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TRUXX

Gas Fired Waterbath CNG Heating & Decompression System

Operations & Maintenance Manual

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FILE: MANUAL PN 52984 REV 03-18-15 GAS FIRED WATERBATH

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WARNING

Read this OPERATION & MAINTENANCE MANUAL before operating this equipment.

- **NOTE:** Algas-SDI reserves the right to use alternate appropriate manufacturers' components. Portions of the literature contained in the Operation Manual have been supplied by vendors. Please check to be sure supplied data matches your configuration. Contact Algas-SDI if any questions exist.
- This equipment contains compressed natural gas (CNG) - a flammable fuel handled under high pressure. Inherent hazards exist and a thorough understanding of the equipment is required for safe operation and maintenance.
- Allow only **TRAINED and FULLY QUALIFIED PERSONNEL** to service this equipment.
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Special symbols are used to denote hazardous or important information. You should familiarize yourself with their meaning and take special note of the indicated information.

Please read the following explanations thoroughly.



CAUTION

This symbol indicates hazards or unsafe practices which can cause personal injury if warning is disregarded or ignored. Use care and follow the instructions given.



WARNING

This symbol indicates hazards or unsafe practices which can cause serious personal injury or death if warning is disregarded or ignored. Use care and follow the instructions given.



FLAMMABLE GAS HAZARD

This symbol indicates a potential hazard which can result in severe personal injury or death. Use extreme care and follow the instructions given.



NOTICE

Damage to parts or equipment may result if the instructions shown are disregarded or ignored.

ALGAS-SDI CONTACT INFORMATION

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WARNING

The equipment described in this manual is designed to operate with natural gas, a flammable fuel under pressure. The nature of the application involves inherent hazards that could result in injury or death. Appropriate safety procedures must be observed when installing, starting, stopping, operating, or maintaining the system.



ONLY trained and fully qualified personnel should service this equipment.

Equipment under operation is LOUD (>90dB) hearing protection is required at all times when within the equipment.



CAUTION

If not operated and maintained in accordance with the manufacturer's instructions, this product could expose you to hazards which could cause death or serious illness. Improper servicing of this equipment may create a potential hazard to equipment and operators.

Description

The TRUXX G/H is a gas fired natural gas heating and decompressing system. It accepts CNG from 150psi to 4,500 psi, heats it to counter the Joule-Thomson Effect (cooling of a gas after rapid expansion) and decompresses it to 40-80 psi and 50°F. It is a fully enclosed and packaged system including all instruments and valves necessary to complete the process safely.

To off-load the CNG from the high pressure trailers the system includes, at a minimum, two integrated decant stations. A decant station consists of the mechanisms to safely deliver the gas from the trailer to the heating and decompression skid (**JTM**).

The JTM enclosure is designed and built with adequate controls and ventilation to be classified as Class I Division 2. It is designed, constructed and tested per ASME B31.3 and NFPA 70.

Basic Features

1. Open monitor decompression regulation system to safely regulate trailer gas to distribution pressure.
2. A natural gas fired water bath CNG Heating system to heat the inlet gas.
3. Active temperature mixing to ensure distributed gas falls within an appropriate temperature range.
4. Emergency stops (E-Stops) located internally and externally. Additional E-stops, if required, may be integrated into the unit.
5. Decanting Lane status indication makes it easy to know which trailer is currently decanting (optional).
6. Hoses, couplings, and whips (if requested) provided for trailer connections.
7. Hose for trailer valve actuation (optional).
8. No external instrument gas required.
9. Low power consumption—<15A, single phase.

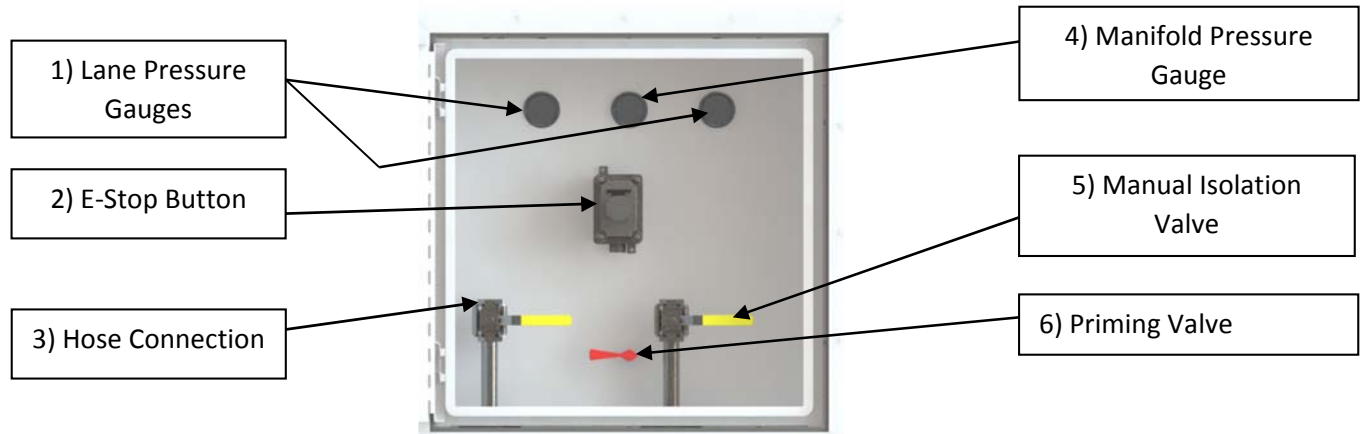
General Description of the Sequence of Operations

One trailer is decanted at a time during the decanting process. When the system calls for fuel from a decanting lane (lane one for example), the appropriate actuated lane valve opens and gas flows into the system. The gas is heated and then gas pressure is reduced from trailer pressure to an intermediate or outlet pressure by a pressure regulating valve. The intermediate pressure gas is then subjected to a second stage pressure regulator (if equipped) prior to discharge to customer's distribution piping.

The system is designed to operate with a trailer pressure of approximately 3600 psi (at a settled temperature of 60°F/15°C) which drops as gas flows. When the pressure in the trailer connected to the decanter reaches the switch-over pressure, or is unable to meet the requirements of the load, the connected trailer is deemed empty and the system switches decanting to the next trailer in the queue. At this point the decanting process for the original (low pressure) trailer terminates. It is also possible to perform a manual switch to the next trailer in queue by pressing the swap lanes button on the HMI, by pressing the currently decanting lane authorize button (if equipped), or by closing the active lane manual isolation valve.

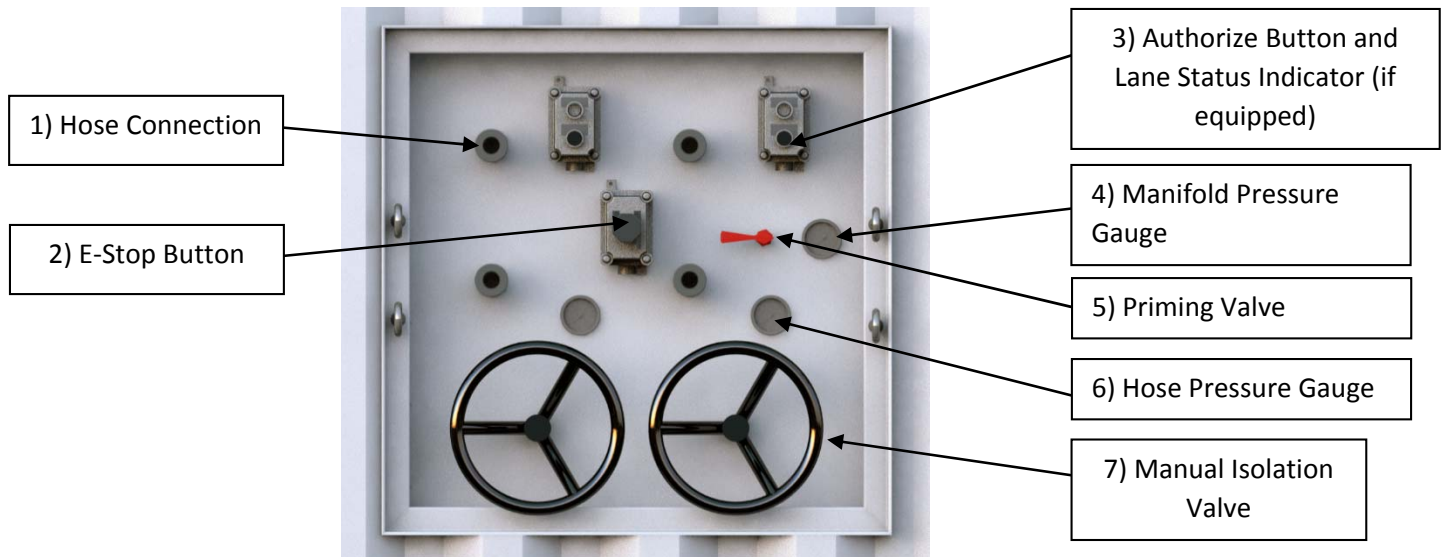
The TRUXX control system maintains a constant temperature within the waterbath heat exchanger. In extreme cases, if insufficient heat is available, the system will shut down to protect downstream piping and fuel burning equipment. Refer to the system P&ID to determine low temperature shutdown setpoints. The decanter is also equipped with a cold gas bypass valve which allows unheated gas to bypass the heater(s). This valve is used in conjunction with outlet temperature as determined by the temperature controllers to mix cold gas along with heated gas to meet the desired outlet temperature. The bypass valve is equipped with a modulating controller.

