

NOTICE: Check immediately upon receipt for damaged parts. If some are found, save all packing material and parts, and notify the delivering carrier. They are responsible.

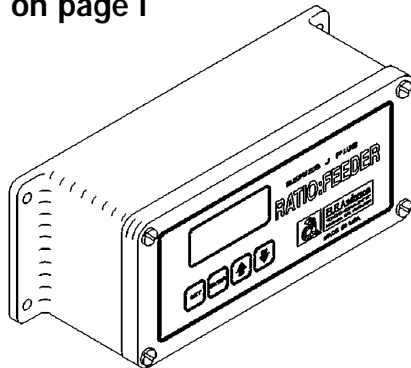
PRICE \$4.00

RATIO:FEEDER®

SERIES J PLUS

PUMPER CONTROLLERS

See Quick Start information
on page i



Made in the USA
Serving our customers since 1956

GETTING TECHNICAL ASSISTANCE

The H.E. Anderson Company is anxious to assist our customers with installation and use of our products. Our technical people are available each week day from 8:30 a.m. to 4:30 p.m. central time. You may call us toll free at **1-800-331-9620** from anywhere in the U.S.A. and Canada. If no one is available, we will promptly return your call.

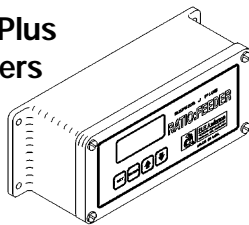
Before you call, we suggest that you review this manual. You may find the answer to your question there. But even if you do not, reviewing the manual will help us to help you.

There is some information you should have available when you call. You should know the program number and serial number of your control unit. Also, you should note the number of pumpers of each type, and their model numbers. We may not need all this information, but having it available at the start can some times save a lot of time and trouble for you. You may record the information below for convenient reference. NOTE: The program number can be displayed by pressing both the **↑** and **↓** keys together.

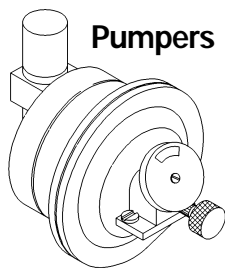
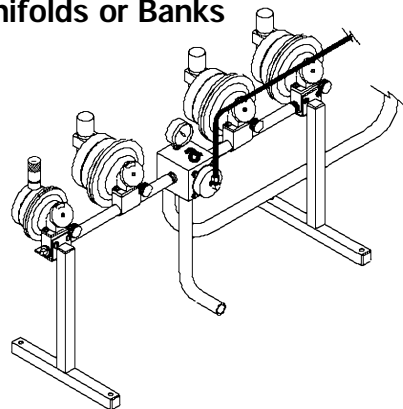
SERIAL _____	PROGRAM NUMBER _____
PUMPER #1 _____	PUMPER #4 _____
PUMPER #2 _____	PUMPER #5 _____
PUMPER #3 _____	PUMPER #6 _____

Manuals are provided for these major assemblies

**Series J Plus
Controllers**

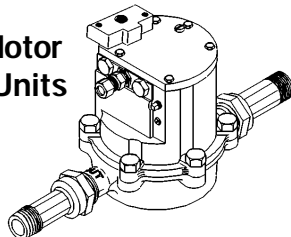


Manifolds or Banks



Pumpers

**Water Motor
Control Units**



J PLUS QUICK START INFORMATION

MODEL NO. _____ SERIAL NO. _____

Do all wiring before connecting power. Use a surge suppresser on the incoming a.c. power line. Plug in the power cord and watch the LCD display. If it does not come on, unplug the power and check the wiring.

This unit was ordered with the following capacities or settings:

CUSTOMER REQUESTED ___ DEFAULT ___
PROGRAM NUMBER _____
K FACTOR _____
MAXIMUM FLOW _____
GALLONS PER STROKE #1 _____ (OUTPUT #1)
GALLONS PER STROKE #2 _____ (OUTPUT #2)

With the above settings, pumpers will have the following chemical to water feed ratio capacities:

BASE #1 = (OUTPUT #1 x 3785) ÷ 40

H4-**, P4 — 1: _____ (BASE #1)
H2-**, P2 — 1: _____ (BASE #1 x 2)
H1-**, P1 — 1: _____ (BASE #1 x 4)
T4-**, — 1: _____ (BASE #1 x 10)

BASE #2 = (OUTPUT #2 x 3785) ÷ 40

H4-**, P4 — 1: _____ (BASE #2)
H2-**, P2 — 1: _____ (BASE #2 x 2)
H1-**, P1 — 1: _____ (BASE #2 x 4)
T4-**, — 1: _____ (BASE #2 x 10)

If more than one pumper is used to pump the same chemical, divide the ratio (BASE) by the number of pumpers used.

To verify the settings, press the indicated keys.

SET To display the K FACTOR
SET + **↑** To display GALLONS PER STROKE #1
SET + **↓** To display GALLONS PER STROKE #2
↑ + **↓** To display the PROGRAM NUMBER

To change a setting, first display it; then press **SET** and **ENTER** together until the display blinks. Then use **↑** or **↓** to set. Then press **ENTER**.

IMPORTANT! READ YOUR MANUAL

If the PROGRAM NUMBER, the K FACTOR, or the GALLONS PER STROKE are changed, the feed ratio will also change. **Be careful!** Read Section 3 of this manual for more information about changing any settings or contact the factory.

NOTE: The K FACTOR may only be changed during the first minute after power up. (See Section 3.4)

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1 INTRODUCTION

The Series J Plus Ratio:Feeder® injector is designed to be the most accurate and trouble free injector available. The control unit, consisting of the meter measuring unit and electronics should be virtually maintenance free. All models have two programmable outputs; This allows you to feed different chemicals at two different stroking rates. Specifications for these systems are given in Table 1, page 7, and Appendix A. in the rear of this manual.

This manual covers assembly and installation of the injector. It also covers operation and maintenance of the control unit. The injector pumpers and manifold pilot valve are covered in detail in separate manuals or instruction sheets.

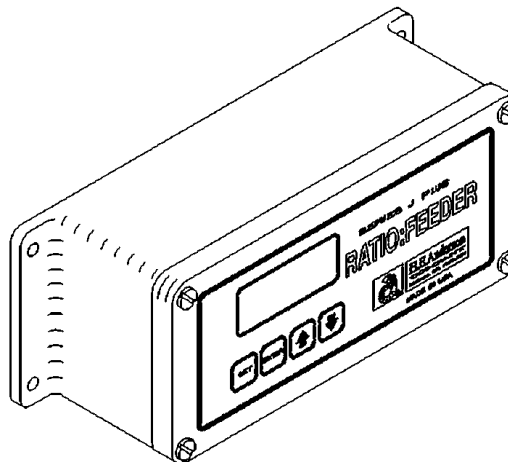


Figure 1
Series J Plus Controller

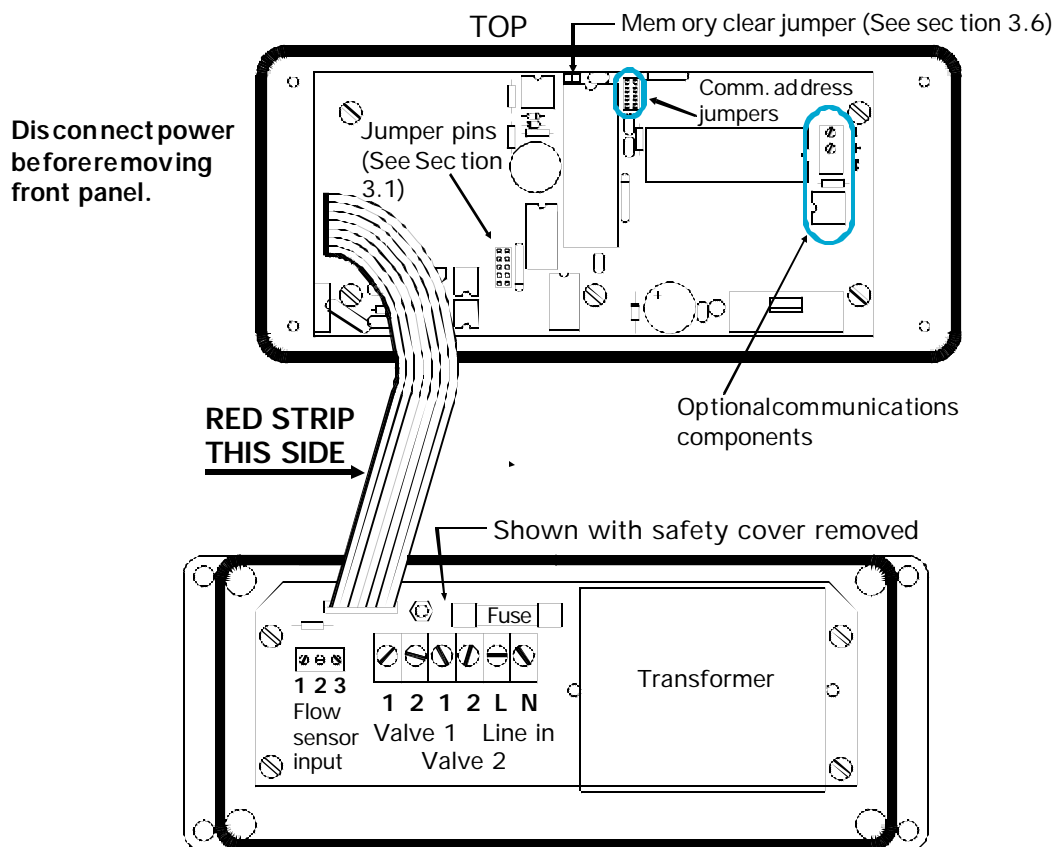


Figure 2
J Plus front and rear circuit boards

1.1 INSTALLATION GUIDELINES

1.1.1 Access

Install the system neatly and with room for easy maintenance access.

