

INSTALLATION GUIDE

1/2" CONDENSATE TRAP

The patented Drain-All was designed for removing condensate from compressed air systems. Since it is totally pneumatic, it does not require any electricity and can be easily installed using simple piping connections at any point in a system including remote locations. It can handle pressures up to 170 PSIG and liquid temperatures up to 170°F. It has 1/2" NPT inlet and outlet ports and a full 1/2" smoothly contoured condensate flow path. The industrially robust, highly reliable Drain-All has few moving parts and at 21 pounds, can stand up to the most demanding applications with minimal maintenance.



INDEX

INSTALLATION	2
START-UP & TROUBLESHOOTING	3
PRODUCT TECHNOLOGY - HOW IT WORKS	4
FREQUENTLY ASKED QUESTIONS	5
INSTALLATION LOCATIONS	6
INSTALLATION METHOD #1	7
INSTALLATION METHOD #2	8
INSTALLATION METHOD #3	9

Quality System ISO 9001 Certified United States Patent: 5,983,919

+1 314.781.6022 FAX +1 314.781.7859 INFO@DRAIN-ALL.COM WWW.CDIVALVE.COM



INSTALLATION

Before installing the Drain-All condensate trap, a review of the following items will help make the right decision regarding options which could be used to ensure long-term maintenance free operation.

RUST AND SCALE

Even though the Drain-All condensate trap is designed for handling rust and scale, it is recommended that the system be blown down after all piping is installed and before the trap is connected to the piping. The Drain-All condensate trap, with a large, smooth, liquid flow path, easily handles contaminants in the liquid once the system is in operation. If there is excessive rust and scale on a continuous basis, consider using the Rust Handler[®] designed for compressed air systems that have extremely heavy amounts of rust and scale.

CONTROL AIR & BALANCE LINE

The control air line provides air through the sealed center tube to operate the air cylinder. Clean dry air should be used for this control air supply. The balance line provides a means to handle the displaced air from the reservoir as the liquid enters the reservoir. The control air line and the balance line are two separate lines which have nothing in common with each other and should never be connected to each other in any way. Do not connect them together with a tee fitting.

CONTROL AIR

Control air pressure requirements vary by product and must be regulated within specifications provided in the product's literature.

BALANCE LINE

The balance line must have either (1) exactly the same pressure as the vessel being drained or (2) slightly less pressure than the vessel being drained.

The same pressure is achieved when the balance line is tied back into the vessel being drained, such as connecting the balance line at a tee fitting on the vessel's pressure gage or access port. A slightly lower pressure may be achieved by locating the balance line connection on the air header pipe a few feet downstream from the vessel being drained. When hooking the balance line to an air header, connect it to the header prior to any other vessel attached to the header. If there is absolutely no place to connect the balance line into the air system, or if a temporary installation is to be made while waiting for the next shutdown to tie in the balance line, the balance line can be vented to atmosphere. Install the needle valve that comes as a component of the installation kit into the port on top of the tap where "Balance Line" is indicated. Then follow the start-up instructions for adjusting the opening of the balance line needle valve. There will be very little air loss to atmosphere. The preferred method for reliability is always to connect the balance line back to the pressure vessel.

NO MANIFOLDS

There cannot be multiple system drains through a manifold to one trap. This will not work because all system drains will not be of the same pressure. Therefore, the liquid from the higher pressure drain lines will bypass the trap and flow backwards up the lower pressure drains. Installing check valves on system drains is not a solution because pressure variations which inhibit proper operation will still be present. Proper installation of the balance line is not possible with multiple drains hooked up through a manifold.

CORROSION

There are Drain-All products available which include corrosion resistant coatings and materials. If the application environment is highly corrosive, review these products and options to determine if they should be specified. Also available are Drain-All products which handle higher pressures and temperatures.

INSTALLATION STEPS

1. Prior to installing the trap, blow down the vessel being drained to remove excessive rust, scale, and dirt knocked loose during piping installation.
2. Remove the trap from the box and set it in an upright position where it will be connected. Most Drain-All products do not have to be secured. Larger volume and higher pressure products may require some form of movement restraint. To ensure proper operation in all installation layouts, the top of the trap should be lower than the bottom of the vessel being drained.
3. Using 1/2" pipe, connect the vessel being drained to the 1/2" liquid inlet on the base of the trap. Be sure to install a shut-off valve and a bypass valve between the vessel being drained and the trap. This will allow easy removal of the trap "on the run" during any preventive maintenance activities. After installing the piping, close the inlet shut-off valve.
4. Using 1/2" pipe, connect the trap discharge outlet to a sealed drain pipeline or enclosed/covered trough. The discharged liquid is under pressure and can splash back if directed downward toward the bottom of a simple, shallow, open through-type floor drain.
5. Connect the balance line from the trap to the appropriate connection point on the vessel being drained using the appropriate tubing and fittings/valves. The balance line must be sloped down towards the trap. After installing the balance line, close the balance line valve.
6. Using tubing and provided needle valve, connect the control air supply line to the control air filter inlet on the trap. Always use the cleanest and driest air possible to ensure long term maintenance free operation. After connecting the control air line, close the control air needle valve and proceed to start-up section.
7. Please go to CDIvalve.com and fill out the **Warranty Registration Form for your condensate trap.**