TRUXX 20G - Decant Station



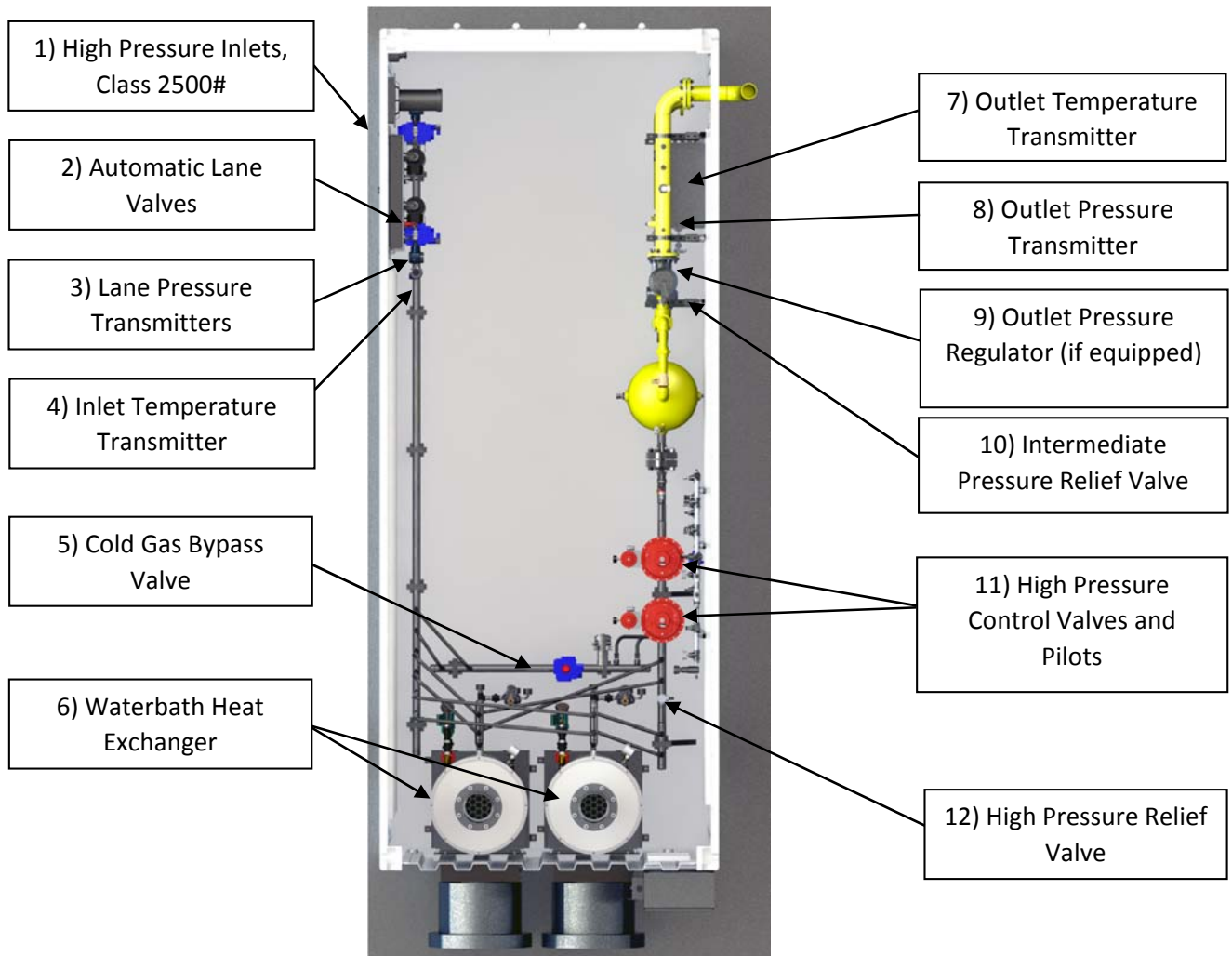
1. **Hose Pressure Gauge** – indicates pressure in the hose and up to actuated valve.
2. **Emergency Stop** – a latching button that, when pressed, shuts the entire system down.
3. **High Pressure CNG Hose Connection** – 1" NPT connections to CNG trailers.
4. **Manifold Pressure Gauge** – indicates pressure in the high pressure manifold.
5. **Manual Isolation Valve** – double blocks gas from the JTM to disconnect the trailer hose safely.
6. **Prime Valve** – spring return valve to prime system

TRUXX 40 and 75G - Decant Station



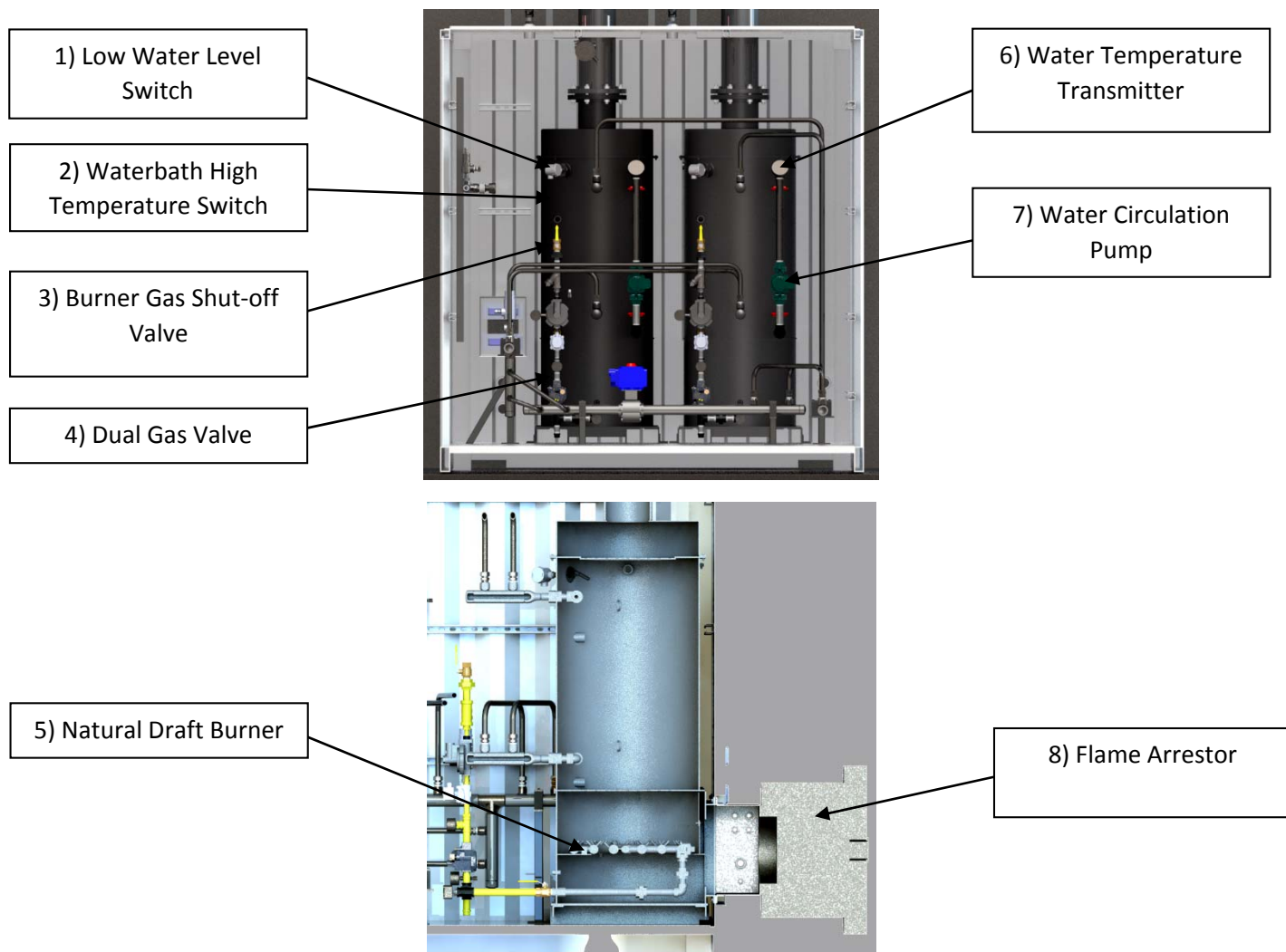
1. **High Pressure CNG Hose Connection** – 1" NPT connections to CNG trailers.
2. **Emergency Stop** – latching button that, when pressed, shuts the entire system down. Safety valves will close and burners will shut off
3. **Authorize Button** – activates lane and place into queue, indicator light to indicate status (optional).
 - Off – lane inactive
 - On – lane Queued
 - Slow Blinking – lane actively decanting
4. **Manifold pressure Gauge** – indicates pressure in the high pressure manifold.
5. **Prime Valve** – spring return valve to prime system and activate the gas powered valves.
6. **Pressure Gauge** – indicates pressure in the hose.
7. **Manual Isolation Valve** – double blocks gas from the JTM to disconnect the trailer hose safely.

JTM Module Internal Components



1. **High Pressure Inlets** – 1” NPT for each decant hose.
2. **Automatic Lane Valve** – smoothly switches between lanes automatically.
3. **Lane Pressure Transmitter** – one for each lane, to indicate pressure in the trailer.
4. **Inlet Temperature Transmitter** – used as indication, alarm and control for low temperatures that result in refrigeration that takes place in the CNG cylinders themselves as the pressure in them rapidly drops.
5. **Cold Gas Bypass Valve** – this valve is automatically modulated to allow cold, unheated gas to bypass the heater to maintain a desired outlet temperature.
6. **Waterbath Heat Exchanger** – the waterbath is a water / glycol mix that is heated by a forced draft natural gas burner. A high pressure coil is immersed in the glycol and heat is transferred through the coil to the CNG.
7. **Outlet Temperature Transmitter** – monitors outlet temperature to ensure it is to specification.
8. **Outlet Pressure Transmitter** – monitors the outlet pressure to ensure it is to specification.
9. **Final Pressure Regulator** – regulates the outlet pressure to the desired delivery pressure.
10. **Intermediate Relief Valve** – protects intermediate piping from over pressure.
11. **High Pressure Regulator** – reduces the pressure from trailer pressure to an intermediate pressure for smooth pressure control. Features a wide open monitor configuration to protect downstream piping.
12. **High Pressure Relief Valve** – protects the high pressure piping from overpressure due to trapped gas heated by heater.

