FS1 Setup Manual

Flow Switch Controller and Pumps

HCT Chemigation System for Pressurized Water Systems
Golf Courses, Landscape, water pressure systems exceeding 60 psi

7.28.21

Description

The FS1 is a Switch Box, taking the signal from a flow switch or flow meter, then providing an on/off signal and or flow meter pulses which can then be relayed from the box to the chemical injection pumps for chemical pumping accuracy based on flow rates.

The pumps are designed to receive either an on/off signal to pump or not pump, or a variable signal to pump an appropriate amount of chemical based on the flow rate of the water. The pumps we recommend are designed for our / HCT's aggressive acid and oxidizer chemistry – they operate at a low amount of chemistry necessary and the pressure of the water system.

The FS1 will operate up to three pumps. Each pump can be adjusted to deliver the precise amount of chemicals needed for HCT's program plus an extra pig tail to operate perhaps a third pump for periodic or continuous fertilizer injection.

You'll see below the FS1 is capable of being connected to a variety of flow switches and or flow meters so that a single FS1 is adaptable to a variety of pump stations, if not most/all.

One size fits all

FSC-1 has no maintenance components, can operate from one and up to three pumps, takes almost any flow switch or meter signal.

NOTE: If you are picking up pulses from the flow sensor, there is no need for an isolator. Most installs are pulses. The pulse output from the flow meter, or pump station, can go directly to the input on the FS1. It can use a 4-20 mA without an isolator, but it must be wired in a loop. Some people prefer to isolate it just in case. Regardless if using pulses, an isolator is not needed unless you are using a Data Industrial / Badger Flow meter. If so, see the next page.

Wiring, not fully knowing how you are outputting the pulse to the isolator is:

Connect Terminal #7 of the HCT Controller to V+ of the FC-ISO-C

Connect Terminal #8 of the HCT Controller to V0 of the FC-ISO-C

Run a Jumper from V0 to the Other V0's

Connect Terminal #9 of the HCT Controller to A0 Terminal of the FC-ISO-C

If you are doing pulses and have to have an isolator, we suggest an Opto relay.
https://www.automationdirect.com/adc/shopping/catalog/relays_-z-_timers/optocoupler_relays/52511

Technical Support – Please pre-arrange by appointment

Ontario, CA – PST Time Zone

Robert Bass – Developer Engineer - (480) 221-3128

Setting Expectations

1. Analog (4-20mA) Signal Conditioner

Some flow meters require signal conditioners which may be necessary. Here is the isolator that we suggest SC6-1102. It is powered from the HCT controller.

https://www.automationdirect.com/adc/shopping/catalog/process_control_-a-_measurement/signal_conditioners/high_density_signal_conditioners/sc6-1102

To connect the Signal Conditioner to the Flow Switch Controller, do the following;

a. Connect Terminal # 7 of the Flow Switch Controller to Terminal # 5 of the SC6-1102 Signal Isolator.
b. Connect Terminal # 10 of the Flow Switch Controller to Terminal # 6 of the SC6-1102 Signal Isolator.
c. Connect the +4-20mA Output from the Pump Station to Terminal # 3 of the SC6-1102 Signal Isolator.
d. Connect the -4-20mA Output from the Pump Station to Terminal # 4 of the SC6-1102 Signal Isolator.

2. Flow Sensor Optical Isolator

If your pump station is using the Data Industrial/Badger flow meter and this isolator is not installed in the Pump House control panel, you will need to acquire and install one. Data Industrial Optical Isolator Model A 1018-4026.

Contents

For Use with Flow Switch:

On/Off pump activation
-See Wiring Diagram #1.

-Plug each of the metering pumps into the receptacles provided by the controller.
-Plug the power cord of the controller into a 120VAC GFIC outlet.
-Turn the Main Power switch to the On position.

From the home screen press the Menu Button, as shown in figure 1. Scroll down to Flow Meter Selection by pressing the F4 key, then press Enter by pressing the F5 key, as shown in figure 2. The Flow Switch is selected by default, press the Menu button again and select the Chem Feed Settings, as shown in figure 4. On the Chemical Feed Selection, press the Fixed Speed button, as shown in figure 5, then press the menu button and navigate back to the home screen. If the Pump switch is turned to the Hand (H) position, the pumps will turn on and run manually. With the pump switch in the Auto (A) position, the pumps will only run when flow is detected, as shown in figure 6.

