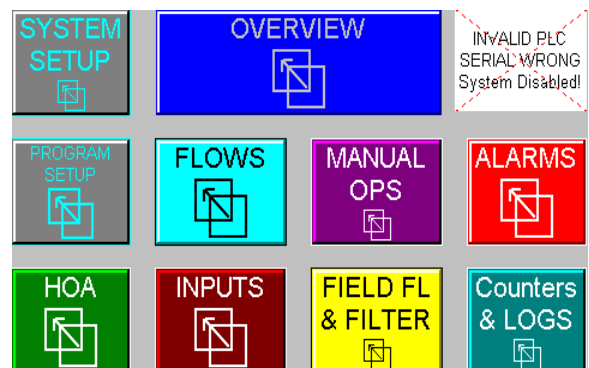


Drip-Tech Control Panel

O&M Manual

Commercial BDMC Panels – Horner PLC
FW 1.06

JNM Technologies, Inc.



Version 1.02

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I Introduction

Drip System Overview

The drip system control panel monitors and controls these stages of the drip effluent dispersal system: pump tank, pumps, filter skid, field valves, drip tubing, and the field flush valve. The manual will discuss the control panel's interaction with these parts of the drip system but will not delve into the maintenance and troubleshooting aspects of these parts.

Pump Tank

Depending on the system requirements, there may be 3-4 floats in the pump tank.

Float Name	Description
Off	The Off float pauses the control panel's irrigation programs and cuts off the pumps.
Dose Enable	Systems with a Dose Enable Float will wait for this float and the Off Float to be up before allowing doses to begin. This ensures that the system will not "short cycle" if the water level is barely up enough to turn on the Off Float.
High Duty/Peak	When the HD Float is up, the control panel can respond in different ways to increase the overall amount of water going out to the zones in a day.
Alarm	This float will set an alarm at the panel and can send an alarm message to the operator.

Pumps

In the larger drip systems, two pumps are typically used to provide redundancy and occasionally extra pressure if required. In some cases, the controller will use a three pump (triplex) scheme. These may be mounted to the filter skid or installed in the pump tank.

The drip control panel will send signals to a contactor/relay or variable speed drive pump control panel to turn on the pumps. The drip control panel may have inputs for signals from the pump panel. These output signals may be pump running, voltage monitor, emergency stop, or alarm.

Filter Skid

Filter

Typical JNM Technologies filter skids will use a self-cleaning disc filter. Under normal circumstances, the disc filter rings stay compressed and the effluent goes from outside the rings to the inside cavity and out of the filter. Following the filter is a master valve and a flowmeter. The master valve is controlled by a solenoid valve which keeps the master valve open during normal operations.

Each filter pod has an associated backflush valve and solenoid. When the controller decides to flush the filter, it will close the master valve and then activate one backflush valve solenoid at a time to flush each filter pod. The backwash water is returned to the trash tank or equalization tank of the treatment system. Once the filter flush is done, the master valve is re-opened to allow water to the fields.

Hydrometer

To save room and increase flowmeter accuracy, JNM Technologies filter skids often use a hydrometer for the master valve. A hydrometer is a combination flowmeter and valve. This valve will have a control solenoid and possibly a pressure regulator.

During normal operations, this valve is opened by the controller. Most master valves are normally closed and the solenoid must be activated to allow water to pass. For normally open master valves, the solenoid is only activated during filter flushes to close the valve.

The flowmeter register has a reed switch output which closes every 1 or 10 gallons depending on the flowmeter size/register. The drip controller will monitor the flowmeter output to determine how much flow is going out to the drip fields.

Pressure Transducers

On some filter skids, the inlet and outlet manifolds are monitored by analog pressure transducers. The drip controller will monitor these transducers to provide logs of the pressure conditions during dosing operations. The pressure signals can also be used as a backup differential pressure signal for filter flushing. These transducers can provide feedback on the status of the pumps, the filters, and even the field piping and valves.

Differential Pressure Gauge

Most filter skids will include a differential pressure gauge (DP gauge). This device only measures the pressure difference between the filter's inlet and outlet manifolds. Once the differential pressure reaches a set number, the DP gauge will close a relay output to send a signal to the drip controller that the filter needs to be flushed. A typical DP gauge setpoint is 5 psi.

Field Valves

The drip dispersal area is often split up into drip zones to reduce the amount of flow required at any one time. Each drip zone is controlled by a hydraulic valve and a solenoid. These valves are normally closed and must be activated by the drip controller to pass water into the zone. The solenoids have manual overrides which can be activated in case there are issues with the controller, wiring, or the solenoid coil.

Drip Tubing

The drip tubing has pressure compensating emitters so that the flowrate to a zone is consistent regardless of the water pressure. The length of tubing installed in a zone dictates the expected flowrate for that zone. The drip controller can monitor the flowrates to a zone to diagnose whether there are any issues with the tubing or associated piping. The operator can look at flow logs to determine if a zone valve is stuck open or closed based on the flows as well.

Field Flush Valve

As each zone is dosed, some biological buildup and other material can begin to accrue in the tubing and distribution manifolds. To clean the debris out, the drip controller will alter its schedule to perform a field flush on each zone. The goal is to increase the velocity of the water moving through to tubing to 1.5-2 ft/s which is found to clean and scour the tubing well.

The drip controller will be programmed to do a field flush cycle every 2-4 weeks. Field flush cycles are spaced out to avoid overloading wastewater treatment system with too much additional water. During a field flush, the controller may increase the system pressure, may run less zones at a time than during normal dosing, and will open the field flush valve. The field flush valve is typically installed on the skid but may be located elsewhere due to geographical constraints/advantages. The valve is normally closed during normal operations and only activated during field flush cycles. The dirty field flush water is returned to the front end of the wastewater treatment plant.

Each drip zone has a check valve on the field flush return manifold to prevent water entering the zone from other zones.

Drip Controller

PLC

The control panel is run by a Horner X-series micro PLC. The PLC is the device that makes all of the control decisions by monitoring the floats/switches to then operate the valves and pumps.

Interface Relays

The PLC inputs are sensitive and could potentially be damaged by the voltage spikes and shorts that occur on field wiring. To decouple them from the field wiring, the control panel uses interface relays for the inputs to the controller along with separate power supplies and transformers for internal and external circuits.

The interface relays have LEDs to indicate when they are active. The relays are also easily replaceable should one fail over time.