1.1.2 Environment

WARNING!

NEVER ALLOW THE UNIT TO FREEZE! THE UNIT IS NOT WARRANTED FOR FREEZE DAMAGE.

Freezing can cause expensive damage, even during storage if the measuring unit and pumpers have not been properly drained.

A drain or container for waste water should be close at hand. The unit wastes approximately twice as much water as chemical pumped. The waste line should be kept short, or expanded to a larger size for runs longer than fifteen feet.

1.1.3 Safety

IMPORTANT!

THE WASTE LINE MUST EXIT TO ATMOSPHERIC PRESSURE AND MUST NOT BE ELEVATED OR RESTRICTED IN ANY WAY.

Most chemicals used to treat water are dangerous to someone or thing. Do not permit access by children or pets. Label chemicals and keep a supply of antidotes, neutralizing agents, and safety precautions handy. Provide safety equipment such as goggles, gloves, aprons, or anything common sense tells you you might need. Check with the manufacturer of the chemical for safety precautions for specific chemicals.

When feeding dangerous or corrosive chemicals, the drain hole in the bottom of the pumper cylinder (See Figure 3, page 6 in the pumper manual.) should be attached to a drain line which empties into a resistant

container. An alternative would be placing a resistant container directly beneath the drain hole.

The injector should also be protected from corrosive vapors with adequate ventilation. Corrosion can sometimes attack diaphragms from the back side, resulting in premature failure.

1.1.4 Location

The injector should be out of the way, yet accessible and installed in the water line before the point of use of the treated water. If your water supply is from a municipal or public water line, the installation should comply with local codes. That means you should be sure that a backward flow of treated water into public mains cannot occur. Contact your local water authority for approved devices and recommendations to insure that your installation meets their standards.

You will need a drain. Your system will waste about twice as much water as chemical pumped. You need a way to dispose of this waste water.

IMPORTANT!

WE STRONGLY RECOMMEND PROTECTING THE CONTROLLER WITH A SURGE PROTECTOR. THE UNIT IS NOT WARRANTED AGAINST DAMAGE FROM ELECTRICAL SURGES.

You will need an electrical outlet nearby to power the control electronics. The control enclosure may be mounted in any convenient location, but should not be in a place where it can get extremely hot from direct sunlight or other heat source.

The power cord can be removed and conduit used for power wiring if desired or if local codes require. All other wiring is low voltage and does not need any special protection.

1.1.5 Water Hammer

Water hammer can be a serious problem in installations with long pipe runs, or where solenoid valves are used. Water hammer can generate pressures up to 500 psi or more! This puts stress on the whole injector (and on your entire water system), but it is especially destructive to diaphragms. If water hammer might be a problem with your installation, you should install some sort of suppresser such as a “pop” valve or an accumulator (captive air device) near your injector.

1.1.6 Water Quality

Solids in your water supply act as abrasives and will wear away the water measuring mechanism. If you have problems with solids, install a filter upstream of the injector and place pressure gauges before and after. You can use the difference in pressure readings to tell when the filter is plugged up.

1.2 UNPACKING

Check for broken or damaged parts. If some are found, save all packing material and parts, and notify the delivering carrier immediately. They are responsible.

Do not dispose of any material until the unit has been assembled and you are sure nothing is missing.

2 ASSEMBLY AND INSTALLATION

To reduce shipping damage, your water line piping was shipped only partially assembled. You will need PVC pipe cleaner and glue to complete assembly; these are available at most hardware and discount stores. The sub assemblies are marked with labels. Follow the instructions on the labels and match the letters and arrows to get things in their proper positions.

Figure 1, on page iv, facing page 1, shows a complete installation. The dashed parts are

not included with the system. They may be purchased locally from a plumbing supply.

These parts include necessary pipe and fittings to connect up to your water system, cut-off and bypass valves. The bypass arrangement shown in the drawing is not absolutely necessary, but we recommend it so you may service the injector without interrupting water service.

Other piping can be of your preference – steel, plastic, or copper; even heavy duty flexible hose could be used for smaller systems. A check valve should be installed in the main line before the by-pass and injector. Any on-off water valve should be installed downstream from the blending tank. This will insure that the system injection point will always be pressurized, making siphoning of chemical unlikely.

2.1 ASSEMBLY

Figures 4 through 9 illustrate the step by step process of assembling an injector from one of our standard package kits **Do not follow these steps if you did not purchase a standard package system.** For non-package systems refer to Figure C-1 in Appendix C.

After assembly, plumb the system into your main water line.

Once installation is complete and all pipe connections are tight, remove the meter from the system. The piping should not spring apart or close up when it is removed. Continuous strain could interfere with operation. Adjust the piping if necessary.

Before reinstalling the meter, flush the system to remove metal flakes and other debris from the plumbing. Then reinstall the meter.

See the pumper manual for complete information on installing the pumps.

Series J Plus Ratio:Feeder Systems

Use Teflon® tape on threaded connections on the main water line only.

Screw one long extension assembly into the inlet of the blending tank.

Looking from the elbow end, stop with the elbow pointing about 33° left of vertical for the 12 gal lon tank and 15° for the 30 gal lon