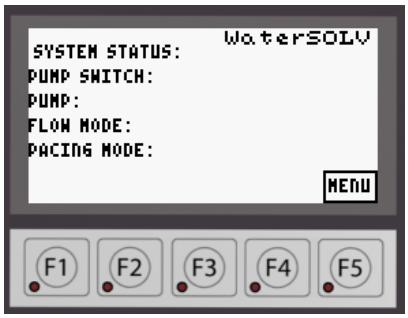


Figure 1. Home Screen

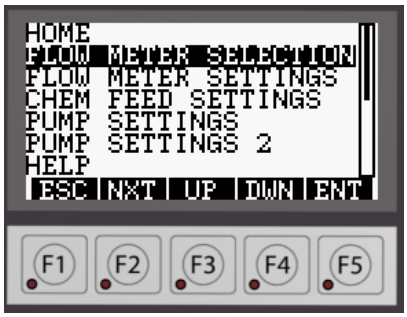


Figure 2. Menu Screen

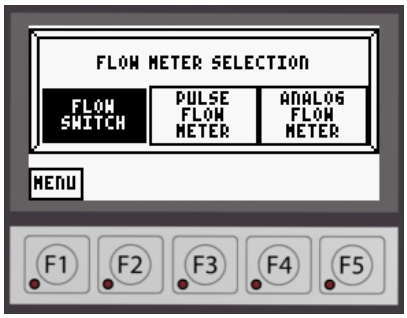


Figure 3. Flow Meter Selection Screen

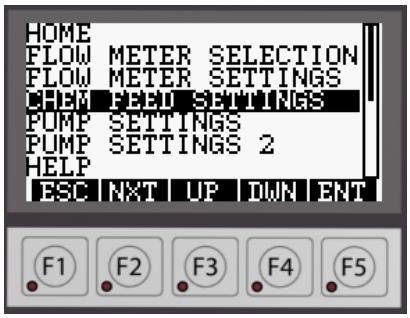


Figure 4. Menu Screen

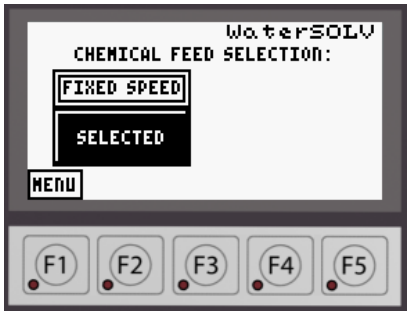


Figure 5. Chemical Feed Screen

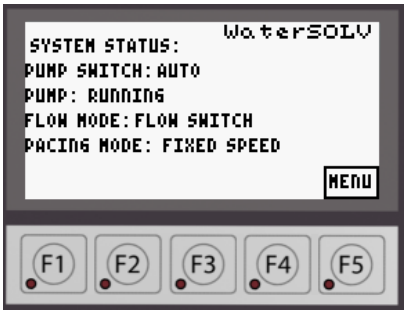


Figure 6. Home Screen

For Use with a Pulse Flow Meter:

For a two (2) wire flow meter.
-see Wiring Diagram #2.
(For a three (3) wire flow meter, see Wiring Diagram #3.)

-Plug each of the metering pumps into the receptacles provided by the controller.
-Plug the power cord of the controller into a 120VAC GFIC outlet.
-Turn the Main Power switch to the On position.

The metering pump(s) will need to be set to external mode. From the home screen press the Menu Button, as shown in figure 1. Scroll down to Flow Meter Selection by pressing the F4 key, then press Enter by pressing the F5 key, as shown in figure 2. Flow Switch is selected by default, but the Pulse Flow Meter will need to be selected. Do this by simply pressing it. Next press the Menu button and select the Flow Meter Settings and then select which type of meter it is, as shown in figure 7. If a Badger Flow meter is being used, select that by pressing the button. Once the button is pressed, the display will show two boxes that need information, as shown in figure 8. The K-Value and Offset can be found in the manual for the Badger flow meter. These values are dependent on the pipe size and schedule.

