How to Drain Air Distribution Systems

Air distribution systems make up the vital link between compressors and the vast amount of air-utilizing equipment. They represent the method by which air is actually transported to all parts of the plant to perform specific functions.

The three primary components of air distribution systems are air mains, air branch lines, and air distribution manifolds. They each fill certain requirements of the system, and together with separators and traps, contribute to efficient air utilization. Common to all air distribution systems is the need for drip legs at various intervals. These drip legs are provided to:

1. Let liquid escape by gravity from the fast-moving air.
2. Store the liquid until the pressure differential can discharge it through the drain trap.
3. Serve as dirt pockets for the inevitable dirt and grit that will accumulate in the distribution system.

Air mains are one of the most common applications for drain traps. These lines need to be kept free of liquid to keep the supplied equipment operating properly. Inadequately trapped air mains often result in water hammer and slugs of liquid, which can damage control valves and other equipment. There is also a freeze potential wherever water is allowed to accumulate. In areas where air is moving slowly, the accumulation of water can effectively reduce the pipe size, thereby increasing the pressure drop and wasting energy.

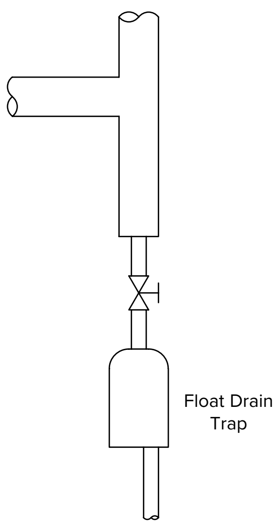


Figure LD-14.
Drain trap installed straight under a low point.

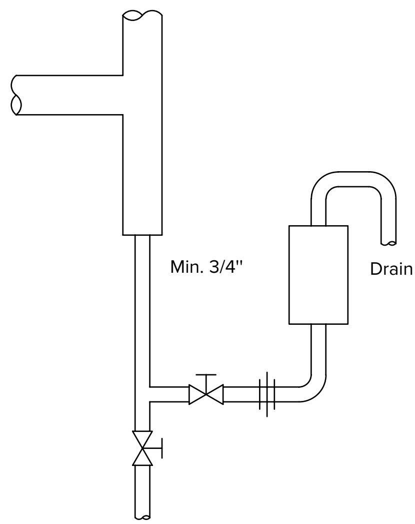


Figure LD-15.
Series 200 or 300 inverted bucket drain traps installed on compressed air line contaminated by oil.

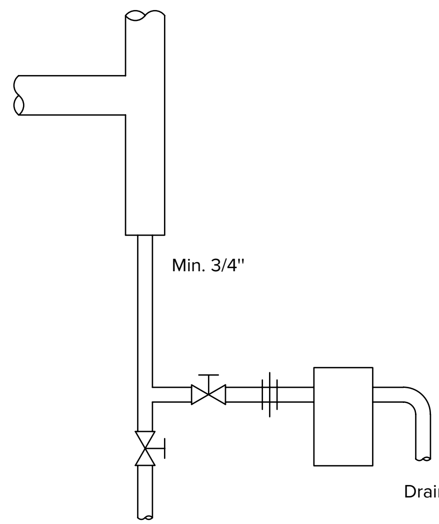


Figure LD-16.
Series 800 or 900 inverted bucket drain traps installed on compressed air line contaminated by oil.

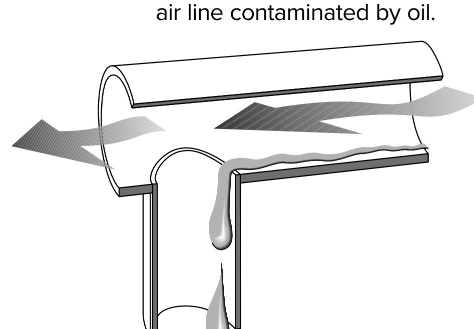


Figure LD-17. Drip leg length should be at least 1-1/2 times the diameter of the main and never less than 10". Drip leg diameter should be the same size as the main, up to 4" pipe size and at least 1/2 of the diameter of the main above that, but never less than 4".

Chart LD-3. Recommendation Chart
(See chart on page LD-6 for "Feature Code" references.)

Equipment Being Drained	1st Choice and Feature Code	Alternate Choice and Feature Code
Air Mains	FF B, C, D, J, M	FP*

*IB is a good alternative where heavy oil carryover is likely.

Selection of Drain Traps and Safety Factor for Air Mains

Traps should be selected to discharge a volume of liquid normally produced when the system is up and running. Liquid loads can be estimated if actual CFM or air volume flow is not known. If cold temperatures are possible, the dew point at supply pressure must be known. Once this maximum is determined, the safety factor used to size the trap will be only 10% of the total potential liquid load. Ten percent of the total is used because most of the liquid has been removed in the aftercooler and receiver. The drain trap must handle only the small remaining amount of 10% of the total possible load.

If actual airflow rate is not known, it can be estimated using Chart LD-4, titled “Pressure Drop in Compressed Air Pipe.” Using an assumed pressure drop of 1/4 (.25) psig per 100 ft, and 100 psig gauge pressure of air through a 4" line, it can be seen that approximately 1 000 cu ft of free air per minute are flowing through the line. Taking this figure to the chart titled “Water Condensed From Compressed Air,” Chart LD-6 on page LD-20, it can be seen that if 80°F, 90% RH air is delivered at 100 psig, then 1.2 lbs of water will be condensed per minute at 1 000 CFM. This number will be multiplied by 60 to convert from minutes to hours, which equals 72 lbs/hr. For this air main then, take 10% of this figure, or 7.2 lbs/hr, to be the flow rate to the drainer.

