BREWERY
WASTEWATER DESIGN

TECHNICAL MANUAL FOR

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Executive Summary

The objective of this system is to automatically control, measure, record, and report wastewater discharge within the local discharge limits:

pH limits of 5.0 – 8.5

Process wastewater from Old Schoolhouse Brewing (OSB) gravity flows to an underground lift station outside the brewery. As the water falls out of the pipe and into the tank, it passes through a simple coarse screen to catch large chunks like pallet wood, shrink wrap, keg caps, etc. The lift station has a mixer system installed to mix the tank, test the pH, and automatically add chemicals to bring the pH within discharge range. Once the pH is in range and the tank is 40% full or more, the discharge pumps will kick on and begin to discharge wastewater to sewer through a flow meter.

The controls for this system allow remote access, data logging, and alarming via text message and email. The remote access means employees can log in from their desk, from home, or from their smart phone. Brewery Wastewater Design (BWD) can also access the system and make changes from Colorado. The datalog means the system takes a 'snapshot' of all key parameters once every 5 minutes, such as pH, tank level, flow, and total flow. The datalog then generates graphs of all this data and automatically exports it weekly via emailed spreadsheet.

As installed this system will function very well for many years.

USING THIS MANUAL

This manual is full of internet hyperlinks. For this reason, this manual is most effective when viewed electronically.

General Precautions

The tip of the pH electrode must be submerged at all times; which is why it comes with a cup around the tip during shipping, and why it's installed in a low spot in the piping. The electrode adapter has 1.25" MNPT threads, your pipe needs 1.25" FNPT threads. You were supplied with a 1.25" plug to fill the electrode mounting hole until you are ready to startup. Wire in the electrode as instructed but do not install the electrode in the pipe, instead install the 1.25" plug in the pipe so you can test fire the pump. Keep the electrode tip installed in factory supplied cup during this time.

The flow meter must also be fully flooded with water at all times, which is also why the meter is installed in a belly in the pipe. Air bubbles or a partially empty pipe will lead to a 20mA signal from the meter and give a false high reading from the flow meter. Also, pay attention to the electrodes on the inside of the meter body. See Image 1 below:

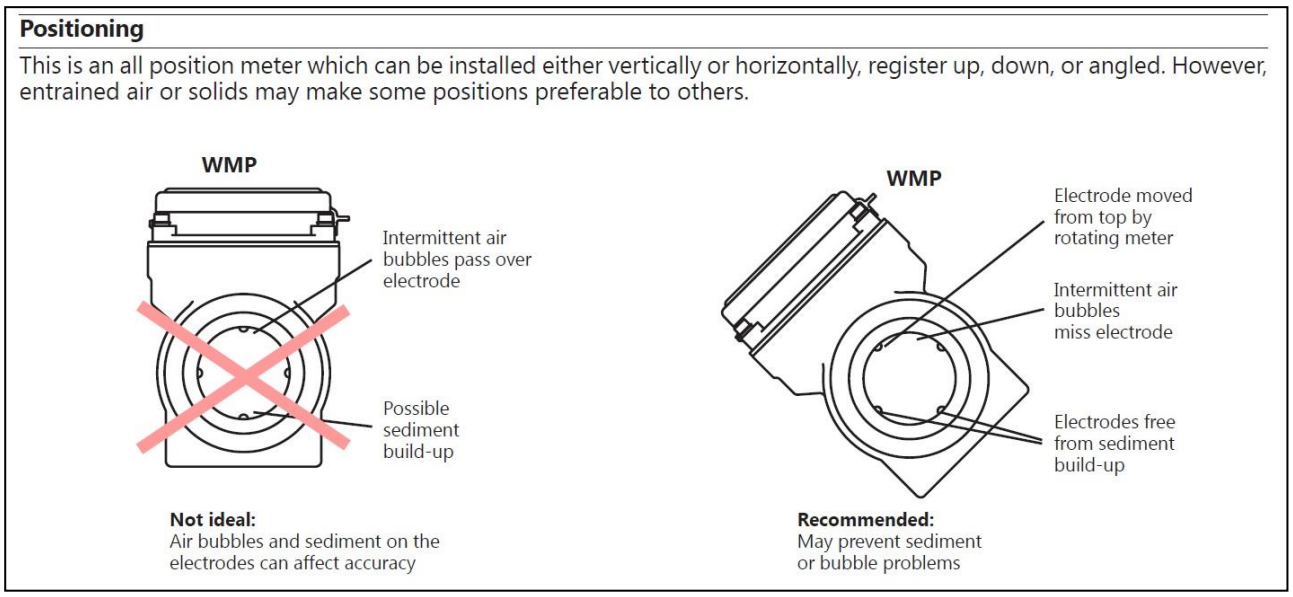

Image 1. Proper flow meter position.

All meters are different, check the manual for the correct mounting position. The above shows a Seametrics WMP flow meter.

Before turning the Walchem unit on for the first time, it's best to verify that the actual field wiring matches the electrical drawing exactly. John has had several projects where licensed controls electricians wired the instrumentation incorrectly and fried the analog input card and/or transmitters. It's not that complicated, but there are a few unusual wiring layouts, such as connecting + to -. This naturally confuses electricians, but the electrical drawing has been prepared correctly.

Before starting up the Walchem, make sure the SJE Rhombus unit is powered up and HOA switches on the Rhombus are in Off. These switches can be turned to Auto at any time after startup.

Verify the chemical pumps are plugged in to the correct outlet. One outlet is for the acid pump, the other is for the caustic pump.

The chemicals used for pH adjustment are quite strong, 50% caustic (NaOH) and 95% sulfuric acid (H_2SO_4). Adding these chemicals to the wastewater is literally money down the drain, so we try to be as efficient as possible with usage, shipping, and handling of these materials. Always wear safety glasses, face shield, and gloves when working with these chemicals.

A brewery is full of confined spaces. This wastewater tank is no exception, in fact this tank is classified as a permit required confined space. Do not enter this tank under any circumstances without proper precautions. For instance, CO_2 is heavier than air and this tank will become a fermenter due to the nature of yeast and a brewery. Due to this fermentation, there is probably insufficient oxygen in the tank to support life, one breath is all it takes to pass out down there and you're dead.

There is both high and low voltage power associated with the system. All high voltage controllers are lock out/tag out compatible. All low voltages can be eliminated by simply unplugging the Walchem controller.

Controls

PROCESS DESCRIPTION

Description of the logic running the Walchem W900 controller:

1. The mixer pump runs any time tank level is above 20%.
2. The caustic and acid pumps will run automatically, trying to keep the pH between 5.6 and 11.9. The chemical pumps can run only of the mixer pump is running.
3. If the underground tank level is above 40% and the pH is in range, a discharge pump will turn on and begin discharging to sewer through the flow meter.
    - The tank will discharge down to 10% tank level.
    - If the pH goes out of range while discharging to sewer for more than 60 consecutive seconds, the discharge pump will turn off.
4. If the pH tank level is above 40% and the pH is not in range:
    - The mixer and chemical pumps will continue running, trying to get the pH in range.
    - If the pH comes in range, a discharge pump will turn on.
    - If the pH does not come in range and the tank level reaches 70% full, the autodialer feature will text message and email the appropriate people.
5. When the tank is refilling from 10% to 30%, the chemical feed pumps will be disabled.
6. If the tank gets too full, it will gravity overflow to sewer.
7. The areas above with an underlined 'and' indicate an interlock. There are many interlocks built in to this system. Interlocks allow for and/or as well as either/or type logic.
8. All of these settings are customizable. BWD can access this controller from their office in Colorado and make programming changes 'on the fly'.
9. This lift station level and pumps are controlled by the SJE Rhombus alternating pump controller. There are 2 pumps in the tank, they alternate with each pump cycle. The SJE Rhombus controller is controlled by the Walchem controller.

CONNECTING YOUR CONTROLLER

The Walchem W900 controller is designed to be connected to the internet for full functionality. Once connected, the controller will have a web page that provides remote access from any computer or smartphone. It will also send email and text message alarms, and email a data log report each week. The internet connection should be made with a direct network cable, although a wireless ethernet adapter is an option.

There are 2 systems to set up for this remote access, the IP address and the email settings. Here are instructions to set the controller up on the network, including the IP address. See section 5.4.6 of the manual for instructions to set up the email function. Here is the general tech support page for this controller. Feel free to call Walchem if needed, 508-429-1110.

Brewery Wastewater Design is not an IT firm; however, we have a partnership with an IT outfit in Oregon who can help get this controller connected. He has done this many times for us with other breweries, let John know if you would like his help. If you want to attempt this on your own, or with your own IT guy, we have gleaned these notes from others.

CHANGING THE PROGRAM

The program outlined above was written by John, custom for your brewery. But this is your system, we encourage you to learn how it works and recommend changes if needed. It is advised to not make programming changes without talking to John first, at least until you get comfortable with the system. There are many interlocks built in to the program, we want to make sure those interlocks still work and don't cause problems for you. If desired we can make a revised version of the program and John can test it before going 'live' with it in your system.

LOGGING IN

There are 2 ways to login to the Walchem controller.

1. Master	2. View Only
• Full Viewing & Configuration	• Full Viewing • No Configuration

Depending on your operation, it may be best to have employee's login with the View Only password?

Default username = admin

Default admin password = 5555

Default view-only password = 1111

It is best to customize these codes. You can go to the 'Config' menu on W900 display, then Security Settings. If you change these codes let Brewery Wastewater Design know, otherwise remote access isn't possible.

NORMAL OPERATION

There are two ways to interface with the W900 controller, the touchscreen on the door and by remote access from any computer in the world.

TOUCH SCREEN INTERFACE

Images below are from pages 35-40 of the manual. Other sections of this manual will refer to these pages.

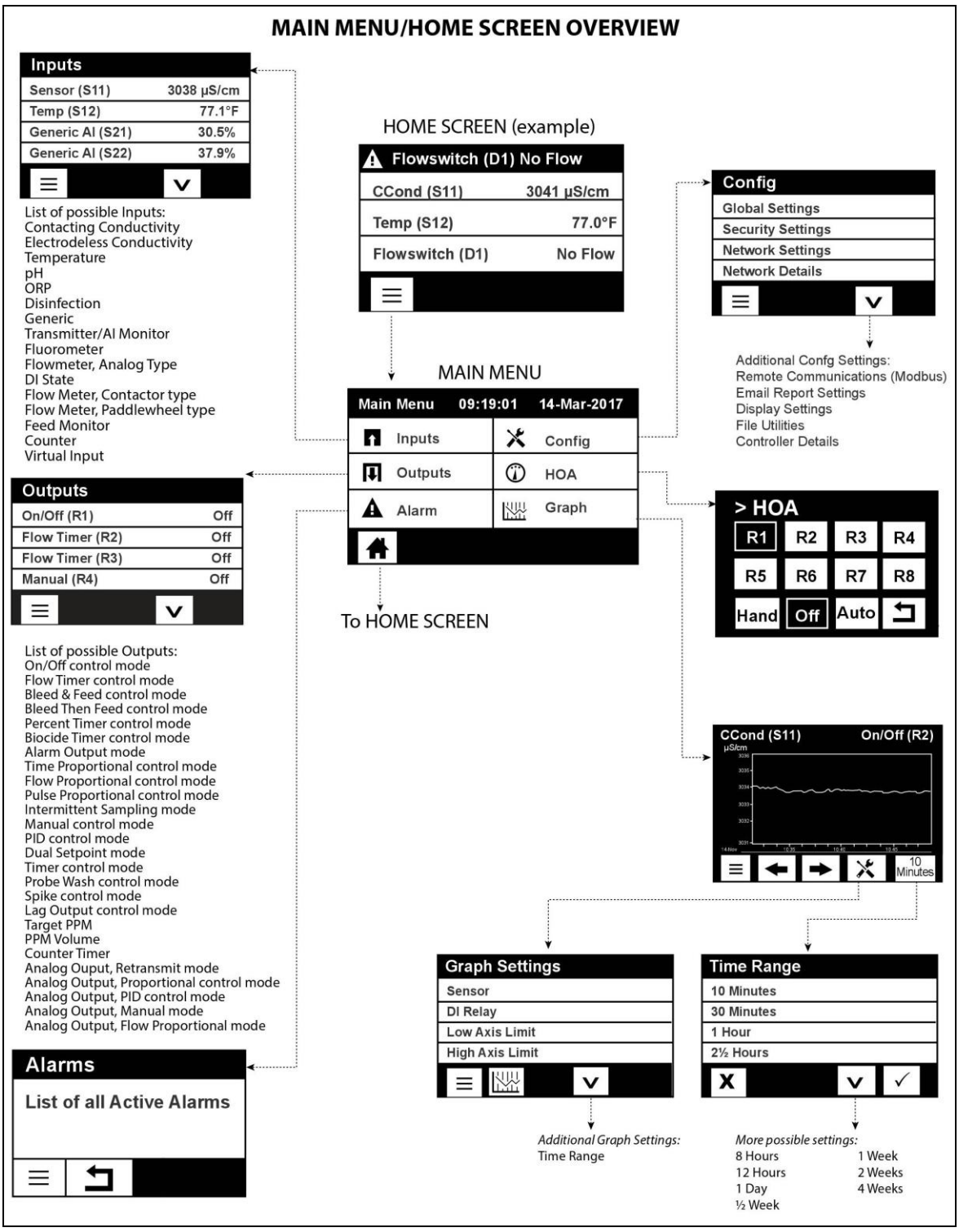

Image 2.

