

Plumbing Guide

HT-500 / LT-500



BIO-RESPONSE
SOLUTIONS



AQUAMATION

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Plumbing Guide

HT-500 & LT-500



The HT-500 and LT-500 systems require hot and cold water connections, a drain line, and a vent line. Please see the attached drawing for system dimensions and connections. Special considerations must be made for the drain and vent lines to prevent odor issues (and foaming issues during draining). As with any system that fills with water while unattended, a containment method and floor drain (or alternative solution) is **Required**.

STEP 1: PRE-INSTALLATION

1. DRAINING BY GRAVITY VS PUMP

- a. Most system installations are able to be gravity drained.
- b. A discharge pump must be ordered if the system is unable to gravity drain (gravity draining requires a floor drain or near ground level drain; discharge height is ~8" above grade; or a pump is required if the system must drain above grade). Also, if the system will be draining into a tank, a discharge pump is required.
- c. If a discharge pump is needed, Bio Response should be notified at the time of purchase. All units are prewired and preprogrammed for a pump, so it may be added at any time in the future of the unit is moved and later requires a pump for drainage.

2. HOT WATER HEATER

- a. Hot water is required to provide hot water rinses. Some hot water heaters can also decrease heat up time (and subsequently overall cycle time) for the process.
- b. Recommendations for optional performance: At least 5gpm flow into the unit, preferably a continuous flow (tankless) gas or propane water heater unit where possible. If using a tank type water heater, 120 gallons is optimal but an 80 gallon unit can be used. Gas or propane water heaters are generally able to be hotter. If using an electric water heater a 120 gallon size is highly recommended.
- c. Standard 140 ° F unit is sufficient, however a commercial unit capable of 165 185 degrees F input should be considered for some heavy use customers. This can cut significant time from the heat up, and can improve workflow for an operator using the equipment daily. The customer or contractor can contact us to determine the best fit for use and budget (317-386-3500).

3. FLOOR DRAIN AND CONTAINMENT

- a. As a measure of precaution, provisions for overflow containment is **required**. Just as with any water filled device (such as a clothing washer or dishwasher), It is possible for a water valve to stick open and flood the area in which case a floor drain or revetment with pump are recommended. At minimum seal the wall baseboards to prevent water from going under the wall into other spaces.
- b. A floor drain near the machine is preferred, with a curb/berm to direct any liquid to the drain.
- c. If a floor drain is not present, or the machine will be located too far a distance from the floor drain, a curb/berm directing overflow to a sump should be explored.
- d. The purpose of the curb/berm is to direct flow to an outlet. This has been seen as permanent concrete curbs, portable plastic spill berms (available for purchase online, these are typically moveable), and simple solutions like 2x4 pressure treated wood adhered to the floor (edges sealed with a silicon or alternative sealant). The equipment owner is responsible for choosing the best solution for their installation. Please consider the damage that would occur to the space (and the neighboring spaces) if a significant water leak occurred. A curb or berm or berm with sump pump is a low cost prevention measure.

4. WATER SOFTENER

- a. Please speak with Bio-Response if the facility location has known hard water. A good indication is whether households use water softeners to protect their water heater and appliances. We recommend softening the water if it is hard, because part of alkaline hydrolysis is to convert fats to soap; this saponification step is important to complete hydrolysis and is much more effective in soft water. If your water is not extremely hard you may wish to try the process before adding a water softener.

5. FACILITY ASSESSMENT

- a. By the time the plumber arrives to plumb the system, (and dry cooler if a HT unit) the unit will already be set in place by the customer or rigging team, and the fork truck will be gone. If there are any plumbing, logistics, or space concerns, the customer should involve the plumber before this point. Often times, the plumbing/drain location is the determining factor for placement.
- b. Please refer to attached drawings. The standard HT-500 and LT-500 systems have a right mounted control cabinet that requires 3' of space to the right of the unit for opening the control cabinet (by code). The touch screen HMI faces the right. Bio-Response does offer left hand configuration or a custom standalone control module, at a slight upcharge, for sites that do not have the space for the standard unit; please inquire.
- c. Some options require additional space: discharge pump, pH reduction, filter. Please contact Bio-Response for information.
- d. A utility sink is recommended for general purpose use (cleaning, handwashing, etc.).