START-UP & TROUBLESHOOTING

START-UP

1. Close control air line and balance line valves as well as inlet isolation shut-off valve.

2. Bring up system pressure.

3. Fully open control air needle valve.

Check for leaks in control air line. Push the “Push to Test” button on top of the trap to verify the air cylinder strokes, opening the discharge ball valve. Leave control air needle valve open.

4a. Applications where the balance line is connected back to vessel being drained. Fully open the balance line valve. Check for air leaks on balance line and fittings. Leave balance line valve fully opened. The valve can be used as an isolation shut-off valve.

4b. Applications where the balance line needle valve is vented to atmosphere or connected to a header pipe leaving the vessel being drained. Open the balance line needle valve only enough to ensure a small amount of air can flow through it. This will be adjusted in a later step.

5. Gradually open the inlet isolation shutoff valve to the full open position to allow liquid to enter the trap. The reservoir will fill until the float is raised to the upper position actuating the control circuit extending the air cylinder and opening the ball valve. Once the discharge starts, the liquid level in the Drain-All reservoir begins to lower. This lowers the float back to its original position which deactivates the control circuit closing the ball valve.

6a. When the balance line is connected back to the vessel being drained, there is no pressure differential between the inlet and balance line and there will be no bubbles in the liquid. In this application keep the balance line valve in this connection fully open. The top of the trap must be below the bottom of the vessel being drained.

6b. Applications where the balance line needle valve is vented to atmosphere or connected to a header pipe leaving the vessel being drained. With liquid in the reservoir and the liquid discharge ball valve in the closed position, close the balance line needle valve. As you slightly open the balance line needle valve, look into the translucent sleeve just above the inlet port and

look for a trickle of small bubbles. Continue to open the needle valve until you see these bubbles indicating a proper setting for the balance line needle valve. Remember that bubbles will only be seen if there is a pressure differential (when balance line is vented to atmosphere or to a header leaving the vessel being drained).

7. Once properly installed, no further adjustments to the trap are necessary. The trap is fully automatic, discharging on demand as needed when liquid accumulates.

TROUBLESHOOTING

1. Water does not enter.

A. Balance line isolation shutoff valve is closed which does not allow liquid to enter the trap.

Solution: Adjust balance line valve per installation instructions.

B. Liquid inlet shut-off valve is closed.

Solution: Fully open liquid inlet shut-off valve.

C. Vessel drain, and/or pipe from vessel drain to the trap inlet is plugged.

Solution: Clear obstruction. If rust or debris is commonly present consider upgrading to the Rust Handler model.

D. Location of balance line connection causes higher balance line pressure than liquid inlet pressure. The trap is “back flowing”.

Solution: Refer to installation instructions for proper balance line installation.

2. Fills and will not drain.

A. Control air line needle valve is closed, or not fully open

Solution: Fully open control air needle valve.

B. Lack of adequate air pressure on control air line.

Solution: Provide more than the minimum required PSIG to control air line connection per the product specification.

C. Hole in valve stem clogged.

Solution: Clear obstruction. Do not alter hole diameter.

D. Filter element clogged or dirty.

Solution: Replace part.

3. Discharge ball valve stays open.

A. Center tube magnet installed upside down, i.e., north and south poles reversed.

Solution: Reinstall center tube magnet rotating it 180 degrees, end for end.

B. Bleed hole for air cylinder clogged.

Solution: Clear bleed hole on side of air cylinder located on opposite side from control air connection to the cylinder. Do not alter hole diameter.

C. Center tube magnet stuck or not properly sealing against valve stem. This can result from excessive oil and water contaminates allowed to get into the control air lines and then into the center tube, thereby coating the center tube magnet and causing it to stick.

Solution: Clean center tube and center tube magnet and reassemble. Also, if possible, connect the control air line to a clean dry air source which will prevent reoccurrence. If problem persists then consider upgrading to the Rust Handler model.

4. Excessive bubbling action in reservoir.

A. Air leak in balance line and/or fittings.

Solution: Refer to installation instructions and start-up procedures.

B. Balance line needle valve opened too far.

Solution: Adjust balance line needle valve per installation instructions.