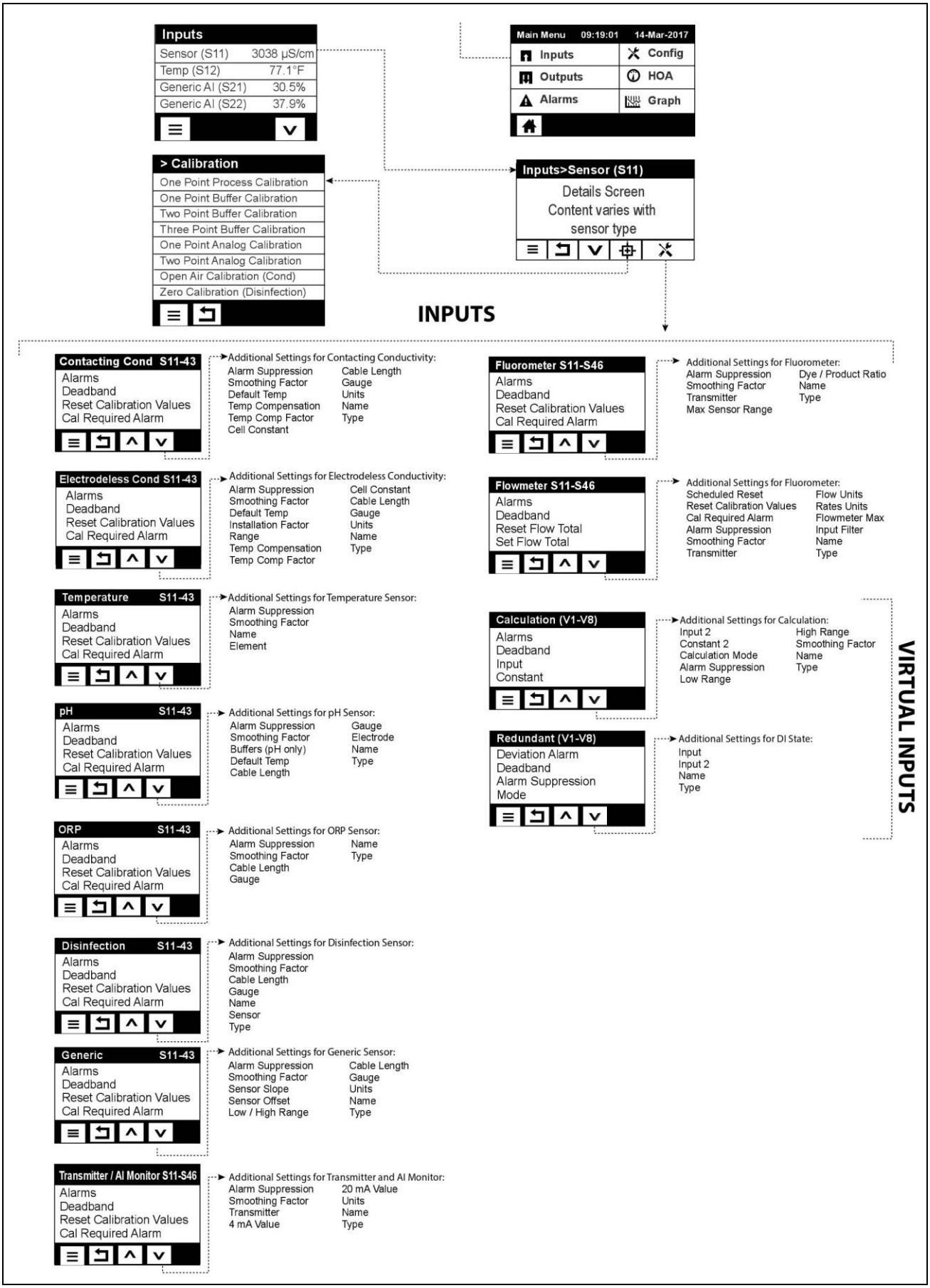
Inputs
Sensor (S11) 3038 µS/cm
Temp (S12) 77.1°F
Generic AI (S21) 30.5%
Generic AI (S22) 37.9%
Main Menu 09:19:01 14-Mar-2017
Inputs
Config
Outputs
HOA
Alarms
Graph
> Calibration
One Point Process Calibration
One Point Buffer Calibration
Two Point Buffer Calibration
Three Point Buffer Calibration
One Point Analog Calibration
Two Point Analog Calibration
Open Air Calibration (Cond)
Zero Calibration (Disinfection)
Inputs>Sensor (S11)
Details Screen
Content varies with
sensor type
INPUTS
Contacting Cond S11-43
Alarms
Deadband
Reset Calibration Values
Cal Required Alarm
Additional Settings for Contacting Conductivity:
Alarm Suppression
Smoothing Factor
Default Temp
Temp Compensation
Temp Comp Factor
Cell Constant
Cable Length
Gauge
Units
Name
Type
Electrodeless Cond S11-43
Alarms
Deadband
Reset Calibration Values
Cal Required Alarm
Additional Settings for Electrodeless Conductivity:
Alarm Suppression
Smoothing Factor
Default Temp
Installation Factor
Range
Temp Compensation
Temp Comp Factor
Cell Constant
Cable Length
Gauge
Units
Name
Type
Temperature S11-43
Alarms
Deadband
Reset Calibration Values
Cal Required Alarm
Additional Settings for Temperature Sensor:
Alarm Suppression
Smoothing Factor
Name
Element
pH S11-43
Alarms
Deadband
Reset Calibration Values
Cal Required Alarm
Additional Settings for pH Sensor:
Alarm Suppression
Smoothing Factor
Buffers (pH only)
Default Temp
Cable Length
Gauge
Electrode
Name
Type
ORP S11-43
Alarms
Deadband
Reset Calibration Values
Cal Required Alarm
Additional Settings for ORP Sensor:
Alarm Suppression
Smoothing Factor
Cable Length
Gauge
Name
Type
Disinfection S11-43
Alarms
Deadband
Reset Calibration Values
Cal Required Alarm
Additional Settings for Disinfection Sensor:
Alarm Suppression
Smoothing Factor
Cable Length
Gauge
Name
Sensor
Type
Generic S11-43
Alarms
Deadband
Reset Calibration Values
Cal Required Alarm
Additional Settings for Generic Sensor:
Alarm Suppression
Smoothing Factor
Sensor Slope
Sensor Offset
Low / High Range
Cable Length
Gauge
Units
Name
Type
Transmitter / AI Monitor S11-S46
Alarms
Deadband
Reset Calibration Values
Cal Required Alarm
Additional Settings for Transmitter and AI Monitor:
Alarm Suppression
Smoothing Factor
Transmitter
4 mA Value
20 mA Value
Units
Name
Type
Fluorometer S11-S46
Alarms
Deadband
Reset Calibration Values
Cal Required Alarm
Additional Settings for Fluorometer:
Alarm Suppression
Smoothing Factor
Transmitter
Max Sensor Range
Dye / Product Ratio
Name
Type
Flowmeter S11-S46
Alarms
Deadband
Reset Flow Total
Set Flow Total
Additional Settings for Fluorometer:
Scheduled Reset
Reset Calibration Values
Cal Required Alarm
Alarm Suppression
Smoothing Factor
Transmitter
Flow Units
Rates Units
Flowmeter Max
Input Filter
Name
Type
Calculation (V1-V8)
Alarms
Deadband
Input
Constant
Additional Settings for Calculation:
Input 2
Constant 2
Calculation Mode
Alarm Suppression
Low Range
High Range
Smoothing Factor
Name
Type
Redundant (V1-V8)
Deviation Alarm
Deadband
Alarm Suppression
Mode
Additional Settings for DI State:
Input
Input 2
Name
Type
VIRTUAL INPUTS

Image 3.

