IB-117

Double Duty® 12
Steam Trap/Pump Combination
Installation and Operation Manual

Armstrong®

Installation and Set Up Overview

Warning: *This bulletin should be used by experienced personnel as a guide to the installation and maintenance of the Armstrong Double Duty® 12 or Double Duty® 12 package. Selection or installation of equipment should always be accompanied by competent technical assistance. We encourage you to contact Armstrong or your local representative if further information is required.*

Double Duty® 12 Overview

Product Information:

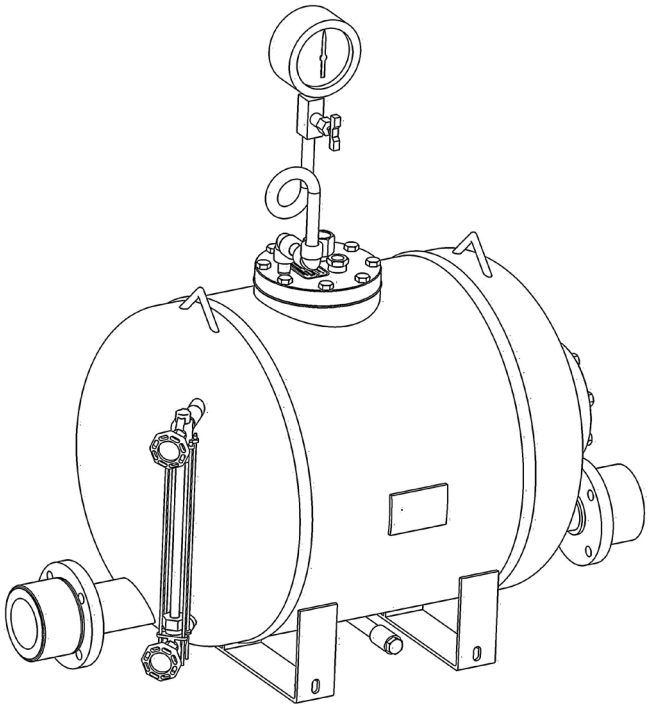
The Armstrong Double Duty® 12 is a flanged fabricated steel vessel, which is pressure rated for 200 psi, full vacuum, and has an ASME Sec. VIII "U" stamp. It is a steam trap with integral pump with the capability of switching between trapping and pumping automatically. The Double Duty® 12 is designed to be operated by steam in a closed system and used to evacuate condensate from steam systems. It can also use air or inert gas as the motive fluid in a vented system.

Typical Application:

Heat exchange equipment with modulating control has the possibility that the system could stall (no longer be able to drain condensate). If only a steam trap is used, condensate could flood the heat exchange equipment causing corrosion, water hammer and poor process temperature control. The Double Duty® 12 is a steam trap with an integral pump, which automatically takes over when the steam trap stalls. If condensate can not be discharged by the steam trap, the Double Duty® 12 body will fill with water until the level is high enough for the pump to take over and push the condensate into the return system using high pressure steam as the motive fluid.

Suggested Optional Accessories:

- Receiver
- Inlet and discharge check valves
- Gauge glass assembly Double Duty® 12
- Gauge glass assembly receiver
- Pressure gauge assembly Double Duty® 12
- Pressure gauge assembly receiver
- Pressure gauge assembly motive
- Pressure gauge assembly condensate discharge
- Pressure gauge assembly heat exchange equipment



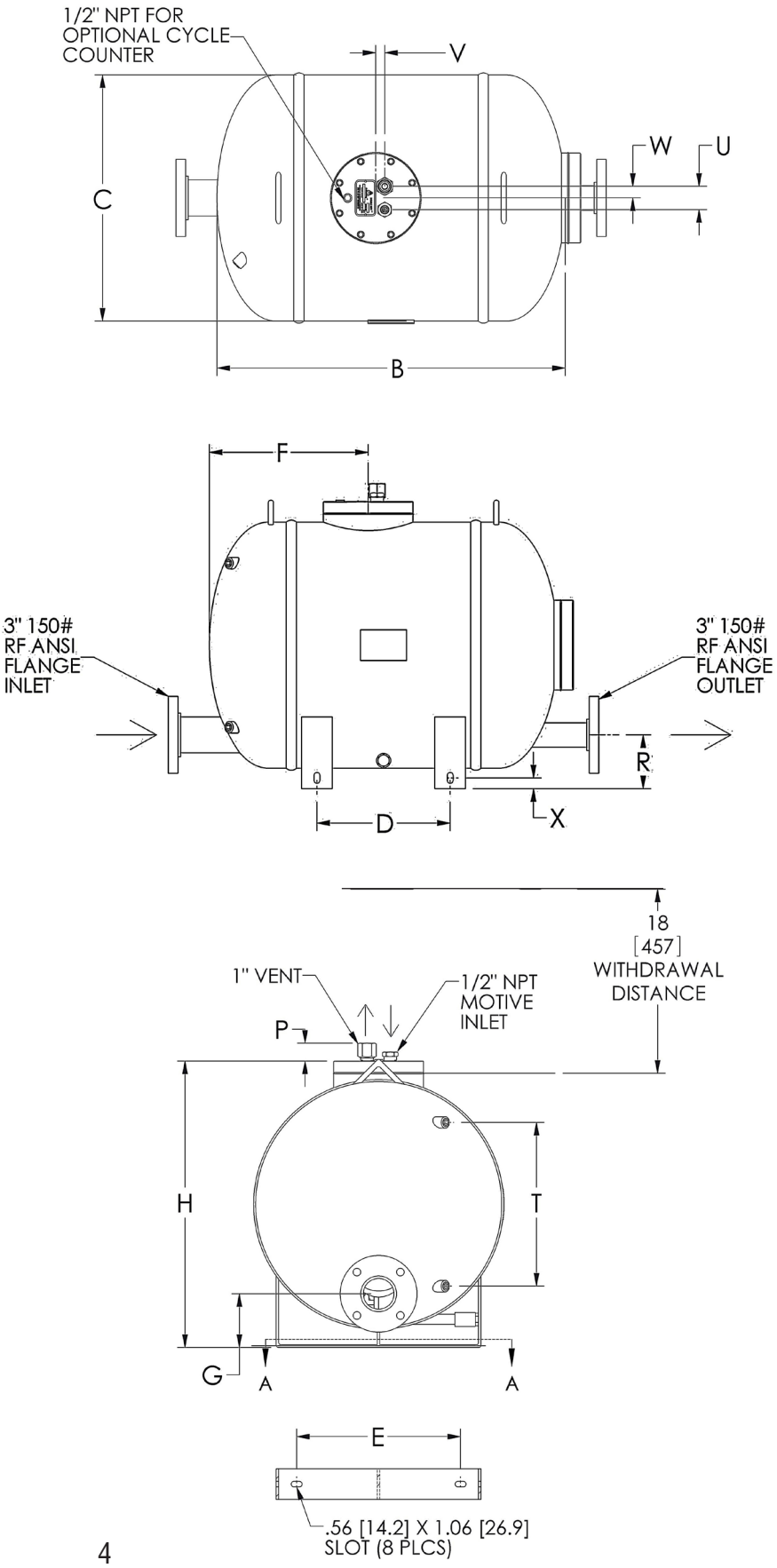
Product Information

Materials	
Body and Cap	Fabricated steel 200 psi ASME Sec. VIII design “U” stamped
Cap Gasket	Flexible graphite
Mechanism Assembly	Stainless steel
Springs	Inconel X-750
Float	304 Stainless steel
Recommended Check Valves	Wafer style; carbon steel body w/stainless steel trim