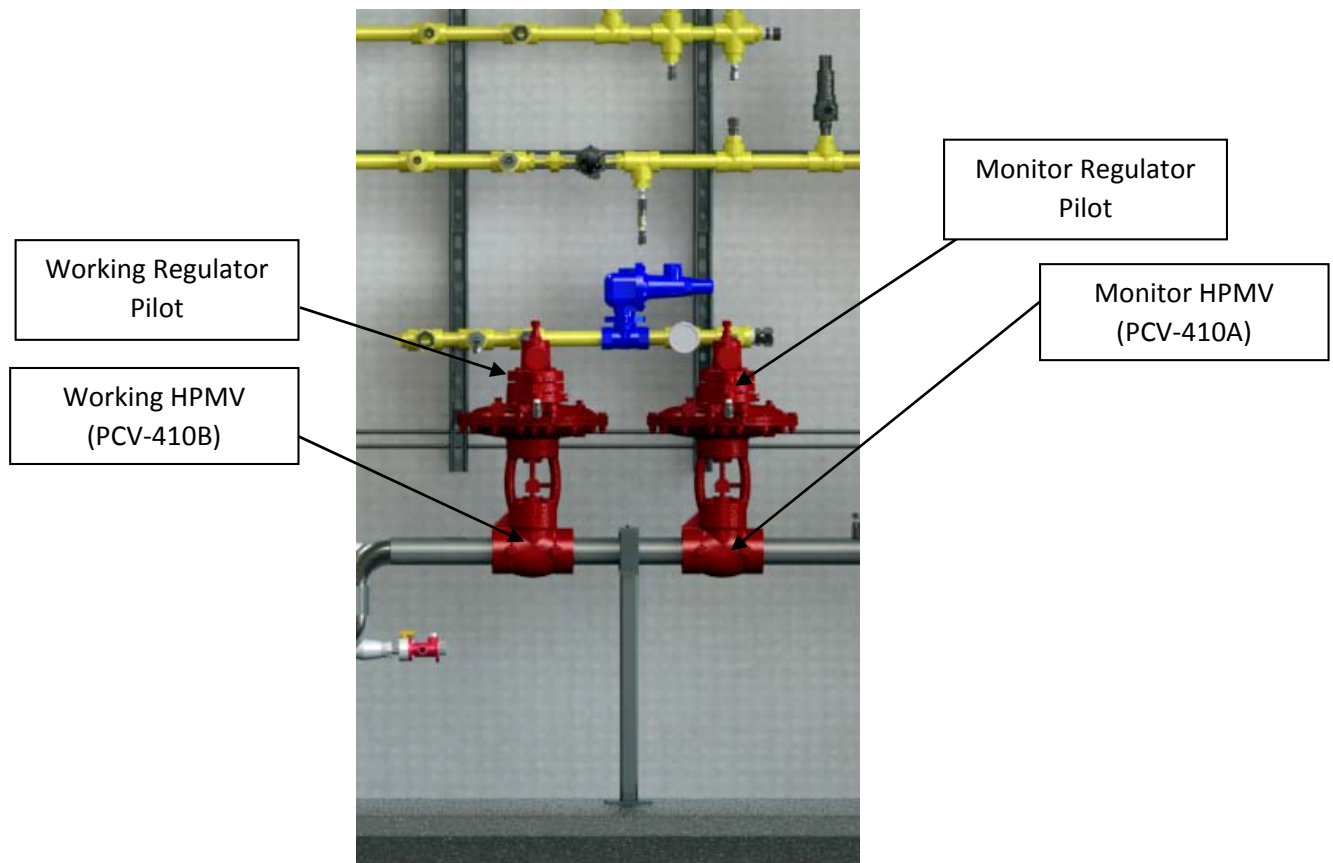
Waterbath Components



1. **Low Water Level Switch** – part of the boiler safeties. Used to shut down the burner if the water level drops below the switch.
2. **Waterbath High Temperature Switch** – part of the boiler safeties. Used to shut down the burner in the event the water gets too hot.
3. **Burner Gas Shut-off Valve** – manually shuts-off gas flow to burner.
4. **Gas Valve** – an automatic valve with double block
5. **Natural Draft Burner** – natural gas fired burner to heat water.
6. **Water Temperature Transmitter** – used for controlling the burner on and off points.
7. **Water Circulation Pump (if equipped)** – circulates hot water to keep a uniform bath temperature.
8. **Flame Arrestor** – protects the classified area from a burner flash back

Decompression Valve Pressure Adjustment

The decompression valve system is located just upstream of the buffer tank and can be easily identified by the large diaphragm cases on top of each valve. They are each controlled via a pressure pilot mounted on top of each diaphragm case. The system works by sensing the pressure within the buffer tank and adjusting the opening inside each valve to either increase or decrease the amount of gas allowed through the valve. The two decompression valves must be set with a differential greater than 50psig between them. The decompression valve system is comprised of two main components; shown below:

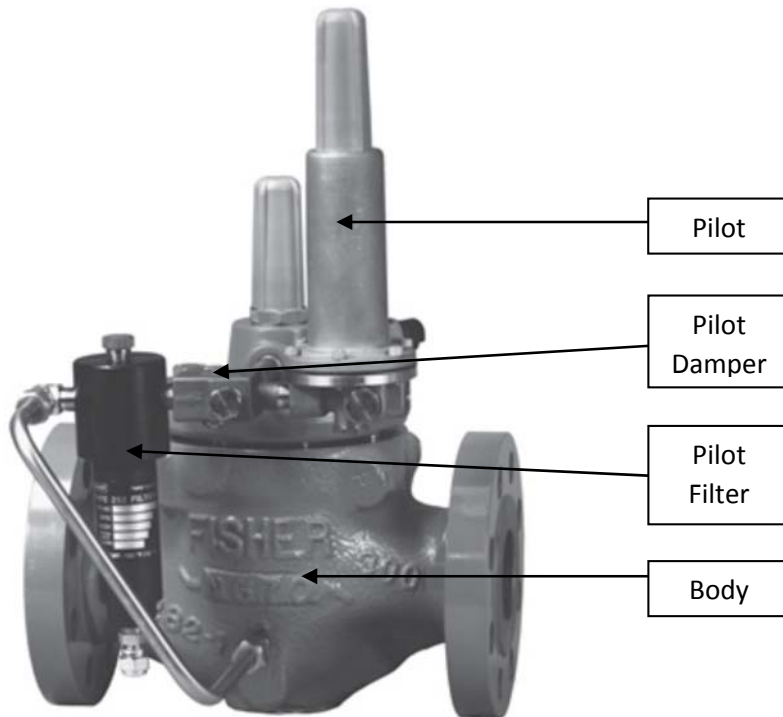


To adjust the outlet pressure regulator:

1. Loosen the pilot adjustment locknut.
2. Turn the pilot adjustment Clockwise (CW) to increase pressure. Turn the pilot adjustment Counter-Clockwise (CCW) to decrease pressure.
3. Tighten the pilot adjustment locknut.

Outlet Regulator Pressure Adjustment Procedure (if equipped)

The outlet pressure regulator is located downstream of the buffer tank, just prior to the discharge piping on the skid. There are four major components to the outlet pressure regulator; shown below:

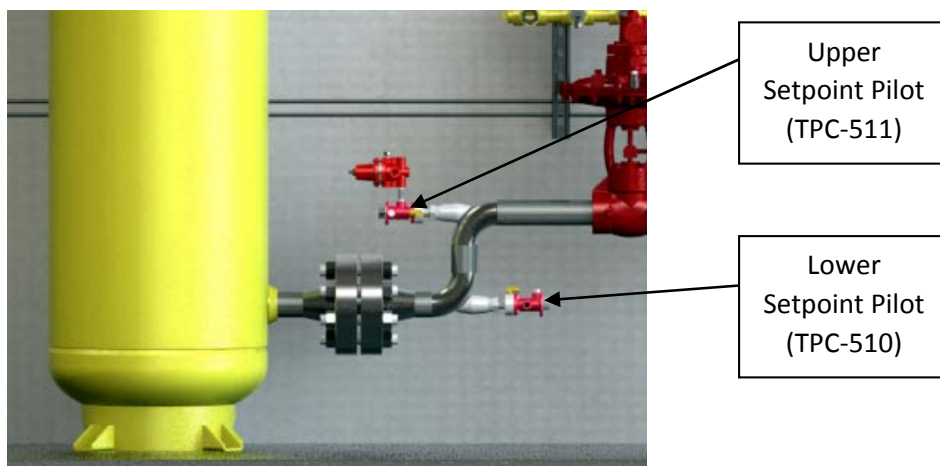


To adjust the outlet pressure regulator:

4. Remove the pilot adjustment cap
5. Loosen the pilot adjustment locknut
6. Turn the pilot adjustment Clockwise (CW) to increase pressure. Turn the pilot adjustment Counter-Clockwise (CCW) to decrease pressure.
7. Tighten the pilot adjustment locknut
8. Re-install the pilot adjustment cap

Outlet Temperature Adjustment

The temperature control system consists of two temperature pilots and an actuated valve. The temperature control pilots set the system high and low setpoints, modulating the actuated valve in order to achieve a stable outlet temperature.

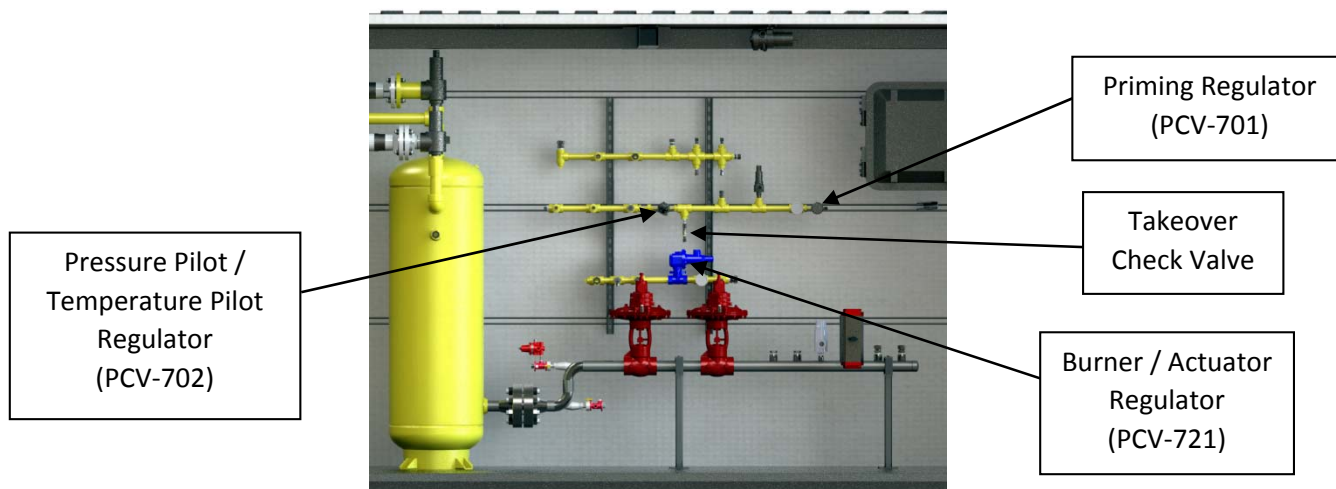


To set the outlet temperature:

1. Locate the temperature setpoint dial on the pilot
2. Set the high temperature pilot to 10°F above the desired outlet temperature
3. Set the low temperature pilot to 10°F below the desired outlet temperature
4. Allow the system to run and stabilize – then make small adjustments to the high and low temperature pilots in no more than 5°F increments until the desired outlet temperature is achieved.

Instrument Gas Pressure Regulator Adjustment

The instrument gas system consists of three separate regulators that accept both upstream and downstream pressure. The regulators then feed the burner(s), inlet valve actuators, temperature control pilots, and pressure control pilots. The Priming regulator is only used during cold startup of the unit, providing instrument gas pressure when there is an absence of downstream pressure. Once the priming regulator has fed instrument gas into the system and the decompression valves have introduced enough pressure downstream, the takeover check valve allows downstream gas to flow into the instrument gas system and the priming regulator closes. The instrument gas has two different pressure sections: Pilot and Actuator/Burner. The Pilot system regulator is set to 40psig. The Actuator/Burner system regulator is set to 50psig (TRUXX 20G and 40G) or 80psig (TRUXX 75G).