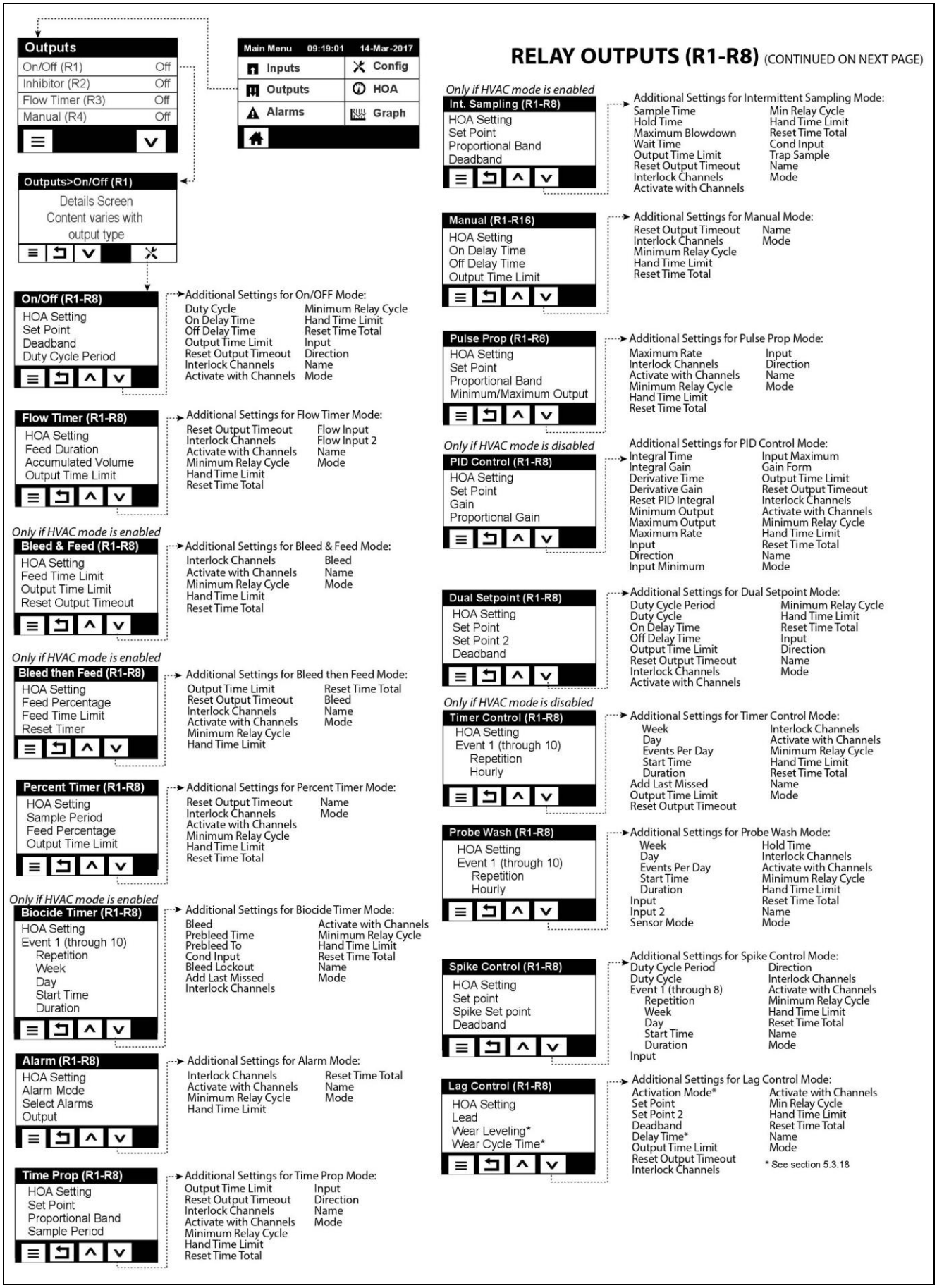
Outputs
On/Off (R1) Off
Inhibitor (R2) Off
Flow Timer (R3) Off
Manual (R4) Off
Main Menu 09:19:01 14-Mar-2017
Inputs
Config
Outputs
HOA
Alarms
Graph
Outputs>On/Off (R1)
Details Screen
Content varies with
output type
RELAY OUTPUTS (R1-R8) (CONTINUED ON NEXT PAGE)
On/Off (R1-R8)
HOA Setting
Set Point
Deadband
Duty Cycle Period
Additional Settings for On/OFF Mode:
Duty Cycle
On Delay Time
Off Delay Time
Output Time Limit
Reset Output Timeout
Interlock Channels
Activate with Channels
Minimum Relay Cycle
Hand Time Limit
Reset Time Total
Input
Direction
Name
Mode
Flow Timer (R1-R8)
HOA Setting
Feed Duration
Accumulated Volume
Output Time Limit
Additional Settings for Flow Timer Mode:
Reset Output Timeout
Interlock Channels
Activate with Channels
Minimum Relay Cycle
Hand Time Limit
Reset Time Total
Flow Input
Flow Input 2
Name
Mode
Only if HVAC mode is enabled
Bleed & Feed (R1-R8)
HOA Setting
Feed Time Limit
Output Time Limit
Reset Output Timeout
Additional Settings for Bleed & Feed Mode:
Interlock Channels
Activate with Channels
Minimum Relay Cycle
Hand Time Limit
Reset Time Total
Bleed
Name
Mode
Only if HVAC mode is enabled
Bleed then Feed (R1-R8)
HOA Setting
Feed Percentage
Feed Time Limit
Reset Timer
Additional Settings for Bleed then Feed Mode:
Output Time Limit
Reset Output Timeout
Interlock Channels
Activate with Channels
Minimum Relay Cycle
Hand Time Limit
Reset Time Total
Bleed
Name
Mode
Percent Timer (R1-R8)
HOA Setting
Sample Period
Feed Percentage
Output Time Limit
Additional Settings for Percent Timer Mode:
Reset Output Timeout
Interlock Channels
Activate with Channels
Minimum Relay Cycle
Hand Time Limit
Reset Time Total
Name
Mode
Only if HVAC mode is enabled
Biocide Timer (R1-R8)
HOA Setting
Event 1 (through 10)
Repetition
Week
Day
Start Time
Duration
Additional Settings for Biocide Timer Mode:
Bleed
Prebleed Time
Prebleed To
Cond Input
Bleed Lockout
Add Last Missed
Interlock Channels
Activate with Channels
Minimum Relay Cycle
Hand Time Limit
Reset Time Total
Name
Mode
Alarm (R1-R8)
HOA Setting
Alarm Mode
Select Alarms
Output
Additional Settings for Alarm Mode:
Interlock Channels
Activate with Channels
Minimum Relay Cycle
Hand Time Limit
Reset Time Total
Name
Mode
Time Prop (R1-R8)
HOA Setting
Set Point
Proportional Band
Sample Period
Additional Settings for Time Prop Mode:
Output Time Limit
Reset Output Timeout
Interlock Channels
Activate with Channels
Minimum Relay Cycle
Hand Time Limit
Reset Time Total
Input
Direction
Name
Mode
Only if HVAC mode is enabled
Int. Sampling (R1-R8)
HOA Setting
Set Point
Proportional Band
Deadband
Additional Settings for Intermittent Sampling Mode:
Sample Time
Hold Time
Maximum Blowdown
Wait Time
Output Time Limit
Reset Output Timeout
Interlock Channels
Activate with Channels
Min Relay Cycle
Hand Time Limit
Reset Time Total
Cond Input
Trap Sample
Name
Mode
Manual (R1-R16)
HOA Setting
On Delay Time
Off Delay Time
Output Time Limit
Additional Settings for Manual Mode:
Reset Output Timeout
Interlock Channels
Minimum Relay Cycle
Hand Time Limit
Reset Time Total
Name
Mode
Pulse Prop (R1-R8)
HOA Setting
Set Point
Proportional Band
Minimum/Maximum Output
Additional Settings for Pulse Prop Mode:
Maximum Rate
Interlock Channels
Activate with Channels
Minimum Relay Cycle
Hand Time Limit
Reset Time Total
Input
Direction
Name
Mode
Only if HVAC mode is disabled
PID Control (R1-R8)
HOA Setting
Set Point
Gain
Proportional Gain
Additional Settings for PID Control Mode:
Integral Time
Integral Gain
Derivative Time
Derivative Gain
Reset PID Integral
Minimum Output
Maximum Output
Maximum Rate
Input
Direction
Input Minimum
Input Maximum
Gain Form
Output Time Limit
Reset Output Timeout
Interlock Channels
Activate with Channels
Minimum Relay Cycle
Hand Time Limit
Reset Time Total
Name
Mode
Dual Setpoint (R1-R8)
HOA Setting
Set Point
Set Point 2
Deadband
Additional Settings for Dual Setpoint Mode:
Duty Cycle Period
Duty Cycle
On Delay Time
Off Delay Time
Output Time Limit
Reset Output Timeout
Interlock Channels
Activate with Channels
Minimum Relay Cycle
Hand Time Limit
Reset Time Total
Input
Direction
Name
Mode
Only if HVAC mode is disabled
Timer Control (R1-R8)
HOA Setting
Event 1 (through 10)
Repetition
Hourly
Additional Settings for Timer Control Mode:
Week
Day
Events Per Day
Start Time
Duration
Add Last Missed
Output Time Limit
Reset Output Timeout
Interlock Channels
Activate with Channels
Minimum Relay Cycle
Hand Time Limit
Reset Time Total
Name
Mode
Probe Wash (R1-R8)
HOA Setting
Event 1 (through 10)
Repetition
Hourly
Additional Settings for Probe Wash Mode:
Week
Day
Events Per Day
Start Time
Duration
Input
Input 2
Sensor Mode
Hold Time
Interlock Channels
Activate with Channels
Minimum Relay Cycle
Hand Time Limit
Reset Time Total
Name
Mode
Spike Control (R1-R8)
HOA Setting
Set point
Spike Set point
Deadband
Additional Settings for Spike Control Mode:
Duty Cycle Period
Duty Cycle
Event 1 (through 8)
Repetition
Week
Day
Start Time
Duration
Input
Direction
Interlock Channels
Activate with Channels
Minimum Relay Cycle
Hand Time Limit
Reset Time Total
Name
Mode
Lag Control (R1-R8)
HOA Setting
Lead
Wear Leveling*
Wear Cycle Time*
Additional Settings for Lag Control Mode:
Activation Mode*
Set Point
Set Point 2
Deadband
Delay Time*
Output Time Limit
Reset Output Timeout
Interlock Channels
Activate with Channels
Min Relay Cycle
Hand Time Limit
Reset Time Total
Name
Mode
* See section 5.3.18

Image 4.

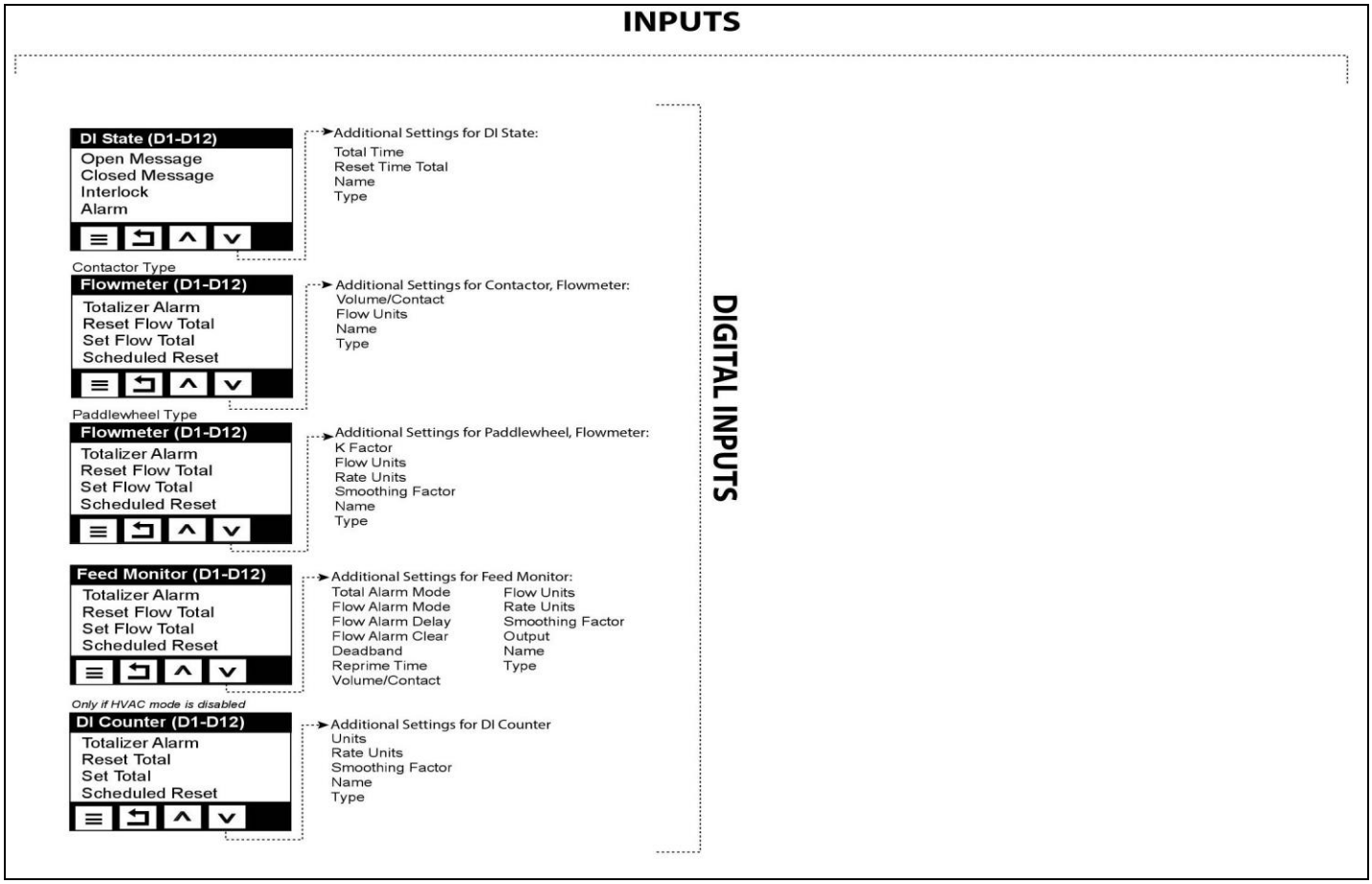
INPUTS
DIGITAL INPUTS
DI State (D1-D12)
Open Message
Closed Message
Interlock
Alarm
Additional Settings for DI State:
Total Time
Reset Time Total
Name
Type
Contactor Type
Flowmeter (D1-D12)
Totalizer Alarm
Reset Flow Total
Set Flow Total
Scheduled Reset
Additional Settings for Contactor, Flowmeter:
Volume/Contact
Flow Units
Name
Type
Paddlewheel Type
Flowmeter (D1-D12)
Totalizer Alarm
Reset Flow Total
Set Flow Total
Scheduled Reset
Additional Settings for Paddlewheel, Flowmeter:
K Factor
Flow Units
Rate Units
Smoothing Factor
Name
Type
Feed Monitor (D1-D12)
Totalizer Alarm
Reset Flow Total
Set Flow Total
Scheduled Reset
Additional Settings for Feed Monitor:
Total Alarm Mode
Flow Alarm Mode
Flow Alarm Delay
Flow Alarm Clear
Deadband
Reprime Time
Volume/Contact
Flow Units
Rate Units
Smoothing Factor
Output
Name
Type
Only if HVAC mode is disabled
DI Counter (D1-D12)
Totalizer Alarm
Reset Total
Set Total
Scheduled Reset
Additional Settings for DI Counter
Units
Rate Units
Smoothing Factor
Name
Type

Image 5.