Specifications	
Motive Fluid	Steam
Max. Operating Pressure	200 psig @ 400 deg F (14 bar @ 204 deg C)
Max. Allowable Pressure	200 psig @ 400 deg F (14 bar @ 204 deg C)
Min. Motive Differential	10 psig

Physical Data		
	in	mm
“B”	34	864
“C”	24	610
“D”	13	330
“E”	16	406
“F”	15-1/2	394
“G”	5-1/4	133
“H”	28	712
“P”	1-5/8	41
“R”	5-1/4	133
“T”	16	406
“U”	2-1/4	57
“V”	7/8	22
“W”	1-1/8	29
“X”	1-1/16	27
Face to Face	42*	1067
Weight	348 (158)	
Check Valve Connection	3	75

*Tolerance +/- 1/2”

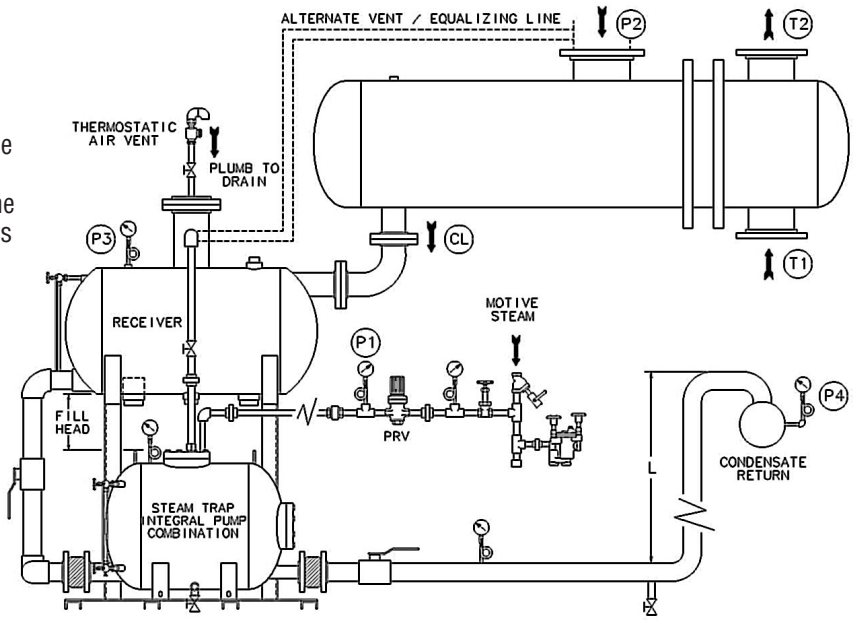


Product Information Continued

Capacity

Needed to size the Double Duty®12:

1. Space constraints: height, width or length restrictions
2. Motive fluid available and pressure to be used (psig)(P1)
3. Total back pressure
   = (vertical lift (L) + pressure in return(P4) + friction loss) (psig)
4. Heat exchange equipment maximum operating pressure (psig)(P2)
5. Heat exchange equipment maximum condensing rate (lbs./Hr.)(CL)
6. Incoming media temperature (deg. F) (T1)
7. Outgoing media temperature (deg. F) (T2)
8. (P2) - (P3) = pressure drop across equipment
   The vent/equalizing line from the Double Duty® 12 may be plumbed to the steam inlet side of the equipment being drained, if the pressure drop across the equipment is less than 1/2 psi and the fill head is a minimum of 24". If these conditions do not exist, the default is to equalize to the discharge side of the heat exchange equipment.

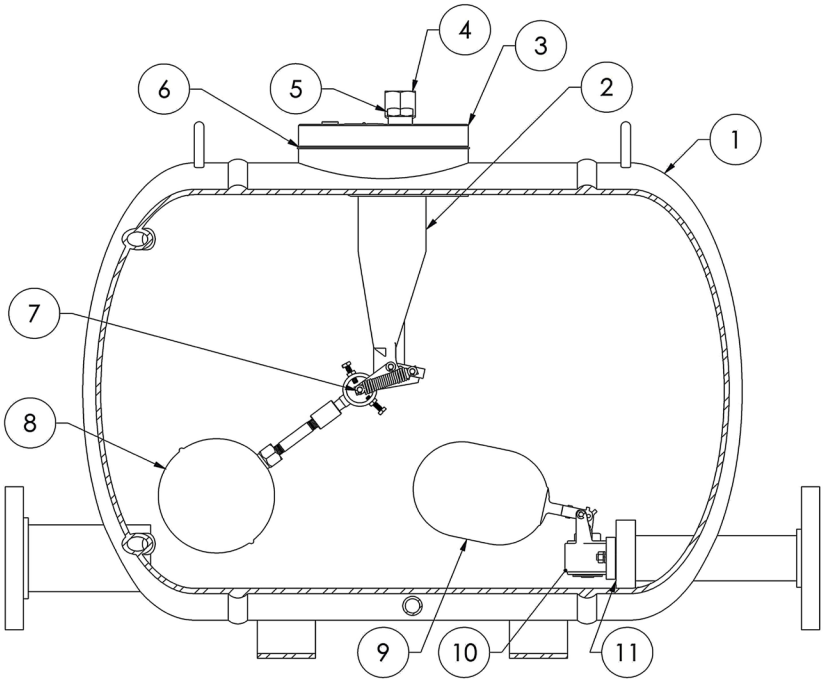


- Maximum average instantaneous discharge rate is approximately 160 gpm

- Note: The Double Duty® 12 is a steam trap with integral pump. It replaces a single steam trap. Do not use for group trapping of multiple pieces of heat exchange equipment.