Rule of Thumb for Calculating Compressor Liquid Loads

$$\frac{\text{CFM x 20 gr/cu ft x 60 min/hr}}{\text{7 000 gr/\#}} = \text{\#/hr}$$

1. Assuming worst condition:
   100°F @ 100% RH
   For other conditions, see page LD-7
2. Using air main safety factor of: Load x 10%

Installation of Drain Traps on Air Mains

Drip Legs. All air mains should utilize drip legs and traps at all low spots or natural drainage points, such as ahead of risers, end of mains, ahead of expansion joints or bends, and ahead of valves and regulators (see installation Fig. LD-17).

Where there are no natural drainage points, drip legs and drain traps should still be provided. These should normally be installed at intervals of about 500 ft.

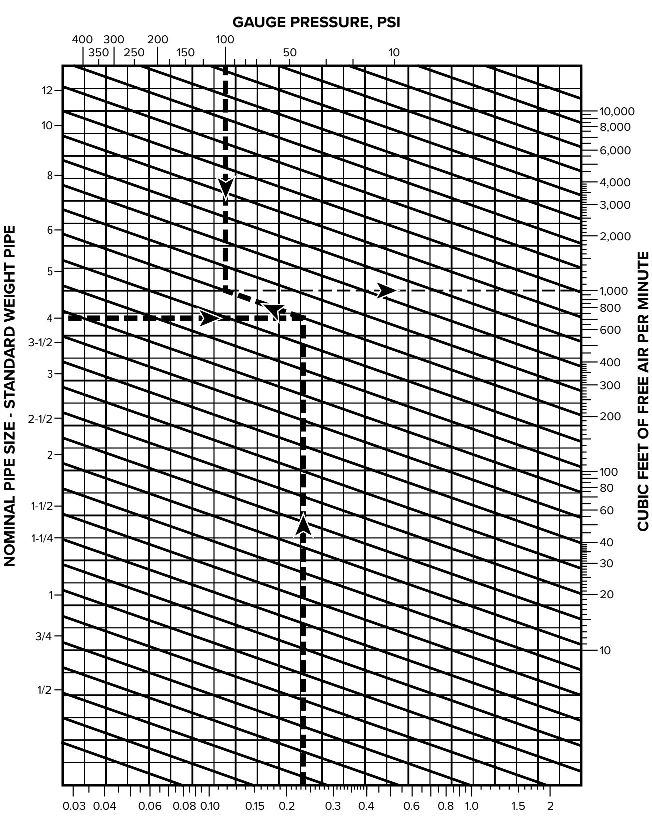


Chart LD-4. Pressure Drop in Compressed Air Pipe
Chart gives pressure drop in compressed air piping in pounds per square inch per 100 ft of pipe. Initial pressure, flow and size of pipe must be known or assumed.

Liquid Drainers

Branch Lines

Branch lines are takeoffs of the air main supplying specific areas of air-utilizing equipment. Branch lines must always be taken from the top of the air main. The entire system must be designed and hooked up to prevent accumulation of liquid at any point. If a specific process area requires it, an air dryer will be installed on the branch line.

Trap Selection and Safety Factor for Branches

The formula for computing liquid load in branch lines is the same as that used for air mains. Branch lines also have a recommended safety factor of 10% of total air load. Drip legs must be installed ahead of risers and at the end of branch lines, especially when branch line runouts exceed 50 ft. There are usually several branches off the air main, and in many cases they experience a high liquid load when they run against cold outside walls. This cooling causes more moisture to condense in the branch line than would be seen in the air main.

Distribution Manifolds

A distribution manifold is a terminal for a branch line from which several air users are taken off. They are particularly common in manufacturing facilities for pneumatic tool hookups or takeoffs to cylinder actuators. Like branch lines, it is common for distribution manifolds to be installed against cool walls where low temperatures cause condensation and the accumulation of liquid.

Distribution manifolds are often equipped with filters and regulators. Regulators may also be found at the termination before the air-using device.

Since the air distribution manifold is usually one pipe size larger than the branch line, it is common for air velocity to drop when coming from the branch line. With this decrease in velocity, often combined with lower ambient temperatures, it is common for a liquid to accumulate in the distribution manifold. For this reason, the use of filter-drainer combinations or separate drain traps is recommended. Trapping the liquid in the distribution manifold is important to protect the regulators on air-using equipment and orifices in air-using instruments.

This is a location where manual valves are commonly misused due to their accessibility. To drain the liquid and keep it from fouling an instrument or pneumatic tool, manual valves will often be cracked to atmosphere. When they are left this way, the result is a large air loss due to the unrestricted free blow of air to atmosphere.

Trap Selection and Safety Factor for Distribution Manifolds

Normally the smallest drain trap is practical for distribution manifolds up to manifold diameters of 2". Above 2", the distribution manifold should be considered a branch, and then the sizing procedure from the Air Main section would apply.

Chart LD-5. Recommendation Chart
(See chart on page LD-6 for "Feature Code" references.)

Equipment Being Drained	1st Choice and Feature Code	Alternate Choice
Branch Lines	FF B, C, D, J, M	FP*
Distribution Manifolds	FF B, C, D, I, M	FP

*IB is a good alternative where heavy oil carryover is likely.

