Operation & Service Manual

EBM Enviro-Blender Metering System
Automatic Water Temperature and Volume Control

THE FRED D. PFENING COMPANY
1075 W FIFTH AVE.
COLUMBUS, OHIO 43212
Phone: 614-294-5361 Fax: 614-294-1633
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INSTRUCTION, OPERATION, AND MAINTENANCE MANUAL FOR ENVIRO-BLENDER METERING (EBM) SYSTEM (Automatic Water Temperature Blender)

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Introduction

The Pfening ENVIRO-BLENDER METERING (EBM) SYSTEM is an automatic water metering and temperature control system. It is comprised of valves, piping, electronic controls, and a liquid meter. It is accurate and reliable. It is unique in that it does not use motors to actuate the blending valves. The ENVIRO-BLENDER METERING (EBM) SYSTEM utilizes a pneumatic proportional valve to blend hot or chilled water with city water to achieve the desired water temperature set point.

The Pfening ENVIRO-BLENDER METERING (EBM) SYSTEM is also unique in that it does not dump initial "off temperature" water to the drain. The ENVIRO-BLENDER METERING (EBM) SYSTEM keeps track of the amount of off temperature water and compensates for the off temperature water during the batch sequence. This saves water and energy used to heat or chill the water supplies.

The Pfening ENVIRO-BLENDER METERING (EBM) SYSTEM is capable of being controlled locally; or remotely from a mixer operator station. If remote operation is desired, then the batch temperatures and amounts will be the same every time unless the operator changes set points locally on the controller OIT (Operator Interface Terminal). Note: The controller can be remotely controlled from a Logix 5000 PLC over Ethernet along with the temperature and weight.

The Pfening ENVIRO-BLENDER METERING (EBM) SYSTEM is capable of delivering blended water to multiple mixers one at a time with minor modifications. Standard versions of the unit are available to deliver to one, two, or three mixers. Customized versions are available at additional cost. A standard version can also control a remote water pump.

The Pfening ENVIRO-BLENDER METERING (EBM) SYSTEM has 10 preset set points and a manual override for weight and temperature amounts. The ENVIRO-BLENDER METERING (EBM) SYSTEM will log the data from the last 100 batches of water. It records the batch set points, actual temperature, and actual batch weight. This batch information can also be written to an optional flash memory card.

The batch weight is calculated in the ENVIRO-BLENDER METERING (EBM) SYSTEM controller from a pulse count generated by a water meter. Each pulse generated by the meter represents a fraction of a pound of water. The controller keeps a running total of pounds of water and displays the total as a whole number. When the preset total is reached, the controller automatically closes the flow solenoid valve, stopping the flow of water.

The ENVIRO-BLENDER METERING (EBM) SYSTEM can be either wall mounted or mounted on an optional aluminum floor stand for easier installation.

Guarantee and Liability

The Seller guarantees material and workmanship of material furnished hereunder from date of shipment for a period of one year. As long as the equipment has been properly cared for and operated under normal conditions and provided the customer promptly notifies the Seller in writing that a defect exists. Within the guarantee period, we agree to repair or replace at our option any part or parts, which in our opinion are defective when such parts are returned to our plant with all shipping charges, prepaid. The Seller will assume no expense or liability for any repairs or alterations made by the purchaser or others without our written consent. We are not liable for any consequential damage in case of any failure of our equipment to meet the conditions of our guarantee. Equipment and accessories furnished by third parties are guaranteed only to the extent of the original manufacturer's guarantee to the Seller. It is understood that there are no other warranties of any sort, express or implied.

Operation Description

The layout of the blending valves is shown in Figure 1 below. The three incoming lines are connected to the chilled, hot and city water positions respectively. Valves SV2 (6) and SV1 (7) enable either hot or chilled water. The proportional valve FCV1 (8) controls how much of either hot or chilled supply is added to the city water.

The water flow temperature from temperature emitter TE1 (10) is the process variable that the PLC uses in the PID's to control the proportional valve. The PLC will make a comparison between the water flow temperature and the set point temperature. If the water flow temperature set point is above the city water flow temperature then the chilled water solenoid valve SV2 (6) will be open and the hot water solenoid valve SV1 (7) will be closed. If the temperature set point is below the city water temperature then the chilled water solenoid SV2 (6) will be closed and the hot water solenoid SV1 (7) will be open.

If there is more than one delivery point, a selector switch on the front of the ENVIRO-BLENDER METERING (EBM) SYSTEM control cabinet determines which mixer the water is delivered to. The flow emitter FE1 generates a pulse count based on the amount of water that has passed by the meter. The PLC controller converts the pulse count to a unit of weight measure.

Installation Instruction

Referring to Figure 1, connect the water supply lines to the manual ball valves as shown in the figure. The chilled, hot, and city water lines *must* be connected as shown. The unit will not work properly if the water supply lines are connected differently. The ENVIRO-BLENDER METERING (EBM) SYSTEM is supplied with three water pressure regulators (5). All three of these regulators should be set to 60 psi max. These regulators help to balance out the water supplies before mixing. This helps ensure accurate mixing of different temperature water and accurate metering of the weight. The pressure settings are shown on the dial. The knob for the pressure setting is under a black protective plastic cap. The water check valves (2) will prevent back flow from one line to another in the case of pressure imbalance.

Next, connect the outlet piping or hose to the flow valve outlet(s). Plumb this line to the mixer or wherever, the water is to be used. If the outlet piping is long, pitch the pipe so that it will drain after each draw for better temperature and volume control.

Next, there is an air pressure regulator on the side of the ENVIRO-BLENDER METERING (EBM) SYSTEM control cabinet that is used to actuate the proportional valve. This is a combination filter regulator assembly with an automatic pulse drain. It has a gauge on the side to indicate the regulated air pressure. The air pressure should be set for 25 PSI. It has a 1/8" NPT port on the side of it for the air supply line. Connect a clean air supply line to the regulator.

Once the ENVIRO-BLENDER METERING (EBM) SYSTEM assembly is anchored and the water and air supply lines are connected, turn on the air and water supplies and check for leaks. Next, locate a 120 volt single phase grounded receptacle (Preferably GFCI type) and plug in the controller. The operator interface display should light up.

The flow rate should be between 100 and 200 lbs. per minute (11 to 25 gals. per minute). Water temperature may be from 32 °F to 180 °F. If the water flow is too slow, check the water supply pressure and pressure regulators, or the pipe size may be too small. Use the regulators to adjust the pressure in the lines so that the pressures are equal when the water is running. The two higher pressure lines will have to be adjusted down to match the pressure in the lowest pressure line. If inadequate flow results, pressure in the low pressure line will have to be increased by re-plumbing with larger pipe or adding a pump.

ENVIRO-BLENDER METERING (EBM) SYSTEM
## Hardware Description for Assembly
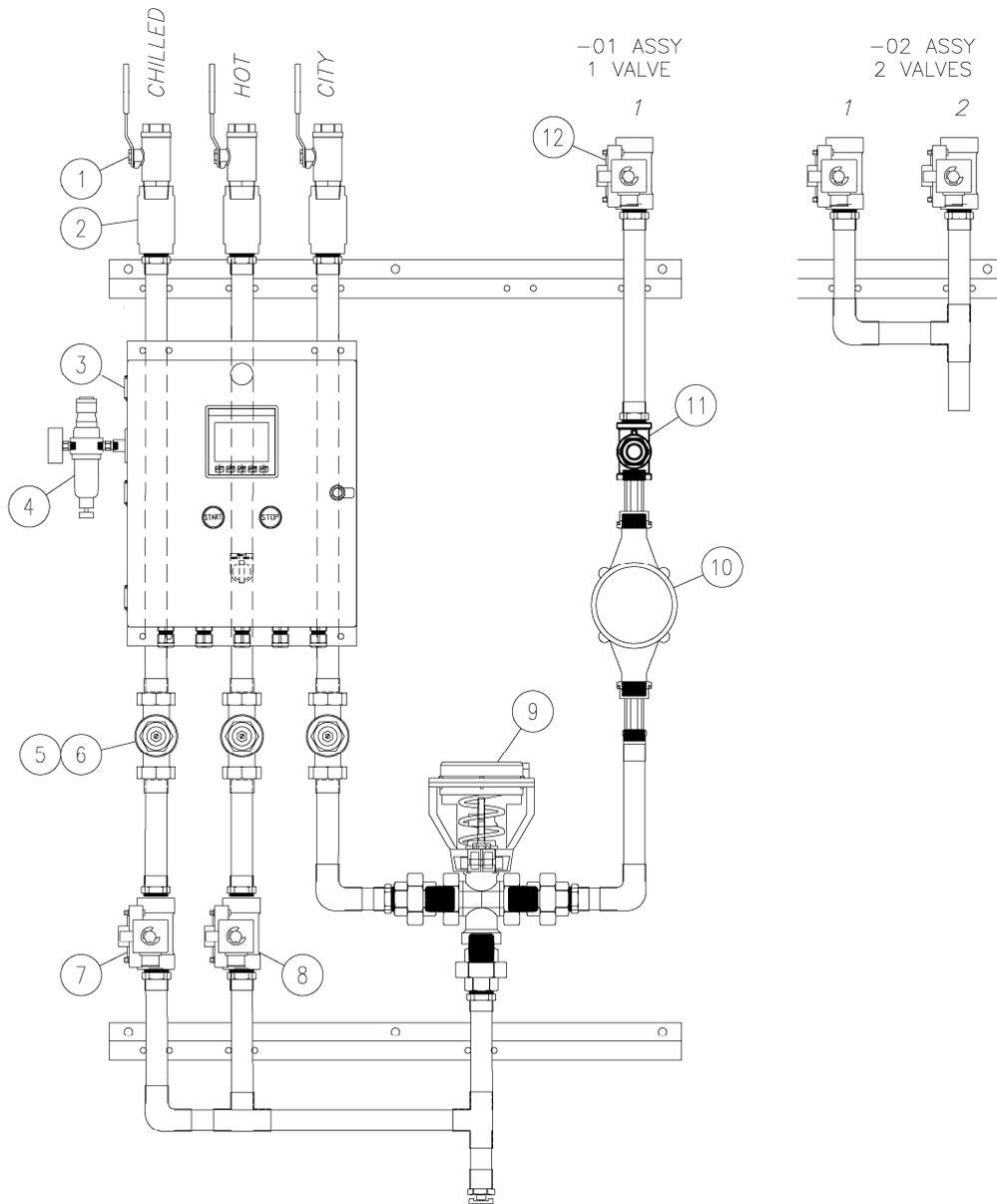
Figure 1 – Typical Pfening EBM Water Blender & Meter

LEGEND

1 – Manual Shutoff Ball Valve
2 – Check Valve
3 – PLC Control Cabinet
4 – Air Pressure Filter/Regulator
5 – Water Pressure Regulator
6 – Pressure Transmitter

