



User's Manual

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The Brown Central Source machine is designed to be used in junction with the Brown Synergy. The function of the Central Source is draw water, pretreat, or any other fluid from a large source tank (typically 55 gallon fluid tanks), and distribute it at pressure to multiple pretreater machines. The Central Source will also report to an operator the state of the system (including line pressures, tank volumes, voltage levels, and system errors) via an intuitive user interface. This interface also offers the user the option of full manual control of all actuators in the system.

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Glossary of Terms

Hardware



Input Tubing: .The tubing used to transport fluid from fluid source tanks to the Central Source. The Central Source System is shipped with 3 15ft rolls, already connected to the fill system.



Output Tubing: The tubing used to transport fluid at pressure from the Central Source to the Synergy. The Central Source System is shipped with 3 100ft rolls.



Dip Tube: The tubes used to pull fluid from the bottom of tanks. Comes in 36in and 18in varieties, for pulling from source tanks and the 5gal tanks, respectively.



Fill Cabinet: The cabinet housing the fill system, including filters and pumps.



Spray Cabinet: The cabinet housing the spray system, including filters, pumps, accumulator tanks, bleed valves, regulators, and pressure transducer sensors.



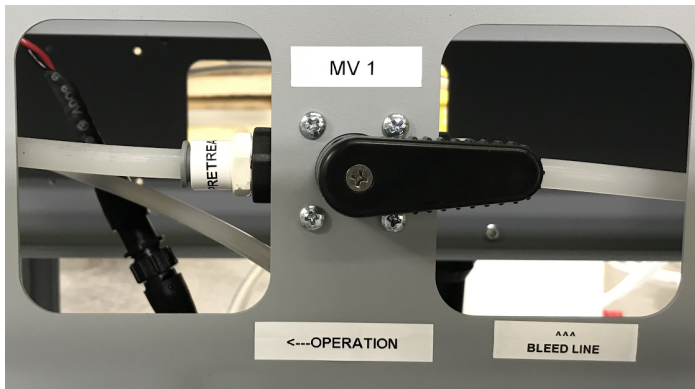
Fluid Cabinet: The cabinet housing the fluid storage system, including 5gal tanks, scales, and hall effect sensors.



55gal/Source Tank: The large tank that acts as the source of the fluid. Typically a 55gal drum, but any conveniently sized tank will work. Not shipped with Central Source System.



5gal Tank: The tanks stored within the Fluid Cabinet on the scales. Holds the volume of fluid being measured by the system.



Bleed Valve: The valve used to change a line between bleed and operation modes. Located on the crossbeam in the spray cabinet.



Power Switch: The switch used to control power to the system. Also used as an emergency stop device.



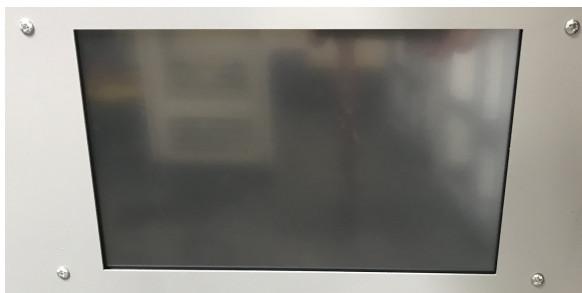
On Button: The button that turns the machine on. The LED inside this button will light up if the machine is receiving power, but the machine will not turn on until it is pressed.



Stacklight: The array of lights that alert the user to any errors detected by the system. A red light means the line is currently throwing an error. Each horizontal row of lights corresponds to a single fluid line, so that it may be viewed from any side. The top row depicts errors with Line 1, the middle row Line 2, and the bottom row Line 3.



Computer: The computer responsible for running the Central Source Software. The computer does not control the machine's operation, only the display of the software, and communication of preferences. This means that if the computer is shut down at anytime, the machine will continue to operate with its current settings.

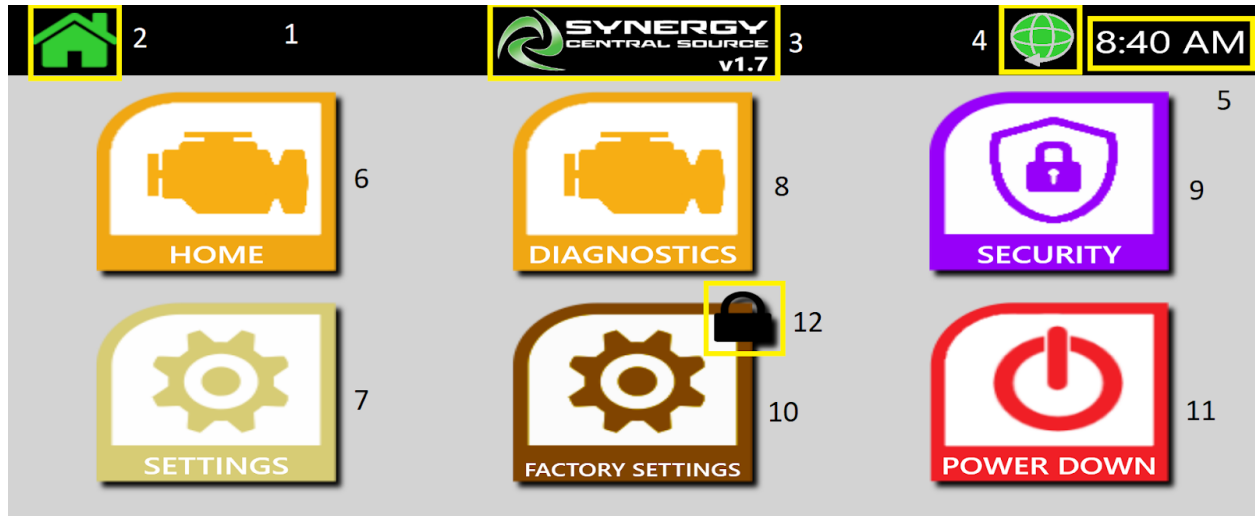


Touchscreen: The hardware responsible for showing the display of the computer, as well as allowing the user to input commands to the computer. On-screen keyboards automatically appear when each control is interacted with within the software, so an external keyboard is not usually necessary.

Software

Navigation:

The Navigation screen provides the user with basic information, as well as buttons to access any screen in the software.



1. Home Bar

The black bar running horizontally across the top of the screen. It is visible from any screen within the software.

2. Home Button

The green house icon in the upper left of the screen. If this button is pressed in any other screen, it will return to the Navigation screen. If this button is pressed in the Navigation screen, it will go to the Home screen.

3. Title Box

Contains the name as the software, as well as the software version. When an update is received, the software version will change.

4. Network Icon

Displays the current network status. If the icon is red, there is no network detected. If the icon is yellow, the machine is connected to a network, but does not have an internet connection. If the icon is green, the machine is connected to a network with internet access.

5. Time

The computer's time is displayed here.

6. Home Tab

Navigates to the Home screen. (see Home Screen)

7. Settings Tab

Navigates to the Settings screen. (see Settings Screen)

8. Diagnostics Tab

Navigates to the Diagnostics screen. (see Diagnostics Screen)

9. Security Tab

Navigates to the Security screen. (see Security Screen)

10. Factory Settings Tab

Navigates to the Factory Settings screen. These settings should not need to be calibrated after machine is shipped.

