



CSI

2700 N Partnership Blvd, Springfield, MO 65803



Hot Water Set

Installation, Operation, and Maintenance Manual

Hot Water Set

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Safety

Important Safety Information

Read this manual before installing, operating, and maintaining this equipment. Failure to read the manual can result in personal injury and/or equipment damage.

Do not attempt to remove and/or modify any CSI products or programming. Doing so can create unsafe conditions for the operator(s) and/or surrounding persons. Any change to CSI products or programming will void any and all warranties.

Do not place any CSI product in an application where general product service ratings are exceeded. Doing so puts the operator(s) and/or surrounding persons at risk of personal injury and/or result in equipment damage.

The words **DANGER**, **WARNING**, and **CAUTION** and their meanings, as used within these instructions, are listed below:



DANGER

Indicates an imminently hazardous situation, which if not avoided, has a high likelihood of resulting in death or serious injury. This symbol is used in only the most extreme at-risk cases and warrants immediate action.



WARNING

Indicates a potentially hazardous situation, which if not avoided, could result in death or serious injury. This symbol is used for moderately at-risk cases and warrants immediate action.

CAUTION

Indicates a potentially hazardous situation, which if not avoided, may result in minor or moderate injury. This symbol may also be used to alert against an unsafe operating or maintenance practice.

If, at any point during operation a Danger, Warning, or Caution indication is present, the operator should immediately take steps to resolve the problem and/or seek assistance from a supervisor.

Do not remove labeling on any CSI product. Immediate replacement of any missing label is important for both the customer and manufacturer.

Disclaimer of Liability

Central States Industrial (CSI) does not assume responsibility and expressly disclaims liability for loss, damage, or expenses that arise in any way from the installation, operation, use, or maintenance performed in accordance with this manual. CSI assumes no responsibility for any infringement of patents or other rights of third parties that may result from use of the module. No license is granted by implication or otherwise under any patent or patent rights.

CSI reserves the right to make changes to the product, specifications, or this manual without prior notice.

Introduction

Thank you for purchasing a CSI product.

This manual contains operation instructions for Central States Industrial's hot water set.

Application

Hot water sets (HWS) from CSI are built to sanitary standards and are fabricated using an all stainless steel construction for a hygienic long lasting design. HWS skid systems are designed and built to specific application requirements, such as heat exchanger type, desired flow rates, and desired water temperatures. If used properly, this system cannot only be a source of savings but a vital step in ensuring product quality.

If you have questions or concerns regarding your HWS skid system, please contact CSI at **800.721.2394** or **417.831.1411**.

Technical Data

Maximum Compressed Air Pressure	100 psig
Air Inlet Size	1/2" FNPT
Maximum Product Pressure	145 psig
Product Temperature Range	0°F – 180°F
Electrical Requirement	AC 480V, 60Hz +/- 6%
Amperage Requirement Based on System Configuration	Indicated on as-built electrical drawings for your system.

Introduction

Built-in Safety

Each control unit has built-in, integrated safety features including air lockout complying with Occupational Safety and Health Administration (OSHA) lockout/tagout procedures. In case of emergency, the emergency stop capabilities provide a way to halt all operations. Control units can also incorporate system timeouts, providing added protection for operators.

Air Lockout Capability

When the air is in the off position, a pad lock can be attached to the air switch to prevent accidental operation.

This complies with OSHA lockout/tagout procedures



E-Stop Capability

When the E-stop is activated, all operations are stopped.

To release the E-stop, twist in a clockwise rotation until the piece pops up.

Installation

The control cabinet will arrive mounted to the skid and pre-wired to any instruments installed on the skid. Typical installation requires a dedicated 480V 3-Phase with Branch Circuit Protection with sufficient amperage for the control system.

Electrical schematics will be provided with the control panel for the hot water set. The drawings will indicate the location, voltage, and amperage requirement for the panel. The HWS system is designed to work as a standalone system and does not require any integration with the plant's infrastructure.



WARNING

To avoid electrocution, a registered electrician should do all electrical work. Industrial safety standards and local codes should be followed. All power must be off and safely locked out during installation.

Air Connections

Air Input to Cabinet

Air connection 1/2" NPT Female



Note: Central States Industrial recommends that the cabinet be supplied with clean instrument air at the minimum pressure, typically 90 psi, for your application.

Operation

Control Panel

In this section, you will find instructions regarding selecting the HWS parameters and starting the system through the use of the touchscreen control panel. Operators should take a moment to familiarize themselves with the instructions below.