7 – Chilled Water Solenoid Valve
8 – Hot Water Solenoid Valve
9 – Water Proportional Valve
10 – Pfening Hot Water Meter
11 – RTD Temperature Sensor
12 – Water Flow Solenoid Valve
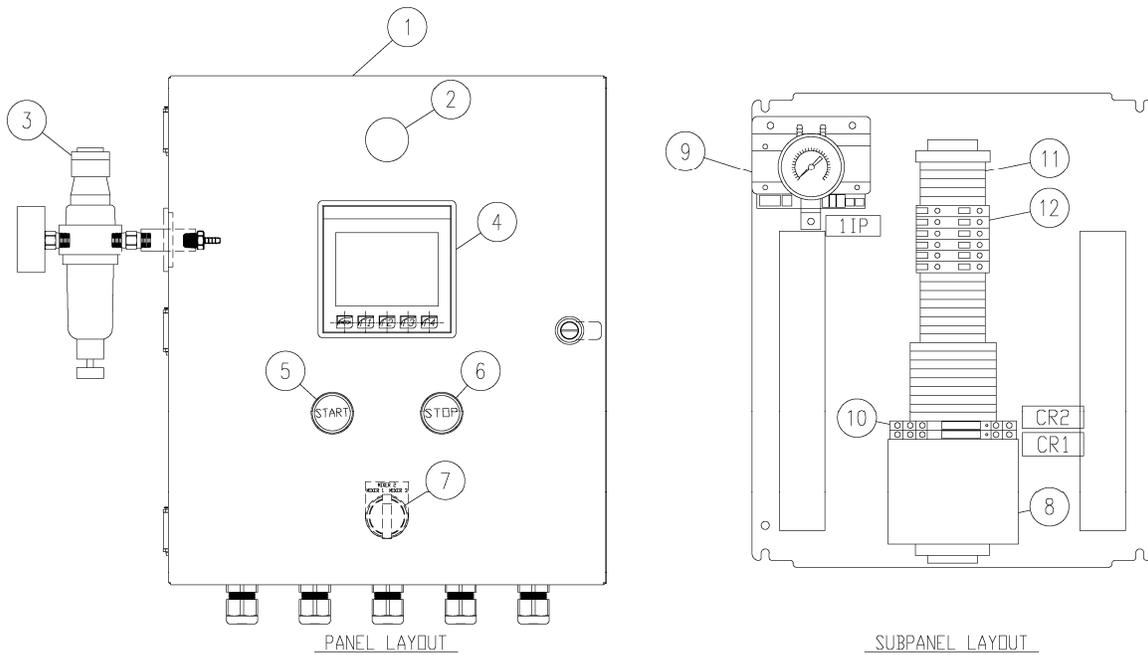
Figure 2 – Typical Pfening Controller

LEGEND
1 – Stainless Steel Control Cabinet
2 – Warning Horn
3 – Air Pressure Filter/Regulator
4 – Operator Interface Terminal/PLC
5 – Start Batch Pushbutton
6 – Stop Batch Pushbutton
7 – Mixer Delivery Selector Switch (Optional)
8 – 24VDC Power Supply
9 – Tempered Water I/P Transducer
10 – SPDT Relay and Socket
11 – Wire Terminals for Field Devices
12 – Fuses for Output Devices

ENVIRO-BLENDER METERING (EBM) SYSTEM
## Elementary Wiring Diagram for Controller
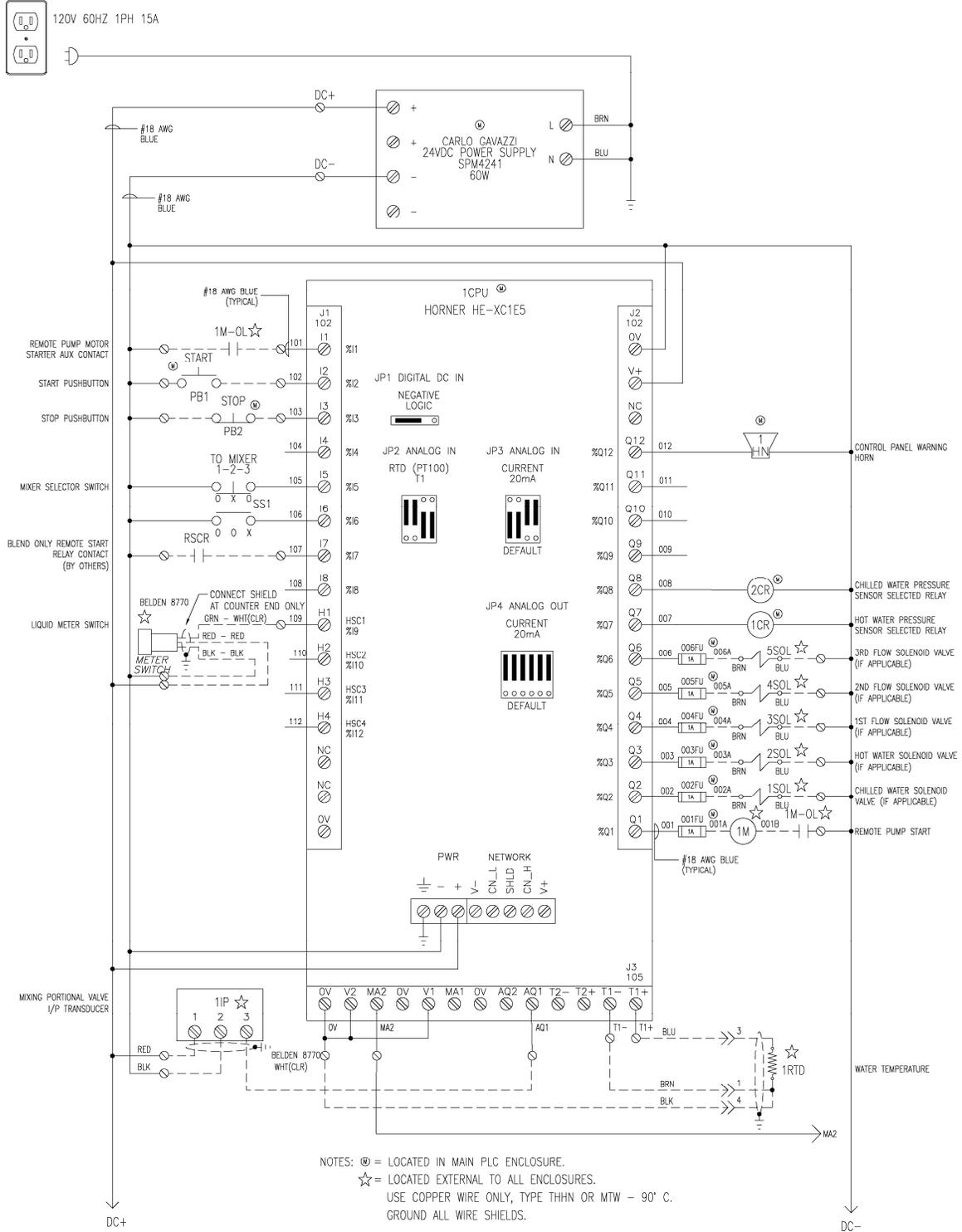
Figure 3 – Typical Wiring Diagram

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ENVIRO-BLENDER METERING (EBM) SYSTEM
## Elementary Wiring Diagram for Controller Cont.
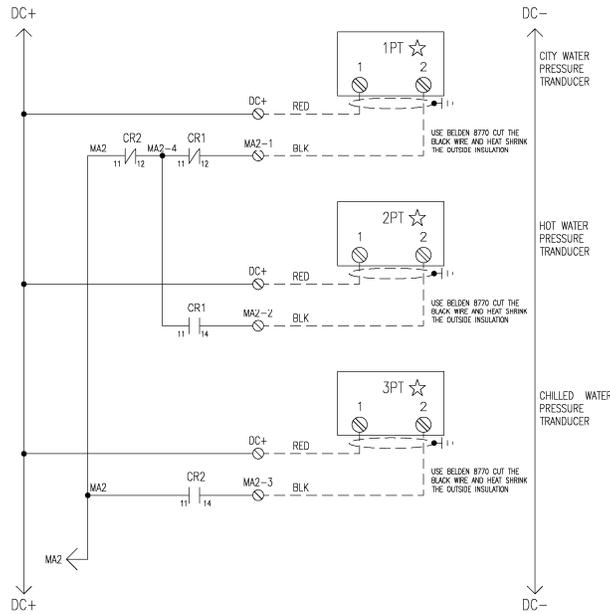
Figure 4 – Typical Wiring Diagram Cont.

External Wiring Diagram for Optional Remote Pump Start
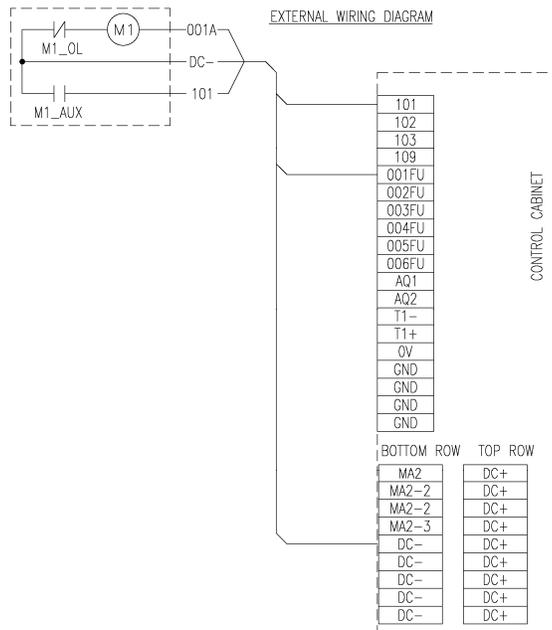
Figure 5 – Typical External Wiring for Remote Pump Start

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Sequence of Operation

(See screens on following pages)

To change presets:

1. Press the **Preset List** button on Screen1 the Main Screen. Refer to Figure 7 below. You will be able to see a table with a temperature column and a weight column.

2. To change the values touch the screen where you want to change the value. A popup numeric keypad will appear. Type in the desired value and then press **Enter**. Press **ESC** to leave the value unchanged.

3. There are a total of 10 presets available. The first 5 presets are on the first Preset Screen. The second 5 presets are one the Next Preset Screen.

To choose a preset:

1. Press the **Choose Preset** button on the Main Screen to cycle through the presets.

2. A message, above the **Choose Preset** button on the Main Screen, will appear letting you know what preset is selected. You will also see the preset number by the weight value, **Preset 1 LB.** If you are at Preset 10, pressing the button again will take you back to Preset 1.

To change target values without using presets:

1. Touch the **Target Deg. F** value that is highlighted in Figure 6 below. A popup numeric keypad will appear. Type in the desired value and then press **Enter**. Press **Esc** to leave the values unchanged.

2. Touch the **Preset LB** value that is highlighted in Figure 6 below. A popup numeric keypad will appear. Type in the desired value and then press **Enter**. Press **Esc** to leave the value unchanged.

To RUN a batch:

1. Verify the proper target values are entered.

2. Press the green **START** pushbutton on the front of the control cabinet. The controller will automatically stop at the end of the draw.

To STOP a batch:

1. Press the red **STOP** pushbutton on the front of the control cabinet. The controller will remember where if left off in the batch.