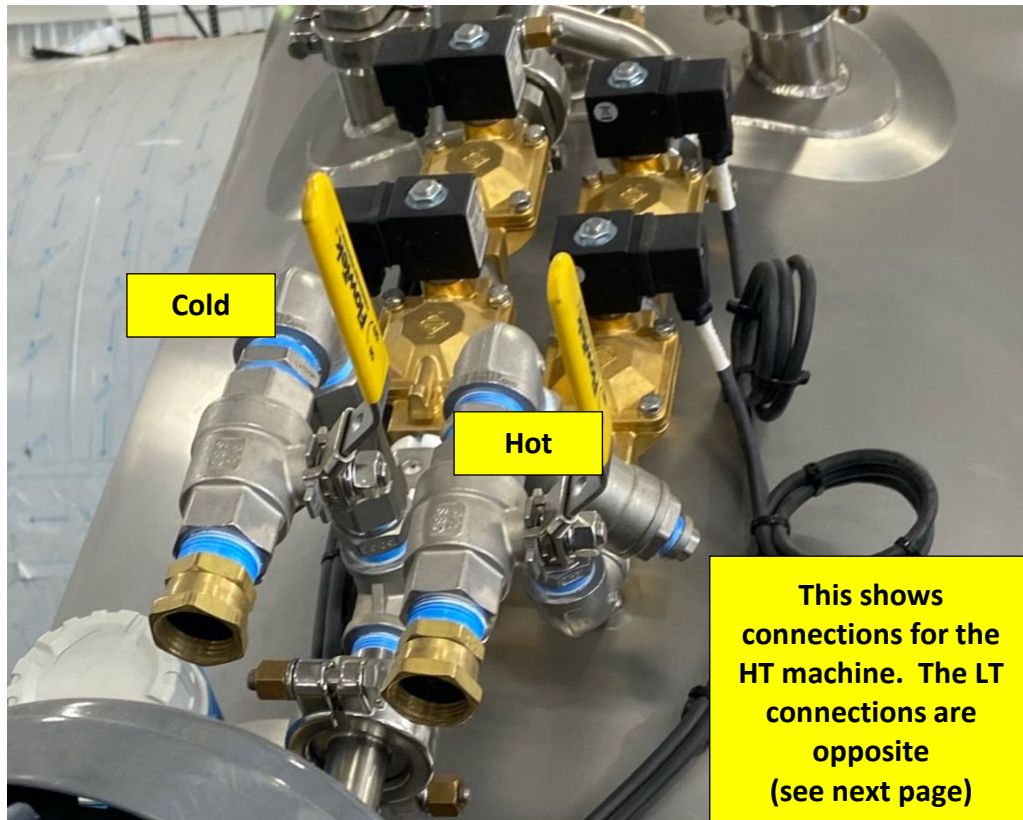
- e. A safety shower and eyewash station are required. It is recommended that this unit be located next to the machine for facilities using dry alkali, not next to the dry alkali storage. Bio-Response recommends any unit compliant with ANSI Standard Z358.1 (example: [Guardian G1902P](#)). Special units are available for installations where freezing could be an issue. Un-plumbed compliant units are also available (example: [Guardian G1562](#)). Each customer is responsible for their own layout; please contact us for guidance. *Please refer to the Facility Setup guide for QR Code links to each example.*
- f. *Note: While not a requirement, a direct drain line to the sewer is preferred over a line that is shared/connected with other businesses' plumbing (i.e. common with industrial complexes with multiple units). Please contact Bio-Response for discussion. Discharge to a septic system is not recommended; please contact Bio-Response for alternative solutions.*

THE FOLLOWING APPLIES TO THE HT-500 UNIT ONLY

The HT-500 utilizes a dry cooler system to initially cool the unit prior to draining. The dry cooler is much the same as the radiator and fan on any car or truck. This system requires additional space considerations to be made when selecting and installation area. The dry cooler should be located outside the building and as close to the unit as possible. Some customers in very cold regions have elected to place the dry cooler inside with a direct ventilation access to the outdoors. The dry cooler exhausts a tremendous amount of heat at the end of the process, and if located indoors must be ventilated to the outdoors to prevent overheating the facility. A photo of an outdoor installation appears later in this document.