PRODUCT TECHNOLOGY - HOW IT WORKS

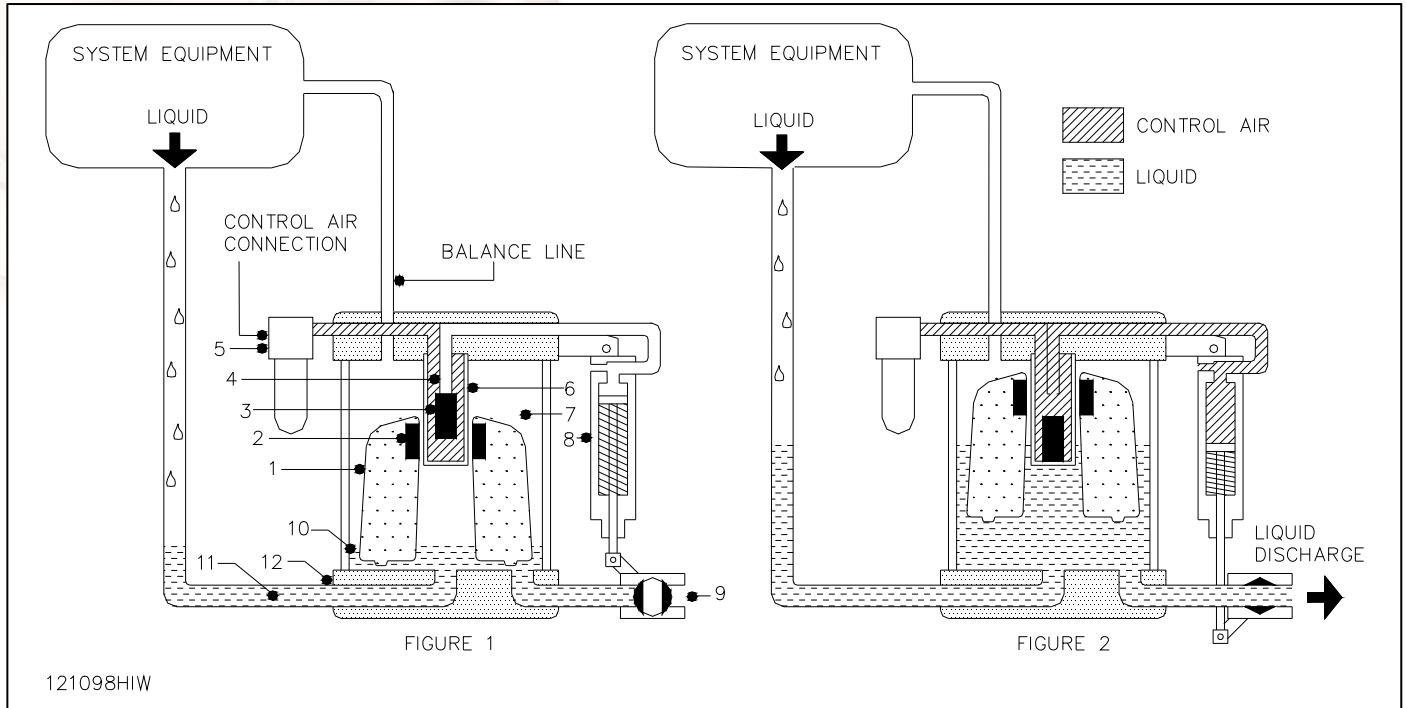


FIGURE 1: START OF CYCLE

The float (1) with a molded in magnet (2) is sitting on the base in its lowest position. The float magnet exerts a magnetic force repelling the center tube magnet (3) upward, holding it seated against an orifice in the lower end of the valve stem (4). This retains the control air coming in through the control air filter (5) in the center tube (6). The control air circuit including the center tube magnet and valve stem are isolated from the liquid held in the reservoir (7). The air cylinder (8) is in the home position and the discharge ball valve (9) is closed.

There is always a residual amount of liquid (10) left in the bottom of the reservoir after each discharge cycle. The trap stops discharging before all accumulated liquid is removed providing a liquid seal that conserves expensive compressed system gas. Liquid (11) flows through the inlet port (12) and into the reservoir to start the fill cycle. Liquid continues to fill the reservoir until the float has displaced enough liquid to become buoyant and the float pops upward to the upper position shown in Figure 2.

FIGURE 2: START OF DISCHARGE

The liquid flows in and raises the float to its highest position as shown. The float magnet is raised up past the center tube magnet and repels the center tube magnet downward opening the orifice in the valve stem. This allows the control air held in the center tube to flow through the control air circuit to the actuating cylinder. The actuating cylinder extends and opens the ball valve starting the discharge of accumulated liquid.

When the correct amount of liquid has been discharged, leaving a liquid seal in the reservoir, the float has been lowered to a point where the float magnet is below the center tube magnet. In this position, the float magnet repels the center tube magnet back upward against the valve stem orifice, which seals off the control air flow to the actuating cylinder. The cylinder has a spring which then returns the cylinder to its home position, closing the discharge ball valve. The discharge is stopped as shown in Figure 1 and the fill cycle repeats.