2. Press the green **START** pushbutton on the front of the control cabinet to resume the batch.

To RESET a batch:

1. Press the red **STOP** pushbutton on the front of the control cabinet twice in 1 second and the batch will reset back to 0 LBS.

Screens Outline

Main Screen

        Preset List 1

                Preset List 2

                Batch History

                Batch Totals

        Main Screen with Details

                Line Pressure

        Alarm History

        Setup – (requires password)

                System Info

                Weight Calibration

                        Measured Test Weight

                        Scale Factor Screen

                Set Time, Date and Password

                Advanced Setup

                        Preact With Weight Settings

                Manual Control

Alarm Pop-Up

Controller Operation

Main Screen
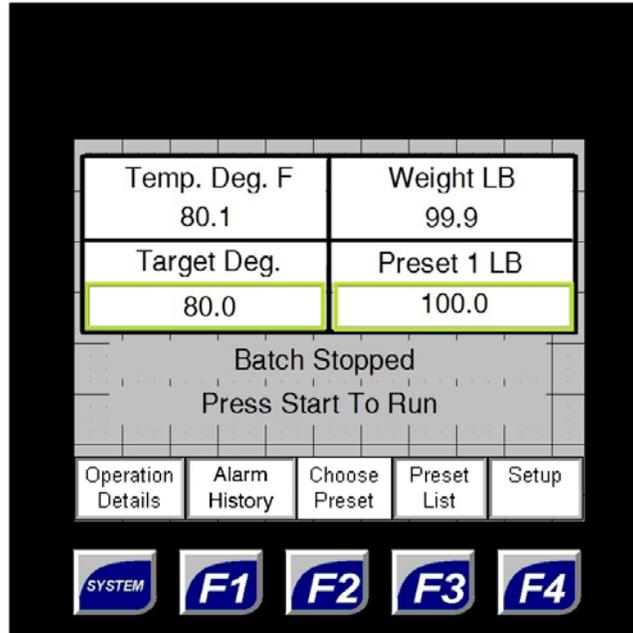
Figure 6 – Main Screen

The Main Screen is displayed after power up and is the only screen needed for normal operation.

Upon installing a new water blender, the basic setup parameters need to be selected and the unit needs to be calibrated. Figure 6 shows the main screen that the controller will display upon power up of the unit. The operator interface terminal is a touch screen. The function buttons are not used or needed.

Choose Preset Recipe
Pressing the Choose Preset button will cycle through the 10 available preset recipes.

Enter Recipe Directly
The temperature and weight goals can be directly entered by pressing the appropriate button.

Normal Run
If the unit has been set up, it is ready to press the start button and begin operation. The unit will stop automatically at the end of the draw; the stop button is only for unusual circumstances.

List of Preset Recipes

The first Preset List Screen is entered from the Main Screen or the Main Screen Details Screen.
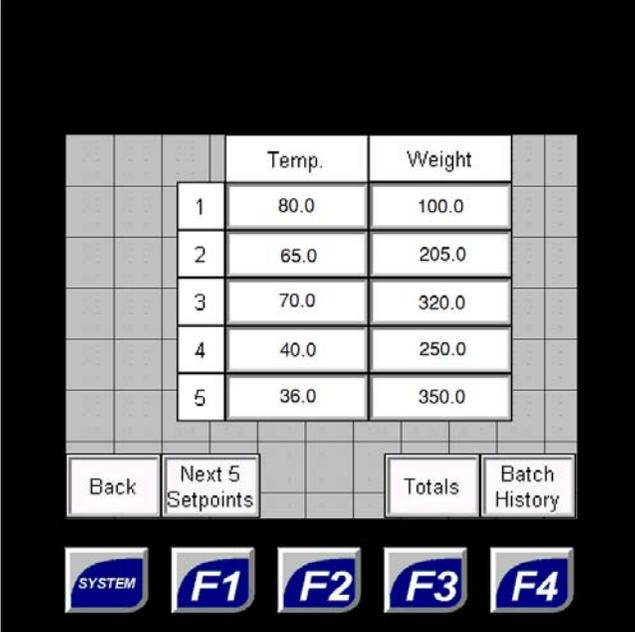
Figure 7 – Preset List 1

Review and Enter Recipes
The presets can be configured on this screen by touching the cell of the preset that the operator wants to change. There is a temperature set point and a corresponding weight set point. Press the "Next 5 Setpoints" to see the remaining 10 set points. Once the preset set points have been configured, Press the "Back" button to return to the "Main Screen".

Batch History

The Batch History Screen is entered from the first Preset List Screen.
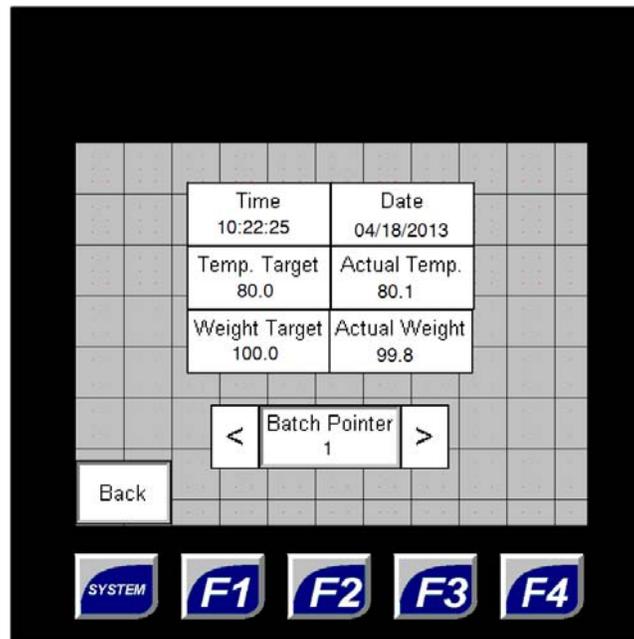
Figure 8 – Batch History Screen

Review Batch History
This screen allows the operator to scroll through the last 100 batches and look at the Time, Date, Temperature and Weight set points, and the Temperature and Weight actual amounts of each batch. Pressing the right or left arrow button will move the operator backwards and forwards through the records. Once 100 batches have been saved in the data table in the PLC the oldest batch is overwritten when the 101st batch goes into the data table. Batch 1 is the last batch made and batch 100 is the batch made 100 batches ago.

If the operator wants to skip through the data table to a specific batch in the table, then the operator can press the "Batch Pointer" button on the screen and enter a specific batch number up to 100 to be viewed.

Pressing the "Back" navigation button will take the operator back to the "Preset List" screen. Refer to Figure 7.

Batch Totals

The Batch Totals Screen is entered from the first Preset List Screen.
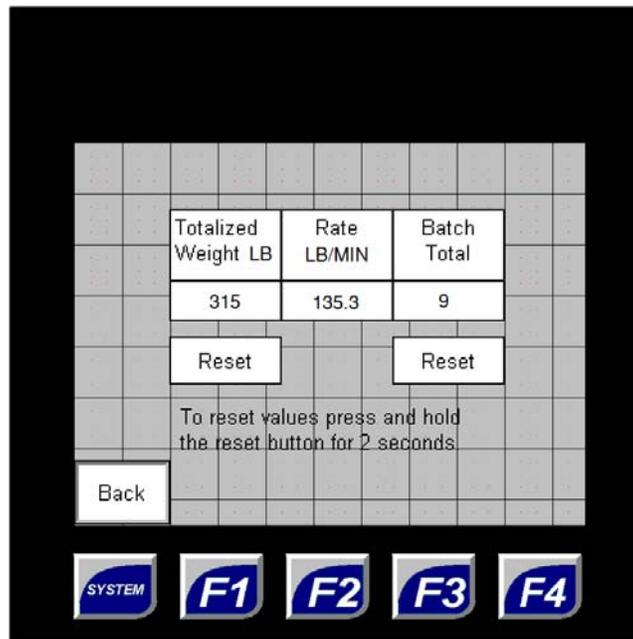
Figure 9 – Batch Totals Screen

Total Weight and Batches
This screen shows the total weight of water dispensed and the total number of batches since the last reset. The units of measure change with the operator's selections. The totalized weight and batch counter can be reset.

Current Rate of Delivery
The screen also has the current rate of delivery. The rate is displayed in real time. To see a number greater than 0 the blender will have to be running a batch.

Main Screen with Details

The Main Screen Details Screen is entered from the Main Screen – Operation Details.

This screen is an alternative to the Main Screen. It has details that are of programming interest.
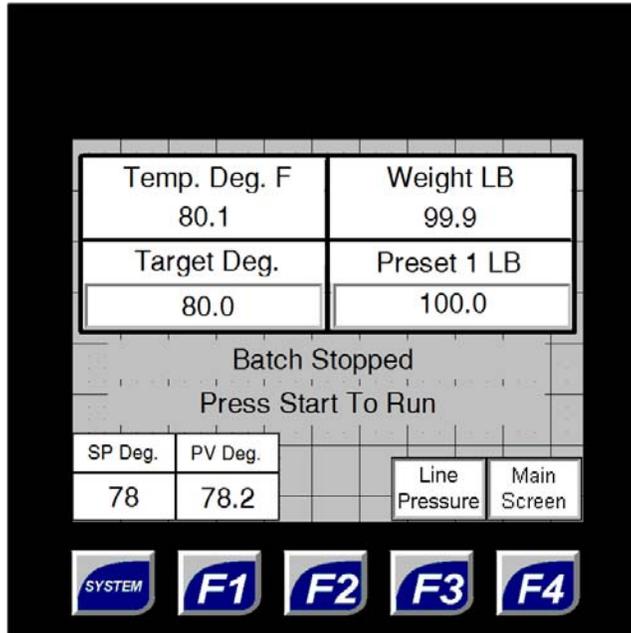

Figure 10 – Main Screen Details

Normal Operation
The Operation Details screen has all the features the main screen has plus some additional information that can be useful when troubleshooting. This screen can be accessed during normal batching operation and can be used to make batches.

Details of Program Operation
The PV (process variable) is the measured water temperature after the proportional valves. The process variable (actual temperature from the RTD) is used in the PLC PID program block to control the outputs to the proportional valves.

The SP (setpoint) number is the set point variable for the PLC PID program block. This is the set point that controls the PID block. It changes based on the average batch temperature and how well the PID is controlling the proportional valve. The set point for the PID can vary from the temperature goal for the entire batch based upon actual changing water conditions.

Line Pressure

The Line Pressure screen is entered from Main Screen Details

This screen shows the water pressure of the three lines, with one current.
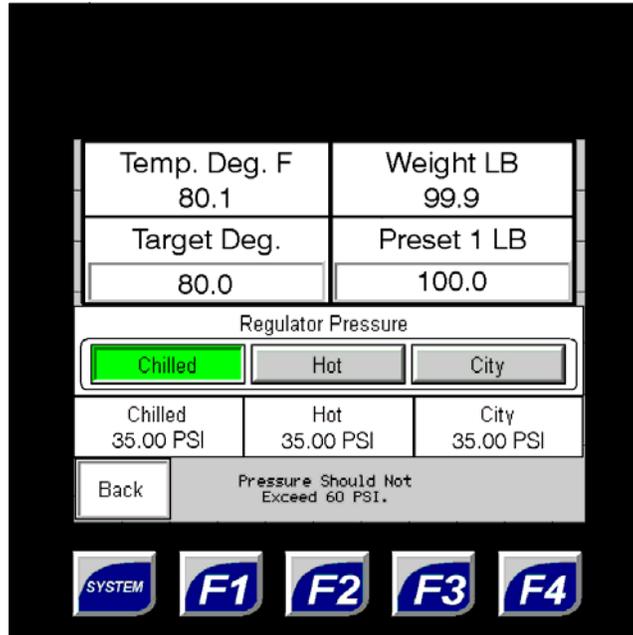
Figure 11 – Line Pressure

Pressure Observation
The pressure transmitters share one A/D input, so only one pressure is actively being read at a time. The two pressures that are not lit display the last pressure that they had before the switch.