Pump Controller

The pump controller may be based on simple motor contactors, soft starters, or variable speed drives. The pump controllers have a Hand-Off-Auto switch for each pump. The switch allows the operator to turn on or off pumps for maintenance and testing. The pump controllers may vary per project but usually the pump controller will provide feedback on alarms, voltage status, and pump run status. The pump controller also houses circuit breakers and overload circuits to protect the controls from pump malfunctions. If the pumps are $\frac{1}{2}$ – $\frac{3}{4}$ HP, the pump controller will be integrated with the PLC controls and will omit the overload circuits since these pumps have internal overloads.

II Getting Started

Starting The Controller

Control Power

The internal breaker labeled “BDMC” or “Controls” provides power to the PLC and power supplies. Turn the breaker to the ON position to start the controller. If this breaker tripped during normal operations, take care when resetting since there may be a damaged component or shorted wire somewhere. Inspect the panel for any signs of loose wire or other damage.

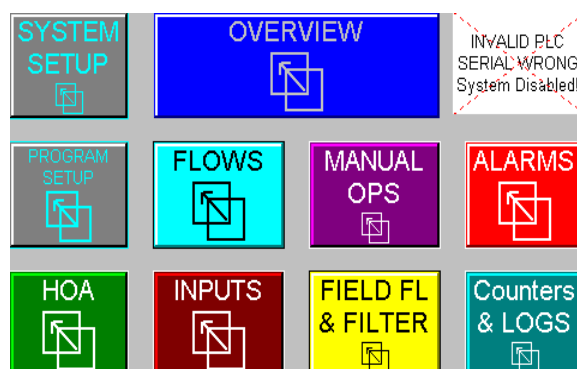
Boot Up

The PLC takes around 10 seconds to reboot. You will see the status light flashing and some animations on the screen while the controller is starting. Once you see the “Main” screen appear, the controller is ready to run. The controller starts in automatic mode and no user intervention is required for it to continue operating by itself.

The controller will wait one rest period before starting the first dose.

Navigating the User Interface

Touchscreen HMI



The control panel Human-Machine-Interface (HMI) uses a touchscreen interface. Press the buttons on the screen to access the different settings and menus.

Pump HOA Switches

Use the Pump HOA switches to override the PLC controls.

Setting	Function
HAND	Turns the pump contactor on constantly. WARNING!: This can result in damage to the pumps if the water level goes too low. It does not account for the floats.
OFF	Keeps the pump contactor off
AUTO	The pump contactors are controlled by the PLC.

High Water Silence and Test

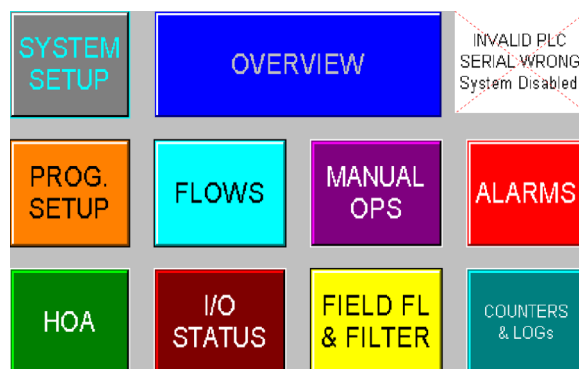
In the event of high water, the alarm light will turn on and the buzzer will sound. To silence the buzzer, turn the knob on the side of the enclosure to “Silence” position. The alarm will stay silenced as long as the high water float is still raised. You can also press the Silence button on the Overview Screen to silence the alarm. If held to the “Silence” position for 3 seconds, the controller will try to clear all the alarms and reset the zone failures.

To test the alarm light and buzzer, turn the knob to the “Test” position for about 10 seconds. The red light will come on immediately followed later by the buzzer as long as you hold the knob in the “Test” position. If the alarms have been silenced, the buzzer will not sound. Press the Clear Alarms button to remove the 24 hour silence period.

III HMI Screens

Screens

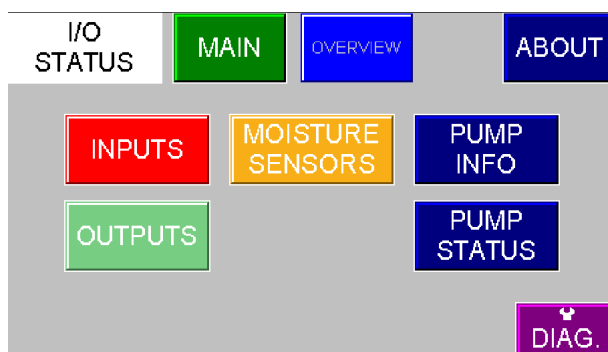
Main Screen



The Main Screen is a collection of links to the various information and setup screens for the drip system. Press a button to access the screen desired.

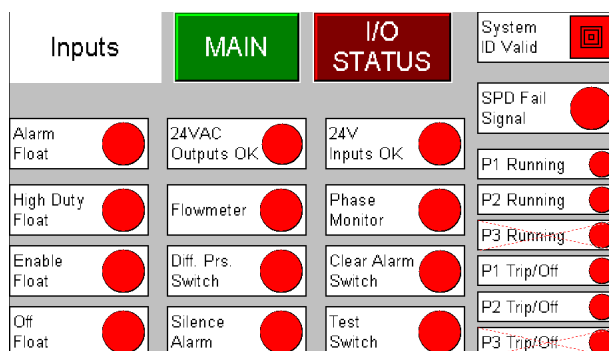
If for some reason the PLC has the wrong firmware/serial combination, you will see the “Invalid PLC” warning in the upper right corner.

I/O Status



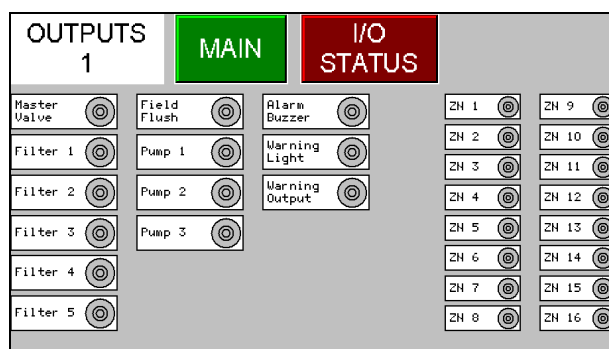
This is the menu to access the status of the various inputs and outputs of the system. Press a button to access the specific I/O required.

Inputs



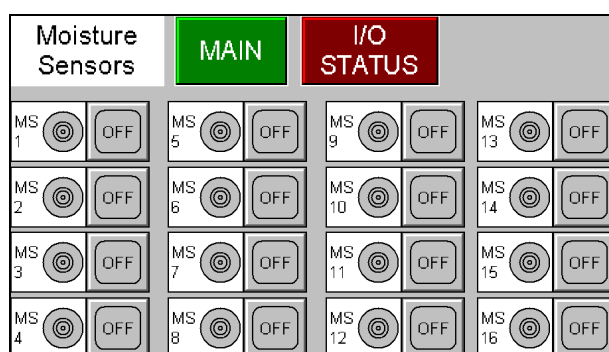
The Inputs Screen shows the status of the system inputs. The indicators are red when off and green when on.