11. Power Down Button

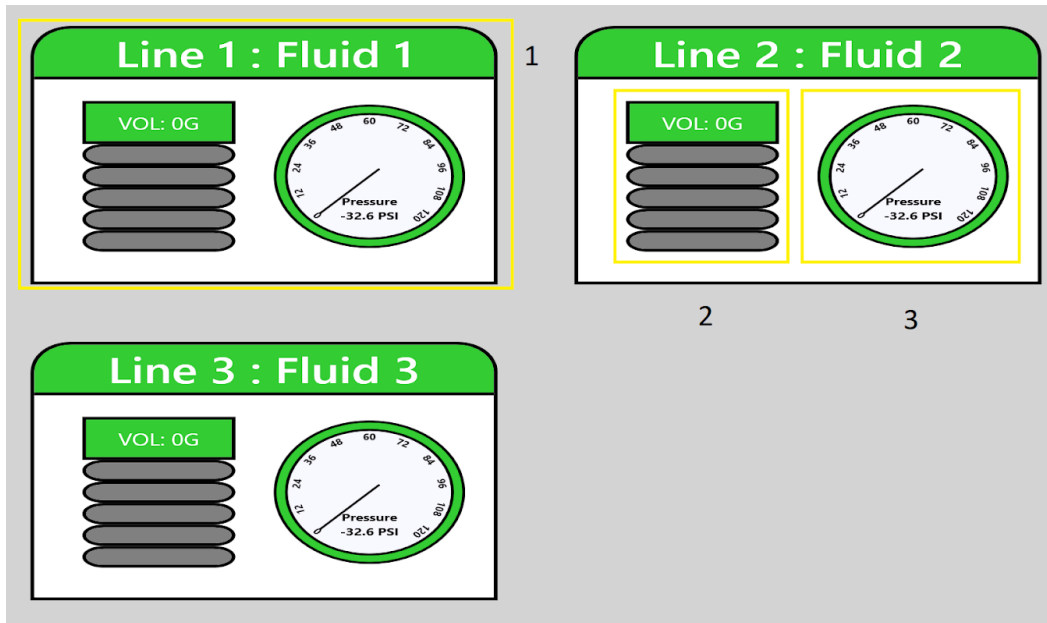
Powers down the machine. (see Power Down)

12. Locked Icon

If this icon appears on a tab, it means that access to that screen is restricted by the security settings. These settings can be configured in the Security screen.

Home Screen:

The Home Screen provides the user with basic information about the system. It is updated in real time, and is the primary interface for regular operation of the machine.



1. Fluid Window

Each of these windows corresponds to each of the three fluid lines in the system. The name of the line can be seen at the top of the window. This name can be changed in the settings screen.

2. Tank Level Icon

Depicts the current fluid level in the 5 gallon tank. The number of bars that turn green/blue correspond to the number of gallons of fluid in the tank. The numerical value is also shown at the top of the icon. The default color is green. When the icon turns blue, it means that the system detected low fluid volume and has started a refill cycle. This means the tank is currently refilling, drawing fluid from the fluid source.

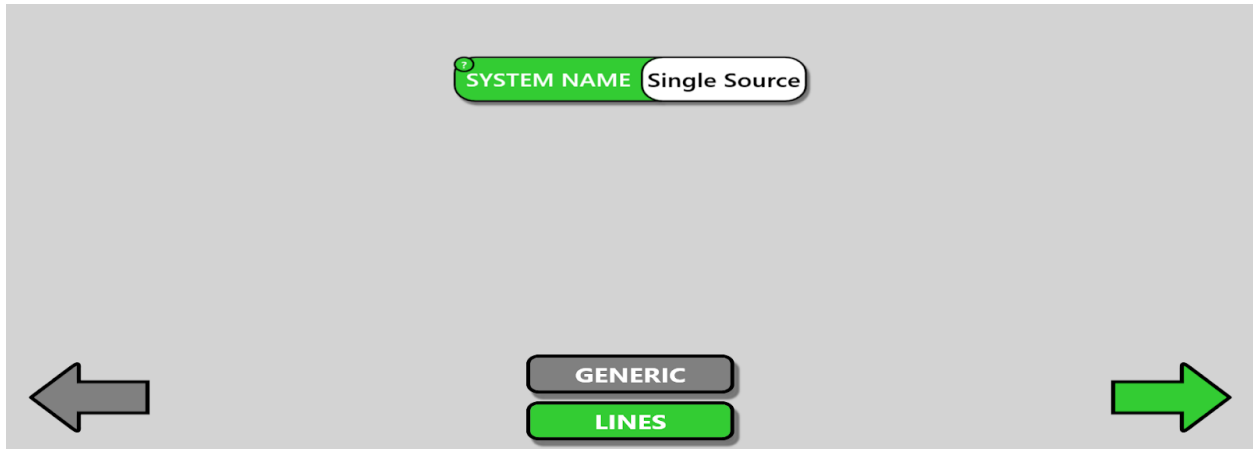
3. Pressure Icon

Depicts the fluid pressure in the line. Both the needle and the numerical value at the bottom show the pressure in PSI. The default color is green. When the icon turns blue, it means that the system detected low pressure, and is repressurising by running the spray pump.

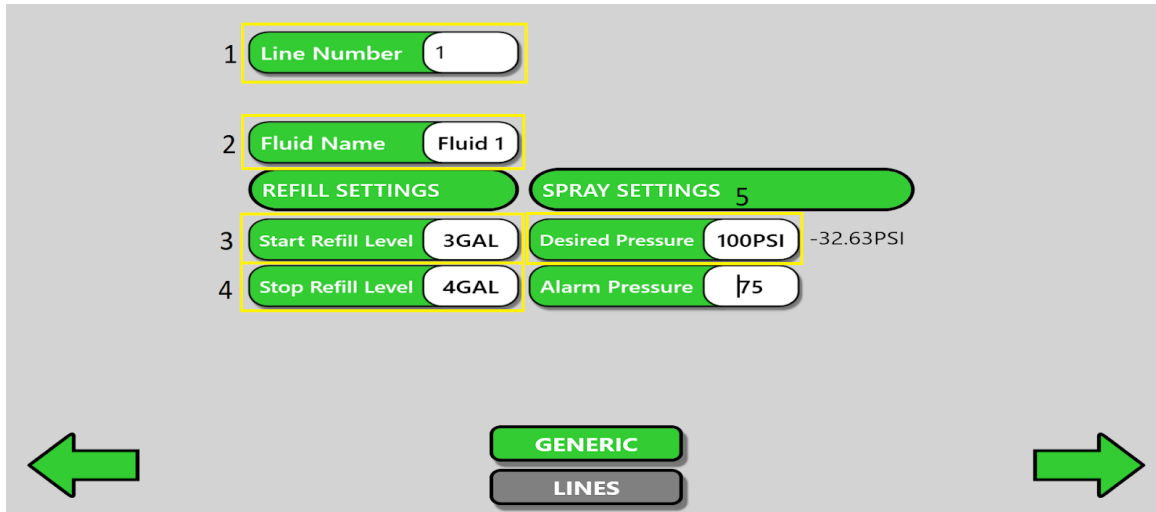
Settings Screen:

The Settings screen is where the user can edit all settings related to regular system operation. It is separated into two tabs: Generic Settings, and Line Settings.