To adjust the Burner/Actuator pressure regulator:

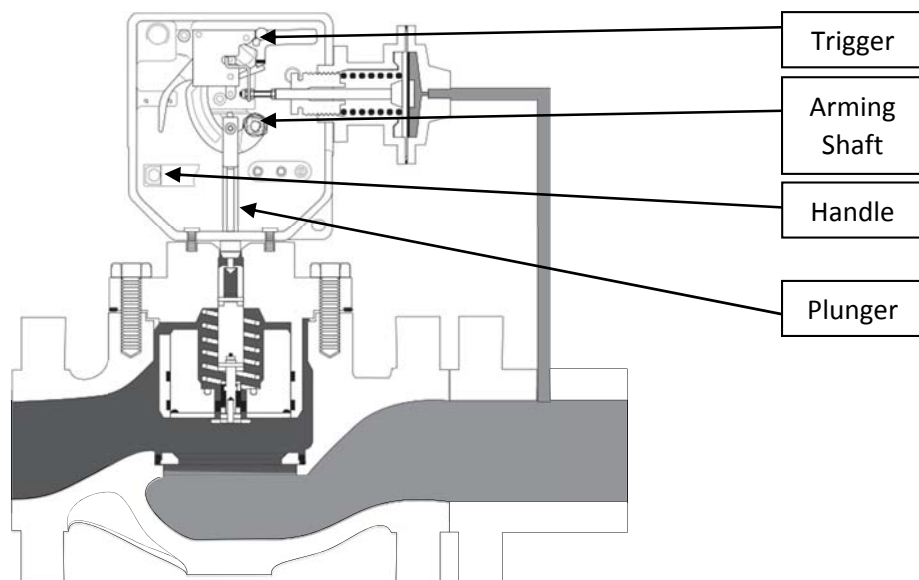
1. Remove the pilot adjustment cap
2. Loosen the pilot adjustment locknut
3. Turn the pilot adjustment Clockwise (CW) to increase pressure. Turn the pilot adjustment counter-clockwise (CCW) to decrease pressure.
4. Tighten the pilot adjustment locknut
5. Re-install the pilot adjustment cap

To adjust the Pressure Pilot/Temperature Pilot pressure regulator:

1. Loosen the pilot adjustment locknut
2. Turn the pilot adjustment Clockwise (CW) to increase pressure. Turn the pilot adjustment counter-clockwise (CCW) to decrease pressure.
3. Tighten the pilot adjustment locknut

Resetting the Slam Shut Valve (if equipped)

The slam shut valve is located just upstream of the second stage regulator (if equipped).



To reset the slam shut:

1. Remove the cover from the front of the slam shut
2. Remove the handle stored inside the trigger housing
3. Place the handle on the arming shaft
4. Rotate the handle so the arming shaft allows the main plunger to open (CW rotation)
5. Reset the trigger (located on the top right inside the cover)
6. The slam shut valve is reset when gas flows freely through the valve and the trigger stays armed

NOTICE:

The procedures contained below are intended only to assist the owner of TRUXX decanting systems in developing their operational procedures to operate the decanting system in a safe and effective manner. The owner of the system is ultimately responsible for ensuring the safe operation and maintenance of the TRUXX system. It is recommended that all operators of the system obtain training from qualified individuals on the proper use of the system prior to use.

Starting the System

Cold Start (less than 50 PSIG inside system, waterbath can be cold or hot, assumes trailer and electrical connections are properly attached to equipment)

1. Close outlet valve on skid or field piping.
2. Reset the E-Stop system. (If required)
3. Open manual isolation valve on attached trailer and equipment lane.
4. Prime system by holding down Priming Valve. The manifold pressure should be at least 500psig before proceeding.
5. Start the system from the main screen on the HMI.
6. Authorize a trailer. (If required)
7. Wait for system manifold pressure to come up to trailer pressure.
8. Allow the waterbath to heat up to setpoint. The System Ready pilot light will turn green on the main screen once the waterbath temperature has risen above 130°F.
9. System is now active.
10. Open outlet valve on skid or field piping.

Warm Start (over 50 PSIG inside system, waterbath hot, assumes trailer and electrical connections are properly attached to equipment)

1. Reset the E-Stop system.
2. Clear any active alarms on the alarm screen.
3. Start the system from the main screen on the HMI.
4. Authorize a trailer if none is already authorized.

Initial Startup/Regulator Setup (under 50 PSIG inside system, waterbath cold, no or unknown set points on any pressure regulator, assumes trailer and electrical connections are properly attached to equipment)

1. Verify that all pressure regulator adjustment screws are backed OUT (set point to 0 PSIG).
2. Close outlet valve on skid or field piping.
3. Reset the E-Stop system.
4. Clear any active alarms on the alarm screen.
5. Open manual isolation valve on attached trailer and equipment lane.
6. Prime gas into the high pressure manifold.
7. Slowly adjust Priming Regulator (PCV-701) to 40-50 PSIG.
8. Slowly adjust Pressure Pilot/Temperature Pilot Regulator (PCV-702) to 30 PSIG.
9. Slowly adjust Burner/Actuator regulator (PCV-721) to 10 PSIG above Priming Regulator, PCV-701
10. Authorize trailer into system. (Start System)
11. Adjust Working Regulator Pilot screw (downstream, PCV-410B) roughly half way in. The HPMV will rise to full open but no gas should be distributed through the system as the Monitor Regulator (upstream, PCV-410A) should still be closed.
12. Very slow adjust Monitor Regulator (PCV-410A) to desired set point. Keep in mind the monitor regulator set point must be above the working regulator set point. At no point during this adjustment should the downstream HPMV being to close. If it does turn in the pilot adjustment screw on the Working Regulator Pilot.
13. Back the Working Regulator Pilot all the way out. The HPMV should close completely.
14. Bleed out outlet/intermediate pressure until the line pressure is below desired operational pressure.
15. Slowly adjust Working Regulator Pilot (PCV-410B) to desired set point.
16. Set burner regulator (PCV-320) to desired set point.
17. Set temperature controllers to desired set points.
18. The pilot gas line may need to be purged several times before reliable ignition can be achieved. This is handled by pressing START several times on the HMI following a burner failure after startup.
19. All set points are complete and if the burner has been purged then the system is active. Follow Cold Start Procedure from Step 7.

Connecting a Trailer to System

1. Connect the Vehicle Grounding System and trailer gas hose to a full trailer from the decanting station.
2. Open the manual isolation valve on the front panel of the JTM.
3. If Equipped - Press and hold the Decant Authorization button for 5 seconds. This will authorize the lane and place it into the first in, first out queue. The white indicator light will turn on solid if the lane is authorized but not decanting, and blink if it is authorized and actively decanting.

Switching Trailers in the System

1. With two trailers connected and authorized, press either decant authorize button (if equipped) or the SWAP LANES button on the HMI. This will open the next to decant trailer's actuated lane valve and close the current decant trailer's actuated valve.
2. The white light indicating queued or decanting should be off, and not illuminated, indicating the lane is not authorized.
3. Properly disconnect the trailer using the *"Disconnecting a Trailer from the System"* sequence below.

Disconnecting a Trailer from the System

1. Check the pressure indicator at the decanting station and verify that the trailer is at switch-over pressure. The white light indicating queued or decanting should not be illuminated.
2. Open the trailer blowdown valve slowly to bleed off the excess pressure in the equipment manifold, trailer manifold and hose(s).
3. Close the manual isolation valve at the decant post and all manual valves on trailer upstream of trailer manifold.
4. Disconnect the trailer pressure and replace protective cap after ensuring it is clear of any debris (if included in the system).
5. Disconnect the decant hose, whip socks and grounding cable.

System Shutdown

1. Shut off all manual lane valves.
2. The system will automatically shut down each trailer at switchover pressure as set on HMI.
3. Disable system on main screen.
4. Bleed down all gas within the system. See *System Bleed-Down Procedure*.

E-stop Reset

The E-stop buttons are located both inside the unit on the control panel and outside on the decant station. To reset the E-stop system, first check that all E-stop buttons are pulled out, and then depress the E-stop reset button, located on the exterior electrical box or interior electrical control panel. The HMI will indicate that the E-stop Tripped alarm is cleared when the system has been reset.

Operation of Block and Bleed Valves

Block and bleeds are located between each pressure indicator and transmitter. The purpose of block and bleeds is to allow for the maintenance and calibration of the various transmitters and gauges as well as providing a test point as needed. It is also possible to close the block and then bleed all remaining pressure via the bleed valve.

System Bleed-Down Procedure

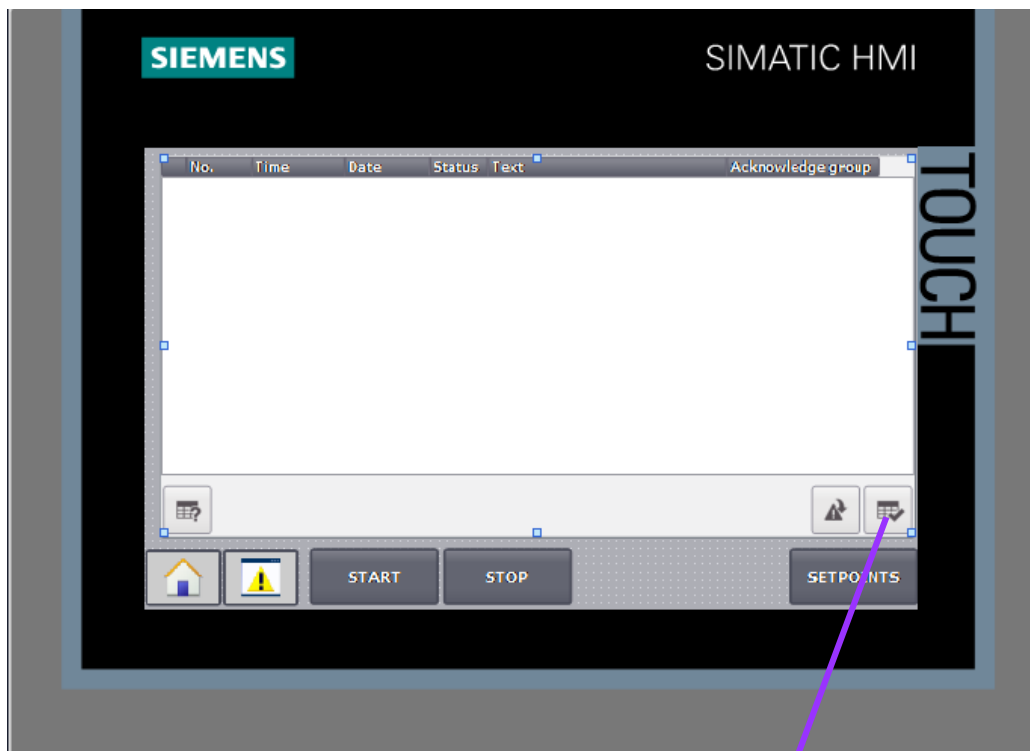
Blowdown equipment manifold and hoses via trailer blowdown. Close all trailer lane manual isolation valves and place appropriate maintenance locks on valves. Open ball valve underneath expansion tank to vent low/intermediate pressure piping. As this is opened the high pressure regulators will continue to decompress any pressure within the high pressure piping. Open the block and bleed valve for the last pressure transmitter in the line (process gas pressure transmitter) to bleed all remaining pressure from the system. After that has been completed, the system will be safe for performing maintenance. Refer to the system P&ID for the correct valve.

Human-Machine Interface (HMI) Panel

The HMI panel allows control of the TRUXX system through an intuitive touch screen. The operation of the TRUXX system is automated via Programmable Logic Controller (PLC), though certain operating parameters and setpoints of the system can be manually controlled from the HMI screens. There is a row of soft buttons along the bottom of the HMI screens that allow navigation between HMI screens.