Outputs



The Outputs Screen shows the status of the system outputs. The indicators are gray when off and green when on.

Moisture Sensors



The Inputs Screen shows the status of the moisture sensors inputs (if installed). Use the button next to each sensor input to enable/disable the moisture sensor. If a moisture sensor is active when the corresponding program starts to dose, the program will be skipped and the next available program will be used instead.

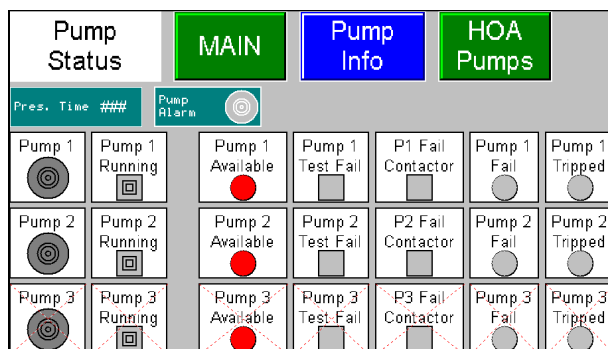
Pump Info

Pump Info	MAIN	OVERVIEW	Pump Status
Pump Statistics			Reset Pump Statistics
Pump 1 Count #####	Pump 1 Hours #####	Pump 1 Minutes #####	Pump Out Allowed
Pump 2 Count #####	Pump 2 Hours #####	Pump 2 Minutes #####	Lag On
Pump 3 Count #####	Pump 3 Hours #####	Pump 3 Minutes #####	Pump Test OK
		Pump Testing	Pump Lag Index ##
			Auto Run Allowed
			PM Status

The Pump Info Screen shows the count and runtime statistics for the pumps as well as other troubleshooting information for the pumps. Press the Reset Pump Statistics Button to reset all pump counts and runtimes.

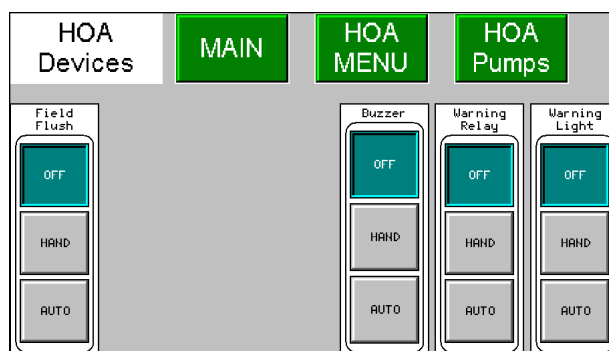
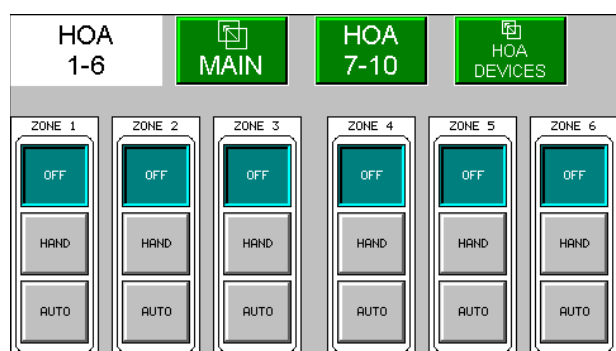
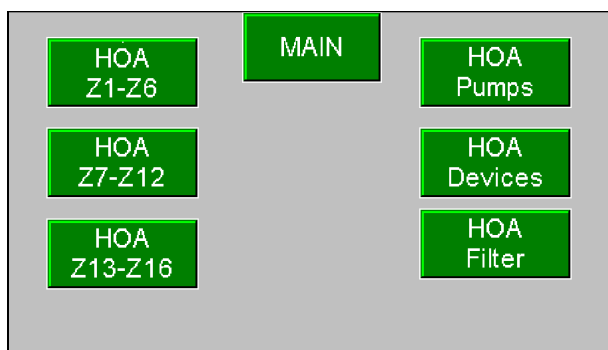
Item	Description
Lag On	Lag pump should be activated
Pump Test OK	Pump Testing received enough flow pulses in time to determine that the pump is working
Pump Testing	System is checking for the pump to generate flow after initially turning on (time and gallons required are user settings).
Pump Out Allowed	Phase monitor status is okay and Emergency Stop not engaged (if installed)
Pump Index	This pump is the lead pump. Add 1 to this number (0 → Pump 1)
Pump Lag Index	This pump is the lead pump. Add 1 to this number (1 → Pump 2)
Auto Run Allowed	Auto dosing allowed. Pumps are available, Off/Enable Floats active, Auto Dose enabled.
PM Status	Phase monitor status

Pump Status



Item	Description
Pump 1	Pump output is activated
Pump 1 Running	Pump feedback from contactor
Pump 1 Available	Pump is in AUTO and has not failed due to trip, contactor failure, or pump test failure
Pump 1 Test Fail	Pump failed a flow test
Pump 1 Fail Contactor	Feedback from the pump contactor failed to activate
Pump 1 Fail	Pump failed a flow test and alarm has been set
Pump 1 Tripped	Pump trip feedback was activated when the system tried to use the pump.
Pres. Time	Pressurization time remaining
Pump Alarm	A pump is in an alarm/failure condition

HOA Screens

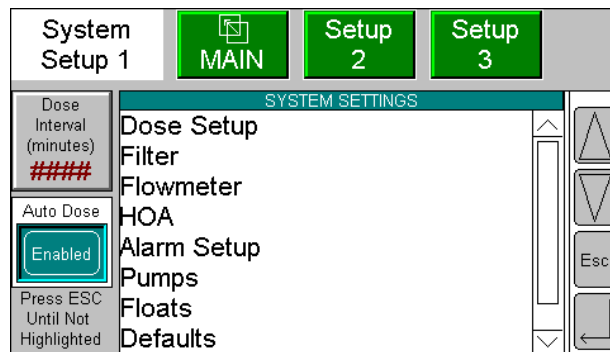


The HOA screens provide software based Hand-Off-Auto control of the zone valve outputs as well as the devices like the pumps and filters. When set to HAND, the associated output is turned on. When set to OFF, the controller will not automatically activate that output. The controller will skip any device that is set to OFF. The AUTO setting is normal and allows the PLC to activate the device output as needed.

