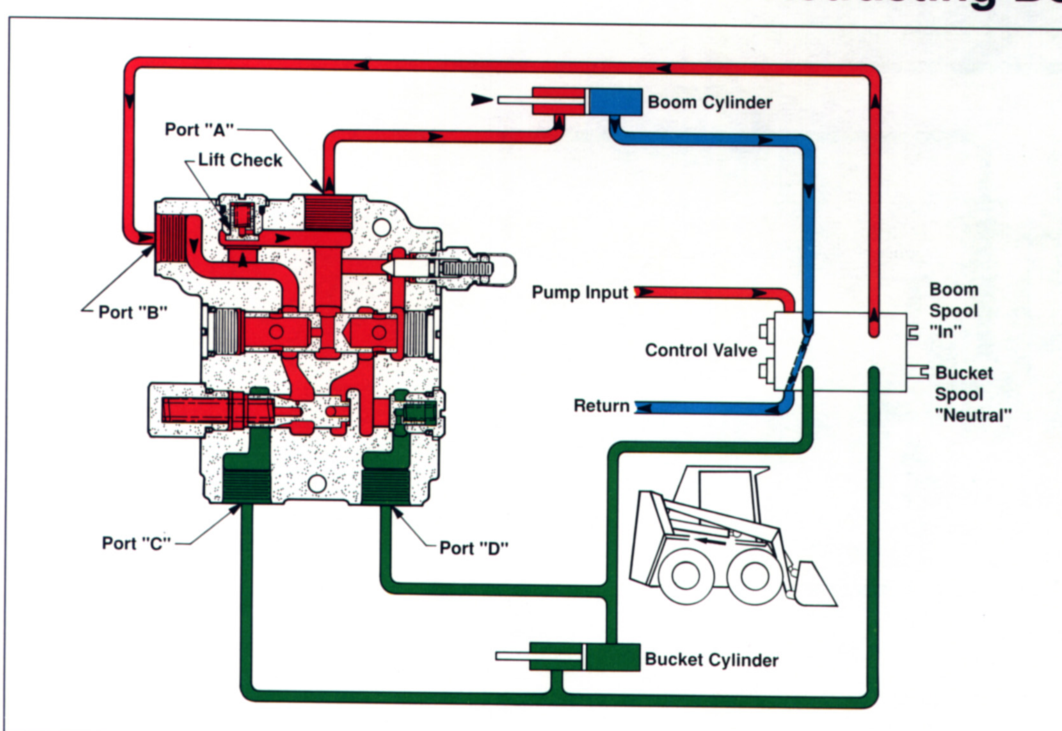
Bucket Cylinder Extended

In case the bucket cylinder strokes out first during the self-level cycle, or the operator moves the bucket spool to dump the bucket, the boom cylinder will continue to raise. The unloading spool will shift to the left and unload the flow going to the bucket cylinder head port. The oil flow goes back to tank, thus preventing the boom cylinder from stopping during the "Raise" function.



Retracting Boom Cylinder

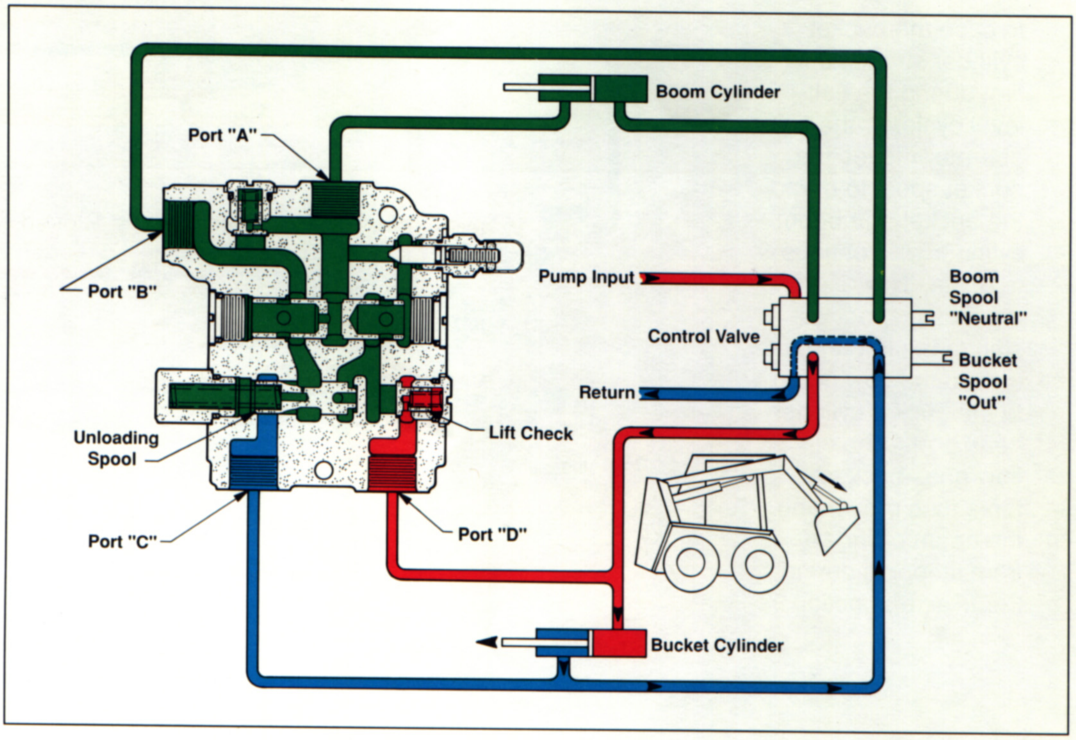
Moving boom spool "In", the oil flow is directed to port "B" on the self-level valve. Flow enters self-level valve, opens lift check and flows out port "A" to the rod port on the boom cylinder. Flow from head port is directed back to the control valve and returns to tank.