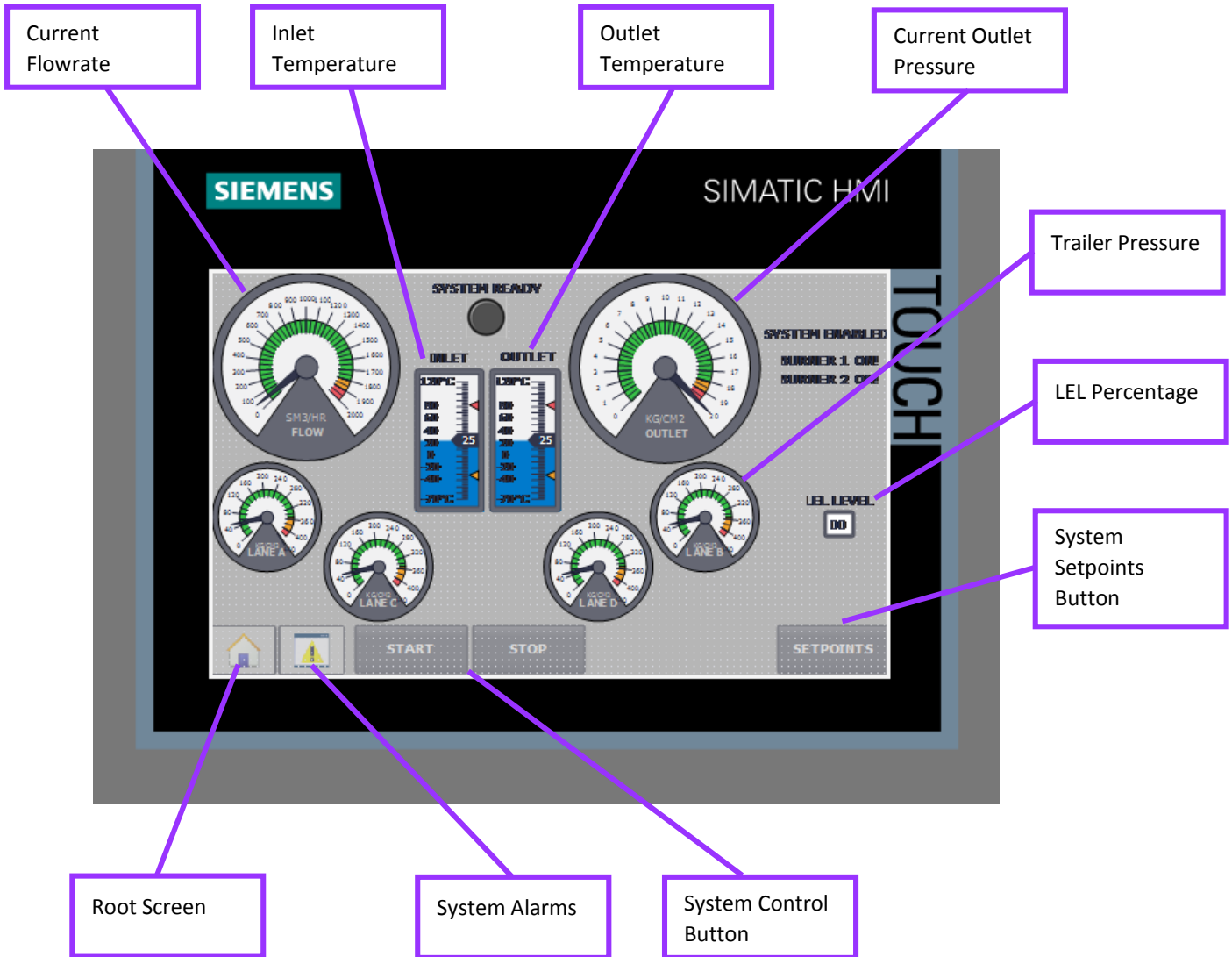
Alarms Screen

The Alarms screen gives a history of activated and subsequently acknowledged alarms. The letter I in front of the alarm indicates an incoming alarm. The letters IA indicates an incoming, acknowledged alarm.



Acknowledge
Alarm Button

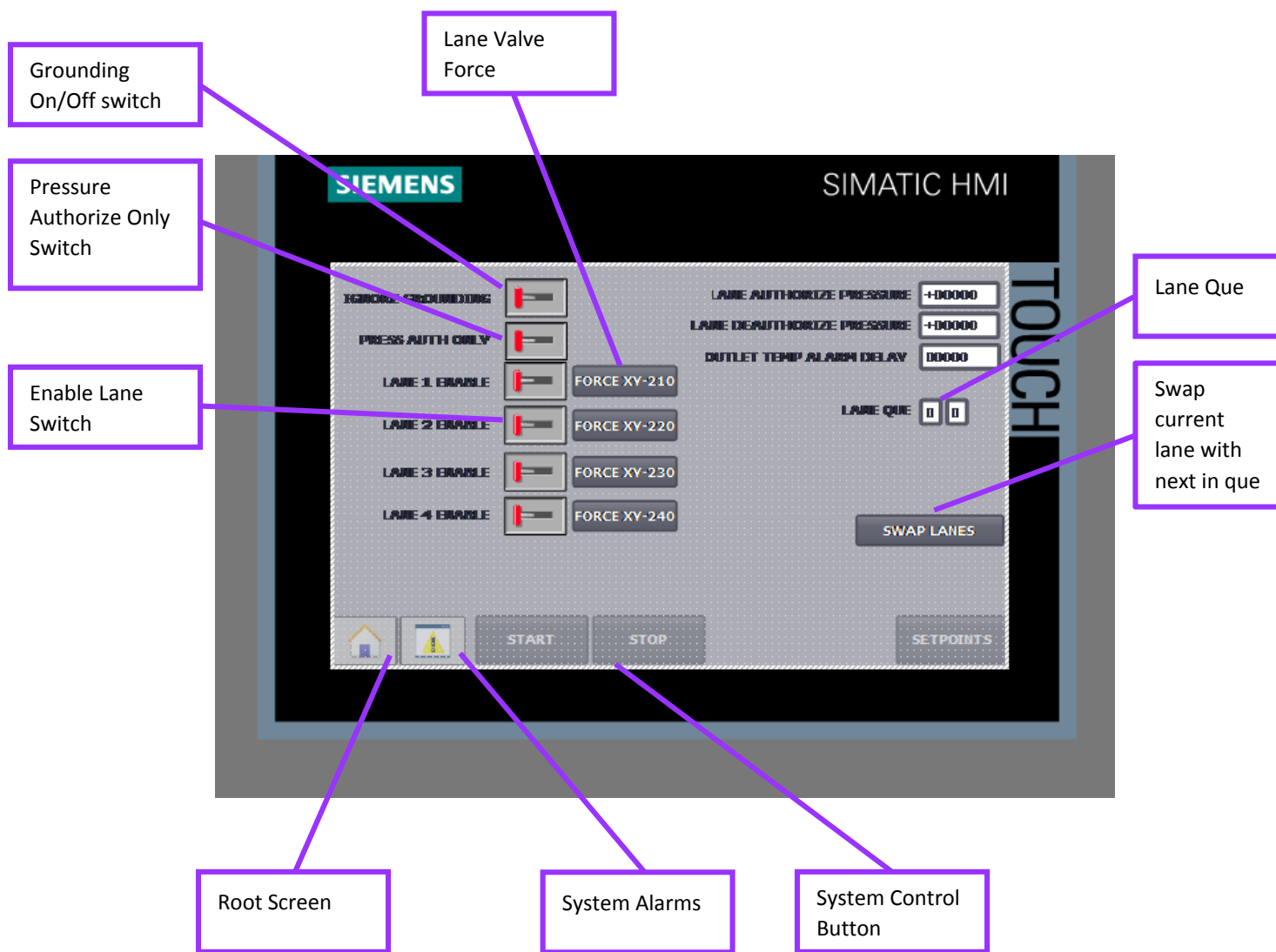
Main Screen



Decant Station Screen

The Decant station screen covers the control for all system decants. These screens give information regarding the setup of all the decant stations. The decant station control screen allows the user to configure the system with the following features and setpoints:

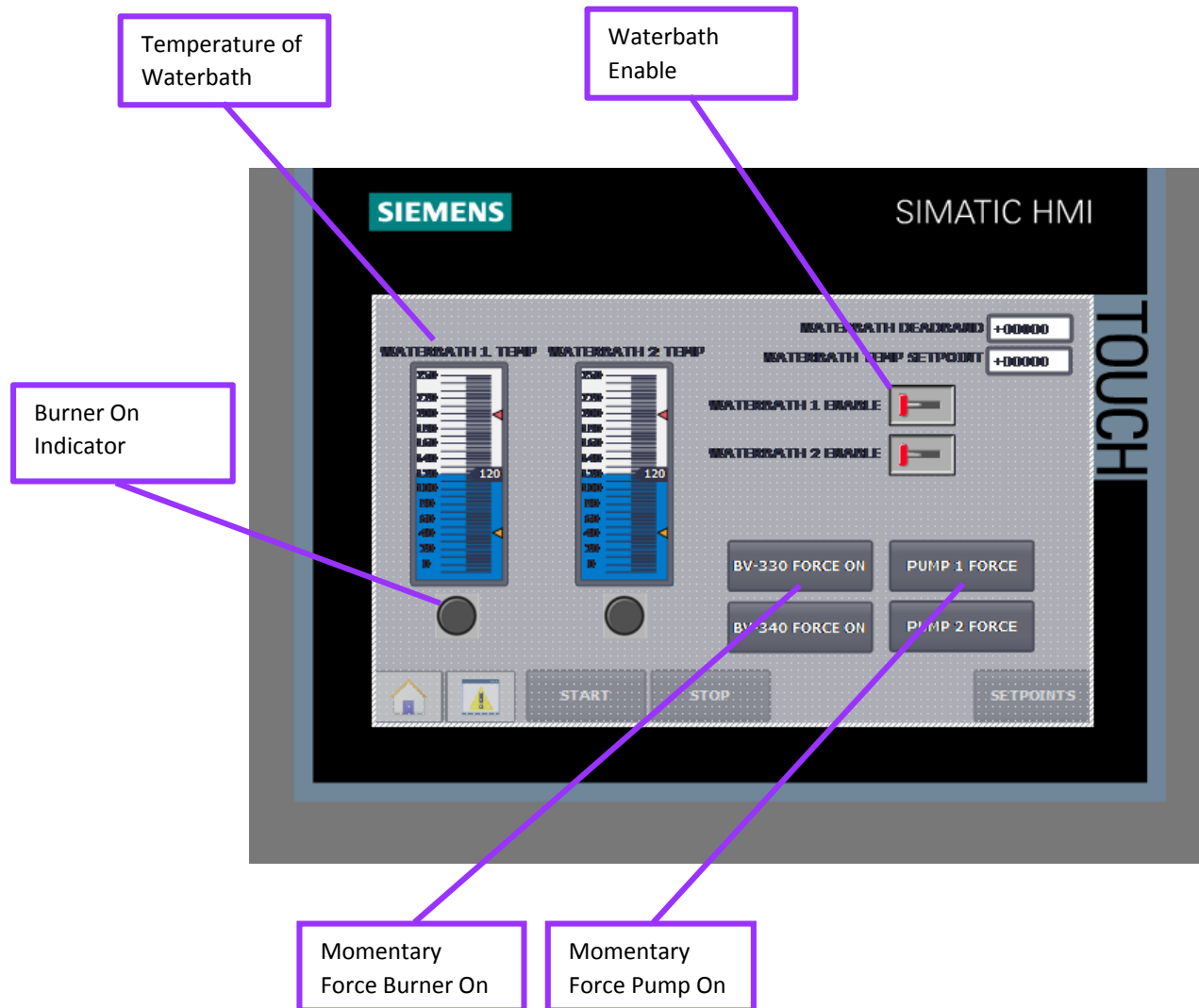
1. Ignore Grounding – The user can choose to ignore permissive grounding as a pre-requisite for allowing a trailer to authorize
2. Press Auth Only – The user can choose to ignore the authorize buttons (if equipped) and authorize a trailer into Queue based purely on inlet pressure.
3. Enable lane – This allows the user to enable or disable lanes as desired. This only removes the ability to use the lane and does not remove the alarm monitoring of the lane.
4. Lane Authorize Pressure – This is the pressure at which a lane must achieve prior to authorization
5. Lane De-authorization Pressure – This is the pressure at which the lane must go below in order to be considered empty.
6. Outlet Temp Alarm Delay – This is the amount of time that the low temperature alarm on the outlet will be ignored. This allows the system to be started in cold temperatures that would otherwise shut the system down.
7. Lane Queue – This is the order in which the trailers will decant.