Pressure Regulation
See installation instructions above.

Setup Screen
Entering Setup
To select the basic parameters for the new water blender the operator will need to enter the setup portion of the application. Press the highlighted button on the main screen that is labeled, "Setup". Refer to figure 6. The application will ask the user for the password. The default password to enter setup is "5354". This password can be changed at a later time. Changing the password will be explained later in this document. Make sure that the password that you choose is written down somewhere just in case it is forgotten. You will not be able to gain access to the setup routine if you forget the password or change the password from the default code. Entering the password will bring up the Basic Setup Screen.
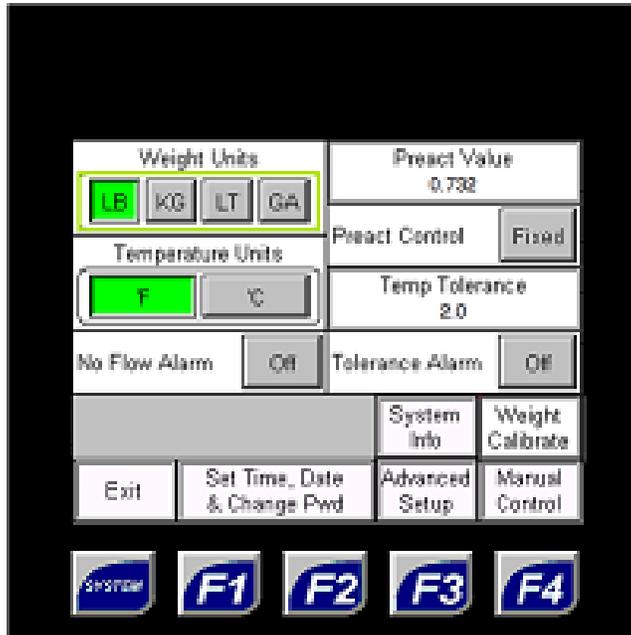

Figure 12 – Setup Screen

Weight And Temperature Units
The Setup Screen is used to select the units of measurement to display. Weight units can be displayed in KG, LB, LT, or GA. Temperature units can be displayed in °F or °C. Press the button corresponding to the desired units.

No Flow Alarm
The No Flow alarm is used to detect when there is no liquid flowing from the blender to the mixer. It is recommended that this alarm be set to "ON". If a no flow situation arises, then the horn on the cabinet will sound and an Alarm Screen will be appear on the display to notify the operator of a problem. The Alarm Screen will be explained further later in this document. Refer to the troubleshooting section of this manual for further help in addressing the problems that could cause a No Flow Alarm.

Preact Value
The preact value is an amount below the weight set point at which the flow valve closes. The preact compensates for the mechanical delay between when the PLC tells the flow valve to close and the flow valve actually closes. The preact button on the screen controls whether the preact is fixed or automatically calculated by the PLC. It is recommended that the preact be set to "Auto".

Temperature Tolerance
The Temperature Tolerance value is the tolerance in degrees that the flow water can be over or under before a water temperature not hot enough or cold enough alarm will occur. The Temperature Tolerance Alarm can be turned off.

System Info and Reset

The System Info screen is entered from the Setup Screen. In addition to the Pfening company information, there is a button to reset the programmable controller to factory defaults.

Weight Calibration Screen

Calibration of the water blender is important for accurate delivery of the water to the mixer. Calibration of the blender should be performed at startup and whenever the regular check of the delivered weight is not within about 1/2% of the goal weight.

The Weight Calibration Screen is reached from the Setup Screen.
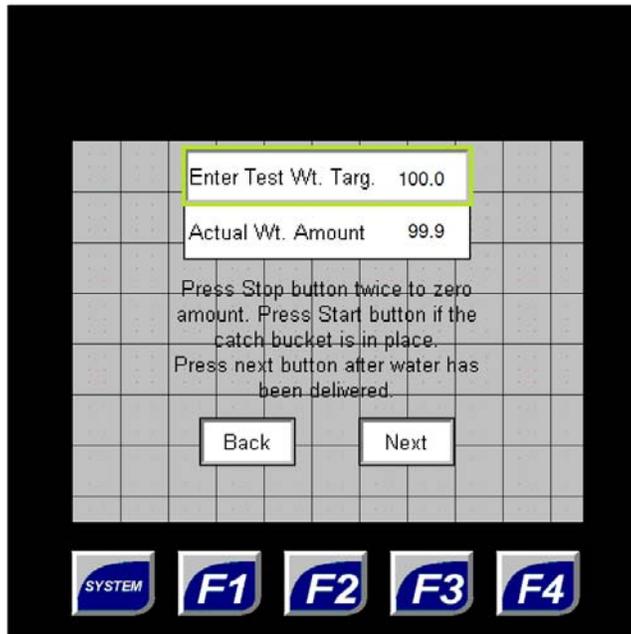
Figure 13 – Weight Calibration Screen

Enter Test Weight
Press the Enter Test Wt. Targ. button shown in Figure 13 to enter the amount of water to be dispensed for the purpose of calibrations. Generally, this is the maximum amount of water the catch bucket can hold before overflowing. The amount should be in pounds (Lb), or the unit selected in the Setup Screen. The closer the weight is to the normal recipe weight, the more accurate the calibration with at least 100 pounds being desirable.

Setup and Run Test Amount

A calibrated scale will be needed for the next step in the calibration sequence. Place the catch bucket on the scale and tare the scale for the weight of the catch bucket. Connect a hose to the flow valve on the blender and run the hose into the catch bucket. Press the green start pushbutton on the front of the ENVIRO-BLENDER METERING (EBM) SYSTEM control cabinet to initiate the dispensing of water into the catch bucket. As water is being dispensed into the catch bucket the number beside "Actual Wt. Amount" shown on the calibration screen will increment. This number represents how much water the blender believes it is dispensing.

Once the blender has reached the set point and the flow valve has closed, press the "Next" button. This navigation button will take the operator to the "Measured Test Weight Screen". Refer to Figure 14 below.
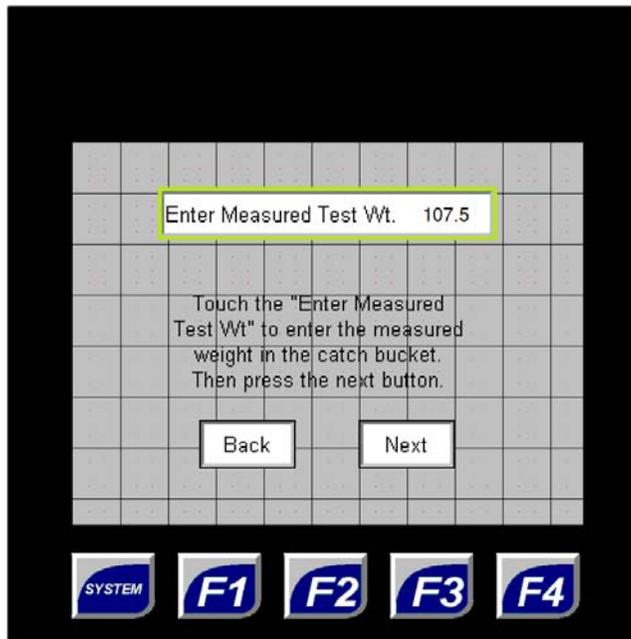
Figure 14 – Measured Test Weight Screen

Enter the Measured Weight

Weigh the catch bucket with the water in it on the scale that was used to tare the weight of the bucket. Press the "Enter Test Weight" button on the screen and enter the measured amount of the water in the catch bucket. Make sure the tare weight is not part of this amount. The PLC program will use this information to re-compute the scale factor used for the pulse counts coming from the liquid meter. This scale factor is the equivalent amount of water per pulse count. Press the "Next" button on the screen to go to the "Scale Factor Screen". Refer to Figure 15 below.
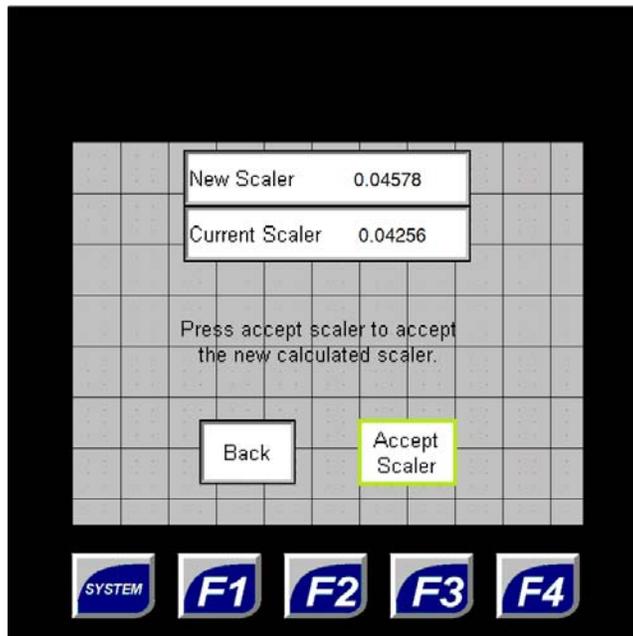
Figure 15 – Scale Factor Screen

Accept New Scale Factor
The default scale factor for the ENVIRO-BLENDER METERING (EBM) SYSTEM is 0.0420 LB/pulse. After the measured test weight amount has been entered into the PLC program, the program will automatically compute a new scale factor. Press the "Accept Scaler" button on the screen to accept the newly re-computed scale factor.

Next, press the "Back" button on Screen 12 and Screen 13 to return to the "Weight Calibration Screen" as shown in Figure 13. It is highly recommended that the calibration sequence is run at least twice to verify the computed scale factor. If the PLC program cannot compute the scale factor correctly, then it can be manually entered on the "Scale Factor Screen" by pressing the button called "New Scaler" and manually entering a scale factor.