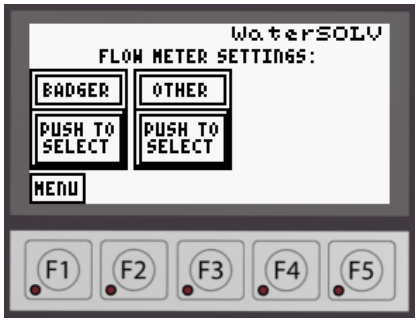


Figure 7. Flow Meter Selection Screen

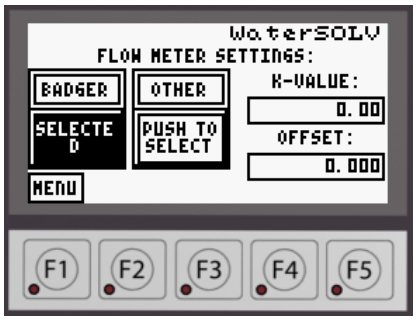


Figure 8. Badger Flow Meter Settings Screen

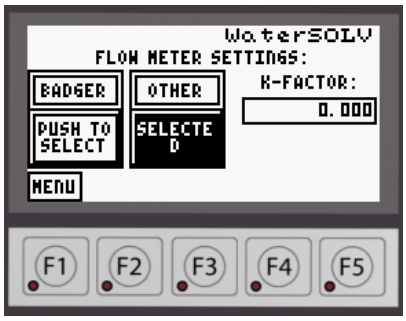


Figure 9. Other Flow Meter Settings Screen

If a different flow meter is being used, select Other by pressing the button. Once the button is pressed, the display will show one box that need information, as shown in figure 9. The K-Factor can be found in the manual for the flow meter and is dependent on the pipe size and schedule.

Once the Flow Meter Settings have been set, press the Menu button again and select the Chem Feed Settings, as shown in figure 4. If the pump will be pumping at a fixed speed when flow is detected, press the Fixed Speed button on the Chemical Feed Selection, as shown in figure 5, then press the menu button and navigate back to the home screen. If the Pump switch is turned to the Hand (H) position, the pumps will turn on and run manually. With the pump switch in the Auto (A) position, the pumps will only run when flow is detected, as shown in figure 6.

If the pump will be pumping proportional to the flow rate, press the Proportional button on the Chemical Feed Selection, as shown in figure 10. Press the menu button and navigate to the pump settings screen. If two pumps will be used, select the Multiple Pumps, as shown in figure 11. Next press the Next button and select the Pump 1 Settings screen. On this screen you will select the brand pump being used, as shown in figure 12. If LMI is selected, a button will be displayed to then select the model being used, as shown in figure 13 and 14. Select the model pump being used and press the Exit button. Depending on the model selected, the Pump's Max Output might auto fill. If it didn't, these information as well as the desired PPM

will need to be entered. If the Walchem is selected, the Pump Max Output and Desired PPM will need to be entered.

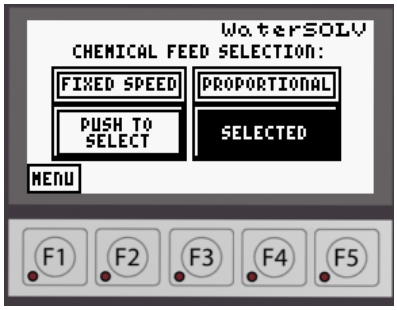


Figure 10. Chemical Feed Screen

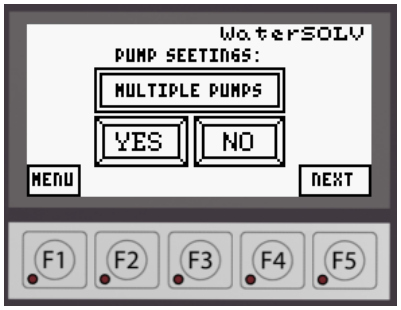


Figure 11. Pump Settings Screen

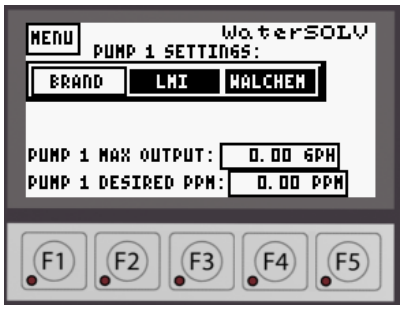


Figure 12. Pump 1 Settings Screen

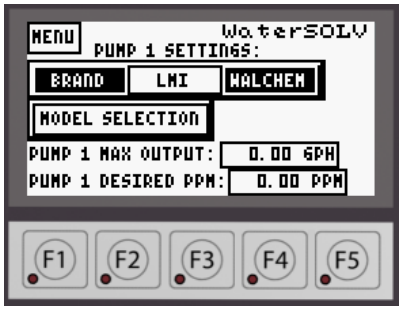


Figure 13. Pump 1 Settings Screen

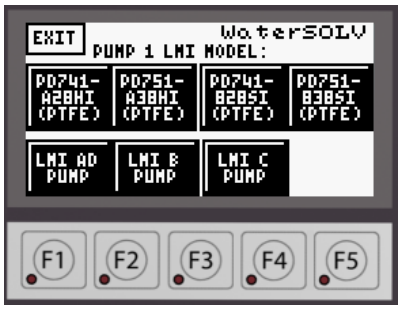


Figure 14. LMI Pump Selection Screen

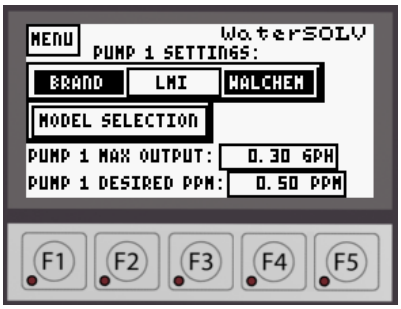


Figure 15. Pump 1 Settings Screen

If a second pump is being used, go to the next screen and repeat the above steps for the second pump.