System Start

- a. Ensure all utility connections are active for the skid and the system has been filled with water.
- b. Ensure the compressed air shut-off valve is open and the system has 90 psig pressure minimum.
- c. Ensure the E-Stop is not active and the system is ready to run.
- d. Ensure all configuration settings have been set to the desired temperature and flow setpoints.
- e. To change wash parameters, press the **Config** button, which will display a user login screen.
 - I. Input user name and password.
 - II. Default login to change configuration parameters:
 - i. User: engineer
 - ii. Password: engineer
 - III. After successful login, you will be presented with a screen where you can adjust the desired HWS settings for temperature, flow, and chemical concentration.
 - IV. Make the desired configuration changes, and press the **Logoff** button. This logs out the elevated user and returns to standard user credentials.
- f. To start the system, first ensure it is fully and safely connected. Press the **Commands** button, and the system will present the available commands.
 - I. Select the **Enable Auto Control** on the left. When ready, press the **Start** command on the right.
 - II. As a safety precaution, if an issue arises during the sequence, the operator can press the **Abort** button to cancel the current sequence.
 - III. If the operator wishes to pause, but not cancel the sequence, the **Hold** button can be pressed. This will pause the current sequence, but will keep the current position and time remaining.
- g. When the system is started, it will automatically open any automated valves and start the supply pump and heating system.
- h. The system will continue to run in automatic mode until the operator stops the system by pressing the **Shutdown System** button, **Abort** button, **Hold** button, **E-Stop** button, or the system goes into a High Limit alarm state.
 - I. If the system goes into alarm, the issue that caused the alarm must be resolved. For High Limit alarms, the operator must acknowledge the alarm before the skid can be operated again. Transmitter errors will auto-acknowledge themselves once the problem has been resolved.

Operator Interface Screens

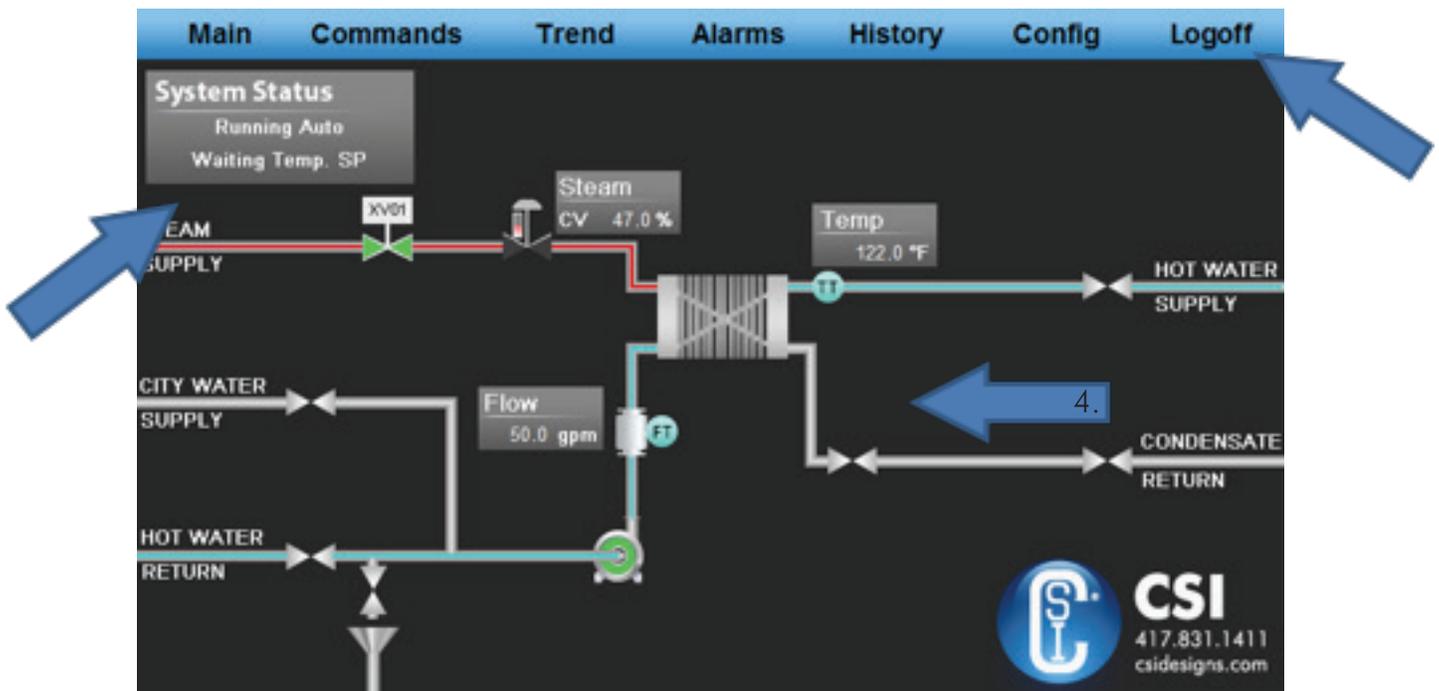


Figure 1 - Main Screen

The main screen displays all system statuses in an intuitive manner.

1. The main navigation bar is located at the top of every screen.
2. When equipment (such as valves and pumps) is running or open, the color will change to green. When equipment is closed or stopped, the color will change to red. The steam control valve, if equipped, will turn red as it opens, indicating that steam is being applied to the heat exchanger.
3. In the top left corner of the screen, there is a grey area that contains system statuses. The statuses provide the following possibilities:
 - a. **Current System Status** – System Idle, Running Auto, System Holding, System Restarting, System Aborting, Communication Lost, Aborted by Plant, System E-Stopped
 - b. **Current Conditions** – Waiting Temp SP, Temp SP Met
4. When the system is sitting idle, and there are no active alarms, the start-up operators are allowed a small amount of manual control of the system, as long as the built in interlocks are complied with. Press the equipment object you would like to open or turn on, and it will comply if the interlock permissions match. To close or shut off the piece of equipment, press the same button again. Refer to the *Interlocks/Alarms* section for more information.

