



**Flo-Pro™**  
**Small Horizontal Tank**  
**Injection System**  
**Installation and Operating Guide**



**Underhill International Corporation**

20505 Crescent Bay Drive • Lake Forest, CA 92630

Phone 949 305-7050 • Fax 949 305-7051

[www.underhill.us](http://www.underhill.us)

**Table of Contents**

**System Configuration ..... 3**

**Getting Started..... 4**

**Sizing the Injector Tank ..... 4**

**Locating the Injection Tank..... 5**

**Metering Setup ..... 6**

**Testing the System ..... 7**

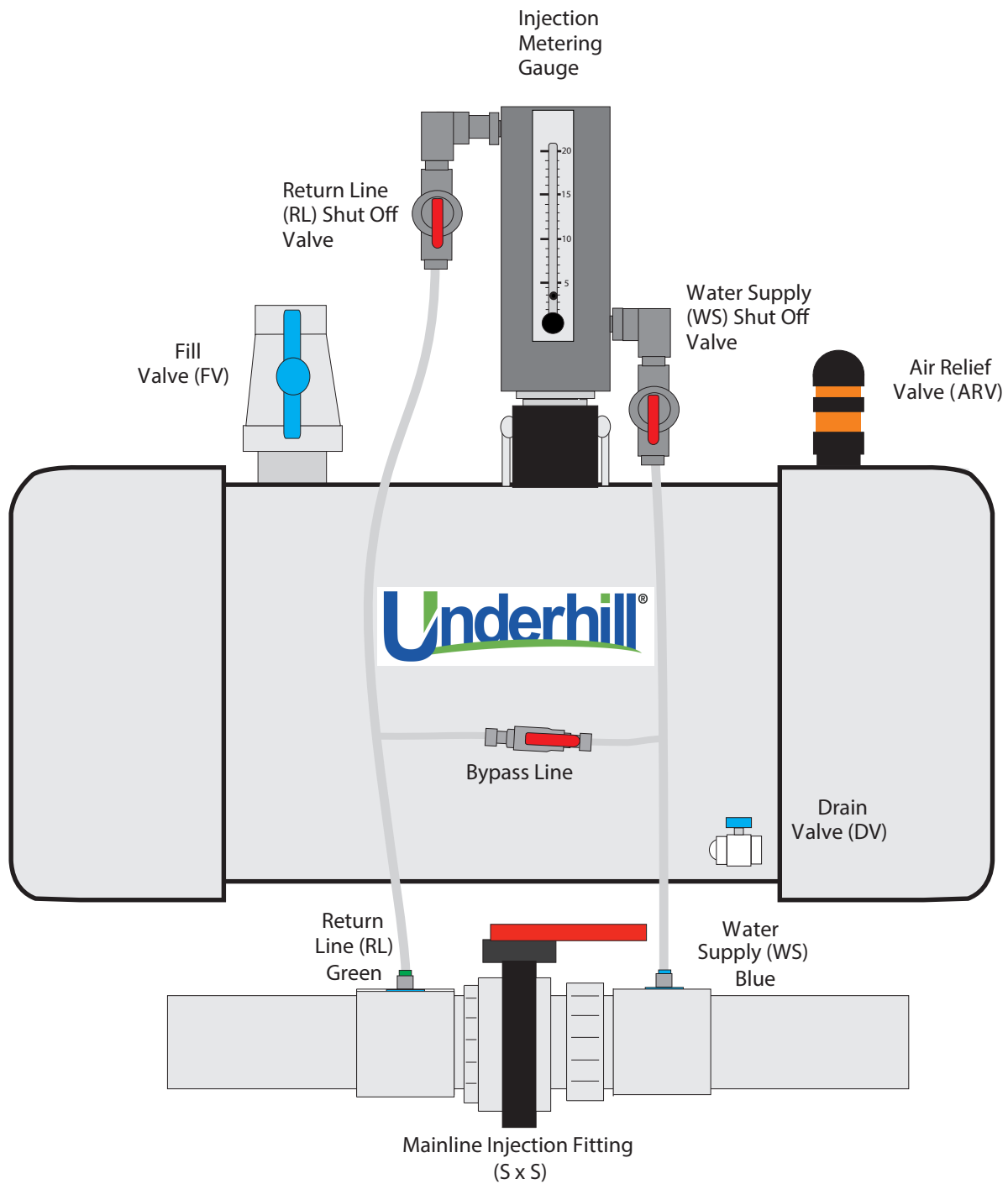
**Injecting Product ..... 7**

**Set System Metering Rate ..... 9**

**HI-FLO Bypass Operation (Adjustment) .....11**

**Technical Assistance.....12**

## System Configuration



## Getting Started

Take a few moments and observe the components that represent the Underhill Flo-Pro™ small horizontal tank injection system. Verify all of the components are complete and undamaged before starting an installation.