THE BALANCE LINE PORT

The balance line port is a hole through the head of the trap that goes into the reservoir. This port allows the air trapped in the top of the reservoir to move out of the reservoir to allow liquid to enter the reservoir through the inlet port. If there were no balance line port, as liquid entered the reservoir under pressure, the air trapped in the top of the reservoir would be compressed until it was the same pressure as the liquid coming in and the unit would stop filling.

There are three methods of connecting to the balance line port. The most effective is to connect it back to the vessel being drained as shown in the illustrations above. In this configuration, the reservoir is at the same pressure as the vessel being drained and the liquid is filling by gravity. In this case, the top of the trap must be lower than the bottom of the vessel being drained. The balance line can also be attached to a header pipe leaving the vessel being drained or vented to atmosphere using a needle valve. Venting to atmosphere uses very little air if the needle valve is adjusted properly.

FREQUENTLY ASKED QUESTIONS

Where should a Drain-All be installed?

At liquid accumulation points within a system at compressors, air receiver tanks, intercoolers, aftercoolers, dryers, separators, filters and drip legs.

Is this an oil-water separator?

No. Drain-All is a liquid drain and it will drain oil, water, and particulates from the compressed air system. Once this is accomplished, the discharge should be piped to an oil-water separator before discharging to the environment.

Does this replace a dryer?

No. Drain-All works in conjunction with a dryer. Dryers typically convert water vapor in the compressed air into liquid which is usually discharged through a small automatic drain device integral to the dryer. These small automatic drains are often prone to clogging and failure. When this occurs, such drains are normally replaced with Drain-All units which do not clog. A dryer prepares the moisture for removal from the system by condensing it. It is the job of the reliable Drain-All to ensure that the liquid is actually discharged from the air system.

Is it mandatory to use a balance line?

Yes. The balance line provides a means to handle the displaced air from the reservoir as the liquid enters the reservoir. In specific cases, however, where there is no easy way for the balance line inlet to be connected to the vessel being drained the balance line can be vented to atmosphere if the installation method 3 is followed.

What is the capacity?

In each application, based on pressures and piping layout for that application, a Drain-All model will eject a specific amount of liquid on each cycle. This varies by model and application. Contact Drain-All or your distributor with specifications on the pressure and capacity of liquid you need to handle and an appropriately sized Drain-All can be selected for your application.

What size compressor can it handle?

There are Drain-All models that will function effectively on any size compressor, compressed air system, atmospheric, or vacuum system. Contact Drain-All or your distributor with specifications on the pressure and capacity of liquid you need to handle and an appropriately sized Drain-All can be selected for your application.

Can one Drain-All be used to drain multiple tanks and/or compressor systems?

No. Individual tanks, even if connected to each other, will not all be of precisely the same pressure level and the liquid would accumulate in the lowest pressure drain or system thereby bypassing the Drain-All. Furthermore, the use of check valves from multiple vessels to a single Drain-All installation will not make this work properly. Always install one Drain-All for each item of equipment to be drained.

Can a Drain-All be used in systems with pressure greater than 170 PSIG?

Yes. Higher pressure models are available. If the control air comes from higher pressure systems, a pressure regulator on the control air line may be used and set at the proper control air pressure or optional control air components can be ordered to accommodate higher pressures.

Can the balance line and the control air line be hooked together via a tee connection?

No. Each of these air lines has its own specific purpose and should never be tied together. The control air should be the cleanest driest air available since it supplies air to the control circuit to operate the pneumatic actuating cylinder which functions best and lasts longer if clean dry air is used.

The balance line allows the air in the reservoir to move out leaving room in the reservoir for the incoming liquid. This air contains moisture that would be drawn across a tee fitting tied to the control air line and be pulled directly into the control air circuit, which can damage control air pathways and the air cylinder.

Is there only one model Drain-All?

No. There are models for a wide range of special applications. Dimensional alterations, design changes, component options and special materials or coatings are used in models to withstand high temperatures and highly corrosive environments as well as accommodate high volume discharge requirements.

What if the system has an abundance of metallic trash?