Operator Interface Screens

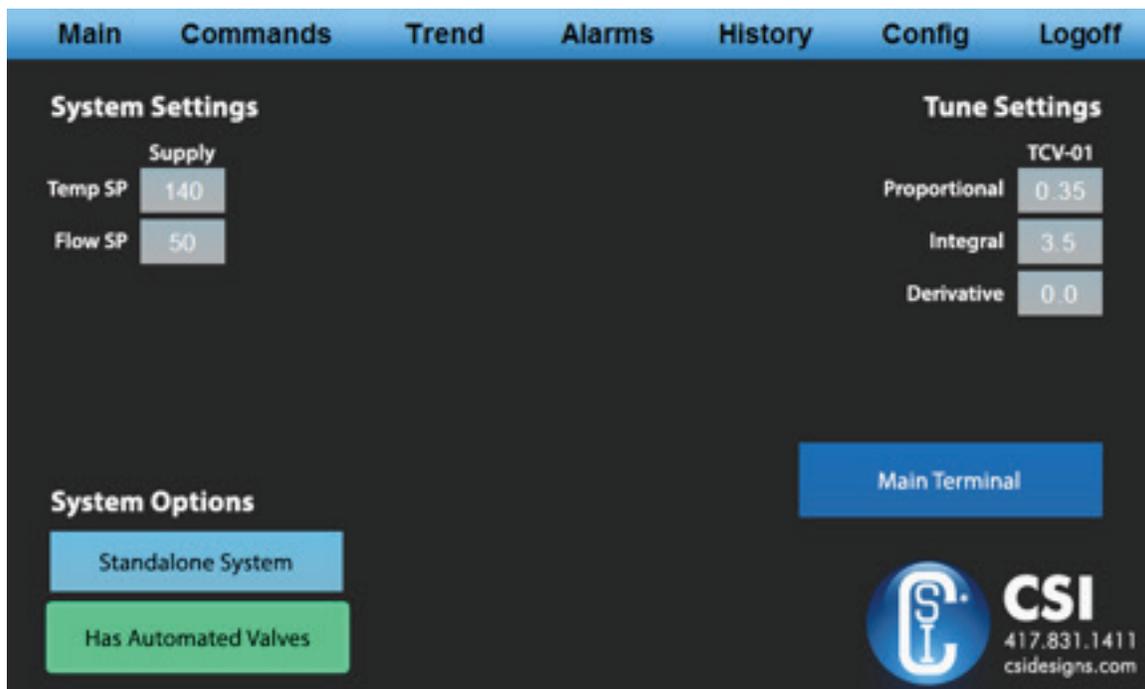


Figure 2 - Configuration Screen

The configuration screen displays the overall system settings that can be adjusted to the desired HWS parameters by allowed users.

- 1. Temp SP** – Desired hot water temperature setpoint.
- 2. Flow SP** – The desired flow rate of the system.
- 3. Steam Control Valve Tuning TCV-01** – These gain settings can be adjusted to control how the steam valve reacts per PID.

Note: This system is shipped with a default general tune and may require fine-tuning once installed at the facility, as each plant has a different boiler with varying flow and pressure. If CSI is providing start-up support, your start technician will tune the system while onsite as part of the standard SOP.

- 4. System Options** – These will be set at the factory with the options purchased with the system.
 - a. Has Automated Valves** – This feature will be enabled if the skid is purchased with automated valves in the system.
 - b. Has Plant Integration** – This feature allows the system to communicate with a Rockwell plant PLC via Ethernet messaging. If plant integration is desired, let your CSI representative know so they can provide you with the standard statuses and commands available with this system. Programming tools are also available to simplify integration tasks.

Operator Interface Screens



Figure 2 - Commands Screen

Control Types

- 1. Enable Auto Control** – Phases included are pre-rinse, caustic, drain, and final-rinse phases.
- 2. Shutdown System** – Phases included are pre-rinse, caustic, drain, and final-rinse phases.

Commands

- 1. Start** – Starts the automated sequence
- 2. Hold** – When the system is running, the operator can put the system in a hold state. This will stop the active cycle, so the system can restart from where it was paused without starting the sequence over.
- 3. Restart** – When the system is in the held position, the operator can resume the cycle from where they left off.
- 4. Abort** – This will shut down the system, cancel the active cycle, and bring the system into an idle state. This may also happen if a High Limit alarm goes active or if an operator presses the **E-Stop** button on the control panel.