For Use with an Analog Flow Meter:

-For an analog loop powered flow meter
-see Wiring Diagram #4.

-Plug each of the metering pumps into the receptacles provided by the controller.
-Plug the power cord of the controller into a 120VAC GFIC outlet.
-Turn the Main Power switch to the On position.

The metering pump(s) will need to be set to external mode. From the home screen press the Menu Button, as shown in figure 1. Scroll down to Flow Meter Selection by pressing the F4 key, then press Enter by pressing the F5 key, as shown in figure 2. Flow Switch is selected by default, but the Analog Flow Meter will need to be selected. Do this by simply pressing it. Next press the Menu button and select the Flow Meter Settings and then enter the maximum system flow rate, as shown in figure 16. To enter the maximum flow rate, click on the box with the flow rate and a new display will appear, as shown in figure 17. Once the value is entered, press the enter (ENT) button. ESC is escape and will bring you back to the previous screen and clear any value that was entered, BS is back space, and CL is clear and will clear the value.

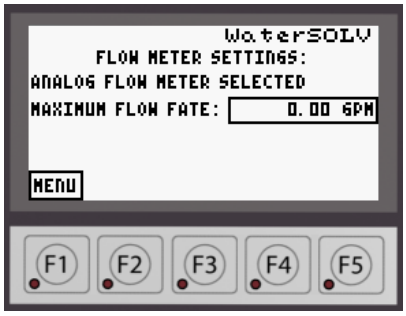


Figure 16. Flow Meter Selection Screen

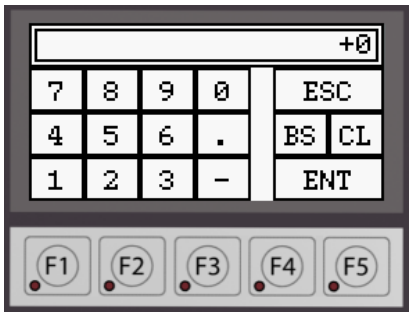


Figure 17. Flow Rate Value Selection Screen

Once the maximum flow rate has been set, press the Menu button again and select the Chem Feed Settings, as shown in figure 4. If the pump will be pumping at a fixed speed when flow is detected, press the Fixed Speed button on the Chemical Feed Selection, as shown in figure 5, then press the menu button and navigate back to the home screen. If the Pump switch is turned to the Hand (H) position, the pumps will turn on and run manually. With the pump switch in the Auto (A) position, the pumps will only run when flow is detected, as shown in figure 6.

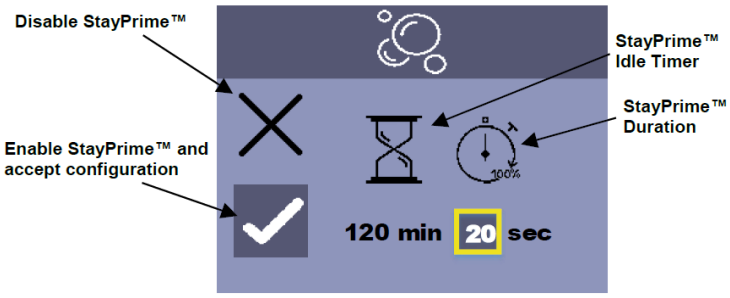
If the pump will be pumping proportional to the flow rate, press the Proportional button on the Chemical Feed Selection, as shown in figure 10. Press the menu button and navigate to the pump settings screen. If two pumps will be used, select the Multiple Pumps, then select if the pumps will be pumping at different PPM's, as shown in figure 11. Next press the Next button and select the Pump Settings 2 screen. On this screen enter the specified information, then return to the home screen.

LMI PD Pump Settings Suggestions:

If using the LMI PD pump with the WaterSolv BC it is highly recommended that you enable the StayPrime™ function. This feature will run the pump for a desired amount of time if it has not run for a desired amount of time ensuring that the pump stay primed. This function is useful for the WaterSolv BC because of the potential for off gassing and causing a vapor lock.

To enable this function, from the Home Screen, press the Menu Button while the pump is stopped. Then press the Left Button three times to select the StayPrime™ Degassing Technology Icon, . Press the Enter Button to view the StayPrime™ Degassing Technology Configuration, as shown in figure 18. StayPrime™ Degassing Technology is disabled by default.