Waterbath (Heat Exchanger) Screen

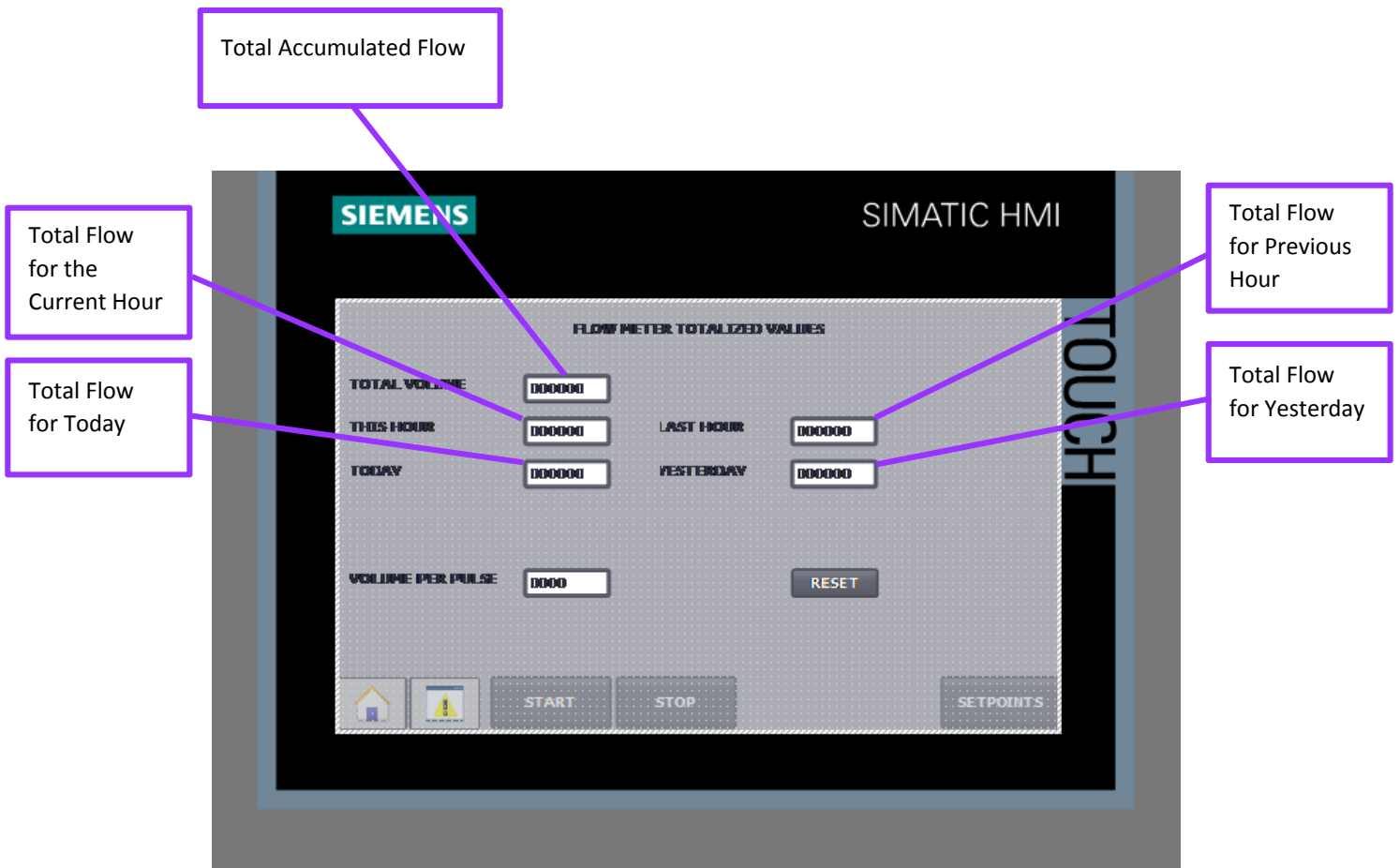
The Waterbath screen allows the enabling of individual waterbath heaters. This screen is also used to give the temperature of the waterbath(s). If there is a second heater, it will be located next to the first one on this screen (i.e. there will be two heaters on the screen). The Waterbath screen allows the user to configure the system with the following features and setpoints:

1. Waterbath temperature – This is the current waterbath temperature.
2. Waterbath enable – This allows the user to disable a waterbath
3. Burner On indicator – This will change from grey to red when a burner is active
4. BV Force – This is a momentary pushbutton that allows the user to over-ride the system and force a burner on for troubleshooting purposes.
5. Pump Force – This is a momentary pushbutton that allows the user to over-ride the system and force a pump on for troubleshooting purposes.
6. Waterbath Setpoint – This is the temperature that the system will turn the waterbath off.
7. Waterbath Deadband – This is the difference between the on and off setpoint of the waterbath heat control. This will be the temperature at which the waterbath will turn on.



Totalizer

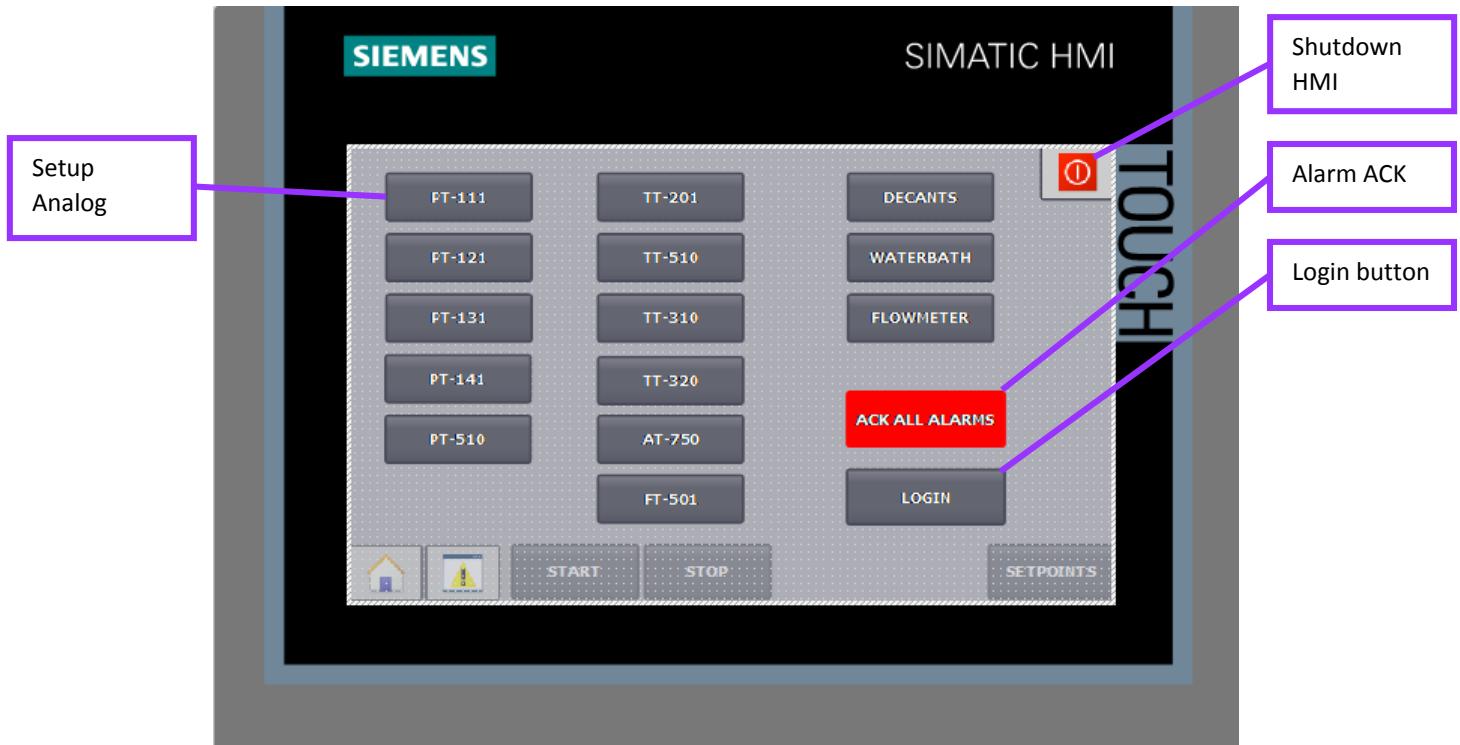
The Flow Control Screen gives information on the flow of the process gas to the customer. This information includes the total for today, total for yesterday, total for this hour, and total for last hour. This screen also includes setpoints for the flowmeter volume per pulse and the ability to reset the totalized values.



Setup Screens

The Setup Screens allow the customer to see the various system set points and make any changes or modifications to those set points. The Setup Screens should be password protected to prevent accidental tampering. The setup screen allows the user to access all of the system configuration options and setpoints.