Operator Interface Screens



Figure 2 - Commands Screen

Starting the First Cycle

1. First select **Enable Auto Control**.



Figure 3 - Commands Screen

2. The button will turn green and display **Ready to Start**.

Operator Interface Screens

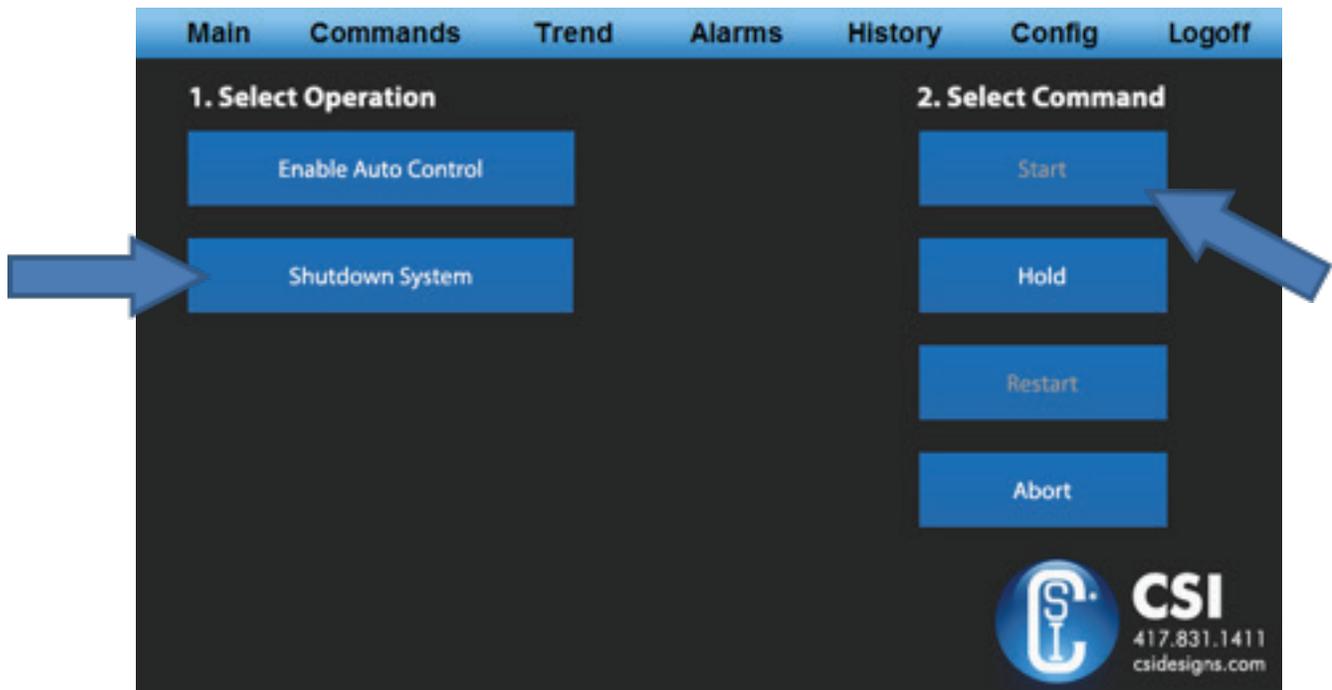


Figure 4 - Commands Screen

3. When ready, press the **Start** command. The **Start** button will momentarily turn green until the system is running.
4. The system will continue to run as long as there are not alarms. Pressing the **Shutdown System** button will turn the system off.

Operator Interface Screens



Figure 5 - Commands Screen

5. Once the system is running, the **Hold** and **Abort** buttons will be available during the cycle. The operator can return to **Main** to monitor skid operation.
6. The **Shutdown System** button will change to **System Shutting Down** until the system has completed its ramp down and is sitting at idle.

Operator Interface Screens

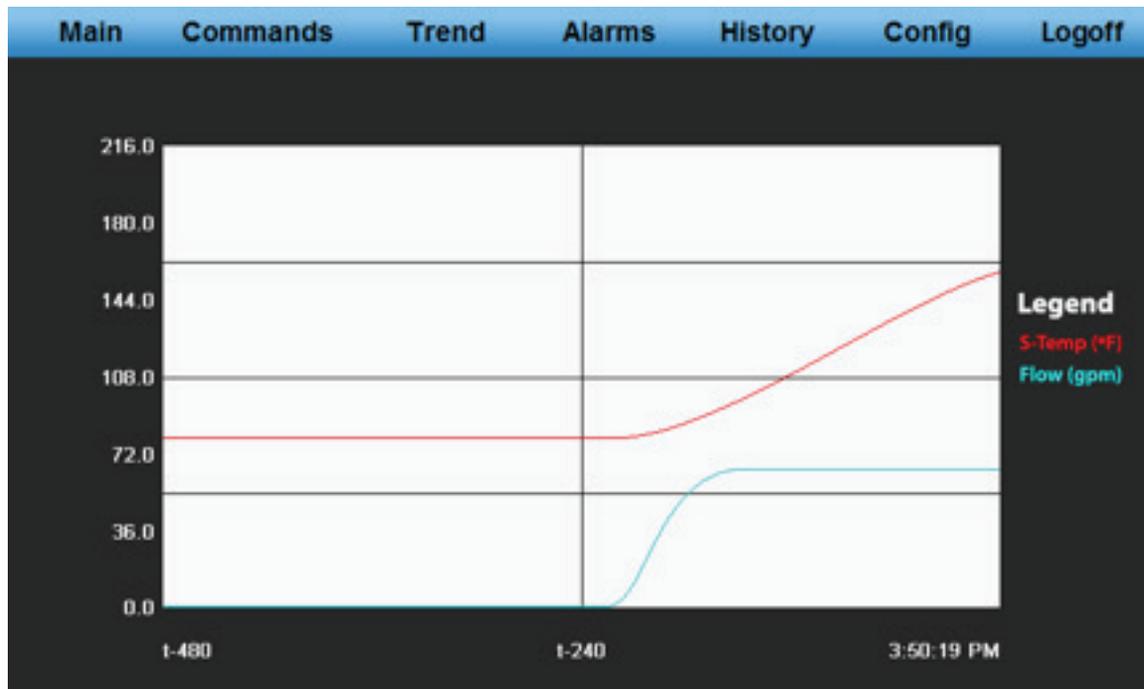


Figure 6 - Trend Screen

7. The **Trend** screen logs the actual process values of supply flow and supply temperature. These data points are sampled every second and plotted on the same graph for monitoring