Time and Date Setting

The Time and Date Screen is reached from the Setup Screen.
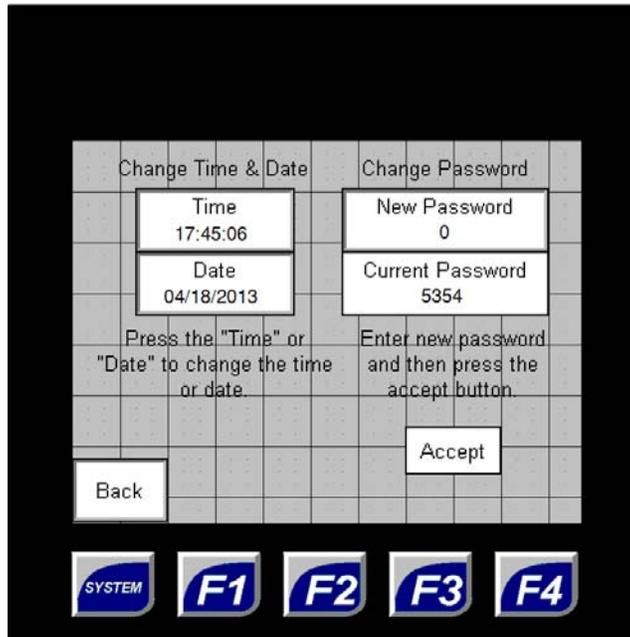
Figure 16 – Time and Date and Password Setting Screen

Change Time & Date
Pressing either of the highlighted button on the "Time and Date Setting Screen" will allow the operator to directly enter the correct time and date. See Figure 16 above. The Time must be entered in a 24 hour format.

Change Password
To change the password to access the setup parameters on the ENVIRO-BLENDER METERING (EBM) SYSTEM. This screen will display the current password. Pressing the button labeled "New Password" will allow the operator to enter a new password for accessing the setup parameters. Once the new password has been entered, press the "Accept" button to accept the new password.

Caution: Do not lose track of your ENVIRO-BLENDER METERING (EBM) SYSTEM password. If the ENVIRO-BLENDER METERING (EBM) SYSTEM Password is changed from the default password, and it is lost or forgotten, then there is no way access the setup parameters without downloading the PLC program again.

The RTD temperature sensor is calibrated at the factory. Generally, the operator should not be concerned with the RTD calibration sequence unless the RTD probe needs to be replaced in the field or the temperature readings from the RTD probe are inaccurate.

Advanced Setup Screen

Press the Advanced Setup button on the Setup Screen to access the advanced parameters.
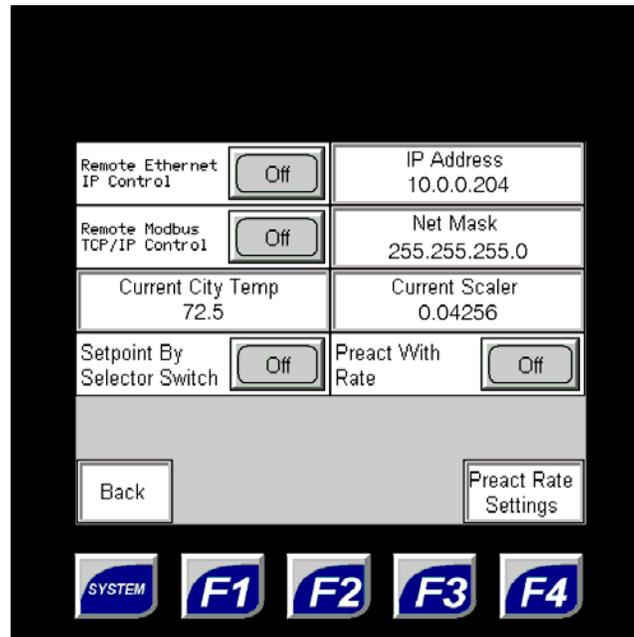
Figure 17 – **Advanced Setup Screen**

Remote Control
The Remote Control allows the controller operation and setpoints to be set remotely over Ethernet from an A-B Logix 5000 processor. Turning the remote control on allows changes to be made to the weight and temperature only by the remote PLC. However the system can still be started and stopped using the buttons located on the controller or another electrical contact device. The Remote Modbus button accepts the setpoints over a Modbus TCP/IP network.

IP Address / Net Mask
The IP Address, Subnet and Gateway Ethernet addresses can be changed. Press the associated box to change the address. The factory IP address is 10.0.0.204 with a Network mask of 255.255.255.0

Current City Temp
The city temperature is automatically set when the blending valve has been sitting at 100% city for a period of time. The water temperature taken at that time is then processed as the city water temperature. However the operator can manually change the city water temperature by pressing the Current City Water Temp and keying in an appropriate new city temperature value.

Current Scaler
The Current Scaler button allows the user to directly change the scaler value without doing a weight calibration, but the preferred method is the use the weight calibration procedure. The scaler value is the pounds per pulse out of the meter. Pressing the scaler button brings up a numeric keypad which in turn is used to manually key in the scale factor.

Setpoint By Selector Switch

Choosing the setpoint by selector switch feature is available on units that have multiple mixers and multiple mixer delivery valves. With the value turned on the system will operate with the setpoints associated with each of the mixers and the respective selector switch position. Mixer 1 is associated with Preset 1 values in the Preset List table. Should mixer 2 be selected then the system will use the values in Preset 2 in the Preset List. Current options include 3 positions available for delivery to each of 3 mixers.

Preact With Weight

The Preact With Rate monitors the flow rate and adjusts the preact in real time to give more accuracy to the water shutoff. So the faster the water flows the larger the preact and the slower the water flows the lower the preact. This function is disabled (Off) by default and should be used only with Pfening supervision.

Preact With Weight
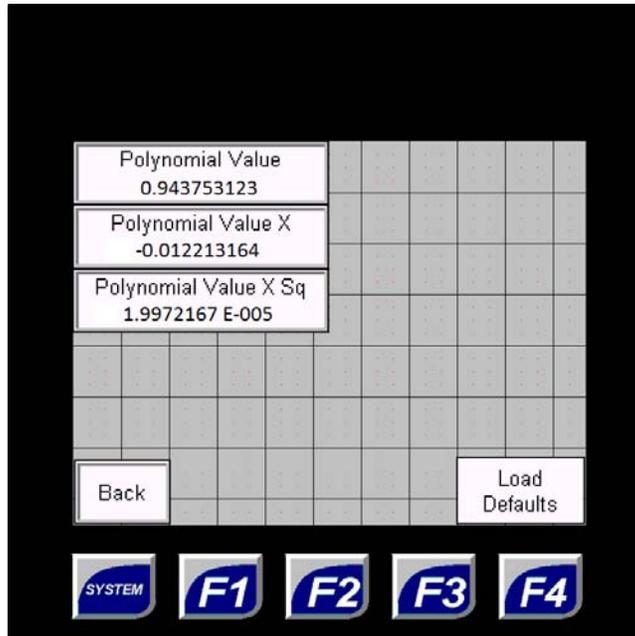
Figure 18 – Preact With Rate Settings

Preact With Weight cont.

The Preact With Rate Settings allows you to change the preact rate curve. The curve is a polynomial curve of preact = $a + b(x) + c(x^2)$ where x is the flow rate and a, b, and c are the values shown in Figure 18. The Polynomial valves are created by taking a sample of the over draw for several different flow rates. The default values are created for the current valve on the meter. A different valve may have a different curve and this preact with rate may not work. This is disabled by default and should be used only when the system has large flow rate problems.

The Load Default button loads the default polynomial values.

Manual Control

The Manual Control Screen is entered from the Setup Screen.
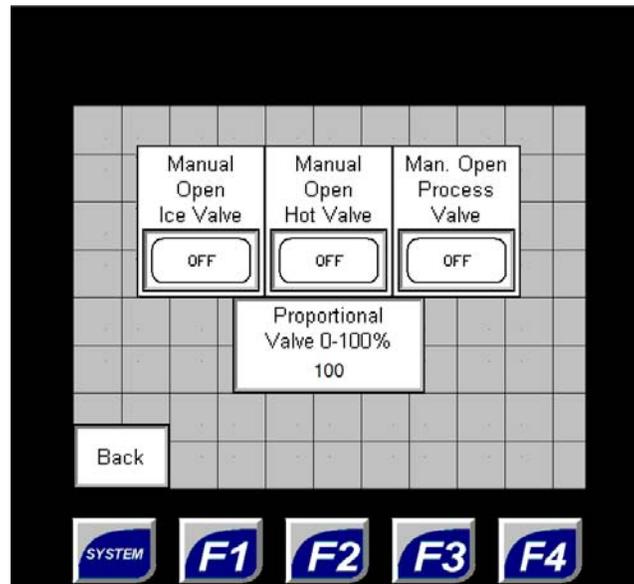
Figure 19 – Manual Control Screen

Manual Operation
Figure 19 above shows the "Manual Control Screen". This Screen is for basic troubleshooting and maintenance. Pressing the button "Manual Open Ice Valve" will open the chilled water solenoid valve. Pressing the "Manual Open Hot Valve" will open the hot water solenoid valve. Pressing the "Man. Open Process Valve" will open the flow solenoid valve. If multiple mixers are involved, then place the selector switch on the front of the ENVIRO-BLENDER METERING (EBM) SYSTEM control cabinet in the desired mixer flow valve position.

If the operator would like to run the city water for testing, then the proportional valve should be set to 100%. For hot or chilled water, the percentage should be 0. It is important to note that water is neither metered nor tempered while running in the manual mode.

Alarms
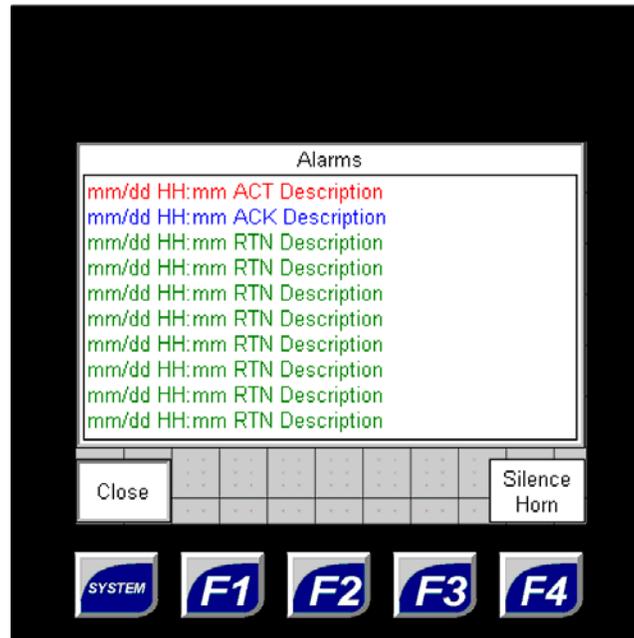
Figure 20 – Alarm Popup Screen

Alarm Popup Screen This screen can appear on the ENVIRO-BLENDER METERING (EBM) SYSTEM controller at any time. It is triggered when an alarm condition occurs. It will display the time and date the alarm occurred, if the alarm was acknowledged, and the description of the alarm. The "Silence Horn" button in the lower right hand corner of the screen will shut off the control cabinet warning horn. The alarm is acknowledged when the screen is closed. When the "Close" button in the lower left hand corner is pressed the screen will close returning the operator to the previous screen.

The following is a list of alarms the ENVIRO-BLENDER METERING (EBM) SYSTEM controller will generate. The flow alarm must be enabled on the Basic Program Screen before the Water Flow Alarms will be generated by the controller (Refer to Figure 12). See Table 1 below for an alarm list.