Installation

The ABCs of trap installation must be followed: “A” for accessible, “B” for below the point being drained, and “C” for close to the point being drained. If the discharge point for this drain trap is some distance away from the drain point, the discharge line from the trap should be run out—not the inlet to the trap.

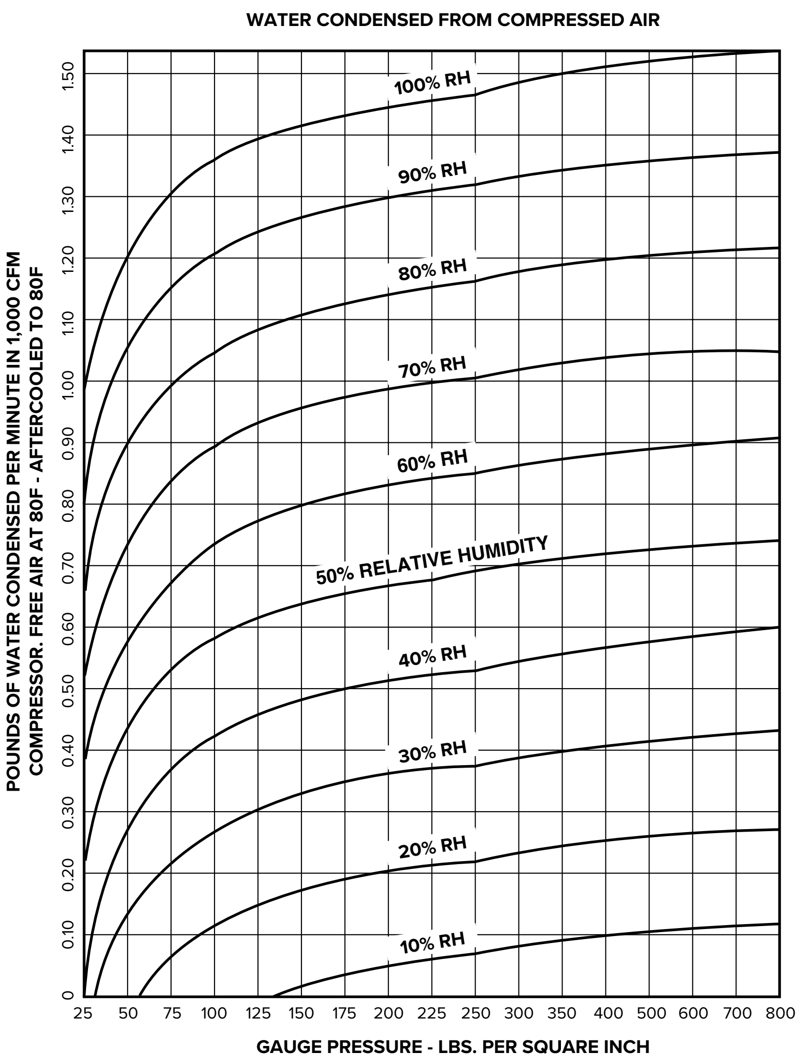
When installing traps on the drain connection of filters, particular care should be taken to the connection size. Normally outlet connections on filters are 1/4" in size or less. This connection size is normally not large enough to allow anything but slugs of liquid to flow into the trap housing. If a float trap is utilized, it should be either back vented or the connection size must be increased to 3/4" minimum. For additional installation recommendations, see pages LD-51 and LD-52.

Table LD-3. Correction Factors

For lbs water condensed at temperatures other than 80°F, find wt condensed at 80°F and multiply by factors shown.

°F	Factor	°F	Factor	°F	Factor	°F	Factor
10	.070	50	.373	100	1.81	140	5.15
20	.112	60	.525	110	2.39	150	6.52
30	.176	70	.729	120	3.12	160	8.19
40	.259	90	1.35	130	4.02	170	10.2

Chart LD-6. Water Condensed From Compressed Air



NOTE: Amount of water condensed is in direct ratio to compressor rating. For example, for 500 CFM compressor, multiply determined amount of condensate by 0.50; for 200 CFM compressor, multiply amount of condensate by 0.20.

Liquid Drainers

How to Drain Intercoolers, Aftercoolers, and Aftercooler Separator Combinations

Aftercooler

An aftercooler serves as the primary means of moisture removal on industrial air systems. It increases the efficiency of air distribution by reducing pressure drop created when air flows through the system. It does this by using cooling water to reduce the specific volume of the air which, in turn, allows the air to flow through the system with less pressure drop. Aftercoolers are found on most industrial compressors over 10 hp in size. In addition to removing the heat of compression, aftercoolers also remove approximately two-thirds of the liquid found in the air, and help in the removal and knock-down of oil carryover from the compressor.

Intercooler

Compressor intercoolers are designed to increase the efficiency of compression by reducing the temperature and specific volume of air between stages of compression. This allows the compressor to do more work at a lower temperature than would normally occur. Because some condensing will occur in the intercooler, a drain trap is required to protect compressor parts.

If liquid were to carry over from the intercooler, it could also carry dirt or scale into the compressor and/or also cause corrosion within the compressor, both of which are undesirable for efficient compressor operation. If slugs of liquid were to pass from the intercooler into the compressor, it would make the compressor operation erratic. Efficient trapping is required at this point to deliver dry air to the next stage of the compressor.

An intercooler is typically a shell and tube heat exchanger. Liquid condensate flow out of the heat exchanger is usually irregular, causing slugs to accumulate and pass into the drain trap. Because of this, a drip leg is required on the intercooler, and full size outlet piping from the intercooler must be used into a dirt pocket. The drip leg allows the slug of condensate to be handled by the drain trap and handles some small backup while the drain trap is discharging the liquid.

