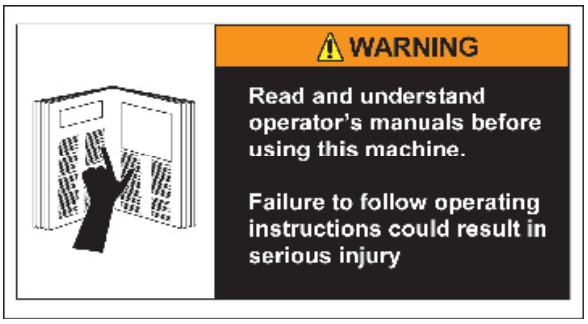
Vapor Recovery Unit PLC

Operation manual

Vilter

EMERSON
Climate Technologies

Important Message



READ CAREFULLY BEFORE INSTALLING AND STARTING YOUR VAPOR RECOVERY UNIT (VRU).

The following instructions have been prepared to assist in installation, operation and maintenance of Vilter VRUs. Following these instructions will result in a long life of the unit with satisfactory operation.

The entire manual should be reviewed before attempting to install, operate, service or repair the VRU.

A Vapor Recovery Unit (VRU) is a positive displacement machine. It is designed to compress gas. The compressor must not be subjected to liquid carry over. Care must be exercised in properly designing and maintaining the system to prevent conditions that could lead to liquid carry over. Vilter Manufacturing is not responsible for the system or the controls needed to prevent liquid carry over and as such Vilter Manufacturing cannot warrant equipment damaged by improperly protected or operating systems.

VRU components are thoroughly inspected at the factory. However, damage can occur in shipment. For this reason, the equipment should be thoroughly inspected upon arrival. Any damage noted should be reported immediately to the Transportation Company. This way, an authorized agent can examine the unit, determine the extent of damage and take necessary steps to rectify the claim with no serious or costly delays. At the same time, your distributor should be notified of any claims made.

All inquires should include the Vilter sales order number, VRU serial and model number.

All requests for information, services or parts should be directed to your distributor.

Equipment Identification Numbers:

Vilter Order Number: _____ Compressor Serial Number: _____
Vilter Order Number: _____ Compressor Serial Number: _____
Vilter Order Number: _____ Compressor Serial Number: _____
Vilter Order Number: _____ Compressor Serial Number: _____

Table of Contents

Section Title **Section Number**

Section 1 • General Information

HOW TO USE THIS MANUAL

This manual contains instructions for the PLC. It has been divided into 4 sections:

Section 1: General Information

Section 2: Operational Descriptions

Section 3: Overview Screens

Section 4: Alarms, Trips and Status Messages

It is highly recommended that the manual be reviewed prior to servicing system parts.

Figures and tables are included to illustrate key concepts.

ADDITIONAL IMPORTANT NOTES

- Installation, operation and maintenance instructions can be found in the associated VRU manual.
- Due to continuing changes and unit updates, always refer to the Vilter.com website to make sure you have the latest manual.
- Any suggestions of manual improvements can be made to Vilter Manufacturing at the contact information on page i.
- For Wiring Requirements, refer to your supplied Electrical Drawings.

Glossary of Terms

Alarm Warning

Annunciated by the compressor PLC that an operational or process condition is abnormal. When active, alarms will be displayed but will not shut down the compressor.

Compressor Differential Calculated

Discharge Pressure minus Suction Pressure. Monitored to ensure compressor is equalized before starting.

Differential Pressure

The difference between the Discharge Pressure and Suction Pressure.

Discharge Pressure

Pressure of the gas measured at the outlet of the compressor.

Discharge Temperature

Temperature of the gas measured at the outlet of the compressor.

Ethernet IP

Communication protocol used to communicate to the compressor PLC.

HMI

HMI stands for "Human-Machine Interface." The compressor HMI is a touch screen terminal mounted in the door of the compressor control enclosure.

Oil Cooler

Heat Exchanger where hot oil from the compressor is cooled.

Oil Cooler Outlet Temperature

Temperature of compressor oil measured at the outlet of the oil cooler.

Oil Stabilizer Heater

Heater element(s) used to heat the oil in the oil stabilizer vessel.

Oil Stabilizer Temperature

Temperature of the gas measured at the oil stabilizer vessel.

Outlet Scrubber

Vessel located on the outlet side of gas compressor to remove moisture, oil, and/or contaminants.

PID Controller

PID stands for "Proportional Integral Derivative." A PID controller manipulates a control variable (example: fan/pump speed) to maintain a process variable (example: process temperature or pressure) at a desired value (set-point). The controller is driven by mathematical calculations that tell the control variable how to react to changes in the process variable.