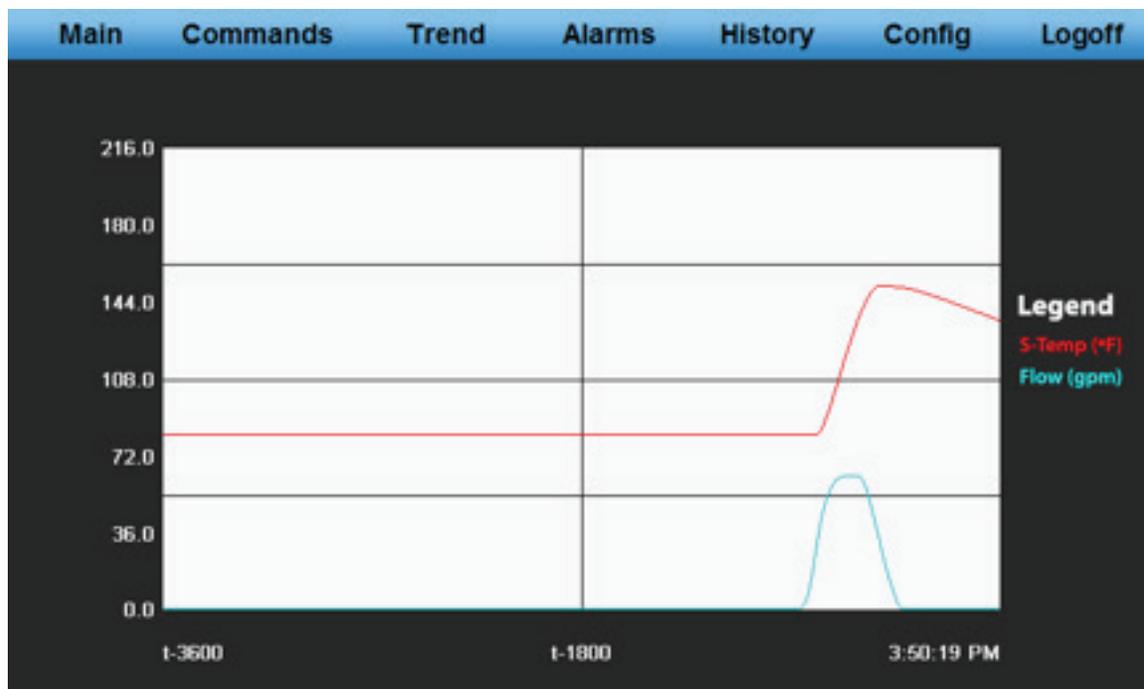


Figure 7 - History Screen

8. The **History** screen logs the actual process values of supply flow and supply temperature, exactly as the **Trend** screen does except the data points are sampled every eight seconds, allowing the **History** screen to monitor a longer time frame, approximately an hour.

Both the **History** and **Trend** screens are limited to 500 data points.

Operator Interface Screens

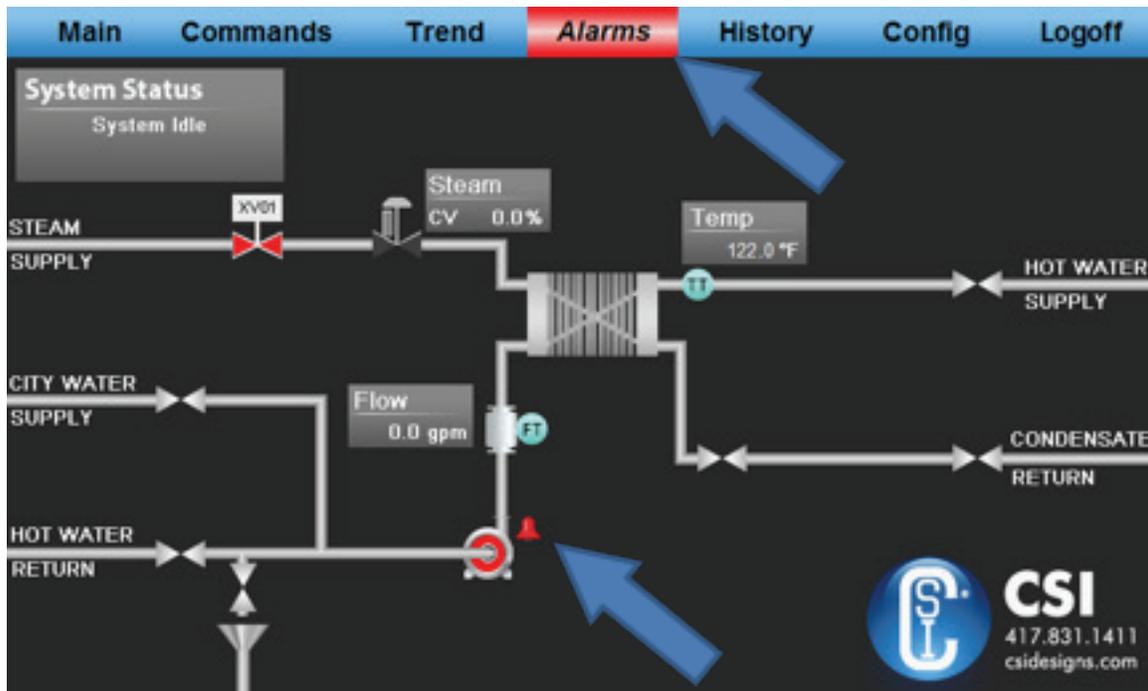


Figure 7 - Alarm Screen

9. When the system has an active alarm, the **Alarm** button will flash red on every screen, indicating that there is a system problem. The skid will abort any current cycles and return itself to an idle state. By pressing the **Alarm** button on the main navigation, you will be presented with the **Alarm** screen. On the main screen, a small red bell will also display next to the piece of equipment currently in an alarm state.