Generic Settings: The generic tab within the settings screen has settings related to the system as a whole. It currently only includes the system name. This name appears in error messages and system logs.



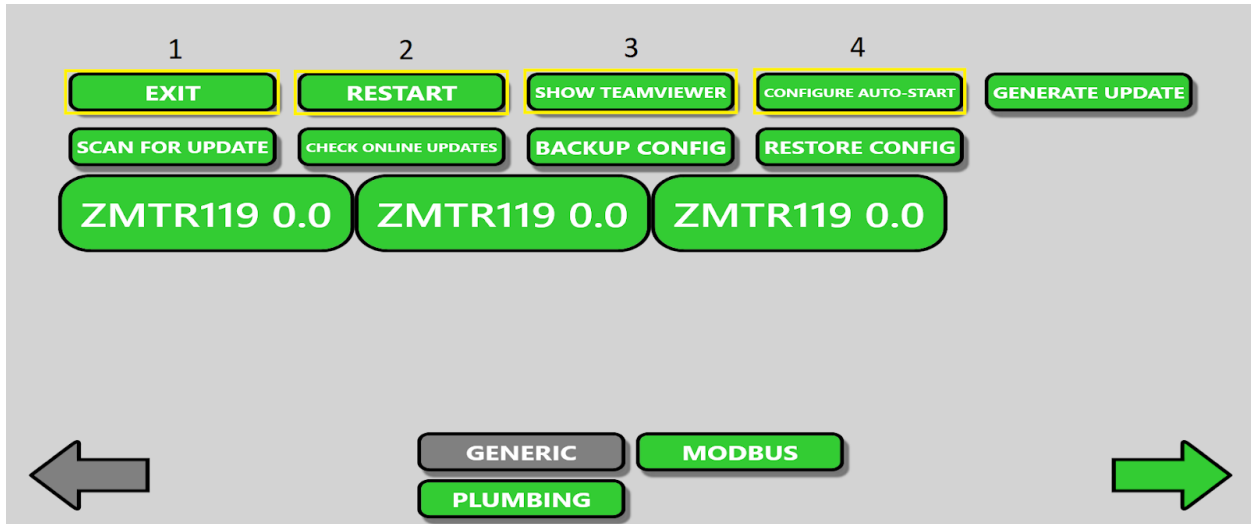
Line Settings: The line settings tab includes settings for each fluid line individually.



1. Line Number
Allows the user to choose which fluid line's settings are being displayed and edited.
2. Fluid Name
Allows the user to edit the name of the fluid line.
3. Start Refill Level
The volume at which the system will start a refill cycle. When the volume in the 5 gallon tank gets below this level, the system will turn on the fill pump.
4. Stop Refill Level
The volume at which the system will stop a refill cycle. When the volume in the 5 gallon tank gets above this level, the system will turn off the fill pump.
5. Desired Pressure
The pressure that the system will automatically maintain in the line. If the line pressure drops below this value, the system will activate the spray pump to repressurise.

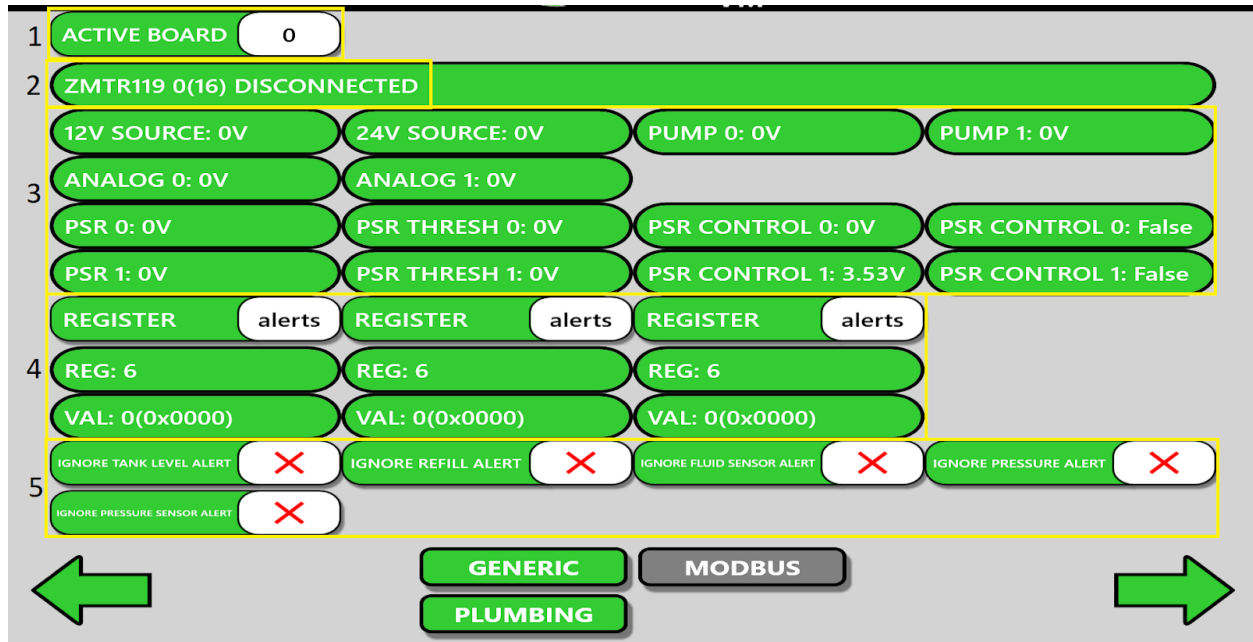
Diagnostics Screen: The Diagnostics screen has many functions valuable for detailed observation and control of the system. It has three tabs: Generic, Modbus, and Plumbing.

Generic Diagnostics: Gives the user many options related to the software as a whole.