This screen is useful for manually testing the various system components. Once maintenance is complete, return the HOA controls back to AUTO or OFF as required.

Several system settings modify the HOA control actions. If the "Pump HOA w/ Flts" is enabled, the Off Float must be active for the pump outputs to turn on in HAND. If "HOA Auto Reset" is enabled, any devices set to HAND will be reset to AUTO after the "HOA Reset Time" in minutes.

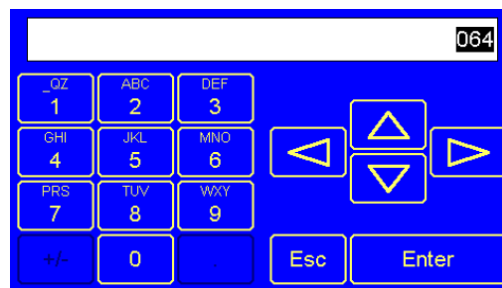
System Setup 1



The System Setup 1 Screen is the main setup for screen for changing a majority of the drip system settings other than the program/zone settings.

To navigate the settings, press the sub-menu desired or use the up/down arrow keys on the right side to select the sub-menu. Press the enter key (↵) to access the sub-menu.

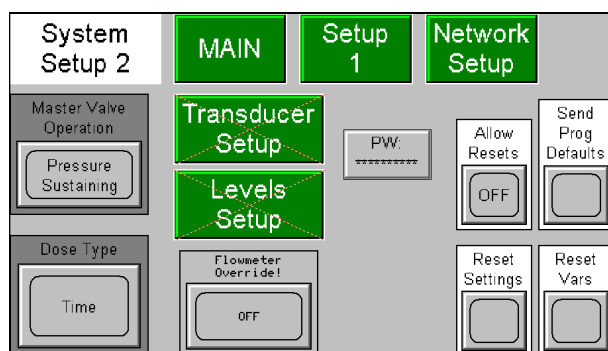
Next select the desired setting to change using the arrows or directly pressing the setting name. Press the enter key to bring up the number entry keypad. Enter the desired number and press Enter to save or ESC to escape without saving changes. For settings that can be enabled/disabled, use 1 for enable and 0 for disable.



Once you are done with making settings changes, make sure the press the ESC key on the right side of the screen until no setting or sub-menu is highlighted. Otherwise, you can not leave the screen.

See the System Settings chapter for explanations of each setting.

System Setup 2



Setting Name	Option 1	Option 2
Master Valve Operation	Pressure Sustaining: Master Valve output only activates during a filter flush. This assumes a normally open valve.	Master Valve: The Master Valve output activates during dosing to open the normally closed master valve. During filter flushing, the output deactivates to close the valve and keep all water for the flush.
Dose Type	Time: Dose length is based off of time elapsed	Gallons: Dose length is based off of flow through the flowmeter. Requires a flowmeter with pulse outputs
Flowmeter Override	OFF: default mode. Flow pulses only come from the flowmeter input	ON: When activated, the PLC generates simulated flow pulses only during doses. The flowrate is based on the dosing program's expected flowrate. This is for temporary use while the flowmeter's pulse output is broken.

To activate any reset, the “Allow Resets” button must be toggled on first.

Send Prog Defaults: Sets the default dose setup values to each program.

Reset Settings: Resets all the system settings to default.

Reset Vars: Reset some of the basic system variables like current zone. This is like a soft-reboot. Only use this if for some reason the system has become stuck due to settings changes that left the system in an unexpected state.

Network Setup

Network Setup	MAIN	Setup 1	Setup 2
IP Addr:	####.####.####.####		Email Setup
Netmask:	####.####.####.####		
Gateway:	####.####.####.####		
DNS (X5):	####.####.####.####		LAN Status ####

The Network Setup screen allows the operator to manage the ethernet settings. This is mainly useful on projects with either WebMI integration for remote login or Modbus register transfer.

These settings are set during installation and should not be changed unless directed to do so by JNM Technologies or the local IT network manager.

Email Setup

Email Setup	MAIN	Setup 1
Email 1:	XXXXXXXXXXXXXXXXXXXXXXXXXXXX	
Email 2:	XXXXXXXXXXXXXXXXXXXXXXXXXXXX	
From Email:	XXXXXXXXXXXXXXXXXXXXXXXXXXXX	
System Name XXXXXXXXXXXXXXXXXXXXXXXXXXXX		
SMTP Server XXXXXXXXXXXXXXXXXXXXXXXXXXXX	SMTP Port ####	SMTP Login XXXXXXXXXXXXXXXXXXXX
DNS IP ###.###.###.###	SMTP Password XXXXXXXXXXXXXXXXXXXX	

The Email Setup screen allows the operator to manage the email recipient settings. This allows the system to send alarm emails to users when connected to the internet or a local SMTP server.

Transducer Setup





Transducer Setup		MAIN	Overview	Levels Setup	
GST RAW -#####	GST Value -##### #	GST 0 Count -#####	GST Cal. Point -##### #P	GST Cal. Count -#####	
INLET RAW -#####	Inlet Value -##### #	Inlet 0 Count -#####	Inlet Cal. Point -##### #P	Inlet Cal. Count -#####	
OUTLET RAW -#####	Outlet Value -##### #	Outlet 0 Count -#####	Outlet Cal. Point -##### #P	Outlet Cal. Count -#####	

The Transducer Setup screen allows the operator to manage the transducer calibration and endpoints. The raw input count for the 0 point and some other point will set the scale of the transducer input.

To set the transducers 0 count, use the raw value when the transducer is exposed to 0 pressure.

For the next point, apply a measurable pressure to the transducer. Input this pressure as the “Cal. Point” and use the raw value for the “Cal. Count.”

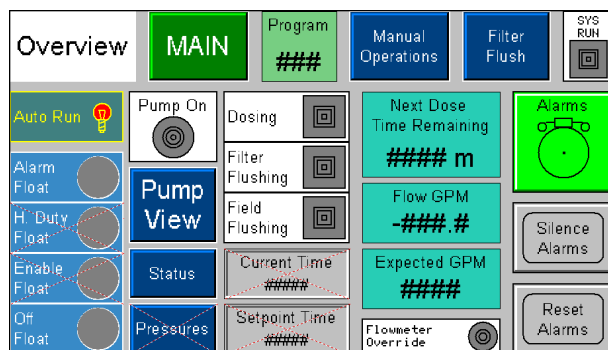
GST Levels Setup

GST Levels	MAIN	Overview	Transducer Setup
GST Value #####.		Alarm Level #####.	 Alarm Level
		High Duty Level #####.	 High Duty Level
		Dose Enable Level #####.	 Enable Level
Transducer Hysteresis #####.		Off Level #####.	 Off Level

The GST Levels Setup manages the conversion from the pressure transducer to the equivalent floats for automatic system operations.