Covered by one or more of the following U.S. patents: 4,408,518; 4,709,618; 4,723,478; or 4,561,342.
Other U.S. and foreign patents issued and pending.

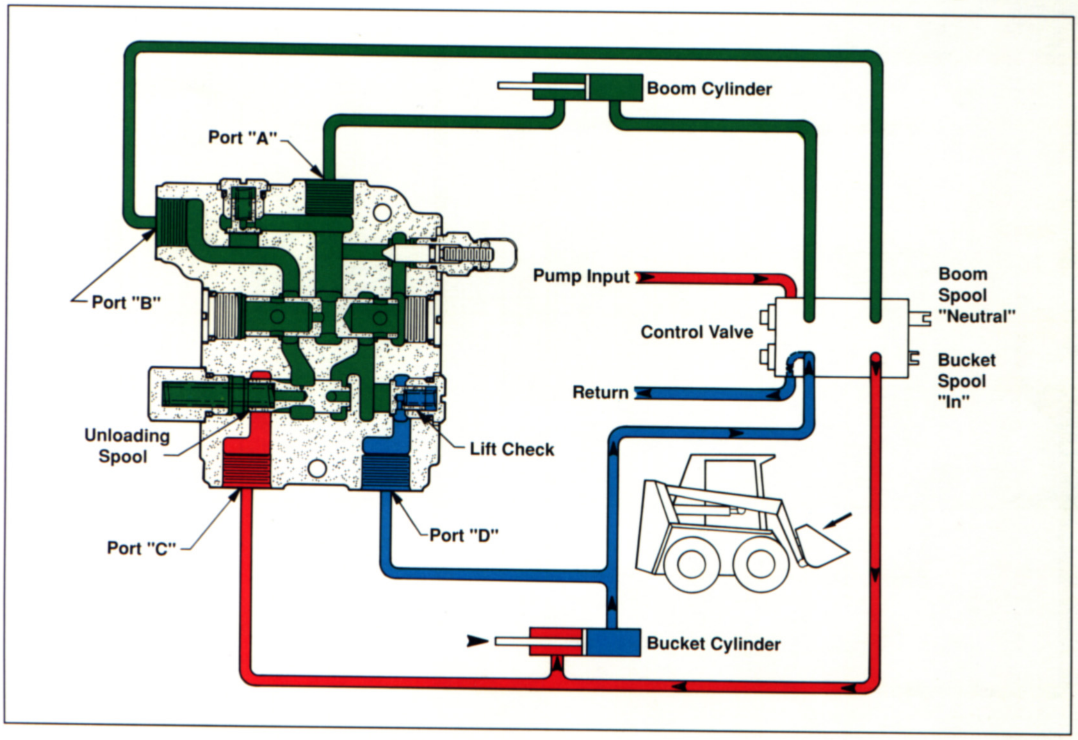
Extending Bucket Cylinder

With the bucket spool shifted "Out" oil flow is directed from the control valve to the head port of the bucket cylinder. The flow also enters port "D" on the self-level valve but is blocked by the lift check. Return flow also enters port "C" on the self-level valve and is blocked by the unloading spool. Flow from the rod port is directed back to the control valve and returns to tank.



Retracting Bucket Cylinder

With the bucket spool shifted "In", oil flow is directed to the rod port of the bucket cylinder. Flow also enters port "C" on the self-level valve through a tee connection but is blocked by the unloading spool. Oil returning from the head port is directed back to the control valve and returns to tank. Oil flow from the head port enters port "D" on the self-level valve through a tee connection but is blocked by the lift check.



39055 Self-Level Flow Divider Worksheet

Required Data:

Boom Cylinder Bore Diameter .... = A
Boom Cylinder Rod Diameter .... = B
Boom Cylinder Self-Level Stroke .... = C
Bucket Cylinder Bore Diameter .... = D
Bucket Cylinder Rod Diameter .... = E
Bucket Cylinder Stroke – Level to Dump .... = F
Bucket Cylinder Stroke – Rollback to Dump .... = G

Standard Bucket Geometry

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

Reverse Bucket Geometry

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

Case 1 – Standard Geometry – Bucket Cylinder Extends to Dump Bucket.

'A' Port – Boom Rod End
'C' Port – Bucket Rod End
'D" Port – Bucket Head End

$$\frac{(D^2)(F)}{(A^2 - B^2)(C)} = \% \text{ Flow at 'D' Port with Bucket Starting Level to Ground}$$

Case 2 – Standard Geometry – Bucket Cylinder Extends to Dump Bucket.

'A' Port – Boom Rod End
'C' Port – Bucket Rod End
'D" Port – Bucket Head End

$$\frac{(D^2)(G)}{(A^2 - B^2)(C)} = \% \text{ Flow at 'D' Port with Bucket Starting at Rollback}$$

Case 3 – Reverse Geometry – Bucket Cylinder Retracts to Dump Bucket.

'A' Port – Boom Rod End
'C' Port – Bucket Rod End
'D" Port – Bucket Head End

$$\frac{(D^2 - E^2)(F)}{(A^2 - B^2)(C)} = \% \text{ Flow at 'D' Port with Bucket Starting Level to Ground}$$

Case 4 – Reverse Geometry – Bucket Cylinder Retracts to Dump Bucket.

'A' Port – Boom Rod End
'C' Port – Bucket Rod End
'D" Port – Bucket Head End

$$\frac{(D^2 - E^2)(G)}{(A^2 - B^2)(C)} = \% \text{ Flow at 'D' Port with Bucket Starting at Rollback}$$

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