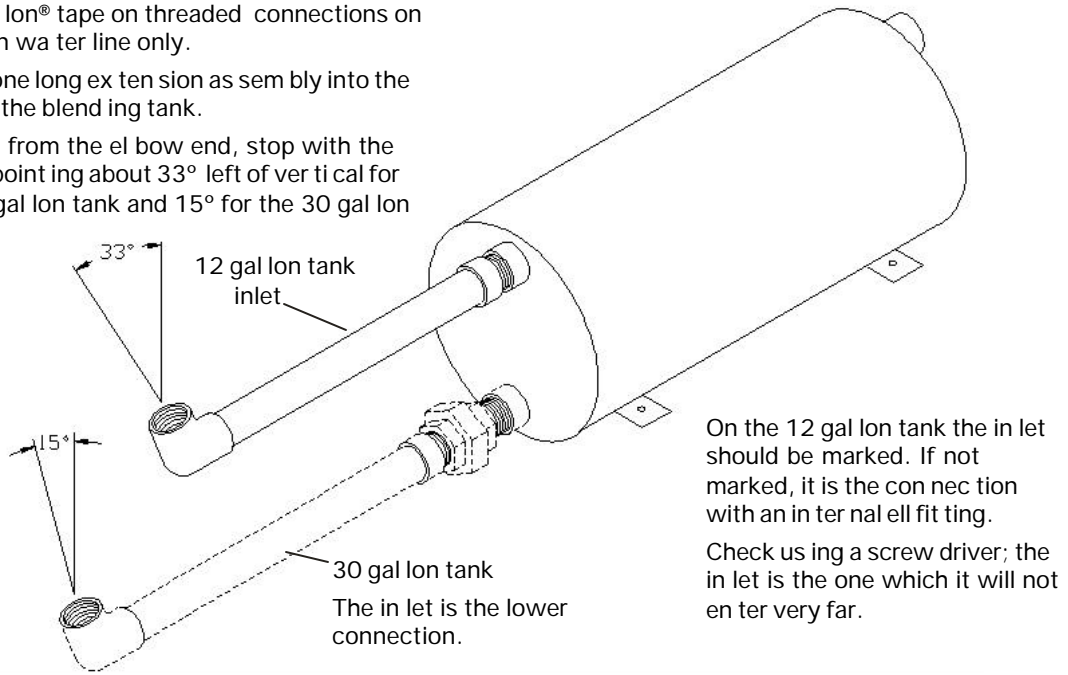


Figure 3

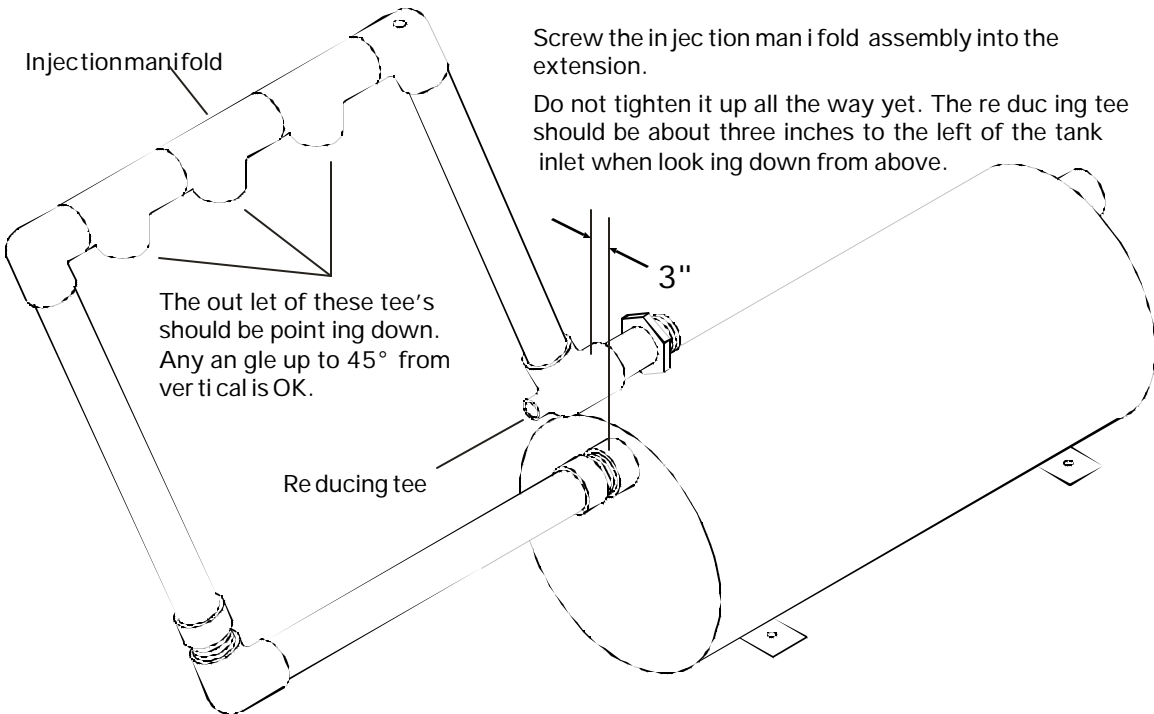


Figure 4

Series J Plus Ratio:Feeder Systems

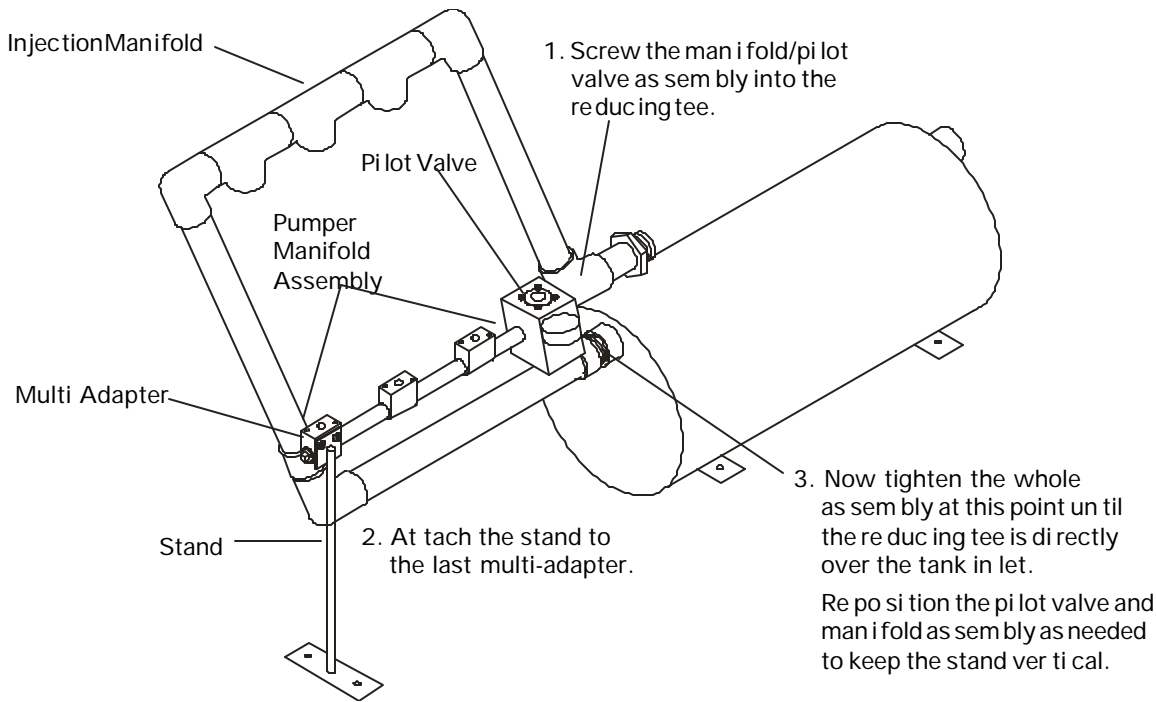


Figure 5

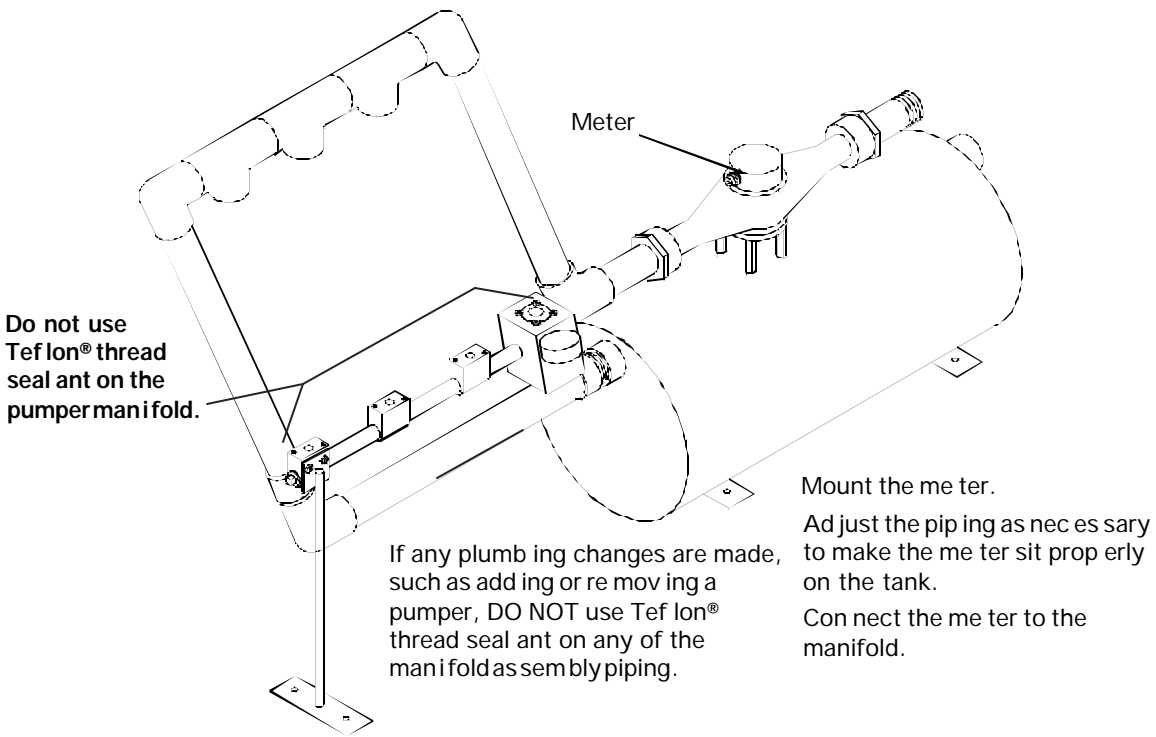


Figure 6

Series J Plus Ratio:Feeder Systems

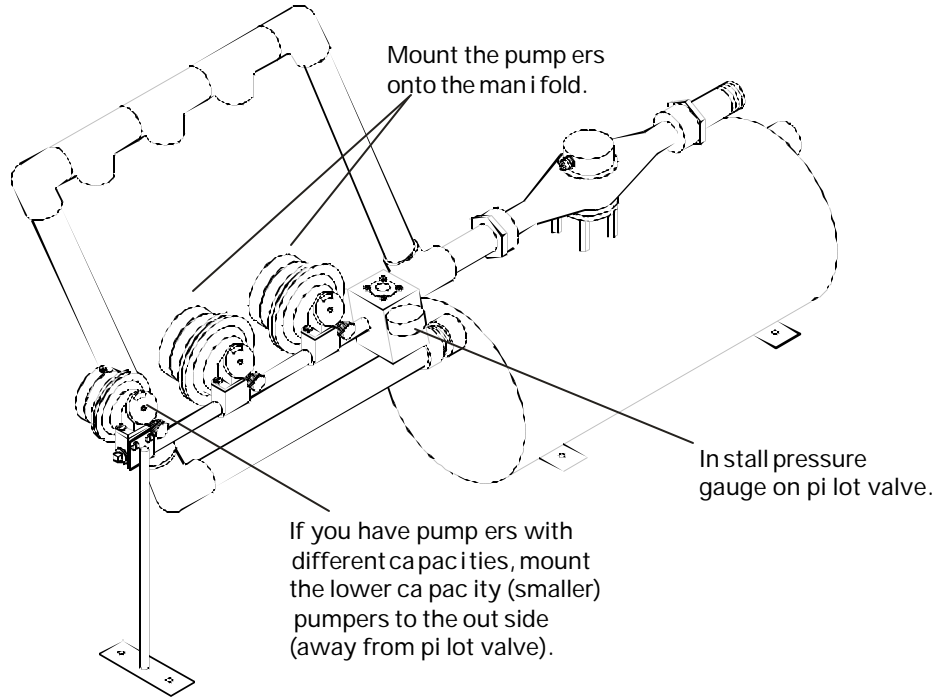


Figure 7

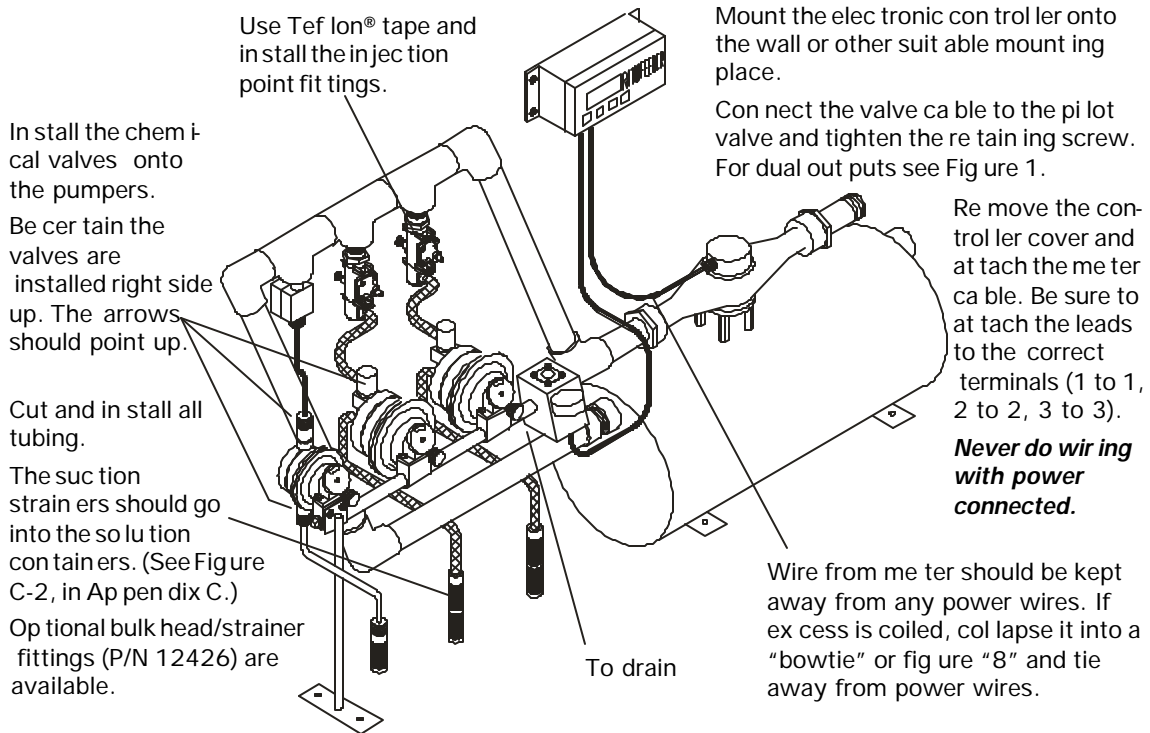


Figure 8

2.2 ELECTRICAL CONNECTIONS

Refer to Figure 2, page 1, for the terminal locations. The flow sensor and valve outputs should be connected before wiring the power connections.

NOTE: Connecting the flow sensor incorrectly can damage the flow sensor electronics.

The terminals on the flow sensor terminal block are labeled 1, 2, & 3, both on the terminal board and on the sensor cable. Be certain to connect wire 1 to terminal 1, wire 2 to terminal 2, and wire 3 to terminal 3. If you need a longer cable, use the color coding to be sure that these connections are correct.

If you have only one manifold valve, connect it to the Valve 1 terminals. If you have a second manifold, connect it to the Valve 2 terminals

Connect the power wiring to the line L and neutral N terminals. **Do not apply power at this time.**

3 SETTING THE CONTROLLER

Your controller must be configured in order to work properly. Units ordered with a meter from the factory should be properly configured on delivery.

NOTE: There are two versions of J Plus controllers, the standard unit displays U.S. gallons for the preset configurations, the other displays liters. This applies to the preset standard meter configurations only; custom configurations can be set to any units.

3.1 SETTING THE JUMPERS

Power must be off to set the jumpers.

See TABLE 2 or 3 to see which jumpers to set. Then refer to TABLE 1 to find their location. To access the jumpers you must

TABLE 1 – JUMPER POSITIONS	
Jumper #	Top
5	● ●
4	● ●
3	● ●
2	● ●
See Figure 2, p.1 for jumper location.	1 ● ●
	Bottom

remove the front panel. See Figure 1, page 1 for the location of the jumpers.

If you have a non-standard flow sensor, choose setting 0 or 1, according to the K factor of the flow sensor. (The K factor is the number of pulses out for each unit [gallon, liter, etc.] of flow through the flow sensor.) You will set the K factor a little later.

3.2 POWERING UP THE UNIT

When power is applied to the unit it will display “—” for a short time as it initializes and will then start displaying the flow (or “OFF” if there is no flow, or meter connected to it). If the unit has never been programmed, or if the jumpers have been changed, it will also alternately display “SET” to indicate that it is set to the default settings in Table 1 or 2, and must be set if you want other settings. These will display alternately until the unit has been programmed.

NOTE: If the display shows only “—” and never advances beyond that, the jumpers are set to an invalid combination. You will need to set them properly. Extra jumpers may be stored on another position by putting the jumper on only one of the pair of pins.