Item	Description
GST Value	Current GST level
Transducer Hysteresis	Once a level threshold is reached and the level is activated, the level will not be deactivated until the GST level drops below the level threshold by the amount of the Transducer Hysteresis.
Alarm Level	GST height in feet for the high water level alarm
High Duty Level	GST height in feet for the high duty level activation
Dose Enable Level	GST height in feet for the dose enable level activation
Off Level	GST height in feet for the off level activation

Overview



The Overview Screen provides a general status view of the main drip system components and dosing operations.

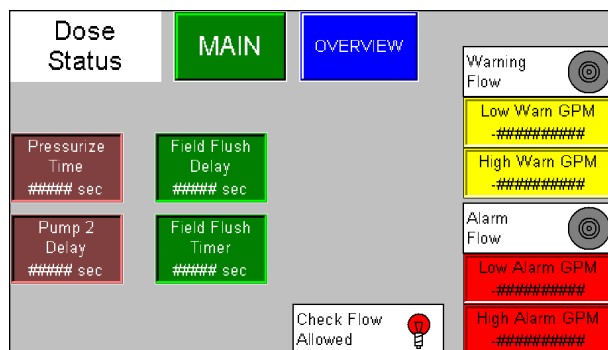
When dosing, this screen shows the current program's dosing setpoint and current value as well as the flow and expected flow.

Should there be alarms, they can be silenced, reset, or viewed with a push of a button from the Overview Screen. To view alarms press Alarms button which should be red or pink colored when there are alarms.

Press the Manual Operations button to perform manual doses and change the current zone.

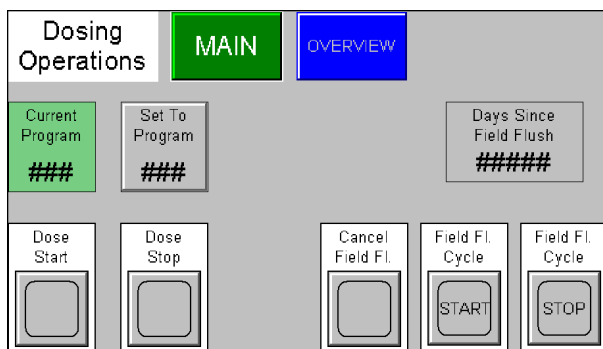
Press the Flushing button to perform a filter flush or field flush cycle.

Dose Status



Item	Description
Pressurize Time	Pressurization time remaining. Flow will be checked after this time elapses. If set to use 2 pumps during pressurization, the lag pump will run during this time.
Pump 2 Delay	Delay before the lag pump turns on.
Field Flush Delay	The delay before the field flush begins on this dose.
Field Flush Timer	The field flush time during which the field flush valve is activated and the lag pump (if set to 2 pumps during field flush) is on.
Check Flow Allowed	Flow is now checked to be within the bounds set by the warning and alarm flows.
Warning Flow	The flow is out of the bounds set by the Low and High Warning Flows.
Low Warn GPM	Low Warning Flow – flow consistently below this will set a low flow warning alarm.
High Warn GPM	High Warning Flow – flow consistently above this will set a high flow warning alarm.
Alarm Flow	The flow is out of the bounds set by the Low and High Alarm Flows.
Low Alarm GPM	Flow consistently below this will set a low flow alarm and causes the zone to be skipped until alarms are cleared.
High Alarm GPM	Flow consistently above this will set a high flow alarm causes the zone to be skipped until alarms are cleared.

Dosing Operations



The Dosing Operations Screen allows the operator to manually start and stop doses.

To change the current program which will be dosed next, press the Set To Program button and enter the desired program.

Dose Start: Start the current program's dose. This essentially just cancels the wait time and is otherwise an automatic dose as normal. The Off Float must be on to start a dose.

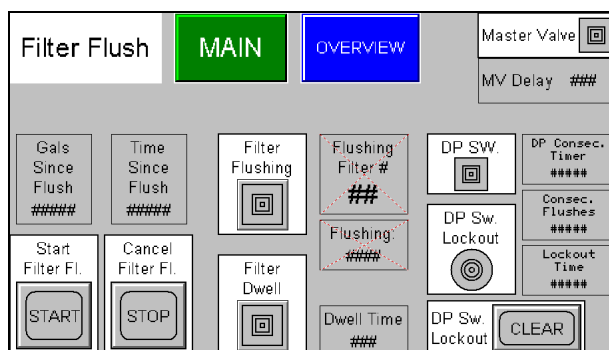
Dose Stop: Stop the current program's dose if already dosing.

Cancel Field Fl.: If the current program is field flushing, this button will cancel the field flush cycle but the remainder of the dose will continue.

Field Fl. Cycle Start: Set all programs to do a field flush.

Field Fl. Cycle Stop: Any program that was set to do a field flush on the program's next dose will now just do a normal dose.

Filter Flushing



The Filter Flushing Screen displays the status of the filter flush and provides manual overrides for the filter flush cycle.

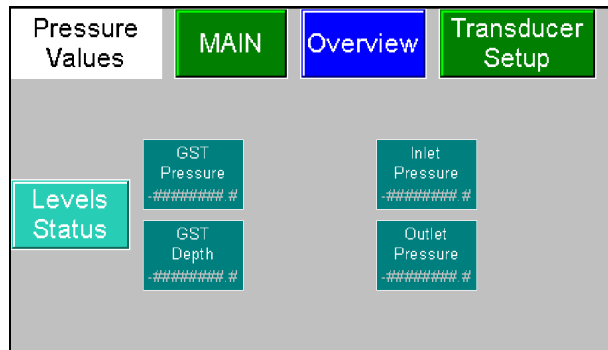
Start Filter Fl.: Manually start a filter flush cycle

Cancel Filter Fl.: Manually cancel a filter flush cycle

Clear DP Sw. Lockout: Remove the DP Switch/Gauge input lockout to allow the system to use the DP Switch input again for starting filter flushes.