The intercooler may also experience oil carryover if the compressor is not of the oil-less or sealed type. As air enters the intercooler, it carries a mist or tiny droplets of oil along with it. Because the air is at a relatively high temperature, this oil is fairly thin. Then, as the intercooler cools the air and oil, the oil may thicken. The drain trap must be able to discharge this oil before it thickens and negatively affects the drain trap and intercooler operation. Trap selection is very important in this type of application where a water and oil mix must be handled by the trap and the oil must be discharged first.

Since the aftercooler removes approximately two-thirds of the total moisture load, traps here will normally be much larger than those found on the rest of the system.

Trap Selection and Safety Factor

Intercooler

Select the proper trap for:

1. Entering water temperature into the intercooler.
2. Airflow rate through the intercooler.
3. Intermediate pressure at which the intercooler is operated.

Use Chart LD-6 on page LD-20, “Water Condensed From Compressed Air,” to determine the pounds of water condensed per minute in 1 000 CFM. Then multiply by 60 to convert minutes to hours and use a safety factor of 2:1.

Chart LD-7. Recommendation Chart
(See chart on page LD-6 for “Feature Code” references.)

Equipment Being Drained	Air		Gas	
	1st Choice and Feature Code	Alternate Choice	1st Choice and Feature Code	Alternate Choice
Aftercooler	IB F , G, J, K, M	FF	*FF B, E, J	FP
Intercooler				

*Since IBs vent gas to operate, an FF is suggested because gas venting may not be desirable.

How to Drain Intercoolers, Aftercoolers, and Aftercooler Separator Combinations

When selecting the type of trap, consider the failure mode and the ability of the trap to respond to slugs of liquid. In most cases, an “open” failure mode will be desirable as it is vital to protect the compressor from slugs of liquid. A quick response to slugs is important so there is no delay between the time the liquid accumulates and the trap discharges the liquid.

Aftercooler
When the aftercooler condensing rate is not known, there are two typical methods for calculating condensate load. The first method is to calculate total airflow through the system. Then using Chart LD-6 on page LD-20, titled “Water Condensed From Compressed Air,” determine pounds of water condensed per minute in 1 000 CFM. Multiply this by 60 to convert minutes to hours for required trap capacity in pounds per hour (the entering maximum incoming summertime temperature and relative humidity must be known to use this chart). This load is then multiplied by 2 to determine required trap capacity.

The second method of calculating trap capacity is to look at maximum allowable flow rate through the aftercooler. Use the “Water Condensed From Compressed Air” chart on page LD-20 in the same manner as described in Method 1. Although this method will normally yield a larger trap size, it allows for the addition of another compressor or the interconnection of several compressors to the system in the event of unplanned by-passes.

In the second method, it’s important to estimate the average water temperature within the aftercooler as closely as possible. Not all air actually comes in contact with the water tubes; therefore, the air is not uniformly cooled to the water temperature. If actual leaving air temperature is known, this is by far the most accurate figure to use. A properly sized aftercooler will normally cool compressed air down to within 15°F of entering air temperature.

Installation
When installing drain traps on aftercoolers or aftercooler separator combinations, the “ABCs” of trap installation should be followed:

Accessible for maintenance and repair.
Below the point being drained.
Close to the drip point as possible.

Be sure to follow manufacturer’s instructions on trap installation. Most aftercoolers are equipped with a separate separator. However, if a separator is not furnished, the aftercooler must be trapped individually. In the case of the aftercooler/separator combination, only the separator normally requires a trap. See Fig. LD-18 or LD-19. But again, it is important to follow manufacturer’s instructions. For additional installation recommendations, see pages LD-51 and LD-52.

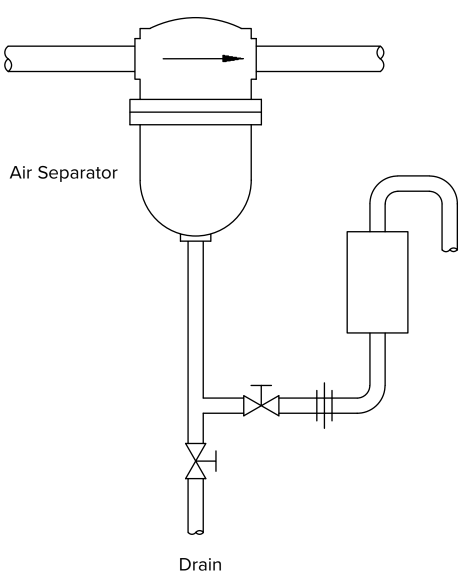


Figure LD-18. Installation of a 200 Series inverted bucket drain trap on compressed air contaminated by oil.

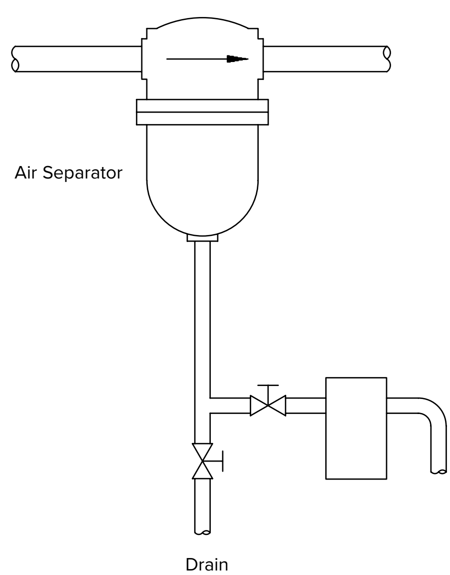


Figure LD-19. 800 Series inverted bucket drain trap installed on compressed air contaminated by oil.