Operator Interface Screens

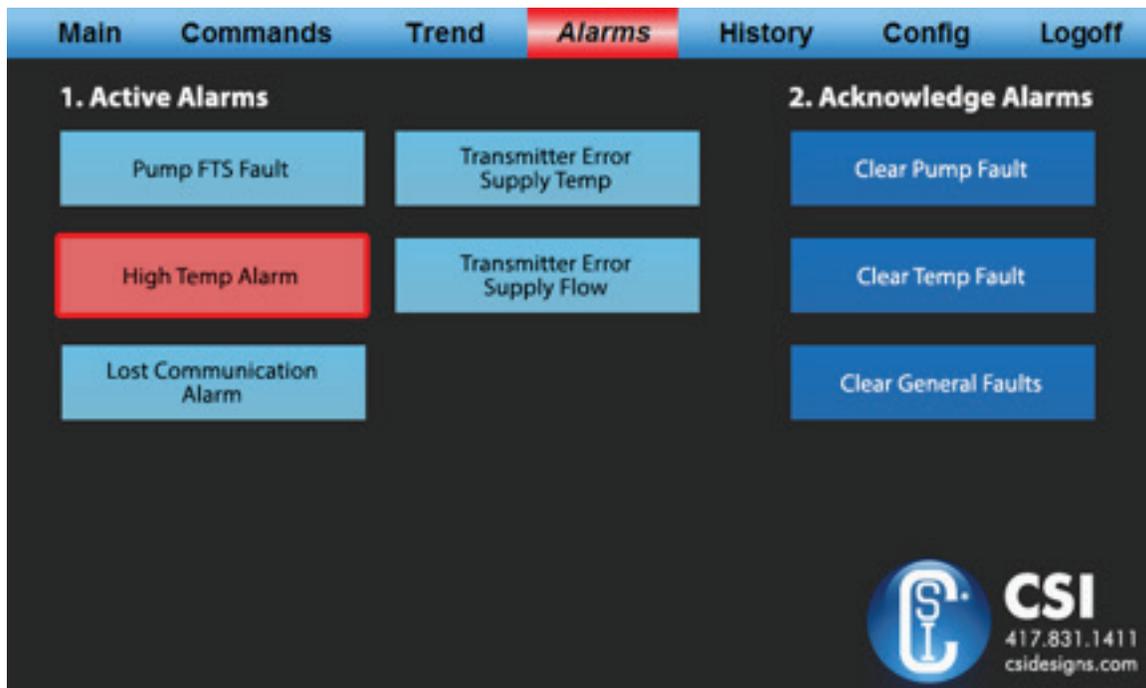


Figure 8 - Alarm Screen

This screen displays the system alarms built into the HWS system. Any active alarms will turn red and receive an illuminated border. Transmitter errors will auto-acknowledge once the problem has been resolved, however there are an additional three alarms that require an operator to acknowledge the alarm before the system can operate again. If the alarms do not clear, then the issue that caused the alarm is still in effect.

Alarm Statuses Explained

- 1. Pump FTS Fault** – The VFD in the control panel has a fault. This can be loss in Ethernet communication, such as when a new program is downloaded. It could also be a true VFD fault, such as overcurrent from a failing motor.
- 2. High Temp Alarm** – The system is set to a max temperature of 212°F. In the event temperature exceeds 212°F, then the High Temp Alarm will go active and any current cycles will abort.
- 3. Transmitter Errors - Return Temp, Supply Temp, Conductivity, Flow, Level** – If the analog signal goes below or above the normal operating range of 4-20mA, the system assumes there is a problem with the transmitter. The **Transmitter** alarm will activate, and any current cycles will abort. The alarm will automatically clear itself once the transmitter is fixed and receiving the 4-20mA analog range.