Materials

Number	Part	Material
1	Body	Fabricated Steel
2	Mechanism	Stainless Steel
3	Cap	Fabricated Steel
4	Vent Seat	Stainless Steel
5	Motive Seat	Stainless Steel
6	Gasket	Flexible Graphite
7	Springs	Inconel X-750
8	Float	304 Stainless Steel
9	Float	304 Stainless Steel
10	Steam Trap	Stainless Steel
11	Gasket	Flexible Graphite



Operation

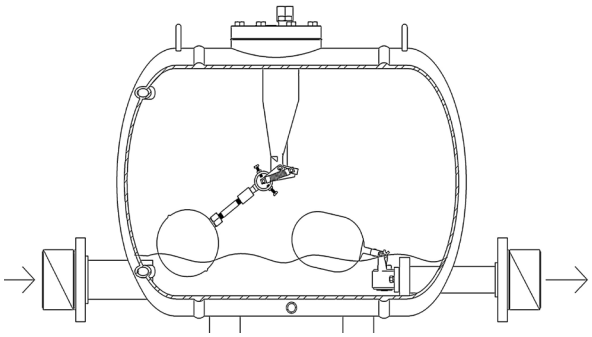


Figure 1: Acting as a steam trap, when the system pressure is greater than the back pressure, condensate enters the body through an external inlet check valve and lifts the steam trap float to allow condensate to leave the body and in to the return line through an external check valve.

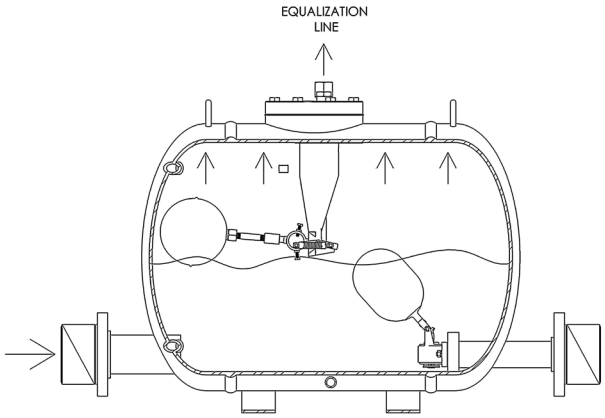


Figure 2: If the system modulates, it may be possible for the back pressure to be greater than the system pressure. This will cause the trap to stall (stop discharging condensate) and the condensate will flood the body.

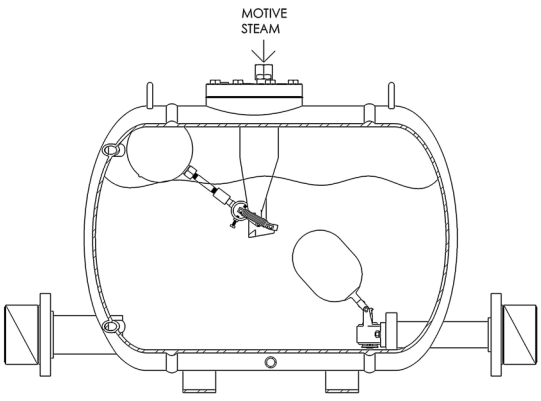


Figure 3: Once the condensate level reaches the pump trip point, the equalization line shuts off and the motive valve opens, allowing high pressure steam into the body.

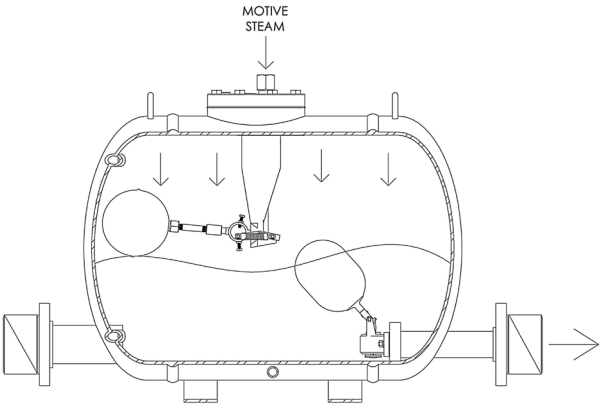


Figure 4: As the body pressurizes the inlet check valve closes. The condensate generated during this time will need to be stored in a receiver or pipe reservoir to prevent water from flooding the heat exchange equipment. When the body pressure is greater than the back pressure, the condensate will be pushed through the trap mechanism and external discharge check valve into the return line.

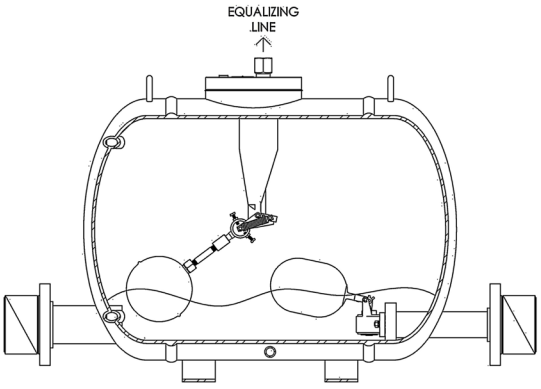


Figure 5: Condensate is pushed from the body by motive steam until the water level reaches the pump's lower trip point. Motive steam is turned off and the vent valve is opened, allowing pressure equalization to occur.