Confirm the injector mainline fitting is sized properly for the irrigation mainline. Varying sizes for PVC mainline pipe can be ordered.

Review the attached Installation Instructions so you are familiar with the product, its components and operation before starting to install.



**Note:** Installing your system improperly can cause risk of water contamination and pose health risks. Do not attach your injection feeder to a irrigation mainline that does not have some form of backflow device (such as a atmospheric vacuum breaker, pressure vacuum breaker and/or pressure principle vacuum breaker). Backflow prevention is not included in with this system. Backflow codes vary by state and city.

Compliance is the responsibility of the installer and user of the injection system. Caution should be exercised to confirm proper backflow prevention for a water source exists prior to making any cross-connections. Install an appropriate backflow device per local or state plumbing codes if none exists. This may or may not include backflow prevention for sites fed from wells.



**Note:** Do not use if delivery water pressure exceeds 100 Psi. Do not use if delivery water pressure exceeds 100 Psi. To avoid potential damage to the injector tank, drain prior to freezing weather and vent air during refill.

## Sizing the Injector Tank

The tables below are intended to provide information for sizing of a tank based on the application and usage. Two tables are shown, one based on square feet and the other in acres depending on the application. The third table provides shipping weights of the 3 models for small horizontal injector tanks.

Model	Capacity (Gallons)	Capacity (Pounds)	Coverage 4-6 weeks (Square Feet)		Unit Size L x W x H	Enclosure Size L x W x H
HF010	10.0	100	100,000	200,000	32" x 12" x 18"	36" x 24" x 24"
HF017	17.5	175	175,000	350,000	36" x 15" x 20"	36" x 24" x 24"
HF025	25.0	250	250,000	500,000	36" x 19" x 25"	36" x 24" x 24"

Acres

Model	Capacity (Gallons)	Capacity (Pounds)	Coverage – Pounds per Acre			
			5 lbs. / Ac	10 lbs. / Ac	15 lbs. / Ac	20 lbs. / Ac
HF010	10.0	100	20	10	7	5
HF017	17.5	175	35	18	12	9
HF025	25.0	250	50	25	17	13

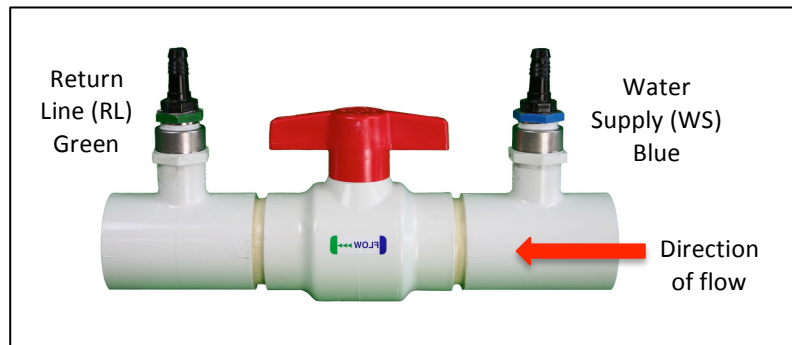
Model	Shipping Weight Lbs. (kgs)
HF010	65 lbs. (29.5 kg)
HF017	90 lbs. (40.8 kg)
HF025	120 lbs. (54.4 kg)

## Locating the Injection Tank

Select the tank location downstream of the backflow device and before the first zone or remote control valve. The tank should be installed on a flat pad of soil or concrete that is level in two perpendicular directions.

## Installing the Injector Mainline Fitting

**Step 1** The injector feeder is to be installed in a PVC irrigation mainline pipe in close proximity to the tank. The injection system comes with 2 (qty), 10 ft. lengths of ½" diameter clear tubing. Longer Water Supply (WS) and Return Line (RL) lengths can be requested at the time of purchase. The "injection mainline fitting" is a slip x slip PVC coupling and is intended to be solvent-welded with appropriate PVC glue for a watertight connection within the irrigation PVC mainline. See Figure 5-1.