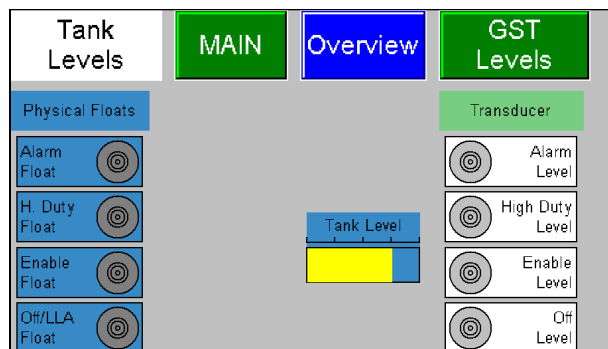
Item	Description
Filter Flushing	The indicator is green when the system is filter flushing.
DP SW.	The indicator is green when the DP Switch input is on.
Flushing Filter #	The current filter that is being flushed
Flushing	The elapsed time of the current filter flushing
Filter Dwell	Indicator is green when the system is waiting between filter flushes
Gals Since Flush	The number of gallons elapsed since the last filter flush
Time Since Flush	The amount of time in minutes since the last filter flush
Consec. Flushes	The number of consecutive filter flushes
DP Consec. Timer	This is for troubleshooting and allows the operator to see the timer which determines whether the next filter flush has started too soon and counts as a consecutive filter flush.
DP Sw. Lockout	The indicator is green when the DP Switch input is locked out due to many consecutive filter flushes.
Master Valve	Master valve output status
MV Delay	The delay for the master valve to close before flushing the filters
Lockout Time	This timer represents the time until the DP switch input will be used again once the DP lockout is initiated.

Pressure Values



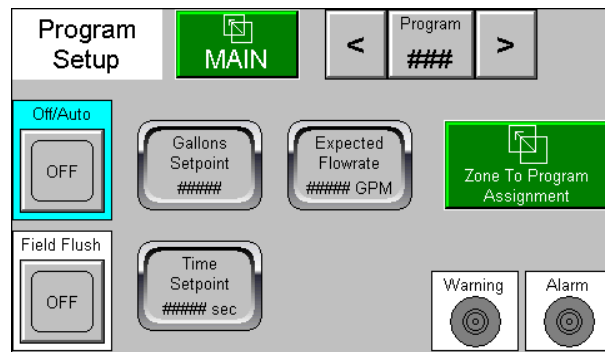
The Pressure Values Screen shows the current values for the GST pressure and depth as well as the inlet and outlet pressures. This button to this menu on the Overview Screen is only shown if the transducer inputs are enabled.

Tank Levels



The Tank Levels Screen shows the status of the floats and the transducer levels.

Program Setup



The drip controller works based off of programs rather than individual zones. Programs are setup with flow or time setpoints and an expected flowrate. Zone valves are then assigned to the program.

To change the current program to edit, press the program button at the top and enter a program number or use the < or > buttons.

Item	Description
Off/Auto	When set to OFF, the program will be skipped by the dosing algorithm.
Field Flush	When set to ON, the program will go through a field flush the next time that it runs.
Gallons Setpoint	In gallons dosing mode, the number of gallons that must pass through flowmeter to complete the dose.
Time Setpoint	The amount of time in seconds that must elapse during the dose of the program in time dosing mode.
Expected Flowrate	The expected flow in gallons per minute. If set to 0, the flowrate will not be checked except for no-flow conditions.
Warning	When red, the current program had a flow warning.
Alarm	When red, the current program had a flow alarm.

Press the Zone To Program Assignment button to assign the zones and field flush groups.

Assign Zones

Assign Zones			MAIN			PROGRAM SETUP		
ZN 1	Prog # ##	Flush 1	ZN 5	Prog # ##	Flush 1	ZN 9	Prog # ##	Flush 1
ZN 2	Prog # ##	Flush 1	ZN 6	Prog # ##	Flush 1	ZN 10	Prog # ##	Flush 1
ZN 3	Prog # ##	Flush 1	ZN 7	Prog # ##	Flush 1			
ZN 4	Prog # ##	Flush 1	ZN 8	Prog # ##	Flush 1			

For each zone, assign it to a program. Multiple zones can be assigned to the same program.

Programs that have multiple zones may require two flush groups if the pumps are not capable of flushing all zones at once. Each zone can be freely associated with the flush group 1 or flush group 2 for the zone's program.

Flows

The Flows Screen shows the last flowrates of each program and overall system flow accumulations. Use the programs' last flowrates to determine the flows that generated program flow warnings and alarms.

Flow History

The Flow History Screen shows the flow information and history for individual programs.

To change the program being viewed, press the Program Selected button to enter a program number or press the < or > buttons.

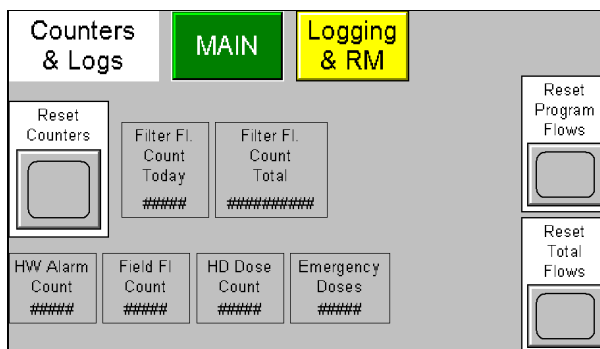
Item	Description
Last Flowrate	Flowrate at the end of the last dose
Prog. Flow Today	Total flow elapsed during this program's doses today
Prog. Flow Total	Total elapsed flow accumulated over all time.
Program Flow History	The amount of daily flow from X number of days ago. 1 would be yesterday, 2 would be 2 days ago, etc.

Total Flow History

Total Flow History	MAIN	Flows	Zone Flow History
Total Flow History (X Days Ago)			
1: ##### 8: #####			
2: ##### 9: #####			
3: ##### 10: #####			
4: ##### 11: #####			
5: ##### 12: #####			
6: ##### 13: #####			
7: ##### 14: #####			

Item	Description
Total Flow History	The amount of total system daily flow from X number of days ago. 1 would be yesterday, 2 would be 2 days ago, etc.

Counters & Logs



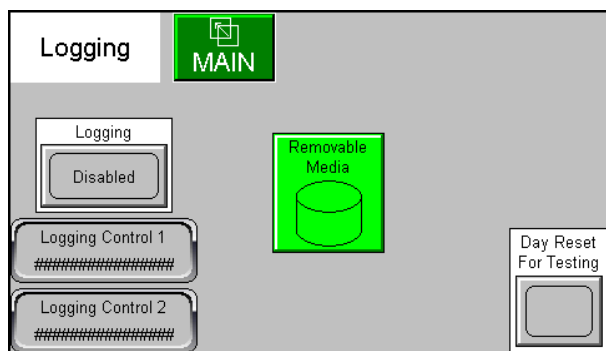
Reset Counters: Reset the drip counters.

Reset Program Flows: Reset the flow histories and accumulations for just the programs.