Operator Interface Screens

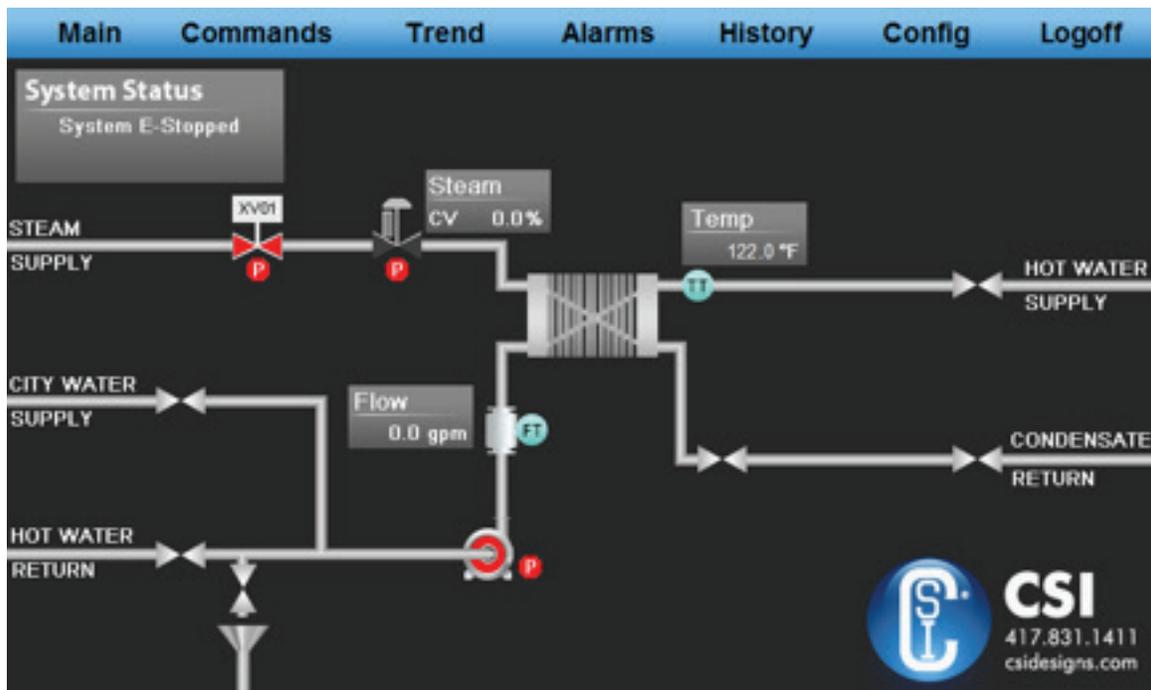


Figure 8 - Main Screen - E-Stopped

Interlocks Explained

When an interlock is active on a device, a small stop sign with a "P" will display on the screen next to the piece of equipment that has an active interlock. The P stands for permission.

E-Stop Active

When the system is powered on and the E-Stop button has been activated, the system will shut down and inhibit all devices from operating until the operator has released the E-Stop button by twisting the button clockwise. There is also an E-Stop active status on the screen.

Interlock - Supply Pump

The supply pump has the following interlock criteria that need to be met prior to the pump operating:

1. The system is not in an E-Stop condition.
2. The pump is not in alarm.

Interlock - Heater

The following interlock criteria needs to be met prior to the heater being allowed to operate:

1. The system is not in an E-Stop condition.
2. The heater is not in alarm.
3. The system is in a running state status.
4. The supply flow is greater than 10 gpm.
5. The supply temperature is less than 212°F.

Maintenance



WARNING

Until a safe work environment has been established, employees should not perform maintenance on the system.

To ensure a safe work environment, it is recommended, but not limited to, verifying the following precautions are met:

- o Power to the control panel should be off and locked out.
- o Remove or lock out the inbound air supply from the pressure regulator.

General cleanliness will extend the life of the control panels and its components. Where possible, the area should be kept free of spills and loose debris. Under no circumstance should the panel be sprayed down or cleaned with any wet fluids. Doing so could damage the electrical and/or pneumatic equipment.

If any hardware issues exist, cease any and all use of the HWS until all issues are resolved.

Maintenance Checklist:

- o Check air lines for cracks and leaks.
- o Check pressure drop across air filter. If pressure drop exceeds maximum allowable, the filter needs to be cleaned or replaced.
 - Note:** The pressure drop should not exceed 14 psig. If the pressure drop exceeds the maximum allowable, the filter needs to be cleaned or replaced.
- o Check for loose connections or connectivity concerns regarding the solenoid valves.
 - Note:** A solenoid valve will not likely give advanced warning before failing.

Maintenance

Replacing Components

CSI provides general instructions regarding the replacement of components used in the manufacturing of the HWS.

Replacing “Poly” Tubing

- a. Disconnect the inbound air line at the pressure regulator and ensure that the control panel is powered down.
- b. Press the outer ring of the pneumatic fitting in, and then gently pull the cracked or leaking air line from the fitting.
- c. Repeat the same procedure for the other end of the air line.
- d. Use the cracked or leaking air line as a guide for the length of the new air line.
- e. Trim the new section of air line to the appropriate length.
- f. Install air line by pressing each end into pneumatic fittings.

Note: After the new line is pressed in, the outer rings on the pneumatic fittings need to extend. If they are not fully extended outward, the hose could be blown out from its seated position when subjected to sufficient pressure.

Replacing Pressure Regulator Filter Element

SMC, the manufacturer of the supplied filter regulator, recommends the filter element be changed every two years or when the pressure drop across the element exceeds 14 psig. To replace the pressure regulator filter element, follow the below instructions:

- a. Locate the spring-loaded release on the front of the pressure regulator.
- b. Press the release down and hold.
- c. Turn the portion of the pressure regulator body below the spring-loaded release.
 - o This may be more easily accomplished by holding the release with the thumb of the hand with which you intend to turn the body.
 - o The pressure regulator body should only need to turn approximately half of a revolution before the operator can gently pull it free.

Note: If you only turn the body a quarter of a turn, the release may try to extend back into place.