NOTE: If you have the unit set to a standard meter and you want to use the default settings, it will operate properly, but you must enter a stroke setting (even if you do not actually

Series J Plus Ratio:Feeder Systems

TABLE 2 – PROGRAMS & SETTINGS (U.S. Gallons)				
Jumpers	Program #	Meter (Flow Range)	K Factor De fault (Range)	Gallons/Stroke De fault (Range)
None	JE0	Custom	50.00 (1.00 – 99.99)	3.12 (Variable up to 199+)
1	JE1	Custom	175.0 (100.0 – 255.0)	3.12 (Variable up to 199+)
2	JE2	$\frac{5}{8}$ x $\frac{3}{4}$ " Multi-jet ($\frac{1}{2}$ – 20 GPM)	234.0	1.06 (0.01 – 199.9)
1 & 2	JE3	$\frac{3}{4}$ x 1" Multi-jet ($\frac{1}{2}$ – 30 GPM)	171.6	1.06 (0.02 – 199.9)
3	JE4	1" Multi-jet ($\frac{3}{4}$ – 50 GPM)	83.26	2.11 (0.04 – 199.9)
1 & 3	JE5	$1\frac{1}{2}$ & 2" Multi-jet ($1\frac{1}{2}$ – 100 & $1\frac{1}{2}$ – 160 GPM)	26.94	4.23 (0.14 – 199.9)
2 & 3	JE6	$1\frac{1}{2}$ " Multi-jet ($1\frac{1}{2}$ – 100 GPM)	26.94	3.19 (0.14 – 199.9)

TABLE 3 – PROGRAMS & SETTINGS (liters)				
Jumpers	Program #	Meter (Flow Range)	K Factor De fault (Range)	liters/Stroke Default (Range)
None	JL0	Custom	35.00 (1.00 – 99.99)	12.5 (Variable up to 199+)
1	JL1	Custom	100.0 (100.0 – 255.0)	12.51 (Variable up to 199+)
2	JL2	$\frac{5}{8}$ x $\frac{3}{4}$ " Multi-jet (2 – 76 lpm)	61.82	4.01 (0.06 – 199.9)
1 & 2	JL3	$\frac{3}{4}$ x 1" Multi-jet (2 – 114 lpm)	45.33	4.02 (0.09 – 199.9)
3	JL4	1" Multi-jet (3 – 190 lpm)	22.00	7.99 (0.18 – 199.9)
1 & 3	JL5	$1\frac{1}{2}$ & 2" Multi-jet (5.7 – 380 & 5.7 – 605 lpm)	7.12	16.01 (0.56 – 199.9)
2 & 3	JL6	$1\frac{1}{2}$ " Multi-jet (5.7 – 380 lpm)	7.12	12.08 (0.56 – 199.9)

change it) to stop the alternate "Set" display. See Section 3.5, "SETTING THE UNITS PER STROKE."

3.3 DISPLAYING THE PROGRAM NUMBER

Press **↑** and **↓** together to display the program number and verify that it is the proper number for your meter type. If the program number is incorrect, recheck and reset the jumpers.

3.4 SETTING THE K FACTOR

NOTE: If you have the unit set to a standard meter you will not be able to change the K factor.

The K factor is the the number of pulses from the meter for each unit (gallon, liter, or other volume unit) of flow. This must be set for each different meter.

NOTE: If the K factor is expressed in pulses per gallon, the controller will display and totalize gallons; if it is expressed in other units, e.g. pulses per liter, the controller will display that unit. In fact, custom settings can be used to change the controller from one volume unit to another.

The variable must be displayed before it can be set. Pressing **SET** will display the K factor. Check that this also matches the value in Table 2 or 3.

If you have the unit set to custom setting 0 or 1 you should set the K factor to that of your flow sensor.

To change the K factor, press **SET** to display it, then press **SET** and **ENTER** together until the display starts to blink. Then press **↑** or **↓** until you have it set properly. Once it is set, press **ENTER** once more.