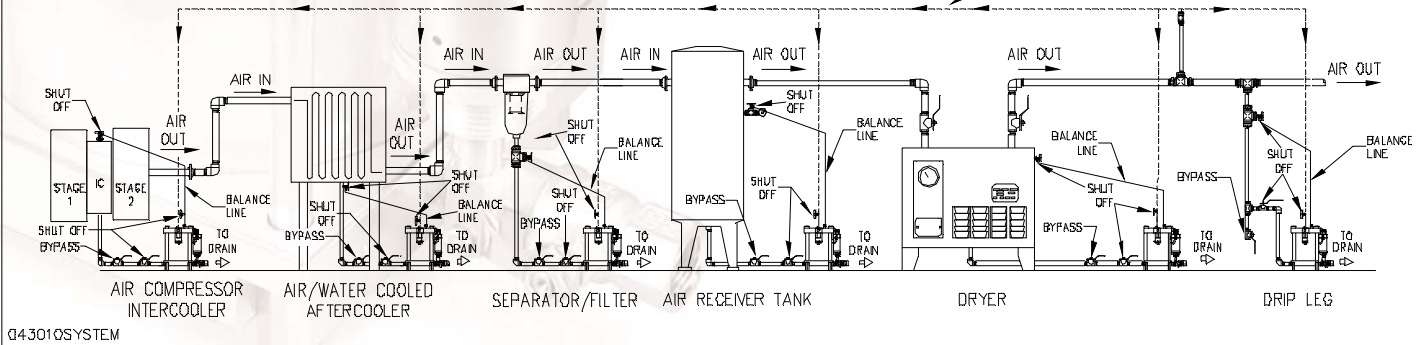
Before installing the Drain-All, blow down the system being drained to eliminate as much existing loose scale as possible. The large, smoothly contoured flow paths in Drain-All units handle normal levels of debris found in most applications. Should there be an excessive amount of debris such as heavy rust, inquire about Drain-All's Rust Handler[®] model designed for that kind of severe duty.

How can the Drain-All be used as an instrument to gather data on condensation in a compressed air system?

With the use of Drain-All's optional cycle counter, the Drain-All can provide accurate data on the amount of liquid that a compressed air system generates. This is very useful when buying new compressed air system equipment because a Drain-All with a cycle counter is a benchmarking instrument. Since the Drain-All discharges the same amount of liquid on every cycle, knowing the number of cycles over a specific period of time under specific temperature and humidity conditions provides the ability to track liquid production. This benchmarking can be correlated to ongoing changes in ambient temperature and humidity conditions to identify variances in liquid production indicating changes which need investigation. Too few cycles would mean not enough liquid is reaching the Drain-All and should be investigated. Too many cycles would mean too much liquid is being made or too much liquid from somewhere is reaching the Drain-All and should be investigated. Knowing the amount of liquid a system produces is also essential for properly sizing oil-water separators.

INSTALLATION LOCATIONS

1. Connect balance line to vessel being drained, to header leaving vessel being drained, or vent to atmosphere – do not manifold balance lines together.
2. Balance line balances reservoir of trap to vessel being drained. Control air operates air cylinder. These two should not be connected together.
3. Bring control air from clean dry source downstream of dryer if possible, can manifold control air lines together.



THERE ARE THREE METHODS USED TO CONNECT THE BALANCE LINE PORT (Also reference pages 7-9 for illustrations)

Method -1

Connect the balance line port to the vessel producing the condensate. This is the preferred method since it is a closed-loop arrangement. In the first four applications above, the balance line is connected back to the vessel that is producing the condensate. The balance line should never droop or slope upward. The pressure on the incoming condensate to the trap and the pressure in the balance line are the same and the trap is filling by gravity. For this method, the top of the trap must be below the bottom of the vessel being drained.

Method -2

Connect the balance line to a tee in the drain pipe leaving the vessel producing the condensate. This is an alternate method to Method-1 when there is no convenient location to connect the balance line to the vessel. This is shown above in the drip leg and separator/filter applications. The bottom of the vessel being drained must be significantly above the top of the trap. This allows the balance line to sloped downward toward the condensate trap. The balance line should

Method -3

Vent the balance line port to atmosphere using a needle valve inserted in the balance line port and slightly opened. This can be used on any application but must be used when the bottom of the vessel is lower than the top of the trap. The needle valve should be opened slightly to a point where only a small amount of air can be felt leaving the needle valve. This method provides a pressure differential in the trap reservoir and condensate is blown into the reservoir instead of filling by gravity.

VESSELS WITH BOTTOM LOWER THAN THE TRAP'S TRIGGER LEVEL

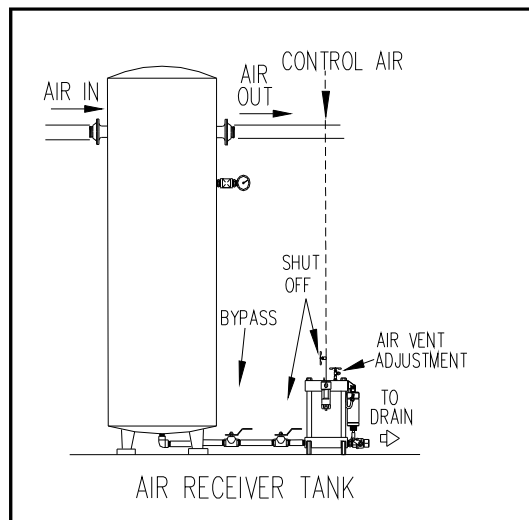
In the Method 3 drawing, there is a dotted line indicating the level of the trigger level of the trap. This is the height the condensate must reach in the trap to start the discharge cycle.