STEP 2: INSTALLATION

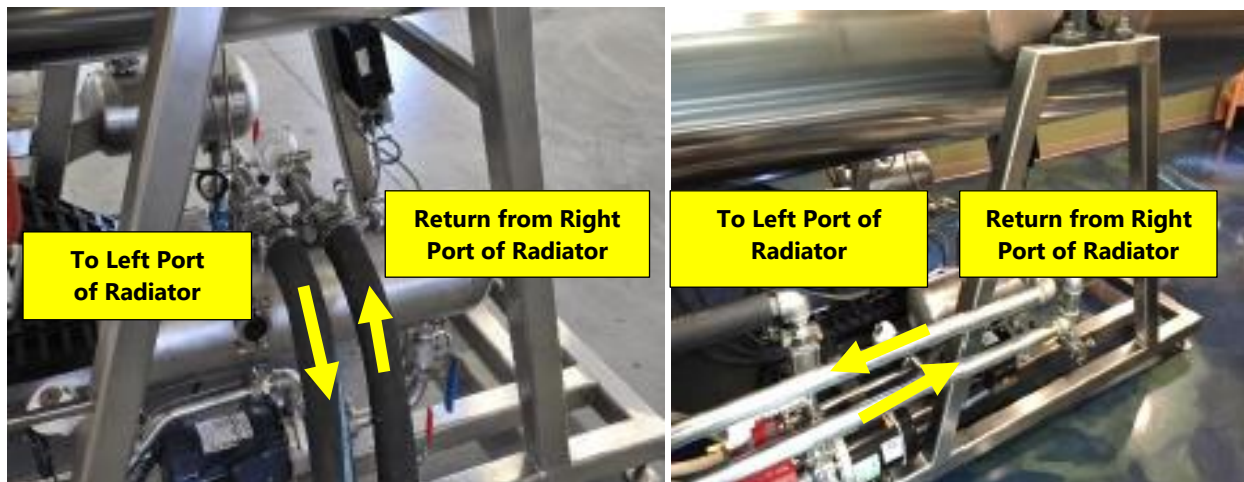
1. HOT AND COLD WATER CONNECTIONS (Connection is same of HT-500 + LT+500)
 - a. These units require both hot and cold water connections. Ten-foot connection hoses come shipped with the unit.