NOTE: Once the K factor has been programmed, you will only be able to

change it within about a minute after power is applied. This is to protect against accidental change of this important number. If you wish to change the K factor, disconnect power for a few seconds and then reapply power and change the K factor. This will also reset the stroking rate to the default.

3.5 SETTING THE UNITS PER STROKE

You may change the stroking rate at any time.

A stroke rate must be displayed before it can be set. Pressing **SET** together with **↑** or **↓** will display the stroke rate (gallons, liters, etc. per pump stroke) for outputs, #1 and #2 respectively.

Once the value is displayed, release the arrow key and without releasing **SET** press **ENTER** until the display starts to blink. Then use **↑** or **↓** to set the output to the desired stroke setting. Once it is set, press **ENTER**.

NOTE: You may not be able to set the stroke rate at exactly to the setting you want, especially with low K factors. In these cases set it to the nearest value.

3.6 CLEARING MEMORY

At some time you may need to clear the controller memory and reset it to the start-up defaults. To do this, disconnect power, remove the memory clear jumper (See Figure 2, p. 1). Wait at least five minutes, replace the jumper, and reapply power.

4 OPERATIONAL START-UP

You should read the *Primary Requirements for Proper Operation* in Appendix A.

IMPORTANT!

IF YOU HAVE NOT FLUSHED OUT THE SYSTEM AS DESCRIBED IN SECTION 2.1 YOU SHOULD DO SO NOW.
--

4.1 INITIAL CHECK-OUT

With the water off, apply power to the electronic controller. After a few seconds the display should indicate **OFF**. Turn the water on **slowly** and let all lines and contact tank fill with water. You should be getting intermittent discharges of water from the waste line.

4.2 START-UP

Turn off the water to stop the injector. Install the strainers in the solution concentrate tanks. If installing as a bulkhead fitting, install about 2" above the bottom of the tank, to prevent the strainer from becoming fouled by sediment which may collect on the bottom.

Connect the suction lines from the chemical container to the lower connection of the valve modules. Connect the discharge lines between the valve module and injection point fittings. Set dials on the pumpers to the number calculated to give the desired feed.

NOTE: See Appendix B. in the rear of this manual, or other applications literature for data on mixing the concentrate solutions and setting the injector.

Fill your concentrate tanks and restart your injector. It should now be operational. You may need to check, as done in the initial check-out, to be sure the pumpers are properly primed.

5 MAINTENANCE

The meter and electronic controller portion of your injector system normally require no maintenance. There is no reason to disturb these components except to service them when a problem arises.

See the pumper manual for information on maintaining your pumpers and associated fittings.

The chemical concentrate solution should be kept clean and fresh. When refilling the concentrate, try to avoid stirring up sediment which may have collected on the bottom of the tank. Your solution tank should be covered, but must be vented with a small vent hole to atmosphere to permit the pump to pump from it.

Periodically you may find you need to completely clean your solution container. When doing this we recommend transferring the suction line of the injector to another container of the same solution, to prevent loss of prime. Use caution appropriate to the chemical.

WARNING!

NEVER TRANSFER THE SUCTION LINE OF A FEEDER PUMPING STRONG ACIDS OR ALKALIS TO A CONTAINER OF WATER. THIS CAN CAUSE DANGEROUS HEAT GENERATION WHICH MAY DESTROY YOUR PUMP.

6 STORAGE

If an injector will not be used for an extended period, it should be removed from service. The pumper and chemical check valves should be flushed with water, either by pumping water through the unit (if not feeding acid) before removing it or by rinsing these parts after removal. The valve openings should be taped closed while still wet. This will protect the seals and prevent insects from plugging up the openings.

When the injector is removed from service it should be drained completely to prevent damage by freezing of water still inside. When removing the injector stop the water flow just after the unit starts the waste cycle (just as it discharges waste water). Remove the meter from the line. Tip the water outlet side of the meter down and drain thoroughly. Failure to

TABLE 4 – TROUBLE SHOOTING		
Condition	Probable Cause	Suggested Action
Unit works, but display flashes SEt .	Stroking rate not set.	Set the stroking rate (See section 3.5.
Un able to set the K fac tor.	K factor can only be set within about a minute after power is applied.	Re move power for sev eral seconds. Reapply power and promptly set the K factor.
Wa ter is flow ing but there is no flow indication on controller display. No pump ing ac tion.	(1) No power to controller. (2) Faulty controller.	(1) Re store power or replace fuse. (2) Replace controller.
Wa ter is flow ing but dis play indicates OFF .	Faulty me ter sen sor or ca ble.	See Sec tion 7.1.
Flow in dica tion, but no pump ing ac tion. No waste wa ter from pi lot valve.	Pilot valve not operating.	Service pi lot valve. (See pi lot valve in for ma tion in se pa rate man ual)
Er ratic or re duced waste wa ter from pi lot valve.	Pilot valve pop pets stick ing.	Service pi lot valve. (See pi lot valve in for ma tion in se pa rate man ual)

drain the unit can result in serious damage from freezing.

7 TROUBLE SHOOTING

If you suspect there may be a problem with your unit please read the following section carefully. **DO NOT DISASSEMBLE ANY PART OF YOUR SYSTEM until you have determined the exact problem**, and then do it carefully, according to instructions. Many small and easily corrected problems are greatly aggravated by not heeding this warning.

Table 4 gives some common problems and tells how to correct them.

There are two basic categories of problems; pumper problems and control problems. If you are getting flow indication and regular cycles of waste water from the pilot valve you can be

virtually certain the controller and pilot valve are working properly. Table 3 gives some possible conditions along with probable causes and suggested action. If you cannot determine the problem, call our factory at the number listed in the front of this manual.

7.1 CHECKING THE METER SENSOR

You have probably already observed the red LED indicators mounted on the sensor circuit board which is housed in the clear housing atop the water meter. Checking these can quickly pinpoint some problems.

The power LED will be lit whenever power to the controller is on. If not, there is a problem with the sensor board or, more likely, with the cable between meter and controller.

Series J Plus Ratio:Feeder Systems

The second LED should light with each pulse from the sensor. It should be pulsing whenever water is flowing. If this occurs, the meter and sensor are working properly. If not, the meter may be clogged with trash or sediment. Remove it, check and clean it if necessary. Do not install the meter upside down. If the meter is clear of trash, the sensor board should be replaced.

If there are pulses from the sensor board LED, but no flow indication, there are two likely possibilities:

- (1) Faulty sensor cable or connections.
- (2) Flow rate is below that which can be computed.

7.2 PUMPER AND DIAPHRAGM PROBLEMS

The most common problems with pumpers are leaky chemical valves and ruptured diaphragms. When a diaphragm ruptures, you will notice a drainage out the drain hole on the bottom of the cylinder. If the chemical side diaphragm has ruptured chemical will be draining from the hole. If the water side diaphragm has ruptured water will be draining from the hole.

Prompt attention to ruptured diaphragms can save added expensive repairs. Wash the inside of the cylinder thoroughly before installing the new diaphragm. A ruptured water side diaphragm should also be fixed as soon as possible, but it is not nearly as critical as the chemical side diaphragm. See the pumper manual for complete information on servicing your pumpers and chemical fittings.

IMPORTANT!

YOU SHOULD REPLACE A RUPTURED CHEMICAL SIDE DIAPHRAGM IMMEDIATELY. IF YOU DO NOT, THE CHEMICAL WILL ATTACK THE BACK SIDE OF THE WATER SIDE DIAPHRAGM, CAUSING IT AND OTHER PARTS TO FAIL ALSO.

8 REPAIR

The only repair you should attempt is replacement of the fuse.

WARNING!

BEFORE OPENING THE ENCLOSURE AND DOING ANYTHING INSIDE YOU SHOULD REMOVE AC POWER FROM THE UNIT.

Other repairs are made by replacing complete circuit board assemblies or the complete front panel assembly. This should be done only by an authorized repair person or under the direction of our technical staff.

8.1 FUSE REPLACEMENT

The fuse is located on the output board next to the transformer, under the protective cover. Replace with the same size and type (1 amp. AGC, Anderson P/N 15554).

9 Factory Service

Should you require service for your Ratio:Feeder injector, the H.E. Anderson Co. offers several flexible factory service options. Call our number listed in the front of this manual for complete information.

If you need to return any parts for service or replacement, our shipping address is:

H.E. Anderson Company
2100 Anderson Drive
Muskogee, Oklahoma 74403 USA

Please enclose a note detailing the problems and the type of service you need. Include the name of a contact person, phone number, and the billing name and address.

Any return for warranty, or credit, must have an RMA number. Contact H.E. Anderson for this number before returning.

APPENDIX A.

Specifications, Operating Requirements and Parts Drawing

Primary Requirements for Proper Operation

There are some conditions which must be met in order for your injection system to operate properly. These are given here.

- (1) Minimum line pressure of 15 psig, measured on the downstream side of the injector. If you do not have a pressure reading of 15 pounds at the pressure gauge on top of the unit, then you do not have enough pressure. If the water is flowing out to an open tank or onto the ground, there will probably not be sufficient back pressure to meet the 15 psig requirement even if there is much greater pressure (e.g. 40 psig) on the inlet. This is the most common cause of erratic operation. In this situation you should install a valve and pressure gauge downstream from the unit. Close the valve until the gauge reads 15 psi or greater.
- (2) The flow rate should be within the maximum and minimum ratings of the system. Table 1 (page 7) gives the ratings for each model.
- (3) Waste line and any tubing attached must open to "daylight" and go directly to a drain. No obstructions or elevating of the line is permitted. If a long line is needed, the waste line should be expanded to a larger size. Put an air vent or gap between the primary and extended waste lines.
- (4) Too much chemical feed is not caused by a mechanical malfunction. It is probably due to siphoning or gravity flow of chemical through the feeder during periods of zero pressure on the system.