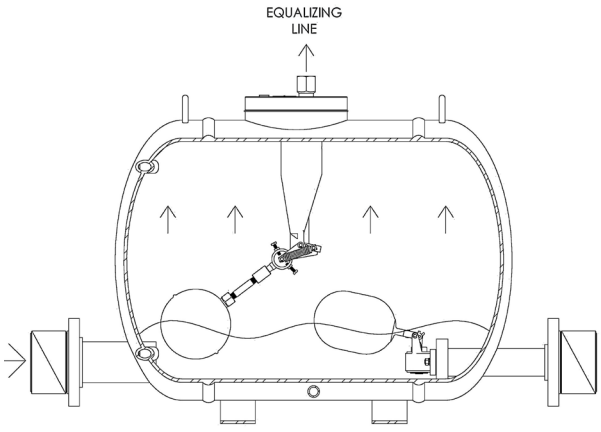
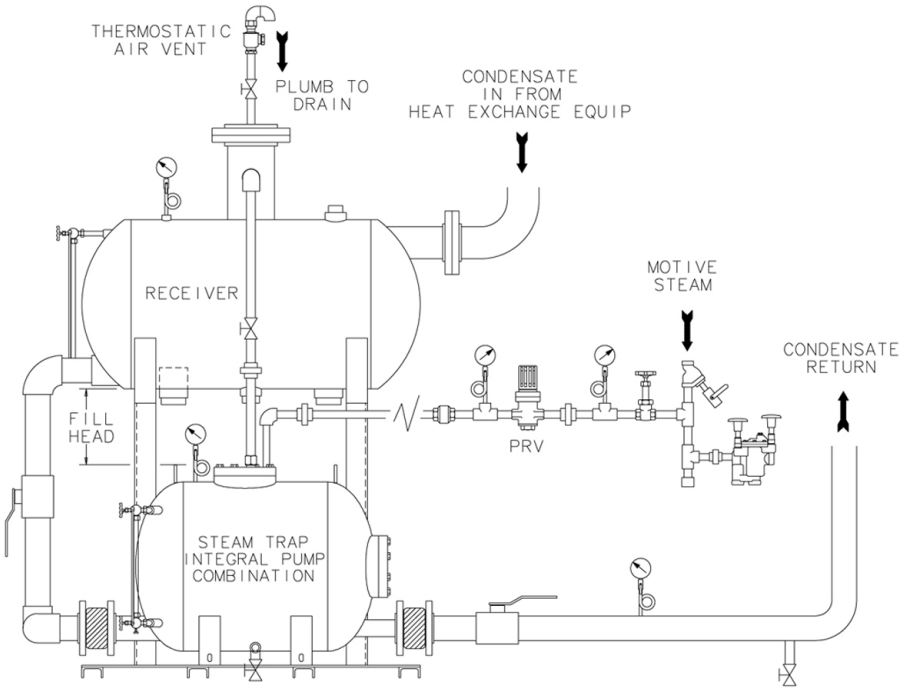
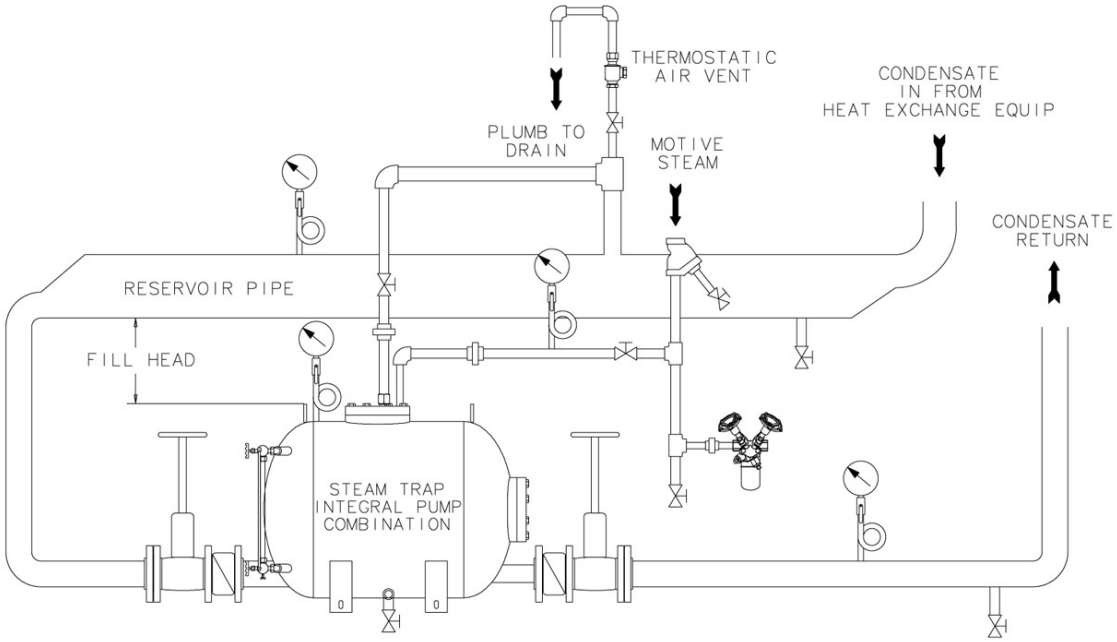


Figure 6: After the pressure equalizes with the system pressure, condensate will begin entering the body through the external inlet check valve. The DD12 is ready to begin another pump cycle or begin trapping.

Installation

Typical Closed Loop System Drawings





Notes:

1. Standard fill head 12". Other fill heads may be used, refer to the fill head adjustment multiplier chart in literature.
2. The Double Duty® 12 steam trap with integral pump system can only replace one steam trap. Multiple pieces of heat exchange equipment cannot drain to a single double duty system.
3. The PRV should be plumbed a minimum of 10 ft. of 1" pipe away from the Double Duty® 12 motive inlet.

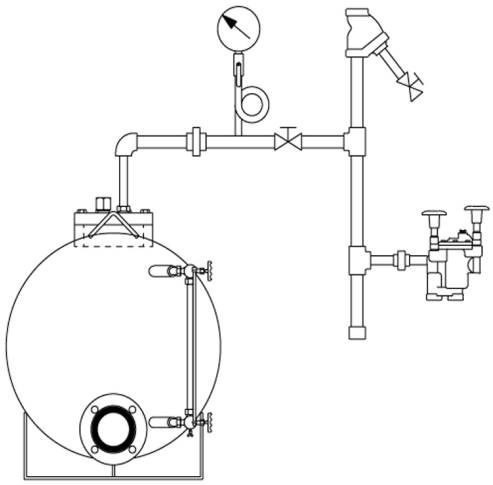
Installation

Fill head: The fill head is the dimension from the top of the cap to the bottom of the receiver. The standard fill head is 12". The fill head can be reduced to 0" at a reduction in capacity. The fill head can also be increased above 12" with a corresponding increase in capacity. A receiver or reservoir should not be installed next to the Double Duty® 12 (causing negative fill head). A fill head less than zero may cause the receiver to flood prior to the pump mechanism tripping.

Liquid Reservoir: Liquid flowing from the heat exchange equipment must be stored while the inlet check valve is closed during the pump discharge cycle. A liquid reservoir or receiver should be installed above the unit to prevent flooding of the equipment.

Vent piping (Equalization Line): The vent is the 1" npt connection on the top of the cap. The equalization line should be self draining and plumbed to the condensate discharge side of the heat exchange equipment. In order to prevent a water seal, the equalization line should be plumbed to a vapor space. A union or flange should be installed on the equalization line near the cap for convenient maintenance.

Motive piping: The motive pipe is 1/2" npt connection on the top of the cap. It should be properly trapped with an Armstrong steam trap and have an Armstrong 100 mesh strainer with blowdown. The motive pressure should be regulated as needed by an Armstrong PRV located a minimum of 10 ft. of 1" pipe away from the DD12 to give downstream accumulation space for the PRV. The optimum motive pressure is 20-30 psi above the back pressure. It is recommended that a pressure gauge be installed in the motive line and a union or flange installed near the cap for convenient maintenance.