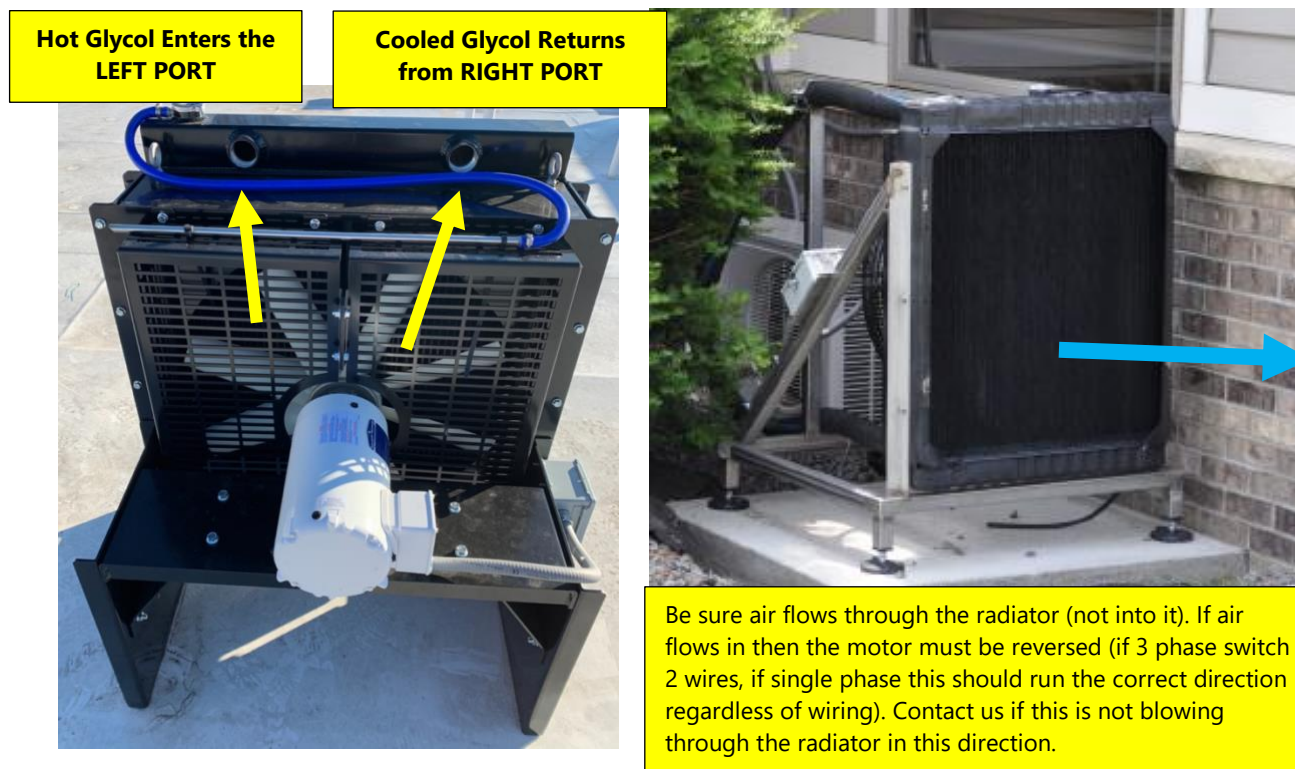
New plumbing lines must be flushed of debris before making the connections to the machine's valves. Special care should also be taken to prevent any material shavings (for example, PVC or copper spiral shavings) from entering the pipes. Such debris can cause water valve failures (such as sticking open) and possible flooding of the facility could result.

For HT Unit Only, Dry Cooler Installation

The dry cooler cools the system from the highest operating temperature (302 degrees F), down to a customer selected temperature prior to co-flush draining (typically down to 180 to 200 degrees F). Pipe and/or hose material must be rated for high temperature and propylene glycol (galvanized pipe, stainless steel pipe, or high temperature EPDM hose are recommended).



The dry cooler system is filled with a 50:50 mix of glycol / water (suitable for the coldest temperatures expected). This is pumped through a coil in the vessel then is pumped to the bottom port of the radiator, through the radiator where a fan provides cooling, then back to the glycol reservoir from the top port of the radiator. The pump pulls from the glycol reservoir. This is a very low energy consuming method of cooling. If water were used for this cooling as much as 500 gallons per cycle would be required! The dry cooler works exactly as the radiator on any gasoline or diesel-powered car or truck.



1. Interior Considerations

- a. The vent can be terminated from the building in two ways: Roof or sidewall (see photos below). A line to the roof is recommended, but if this is not possible the vent needs to be terminated as high as possible in a sidewall application. Please do not vent the unit under a soffit; odor and vapor will re-enter the building. It is imperative that the vent line has no trap, droop, or belly in it. It must remain clear at all times. It is acceptable for condensation to run back down the vent line and into the machine, but a vent line with a belly will fill with condensation and block itself, which will cause back-pressuring in the system (which will interfere with water fill level sensing).