**Injector Mainline Fitting**  
**Figure 5-1**

This should be ordered as the same diameter as the mainline pipe to reduce friction losses or prevent from restricting flow. Different sized Injector mainline fittings can be ordered to match the existing mainline size.

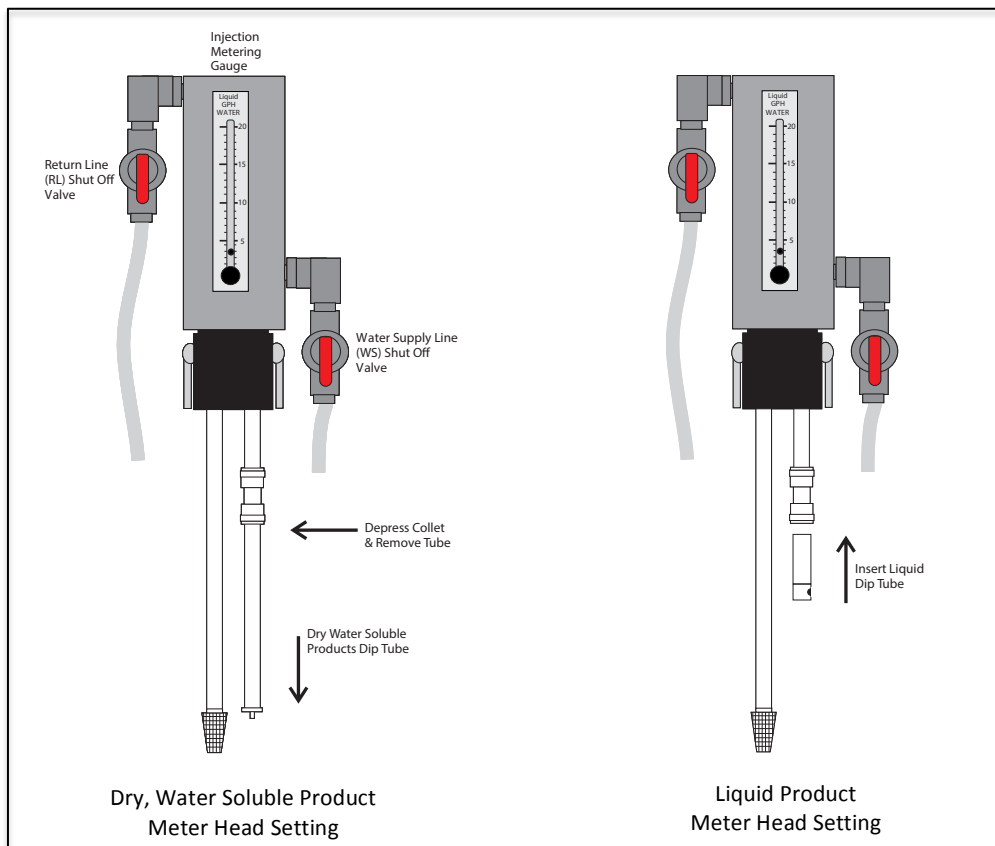
**Step 2** Attach the Water Supply (WS) (blue) and Return Line (RL) (green) tubing to the injector mainline fitting. Wetting the ends of the tubing will make them slip over the barbed fittings easier. Slide the tubing over the barbed fittings.

**Step 3** Attach the opposite ends of the tubing to the corresponding connections with ball valves on the portable tank and secure all clamps.

## Metering Setup

The Flo-Pro Injection System is capable of injecting either liquid or dry, water-soluble products. The primary difference between injecting liquid or dry, water-soluble material is an “agitation-tube” that is used when injecting dry, water-soluble product and removed when injecting liquid product.

Figure 6-1 indicates the metering head configurations for liquid or dry, water-soluble products and shows how to switch the dip tubes.



**Meter Head Setting**  
**Figure 6-1**



The metering valve controls and measures the amount of injected product. Gauges are available in 2, 10, 20, 40 or 100 gallon per hour or 1, 2, or 5 gallon per minute flow ranges.

The metering valve is connected to the tank with a quick disconnect coupler for easy change-out of the agitation tube as needed.

Shut-off valves allow water to enter and product to exit the tank. The valves are also connected to the metering head with unions for servicing or moving to another location if multiple tanks are used.