Inlet Piping: The condensate inlet connection is a 3" 150# flange located on the same end as the (2) ½" npt gauge glass connections. An external check valve needs to be installed on the inlet for proper operation. *Important Note: The condensate inlet and outlet connections should not be reversed.* **Failure to function will result.**

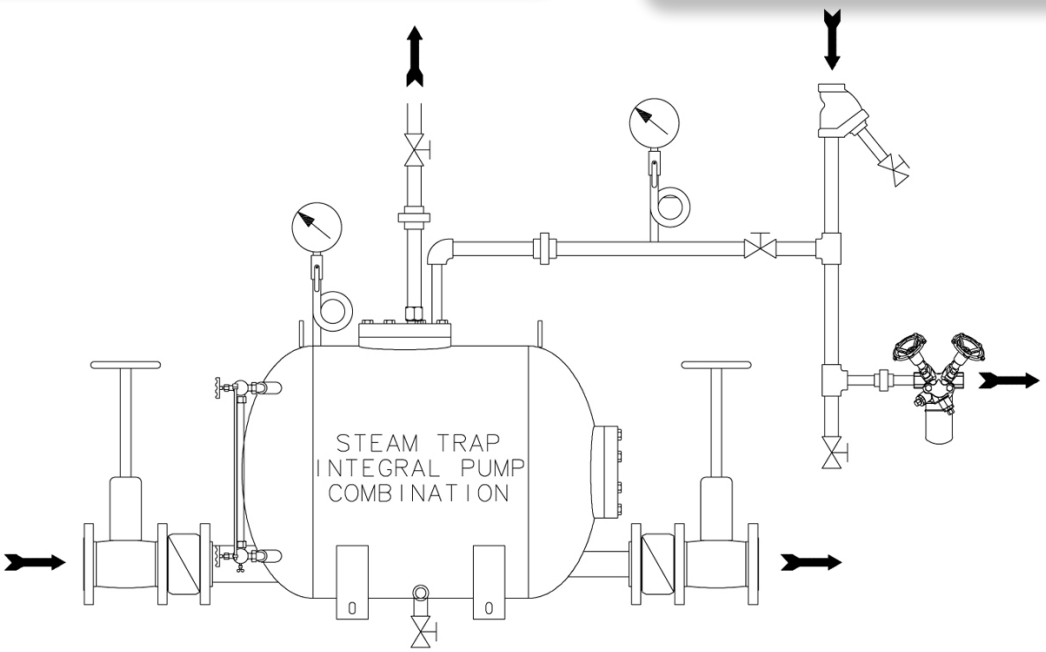
Discharge Piping: The condensate outlet connection is a 3" 150# flange located on the same end as the circular hand hole. An external check valve must be installed on the outlet for proper operation. The discharge piping should be sized for the full load of the heat exchange equipment along with its flash load. If other equipment is also entering the return line, these loads should also be used in the line sizing to prevent excessive return line pressures or water hammer.

Start-Up

- Replace all temporary plugs and fittings with appropriate permanent fittings.
- Make sure piping is clean and free of debris. Debris can affect proper operation and performance.
- The DD12 must be installed with the condensate inlet and outlet horizontal and the motive and vent vertical. The product will not function properly if it is not installed in correct orientation.
- Connect all pipe securely.
- Open all valves slowly to reduce chance of water hammer. *Water hammer could injure personnel or damage equipment.*

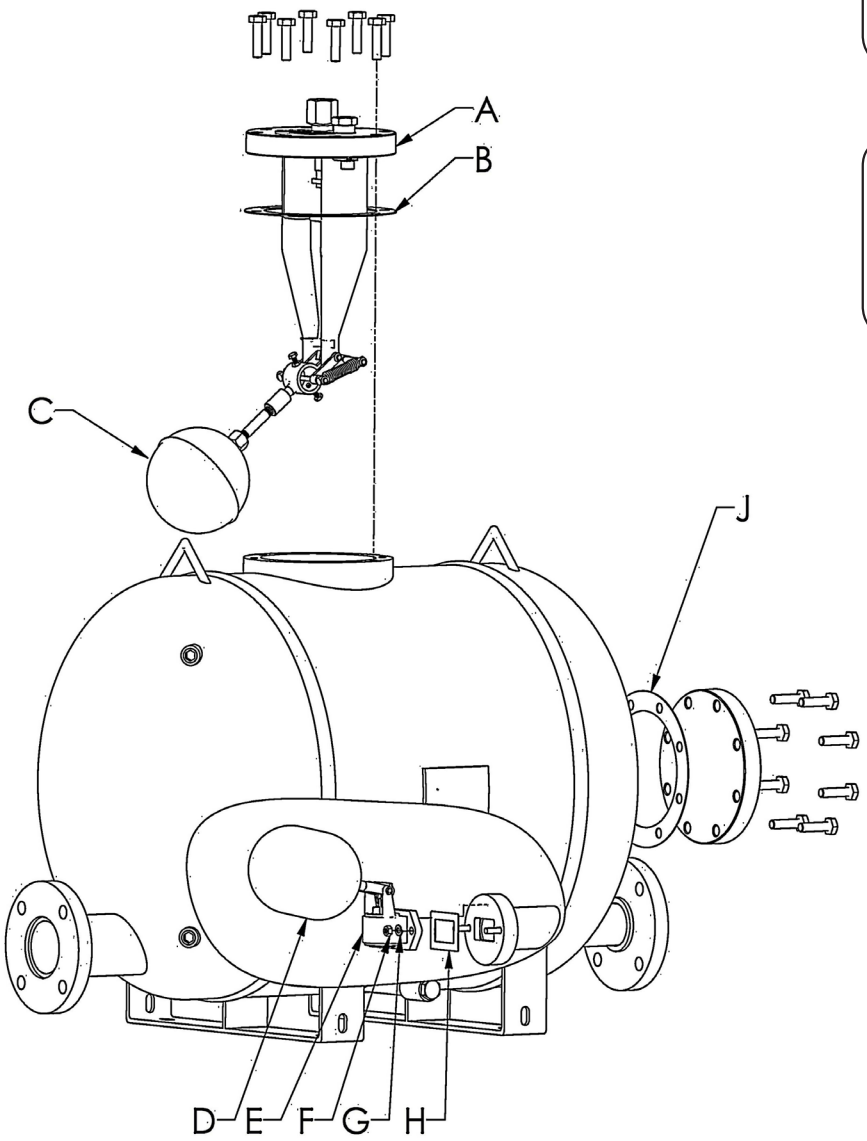
Valve Opening Sequence:

- Open isolation valve(s) in condensate discharge.
- Open isolation valve(s) in equalization line.
- Open isolation valve(s) in motive line. *Confirm no steam leakage by checking pressure gauges.*
- Open isolation valve(s) on thermostatic air vent.
- Open isolation valve(s) on condensate inlet.
- Start-up is complete and operation can be confirmed by use of the gauge glass and pressure gauges.



Maintenance

Warning!: Before starting inspection and repair make sure the unit is completely isolated from the system and all residual pressure has been dissipated.