How to Drain Separators, Separator Filter Combinations

Separators serve an important function within the compressed air system. Separators may also be known as knockout pots, knockout drums or demisters. Their function is to remove liquid that may be moving at a high speed from the flowing air, and they normally perform this function in a two-step process.

1. Separators increase the flow area and volume of the gas, thereby reducing its velocity. Air within the system may flow at velocities exceeding 100 mph. At this velocity any liquid will be entrained as droplets and will not be flowing along the bottom of the pipe. To remove these liquid droplets, it is necessary to reduce the velocity of the gas; otherwise, the droplets accumulate and again become entrained with the flowing gas.

2. The second step is to change direction and impinge the liquid. As the velocity of the gas is reduced, the velocity of the fast-moving droplets can be reduced even further by causing the air to take either 90-degree turns or to centrifugally flow within a chamber. Both of these methods serve to “sling” the droplets up against baffles, plates or the wall of the separator.

Because the droplets have a relatively high mass and are incompressible, their velocity will drop dramatically. At this point, gravity will take over, causing the drops to accumulate and flow into the bottom of the separator. Liquid will often fall in sheets down the wall of the separator and collect at the outlet piping in slugs. The immediate drainage of the slugs is important since the separator is normally a final opportunity to protect an air-using device downstream.

If liquid is allowed to accumulate for any amount of time, it may undermine the entire purpose and function of the separator. Therefore, if the separator does not do its job efficiently, it can actually become a reservoir that accumulates condensate and forms slugs to be transmitted down the air line and into the device being protected. In this case, the use of a separator may be worse than no protection at all.

Locations

Separators are normally located on the leaving side of aftercoolers and before the compressed air receiver. They are often integral with filters located before sensitive air-using equipment or as part of the filter on a distribution manifold. In this case there may be a combination filter, oiler, regulator and separator drainage point for liquids to accumulate.

Trap Selection and Safety Factor

If the separator is part of an aftercooler combination installed between the compressor and the receiver, you should refer to the section on Aftercoolers and Aftercooler Separators for trap selection.

Trap selection is fairly critical, especially on equipment with **larger than** 1" air lines feeding it, since slug formation can wash scale into the air-using equipment and become a serious dirt problem. Therefore, on larger than 1" separators, the flow should be calculated by totaling the air consumption of the devices downstream and using Chart LD-6, “Water Condensed From Compressed Air,” on page LD-20. Use the full water load expected and the safety factor of 3:1 to figure trap capacity.

Chart LD-8. Recommendation Chart
(See chart on page LD-6 for “Feature Code” references.)

Equipment Being Drained	1st Choice and Feature Code	Alternate Choice
Separator Line Size > 1"	FF* J, B, C, E	IB
Separator Inlet Pipe < 1"		FP*

*IB is a good alternative when heavy oil carryover is likely.

To determine proper trap capacity for separators with a pipe size of **less than** 1", the flow can be estimated by using Chart LD-6, “Water Condensed From Compressed Air,” on page LD-20, and then calculating 20% of full load.

The safety factor for both selection procedures is 3:1 since separators must respond to surges of liquid from the inlet. In this case, the trap must handle far more liquid than would be experienced under normal operation.

Installation

When installing ball float type traps on separators 1" and above, it’s important to back vent the trap (refer to the section on how to hook up ball floats for the purpose and function of back vent lines, page LD-51). All other types of drainers should be coupled as closely as possible to the drain leg. The drain leg should be the same size as the drain connection on the separator and extend 6" below the separator with another 6" allowed for a dirt pocket. The trap is then tee’d off this line (see Figs. LD-20 and LD-21). This piping is crucial because, as noted above, if the separator does not receive full drainage, it can be worse than no separator at all. For this reason, the “ABCs” are critical:

Accessible for inspection and maintenance.
Below the equipment being drained.
Close to the drain point.

The line size leading from the drip leg to the inlet of the unit should be kept the same size as the trap inlet for good drainage into the trap. Again, when slugs are being handled it’s important that the trap begin draining immediately. Back vents on float type traps should be a minimum of 1/2" in pipe size with 3/4" preferred. Any valves used in this back-vent piping should be full ported to allow free gas flow out of and liquid flow into the drain trap. For additional installation recommendations, see pages LD-50 to LD-52.

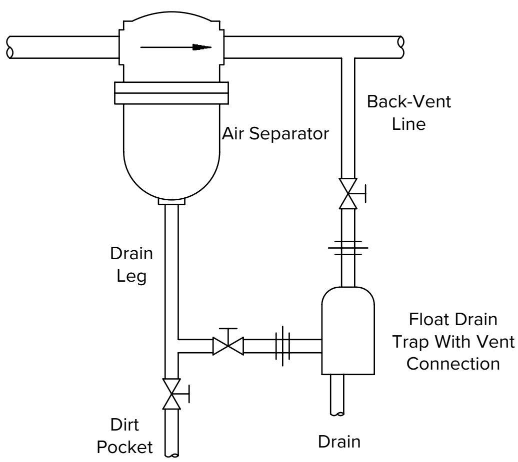


Figure LD-20. Installation of a drain trap with equalizing line downstream of the separator in order to assure a quick and regular flow to the drainer. Note side inlet connection from separator.