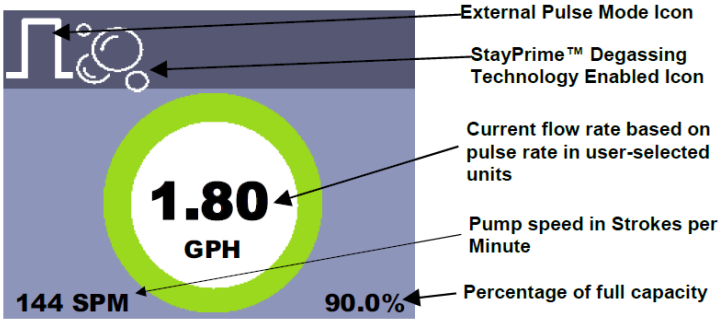
When StayPrime™ Degassing Technology is enabled, the pump will run at 100% stroke rate for the set duration when powered on. The pump will return to its set operating mode and monitor itself for inactivity. Once the StayPrime™ Idle Timer has been reached (no strokes have occurred in the specified time), the pump will run at 100% for the StayPrime™ duration and return to its set operating mode. Select an Idle Timer based on the amount of time in which the pump may lose prime due to off-gassing of chemical. Select a Duration based on the time required to clear the suction line.



Pump External Mode Setting:

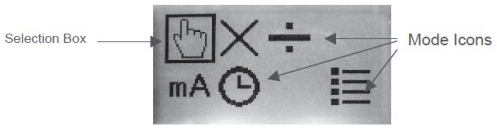
LMI PD Pump:

With the home screen displayed and the pump stopped, press the Menu Button to enter the Settings Menu. Press the Right Arrow Button then press the Enter Button to enter the External Pulse Settings. The default is 1 incoming pulse is 1 output pulse, the Max = 100%, and the pulse width is 1ms. The default settings are perfect, so navigate so the cursor is on the Check Mark and press the Enter Button. After pressing the Enter Button it will exit to the Home Screen and will show the Pulse mode in the top left corner and press the Start Button to put the pump in standby mode waiting for pulses. The ring around the pumps current flow rate will be green.



LMI AD Pump:

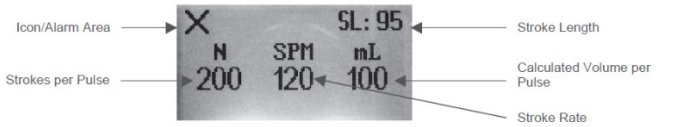
With the home screen displayed and the pump stopped/off (Power LED is off), press the Mode Button to enter the Settings Menu. Press the Down Button until the X (multiply symbol) is highlighted, then press the Power Button to enter the External Pulse Multiply Settings. The default is 1 incoming pulse is N=1. This means for each pulse input, the pump will pulse or pump one stroke. The default settings are perfect and press the Power Button. The Power LED will be illuminated and Amber in color. The pump is ready and waiting for pulses.



Control Mode Selection Menu

- **Mode Icons**: Each icon represents a different control mode, as follows:

= Manual Mode—Internal
= Pulse Multiply Mode—External
= Pulse Divide Mode—External
= Analog mA Mode—External
= Timed Event Mode—Internal
= Advanced Configuration Options



- **Icon/Alarm Area:** The X icon indicates the pump is in the pulse multiply mode. Depending on advanced pump configuration options and any alarms/alerts detected, other icons may be present as well (see Sec. 4.5).
- **Stroke Length:** The numeric stroke length value indicates the current stroke length setting (in percent).
- **Stroke Rate:** Indicates the stroke speed of the pump (1-59 SPH or 1-120 SPM). To allow true flow proportioning, this is set in manual mode (see Sec. 5.1).
- **Strokes per Pulse** (Pump OFF only): Number of strokes (1-9999) to occur for each valid pulse input. See Sec. 6.3 to define a valid pulse.
- **Strokes Remaining** (Pump ON only): Number of strokes remaining for the current batch cycle.

LMI B7/C7 Pump:

On the control panel there is a switch. Toggle the switch to the External position. The pump is now in the External position and waiting for pulses.