Alarm	Description
Water Not Hot Enough Alarm	Flow valve to the mixer is open. The temperature set point is greater than the actual temperature and the tempered water valve is 0% city water. After 10 seconds in this condition the alarm is generated.
Water Not Cold Enough Alarm	Flow valve to the mixer is open. The temperature set point is less than the actual temperature and the tempered water valve is 0% city water. After 10 seconds in this condition the alarm is generated.
Water No Flow Alarm	Flow valve to the mixer is open and the pulse counts from the liquid meter are not changing after 5 seconds.
Water Overflow Alarm	Flow valve to the mixer is closed. The liquid meter pulse count is compared to the set point. If the meter count is more than 50 counts above the set point then this alarm is generated.

Table 1 – Alarm List

ENVIRO-BLENDER METERING (EBM) SYSTEM
Troubleshooting the Controller

ERRATIC DISPLAY AND CONTROL

This controller is engineered and manufactured to withstand reasonable levels of electrical noise and interference found in typical installations. However, there is a compromise between controller cost and the degree of protection. It is always possible for electrical noise and interference to exceed the level of designed-in protection. A common source of interference is the solenoid valve loads switched by the controller, which do not have reverse voltage transient suppressers. Such suppressers are advisable in those cases where the microprocessor electronics being used are being affected by the reverse voltage surges produced when these loads switch off. Even if the controller switching this load is not affected, some other nearby devices may be affected.

Pfening will be happy to recommend an appropriate transient suppression device for your specific inductive load. This is typically a two-wire resistor-capacitor or diode device, which wires across the load. It will not be effective if wired across the contacts at the controller.

A general-purpose snubber is available from Pfening. The ratings of this snubber will be appropriate for Pfening supplied solenoid valves. Please contact Pfening to confirm its application to other loads.

TYPICAL CONTROLLER PROBLEMS

The unit is plugged in and power is on, but nothing happens:

1. Check that all wires to the ENVIRO-BLENDER METERING (EBM) SYSTEM Controller are firmly connected.

2. Check that 120 VAC power is present at L and N on the 24VDC power supply.

3. Check that there is 24 VDC power at the DC+ and DC- terminal on the terminal strip.

4. If power is supplied to the PLC controller but the display is dark, then the PLC controller maybe defective

5. Check to see if the flow solenoid valve is receiving power when the **START** button is pushed. If it is getting power but it does not open, check the solenoid coil. See the Solenoid valve installation section below for an assembly diagram.

Water runs but there is no count:

1. Open the top cover of the Pfening Hot Water Meter liquid meter and make sure that the pick-up switch is tightly held against the top of the meter casing by the retaining screws.

2. Check the wires from the ENVIRO-BLENDER METERING (EBM) SYSTEM controller to the liquid meter switch are not broken or loose.

3. Check the liquid meter switch operation by using a small magnet. Remove the meter switch head by loosening the set screw and rotating the head. Rotate a magnet around the raised bottom of the meter switch housing. There should be about 10 revolutions to get 1 pound on the meter display. If you have a count then the switch is OK.

4.   If the meter has been recalibrated in the field it is possible that the scale factor has been set very low near 0. This will make the meter pulse counts appear to not register. See page 16 for meter re-calibration.

5.   Check to see if the magnet inside the liquid meter is turning. Remove the pickup switch by loosening the screw in the plastic pickup head and rotating it clockwise to disengage. Using a paperclip cut a ¼" long piece of wire form the paperclip. Place this wire in the machined recess in the top of the meter housing where the switch rests. The magnet inside will pull the wire into alignment with it. Now turn on the water. If the magnet is turning, the wire will rotate with it. If the wire is not turning, open the meter and determine what is preventing rotation. Foreign matter in the meter is the most likely cause. If the meter internals show considerable wear or scoring, replace the internals.

Liquid meter is not metering water accurately:

1.   If the liquid amount is off proportionately the same amount each time, the scale factor may have been changed. See page 16 for meter re-calibration.

2.   If the scale factor is correct, but a proportional error of more than 5% is present, the meter internal parts may be worn, broken, or improperly installed. Disassemble the meter and inspect. Reassembly should be done on a workbench.

3.   The standard meter internals are limited to an operation temperature of 180 $^{\circ}$. If water hotter than this is passed through the meter, the internal parts may become distorted, which will prevent proper operation. Distortion generally causes the meter to run slow, resulting in too much water.

    If distortion is suspected, disassemble the meter and remove the metering chamber. The cylindrical sides of the metering chamber should be straight. If a straightedge shows them to be concave, replace the metering chamber. See page 30 for the meter assembly diagram.

    Additionally, the meter internals should turn freely. A small amount of air blown into the rectangular inlet on the side of the metering chamber should spin the internals, making a characteristic "wuk-wuk-wuk" sound.

Temperature control problems:

1.   Check to make sure that all the hand ball valves are open.

2.   If the temperature of the hot and cold incoming water is not adequate, the blender will not be able to provide a satisfactory blend temperature.

3.   If the pressure of the incoming water streams is severely unbalanced, water may backflow into the lower pressure line rather than blending properly. Make sure that the pressure regulators are properly adjusted to 60 PSI or less.

    Use the regulators to adjust the pressure in the lines so that the pressures are equal when the water is running. The two higher pressure lines will have to be adjusted down to match the pressure in the lowest pressure line. If inadequate flow results, pressure in the lowest pressure line will have to be increased by re-piping with larger pipe or adding a pump.

4.   Check to make sure that the air supply to the control cabinet is on and the regulator is properly set to 20 PSI. If the air supply to the control cabinet is shut off or low then the proportional blending valves cannot open properly.

5. Check to make sure there are no air leaks to the proportional blending valves.

Water won't shut off at the set point:

1. If the flow solenoid valve remains open when de-energized, it is stuck open (rapping it will sometimes make it close). Disassemble the valve and clean all parts. If this does not fix the problem, install a new valve or rebuild the existing one.

Request for information, trouble answers, and orders for parts should be sent directly to:

THE FRED D. PFENING CO.
1075 W. Fifth Ave.
Columbus, Ohio 43212

Telephone: (614) 294-5361
Fax: (614) 294-1633

PARTS ORDERS
The need for replacement parts is limited to relatively few components. Efficient and reliable operation is a matter of proper local maintenance rather than wear on parts. To assist the Maintenance Engineer in gaining a clear understanding of the component parts and assemblies we offer the following descriptions for your understanding and ordering.

Send all communications directly to the address above. Quicker and more competent service on parts, information, complaints and solution of your particular problem may be had by writing or telephoning the factory direct. Do not place collect calls.

Repairs and Parts
(also see parts drawings at the end of this manual)

Solenoid Valves: 1" Hot, Chilled, and City water supply solenoid valve. If for any reason the valve becomes inoperative due to a burned out coil, a new coil should be on hand to replace it. We suggest a replacement always be available in your inventory.

You will note that each valve has a spare parts kit, which may be ordered to replace all the operating parts within the valve in case these parts might become worn or broken. This kit should bring your valve back to good operating condition.

Proportional Valve: 1" Proportional Tempered Water and City Water Blendi ng Valve. If for any reason the valve becomes inoperative, a new actuator should be on hand to replace it. We suggest a replacement actuator always be available in your inventory.

Service Calls: We maintain a staff of Installation Supervisors who are available for service calls. The charges are transportation both ways, elapsed time at a per diem rate per 8 hour day. One day charge minimum plus travel time and transportation.

Information Phone Calls: We are always pleased to render a service without charge by telephone or letter. Have your problem well in hand to describe clearly, before placing call; have the man who knows the trouble do the talking; ask for Engineering Service.

Instruction Manual: Has been compiled as carefully as is possible from our experience and knowledge. When in trouble, you can find the answer to your problems, by referring to this Manual. If another Manual is needed, ask for it or as many as can be useful to your organization.

Solenoid Valve Installation

OPERATION: Normally closed valves are closed when the solenoid is de-energized and open when the solenoid is energized.

INSTALLATION: Check nameplate for correct pressure, voltage and service.

POSITIONING: Valves may be mounted in any position.

PIPING: Connect piping so the flow through the valve will follow the directional markings on the valve body. Apply pipe compound sparingly to the male fittings only. If applied to the valve threads, it may enter the valve and cause operational difficulty. Pipe strain on the valve body should be avoided by proper support and alignment of piping. When tightening pipe, do not use the valve as a lever. A strainer is recommended connected as close to the inlet as possible.

SOLENOID TEMPERATURE: Standard valves are supplied with coils designed for continuous duty service. When the solenoid is energized for a long period the solenoid enclosure becomes hot but can still be touched lightly with the bare hand. This is a safe operating temperature. Any excessive heating will be indicated by the smoke and odor of burning coil insulation.

MAINTENANCE: Before making repairs turn off electrical power and depressurize valve. It is not necessary to remove valve from pipe line for repairs.

CLEANING: A periodic cleaning of all solenoid valves is desirable. The time between cleanings will vary, depending upon the media and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation or excessive leakage will indicate that cleaning is required.

TROUBLESHOOTING

> Faulty Control Circuit: Check the electrical system by energizing the solenoid. A metallic click signifies solenoid is operating. Absence of click indicates loss of power supply. Check for loose or blown-out fuses, open-circuited or grounded coil, broken lead wires or splice connections.

> Burned Out Coil: Check for open-circuited coil. Replace coil if necessary. (Spare provided).

> Low Voltage: Check voltage across the coil leads. Voltage must be at least 85% of nameplate rating.

> Incorrect Pressure: Check valve pressure. Pressure to valve must be within the range specified on nameplate

> Excessive Leakage: Disassemble valves and clean all parts. Replace any parts that are worn or damaged with complete spare parts kit for best results. Damage to seating surface may also cause leakage.

> Improper Closing or Opening: Check piston for damage and clean bleed holes. Clean all internal passages in valve and tubing. Check springs. Replace worn or damaged parts.

TO REPLACE COIL
Turn off electrical power and disconnect coil lead wires.   Remove cap nut, lock nut, nameplate, and washer. Remove old solenoid coil. Put new solenoid coil onto the armature tube of the valve. Put the lock-washer and nut onto the armature tube. Hand tighten the nut, then use a wrench to tighten the nut to a quarter turn; **Do not over-tighten the nut, it may cause the armature tube to fail pre-maturely.**

<u>TO CONNECT THE DIN HOUSING</u>
1. Remove the Philip screw from the plastic housing and unplug it from the DIN coil.
2. From the screw opening, push the terminal block out from the plastic housing.
3. Note the 1, 2, and ground markings on the underside of the DIN enclosure.
4. For AC DIN Coil, connect 1 to the Hot wire, 2 to Neutral, and if required connect the ground wire to ground.