SPECIFICATIONS

Controller

Power Requirements

120 VAC Standard
240 VAC (Add A Suffix to model number)
12 VDC (Add DC Suffix to model number)

Enclosure

Gasket sealed plastic enclosure with sealed front panel.

Display

4-digit LCD

Flow Totalizer

0 – 99,999,999 gallons

Flow Meters

Multi-Jet, Turbine, or Custom type supplied by customer.

Temperature Range

33 – 105°F

Pumpers

Positive displacement diaphragm (no sliding seals).
Air gap between diaphragms.

Construction

Heavy wall brass castings. Standard materials handle most chemicals except concentrated sulfuric and nitric acids and aromatic hydrocarbons. Options for aggressive chemicals are available. Manifold is brass.

Pressure

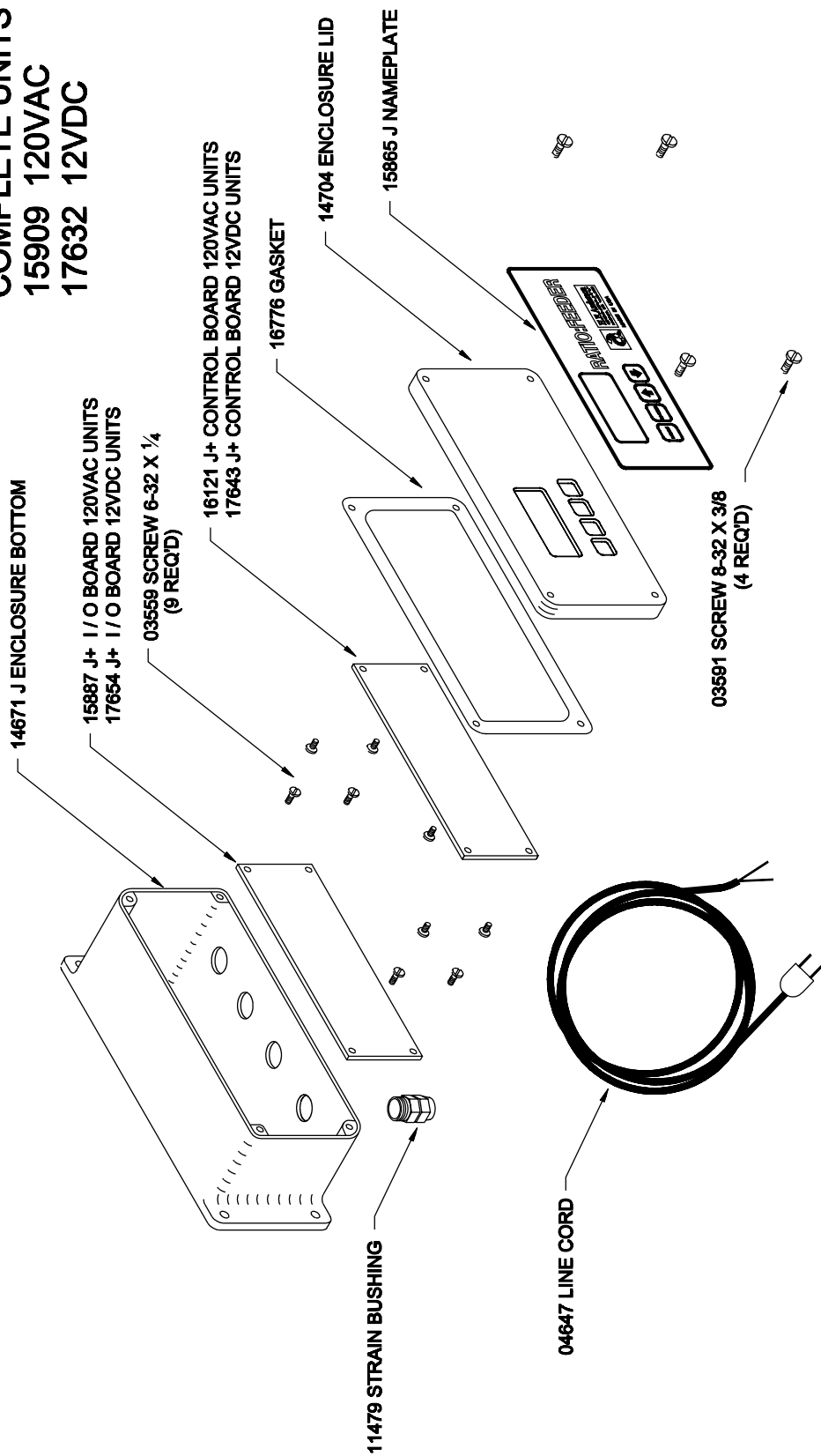
15 – 125 psi

Tank & Piping

(If supplied by H.E. Anderson Co.)
Piping between meter and tank is PVC;
Blend tank is galvanized.

J PLUS CONTROL UNIT

COMPLETE UNITS
15909 120VAC
17632 12VDC



APPENDIX B.

Formulas and Examples

SYMBOLS:

GPS = gallons per stroke as displayed by the controller

ppm N = parts per million nitrogen

ppm K = parts per million potassium

ppm P = parts per million phosphorous

%N = percent nitrogen in fertilizer

%K₂O = percent K₂O in fertilizer

Example: For potassium nitrate (13-0-44) %N = 13 and %K₂O = 44

%P₂O₅ = percent P₂O₅ (phosphoric acid) in fertilizer

G = gallons of fertilizer concentrate mixed in tank at one time

C = total capacity of all pumper(s) pumping the same solution (in milliliters)

Examples: For one #4 pumper C = 40, for one #2 pumper C = 20, for one #1 pumper C = 10; for two #4 pumpers C = 80

Lbs. = pounds of fertilizer in G gallons of concentrate solution

DS = pumper dial setting(s)

FORMULAS:

To calculate the amount of dry fertilizer to add to the concentrate tank when making the stock concentrate solution:

$$(1) \text{ (Nitrogen)} \quad Lbs. = \frac{(GPS)(ppm N)(G)(31.6)}{(C)(\%N)}$$

$$(2) \text{ (Potassium)} \quad Lbs. = \frac{(GPS)(ppm K)(G)(3.80)}{(C)(\%K_2O)}$$

$$(3) \text{ (Phosphorous)} \quad Lbs. = \frac{(GPS)(ppm P)(G)(7.35)}{(C)(\%P_2O_5)}$$

To calculate the dial setting for a specific ppm when the mixture is known:

$$(4) \text{ (Nitrogen)} \quad DS = \frac{(GPS)(ppm N)(G)(31.6)}{(C)(Lbs.)(%N)}$$

$$(5) \text{ (Potassium)} \quad DS = \frac{(GPS)(ppm K)(G)(38.0)}{(C)(Lbs.)(\%K_2O)}$$

$$(6) \text{ (Phosphorous)} \quad DS = \frac{(GPS)(ppm P)(G)(73.5)}{(C)(Lbs.)(\%P_2O_5)}$$

To calculate the ppm contribution for a given amount of fertilizer at a given dial setting:

$$(7) \text{ (Nitrogen)} \quad ppm N = \frac{(C)(DS)(Lbs.)(%N)}{(GPS)(G)(31.6)}$$

$$(8) \text{ (Potassium)} \quad ppm \text{ K} = \frac{(C)(DS)(Lbs.) (\%K_2O)}{(GPS)(G)(38.0)}$$

$$(9) \text{ (Phosphorous)} \quad ppm \text{ P} = \frac{(C)(DS)(Lbs.) (\%P_2O_5)}{(GPS)(G)(73.5)}$$

To calculate the Feed Ratio number when the gal lons per stroke is known:

$$(10) \text{ (Feed Ra tio num ber)} \quad FR = \frac{(GPS)(3785)}{C}$$

EXAMPLE: If your GPS is 2.11 gal lons per stroke, your feed ra tio num ber for a sin gle #4 pumper would be:

$$FR = \frac{(2.11)(3785)}{40} = 199.66$$

Your chem i cal to wa ter feed ra tio (round ing off) is 1:200.

To calculate the gallons per stroke (GPS) for a desired feed ratio:

$$(11) \text{ (Gal lons per Stroke)} \quad GPS = \frac{(FR)(C)}{3785}$$

EXAMPLE: If you want a feed ratio of 1:200 (FR = 200) us ing a sin gle #4 pumper:

$$GPS = \frac{(200)(40)}{3785} = 2.1136$$

You would set your con trol ler to the value near est 2.11.

FERTILIZER CALCULATION EXAMPLE

In our ex am ple we will cal cu late the mix tures and dial set tings to ap ply 100 ppm po tas sium and 150 ppm ni tro gen us ing po tas sium ni trate (13-0-44) and am mo nium ni trate (33-0-0). We will have two so lu tions, each fed sep a rat ely. Since po tas sium ni trate will con trib ute both po tas sium and ni tro gen, we will do those com pu ta tions first. Then we will com pute the mix ture and set ting for am mo nium ni trate.