When the balance line port is connected back to the vessel or header pipe, as shown in the drawing above, the trap is filling by gravity. In these applications the bottom of the vessel must be higher than the top of the trap so that the condensate flows by gravity down and out of the vessel into the trap.

When the bottom of a vessel being drained is lower than the trigger point in the trap, as shown in the drawing to the right, do not connect the balance line port to the vessel or header pipe.

In the drawing to the right, if the balance line were connected to the vessel or header pipe, the condensate would be filling the trap by gravity.

With the bottom of the vessel being lower than the top of the trap, this would result in condensate backing up in the vessel to the same height of the condensate in the trap. When the condensate reaches the trigger level in the trap, shown



by the dotted line, the condensate would also reach the same height in the vessel (the same dotted line).

In an application where the bottom of the vessel is lower than the top of the trap, the balance line must be vented to atmosphere. Venting a small amount of air from the trap reservoir to atmosphere results in a pressure differential in the trap reservoir. This allows the pressure in the vessel to push the condensate downward, out of the vessel, and up into the trap. This achieves proper filling of the trap while removing all condensate from the vessel.

Send application questions to:

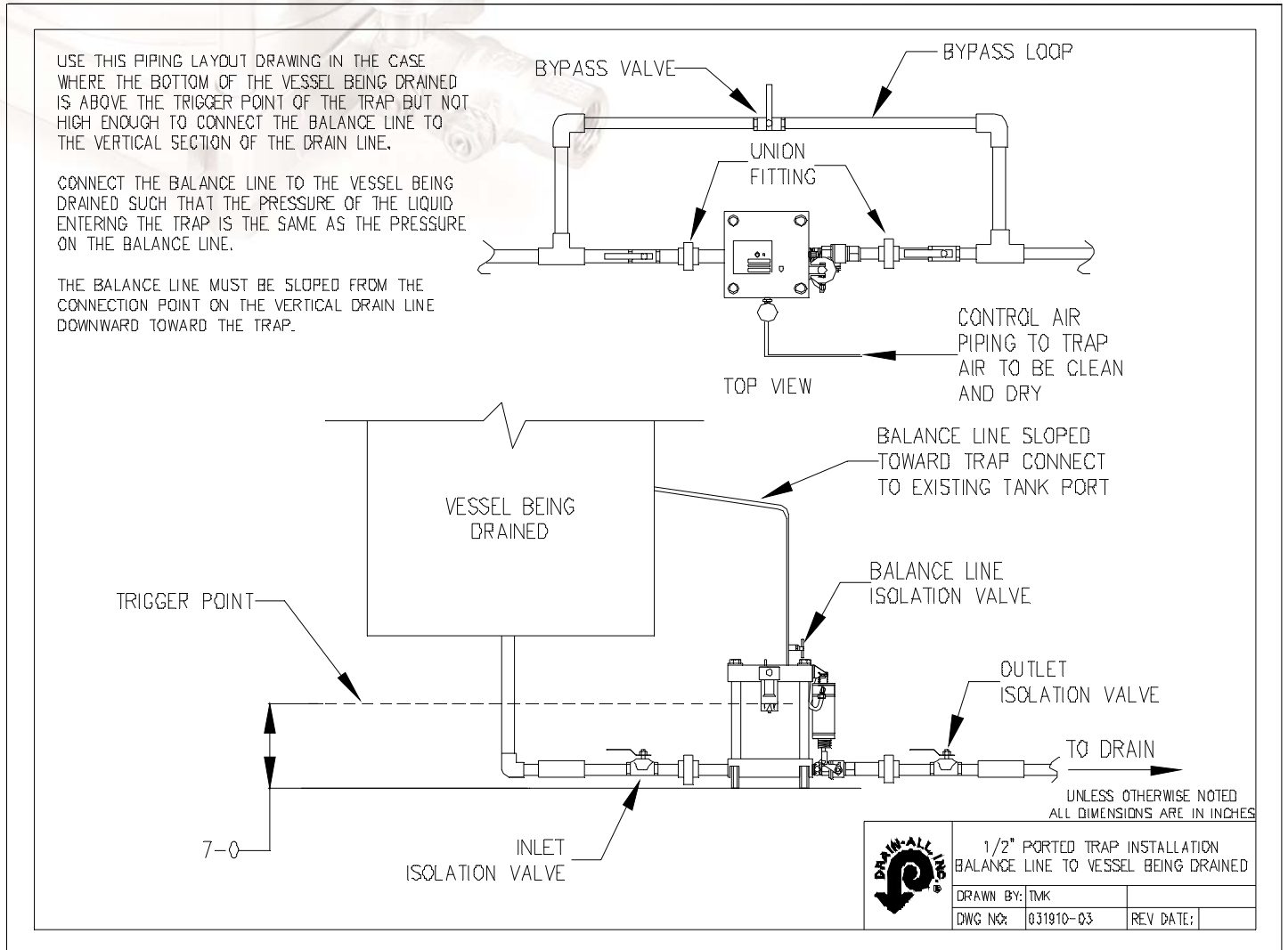


Technical Service
Phone: 800-233-1477
Fax: 314-781-7859
Techservice@Drain-All.com