Removal of Cap Assembly:

- Disconnect all piping plumbed to the cap and remove all bolts, then lift the cap off the body. A withdrawal distance of 18" is needed. The cap will need to be tilted as it is lifted for the float to exit the body.
- Visually inspect the mechanisms for obvious problems. Move the floats up and down manually, checking for free movement and the mechanism snapping back and forth.
- Check the floats to make sure they are undamaged and free of corrosion and pin hole leaks.
- Check pivot points and springs for damage and free movement.
- Check adjustments to make sure they are in the proper range.
- Plumb air to the motive and check that the motive seat properly seals (a small amount of air leakage is normal).

  Trip the mechanism by hand to check that the mechanism operates properly and is able to open the motive valve against the testing air pressure.

Spare Parts:

Cap Assembly:

A. Cap Assembly
B. Gasket
C. Float

Steam Trap Assembly:

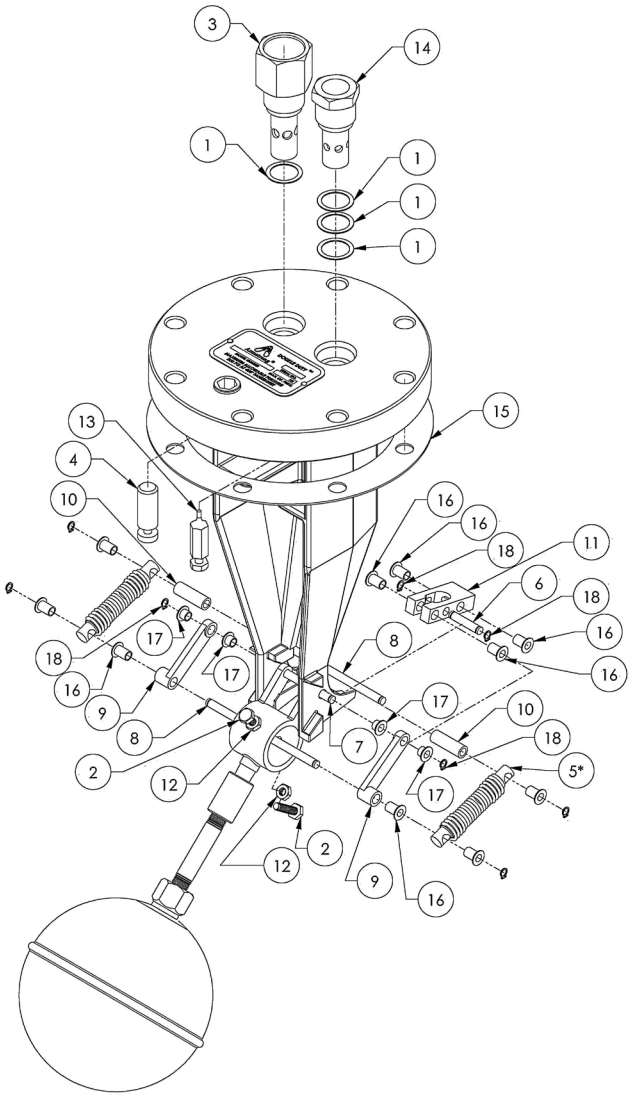
D. Steam Trap Float
E. Steam Trap
F. Nut (2)
G. Lock Washer (2)
H. Steam Trap Gasket
J. Gasket

Spare Parts

Pump Rebuild Kit

Item No.	Description	QTY.
1	Washer Flat	4
2	Bolt Hex 1/4-20 X 1" LG 18-8SS	2
3	Seat Vent 1" NPT for DD12	1
4	Valve Vent DD12	1
5	Spring Assembly Kit DD12	1
6	Pin Pivot	1
7	Pin Pivot	1
8	Pin Pivot	2
9	Arm Spring	2
10	Spacer	2
11	Pivot	1
12	Nut Hex Jam	2
13	Valve Inlet	1
14	Seat motive 1/2 NPT	1
15	Gasket Body	1
16	Bushing long	6
17	Bushing short	4
18	Retaining Ring	4

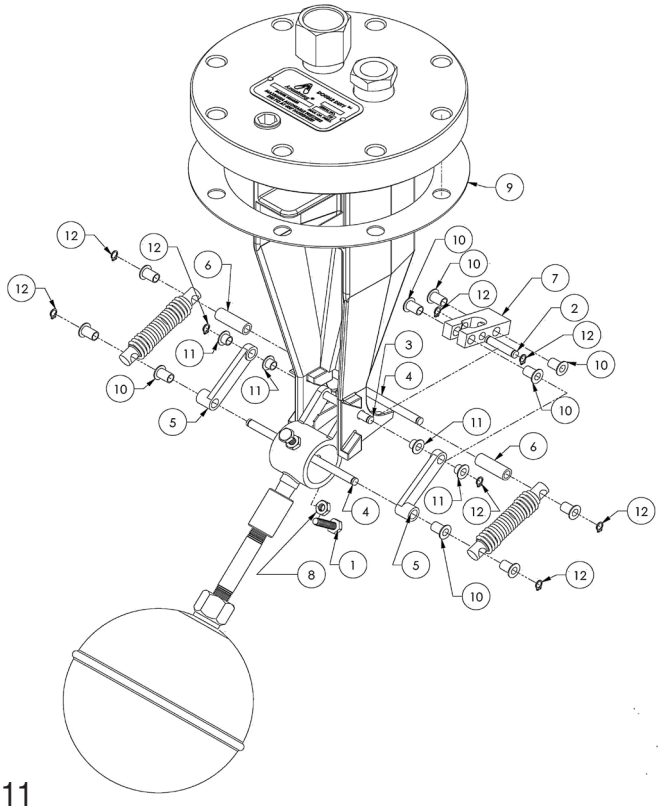
*Spring assembly kit includes: Spring assemblies(2), (4) bushings, and (6) retaining rings (2 extra).
Note: The number of washers that were taken out of the cap should equal the number to be installed. Three are supplied for the motive, but may not be the number used.