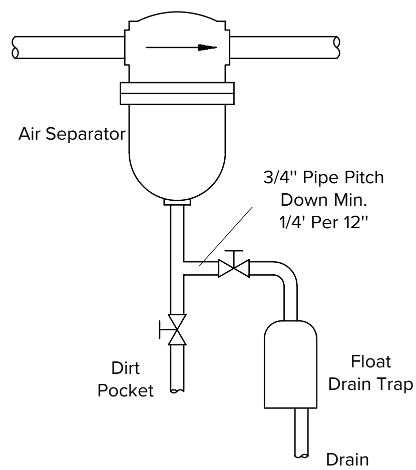


Figure LD-21. Installation of a drain trap on side of separator.

How to Drain Receivers

Receivers perform the vital function of storing air for the system. The receiver dampens pressure fluctuations in the system and provides a very short storage time in the event of compressor failure. It also functions as a liquid knockout drum to prevent entrained liquid (which may carry over) from entering the compressed air dryer or the air mains. The receiver should be sized to provide enough storage time for an orderly shutdown, particularly in the case of instrumentation air systems. Receiver volume is what provides the amount of air required for storage periods.

The receiver should be located close to the compressor. Fallout of liquid is normal due to low velocity within the receiver. Velocity is at the lowest point it will reach in any other part of the operating system. The air has a high dwell time within the receiver and is more likely to cool to ambient. This cooling of the air is what causes moisture to condense.

The receiver is equipped with a drain port at the bottom to allow liquids to flow to drain traps. In many cases, because receivers are so large and located adjacent to the compressor, they are installed close to the floor. When this happens, the drain point is relatively inaccessible, making trap piping difficult and gravity flow into the trap often impossible. To avoid this, the receiver should be located on a small concrete pad, which will facilitate efficient drain trap installation and operation.

For several reasons, it's good to keep the receiver drained. When receiver volume is lost, the dampening of the compressed air pressure is reduced and the storage time between compressor failure and system shutdown is greatly reduced. Corrosion within the receiver can also take place when liquid is allowed to accumulate.

Manual valves are commonly used to drain receivers since they are typically installed close to the floor. The resulting loss of receiver volume is seldom noticed in the day-to-day operation of the system. However, with any manual system, the valve can be forgotten and not opened. Then, when the weather changes from a relatively dry, low moisture load to a warm, high moisture load, the receiver will lose volume and the dampening effect and accumulator effect are decreased. The compressor can short cycle under these conditions, increasing the wear and tear on the compressor. In addition, the only reminder to open the manual valve is when carryover occurs. In this case, an air dryer can be damaged, liquid can be introduced into the air mains and surge through the system, causing scale to be washed into the system, water hammer and/or freeze damage.

Trap Selection and Safety Factor

To select the proper trap for the receiver, it is necessary to calculate total system load using Chart LD-6, "Water Condensed From Compressed Air," on page LD-20. Once this total potential load is known, it will be multiplied by the following factors: With an aftercooler, multiply the load by 50%, with an aftercooler separator combination, multiply the total load by 40%, and if no aftercooler is present, multiply the total load by 70%. Once this load is known, a safety factor of 2:1 is applied.

Table LD-4. Total System Load Multipliers

Calculate Total System Load with	Aftercooler	Aftercooler Separator	None
Multiply by	50%	40%	70%

Chart LD-9. Recommendation Chart
(See chart on page LD-6 for "Feature Code" references.)

Equipment Being Drained	1st Choice and Feature Code	Alternate Choice
Receivers	FS* C, E, I, J, K	IB D

*FF for over 120 lbs/hr load.

Installation

When a float type drain trap is used with a receiver, the level will run at about the inlet connection on the trap. Therefore, it is important to locate the trap as close to the floor as feasible and with no dips in the piping. See Figs. LD-22 thru LD-25. If there is a piping dip with a float type unit and the vent connection is not back vented, the unit will fail to operate. In the case of a back-vented unit, the dip in the piping will be flooded at all times. An inverted bucket trap can be installed above floor level since it will operate above the drain point. An internal check valve, tube and coupling should be installed to prevent the liquid seal from flowing backward on system shutdown. A snap action type float unit should be used when any amount of grit is expected in the system. In this case, the spring life can be extended by moving the drain trap slightly upward to allow liquid to accumulate both within the receiver and within the trap body between trap cycles. For additional installation recommendations, see pages LD-50 to LD-52.

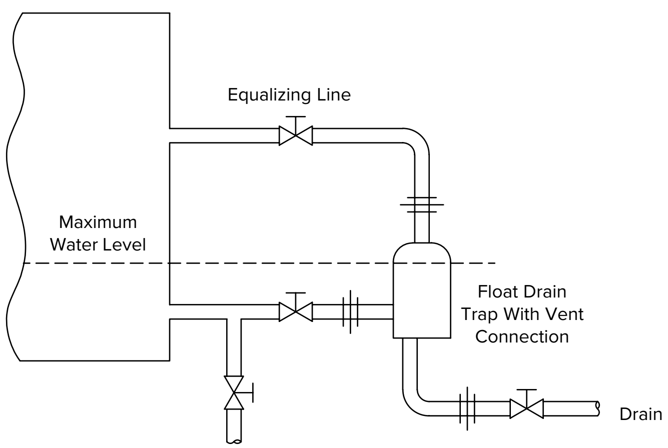


Figure LD-22.
Drain trap installed at side of a receiver, close to floor. Water will rise to broken line before drain trap opens.