2. Exterior Considerations

- a. Please consider that the line's purpose is to vent some vapor and a strong ammonia odor from the process. In a properly configured vent line, the odor will be eliminated outside by dilution and ultimately UV rays (which destroy ammonia). Many of our customers have different needs –please take note of the facility layout and type and proximity of surrounding businesses/areas to gauge the importance of vent line location and height. Good practice for venting odor is to extend the vent at least 2' over the highest surrounding roof peak. You cannot have a trap on the vent line.



Left, side wall vent discharge
(this can be turned up and taken
to a higher discharge point.
Vapor is most active during
heat up (steam vapor)

Right, roof vent discharge



Vent Line; LT Unit:

The system has a 1.5" sanitary connection for a vent line. A Sanitary to 1" Hose fitting is provided with the machine. The vent line exists to vent odor and vapor from the process. The vent line is required for the LT system operation. The line must rise from the machine, with no belly in the line when the machine is in the fully tipped (operation) position. Vent line position does not matter when the machine is in the down (loading) position. The photo below shows the vent line in front of the machine. This is a desirable configuration. A coiled hose can be purchased if the machine vent is directly above the machine (contact us, the coiled hose is a very special item).



Vent Line; HT Unit:

The system has a 1" hose connection that is provided with the machine. The vent line exists to vent odor from the process when filling with water and when discharging. The vent line closes after initial heat up and remains closed during the main processing. The vent line is very desirable for the HT system operation. The line must rise from the machine, with no belly in the line when the machine is in the fully tipped (operation) position. Vent line position does not matter when the machine is in the down (loading) position. The photo below shows the vent line in front of the machine. As with the LT machine this is a desirable vent line configuration. A coiled hose can be purchased if the machine vent is directly above the machine (contact us, the coiled hose is a very special item).



Drain Line Connection

1. This is the most critical aspect of installation. Improper sewer connection will result in odor and foaming problems. The termination of the drain line from the machine must be under water. This is done by terminating the discharge line in the trap below the water line or making a hard connection. Photos below show proper connections.
 - a. *Note: Check local plumbing codes before selecting drain line materials. Some antiquated plumbing codes do not recognize CPVC. One client in Virginia had to de-plumb CPVC and replace it with Schedule 40 PVC. We do not recommend Schedule 40 PVC above grade (it is ok below grade to go into Schedule 40 PVC).*
2. Recommended Drain Materials (in order of preference):
 - a. Galvanized pipe
 - b. CPVC
 - c. ABS
 - d. Schedule 80 PVC (as a last choice)

*Schedule 40 PVC is not recommended. Please call Bio-Response with questions.



Above grade discharge:
Put a trap with a cup on it then stick the discharge pipe into the water of the trap