Piping and Pressure Calculations

This section will be helpful in determining the pipe size to use or the rate of water flow with a given pipe size. The pressure drop in the line may be estimated from the following:

Rate of Water Flow		Pressure Drop – PSI						
Lbs/min	Gals./min	Pfening Meter	2 Way Blender	3 Way Blender	Cut-Off Sol. Valve	¾" Pipe Per Ft.	1" Pipe Per Ft.	1 ¼" Pipe Per Ft.
100	12	2.2	1.0	2.0	2	0.19	0.06	0.015
150	18	5.0	2.4	3.5	4	0.40	0.12	0.032
200	24	8.9	4.5	6.0	7	0.70	0.20	0.055
250	30	14.0	6.7	9.0	11	1.0	0.30	0.082

Table 2 – Pressure Calculations

Factory Default Scaler Values

Pfening Hot Water Meter (Water Only)

Units	Pounds	Gallons	Liters	Kilograms
Preact	0.50	0.50	0.50	0.50
Decimal Point	1	1	1	1
Scaler	0.0420	0.0050	0.0190	0.0190
Alarm	On	On	On	On

Table 3 – Factory Default Values

Ethernet Configuration

On the Configuring EthernetIP.pdf at top of page 2 under connection parameters, set the size to 16 for Input and 16 for Output. Note that all data words are double integers.

The information that the customer PLC has access to are as follows:

Items that are written to the blender
Temp_setpoint - 1st output data word
Weight_setpoint - 2nd output data word
Start_batch – 3rd output data word, bit 0   This needs to be a pulsed output. The start batch signal can go away after the return signal from the valve has been turned on. That signal is available for reading.
Stop_batch – 3rd output data word, bit 1   This also needs to be a pulsed output. It can operate the same way as the start button only in reverse.
Clear_weight – 3rd output data word, bit 2 Pulse this bit to clear the actual weight. Note that once a batch completes the actual weight will automatically reset.
Clear_alarm – 3rd output data word, bit 3. Turn the bit on to clear the current alarm. Once the alarm clears turn the bit off.
Select Mixer 1 – 4rd output data word, bit 0   This data bit needs turn on when the mixer is selected and stay on until a different mixer is selected.
Select Mixer 2 – 4rd output data word, bit 1   This data bit needs turn on when the mixer is selected and stay on until a different mixer is selected.
Select Mixer 3 – 4rd output data word, bit 2   This data bit needs turn on when the mixer is selected and stay on until a different mixer is selected.

Items that are read from the blender
Average_Temp – 1st input data word
Actual_weight – 2nd input data word
Batch_running – 3rd input data word, bit 0
Alarm – 3rd input data word, bit 1
Alarm_code – 4th input data word
       01 = Water Not Hot Enough
   02 = Water Not Cold Enough
       03 = Water No Flow Alarm
       04 = Water Over Flow Alarm

Go to the Advanced Setup Screen to turn the Remote Control to on. The A-B PLC can only control the blender if the Remote Control is set to on.

Configuring Allen-Bradley Unit:

1. Open new configuration in RSLogix 5000.

2. Add Generic Ethernet Module as shown.
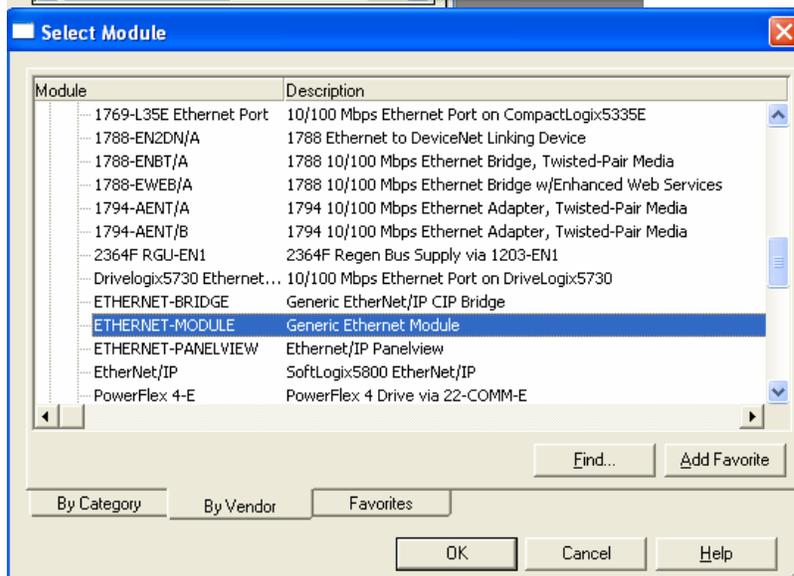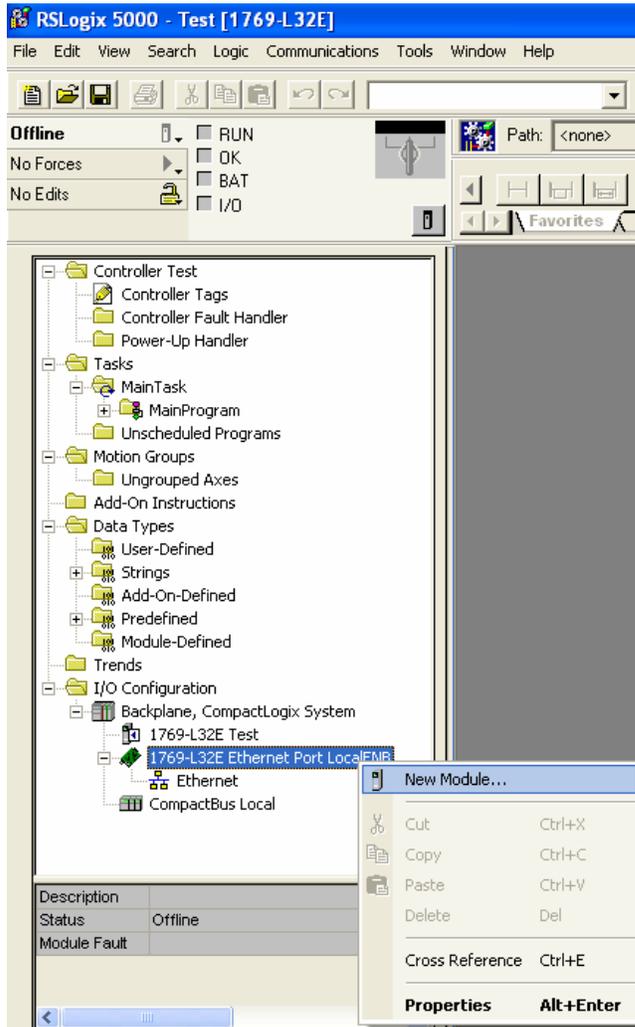
3. Configure Generic Ethernet Module as shown.

Configure IP address of QXOCS unit together with Assembly Instance and Size.
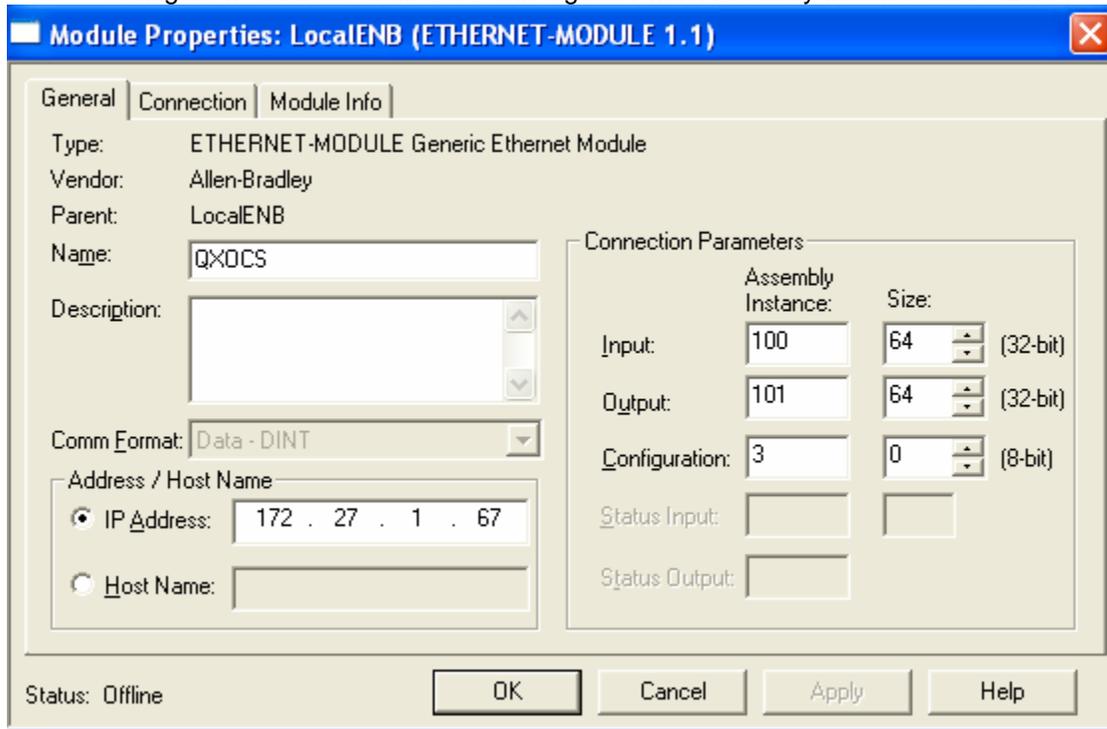
Configure required Requested Packet Interval (RPI)
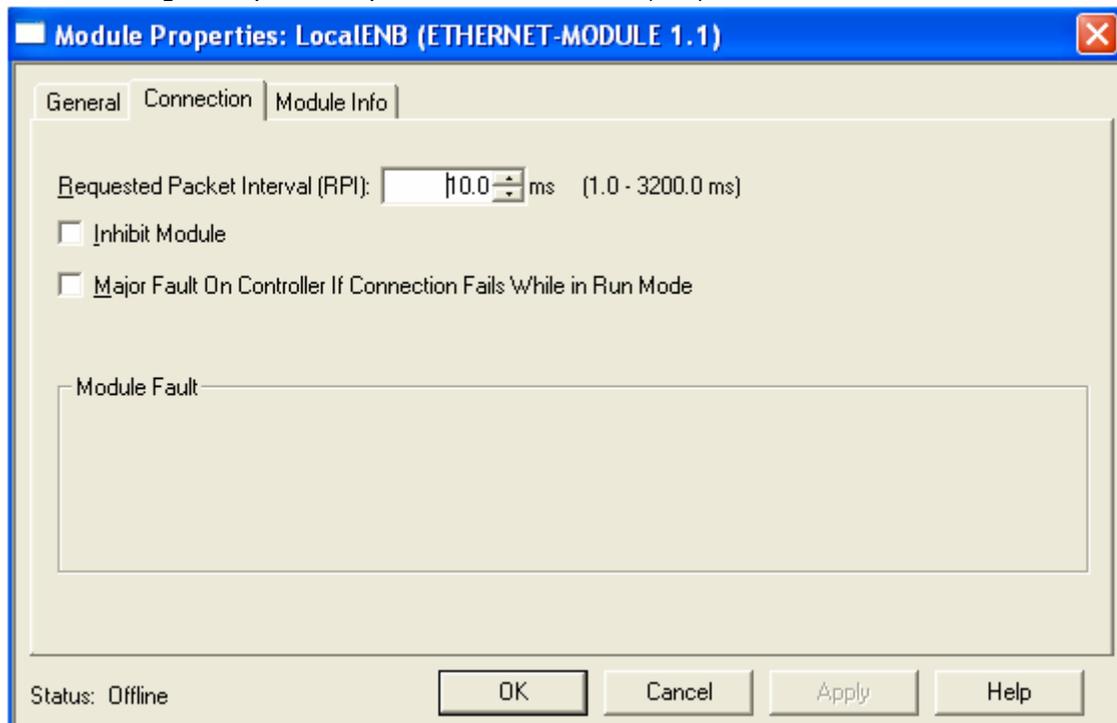
Assembly instance for all Horner-OCS will remain same as shown in the screen shot (i.e. 100 and 101).