- d. Once the body of the regulator is removed, the element can be easily removed and replaced.
- e. Put the body back on and turn it back into position directly opposite of how you removed it. This should seat the body exactly where it began.

Maintenance

Replacing Solenoid Valve

Although solenoid valves used by CSI are rated for one million cycles, there are no performance guarantees for these items. While we do not guarantee a particular number of cycles, we are confident the valves will be free from manufacturer defects.

a. Remove retaining screws from the existing solenoid valve.

Note: Keep them until you are certain new screws have been provided.

b. Gently remove the solenoid valve from the mounting pad.

o Take note of how the solenoid valve is oriented.

o Take note of any and all o-rings, as there may be small o-rings on sealing surfaces.

o In some cases, the top or bottom of the solenoid valve may need to come out first.

c. Verify the o-rings are properly placed on the new solenoid valve.

d. It may be necessary to insert or seat one end of the solenoid valve before the other end will seat properly.

Note: It should never be necessary to force the new solenoid valve into place.

e. Install the retaining screws that you removed in step (a). If new retaining screws were provided, use them and discard the screws from step (a).

Note: For questions or concerns regarding the HWS, contact CSI at **800.721.2394** or **417.831.1411**.

Troubleshooting

Q. What should I do if the automated valves are not operating?

A. Try the following solutions:

1. Ensure that the Occupational Safety and Health Administration (OSHA) air dump valve is in the on position and the supply pressure is over 80 psi.
2. Ensure your configuration settings have not been changed and the setting for **System has Automated Valves** is turned on.

Q. What should I do if I cannot run the pump?

A. Try the following solutions:

1. Check the supply pump interlocks, and ensure all criteria to operate has been met.
2. Ensure the pump is not faulted and the E-Stop is not inhibiting its operation.
3. The supply pump can sometimes airlock when the system first starts and the process lines are dry. Command the current cycle to hold and wait for the pump to stop, and then press the resume command. Many times this will clear the airlock of the pump.
4. Ensure the pump is rotating with the correct rotation, and with the system safely locked out, ensure the pump impeller spins freely without interference or resistance.

Q. What should I do if I cannot run the heater?

A. Try the following solutions:

1. Verify that the supply flow is greater than 10 gpm; this is a safety feature to ensure there is adequate water flow for the heater to run.
2. Ensure the control system temperature setpoint is set at the desired temperature and that the actual temperature is lower than that value.

Note: For questions or concerns regarding the HWS, contact CSI at **800.721.2394** or **417.831.1411**.

Warranty

A. GENERAL PROVISIONS: Central States Industrial Equipment & Service Inc. (hereinafter referred to as the Company) warrants to the original purchaser-used (hereinafter referred to as the Customer) that equipment or parts thereof manufactured by it will be free from defects in material and workmanship only, under normal use and service, for a period of one (1) year from the original shipment date. The Company shall not be liable for any loss of profit, loss by reason of plant shutdown, non-operation or increased cost of operation, loss product or materials, or other special or consequential loss or damages. This warranty will not apply to any equipment (or parts thereof), which has been subjected to accident, alteration, abuse or misuse. This warranty is in lieu of all other warranties, expressed or implied (including the implied warranty of merchantability and fitness) and of all other obligations or liabilities on the part of the Company, and the Company will neither assume nor authorize any other person to assume for it any other obligation or liability in connection with this equipment. In the event of a breach of warranty, our liability shall be limited to the purchase price of the part(s) that have failed.

B. RETURN OF PARTS OR EQUIPMENT TO COMPANY PLANT: Permission to return any parts or equipment must be obtained, in writing, and must be returned with transportation cost prepaid. In the event that equipment (or parts thereof) manufactured by the Company is returned to the plant, the Companies obligation will be limited to repairing or replacing parts, which upon examination are found (to the satisfaction of the Company) to be defective in either material or workmanship. No transportation will be paid by the Company unless written approval for transportation charges is given by the Company.

C. COMPONENTS NOT MANUFACTURED BY THE COMPANY: Components not manufactured by the Company, but furnished as part of its equipment (for example: Valves, controls, gauges, electrical switches or instruments, etc.) will be warranted by the Company only to the extent of the Component manufacturer's warranty.

D. REPAIR OF EQUIPMENT INSTALLED IN THE CONTINENTAL UNITED STATES: Should an in-warranty failure occur, and it is, in the judgment of the Company, impractical to return the equipment for repairs, the Company will arrange for the repairs to be made by its personnel or, at its option, sublet to a qualified company. The Customer will be expected to cooperate by making the equipment available and accessible when the work is scheduled and is expected to provide the necessary utilities. If local labor conditions prohibit such work being done by Company personnel under the conditions and at the rates payable by its contracts with its employees, the Company obligation shall be limited to supervision of the work, replacement of defective parts, and labor costs in an amount equal to the amount which would be payable for a reasonable number of hours required to make the repairs at the rates payable under the terms of Company contracts with its employees. In such event, the Customer shall pay all labor costs and the Company will reimburse them to the extent set forth above.

E. REPAIR OF EQUIPMENT INSTALLED OUTSIDE THE CONTINENTAL UNITED STATES: Should an in-warranty failure occur, and it is, in the judgment of the Company, impractical to return the equipment for repairs, the Company obligation shall be limited, and the Company shall have the options of either sending a service representative to repair (or supervise the repairs) or granting a reasonable allowance for having the repairs made locally.