PLC

PLC stands for "Programmable Logic Controller." The Compressor PLC is an industrial computer that controls the compressor unit or Package.

Pressure Equalizing Solenoid

Solenoid Valve that opens at compressor stop to equalize suction and discharge pressures.

Pressure Ratio

The ratio of compressor discharge pressure to suction pressure.

Pressure Ratio Calculated

(Discharge Pressure) / (Suction Pressure)

Pressure Transducer or Transmitter

Device that measures pressure and transmits the pressure reading as a 4-20mA signal. This 4-20mA signal is read by the PLC and displayed as a pressure.

RTD

RTD stands for "Resistance Temperature Detector." RTDs use electrical resistance to measure temperature. This resistance is read by the PLC and displayed as a temperature.

Suction Pressure

Pressure of the gas measured at the inlet of the compressor.

Status

Compressor status message to inform an operator what the VRU is doing while it is running.

Tank Suction Pressure

Pressure of the storage tank as measured at the process critical location. This is the process control pressure that the VRU uses to control when it starts and stops as well as control the Scroll Compressors speed.

Temperature Transmitter

Device that measures temperature and transmits the temperature reading as a 4-20mA signal. This 4-20mA signal is read by the PLC and displayed as a temperature.

Trip

Compressor shutdown due to an abnormal process or operational condition.

VFD

VFD stands for “Variable Frequency Drive.” A VFD is a motor control device that can vary the speed of an AC induction motor.

VFD Current

The measure of current (in Amperage) from each VFD.