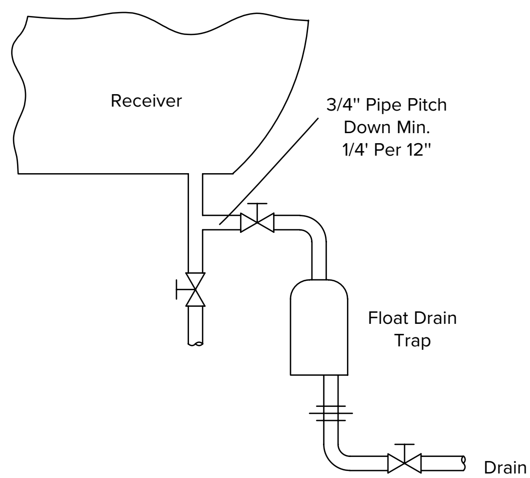


Figure LD-23.
Install the drain trap on side to get better access or compensate for lack of space under the receiver (particularly for drain trap used under compressors).

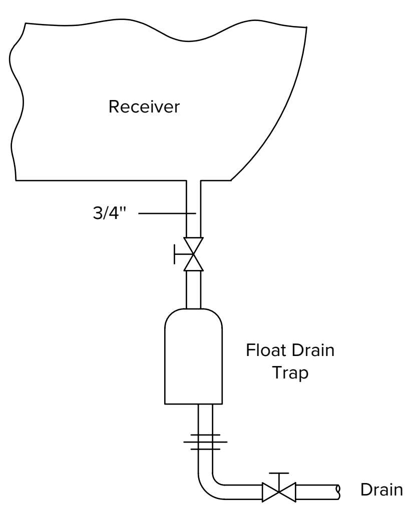


Figure LD-24.
Installation **not recommended** because of the dirt problem that can occur with a drain trap installed straight under the receiver.

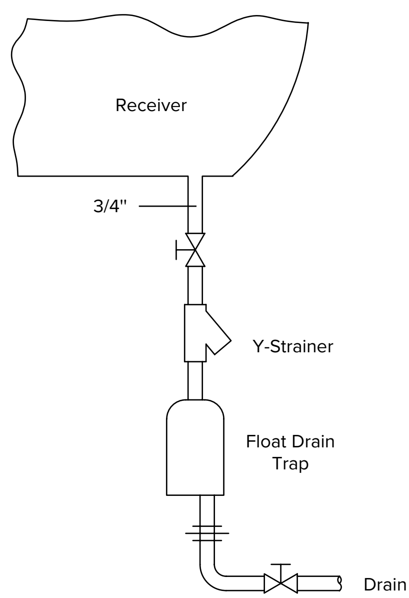


Figure LD-25.
Same installation but with a strainer protecting the drain trap.

Liquid Drainers

How to Drain Dryers

The function of dryers is to eliminate liquid in applications where freezing or any moisture accumulation can cause serious problems with the air-consuming equipment. Dryers should always be installed on instrument quality air systems.

Two basic dryer types are dessicant and refrigerated. In the dessicant type, the dessicant chemical absorbs the liquid by chemically bonding with the water molecules. Dessicant dryers can achieve very low dew points and are often installed with a pre-dryer of the refrigerant type. Refrigerant dryers work the same as aftercoolers by circulating cold fluid, causing the moisture to condense. However, their ability to reach low dew points is limited by the temperature at which frost will form on the heat exchanger tubing (greatly reducing heat transfer).

This leads to a discussion of air dew point. Dew point is the temperature at which moisture will condense out from the air due to its relative humidity increasing above 100%; see Chart LD-11. When this happens, the moisture condenses out and can be drained to a drain trap. Dew point is also important when considering air that has left the dryer, because if the air is ever exposed to temperatures below its dew point, moisture will form. Therefore, when applying air dryers, it is important to consider two features of compressed air usage that will impact dryer selection.

1. When air is compressed, the dew point is increased. Also, the dew point under pressurized conditions must be known. For example, even though a -40°F dew point is achieved at atmospheric conditions, this becomes a dew point of about 10°F once the air has been compressed to 100 psig. In outdoor systems, when the temperature drops below 10°F, condensing and freezing of that moisture will result.

2. When compressed air is expanded through instruments or air tools, its volume increases, pressure decreases and a temperature drop is usually experienced. If the temperature drops below the dew point of the air, undesirable moisture forms in the equipment. The air would never be subjected to that temperature under any conditions other than when expanding.

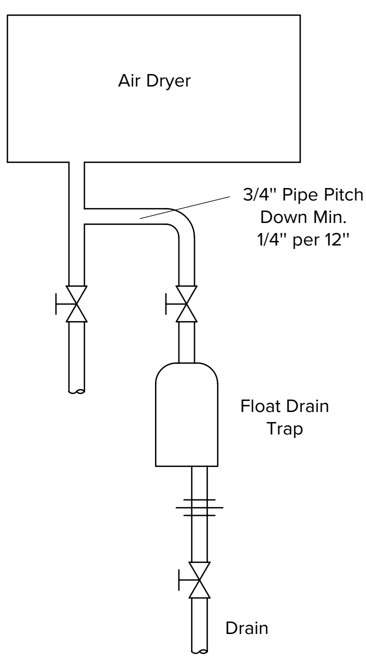


Figure LD-26.
Drain trap installation with dirt leg for purging the dirt.

Chart LD-10. Recommendation Chart
(See chart on page LD-6 for “Feature Code” references.)