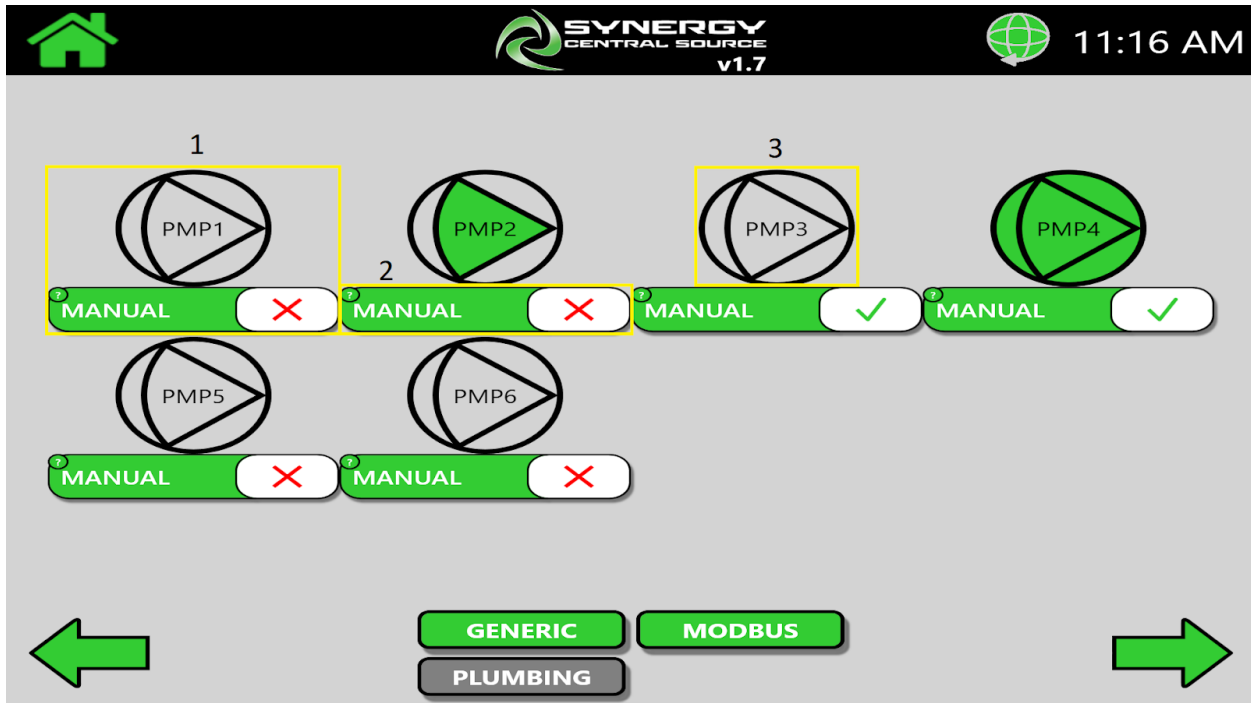
1. Exit
Exits the software, without shutting down the machine. Allows access to computer desktop.
2. Restart
Restarts the Central Source Software.
3. Show Teamviewer
Opens a TeamViewer window. This allows a Brown Technician remote access to the Central Source machine.
4. Configure Auto-Start
Configures the software to automatically start on system boot.

Modbus Diagnostics: Shows details about the board readings, as well as allows the user to disable error catching.



1. Active Board
Shows which board's information is being displayed
2. Board Information
Shows board ID as well as if the board is connected or disconnected.
3. Board Values
Shows all kinds of information reported by the board, primarily voltage values supplied to actuators, or received by sensors.
4. Register Information
Shows ID and value of three selectable registers.
5. Alert Ignores
Lists the five different alerts reported by the board, as well as a checkbox next to each one. If this box is checked, the board will ignore the error, and not throw an alert. This will also prevent the board from deactivating actuators in certain failure cases. Because of this, it is not advised to ignore errors unless suggested by a Brown technician.

Plumbing Diagnostics: Shows a detailed display of the status of the pumps, as well as allows the user to manually control pumps.



1. Pump Displays

Shows an icon corresponding to each of the 6 pumps in the system.

Pump 1: Fill pump for Line 1

Pump 2: Spray pump for Line 1

Pump 3: Fill pump for Line 2

Pump 4: Spray pump for Line 2

Pump 5: Fill pump for Line 3

Pump 6: Spray pump for Line 3

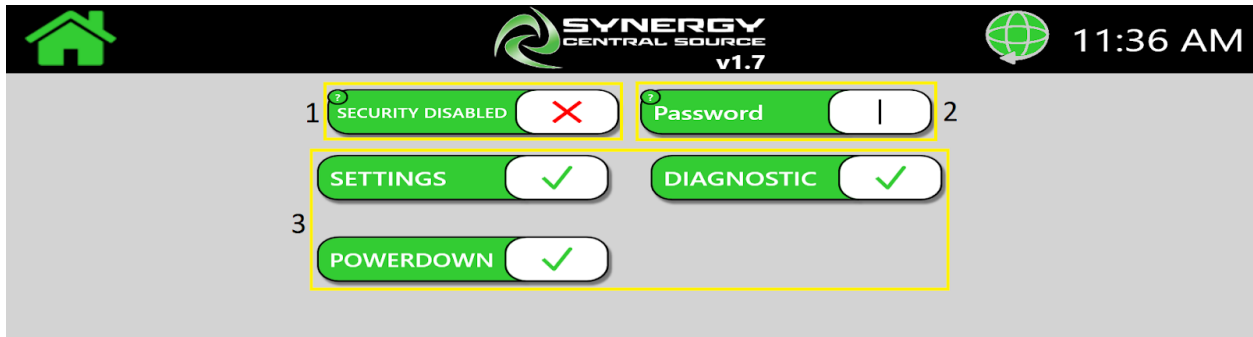
2. Manual Control

Determines whether or not the pump is in manual control mode. If the box has a check, the pump is in manual control mode. If the box has an X, the pump is in automatic control mode. When in manual control, the pump is entirely controlled by user input. This means the user can turn it on and off, regardless of warnings or errors from the system. When using manual control mode, extra care should be taken so that pumps are not run dry, tanks are not overflowed, or lines are not over pressured.

3. Pump Display

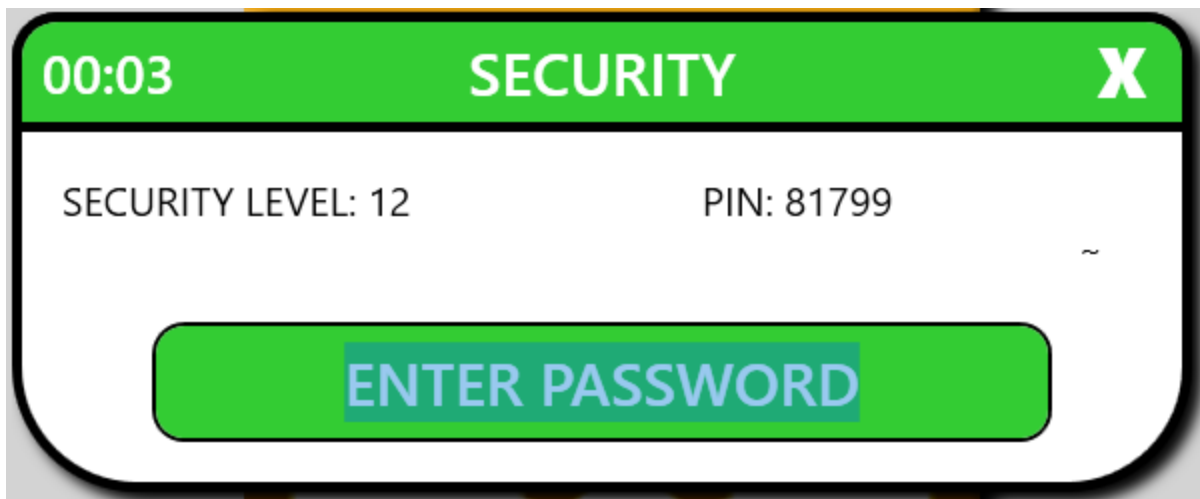
Shows the state of the pump. If the internal triangle inside the icon is green, it means that the pump is being actuated, and should be on. The outer circle of the icon depicts whether the pump is being manually actuated or not. In the figure above, pumps 1 and 2 are in automatic control mode, while pumps 3 and 4 are in manual control mode.