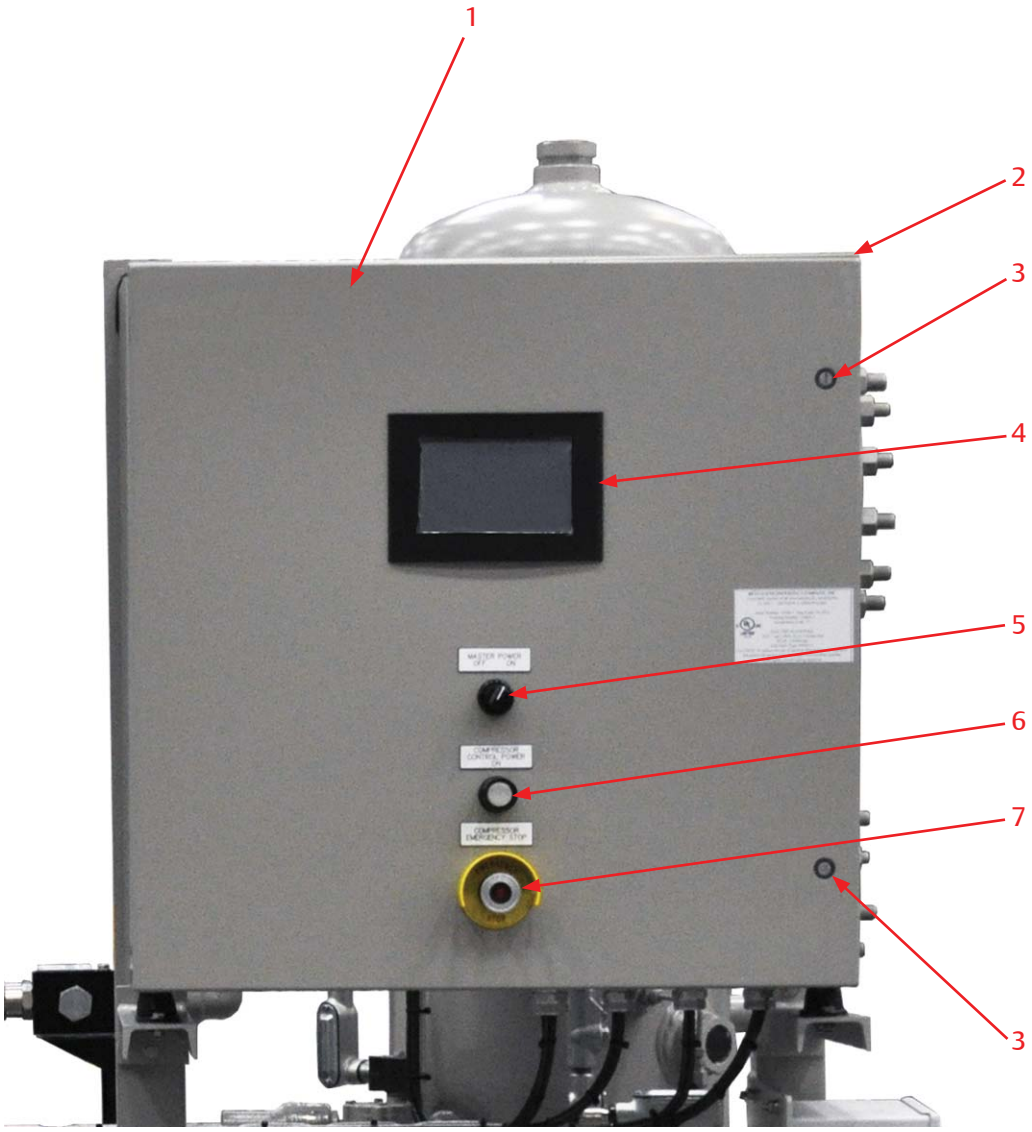
VRU

Vapor Recovery Unit

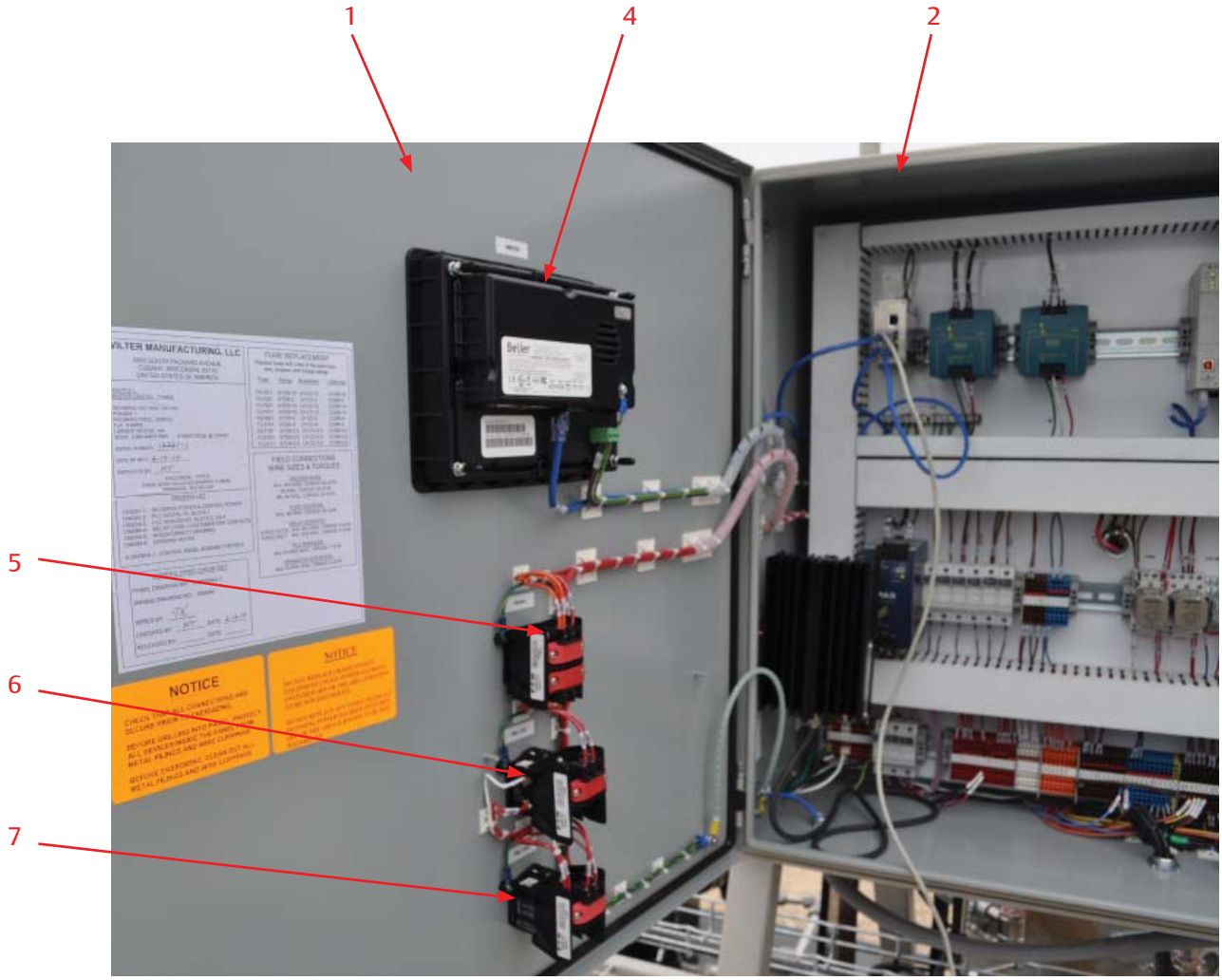
Hardware Components - PLC Exterior

Each Compact Logix PLC may differ, but below are typical components that can found in each PLC. For specific PLC layout, refer to supplied electrical drawings.