The air relief valve allows trapped air in the tank to vent automatically. Air should be vented during initial tank filling by completely filling with product or topping off with water before closing the Fill Valve **(FV)**.

## Testing the System

Once all of the tubing is connected, the metering configuration is adjusted for the type of product to be injected, test the small horizontal Flo-Pro™ injector tank as follows:

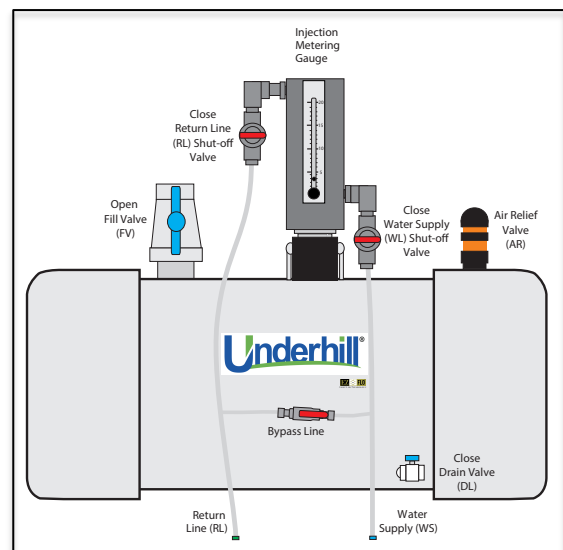
1. Place 2 ounces of food dye in the tank. The food dye is used as a visual indicator that product is being injected through the irrigation system once the metering rate is set.
2. The balance of the unfilled tank is filled with water. After tank filling any excess/trapped air will be purged through the automatic air relief valve. It is recommended the tank be filled completely with fluid and the air vent is used as a backup only.
3. The metering rate is set based on the material being applied and the desired application rate.

## Injecting Product

Once the Water Supply **(WS)** and Return Line **(RL)** are connected to the tank and the system has been tested, the tank can be filled with product. See Figure 7-1.

**Step 1** – Before filling the tank, close and open valves in the following order:

- 1) Close the Water Supply **(WS)** and Return Line **(RL)** shut-off valves
- 2) Open the Drain Valve **(DV)** temporarily to exhaust pressure. (This will be closed in another step).
- 3) Open the Fill Valve **(FV)** and let tank completely drain.

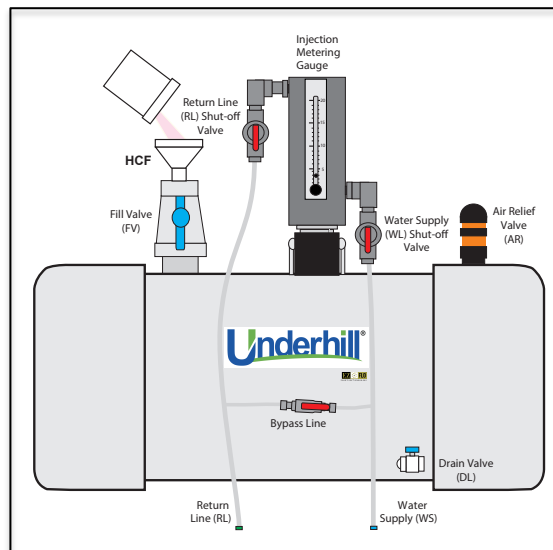


**Set Valves for Filling Tank**  
**Figure 7-1**

**Step 2** – Close the Drain Valve (**DV**) and fill the tank with product (liquid or dry, water-soluble products). No pre-mixing is required. See Figure 8-1.

**For dry, water-soluble products,**

- 1) Verify the dip tube is set for dry, water-soluble product application per Figure 6-1.
- 2) Add 3-4 inches of water to allow the dry product to evenly spread inside the tank.
- 3) Attach the High Capacity funnel (**HCF**) and fill the tank with the desired amount of dry, water-soluble product.
- 4) Any remaining space in the tank is to be filled with water until completely full.
- 5) Close the Fill Valve (**FV**). Any remaining air will be exhausted through the automatic Air Relief Valve (**ARV**).