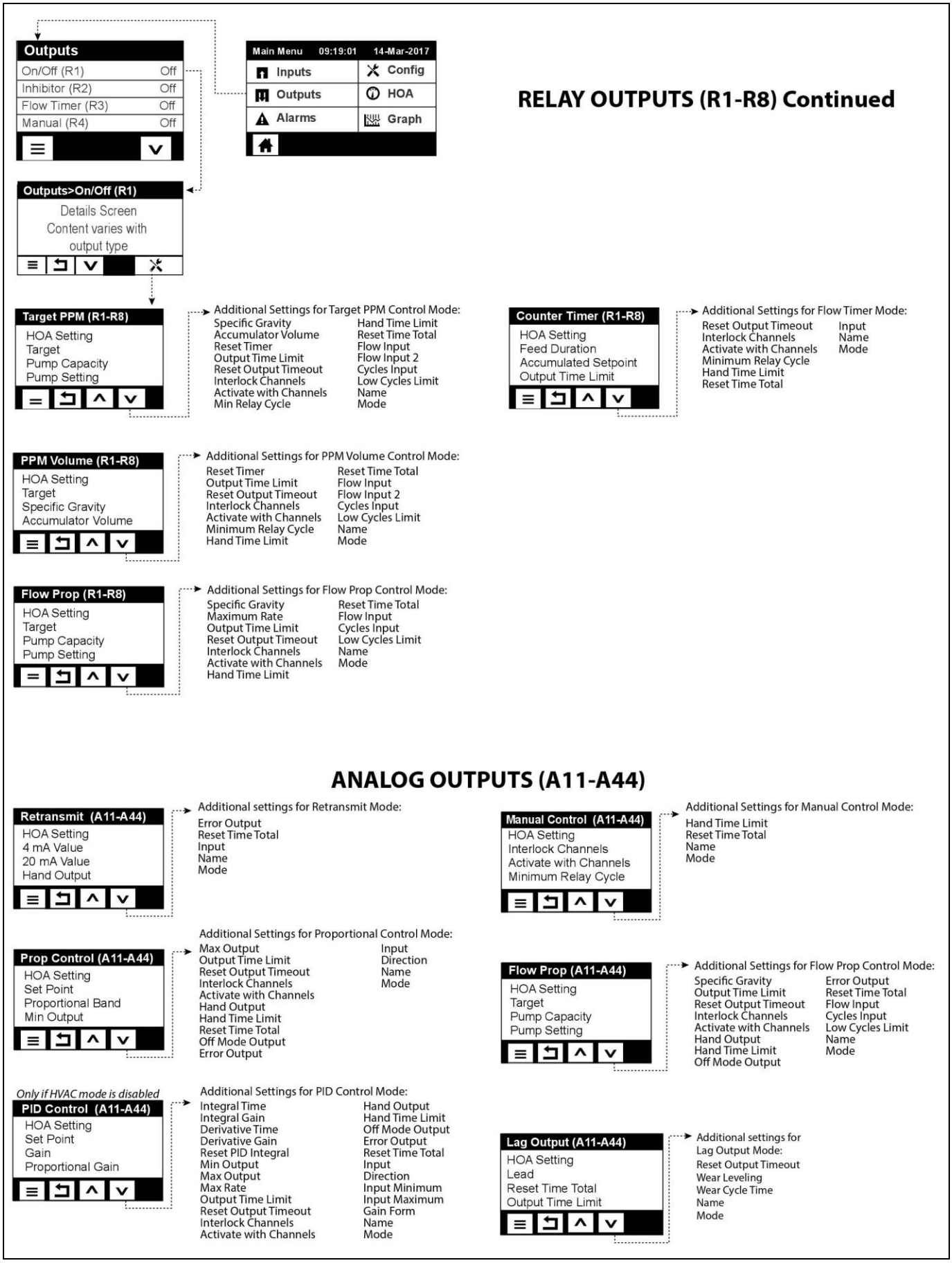
Outputs
On/Off (R1) Off
Inhibitor (R2) Off
Flow Timer (R3) Off
Manual (R4) Off
Main Menu 09:19:01 14-Mar-2017
Inputs
Config
Outputs
HOA
Alarms
Graph
RELAY OUTPUTS (R1-R8) Continued
Outputs>On/Off (R1)
Details Screen
Content varies with
output type
Target PPM (R1-R8)
HOA Setting
Target
Pump Capacity
Pump Setting
Additional Settings for Target PPM Control Mode:
Specific Gravity
Accumulator Volume
Reset Timer
Output Time Limit
Reset Output Timeout
Interlock Channels
Activate with Channels
Min Relay Cycle
Hand Time Limit
Reset Time Total
Flow Input
Flow Input 2
Cycles Input
Low Cycles Limit
Name
Mode
Counter Timer (R1-R8)
HOA Setting
Feed Duration
Accumulated Setpoint
Output Time Limit
Additional Settings for Flow Timer Mode:
Reset Output Timeout
Interlock Channels
Activate with Channels
Minimum Relay Cycle
Hand Time Limit
Reset Time Total
Input
Name
Mode
PPM Volume (R1-R8)
HOA Setting
Target
Specific Gravity
Accumulator Volume
Additional Settings for PPM Volume Control Mode:
Reset Timer
Output Time Limit
Reset Output Timeout
Interlock Channels
Activate with Channels
Minimum Relay Cycle
Hand Time Limit
Reset Time Total
Flow Input
Flow Input 2
Cycles Input
Low Cycles Limit
Name
Mode
Flow Prop (R1-R8)
HOA Setting
Target
Pump Capacity
Pump Setting
Additional Settings for Flow Prop Control Mode:
Specific Gravity
Maximum Rate
Output Time Limit
Reset Output Timeout
Interlock Channels
Activate with Channels
Hand Time Limit
Reset Time Total
Flow Input
Cycles Input
Low Cycles Limit
Name
Mode
ANALOG OUTPUTS (A11-A44)
Retransmit (A11-A44)
HOA Setting
4 mA Value
20 mA Value
Hand Output
Additional settings for Retransmit Mode:
Error Output
Reset Time Total
Input
Name
Mode
Manual Control (A11-A44)
HOA Setting
Interlock Channels
Activate with Channels
Minimum Relay Cycle
Additional Settings for Manual Control Mode:
Hand Time Limit
Reset Time Total
Name
Mode
Prop Control (A11-A44)
HOA Setting
Set Point
Proportional Band
Min Output
Additional Settings for Proportional Control Mode:
Max Output
Output Time Limit
Reset Output Timeout
Interlock Channels
Activate with Channels
Hand Output
Hand Time Limit
Reset Time Total
Off Mode Output
Error Output
Input
Direction
Name
Mode
Flow Prop (A11-A44)
HOA Setting
Target
Pump Capacity
Pump Setting
Additional Settings for Flow Prop Control Mode:
Specific Gravity
Output Time Limit
Reset Output Timeout
Interlock Channels
Activate with Channels
Hand Output
Hand Time Limit
Off Mode Output
Error Output
Reset Time Total
Flow Input
Cycles Input
Low Cycles Limit
Name
Mode
Only if HVAC mode is disabled
PID Control (A11-A44)
HOA Setting
Set Point
Gain
Proportional Gain
Additional Settings for PID Control Mode:
Integral Time
Integral Gain
Derivative Time
Derivative Gain
Reset PID Integral
Min Output
Max Output
Max Rate
Output Time Limit
Reset Output Timeout
Interlock Channels
Activate with Channels
Hand Output
Hand Time Limit
Off Mode Output
Error Output
Reset Time Total
Input
Direction
Input Minimum
Input Maximum
Gain Form
Name
Mode
Lag Output (A11-A44)
HOA Setting
Lead
Reset Time Total
Output Time Limit
Additional settings for
Lag Output Mode:
Reset Output Timeout
Wear Leveling
Wear Cycle Time
Name
Mode

Image 6.

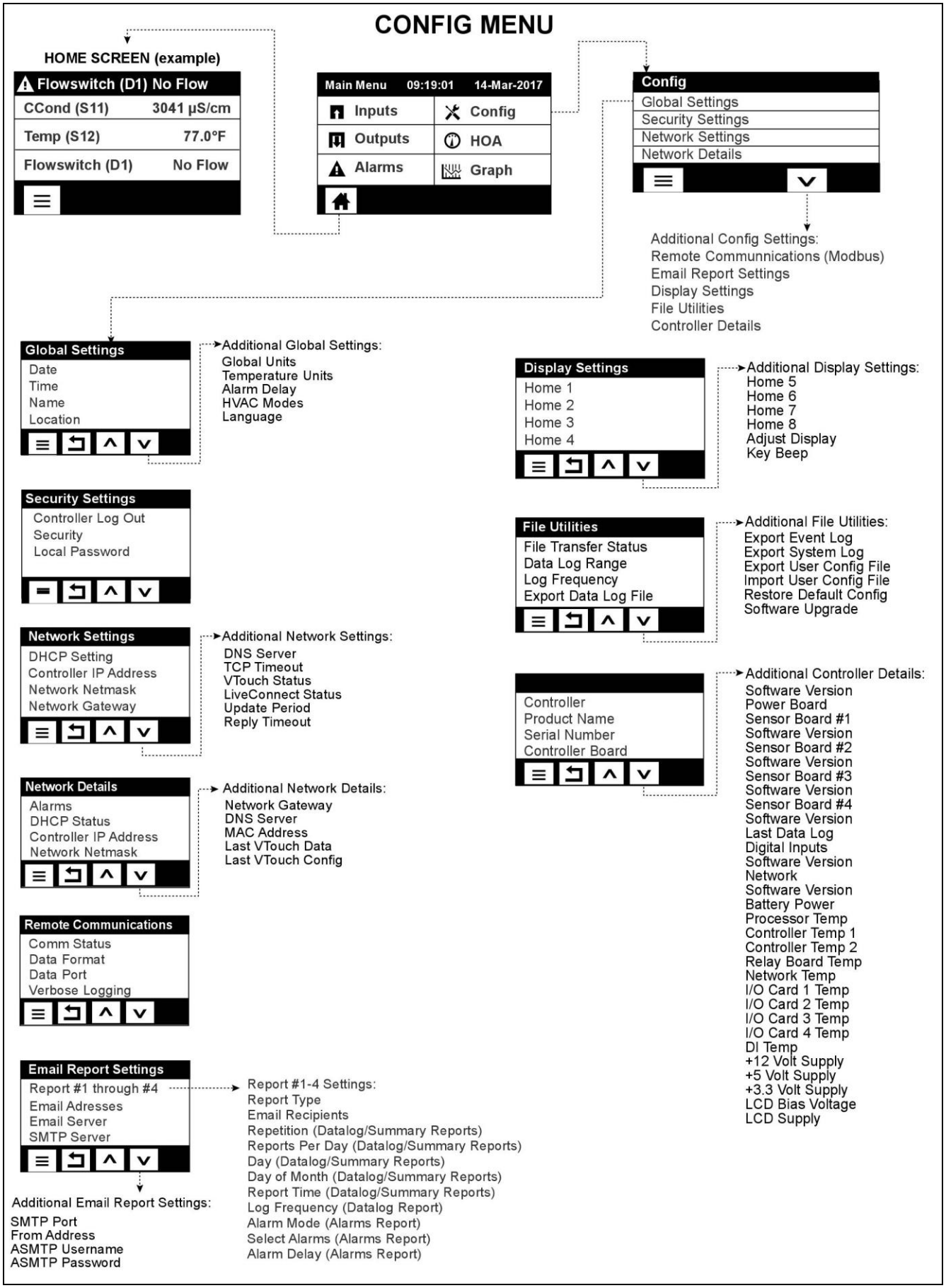
CONFIG MENU
HOME SCREEN (example)
Flowswitch (D1) No Flow
CCond (S11) 3041 µS/cm
Temp (S12) 77.0°F
Flowswitch (D1) No Flow
Main Menu 09:19:01 14-Mar-2017
Inputs
Config
Outputs
HOA
Alarms
Graph
Config
Global Settings
Security Settings
Network Settings
Network Details
Additional Config Settings:
Remote Communnications (Modbus)
Email Report Settings
Display Settings
File Utilities
Controller Details
Global Settings
Date
Time
Name
Location
Additional Global Settings:
Global Units
Temperature Units
Alarm Delay
HVAC Modes
Language
Display Settings
Home 1
Home 2
Home 3
Home 4
Additional Display Settings:
Home 5
Home 6
Home 7
Home 8
Adjust Display
Key Beep
Security Settings
Controller Log Out
Security
Local Password
File Utilities
File Transfer Status
Data Log Range
Log Frequency
Export Data Log File
Additional File Utilities:
Export Event Log
Export System Log
Export User Config File
Import User Config File
Restore Default Config
Software Upgrade
Network Settings
DHCP Setting
Controller IP Address
Network Netmask
Network Gateway
Additional Network Settings:
DNS Server
TCP Timeout
VTouch Status
LiveConnect Status
Update Period
Reply Timeout
Controller
Product Name
Serial Number
Controller Board
Additional Controller Details:
Software Version
Power Board
Sensor Board #1
Software Version
Sensor Board #2
Software Version
Sensor Board #3
Software Version
Sensor Board #4
Software Version
Last Data Log
Digital Inputs
Software Version
Network
Software Version
Battery Power
Processor Temp
Controller Temp 1
Controller Temp 2
Relay Board Temp
Network Temp
I/O Card 1 Temp
I/O Card 2 Temp
I/O Card 3 Temp
I/O Card 4 Temp
DI Temp
+12 Volt Supply
+5 Volt Supply
+3.3 Volt Supply
LCD Bias Voltage
LCD Supply
Network Details
Alarms
DHCP Status
Controller IP Address
Network Netmask
Additional Network Details:
Network Gateway
DNS Server
MAC Address
Last VTouch Data
Last VTouch Config
Remote Communications
Comm Status
Data Format
Data Port
Verbose Logging
Email Report Settings
Report #1 through #4
Email Adresses
Email Server
SMTP Server
Report #1-4 Settings:
Report Type
Email Recipients
Repetition (Datalog/Summary Reports)
Reports Per Day (Datalog/Summary Reports)
Day (Datalog/Summary Reports)
Day of Month (Datalog/Summary Reports)
Report Time (Datalog/Summary Reports)
Log Frequency (Datalog Report)
Alarm Mode (Alarms Report)
Select Alarms (Alarms Report)
Alarm Delay (Alarms Report)
Additional Email Report Settings:
SMTP Port
From Address
ASMTP Username
ASMTP Password

Image 7.

COMPUTER INTERFACE

Your IT person needs to set this up, it is very worth doing. See 'Connecting Your Controller' at the bottom of page 4 of this manual.