Reset Combined Flows: Reset the flow history and accumulation for overall system flow.

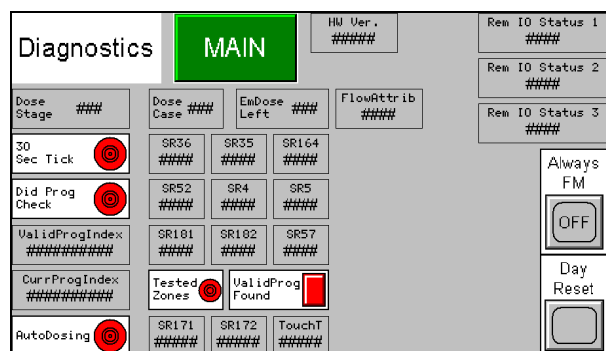
Item	Description
Emergency Doses	The number of times the system has had to use an emergency dose between normal dosing cycles due to high water.
Filter Fl. Count Total	Total number of filter flush cycles.
Filter Fl. Count Today	The number of filter flush cycles today.
Field Fl. Count	Total number of field flush cycles.
HD Dose Count	The number of doses with the HD Float active.
HW Alarm Count	Total number of times the High Water Alarm Float has activated.

Logging



The Logging Screen allows the operator to disable/enable logging to the micro-SD card. The Removable Media control allows the operator to format and view the status of the micro-SD card.

Diagnostics



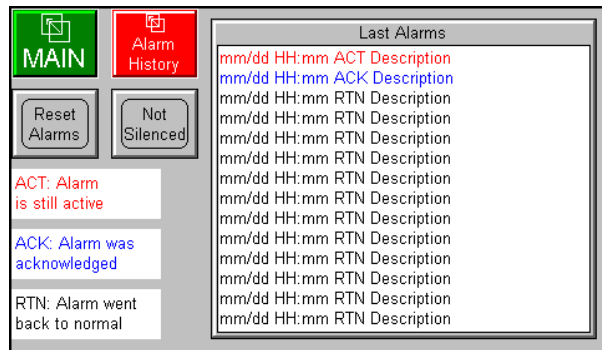
The Diagnostics Screen is for testing and troubleshooting purposes. The items shown on this screen will most likely change depending on features being tested last.

Info



The Info Screen just provides contact information and the firmware version.

Alarm



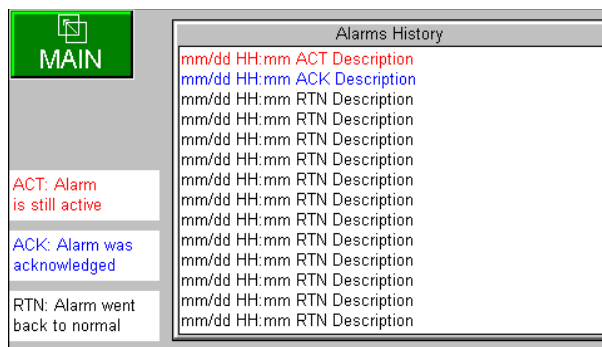
The Alarm Screen shows the current alarms and alarms that cleared themselves without being acknowledged. Press the Last Alarms text area to bring up the Alarm widget. View the alarms and acknowledge them in the Alarm widget.

Descriptor	Color	Description
ACT	Red	Alarm is still active and has not been acknowledged.
ACK	Blue	Alarm has been acknowledged.
RTN	Black	Alarm has returned back to normal condition without first being acknowledged. Acknowledged alarms that return to normal will be cleared out of the Last Alarms text area.

Press the Reset Alarms button to clear the alarms. If alarm conditions still exist, they will show up again quickly and start sounding the alarm buzzer.

The alarm silence can be manipulated with the Silence/Not Silenced toggle button.

Alarm History



The Alarm History Screen allows the operator to view the history of alarms. This will show all past alarms and when alarms have been cleared or acknowledged. Press the text area of the Alarms History to bring up the Alarm History widget and clear or acknowledge alarms.

IV Alarms

Alarms

High Water Alarm

While the PLC records high water alarms, the alarm circuit is independent of the PLC just in case the PLC fails. The red alarm light turns on and the alarm output contacts close immediately when the high water alarm float goes up. The operator can set a number of emergency high water doses to deal with unexpected surge without turning on the beeper. After the controller uses these additional emergency doses in a day, the beeper will come on when the high water float is up.

Silence HWA

The silence alarm knob and OK button silences the beeper.

When the PLC is operating and it sees the silence alarm input and a high water alarm, it will keep the beeper off for 24 hours just in case the alarm float goes up and down during the next day. Pressing the Clear Alarms Button will cancel the 24 hour silence timer.

Maintenance Alarm

For most alarms, the PLC will activate the yellow warning/maintenance light and warning output contacts. Power problems (like blown fuse), floats out of order, pump alarm, and zone alarms will activate the Maintenance Alarm

Silence Maintenance Alarm

The OK button and the silence alarm knob will silence the beeper for 24 hours.

Pressing the Clear Alarms Button will turn off the 24 hour silence timer and allow the beeper to turn on again.

Alarm Test

To test the alarm, turn the Silence Alarm Knob to "TEST" and hold it for ten seconds or until the beeper turns on. This essentially turns on the High Water Alarm Float so the controller will get an alarm for high water and maybe floats out of order.

Alternatively, use the software HOA buttons for the buzzer and warning outputs. The High Water Alarm must be tested with either the High Water Alarm Float or the Test button/knob.

V System Settings

Settings

The System Settings Menu does not have the capability to directly do ON/OFF or TRUE/FALSE types of settings. Instead, use 1=ON and 0=OFF to enable/disable a feature.

Dose Setup

Setting	Description
Number of Programs	The number of dosing programs. Each program has a set time or gallons per dose and one or more zone valves assigned to the program.
Number of Zones	The number of physical outputs for the zone valve solenoids
Pressurization Time	The amount of time for the system flow to stabilize at the beginning of a dose. After this time elapses, the system will begin checking flow to be within the expected range.
HD Percent Added	While the High Duty Float is active, the system will add this percent of a dose program's set time or gallons to the final expected dose setpoint.
Field Flush Interval	The number of days between field flush cycles
Field Flush Duration	The length of time in seconds of a field flush
Field Flush Delay	The delay in seconds from the start of the dose to when the field flush begins
Max No Flow Time	The maximum amount of time that the pumps can be running without any new flow pulses.
Must Complete Dose	If a dose is stopped early due to the Off Float going down, the remainder of the dose will be completed the next time the Off and Enable Float.