Setpoints Screen



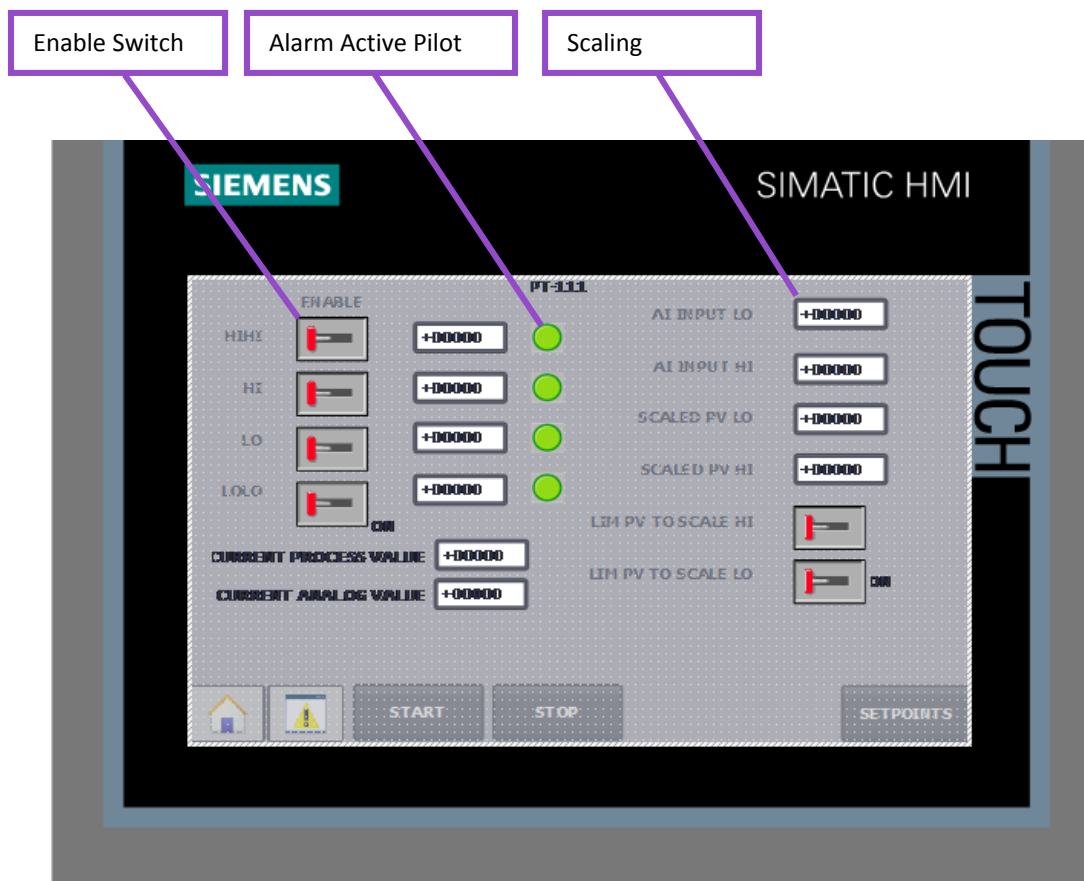
Setup Screen

The analog setup screen allows the user to configure the analog input scaling and alarming on an individual basis. The system uses the following convention for all analog input alarms:

1. HHI – This is the upper shutdown threshold
2. HI – This is the upper warning threshold
3. LO – This is the lower warning threshold
4. LLO – This is the lower shutdown threshold

The following configuration and setpoints are available for every transmitter:

1. Alarm Enable – This allows the user to configure which alarming is actively monitored for a given input.
2. Alarm Setpoint – This is the Process Value which triggers the alarm
3. Alarm Active pilot – This is a visual indication of which alarm is triggered
4. AI input Lo – This is the true low milliamps of the incoming signal
5. AI input Hi – This is the true high milliamps of the incoming signal
6. Scaled PV LO – This is the lower bound for scaling the analog input into engineering units
7. Scaled PV HI – This is the upper bound for scaling the analog input into engineering units
8. Lim PV to Scale HI – This allows the user to limit the process value to the upper PV limit if the analog input goes over range
9. Lim PV to Scale LO – This allows the user to limit the process value to the lower PV limit if the analog input goes under range
10. Current Process Value – This is the current process value in engineering units
11. Current Analog Value – This is the raw analog in value in counts (between 0 and 27,648 counts)



Burner and Flame Safeguard Systems

Typical Burner Operation Sequence

Safety pilot solenoid valve

Ignition transformer

Safety solenoid valves

The burner controls utilize an ON-OFF fire sequence where the burner fires at high-fire until the setpoint is reached, then turns off. If the water temperature falls to the burner start setpoint it will go back to high fire.

Burner

The burner is a multiple jet nozzle mix atmospheric burner. The only burner adjustment to be made is gas input, which is accomplished by adjusting the pressure regulator to achieve correct input pressure at the burner.

Burner REGULATOR Adjustment

The burner regulator was set at the factory and adjustment of the gas pressure/flow rate to the burner should not be necessary. If an adjustment must be made, check the Data Sheet for the Burner Head Pressure settings. The regulators are set when the burner is running.

The regulator pressure can be set by looking at the gauge right before it goes into the waterbath. Adjust the regulator until the Burner Head Pressure measured on the gauge is the same as the value on the Data Sheet.

- Remove the cap or bonnet from the regulator to gain access to the adjustment screw or button.
- Turn the screw clockwise to increase the pressure and counter-clockwise to decrease the pressure.
- Adjust the regulator to achieve the desired burner pressure on the Data Sheet.
- Reinstall the cap or bonnet after the regulator is adjusted.

FLAME MANAGEMENT SYSTEM

Every waterbath heater contains a flame safeguard monitoring system. The flame safeguard controller and the flame rod control the burner's startup operation. LEDs on the flame safeguard show the current operating status.

FLAME SAFEGUARD LED INDICATOR LIGHT

1. The LEDs on the flame safeguard indicate the following:
2. **FLAME SAFEGUARD CONTROL.** If there is an ignition failure or a safety shutdown the flame safeguard shuts down the burner and activates an alarm.

LED	FUNCTION
Steady:	Illuminates when power is on and there is call for heat.
Flashing:	Flashes when there is flame or sequence failure

Waterbath Circulation System (if equipped)

Waterbath

The waterbath is normally a mixture of water and glycol in varying mixture ratios plus corrosion inhibiting additives. It is vented to the atmosphere, so corrosion protection is very important. Glycol is used for freeze protection, but will also lessen the amount of makeup water required due to its lower evaporation rate. For maintenance ***See the appropriate pump/motor in Appendix, Component Information.***

Water Train

The water train is composed of a pump and piping to circulate the waterbath solution and maintain a constant overall temperature. Circulation also increases heat transfer by the scrubbing action on the heat exchanger. The water pump is very important to the overall effectiveness of the unit and should be maintained properly.



WARNING

The equipment described in this manual is designed to operate with natural gas, a flammable fuel under pressure. The nature of the application involves inherent hazards that could result in injury or death. Appropriate safety procedures must be observed when installing, starting, stopping, operating, or maintaining the system.

ONLY trained and fully qualified personnel should service this equipment.



CAUTION

If not operated and maintained in accordance with the manufacturer's instructions, this product could expose you to hazards which could cause death or serious illness. Improper servicing of this equipment may create a potential hazard to equipment and operators.

NOTICE

NOTICE

Electrical wiring terminals may become loose during shipping. Prior to applying electrical power, all power wiring terminals should be checked and retightened as required. Recheck terminals and tighten as necessary after the first month in operation.

The installation configuration of the TRUXX system requires the following:

- Inspect all equipment for shipping damage prior to installation. If there is any shipping damage, please contact Algas-SDI and the shipping company to report the damage. Algas-SDI will assist to the best of our ability with replacement or repairs to any damaged components.
- Securely anchor the JTM and any remote decant module(s) to an appropriate concrete pad or suitable chassis. Protect all equipment from moving vehicles with suitable barriers.
- Consult state, provincial, insurance carriers, and local authorities for any installation requirements prior to installing the unit.
- Clean all foreign material from all pipe lines prior to making final connections. All joints require a pipe sealant suitable for CNG. Test for leaks using an inert gas, such as carbon dioxide or nitrogen, as appropriate per ASME B31.3.
- Check all connections using an appropriate leak detection solution or device. Even small leaks are unacceptable! ELIMINATE ALL LEAKS PRIOR TO OPERATION!

Waterbath Freeze and Corrosion Protection

The G/H Series TRUXX is an open system waterbath heater, meaning it is vented into the atmosphere and requires a little greater corrosion protection than closed systems. This is accomplished by increasing the percentage of corrosion inhibitor from manufacturer recommendations, which are normally for closed systems.



NOTE

The G/H series TRUXX system must have corrosion inhibitors added to the waterbath solution.

Choosing a Glycol Product

ETHYLENE or *PROPYLENE GLYCOL*, either in pure form or in one of the Dow products lower the freezing point and raise the boiling point of the coolant solution. Ethylene glycol products provide better heat transfer and pumping characteristics than propylene glycol products because of their lower viscosity. However, in applications where toxicity is a concern, propylene glycol is preferred because of its low acute toxicity versus moderate toxicity of ethylene glycol products.

Waterbath Fill Level

The Cold Fill Line on the sight gauge is for filling at 60°F (15.6°C). However, the waterbath will only vary 1/2 inch to 3/4 inch below the fill line from 60°F (15.6°C) to -20°F (-28.9°C) and a total of 2 inches to 2 1/2 inches from -20°F (-28.9°C) to 170°F (76.7°C). Because of this, for the initial fill we recommend filling to the Cold Fill Line regardless of the temperature. The waterbath level will then be 1 to 2 inches above the fill line at operating temperature.

Recommended Waterbath Treatment Specification

The recommendations below are for corrosion and freeze protection when required. To contact manufacturers, **See Ordering Information in this chapter.**

- **DOWTHERM SR-1** and water
- **DOWTHERM 4000** and water
- **DOWFROST** and water
- **DOWFROST HD** and water
- Water and **CH20 HYDRO-TREAT**, product #6435
- Pure **ETHYLENE GLYCOL** and **WATER** with **CH20 HYDRO-TREAT**, product #6435
- Pure **PROPYLENE GLYCOL** and **WATER** with **CH20 HYDRO-TREAT**, product #6435

See Calculating Freeze and Corrosion Protection to determine proper amounts of product for protection. Never use pure ethylene or propylene glycol without a corrosion inhibitor. Glycol breaks down under use to form acidic end products which will cause major corrosion to occur. Dow products and CH20's HYDRO-TREAT have chemicals in them to neutralize these acids.

Also, never use pure water without a corrosion inhibitor. Oxygen and other gases will readily dissolve in water greatly accelerating corrosion. An inhibitor forms a layer, only molecules thick, on the metal surface to protect it from the corrosive effect of dissolved gases.

Calculating Freeze and Corrosion Protection

Freeze Protection

To calculate gallons of pure glycol or Dow products to add for freeze protection:

- Determine freeze protection required. This should be at least 5°F (-15°C) below the lowest ambient temperature or lowest temperature the waterbath will reach.
- Determine the % volume of anti-freeze product required in final mix for chosen product from Table #1.
- Determine total waterbath gallons required from data sheet.
- Multiply the total waterbath gallons by % volume/100 to determine gallons of anti-freeze product required.