Mechanism Rebuild Kit

Item No.	Description	QTY.
1	Bolt Hex 1/4-20 X 1" LG 18-8SS	1
2	Pin, Pivot	1
3	Pin, Pivot	1
4	Pin, Pivot	2
5	Arm Spring	2
6	Spacer	2
7	Pivot	1
8	Nut Hex Jam 1/4"-20 18-8SS	1
9	Gasket Body	1
10	Bushing long	6
11	Bushing short	4
12	Retaining ring	10

Note: 2 extra retaining rings included

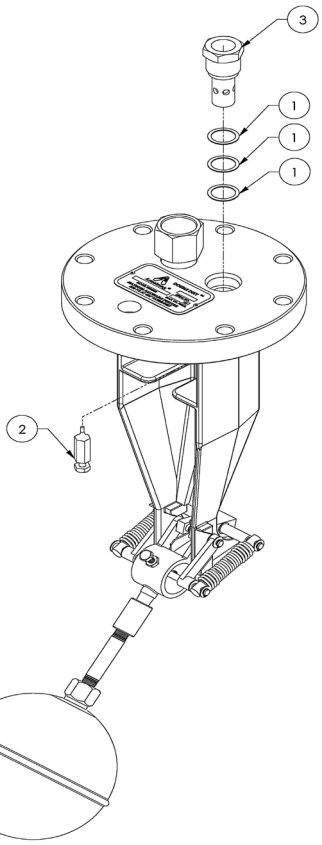


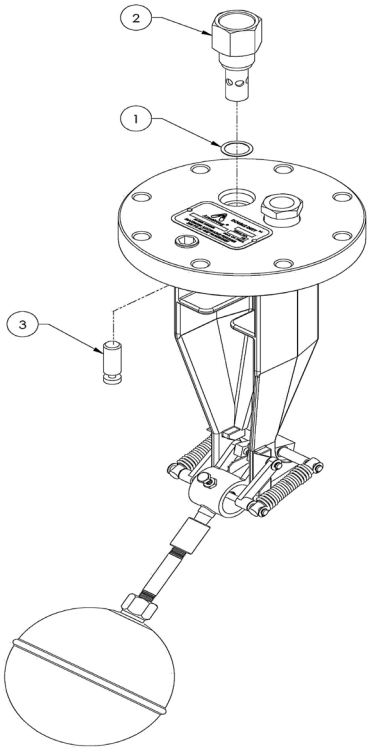
Spare Parts Continued

Motive Valve Assembly Replacement

Item No.	Description	QTY.
1	Washer Flat	3
2	Valve Inlet	1
3	Seat motive 1/2 NPT	1

Note: The number of washers that were taken out of the cap should equal the number to be installed. Three are supplied with each motive valve assembly, but may not be the number used.





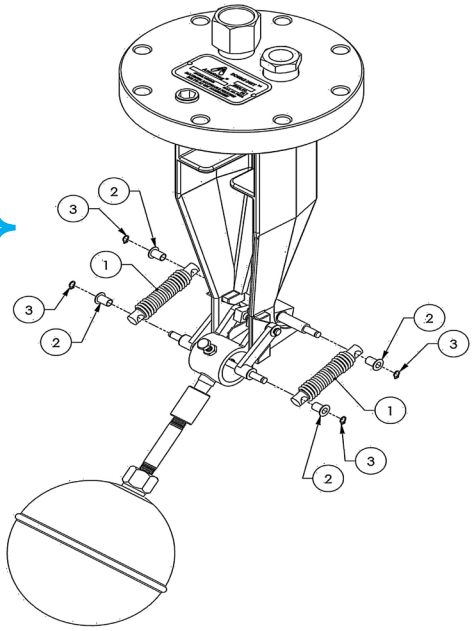
Vent Valve Assembly Replacement

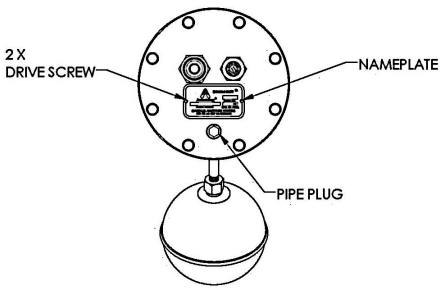
Item No.	Description	QTY.
1	Washer Flat	1
2	Seal Vent 1" NPT for DD12	1
3	Valve Vent	1

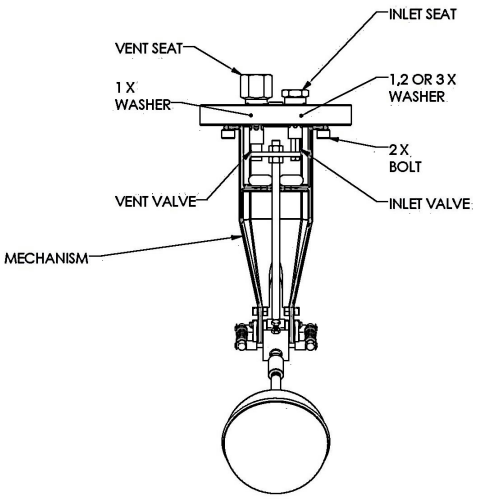
Spring Assembly Replacement

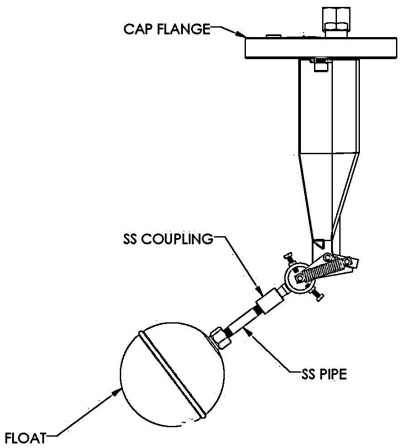
Item No.	Description	QTY.
1	Spring Tension Inconel for DD12	2
2	Bushing long	4
3	Retaining ring	6

Note: Kit includes two extra retaining rings









Cap Assembly

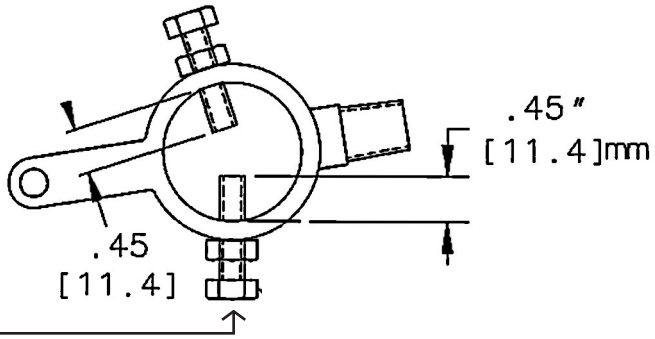
Note: Cap assembly includes gasket

Adjustment Procedure

1. All adjustments must be made while the mechanism is secured to the cap
2. Be sure all lock nuts are tightened (two 11/16" wrenches needed)
3. Use a dial-caliper to set dimensions