Floor drain:
Stick discharge into the water into the trap

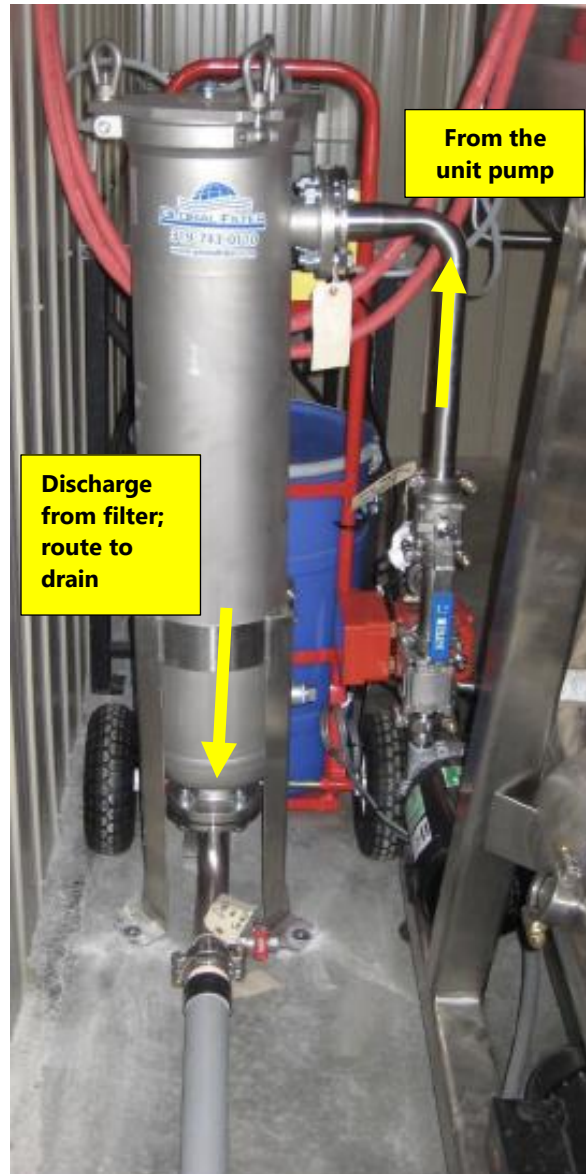


Hard connection: This enters as low as possible, the vent line goes up, and the drain line down.

The key is not to introduce air when draining; air produces foam from the soap that is produced in the process; and allows ammonia odor to escape during discharge. Some plumbing codes may require a trap past the machine. A trap is not necessary because these units have positive shut-off from the machine drain via the drain valve, thus there is no way for sewer gas to back up into the unit. However, a trap can be added past the unit and is required if an open connection is provided as in the top two photos.

Optional Discharge Filter Installation

Some units may come with a bag filter system to filter suspended solids from the effluent prior to discharge. If this is provided then the machine requires pump discharge to push through the filter. The HT comes with a discharge pump, but the LT unit offers a discharge pump as an option. Installation of plumbing terminations are the same except the discharge comes from the filter unit. Photo below shows the filter unit installation.



pH Reduction System Connection:

All Human AH units come standard with CO₂ gas pH reduction unless optional acid pH reduction is specified. CO₂ gas can come from a dewar (higher volume operators) or from one or more ganged together 50 pound CO₂ bottles. Either pH source enters the vessel through the ½" NPT connection to the cryogenic valve at the back of the machine. Gas is regulated to max. 100 psig. You can take the HT to a higher setting, max 150, to speed the pH reduction if desired.



CO₂ gas is regulated to 100 psig for injection. The inlet valve shown below has a brass needle valve to control injection volume (this needle valve is not used for acid injection).