Filter

Setting	Description
Number of Filters	The number of physical filters to be flushed in the filter bank. This should correspond with the number of filter flush solenoids.
Master Valve Delay	The delay from when the master valve output is activated to the start of the first filter flush solenoid activation. This gives the master valve time to close and provide full pressure and flow to the filter flush.
Filter Flush Time	The amount of time to flush each individual filter
Filter Dwell Time	The amount of time to wait between filter flushes. This time allows the backwash valves time to switch positions and build some extra pressure before flushing the next filter.
DP Switch Delay	The amount of time that the DP gauge input must remain active before starting a filter flush.
DP Lockout Count	If a filter flush occurs within a short period of a previous filter flush, the system will increment a lockout counter. Once too many filter flushes have occurred in a short time, the DP gauge input will be locked out. This is to prevent a dose from becoming constant filter flushes with no water going to the field if the filters are dirty or the DP gauge is stuck on.
DP Lockout Time	The amount of time to lockout the DP gauge input. Afterwards, the lockout is cleared and the DP gauge input is allowed to initiate more filter flushes.
DP Fail Time	If the DP gauge is stuck on for this amount of time, then an alarm is set and the DP gauge input is ignored.
Gallons Interval	The maximum number of gallons that may pass between filter flushes. The counter checking against this value is reset after any filter flush.
Time Interval	The maximum amount of time that may elapse between filter flushes. The counter checking against this value is reset after any filter flush.

Flowmeter

Setting	Description
Pulse Size	Number of gallons per pulse from the flowmeter input
FM Installed	Enable/Disable the flowmeter functions.
FM Input Deb.	The minimum amount of time in milliseconds that a flow pulse input must stay on or off to change state. This is called the debounce time and it makes sure that an unsteady or noisy input from a flowmeter does not cause additional pulses
FM Reset Time	The amount of time that must elapse after a flow pulse before resetting the flow to zero.
Add ½ FF Flow	When enabled, during a field flush, count a portion of the flow towards the dose. In most typical designs, the dosing flowrate is typically doubled during a field flush so ½ of the flow is still going to the field as usual.
Fld Flsh Flow Div	This is the divisor of the flow to count towards the dose. Every X number of pulses will go towards the dose elapsed counter.

HOA

Setting	Description
Pump HOA w/ Flts	When enabled, the OFF Float must be active to put a pump into HAND.
HOA Auto Reset	When enabled, after putting any device into HAND, reset all devices in HAND after a set amount of time back to AUTO.
HOA Reset Time (min)	The amount of time in minutes before resetting devices in HAND back to AUTO. This timer starts as soon as any device is in HAND and will only clear once no devices are in HAND.

Alarm Setup

Setting	Description
Skip Alarmed Program	If a program has a flow alarm, skip it and do the next available program.
Flow Check Length	The amount of time that the flow must be consistently out of the expected flow range. All flow readings must be out of bounds for this time period before an alarm is set.
Warning Flow Percent	The percent above or below the expected flowrate which will cause a flow warning for a program. Warning generated if $\text{FLOWRATE} > (1 + X/100) * \text{ExpectedFlowrate}$ or $\text{FLOWRATE} < (1 - X/100) * \text{ExpectedFlowrate}$
Alarm Flow Percent	The percent above or below the expected flowrate which will cause a flow alarm for a program. Alarm generated if $\text{FLOWRATE} > (1 + X/100) * \text{ExpectedFlowrate}$ or $\text{FLOWRATE} < (1 - X/100) * \text{ExpectedFlowrate}$
Silence Reset Time	The amount of time after the system is silenced before clearing the silence automatically. This is to prevent someone from silencing and then forgetting about the problem.
Flow Chk Post Filter	After a filter flush, delay checking the flow rate for flow alarms for this amount of time. Often it may take a short time to reach a steady flowrate again after a filter flush.
Flow Chk Post Fld FI	After a field flush, delay checking the flow rate for flow alarms for this amount of time. Often it may take a short time to reach a steady flowrate again after a field flush.
Allow Early Silence	If the operator presses the silence button without any active alarms, the system will be silenced and will not activate the beeper or output relays should alarms arise. The silence will reset as usual with the silence timer or an alarm clearing.
Emergency Doses/Day	If the Alarm Float rises, the system will try an emergency dose immediately to lower the water level regardless of the current interval timer. This sets the maximum number of extra doses allowed in a day.

Pumps

Setting	Description
Dual Pump Delay	Delay in seconds before activating the second pump after the lead pump.
Dual Pump High Duty	Use two pumps when dosing with the High Duty Float active.
Dual Pump Field Fl.	Use two pumps when field flushing.
Dual Pump Filter Fl.	Use two pumps when filter flushing.
Dual Pump Pressurize	Use two pumps during the pressurization time.
Phase Mon. Override	Override the phase monitor input. Set to 1, if no phase monitor is installed or if the phase monitor is broken.
Phase Mon. ON Delay	The phase monitor input must be consecutively active for this time before allowing dosing or the pumps to run.
Phase Mon. OFF Delay	The phase monitor input must be off for this amount of time before turning the phase monitor status to off.
Contactor Feedback	When enabled, the controller expects feedback from the contactors
Test Pump Flow	When enabled, the controller will look for a number of pulses in a short period of time. If the time elapses before receiving enough flow pulses, then the system will switch pumps and test the next pump. If the next pump successfully passes the test, then the first pump will be in an alarm/failure state.
Use Failed Pumps	When enabled, continue to use a pump that failed the pump test in the pump rotation.
Pump Test Min Pulses	The minimum number of pulses that the system must see during a pump test period. If the pump test time elapses before receiving this number of pulses, then the pump fails.
Pump Test Time	The duration of time for a pump test.

Floats

Setting	Description
Floats ON Debounce	The time in seconds that a float must stay on before changing the float status to on for the dosing program.
Floats OFF Debounce	The time in seconds that a float must stay off before changing the float status to off for the dosing program.

Defaults

Setting	Description
Default Prog. Gals	When sending the defaults to programs, this amount will be set to each program's Gallons Setpoint.
Default Prog. Time	When sending the defaults to programs, this amount will be set to each program's Time Setpoint.

VI Flow Records

Flow Data Logs

The PLC logs the daily flow accumulations for each zone, the overall total flow accumulation, and the daily flow.

These logs are available through the micro-SD card. Please remove the card, read the files off, and return the card promptly. Otherwise, future datalogs may be lost.

VII Manual Change Log

1. 1/12/2021 – 1.00 – Initial Release
2. 2/2/2021 – 1.01 – Added System Setting Descriptions
3. 6/12/2022 – 1.02 – Added new screens and re-worked UI screens. Transducers info added.