The GPS in our ex am ple is 2.11. We will be mix ing 50 gal lons of each fer til izer con cen trate at a time, so G=50. Ppm K = 100, and ppm N = 150. We will be feed ing each so lu tion us ing sep a rate #4 pump ers, so C = 40. From the fer til izer for mula (13-0-44) we find % K₂O = 44. Cal cu la tions will be rounded off. First we will ap ply For mula 2 to cal cu late how much po tas sium ni trate we will need:

$$\text{(Potassium)} \quad Lbs. = \frac{(GPS)(ppm \text{ K})(G)(38.0)}{(C)(\%K_2O)} = \frac{(2.11)(100)(50)(38.0)}{(40)(44)} = 22.8 \text{ Lbs.}$$

To get 100 ppm po tas sium we need 22.8 pounds of po tas sium ni trate. We will make things easy by us ing 25 pounds in a 50 gal lon mix ture of con cen trate. This gives Lbs. = 25. We will use For m ula 5 to cal cu late the dial set ting needed to get 100 ppm K at this mix ture.

$$(5) \text{ (Potassium)} \quad DS = \frac{(GPS)(ppm \text{ K})(G)(38.0)}{(C)(Lbs.) (\%K_2O)(100)} = \frac{(2.11)(100)(50)(38.0)}{(40)(25)(44)} = 9.1$$

We will set our po tas sium ni trate pumper at 9.1.

We will now use Formula 7 to find out how much nitrogen is coming from the potassium nitrate.

$$(7) \text{ (Nitrogen)} \quad ppm \text{ N} = \frac{(C)(DS)(Lbs.)(%N)}{(GPS)(G)(316)} = \frac{(40)(9.1)(25)(13)}{(211)(50)(316)} = 35.5$$

Now we can figure how much nitrogen we need from ammonium nitrate by subtracting the contribution from potassium nitrate from the total needed. This gives us $150 - 35.5 = 114.5$ ppm. We will use Formula 1 to figure how much ammonium nitrate we need in our concentrate.

$$(1) \text{ (Nitrogen)} \quad Lbs. = \frac{(GPS)(ppm \text{ N})(G)(316)}{(C)(%N)} = \frac{(211)(114.5)(50)(316)}{(40)(33)} = 28.9$$

Again we will make things easy by mixing our concentrate in convenient increments. We will mix 30 pounds of ammonium nitrate in each 50 gallons of solution. Using these figures, we can finally apply Formula 4 to calculate the dial setting of our ammonium nitrate pumper.

$$(4) \text{ (Nitrogen)} \quad DS = \frac{(GPS)(ppm \text{ N})(G)(316)}{(C)(Lbs.)(%N)} = \frac{(211)(114.5)(50)(316)}{(40)(30)(33)} = 9.6$$

So, we can get our desired feed of 100 ppm potassium and 150 ppm nitrogen by using these mixtures and dial settings: 25 pounds of potassium nitrate in 50 gallons of solution and feeding at a dial setting of 9.1 on one pumper, and 30 pounds of ammonium nitrate in 50 gallons of solution and feeding at a dial setting of 9.6 on the second pumper.

Once you determine your mixtures you can use the formulas to figure dial settings for different ppm values.

NOTE: If you get a value for DS greater than 10 you will need to increase your feed capacity. You may do this by adding pumpers (increasing C) or by decreasing the gallons per stroke (GPS) by adjusting your controller. If you decrease the GPS you should be careful not to set it too low. At high flows the stroking rate may be too fast and the pumpers may not be able to keep up; then the feed will go down.

To figure your maximum stroking rate, divide the GPS value into the maximum flow for your system. If this value is greater than 30 for multiple pumpers on one manifold or 45 for a single pumper on one manifold you may encounter problems with reduced feed at high flows. You may use your controller to measure the maximum flow under actual maximum flow conditions on your irrigation system.

APPENDIX C. Typical Installation Drawings

Complete system requires:

- Controller
- Water meter/flowsensor
- Manifold(s)
- Pumper(s)
- Blend tank

Options:

- Solution tanks
- Calibration standpipes (not shown)
- Monitors - EC and/or pH

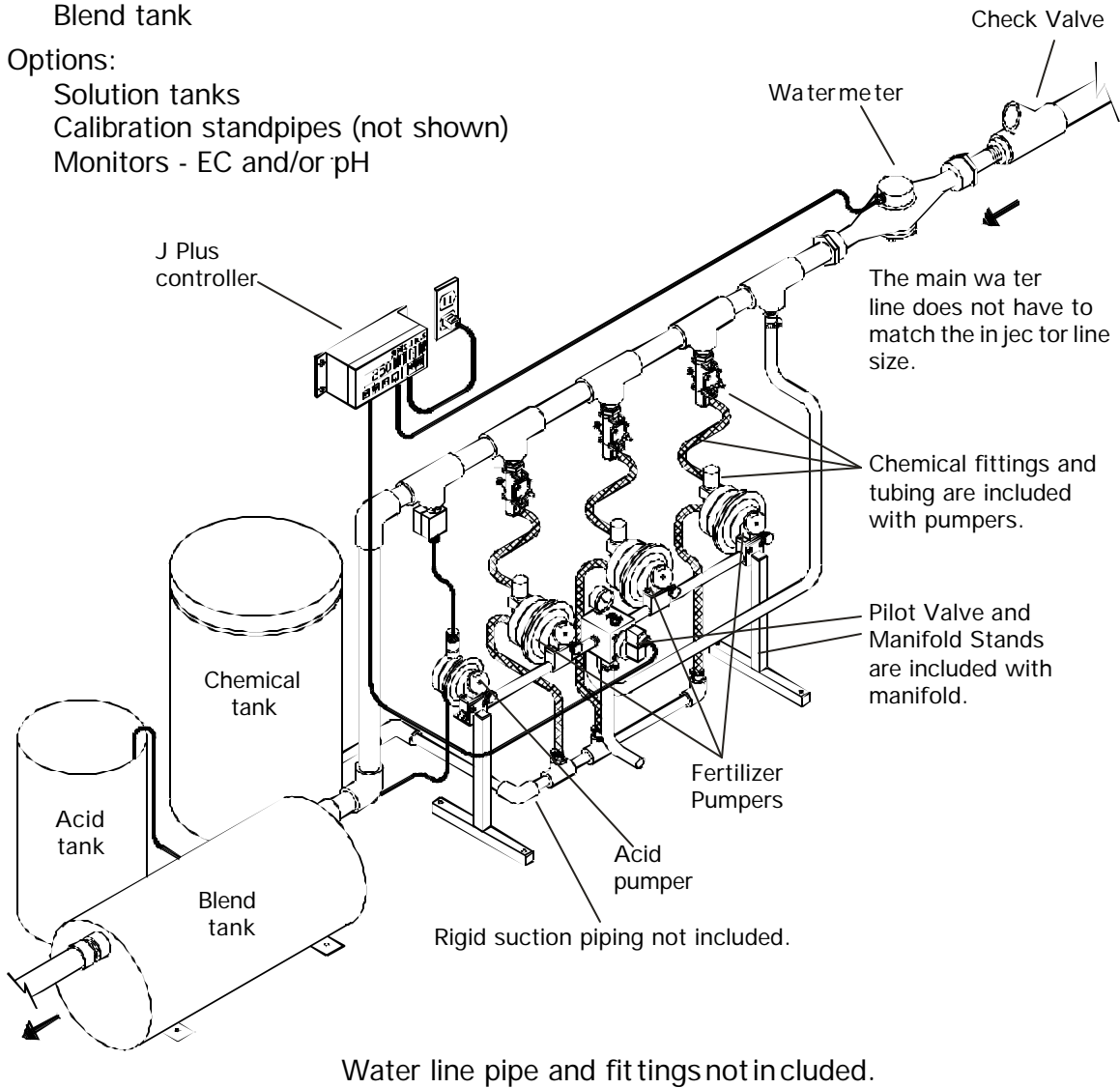


Figure C-1
Typical Custom Installation – All components ordered separately.