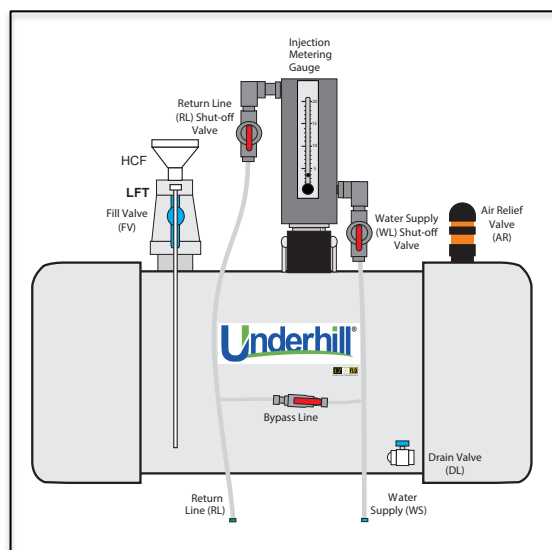
**Fill Tank w/ Product**  
**Figure 8-1**



**Note: Confirm the tank is full of liquid and all air is purged from tank before pressurizing.**

**For liquid products;**

- 1) Verify the dip tube is set for liquid products application see Figure 6-1.
- 2) Attach the High Capacity Funnel (**HCF**) and fill the tank with the desired amount of liquid product.
- 3) The remaining space in the tank is to be filled with water until completely full.
- 4) Close the Fill Valve (**FV**) and any remaining air will be exhausted through the Air Relief Valve (**ARV**).

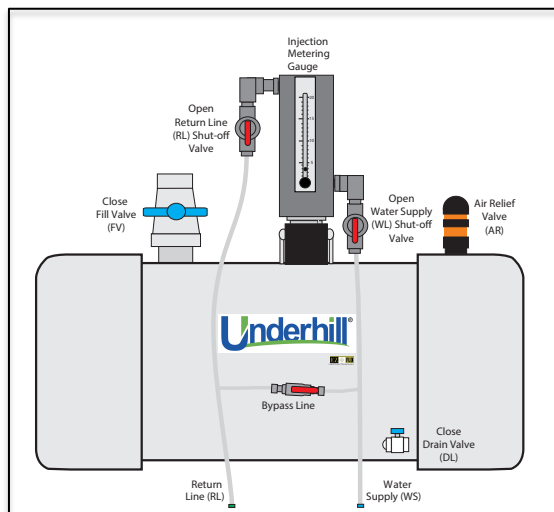


**Liquid Fill Tube**  
**Figure 8-2**



**Step 3** – Open and close valves in the following order:

- 1) Close the Fill Valve (**FV**)
- 2) Open the Water Supply (**WS**) and Return Line (**RL**) shut-off valves. See Figure 9-1.



**Set Tank to Inject Product**  
**Figure 9-1**

## Set System Metering Rate



**Note:** Prior to injecting any material particularly for the first time, set the feed rate by filling the tank with water only and some colored food dye so product can be visually confirmed leaving the return line into the irrigation system.

To set the feed rate, start by collecting the following information:

- Amount of irrigated area in square footage or acres to be applied with product,
- Length of nightly watering window (6-8 hours),
- The size of the tank being used,
- Recommended application rate of the product to be dispensed,
- The number of gallons that will be dispensed within a watering window.



**Note:** Normally injector metering is set once to dispense product over three to five days. Longer dispensing times improve coverage rates and nutrient uptake. Alternative gauges can be provided to extend the dispensing times.

**Liquid Products** – Note: Any amount of liquid product can be added to the system up to the total amount of the tank's capacity. If adding less than the full tank capacity, mix the solution with water to remove all remaining air from the tank.

For example: If the irrigation schedule is for 6 hours per day, the desired dispensing time is 3 days and the system has a 17.5-gallon capacity tank, set the feed rate to 1.0 gallon per hour. At this rate 17.5 gallons of product will dispense in 17.5 hours or 2.92 days of irrigation. **17.5 gallons ÷ 1 gallon per hour = 2.92 days of irrigation (using a 6 hour watering window).**

**Dry water-soluble products-** Note: Approximately two pounds of water-soluble product is delivered in each gallon of the injected mix and the system will hold up to 10 pounds of dry product for every gallon of capacity.