Security Screen: The Security screen allows the user to restrict access to other screens via password protection.



1. Security Disabled
Starts a 1-hour countdown during which all security restrictions are disabled.
2. Password
Holds the value of the current password. If the text block is not blank, all screens under the security protection (including the security screen itself) will require the password to access.
3. Tab Security Toggles
Determines whether or not the associated screen is under security protection. If the box is checked, the password will be needed to access the screen from the Navigation screen. The Factory Settings screen is always password protected.

Password Window:



The password window will appear anytime the user tries to navigate to a screen that is protected by the security system. The screen can be accessed by either typing the configured password into the text box, or by contacting a Brown technician and supplying them with the security level and PIN.

Power Down: Pressing this button will prompt the user for confirmation. Once confirmed, it will shut down the system over a short period of time.

First-Time Setup

Machine Locations

When deciding where to place the Central Source or related parts of the system, keep in mind the interactions between them. The 55 gallon source tanks will need to be conveniently accessible by machinery that can replace them. The Central Source will need to draw from these tanks, and distribute the fluid to the pretreaters. The Central Source is shipped with 15 ft of input tubing, as well as 100 ft of output tubing for each line. This means that the Central Source will have to be much closer to the source tanks than the pretreaters. The pressurised fluid lines from the Central Source to the pretreaters is capable of being much longer than 100 ft, enabling it to be run long distances, even through warehouse rafters. If more tubing is needed, the output tubing can be replaced by any tubing with an outer diameter of 3/8in, and a max pressure of at least 200PSI.

Input/Output Tubing



The input tubing for the Central Source is located inside the lower cabinet of the machine, connected to the fill system. The output tubing is shipped inside of the fluid cabinet, in 100 ft rolls.

The input tubing must go through the holes in the side of the machine labeled 'Fluid Source to Fill System', with each line going through the correct hole.



The end of these lines must then be pushed onto the hose barb connectors on the 36" diptubes, with a metal hose clamp to keep it secure. These dip tubes must then be placed in the source tank of whichever fluid the user wants in that line. Typically, Lines 1 and 2 are pretreat solutions, while Line 3 is a flush fluid, water, or cleaner. Dip tubes should be pushed as far down into the source tank as it will go, so it can pull as much fluid out as possible. The dip tubes must be installed with care, as the ceramic can be brittle, and a crack may cause a lack of suction.



The fluid output of the Central Source is via push-connect bulkheads on the left side of the spray cabinet labeled 'Spray System to Pretreaters'. Before the output tubes are connected, a manual-shutoff valve should be installed first. To install a manual-shutoff valve, cut a small length of output tubing (about 4-6in), and push it into the bulkhead output, on the outside of the central source. To ensure a secure push-connection, push the tubing into the push-connect, tug on it, and push it in again. The manual shutoff valve can then be connected to the end of the small length of tubing. The main length of output tubing can then be pushed into the other end of the shutoff valve, and run to the location of the pretreaters. Repeat this for each of the three output bulkheads.

On the pretreater-end of the output tubes, each fluid line must be able to feed multiple pretreaters. The Y and T push-connect joints are used to split the line to each machine. Either Y or T joints can be used to split a line, depending on which is more convenient for the shape of the tubing. Installing a joint is very similar to installing the manual valves. Simply cut the tubing where the joint is to be placed and connect using the push-connection.

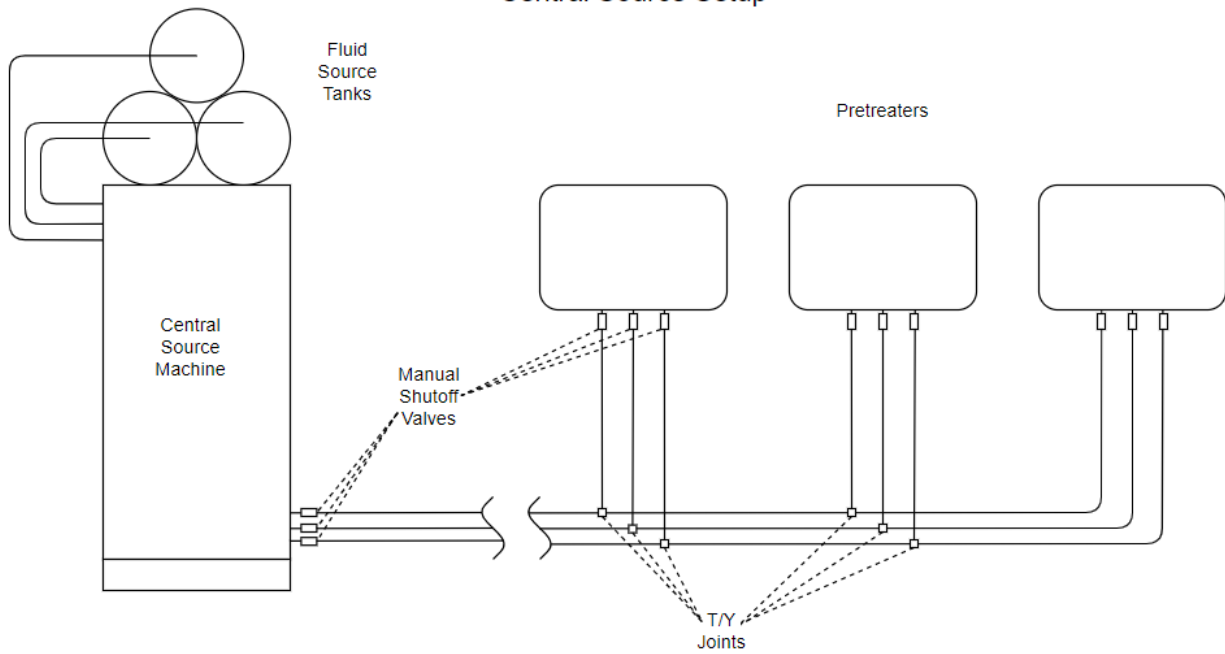


Before the tubes can be fed into each pretreater, manual valves must be installed just outside each machine. This allows the user to turn off a fluid line for one particular machine, without cutting fluid flow to the rest of the pretreaters. These are installed similarly to the valves on the outside of the central source, only these are located just before the tubes are run into the pretreater.



After the exterior valves are installed, there should be three tubes, one for each fluid line, run to each pretreater. The fluid lines can finally be connected to the pretreater through the holes in the side of the upper cabinet. Inside the upper cabinet, there should be three manual valves labeled MV1, MV2, and MV3. These should be connected to Line 1, Line 2, and Line 3 coming from the Central Source, respectively.