NORMAL OPERATION

For normal operations, the two best screens to refer to are the '**Home**' and '**Graphs**' pages. Both of these pages are accessed from the menu on the left side of the screen. The **Home** page is the start page when you first login to the system and it tells you just about everything you need to know. It will take some practice to interpret what you see; for instance; we commonly disable the chemical pumps by turning a relay on. This is an interlock, but having pumps turn off by turning a different relay on is a little confusing at first. See Image 2 below. Relays 2 & 4 are interlocked by R8. *(In this section, the pH limits are 6.5 to 9.0, your pH limits described above are probably different but the logic is the same.)*

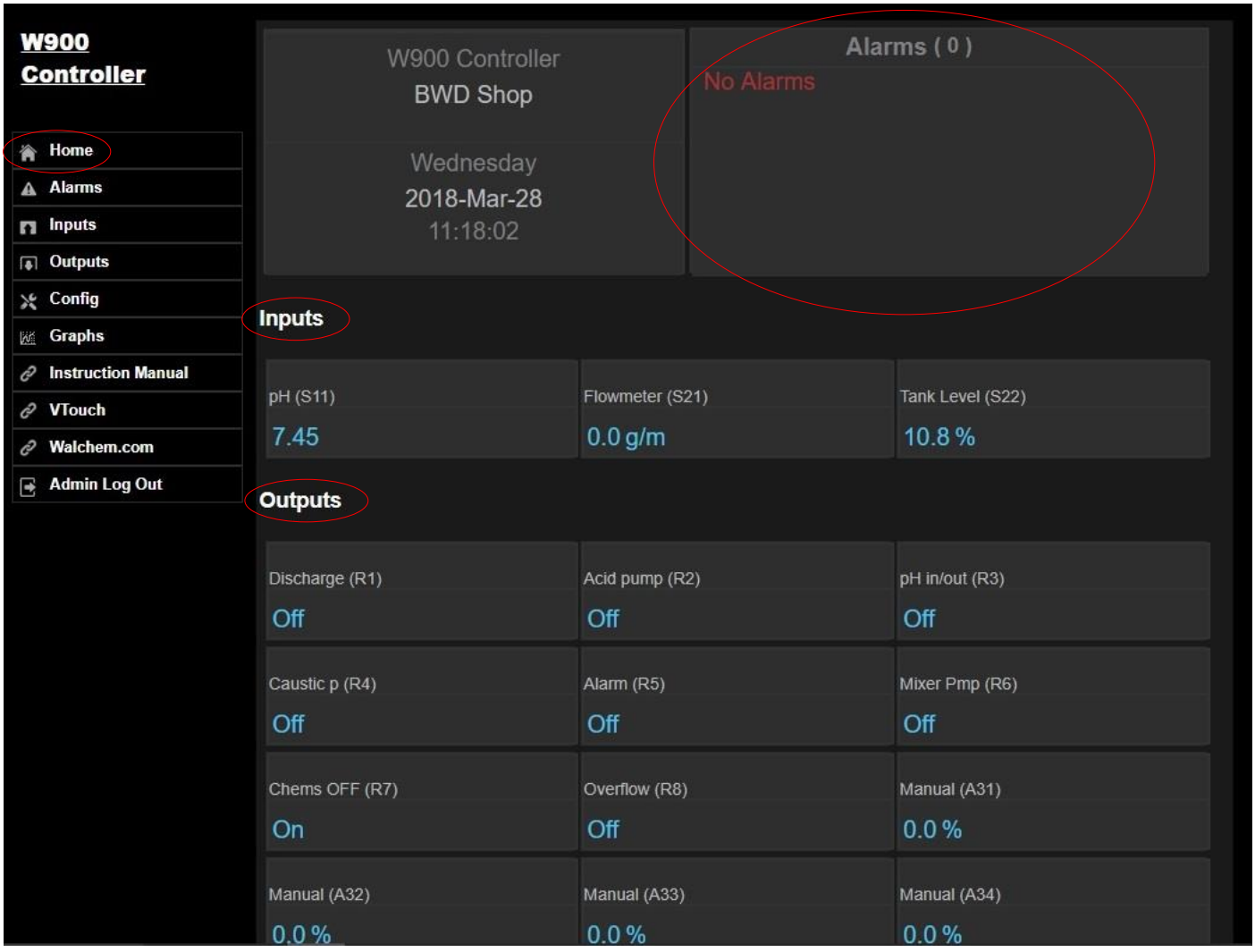

Image 8; the Home screen.

First thing to look at is the Input section, you can see tank level as % and flow in gpm. You can also see total flow in this section. Your screen will look very similar to this.

At the top with the red text is Alarm Status, and you can see in this case we have no alarms.

The Output section tells you what the relays are doing. In this case they're all Off except Relay 7.

On the left side of the screen you can see the menu. The second-best screen to look at after the Home screen is the **Graphs**:

Image 9; Graphs

These graphs are great. Hovering your cursor over the graph will show the date & time in the upper right corner of the graph. The graphs are set so the X-axes will always be at the same date and time on all graphs.

Scroll to the bottom of the screen, you can adjust the time span and what graphs are visible. Press the button to save any changes. Any changes only effect the graphs, nothing else:

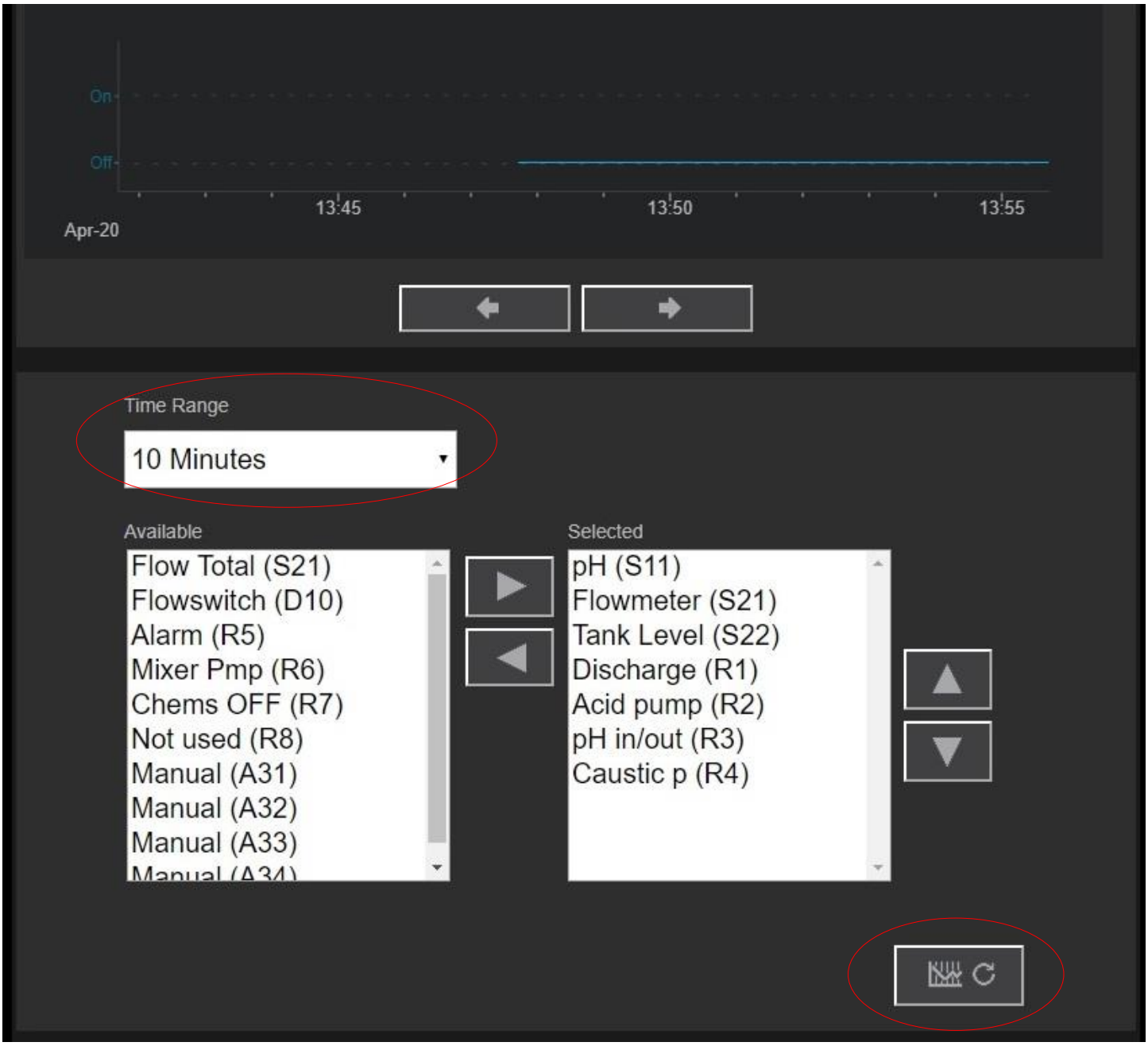

Image 10; Bottom of Graphs screen

These graphs give you the history of what's been going on with this system. They're based on the datalog, a snapshot of all key parameters usually once every 5 minutes. With practice, these graphs can tell you a lot. The most useful graphs are pH, flow (gpm), and tank level (%). You can pick and choose what shows up on the graph by selecting Available inputs from the menu and the left and moving them to the Selected menu on the right.

HIGH LEVEL AND OVERFLOW OPERATION

If the EQ tank level hits 70% full for any reason, the Walchem controller will email and text message staff listed on the Communications page one time. If you don't get these messages, the controller isn't set up correctly. See the *Connecting Your Controller* section above. The local alarm on the back panel will also activate, push the green button to silence this alarm.

If the EQ tank level reaches 90% full, most of these systems are set up so that a discharge pump (or valve) will turn on and pump down to 65% tank level, no matter what the pH is. If the pH comes in range during pump down it will continue pumping down to 10%. If the pH does not come in range, the pump will turn off at 65%. When the tank refills, it will alarm again at 70% and pump down again if it hits 90%. This is a pumped overflow feature, it's better than backing up the drains or flooding the parking lot. The water is recorded in the flow meter, and it's all data logged. Just be sure that you don't operate like this routinely.

The lift station also has a high level alarm, the alarm light/buzzer on the SJE Rhombus controller will activate. The silence switch for the Rhombus controller alarm is on the left side of the enclosure.

ALARMS

The only alarm that actually text messages and emails is the 70% full alarm in the EQ tank. There are other alarms that can be activated but nothing to be concerned about- or at least not significant enough to send out an alarm. We can always add alarms to the text/email list if desired.

Lift Station High Level

The SJE Rhombus alarm is triggered at the high level float in the lift station.

Reset / Silence

The EQ tank alarm has a nice big green silence button on front. After pressing it the red light will continue to flash but the beeper will stop. The beeper can be really loud, a simple piece of tape over a portion of the sounder will help regulate the volume.

The SJE Rhombus controller has flashing light and buzzer. There should be a silence switch on the left side of the enclosure, the light will continue until the high level condition goes away.

SAVING YOUR USER CONFIGURATION FILE (WCF)

At this time you cannot save or export the .wcf file (user configuration file) remotely, you can do this via the touch screen and a USB stick. This is supposed to change at the end of 2018. (This used to be an option, with a recent hardware update this function was removed.)

When it is available, on the menu on the left select Config/File Utilities and select Export User Configuration File. You will also be able to Import WCF files from here.

It's always a good idea to keep a copy of your WCF file around. If you or an employee mistakenly modifies the program and causes malfunctions, you don't need to troubleshoot to get it working correctly again, you can just import the most recent WCF. If the program is modified, it's good to export the WCF- and keep the old one around too. You can give these files custom names, or just rely on the date stamp to tell you which is most current.

COMMUNICATIONS

We can all use better communication! In the Config menu is a submenu called Email Report Settings, this page is where you will enter email addresses and cell phone numbers for the alarms and datalog.

To start with, first we need to enter email addresses in to the controller:

Start by clicking on Email Report Settings, then click on the # of Email addresses:

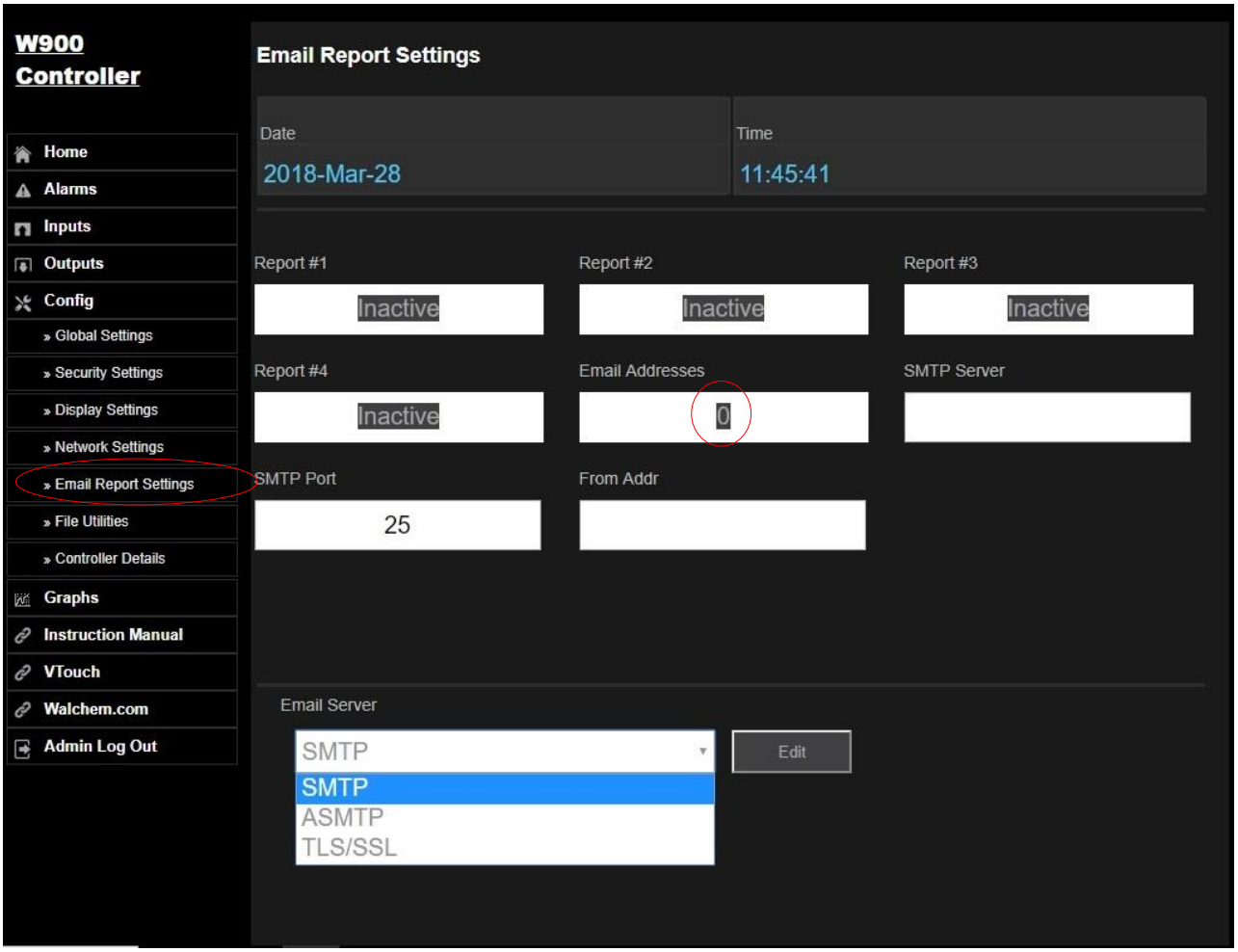

Image 11; Communications setup

Which will bring up this screen, now simply add as many emails as needed:

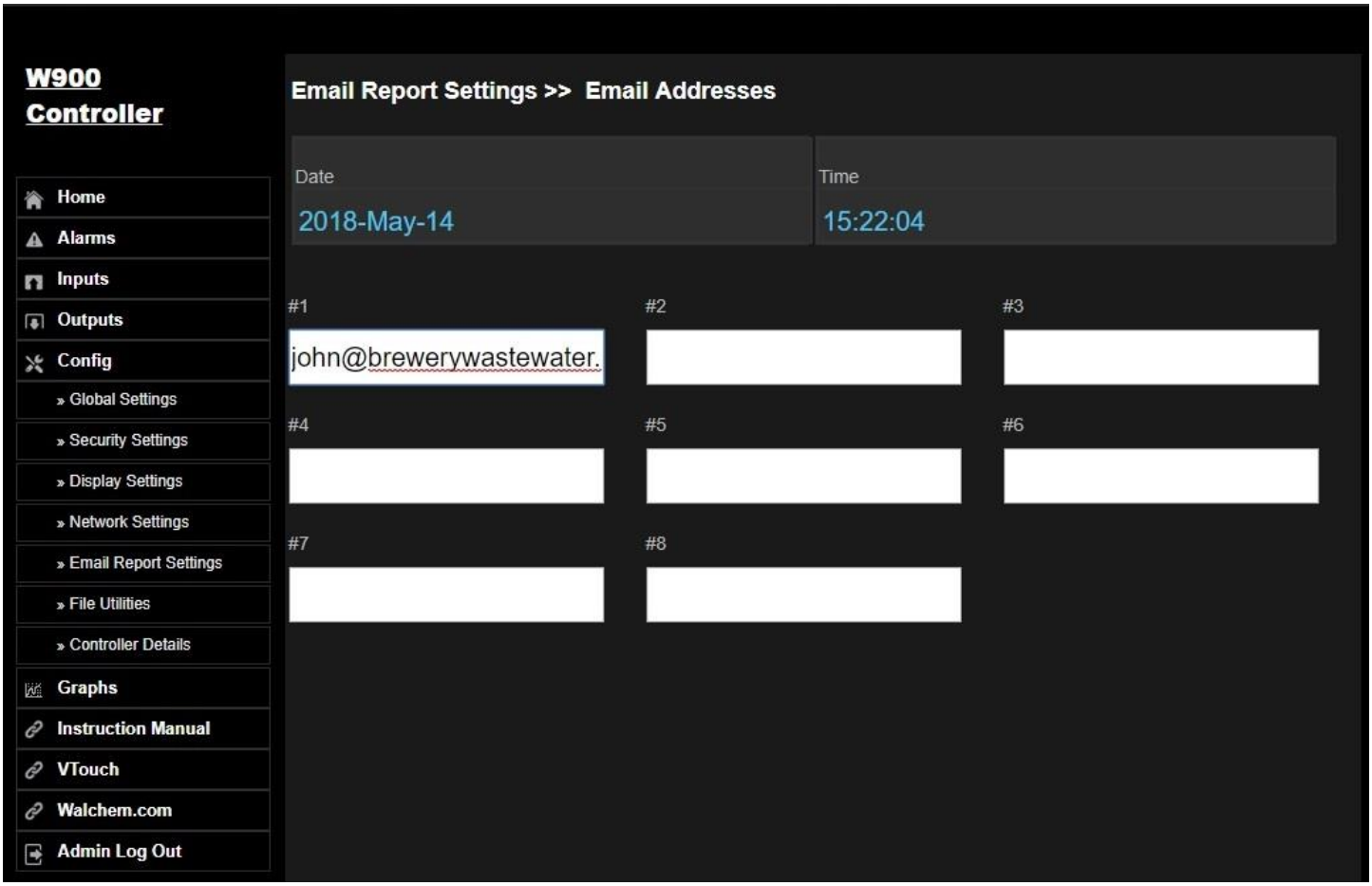

Image 12; Communication setup

For the cell phone numbers, it's actually an email that is converted to text message. Each cell service provider has a unique email address. Some examples:

Verizon = [insert 10-digit number]@vtext.com

AT&T = [insert 10-digit number]@att.text.net

Sprint = [insert 10-digit number]@messaging.sprintpcs.com

T-Mobile = [insert 10-digit number]@tmomail.net

US Cellular = [insert 10-digit number]@email.uscc.net

Make sure the cell phone numbers you enter include the information above. For instance, John uses AT&T as his cell carrier provided, so the email address to enter for text messages to work is:

5413504261@att.text.net

If your cell service provider isn't listed above, you can Google "How to send text messages via email (your carrier)".

Now that all email addresses and phone numbers are entered, go back to the main Email Report Settings menu. If you click on Report 1 (or 2,3,4) this screen comes up. Start by going to Report Type/Edit, and select either Datalog, Alarm, Summary, or Nothing.

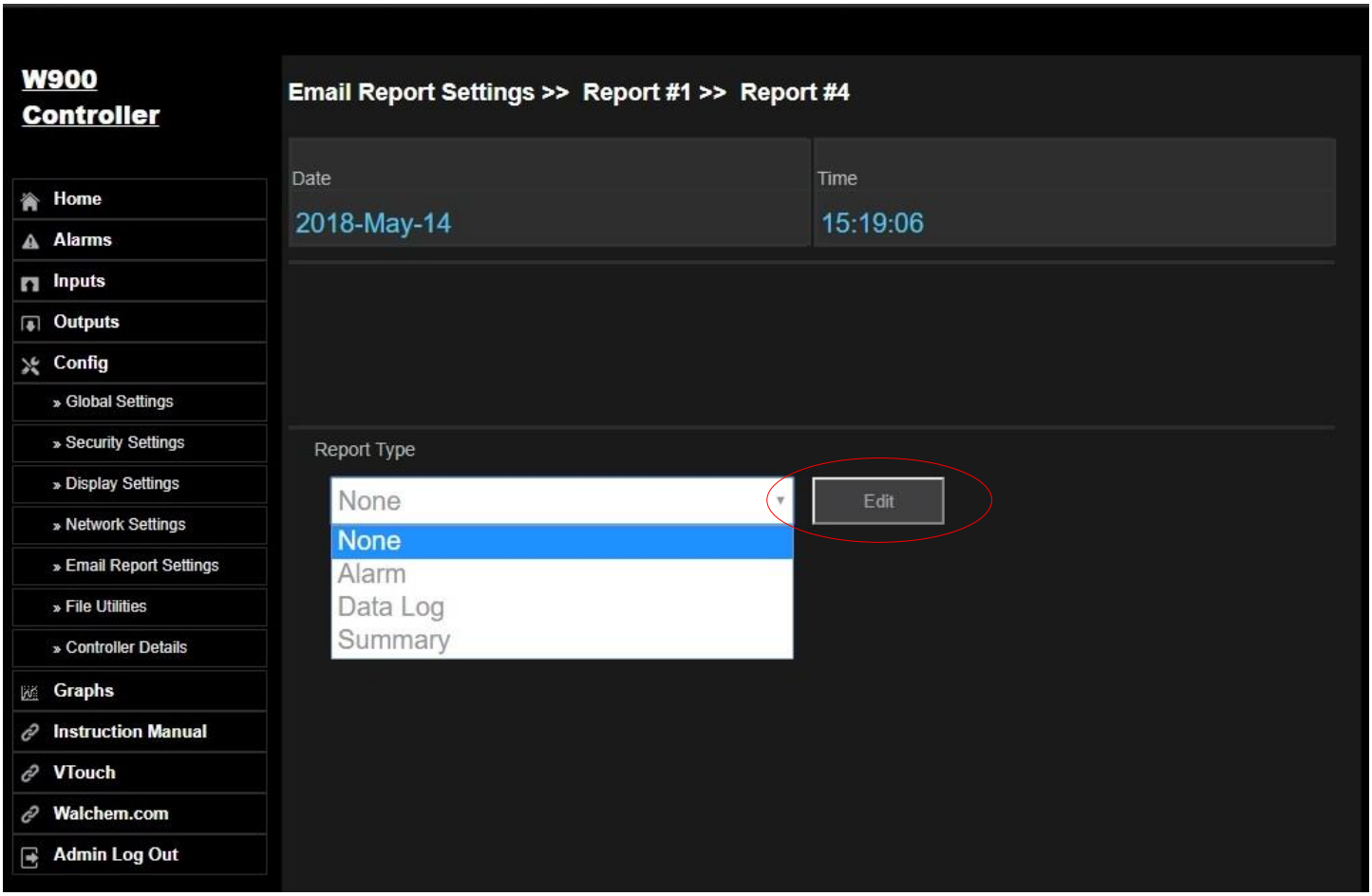

Image 13; Communication setup

The next screen allows you to set repetition (hourly, daily, weekly, monthly) and to select who gets the email, what the log frequency is (when a 'snapshot' of the data is collected), and when it gets sent.

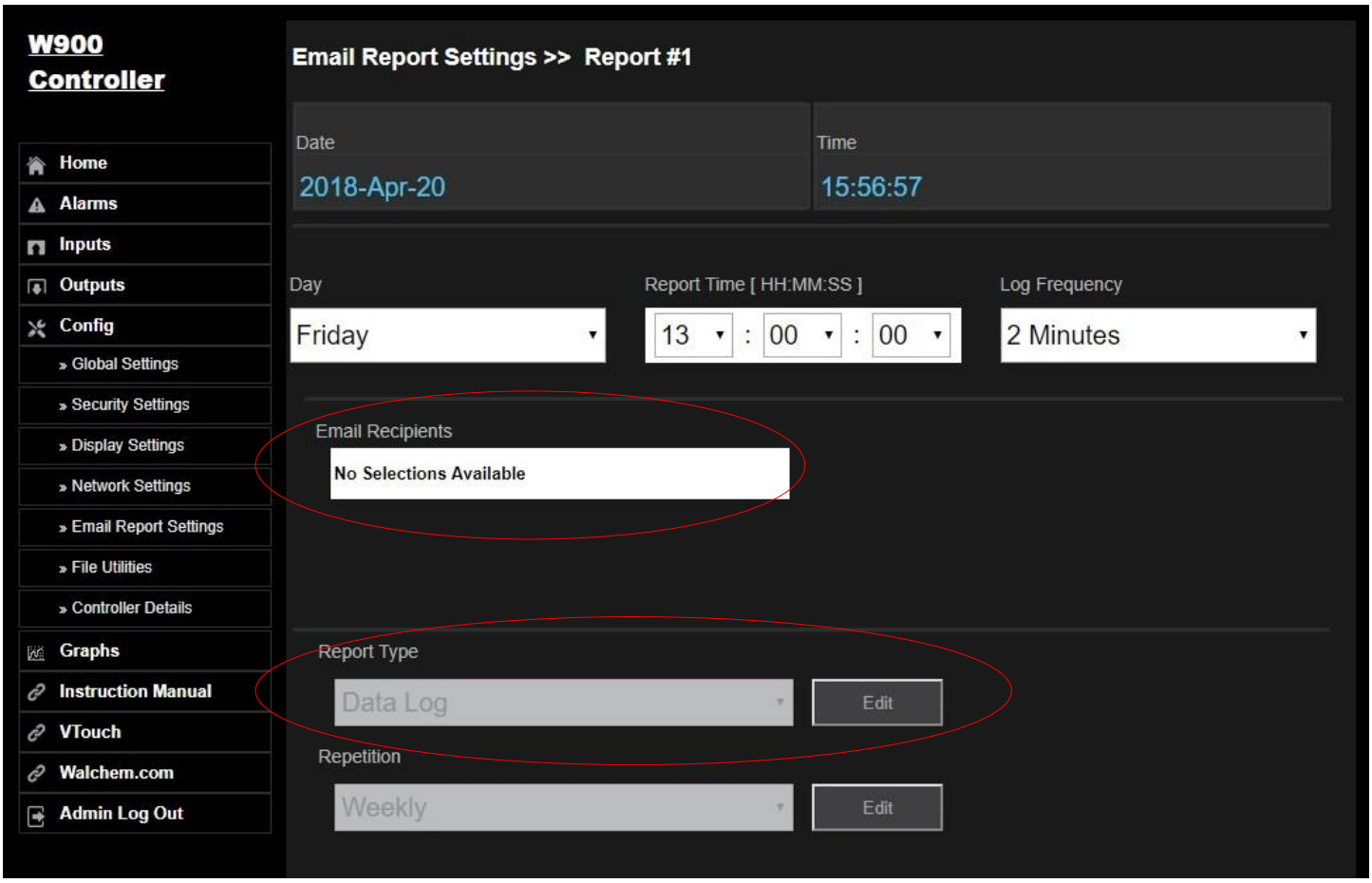

Image 14; Communication setup

Do this for each report 1-4, customizing each for you own needs. We can also do this remotely if needed.