Step 1

1. Adjust bolt & lock nut to achieve the dimension



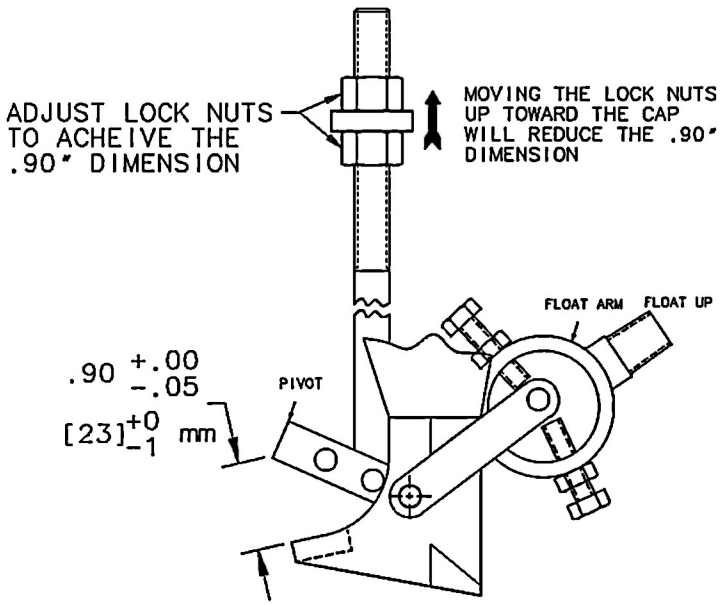
Step 2

1. Measure when the mechanism is fully tripped with the vent valve seated and the motive valve fully open

2. Pivot should be manually lifted through its entire range to make sure no binding occurs on the motive and vent valves

3. If binding is felt, loosen lock nuts and straighten valve holder and retighten (start measurement process again)

4. Recommend that compressed air be plumbed to the motive and the mechanism tripped against air several times by raising and lowering the float arm manually



Step 3

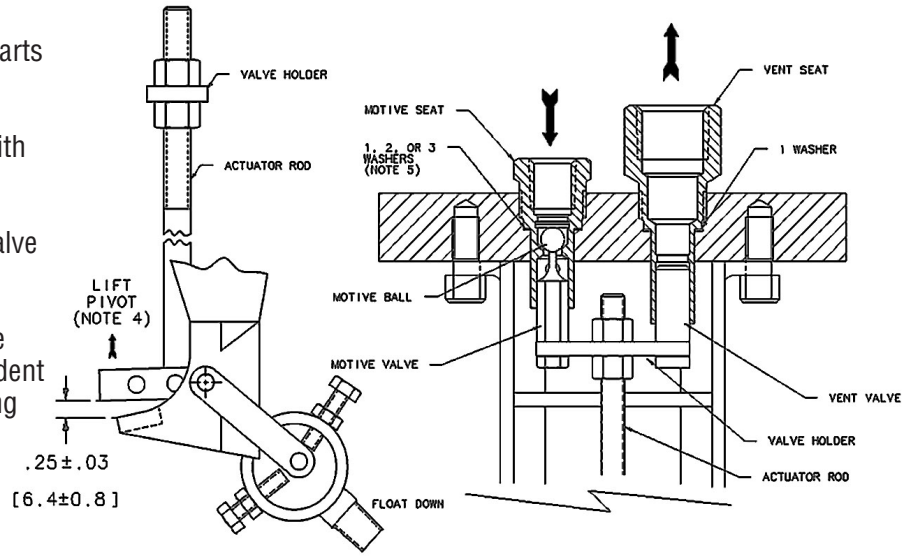
1. Measure the point at which the motive valve starts to lift the motive ball

2. Measure when the mechanism is tripped off with the vent open and the motive ball on its seat

3. Air should be plumbed to motive so point of valve contact can be heard and felt

4. Pivot should be manually lifted until the motive valve contacts the motive ball. This will be evident by the increased effort and the sound of leaking air

5. The dimension is adjusted by adding or subtracting washers under the motive seat



Troubleshooting

Important! For safety of personnel – Vent line piping should be isolated from equipment and pump pressure should be relieved prior to breaking connections.

Warning! Water may run out of the vent connection when the piping is broken. Care should be taken to avoid danger to personnel or damage to nearby equipment.

Areas to Check First:

- Are all isolation valves open?
- Are check valves operating properly (correct direction)?
- Have there been any changes to the system?
- Is the motive strainer free of debris?
- Is the motive pressure at least 10 psi above the back pressure but not exceeding 200 psi?
- Is there sufficient fill head?
- Is the equalizing line free of obstructions/water seal?
- Is the flow through the unit the proper direction?

Assessing Check Valve Function:

- **Inlet check valve assessment:** Isolate the DD12 outlet and allow water to enter body through inlet check valve. When pump mechanism turns on motive, it should pressurize to full motive line pressure and the water level in the gauge glass should not go down. If the water level is going down, the inlet check valve is not holding (water is being pumped backwards through the check valve and into the receiver) and should be repaired or replaced.
- **Outlet check valve assessment:** Isolate the inlet. The water level in the body should not change. If the water level in the gauge glass continues to rise, it is due to the discharge check valve not holding (water from the return line is filling the body) and should be repaired or replaced.

Check Valve Chatter:

- Are you using an Armstrong supplied/recommended check valve?
  *Consider spring assisted non-slam check valve.
- Is the check valve worn?

Troubleshooting Continued

Pump does not cycle:

1. Check gauge glass to make sure water is entering body:
   - No water is entering:
     - Check for blockage of the inlet line (isolation valve, check valve, other obstruction)
     - Check equalizing line: unobstructed, does not have a water seal, vents to a vapor space
     - Check that the pressure of the body is the same as the receiver/pipe reservoir
   - Water is completely filling the body:
     - Check to see if motive piping is unobstructed (isolation valve, check valve, strainer, other obstruction)
     - Check that motive pressure does not exceed 200 psi
     - Check mechanism for damage/wear
     - Check floats for damage/corrosion/pin hole leaks
2. Check motive pressure.
   - It should be at least 10 psi above back pressure.
3. Check pressure in body:
   - While filling, the pressure should be the same as the receiver
   - While pumping, the pressure should be approximately 5-25 psi above the back pressure, water level should be going down as pressure builds, if pump stays pressurized (no water in gauge glass) to full motive line pressure at end of pump down, consult factory or local factory representative
   - If motive turns on pressurizing body to full motive line pressure, but the unit remains full: inadequate motive, blocked discharge line (check valve, isolation valve, internal steam trap, other obstruction)

Double Duty® 12 cycling, but equipment is flooding:

- Is the DD12 undersized?
- Is there sufficient fill head?
- Is receiver sufficient size to store condensate?
- Is there a sufficient motive pressure?
- Is back pressure greater than anticipated?
- Is condensate return line restricted?
- Is a check valve hanging open?

Double Duty® 12 pressurizes, but does not pump:

- Check that motive and vent piping have been installed correctly: motive 1/2" npt, vent 1" npt.
- Check the motive seat for debris. If so, clean or replace motive valve and seat.

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