Typical 3 Pretreater
Central Source Setup



Internal Dip Tubes



For each fluid line, there should be three tubes being fed into the fluid cabinet, labeled "Tank X Input", "Tank X Output", and "Tank X Bleed". If they are not already, these dip tubes should be gently gathered together, and fed into the corresponding 5 gal tank. To insert the tubes without bending them, the 5gal tank can be removed from the scale, and replaced when the dip tubes are inside.

Machine Startup

Before the machine is powered, all valves should be off.. The three manual shutoff valves on the output of the Central Source, as well as the three manual shutoff valves on the input of each pretreater should be turned off (with the handle perpendicular to the tubing). The bleed valves for each line, inside the spray cabinet, should be turned to the “Bleed” position.

Once all valves are turned off, the machine can be powered on. Turn the red power switch to the ON position. The green power button should light up. Press and hold the green power button until a click is heard, and the blue LED on the front of the computer turns on.

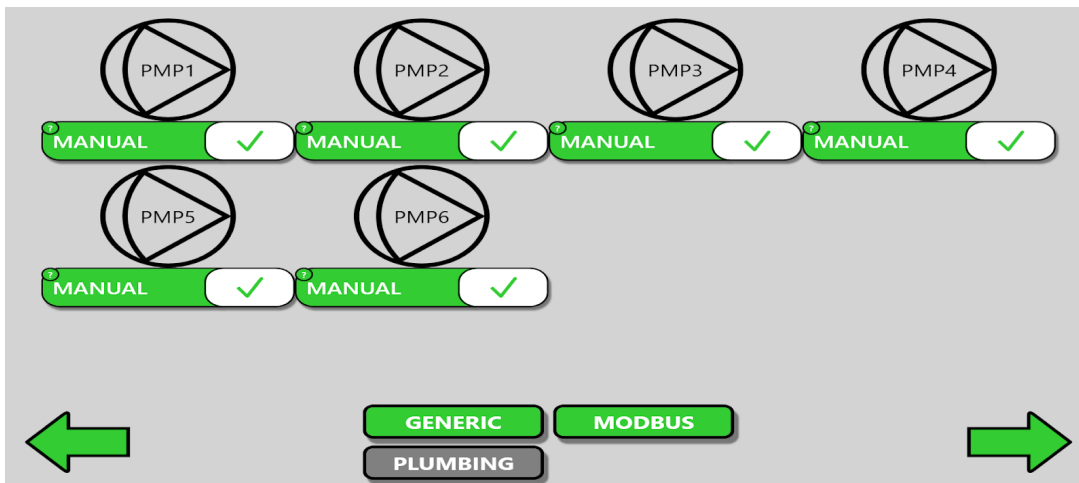
When the machine powers on, the pumps may turn on, but they should deactivate within a few seconds.

In case of emergency, or if the machine needs to be deactivated quickly, the large red switch can be turned to the OFF position. This will cut all power to the machine. This method is to be used in urgent situations only, the typical method of shutting down the machine is by pressing the ‘Power Down’ button on the navigation screen.

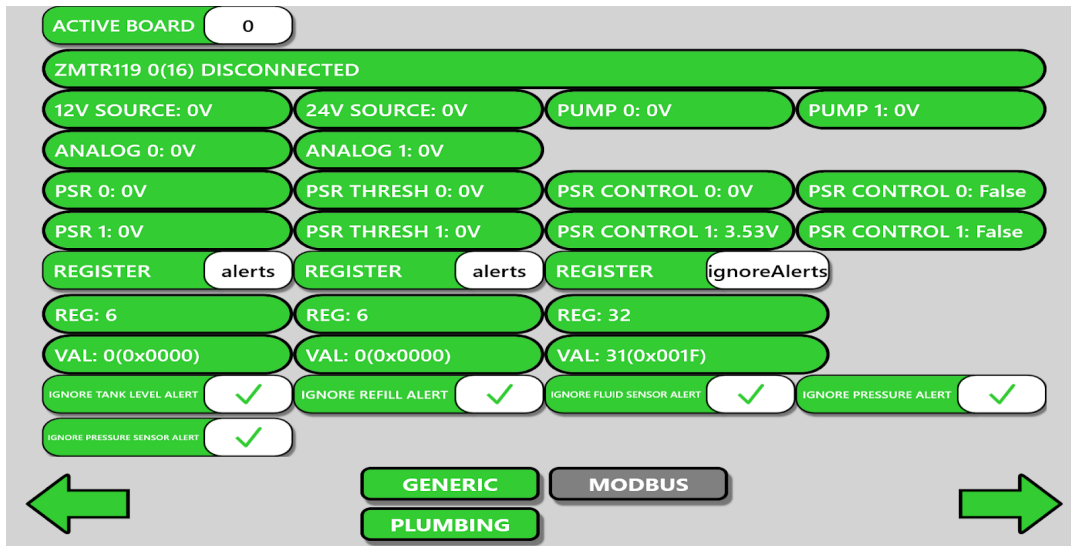
When the computer boots up, it should automatically start the Central Source Software. (If it does not, the “Central Fluid Source” program folder can be found in the computer’s documents folder. Inside that folder, double click the CentralSourceControl.exe to launch the application. Once it starts, configure the app to open on startup. Diagnostics → Generic → Configure Auto-Start).

Deactivating Pumps/Errors

Once the software starts, the pumps should be deactivated to make the setup process easier. Click the Home icon in the upper left to get to the Navigation Screen. Click Diagnostics, then the Plumbing tab. For each of the six pumps, click the red X underneath the icon. It should turn into a green check. This changes the pump to manual control mode (see Plumbing Diagnostics) Ensure that the pump icons are all grey, not green. Once this is done, all pumps should be deactivated.