HOA SWITCHES

An HOA switch is Hand-Off-Auto. Hand = Manual ON. Off = Manual OFF. Auto = Automatic mode. You guessed it, there are two locations for these switches, on the touchscreen and remote via computer.

From the touchscreen:

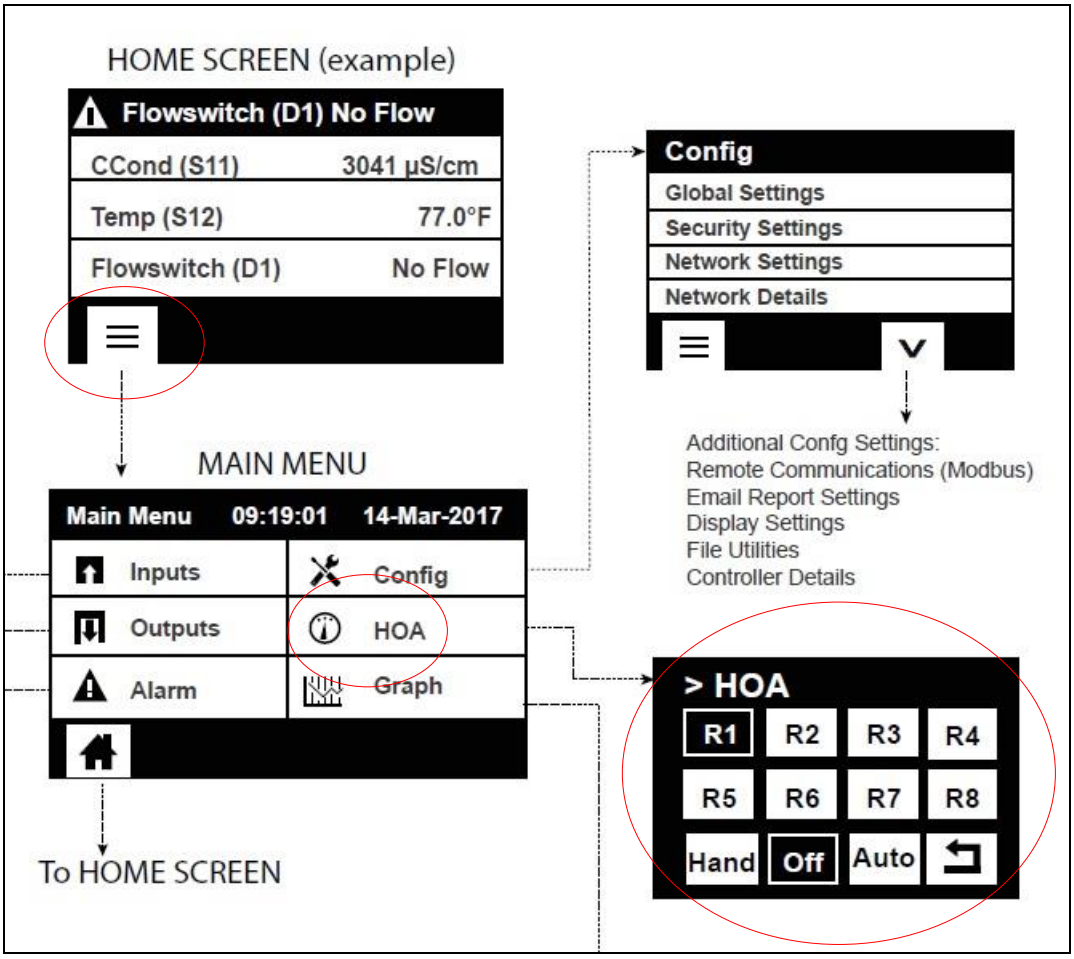

Image 15. HOA on touch screen

From the computer screen, example is Relay 1:

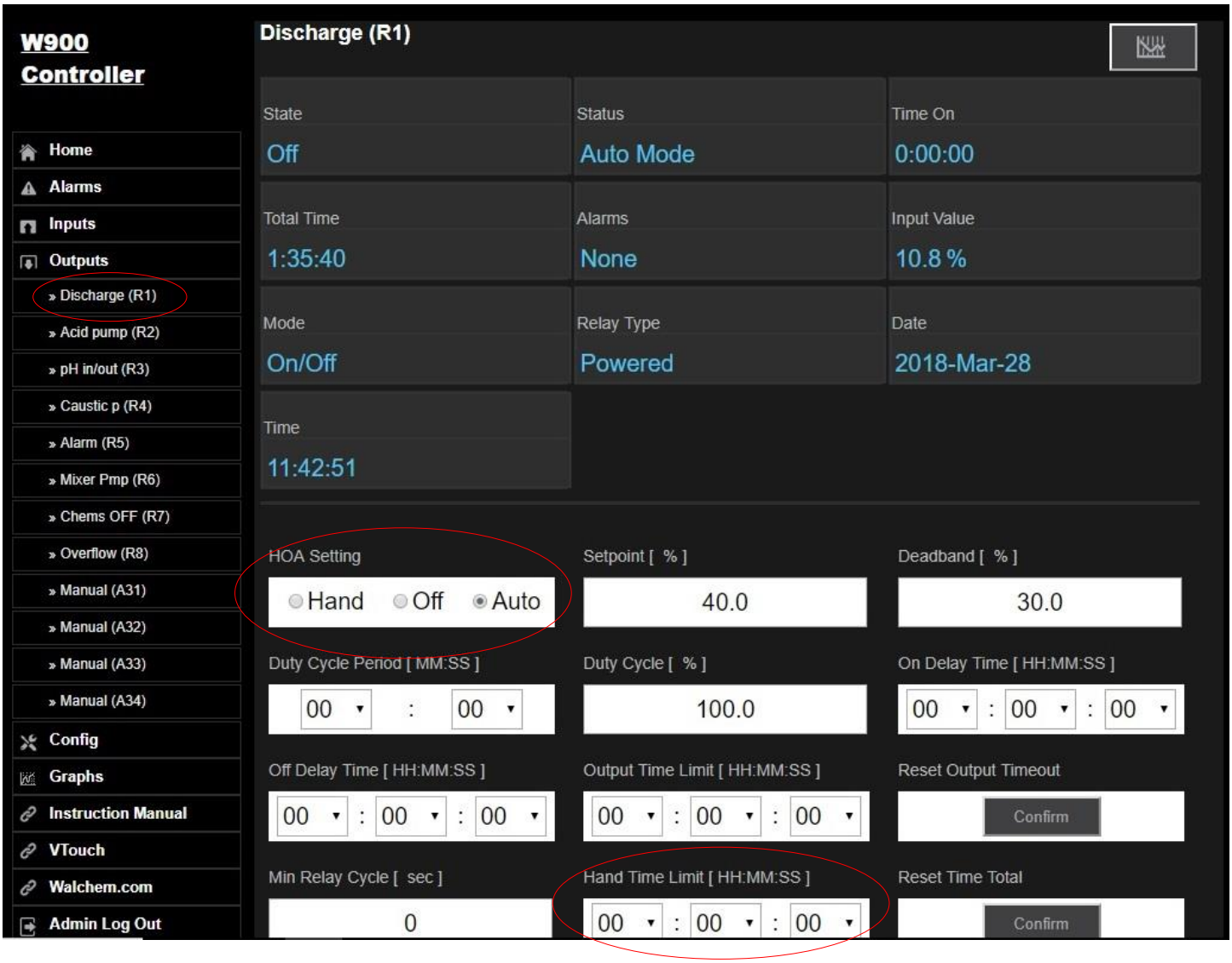

Image 16; HOA via computer

This is the relay that controls the automatic draw down feature from 40% to 10%. In the center left of the screen you can see HOA Setting with the HOA buttons. You can select the buttons to turn the pump ON, OFF, or Auto. Bottom center is a section for Hand Time Limit. Above it is set for 0, but it could be 5 or 10 minutes- or anything else you want. The idea is if you turn a relay to Hand (manual on), it will only stay there for the time limit duration- at the end of the time limit it will revert to AUTO. It's a good idea to have some sort of time limit, you can change it at any time.

While we're at it, notice the Permissive Interlock (PI) section. This is still looking at Relay 1, just lower down the screen:

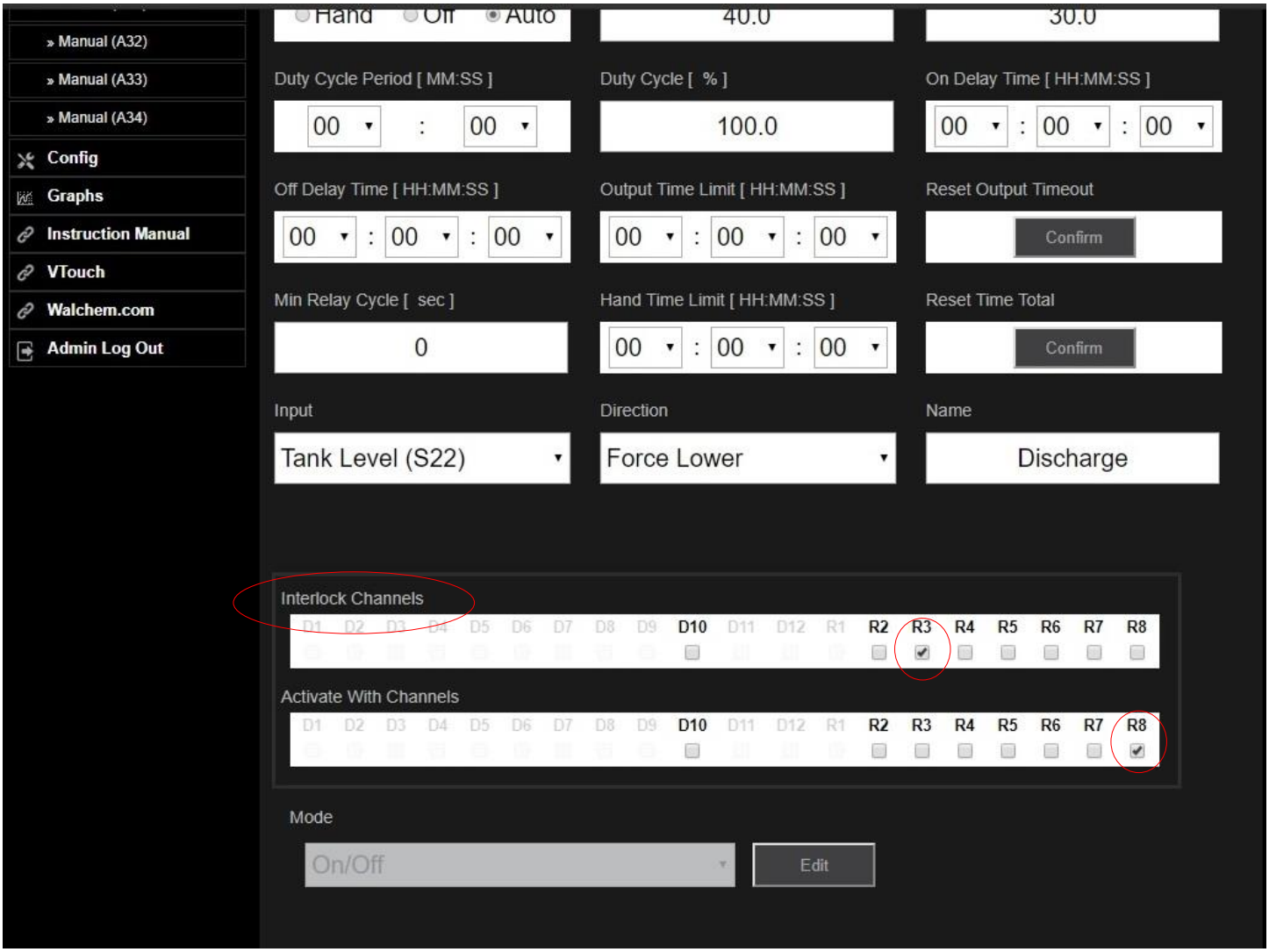

Image 17; Interlocks

In this case there is a PI with R3. Relay 3 happens to be where we set the pH setpoints of 6.6 to 8.9. If the pH goes out of range, R3 turns on. If R3 turns on, R1 cannot turn on due to the permissive interlock.