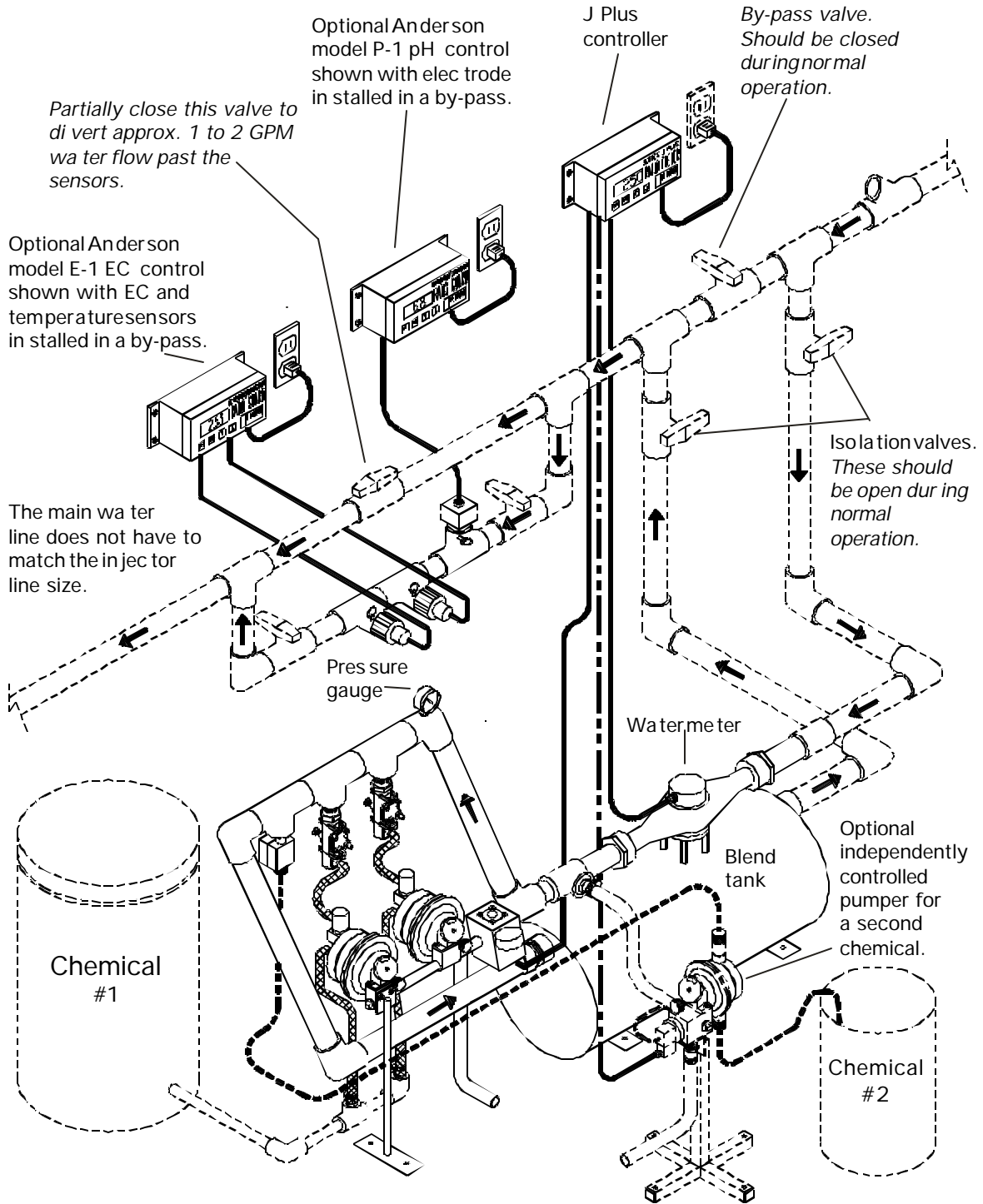


Figure C-2

Typical Package System Installation. Dashed parts are optional or are supplied by the user.

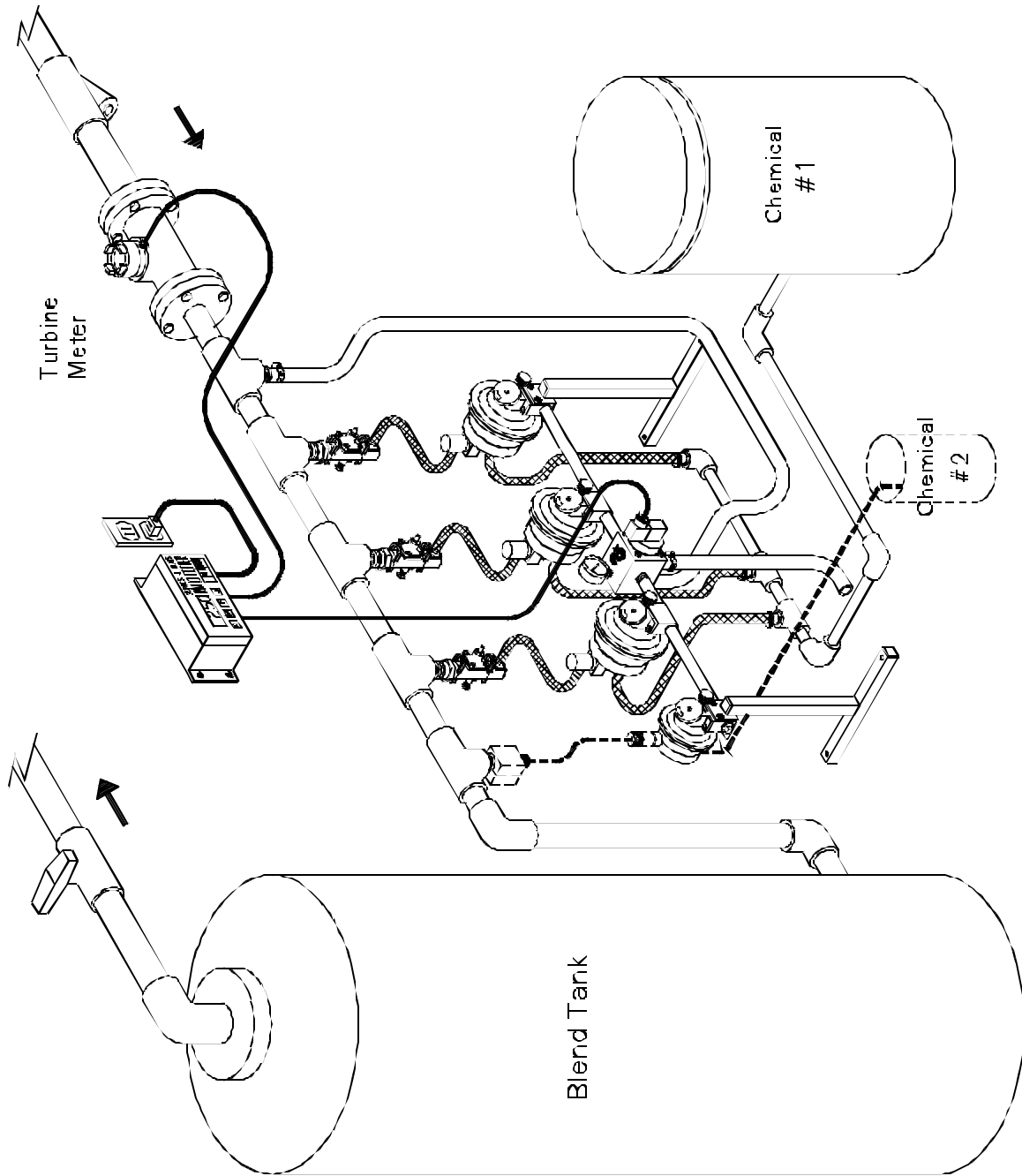


Figure C-3
Typical Installation Using a PVC Turbine Meter

RATIO:FEEDER® LIMITED WARRANTY

WHAT IS COVERED

The H.E. Anderson Company of Muskogee, Oklahoma, will make any necessary repairs and/or replace any parts of any Ratio:Feeder® product made necessary because of defects in materials or workmanship for fifteen months from date of manufacture. Warranty repairs and/or replacements will be performed without charge to the owner by H.E. Anderson Company within a reasonable time after prepaid delivery of the defective product to the H.E. Anderson Company, 2100 Anderson Drive, Muskogee, Oklahoma 74403.

WHAT IS NOT COVERED

This warranty specifically excludes failure of any parts or materials caused by chemical attack or damage caused by operation above rated capacity or pressure. Further, this warranty does not cover wear or failure caused by sand or other foreign materials which may be found in water that is passed through our products, or damage caused by freezing or exposure to water temperatures above 60 °C (140 °F).

This warranty does not cover damage caused by failure to follow prescribed installation instructions and limitations issued by H.E. Anderson Company. In addition, this warranty does not cover service adjustments, repairs, or replacements caused by misuse, negligence, alteration, accident, or lack of specified maintenance.

This warranty does not cover components used by, but not manufactured by H.E. Anderson Company, in the manufacture of our products except to the extent of said component manufacturer's warranty.

This warranty specifically excludes liability for consequential damages or for charges for labor or expense in making repairs or adjustments, or losses of time or inconvenience.

This warranty gives you specific legal rights and you may also have other legal rights which may vary from state to state. H.E. Anderson Company does not authorize any person to create for it any other obligation or liability in connection with these products. ANY IMPLIED WARRANTY APPLICABLE TO THESE PRODUCTS IS LIMITED TO THE DURATION OF THIS WARRANTY. H.E. Anderson Company shall not be liable for consequential damages resulting from breach of this written warranty.

NOTE: Some states do not allow limitation on how long an implied warranty will last or the exclusion of limitations of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

WHAT TO DO IF THERE IS A QUESTION REGARDING WARRANTY

- (1) Promptly notify the consumer advisor at H.E. Anderson Company by telephone at 800-331-9620 or 918-687-4426.
- (2) Confirm the report in writing (or via FAX at 918-682-3342) to the H.E. Anderson Company, stating the circumstances surrounding the problem.

PURCHASER'S OBLIGATION

- (A) Purchaser must give H.E. Anderson Company immediate written notice on discovery of defect.
- (B) Purchaser must pay for shipment of the defective product to the H.E. Anderson Company, 2100 Anderson Drive, Muskogee, Oklahoma 74403.