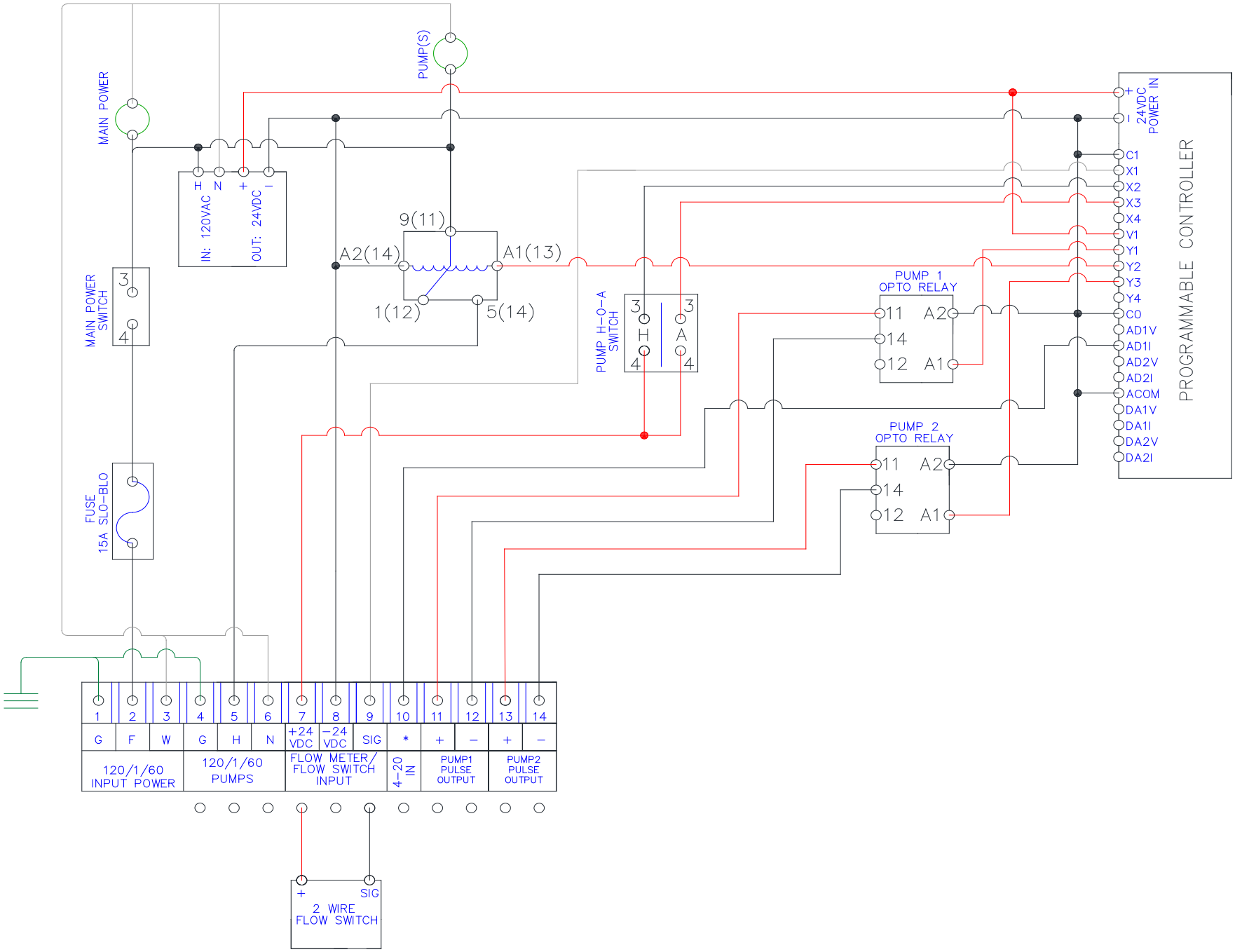
LMI B9/C9 Pump:

Start by pressing the Start/Stop Button to stop the pump. Press the Mod key and hold it for four (4) seconds. The LCD screen displays the last External mode that was programmed. If this is the first time the pump has been put in the External mode, the factory default will be displayed on the LCD screen. The factory default mode is "External Pulse Divide" with a divide value of one (1). The display will alternate between SPM and OFF. Next press and hold the Mode Key and the Start/Stop key for 5 seconds until the screen displays the multiply symbol "X". This has a default multiply by 1, which is desired. Press the Start/Stop Button to put the pump in standby mode waiting to receive pulses.