a product of
Control
Devices, LLC

INSTALLATION METHOD #1

Balance Line to Vessel



Warranty Registration

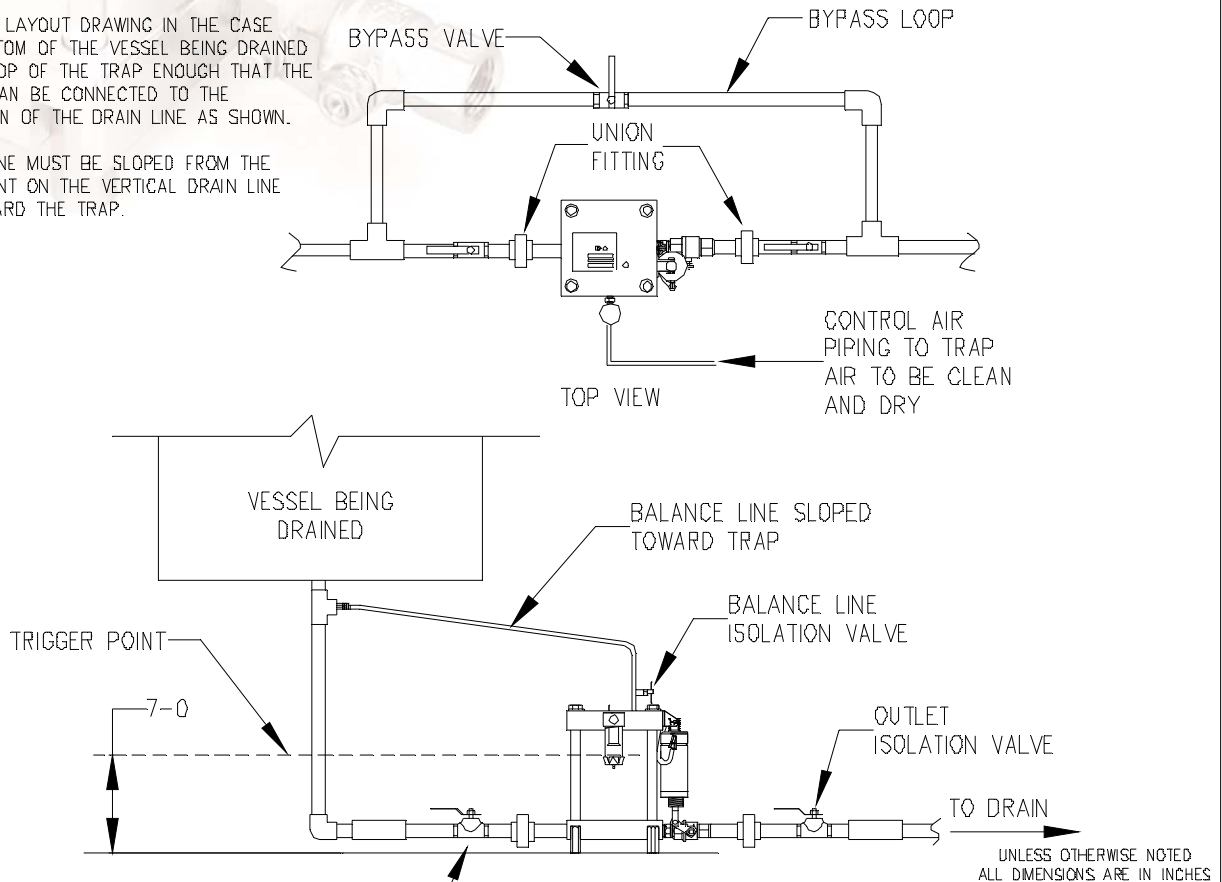
To validate the warranty for your condensate trap, go to cdvalve.com and fill out the warranty registration form.

INSTALLATION METHOD #2

Balance Line to Drain Line

USE THIS PIPING LAYOUT DRAWING IN THE CASE WHERE THE BOTTOM OF THE VESSEL BEING DRAINED IS ABOVE THE TOP OF THE TRAP ENOUGH THAT THE BALANCE LINE CAN BE CONNECTED TO THE VERTICAL SECTION OF THE DRAIN LINE AS SHOWN.

THE BALANCE LINE MUST BE SLOPED FROM THE CONNECTION POINT ON THE VERTICAL DRAIN LINE DOWNWARD TOWARD THE TRAP.