EXAMPLE:

-10°F (15°C) is the lowest operating temperature for a waterbath using **DOWTHERM SR-1** product for freeze protection (for this example we are using total coolant gallons of 221):

- Freeze protection required: -15 °F (-26.1°C)
- Percent volume DOWTHERM SR-1 required at -15 °F (-26.1°C): PV = 43.2%
- (See Table # 1)
- Total Coolant Gallons for waterbath: TCG=221
- (See data sheet)
- Gallons DOWTHERM SR-1 required: GALSR-1
- $TCG \times PV = GALSR-1$
- $221 \times 0.432 = 95.5$ (+125.5 gallons of water)

Recommended Water Specification

Distilled or de-ionized water is recommended for both initial fill and make up due to evaporation. Tap water should not be used because of undesirable dissolved solids and gases present, which can interfere with corrosion inhibitor effectiveness and increase inhibitor depletion rate. If distilled or de-ionized water is not available, water quality should meet minimum quality requirements below.

Chlorides	25 PPM (max)
Sulfates	25 PPM (max)
Calcium	50 PPM (max)
Magnesium	50 PPM (max)

- Total amount of above constituents should not exceed 100 PPM.

Corrosion Protection

Corrosion is an electrochemical process that occurs naturally in all metal objects. In order for corrosion to take place, there must be a positively charged area, known as an anode and a negatively charged area known as a cathode, a path for ionic current flow known as an electrolyte, and a path for electronic current flow which is the metal. The difference in electrical potential between the anode and the cathode when an electrolyte is present creates a galvanic cell, and current flow is induced.

Waterbath heaters contain all of the ingredients for metallic corrosion. In order to minimize this corrosion, certain steps must be taken. Grounding the heater skid and adding a rust inhibiting antifreeze and/or rust inhibitor to the waterbath will help minimize this corrosion. Grounding can be accomplished by attaching the heater skid to a grounding rod, using a 4 AWG or larger stranded copper wire.

Freeze protection that requires less than 50%, by volume, of **DOWTHERM** or **DOWFROST** will need inhibitor adjustment equivalent to a 50/50 mix. Contact Dow for further information on inhibitor adjustment.

When using pure glycol/water mix or 100% water, use data sheet to determine the required amount of **CH20 HYDRO-TREAT** to add.



NOTE

IMPORTANT! Components can be added in any order, however it is strongly recommended that the system be run at operating temperature for 24 hours to insure effectiveness of the inhibitors.

NOTE

Refer to Waterbath Maintenance in Section 6 for addition information.

- An **ELECTRICAL GROUND** must be connected to the container. The container must be grounded using 4 gauge wire or larger to a grounding rod to minimize galvanic corrosion.

- **Table 1 – Pure Glycol and Dow Products**

FREEZE POINT (F)	BOILING POINT (F)	% VOL ETHYLENE GLYCOL.	%VOL DOWTHERM SR-1	%VOL DOWTHERM 4000	FREEZE POINT (F)	BOILING POINT (F)	% VOL. PROPYLENE GLYCOL	%VOL. DOWFROST	%VOL. DOWFROST HD
32	212	0	0	0	32	212	0	0	0
25	214	10.3	12.7	13.2	25	212	11.3	11.8	12
20	215	15.9	16.8	17.3	20	213	18.3	19.2	19.5
15	217	21.1	21.9	22.6	15	215	24	25.2	25.6
10	218	24.5	26.2	27.1	10	216	28.7	30	29.8
5	220	28.3	30.5	31.4	5	217	32.6	34.1	34.7
0	221	32.8	34	35.7	0	218	35.2	38.1	38.6
-5	221	35.8	37.5	38.6	-5	219	38.9	40.7	41.5
-10	222	38.6	40.9	42.2	-10	219	41.7	43.6	44.4
-15	223	41.3	43.2	44.6	-15	219	44.2	46.2	47
-20	224	43.4	46.1	47.6	-20	220	46.5	48.3	49.2
-25	224	45.9	48.6	49.5	-25	221	48.6	50.8	51.7
-30	225	48.1	50.5	51.9	-30	222	50.5	52.8	53.7
-35	226	51.1	52.4	54.3	-35	222	52.4	54.8	55.7
-40	226	52	54.1	56.1	-40	223	54.1	56.6	57.5
-45	227	53.8	55.7	59.3	-45	223	55.7	58.2	59.3
-50	228	55.7	57.2	60.6	-50	224	57.2	59.8	60.8

ORDERING INFORMATION

■ DOW

Phone: 1-800-447-4369

■ DOW ANALYSIS KITS

The Dow Chemical Company
Larkin Lab
C/O Thermal Fluids Testing Lab
1691 North Swede Road
Midland, Michigan 48674

Phone: 1-800-447-4369

■ CH20

CH20
8820 Old Hwy 99 SE
Olympia, WA 98501

Phone: 1-800-562-6184
Fax: 1-360-352-4813
Web Site: www.ch20.com/ch20

■ MISCO PRODUCTS

MISCO PRODUCTS
3401 Virginia Road
Cleveland, OH 44122-4218

Phone: 1-800-358-1100
Fax: 1-216-831-1195
Web Site: www.misco.com

■ OMEGA

OMEGA
One Omega Drive
Stamford, CT 06907-0047

Phone: 1-800-826-6342
Fax: 1-800-848-4271

Maintenance Schedule

NOTICE: It is the responsibility of the owner to ensure that all personnel engaged in maintenance activities have Personal Protective Equipment necessary to perform the tasks and duties assigned.



WARNING

Turn off electrical power at disconnect prior to performing any maintenance to the control panels or electrical components. Use your company’s approved lockout/tagout procedures to ensure that accidental re-energizing of the system does not occur.



WARNING

The use and storage of gasoline or other flammable liquids and vapors in open containers in the vicinity of any heater is hazardous.



CAUTION

Keep a fire extinguisher available in the immediate vicinity before re-applying power when the control cover is removed.

The following is a maintenance schedule for the major items on the TRUXX system. For additional details on individual components, please refer to the appropriate installation/maintenance manual or data sheet in the back of this manual. The timetable on the following maintenance schedule is a suggestion that may need to change based on the severity of conditions, quality/cleanliness of the trailer gas, and the requirements of state and federal laws.

Frequency	Component(s)	Maintenance task
After 1st month of operation	Entire system	Leak check unit at operating pressure. Fix any leaks present.
Monthly	Solenoid valves	Operate all solenoid valves at least once per month to ensure that they open and close properly.
	Regulation valves	Open drain valve to empty accumulated liquid from the valve.
	Thermocouples and RTDs	Check calibration on the thermocouples and RTDs. Calibrate as required.
	Buffer Tank	Drain accumulated liquids from the tank
Quarterly	All control, isolation, regulation, relief, and safety valves	Inspect all valve components for wear, corrosion, or damage and repair/replace as required. See valve manuals/maintenance instructions located in the back of this manual for further details.
Bi-annually	Actuators	Check lubrication of actuator and perform leak test. Lubricate as needed and repair any leaks per the actuator manual in the back of this manual.
	Entire system	Test all pressure safety relief valves.

Continued on next page

Maintenance Schedule

Yearly	Entire system	Leak test entire system
	Thermocouples and RTDs	Check thermowell surface and sensor sheath for corrosion or damage. Replace as needed.
	Flame detector (if supplied by ASDI)	Clean the viewing windows per the flame detector manual in the back of this manual.
	LEL Detector (if supplied by ASDI)	Use calibration gas with known methane content to bump test detector. Many detectors come with a specific bump port.

Troubleshooting Chart

Problem	Possible Cause	Solution
Instrument reading out of range	Blown fuse	Check fuse, replace if necessary.
	Bad instrument	Replace instrument.
Heater enabled but not heating gas	Heater malfunctioning	Refer to heater manual in the back of this manual for heater troubleshooting flow charts.
Trailer loss of ground when grounding lane attached	Damaged ground lane plug	Replace damaged ground lane plug.
	Damaged ground cable	Replace grounding cable
High pressure in decant lane inlet	Trailer overfilled	Decrease trailer pressure.
	Instrument malfunction	Verify pressure reading of instrument against other pressure gauges in system. Replace instrument if necessary.
High intermediate pressure	Incorrect regulator/control valve set point	Check set point of first stage regulator/control valve.
High outlet pressure	Incorrect regulator set point	Check set point of outlet regulator.
Low outlet pressure	Incorrect regulator set point	Check set point of outlet regulator.
	Natural gas demand higher than system design	Verify natural gas demand is not more than rated capacity.
Low outlet gas temperature	Heater malfunctioning	Refer to heater manual in the back of this manual for heater troubleshooting flow charts.
	Outlet temperature too low	Check bypass valve set point.
	Natural gas demand higher than system design	Verify natural gas demand is not more than rated capacity based on the project datasheet.
	Heating bypass valve malfunctioning	Verify that actuator and positioner are functioning correctly.
High outlet gas temperature	Outlet temperature too high	Check bypass valve set point.
	Cold gas bypass valve stuck in closed position	Check cold gas bypass valve positioner.
Low pressure in inlet lane	Leaking hose connection	Close isolation valve(s) on trailer. Find and correct gas leak.
	Equipment actuated valve not seating properly	Close isolation valve(s) on trailer. Repair/replace actuated valve.
		Verify that positioned inlet valve is actuating correctly.

Continued on next page

Problem	Possible Cause	Solution
Actuated valves do not operate	Loss of instrument pressure	See <i>"Loss of instrument air"</i> .
	Blown fuse	Check fuse, replace if necessary.
	Bad PLC output card	Check PLC output card, replace if necessary.
	Bad instrument pressure solenoid valve	See solenoid valve maintenance instructions for the malfunctioning solenoid valve.
Loss of instrument air	Leaking instrument air hose/piping	Find and repair/replace pressure leak.
	Instrument air inlet not connected properly	Check instrument pressure inlet and correct as required.
	Instrument pressure manual valve closed	Open instrument pressure manual valve.
	Low process pressure	Re-prime system, reauthorize lanes.
HMI screen not working properly	HMI not working properly	See HMI user manual in the back of this manual.
System Shutdown	High pressure in decant lane inlet	See <i>"High pressure in decant lane inlet"</i>
	Outlet pressure too high	See <i>"High outlet pressure"</i>
	Outlet temperature too high	See <i>"High outlet gas temperature"</i>
	Outlet temperature too low	See <i>"Low outlet gas temperature"</i>
	Point I/O not working properly	See point I/O instructions in the back of this manual.
	Bad PLC output card	Check PLC output card, replace if necessary.
	High-high LEL	Locate and repair any leaks from joints or packings
Circuit breaker tripped	Defective fuse	Replace fuse.
	Damage to circuit creating a short	Locate and repair circuit to remove the short.

For all troubleshooting issues that are not covered by this manual,
Please contact Algas-SDI at +1-206-789-5410.

APPENDIX A

Component Information

Algas-SDI International, LLC

151 South Michigan Street

Seattle, Washington 98108

USA

Ph.: 1.206.789.5410

Fax: 1.206.789.5414

www.algas-sdi.com