4. Configure local IP address of Allen-Bradley unit as shown.
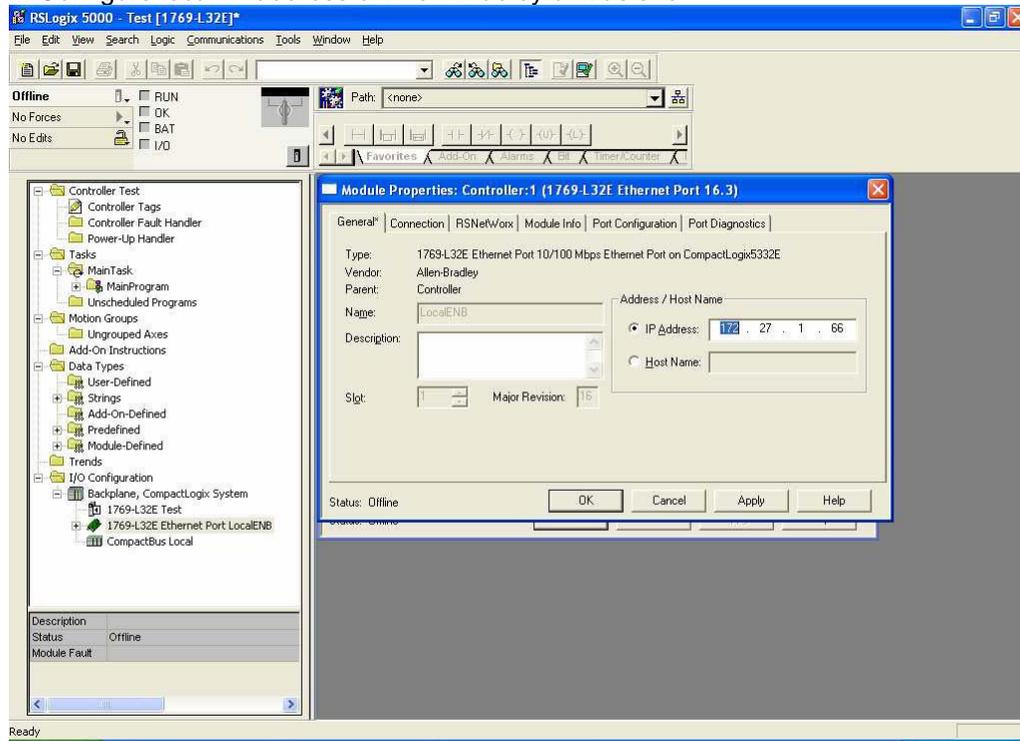
Download changed configuration and put AB unit in RUN mode.

Configuring Horner-OCS Unit:

1. Configure IP address of OCS unit (Should be same as configured in Step-3 of ABunit configuration). Select Ethernet/IP checkbox and configure register address and size as shown. Download the modified configuration and put unit in RUN mode.
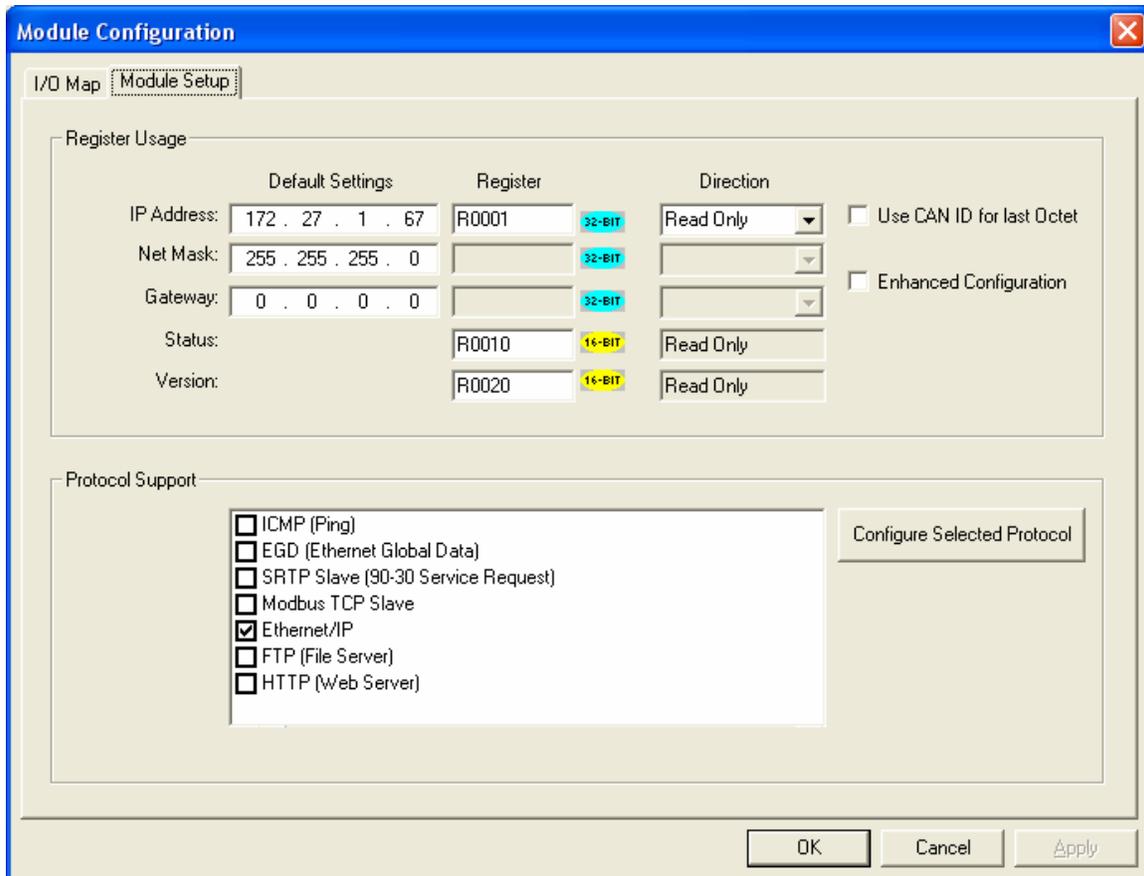
Module Configuration

I/O Map | Module Setup

Register Usage

	Default Settings	Register		Direction	
IP Address:	172 . 27 . 1 . 67	R0001	32-BIT	Read Only ▼	☐ Use CAN ID for last Octet
Net Mask:	255 . 255 . 255 . 0		32-BIT		
Gateway:	0 . 0 . 0 . 0		32-BIT		☐ Enhanced Configuration
Status:		R0010	16-BIT	Read Only	
Version:		R0020	16-BIT	Read Only	

Protocol Support

☐ ICMP (Ping)
☐ EGD (Ethernet Global Data)
☐ SRTP Slave (90-30 Service Request)
☐ Modbus TCP Slave
☑ Ethernet/IP
☐ FTP (File Server)
☐ HTTP (Web Server)

[Configure Selected Protocol]

[OK]   [Cancel]   [Apply]
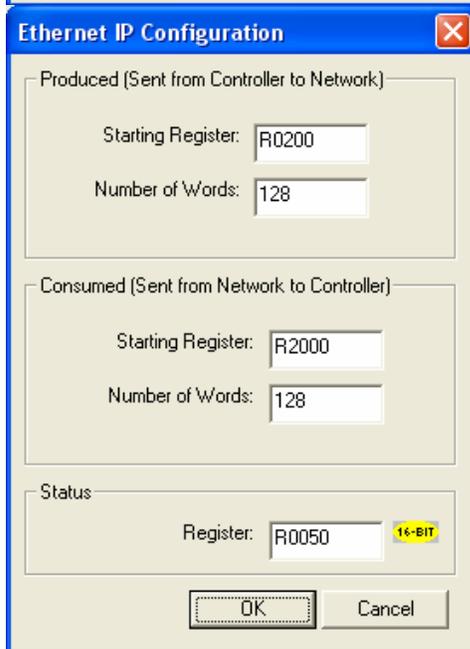
Ethernet IP Configuration

Produced (Sent from Controller to Network)

Starting Register: R0200

Number of Words: 128

Consumed (Sent from Network to Controller)

Starting Register: R2000

Number of Words: 128

Status

Register: R0050   16-BIT

[OK]   [Cancel]

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Ethernet Configuration Modbus TCP/IP

The information that the customer PLC has access to are as follows:

Items that are written to the blender
Temp_Set Point   1st output data word – Modbus address 410610, double integer multiplied by 10
Weight_Set Point - 2nd output data word – Modbus address 410612, double integer multiplied by 10
Start_Batch – 3rd output data word, bit 0 – Modbus address 410614.0, double integer
This needs to be a pulsed output. The start batch signal can go away after you see the batch running signal. If the start bit is left on, the unit will automatically start the next batch when the current batch is completed.
Stop_Batch – 3rd output data word, bit 1 - Modbus address 410614.1
This also needs to be a pulsed output. Pulse it on to stop the batch.
Clear_Weight – 3rd output data word, bit 2 - Modbus address 410614.2
Pulse this bit to clear the actual weight. Note that once a batch completes the actual weight will automatically reset.
Clear_Alarm – 3rd output data word, bit 3 - Modbus address 410614.3
Pulse this bit on to clear the current alarm. Once the alarm bit clears (see Alarm below), turn the clear alarm bit off.
Select_Mixer2 – 3rd output data word, bit 4 – Modbus address 41614.4
        Turn this bit on for delivery to Mixer 2. Needs to be held on for the entire draw. Note that when this bit and the next one is off. Mixer 1 is selected.
Select_Mixer3 – 3rd output data word, bit 5 – Modbus address 41614.5
        Turn this bit on for delivery to Mixer 3. Needs to be held on for the entire draw.

Items that are read from the blender
Average_Temperature – 1st input data word – Modbus address 410600, double integer multiplied by 10
Actual_Weight – 2nd input data word – Modbus address 410602, double integer multiplied by 10
Batch_Running – 3rd input data word, bit 0 – Modbus address 410604.0, double integer
Alarm – 3rd input data word, bit 1 - Modbus address 410604.1
Batch Complete – 3rd input data word, bit 2 - Modbus address 410604.2
Ethernet Communication Status – 3rd input data word, bit 3 - Modbus address 410604.3
        When the communication is working, this bit will be on.
Alarm_code – 4th input data word – Modbus address 410606, double integer
        01 = Water Not Hot Enough
        02 = Water Not Cold Enough
        03 = Water No Flow Alarm
        04 = Water Over Flow Alarm
        05 = Ethernet Communication Alarm

Go to the Advanced Setup Screen to turn the Remote Control to on. The PLC can only control the blender if the Remote Control is set to on. The Node address of the unit is 127.