1/2" PORTED TRAP INSTALLATION BALANCE LINE TO DRAIN LINE		
DRAWN BY:	DEC	
DWG NO:	D71111-02	REV DATE:

Warranty Registration

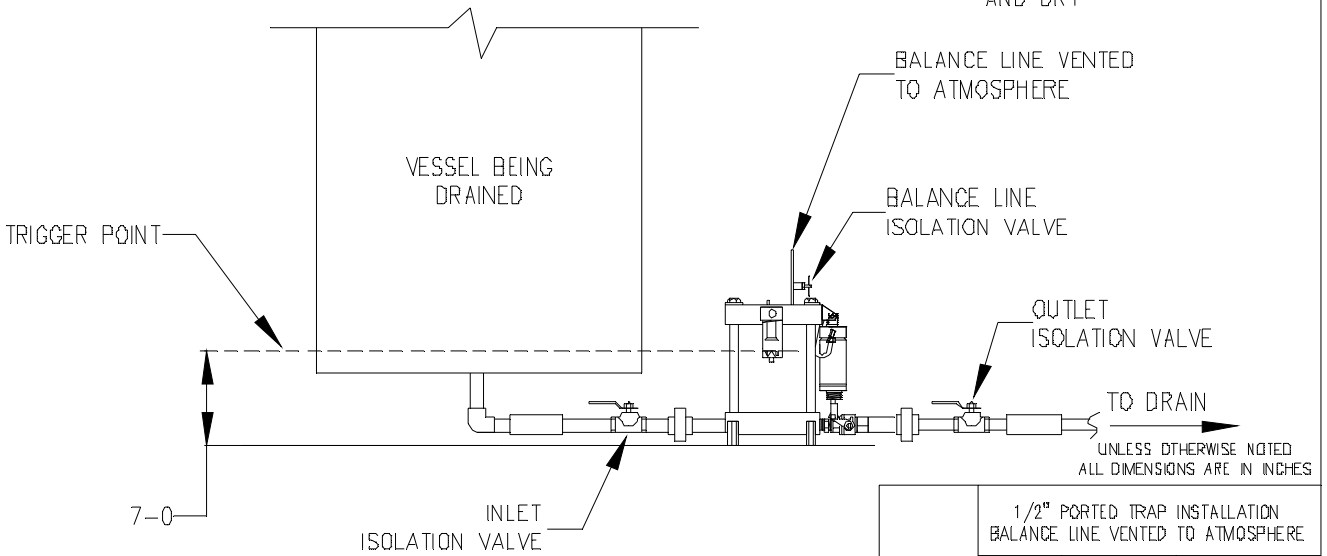
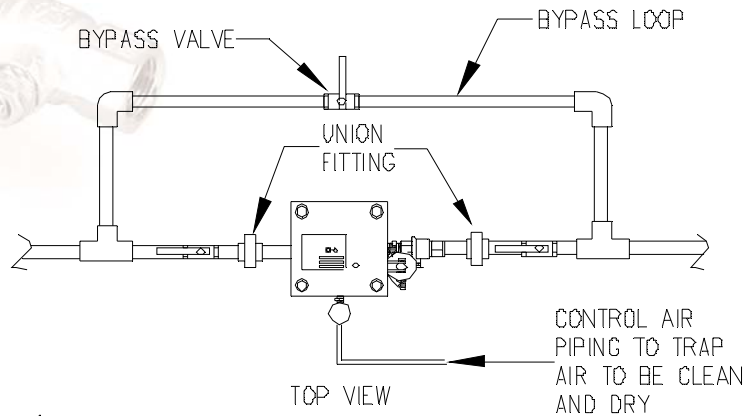
To validate the warranty for your condensate trap, go to cdvalve.com and fill out the warranty registration form.

INSTALLATION METHOD #3

Balance Line Vented to Atmosphere

USE THIS PIPING LAYOUT DRAWING IN THE CASE WHERE THE BOTTOM OF THE VESSEL BEING DRAINED IS BELOW THE TRIGGER POINT OF THE TRAP (7 INCHES ABOVE THE FLOOR).

IN THIS CASE, THE BALANCE LINE MUST BE VENTED TO ATMOSPHERE TO PREVENT LIQUID FROM ACCUMULATING INSIDE THE VESSEL BEING DRAINED. SEE THE PRODUCT INSTALLATION GUIDE FOR THE PROCEDURE ON ADJUSTING THE AMOUNT OF VENTING PROPERLY.



1/2" PORTED TRAP INSTALLATION BALANCE LINE VENTED TO ATMOSPHERE	
DRAWN BY: DEC	
DWG NO: 071111-03	REV DATE:

Warranty Registration

To validate the warranty for your condensate trap, go to cdvalve.com and fill out the warranty registration form.