For example: If the irrigation schedule is 6 hours per day, the desired dispensing time is 3 days, with a system having a 17.5-gallon capacity tank and 175 pounds of dry product has been added to the tank, set the metering rate to 5 gallons per hour. At this rate 175 pounds of dry product will dispense in 18 hours. **175 pounds ÷ 2 pounds per gallon = 87.5 gallons to be injected ÷ 5 gallons per hour injection rate = in 2.43 days of irrigation (using a 6-hour water window).**

Once the injection rate has been properly set and visually confirmed it is feeding into the irrigation system, the tank can be filled with injectable material.

## Winterizing Your System



**Note: Do not use air to blow out the irrigation system with the Flo-Pro Injector attached.**

If the Flo-Pro tank is located in a region where winter temperatures can drop below freezing it is necessary to “winterize” the injection system as follows:

**Step 1)** Turn off the Water Supply **(WS)** and Return Line **(RL)** Valves to the “OFF” position,

**Step 2)** Open the Drain Valve **(DV)** and Fill Valve **(FV)**,

**Step 3)** Drain all fluid in the tank.

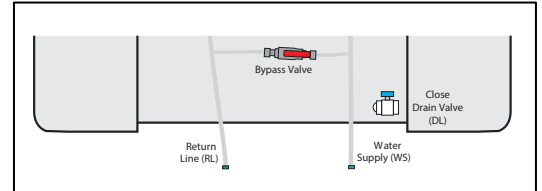
## HI-FLO Bypass Operation (Adjustment)

Typically the HI-FLO systems will operate perfectly fine without the use of the bypass/ venturi Bypass Flow Adjustment Valve, but if injecting into flow streams above 120 GPM, valve adjustment may be required. To properly calibrate and adjust:



**Note:** This calibration is to be accomplished with the Bypass Flow Adjustment Valve and not the feed rate setting.

1. Make sure the tank is completely filled so no air is present.
  - a. Any excess air should be heard existing the air relief valve during pressurization.
2. Start with the Bypass Flow Adjustment Valve in the “Closed” position, (see Figure 11-1).
  - a. Allow the irrigation system to reach maximum flow by scheduling a typical irrigation program. This should represent the largest number of sprinklers operating at one time.
  - b. The key is to calibrate the bypass valve at the maximum flow rate (maximum number of heads operating at one time), so the appropriate amount of bypass is attained. If there is insufficient bypass, the system has the potential to stop injecting at higher flow rates. If there is too much bypass, the system may not be able to inject sufficient product at the required feed rate.
3. Once the mainline is operating at full flow, set the flow meter to the desired feed rate
  - a. **Do not** adjust the Bypass Flow Adjustment Valve yet, as it should remain in the “Closed” position.
4. Observe the metering float and its ability to maintain the set level for a period of 2-3 minutes.
  - a. The metering float will bounce due to fluctuations in pressure but will quickly recover to the selected setting. This is normal operation.
  - b. Continue to monitor and verify the metering float is returning to the appropriate feed rate level and not steadily dropping.
5. If the metering float continues to return to the appropriate level and the irrigation system is operating at full flow, no adjustment needs to be made to the Bypass Flow Adjustment Valve.
6. While monitoring, if the metering float fails to return to the appropriate feed rate level and steadily drops to lower levels, the bypass valve will need to be opened.
  - a. When the metering float steadily drops, increase the observation time to 5 minutes to ensure it holds steady.
  - b. If it fluctuates go to step 7.
7. To adjust the Bypass Flow Adjustment Valve, simply open to the full position



**Bypass Valve**  
**Figure 11-1**

- a. This will instantly relieve any turbulence and the metering float will go past the desired feed rate.
8. Once in the full position, slowly close the Bypass Flow Adjustment Valve until the float begins to fall again.
  - a. Once the metering float falls, adjust the Bypass Flow Adjustment Valve slightly towards the open position until the metering float maintains its set level.
9. After the metering float is stabilized, observe operation for 3-5 minutes and insure the Bypass Flow Adjustment valve is appropriately set.
10. Now the metering float may be set to the desired feed rate.

The bypass valve is now calibrated and it is recommended the handle be removed and set aside to avoid any future tampering. If the bypass valve is ever accidentally adjusted, the above steps must be repeated.



**Special Notation** – In most cases the bypass valve will remain closed. If the bypass valve is too far open, the system will lose its ability to inject at higher feed rates. When the bypass valve is too far closed, the injection may suddenly stop.

## Technical Assistance

If you need further assistance with the installation or operation of your Flo-Pro Injection System, call (949) 427-6445.