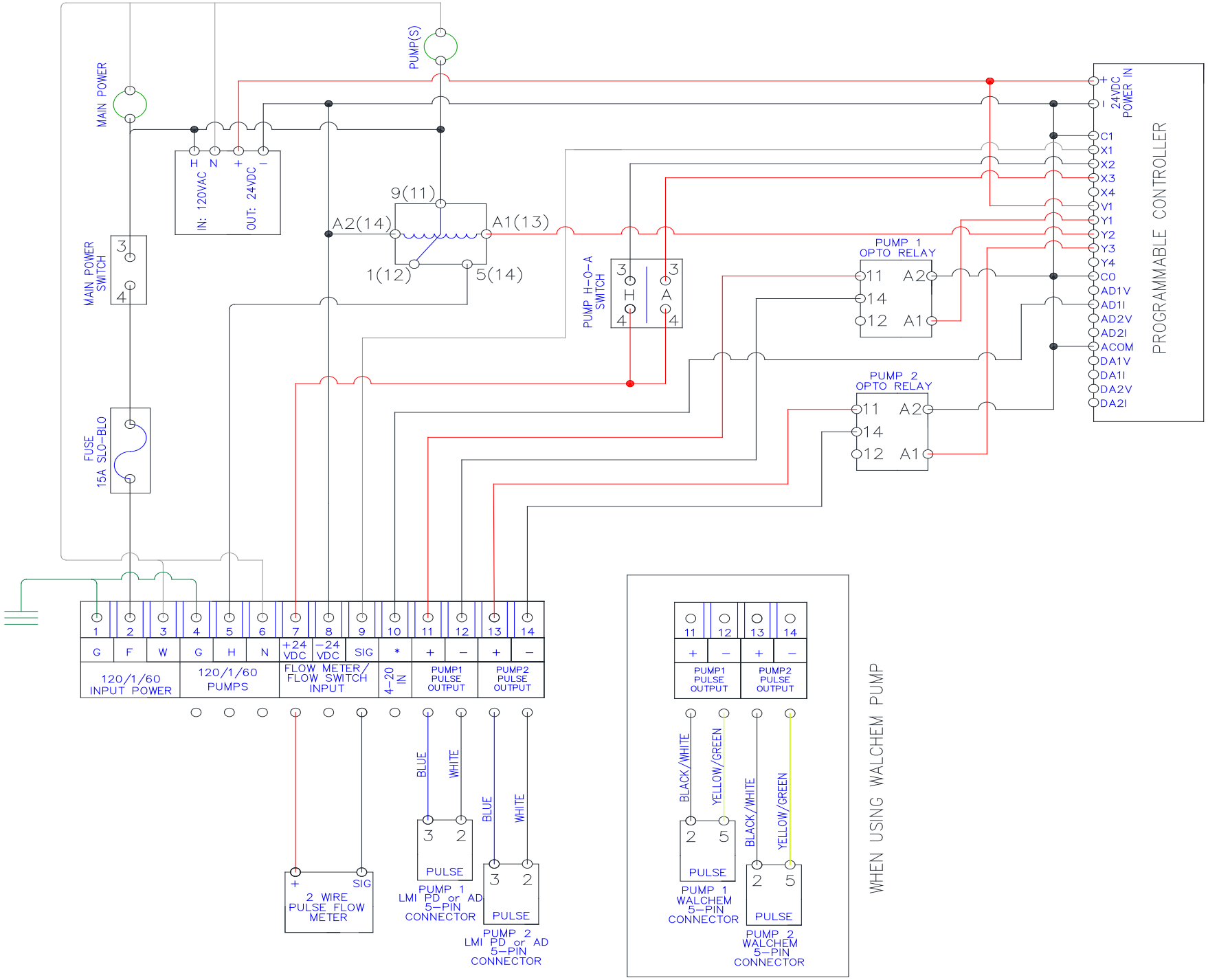
Walchem EWN Pump:

Make sure the pump is in the WAIT condition. You can do this by pressing the START/STOP key until the pump starts pumping, then pressing it one more time. Using the UP/DOWN arrow keys, ensure the pump is set at 100%. Press the EXT key to get into the EXTERNAL Operation Mode. Press and Hold the EXT key for about 3 seconds to get to the External Selection Menu. Using the UP/DOWN arrow keys, scroll until "MULT" is displayed. Press the EXT key again. A number preceded by "X" will display. Default is "X 1". Use the UP/DOWN arrow keys to change the multiplier to the desired setting. Press the EXT key to return back to the External Selection Menu ("MULT" displayed). Press the STOP/START key to back out and return to the External Operation Mode. The display will show "MULT" at the top and the programmed multiplier number in the main display. The pump is now operating in External Operation Multiply mode. As soon as it starts seeing pulse signals, the pump will begin pumping. For example, if your multiplier is set at 5, then the pump will stroke 5 times for every pulse signal it receives.