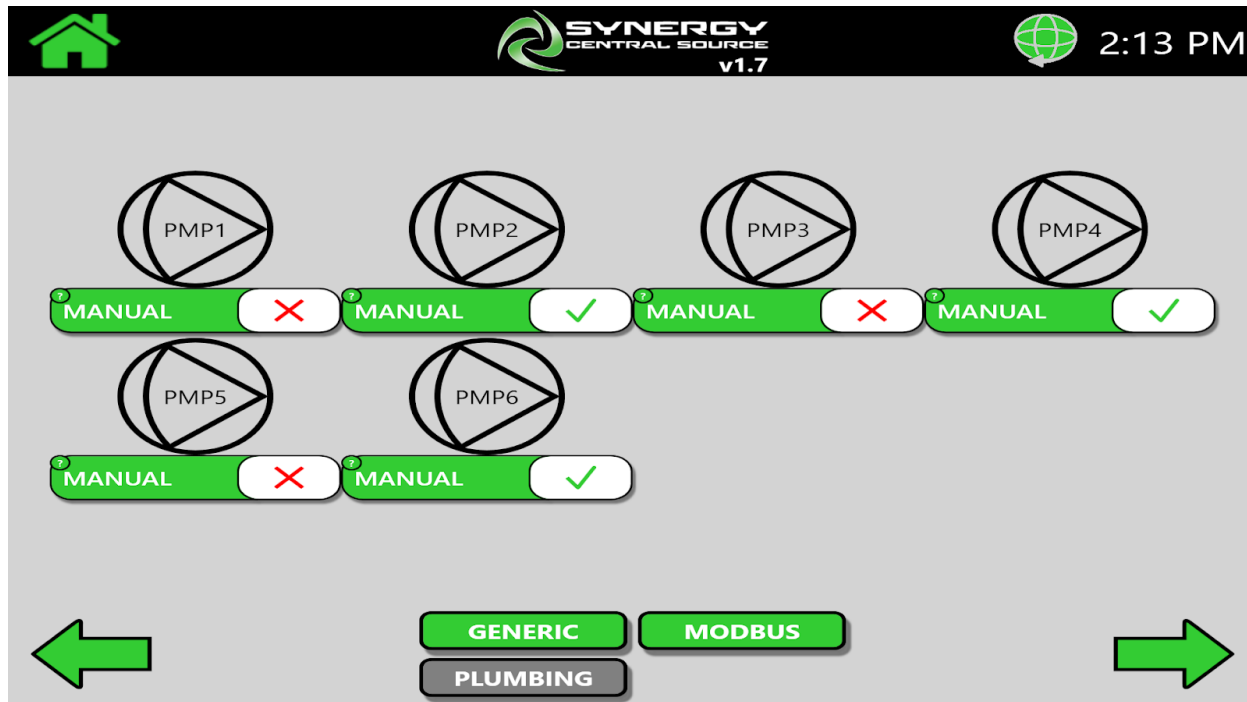


To avoid alerts being thrown, and pumps being unintentionally deactivated during the setup process, the errors thrown by the boards must be ignored. To do this, from the navigation screen, go to Diagnostics → Modbus. Select “Active Board” 0, and check all five of the “Ignore _____ Alert” buttons. This will prevent errors from being thrown by the board, but will also prevent the machine from automatically catching failures, so the operator should stay alert until the errors are re-enabled. Ignore all 5 alerts on all three boards.



Filling Tanks

In order to fill the 5gal tanks, the fill pumps must be primed. Place the 36” diptube labeled “Line 1” in the source tank, and turn on Pump 1 (by tapping the pump icon while in manual control mode). This should turn on Pump 1, and fluid should be pulled from the source tank, through the fill system, and begin filling Tank 1. When the tank gets about 4 gals full. Turn off the pump. Repeat this process for the other two lines (using pumps 3 and 5) until all 5gal tanks are at about 4 gals volume. Once this is done, turn the fill pumps off, and disable manual control (tap the green check, so it turns to a red X) on *only the fill pumps* (pumps 1, 3, and 5). The spray pumps (pumps 2, 4, and 6) should remain in manual control mode for now.



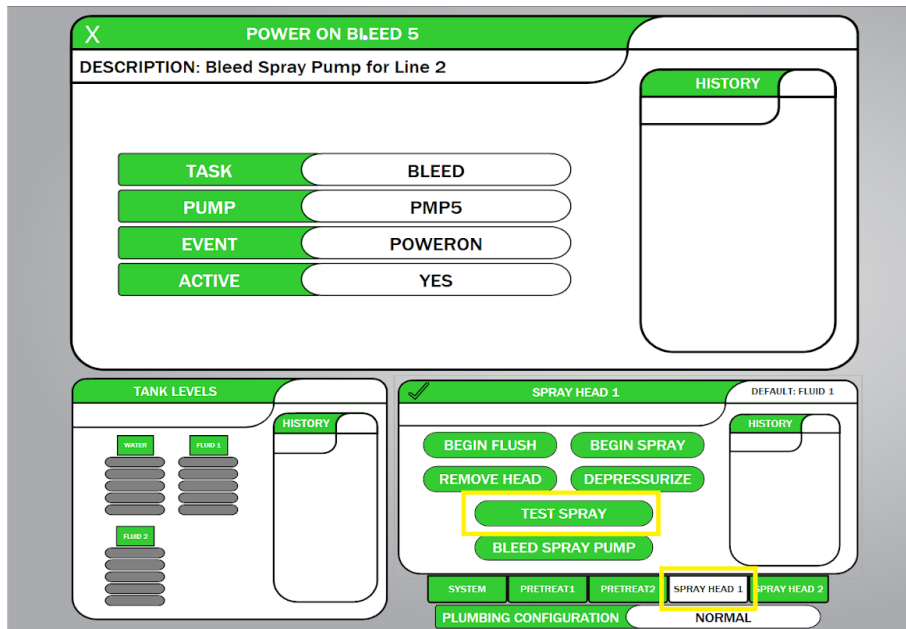
Bleeding Pumps

To prime the spray lines with fluid, the pumps must first be bled, to ensure that there is no air in the line. To do this for Line 1, turn the bleed valve (the 3 way valve on the inside of the spray cabinet labeled MV1) to bleed mode. Then, tap the icon for Pump 2 on the Diagnostics → Plumbing screen (ensuring manual control mode is on) to turn on the pump. This will pull fluid from the 5 gal tank through the spray system, but instead of sending it to the pretreaters, it will return the fluid to the tank. Allow the pump to run for about 2 minutes. Turn the pump off, and repeat for the other two lines (MV2 and Pump 4 for Line 2, MV3 and Pump 6 for Line 3).

Priming Lines

Once the pumps are bled, they are able to pump fluid through the length of the output tubes. Open the manual shutoff valves on the outside of the Central Source, as well as the manual shutoff valves on the inside of one of the pretreaters (move the handles so they are parallel to the tubing). Turn the manual bleed valve for Line 1 from bleed mode to operation mode.

In the Synergy software, navigate to the Maintenance screen, tap 'Spray Head 1' and then 'Test Spray'. While the synergy is doing its test spray, in the Central Source Software, disable manual control on the Line 1 spray pump (Pump 2). The system should automatically actuate Pump 2, and try to pressurize Line 1. When fluid starts to come out of the spray nozzle of the pretreater, it is ok to stop the test spray, to avoid wasting fluid.



The pump may continue to run for a little bit, depending on the length of the line. During this time, the needle on both the physical and virtual pressure gauges on the Central Source should be going up. When the system reaches pressure, the pump should automatically turn off.

Open the shutoff valves inside of the remaining pretreaters, and do a test spray of spray head 1 on those pretreaters until fluid starts to come out of the spray nozzles. This fluid line is now pressurized and primed on all pretreaters.