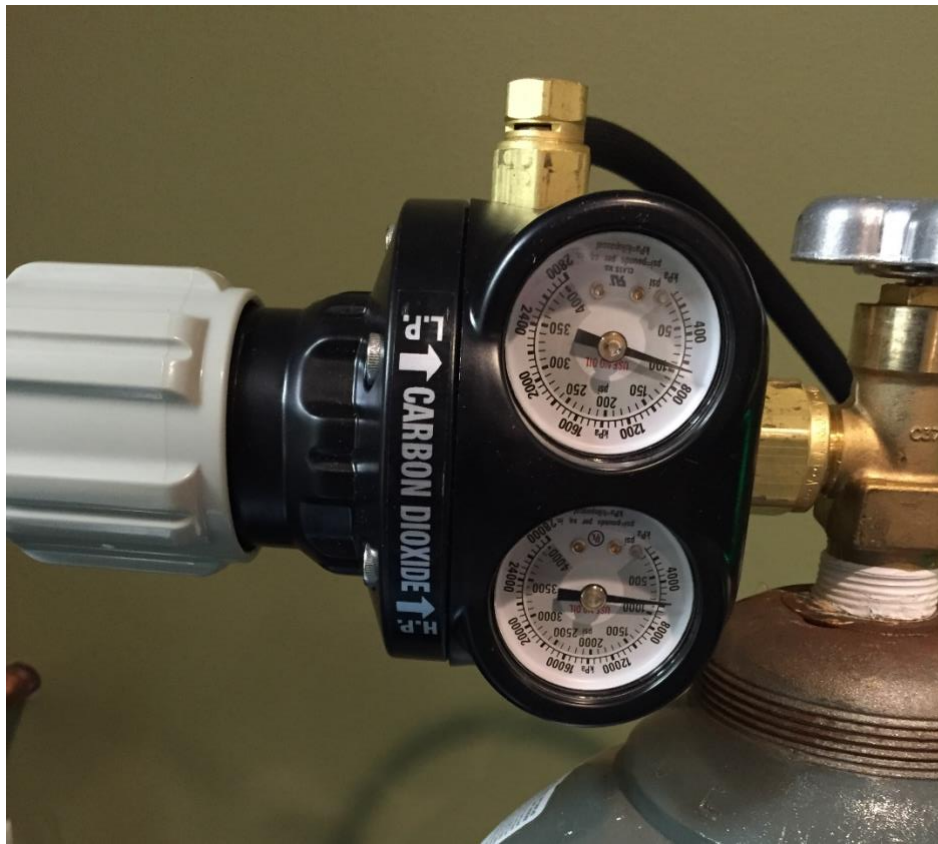


CO2 system

CO2 is available in bottles and dewars. Bottles have normally 700 psig pressure in them. This must be reduced to 90 psig to go into our machines. This requires a gauge on the bottle and a regulator past the gauge to set the pressure at 90 psig. A bottle is shown below with a pressure gauge and regulator. You may gang multiple bottles together. The hose attaches to the regulator and goes to the machine. At the machine the hose requires an end that is male $\frac{1}{2}$ " NPT. This is true for all Bio-Response Alkaline Hydrolysis Systems (Human and PET).



Below the gauge shows 700 psig bottle pressure (bottom gauge) and the pressure regulator is set just below 100 psig (top gauge). Never set the gauge over 90 psig especially for a high temperature AH system.



Below and on the next page are shown two bottles ganged together, with another common gauge setup. The first gauge nearest the bottle shows the bottle pressure and the second gauge shows the pressure setting. This one could be increased to 90 psig but for a PET machine, it can be set lower (depends on the valve opening going into the CO2 valve on the machine)



This regulator is set at 70 psig. For the HT human you can go to 90 psig.



For the Pet and Human Systems if you run more than 3-4 cycles per week it may be time for you to switch from tanks (each tank holds 50 pounds of CO₂) to a dewar. The basic dewar holds 400 pounds of CO₂ however it loses 2% each day if not being used. This is because a dewar is different than a bottle. The bottle is pressurized to 700 psig and can hold the CO₂ indefinitely. The dewar is only 300 psig so to maintain that pressure it has to discharge CO₂ each day in a regeneration step. It makes no sense to have a dewar if you only run one or two times per week whether human or pet systems. If you run daily then you need to switch to the dewar. CO₂ is much less expensive per pound if purchased in a dewar. Dewars can be swapped (like the one shown on the next page) or they can be permanently mounted outdoors and refilled on a routine basis. Most restaurants that have a soda machine use a dewar for their carbonation. Dewars are available in larger sizes also if your volume continues to increase.

See the next page to see what a dewar looks like. You want to use the gas side, not the liquid side. You can use the same regulator and hose on the dewar as you used on the bottle. The decision to go from bottles to a dewar is simply volume related.

Below is a dewar, this one is a 400 pound dewar (holds 400 pounds of CO₂). It is slightly taller than a bottle and about 18" diameter.



You can get the gas regulator at McMaster Carr: It is less than \$200.

<https://www.mcmaster.com/carbon-dioxide-regulators/tank-mount-pressure-regulating-valves-for-air-and-inert-gas-9/>



Male Outlet × Female Inlet Single-Stage Valve With T-Handle

In Summary:

1. You need a hose with a ½" male NPT fitting at the machine end
2. You need a regulator set at 90 psig (6 bar) pressure; no more!
3. You need a bottle, or bottles ganged together, and a tank gauge with a regulator
4. You need to install a CO2 sensor in the room with the machine (for safety, if there is a leak, you cannot breath CO2)
5. Your tank supplier can normally get the hose and gauge / regulator unit

Please call 317-386-3500 with any questions.
Office hours are 8:00am-5:00pm EST. Thank you for your assistance!



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