Related, below with PI section is another called ‘Activate with Channels’. We don’t use this much, but in this case if Relay 8 were to turn on, R1 would turn on as well. Programming— it's confusing but it works great.

It’s recommended not to play with the permissive interlocks, they can cause odd problems that are hard to identify. Of course, once you get used to the system it’s all yours. If you do screw it up, just upload the most recent copy of your WCF.

CHEMICALS & CHEMICAL DOSING PUMPS

Wear a face shield, safety glasses, and gloves!

You have two chemical drums and pumps for your pH adjustment system. Make sure they are adequately full, and when they are near empty make sure there is a full barrel nearby for an easy switch. Try to swap barrels before the little chemical pumps sucks air, priming those pumps can be tricky.

The caustic pump and tubing is designed to use 50% caustic, and the acid pump and tubing is designed for 95% sulfuric acid. Check compatibility if you are thinking of switching chemicals, especially on the acid side. The acid pump and tubing is made of PVDF, the caustic pump and tubing is make of polyethylene (PE).

You will likely use more caustic than acid for pH adjustment. As you grow you can switch out to a 300-gal tote for caustic instead of barrels, or a bulk tank.

Please read the manuals for these pumps, or at least look at the pictures. Here is one example of a handy picture from the manual:

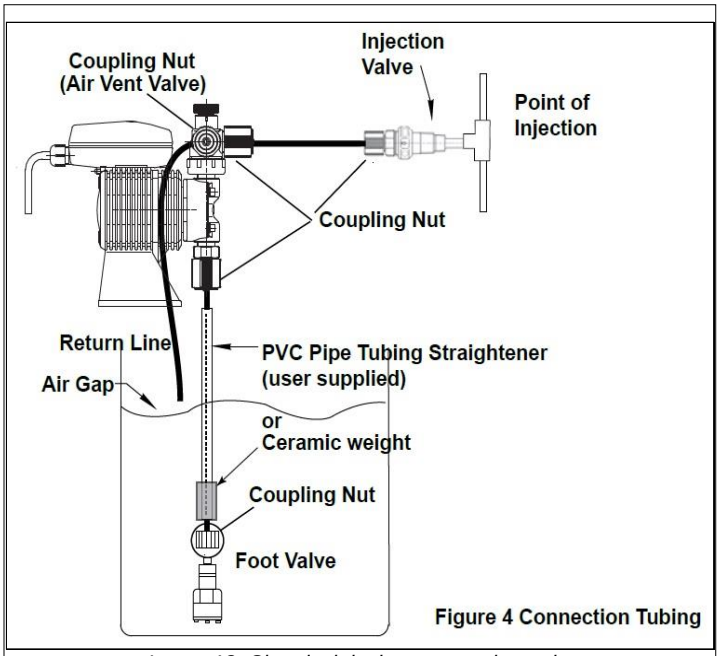

Image 18. Chemical dosing pump schematic.

CHEMICALS- CON'T

Here is another image that is very helpful:

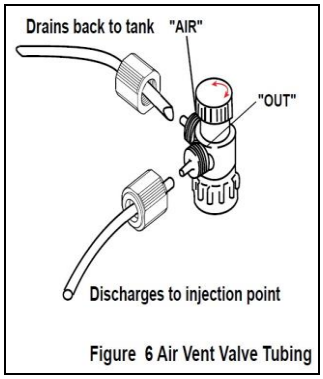

Image 19. Air vent schematic.

Now, go look at the manual. They did come with a manual, right?

Seriously, be careful with these pumps, more importantly the chemicals they are pumping. They are probably handing 50% caustic and 95% sulfuric acid. Wear safety glasses, gloves, and a face shield when working on these things. It can be done safely, just be smart and err of on the side of safety.

If you get caustic on your skin, wash in beer or spent yeast.

Maintenance

SCHEDULE

Weekly

- Check wastewater screen.
- Check pH, see Solids Removal below.
    - Here is a sample pH log sheet, and here is a blank.

Monthly

- Clean wastewater screen. Whatever you get out of there goes in the trash, do not put it in with your spent grain.
- Calibrate pH as needed.

Quarterly

- Inspect tanks for solids.

Annual

- Remove accumulated solids from tanks.
- Replace desiccant filter on pressure transducer.
- Consider replacing all floats annually as a preventive maintenance measure.

Bi-Annual

- Consider replacing the submersible pumps every 2 yrs. The pump itself should be in perfect condition, but the power cord will be swollen and will eventually leak. Preventive maintenance is cheaper than an emergency fix.

**Checking the barrel screen, pH, and chemical drums are hopefully the only routine work that you need to do to your wastewater system.

We recommend adding these items to your electronic calendar with the appropriate repeat function.

PH RECORD

Once per week, collect a grab sample of wastewater from the sample port.

a) Record on the paper log sheet (see here):
   - Date, time, meter reading pH, secondary pH check results (pH paper or handheld tester), action taken, and initials.

b) How do the results between the process pH meter and the secondary check compare? If they are within 0.2, that's pretty close. If they get beyond 0.2, calibrate your meter. Make a note that you calibrated on the log sheet. Retest the pH with a fresh sample and record results. Archive old log sheets, do not discard them. Eventually you will notice a trend. PH will drift, you calibrate, things are good. PH will drift again, you calibrate and results aren't as close as you'd like. PH will drift again, calibration fails, time to replace the electrode.

c) PH testing can be very fickle. The wastewater will leave your brewery in range, but it will begin changing again as soon as it starts heading down the sewer pipe.

d) PH electrodes generally last about 6 months, then they will need to be replaced. Worse, a pH electrode is like a battery. The longer it sits on the shelf, the more life it loses. I recommend ordering a new electrode 3-4 months after initial startup of your system, and every 6 months thereafter. Just add a reminder to your Outlook or online calendar. You can get them through Brewery Wastewater Design or on your own.

SOLIDS REMOVAL

Experience will tell you how often to do this. Every 3-12 months, hire a septic pumping truck to clean the accumulated solids from the bottom of your tank. Do it more often at first until you can establish whether 2 months or 6 months is appropriate. Make sure you or an employee are there for this cleaning, and have a water hose to hose everything down while he's there. It'll stink while this is going on, be a good neighbor and plan accordingly.

FUSES

The Walchem has two fuses, FH1 and FH2. It would be good to get some spares and keep them around, though I try to ship with spares as well. This is a specialized fuse and hard to find locally.

From the manual:

Fuse		P/N	
FH1	Protects relays	102834	5 x 20 mm 6.0 amp 250 V
FH2	Protects power input	102834	5 x 20 mm 6.0 amp 250 V

Discharge to Sewer

NORMAL OPERATION

As mentioned above, this system will automatically pump wastewater to sewer through the flow meter. All flow will be measured and recorded in the datalog.

THINGS YOU CAN DO TO KEEP THE CITY HAPPY

Like a lot of things, wastewater treatment plants don't like change. Like a fermenter, they are alive with their own ecology. Keeping the ecology balanced, happy, and high performing is the job of the wastewater treatment plant operator. The bureaucrats are there to set and enforce rules so the operators have a chance at their jobs. Ultimately the treated effluent from a wastewater treatment plant needs to comply with DEQ and EPA guidelines to protect the receiving body of water, whether that be a river, lake, ocean, or groundwater.

Cooperate with the city. You probably don't agree with everything they're telling you, but you need them; the success of your business relies on this cooperation.

COMPLY WITH YOUR DISCHARGE PERMIT

This whole system is designed to automatically comply with the local regulations. Keep it operating, keep it in compliance, and don't intentionally discharge out of compliance wastewater. Even if they don't catch you, you might screw things up at their end and they will start looking for the source.

SLUG LOADS

In the wastewater world, a slug is a 'plume' of abnormal wastewater heading towards the treatment plant. They're bad. If someone accidentally dumps a whole fermenter down the drain, this is a slug load. If something like this happens, be proactive and call the wastewater treatment plant and give them a heads up, you can deal with repercussions later. Depending on the scale of things, a slug load can kill and entire wastewater treatment plant- and they will be able to trace it to your brewery.

Here is a sample of what I posted at Deschutes Brewery (at the time 200,000 bbls/yr):

Call John Mercer, anytime 24/7 if there is:

a) An unplanned wort spill of 3 bbls or more

b) An unplanned chemical spill of more than 5 gallons of concentrate.

(An unplanned CIP tank dump does qualify for a phone call)

c) An unplanned beer spill of more than 3 bbls

d) A glycol spill greater than 5 gallons

Propylene glycol. Why is this on the list? You are probably using a 20% solution of this as the cooling liquid in your fermenters and brite tanks; all is fine and good until it spills. It is safe and non-toxic, but it has a BOD of about 500,000 mg/L (3x that of wort!). A small spill of propylene glycol can have a major impact at the wastewater plant. Again, when I was at Deschutes, all employees knew if 5 gallons or more of glycol went down the drain that they had to call me. They weren't in trouble, but I could direct that slug into a storage tank and dispose of it at leisure instead of as an emergency- and more importantly, keep the brewery running.

Schematic Drawings

See Appendix A.

Electrical Drawings and Specifications

See Appendix B.

Parts List, Submittals, and Spec Sheets

See Appendix C

Resources

Brewery Wastewater Design
John Mercer
john@brewerywastewater.com
541-350-4261
www.brewerywastewater.com

Walchem W900 Page

Walchem W900 Manual

Walchem Brochure

Walchem Email Support

Walchem LAN settings

Walchem Technical Support

BWD Walchem Setup Notes

Brewers Association Wastewater Manual

Chemical Dosing Pump Brochure

Chemical Dosing Pump Manual

pH Logsheet Blank

pH Logsheet Sample

SJE Rhombus
- 322 controller description
- 322 instructions

Tsurumi pump general information
- 80PU21.5 specs and curve
- TOK-2 slide rail dims
- TOK-2 slide rail operations manual

AMT pump

Flow meter information
- Seametrics WMP and AO55
  - WMP Specs
  - WMP Instructions
  - WMP Manual
  - WMP Quick Start
  - AO55 Specs
  - AO55 Instructions
  - AO55 Manual

Valve information
- Valworx ball valve

If you don't see your equipment above, let me know and I provide all the documentation you need.

BREWERY WASTEWATER DESIGN LIMITED WARRANTY:

For all components:

ALL PRODUCTS ARE PROVIDED TO BUYER BY BWD "AS IS," AND BWD DISCLAIMS ALL WARRANTIES OF ANY KIND RELATING TO THE PRODUCTS OR USE THEREOF, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT, TITLE, OR FITNESS FOR A PARTICULAR PURPOSE. The only warranties given to Buyer relating to the products, if any, are those provided by the manufacturers of such products, and Buyer acknowledges that any warranty claims arising out of the manufacturer warranties must be pursued directly against the manufacturer.

For customers who have purchased the custom preassembled control panel option:

Brewery Wastewater Design (hereinafter “BWD”) guarantees to you (hereinafter “Buyer”) this custom control panel is built, tested, and inspected to industry standards. The components that are used in the control system are guaranteed against defective workmanship for a period of one year from the date that the control panel leaves the factory (exception pH electrode). If a component within the control panel becomes defective within 12 months, BWD will replace the component free of charge plus shipping and handling.

Additionally, if there is an error during startup (when system is initially set up):

- If the error is due to the fault of BWD there will be no charge to remedy the situation.
- If the error is not due to the fault of BWD (whether Buyer or Buyer’s agents failing to follow all of the startup procedures in this Technical Manual or any other cause not due to the fault of BWD), Buyer can opt to have BWD help correct the error, however, Buyer must compensate BWD for all costs associated with correcting the error, including compensating BWD staff for any and all time spent fixing the errors. BWD’s technical assistance staff are billed at an hourly rate of $100 per hour for all technical assistance.

Limitations on Warranty:

BWD is not liable for damage to property, loss of profit, or injury to personnel resulting from defective components or workmanship. This warranty shall not apply to components that have failed due to: misapplication; over torque; operation exceeding the rated capacities; misuse; negligence; improper storage; improper handling and installation; contaminants; Acts of God or Nature; or any other cause that is not due to the fault of BWD. Failure to comply with the manufacturers specifications during installation or operations may result in component failure and voids this warranty. Further, this warranty only applies if Buyer complies with all of the set-up and installation procedures outlined in this Technical Manual. If Buyer fails to comply with the set-up and installation instructions in this Technical Manual, this warranty is void in its entirety.

Warranty satisfaction is available to Buyer only if BWD is promptly notified in writing within one week of Buyer discovering any errors in the system and BWD finds that the component is faulty and not due to alleged defect by workmanship, misuse, neglect, improper handling or installation, operation, maintenance, repair, adulteration or modification, unusual deterioration or degradation of the component, or any other cause that is not due to the fault of BWD.

This warranty will be limited to the option that allows BWD to replace any component that is found to be defective. In this event BWD will refund or replace the component with a new component and that new replacement will be warrantied for twelve (12) months from the date of shipment from the factory. If at any time a replacement component becomes faulty within this twelve (12) month period, BWD reserves the right to void that warranty and the replacement of the component falls directly onto Buyer. BWD is not responsible for any cost incurred to Buyer to replace or repair the defective part.