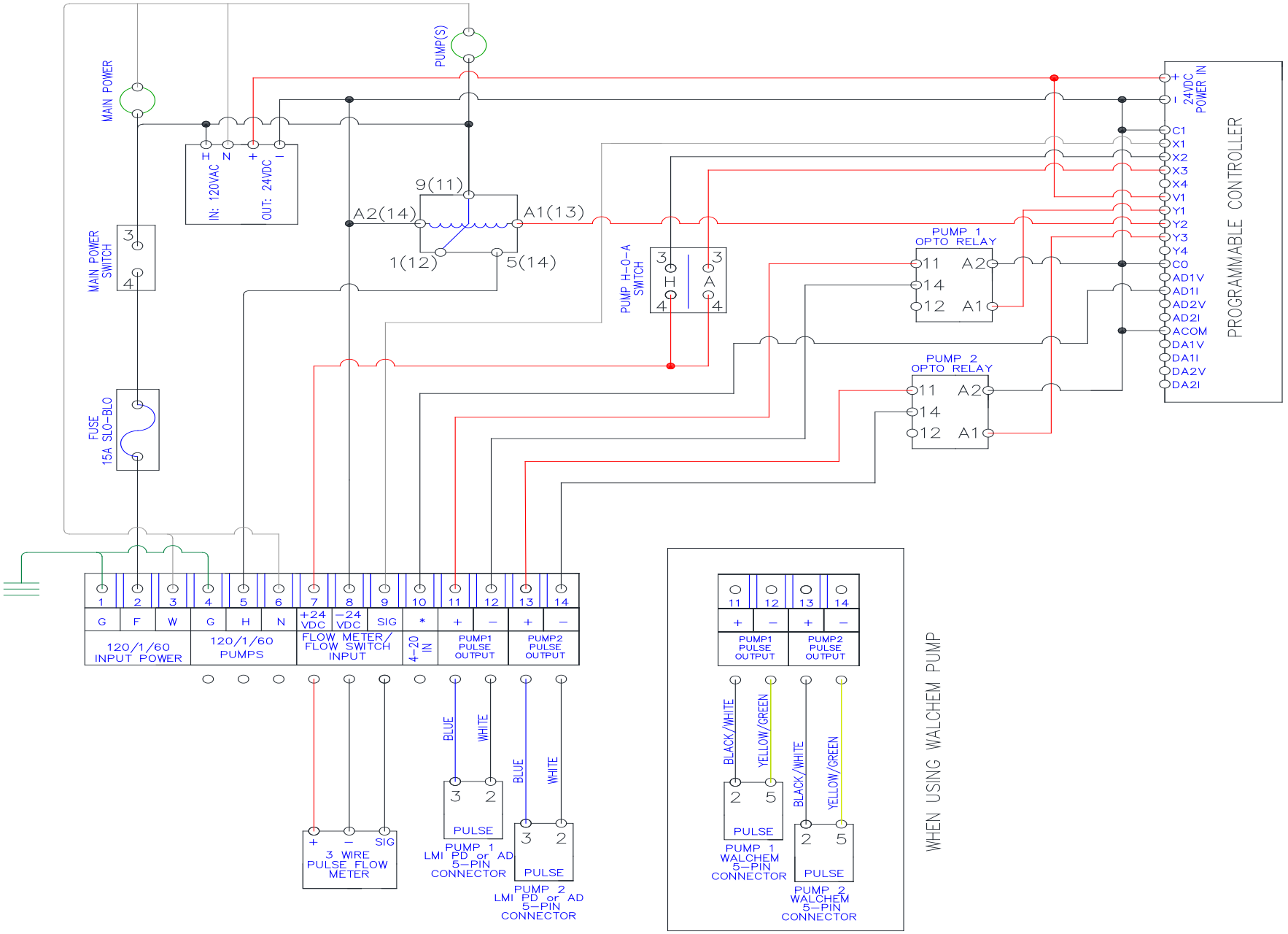
Wiring Diagram 1


MAIN POWER
PUMP(S)
H N + −
IN: 120VAC
OUT: 24VDC
9(11)
A2(14)
A1(13)
1(12)
5(14)
MAIN POWER SWITCH
3
4
PUMP H-O-A SWITCH
3 3
H A
4 4
PUMP 1 OPTO RELAY
11 A2
14
12 A1
PUMP 2 OPTO RELAY
11 A2
14
12 A1
FUSE 15A SLO-BLO
+ 24VDC POWER IN −
C1
X1
X2
X3
X4
V1
Y1
Y2
Y3
Y4
C0
AD1V
AD1I
AD2V
AD2I
ACOM
DA1V
DA1I
DA2V
DA2I
PROGRAMMABLE CONTROLLER
1 2 3 4 5 6 7 8 9 10 11 12 13 14
G F W G H N +24 VDC −24 VDC SIG * + − + −
120/1/60 INPUT POWER
120/1/60 PUMPS
FLOW METER/ FLOW SWITCH INPUT
4-20 IN
PUMP1 PULSE OUTPUT
PUMP2 PULSE OUTPUT
+ SIG
2 WIRE FLOW SWITCH

Wiring Diagram 2



Wiring Diagram 3



Wiring Diagram 4