Equipment Being Drained	1st Choice and Feature Code	Alternate Choice
Dryers	FF B, C, J, N	IB FP

Drain traps are usually required on refrigerated type dryers only. Here the refrigerant chills air and creates moisture that the drain trap can discharge. In the case of the dessicant type air dryer, the chemical grabs the moisture and bonds chemically with the water molecules, and no liquid accumulates. These bonded water molecules are then usually driven off in a regeneration cycle the dryer must periodically undergo.

Trap Selection and Safety Factor

In most cases, the dryer manufacturer will rate the dryer for a given moisture removal rate. The safety factor should still be applied to this load, however. If the manufacturer's ratings are not known, then it's necessary to calculate the moisture content of the air at aftercooler conditions and the moisture content at ambient conditions. Using the lower moisture content between these two, compare that figure to the moisture content at the dew point of the air leaving the dryer. The difference in these moisture contents is then multiplied by the airflow through the dryer to determine the moisture load. The safety factor applied to the load is 2:1 since liquid should be drained immediately from the dryer and the liquid tends to flow into the drain trap in slugs.

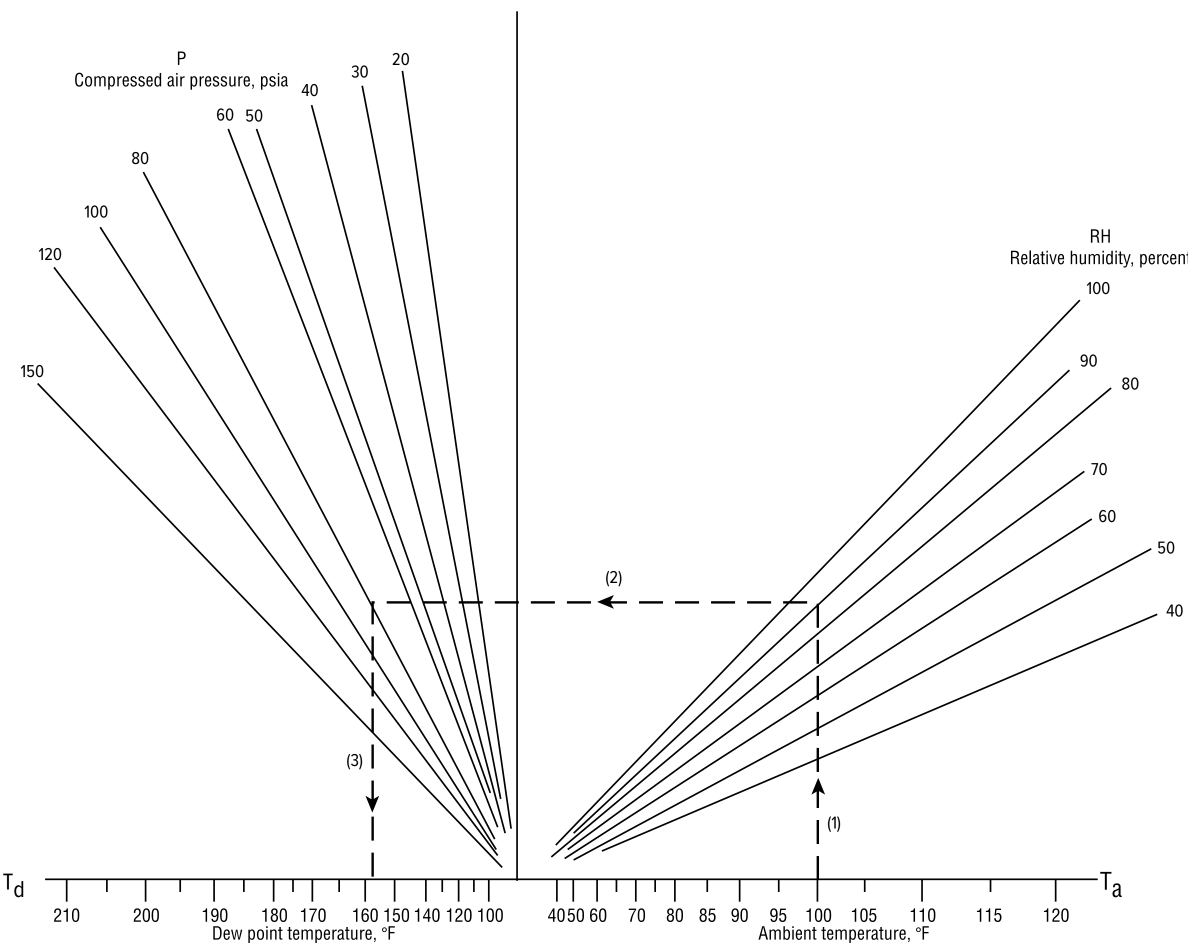
Installation

The dryer should come with a drain port of a given pipe size sufficient to handle the liquid coming out of the dryer. In this pipe size, a drain leg should be piped up 6" below the dryer with another 6" below that as a dirt pocket. Teeing off this line and into the trap with the same inlet size as the trap will allow for gravity drainage into the trap. Again, the ABCs of trap installation should be followed:

Accessible.
Below the point being drained.
Close to the drain leg as possible.

If the trap is too close to the floor to allow the use of a ball float trap, an inverted bucket trap should be considered. For additional installation recommendations, see pages LD-50 to LD-52.

Chart LD-11. Estimated Dew Point of Compressed Air



Nomograph estimates dew point of compressed air.