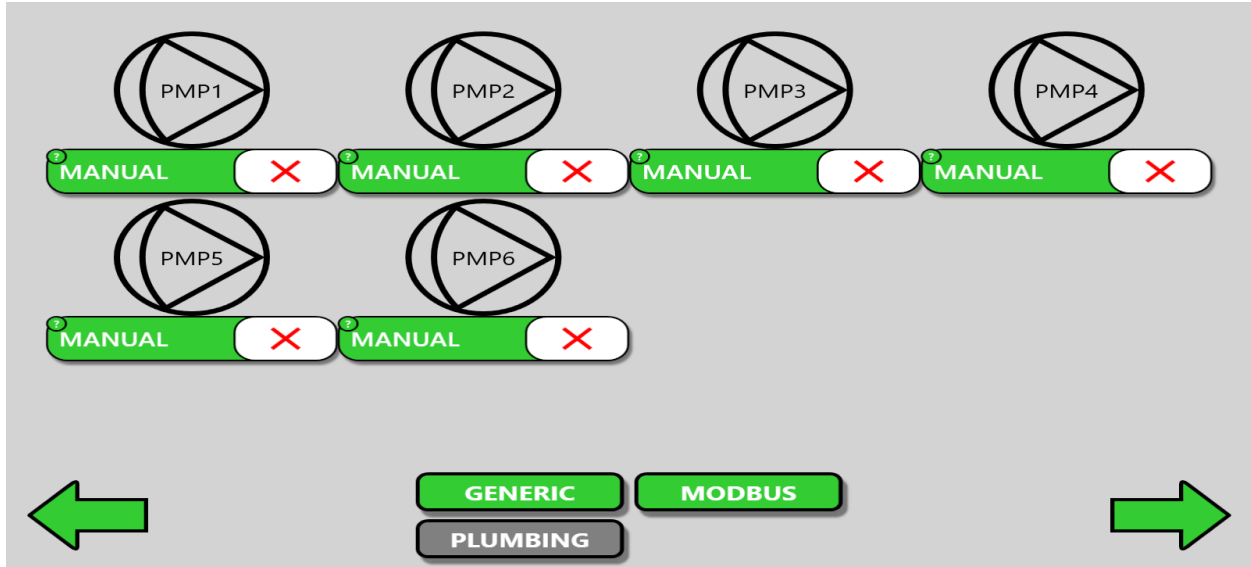
Repeat this process for the other two fluid lines

- For Line 2, select 'Spray Head 2' → 'Test Spray' in the Synergy maintenance screen, and turn on Pump 4 on the Central Source
- For Line 3, select either spray head, but tap 'Begin Flush' instead of 'Test Spray', and turn on Pump 6 on the Central Source

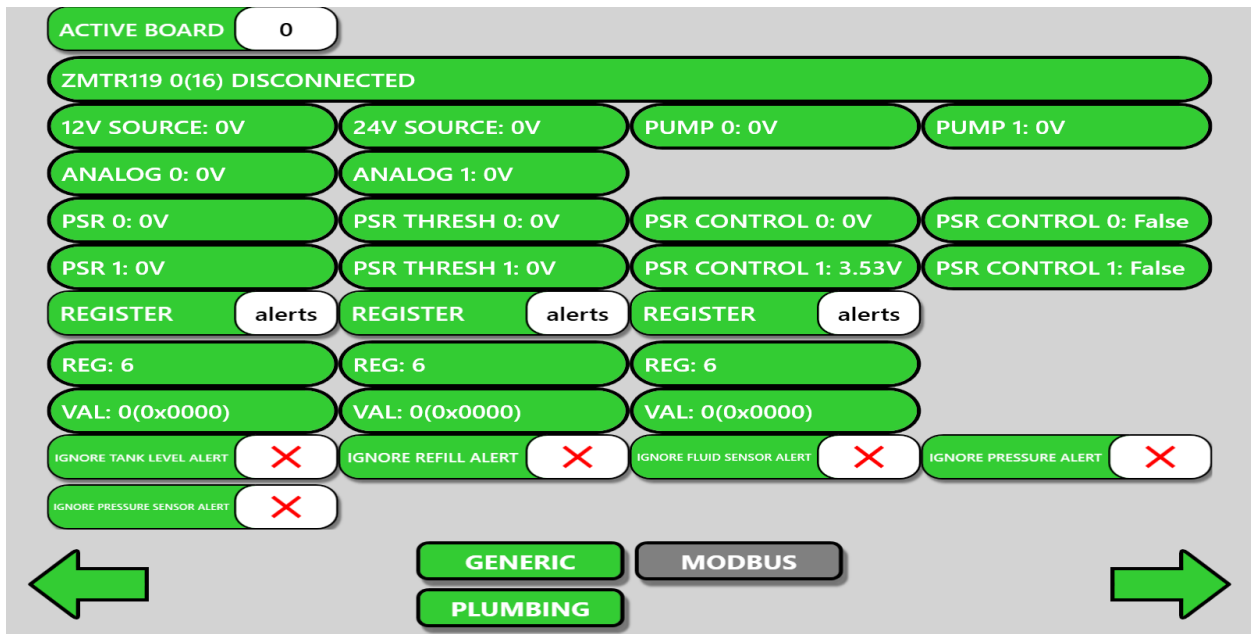
System Checks

Before the system is ready to autonomously operate long-term, a few checks must be made. First, now that the lines are at pressure, ensure that there are no fluid leaks anywhere in the system. The smallest drip can cause a large puddle of wasted fluid over time, so it is important to make sure every plumbing connection is tight and dry. If a leak is found, contact Brown Manufacturing for assistance.

Secondly, double-check that manual control is disabled on all the pumps (the Manual Control checkbox should have the red X).



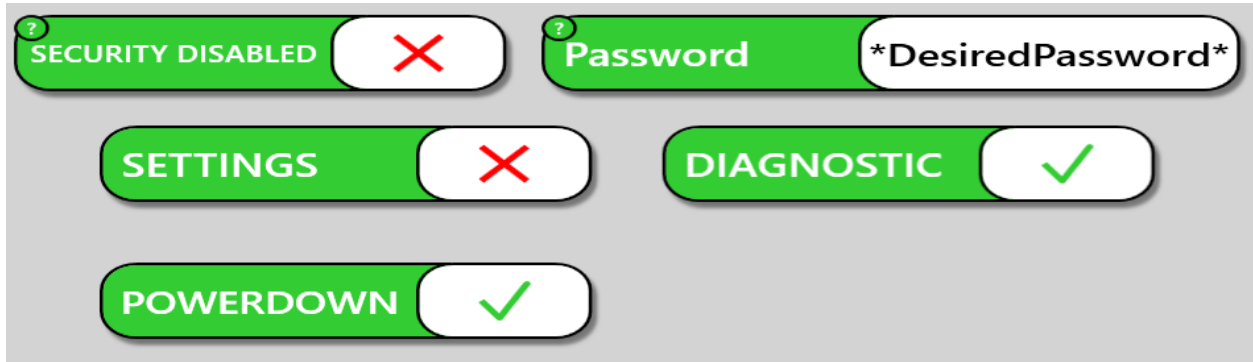
Finally, the errors must re-activated. In Diagnostics→ Modbus, select each of the boards 0-2, and disable all 5 error ignores (tap so they all have a red X). At this point, no errors should be thrown. If an alert is received, consult the Central Source Troubleshooting Guide.



Configuring Security

Once the system has been set up and configured, the user can implement password protection on some screens on the software. This prevents system preferences or calibrations from being changed accidentally.

To do this, navigate to the Security tab and type the desired password into the box labeled "Password". Next, use the checkboxes next to the tab names underneath to select which screens are protected by the password.



Return to the navigation screen, and the Security tab, as well as any tabs checked on the Security screen, will have locked icons. Attempting to click on this tab will prompt the user for a password, that must match the text typed into the password textbox to continue. If the password is lost or forgotten, contact a Brown technician to bypass the security system.