1 - Enclosure Door
2 - Main Enclosure
3 - Door Latch
4 - HMI
5 - Master Power
6 - Compressor Control Reset Button
7 - Emergency Stop Button

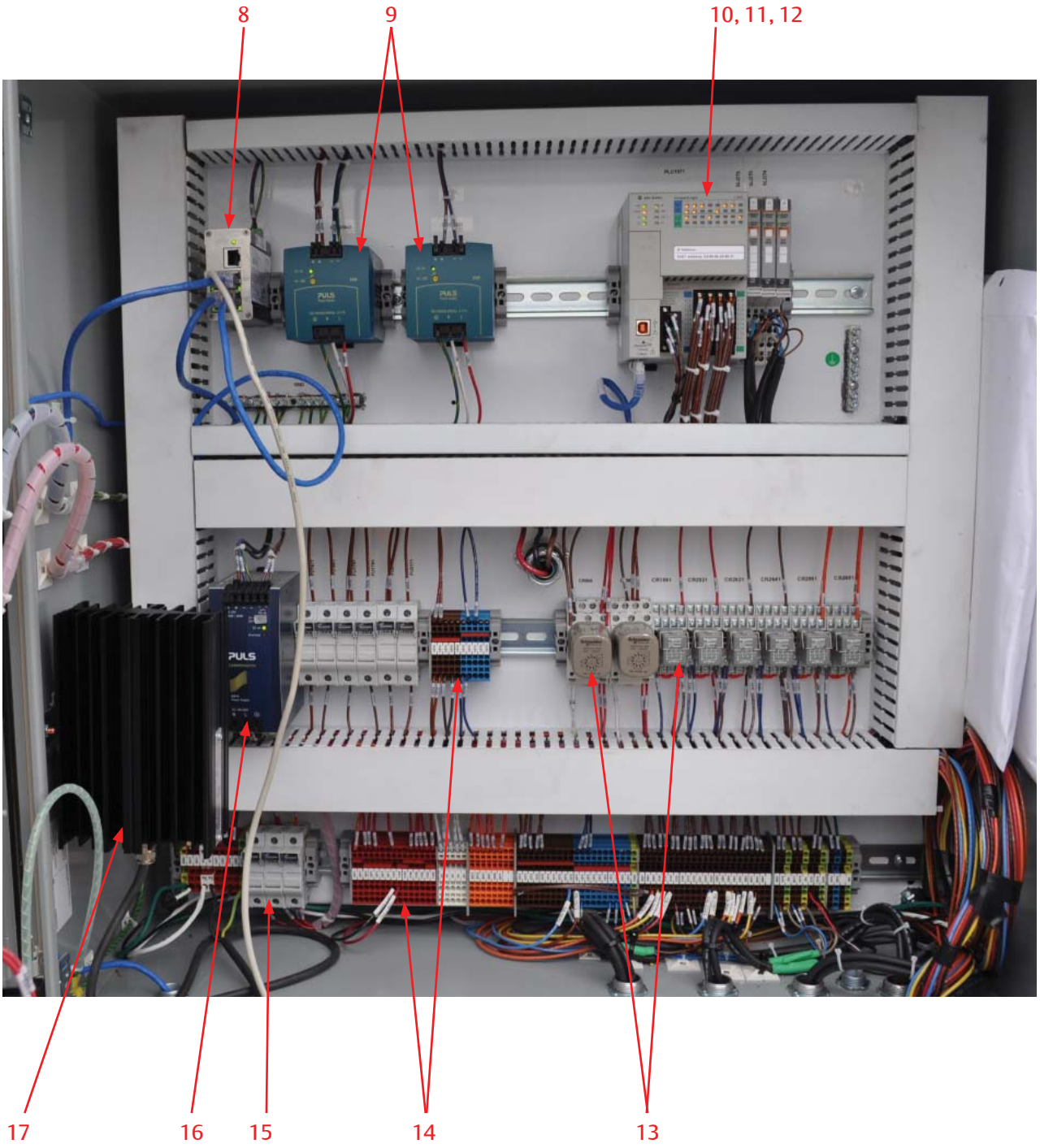


Hardware Components - Enclosure Door Interior



Hardware Components - Main Enclosure Interior

8 - Ethernet Switch, 5 Port RJ45
9 - DC Power Supply
10 - Compact Logix Processor
11 - Compact Logix 4 Input Current Analog Module
DC Power Supplies
12 - Compact Logix 2 Channel RTD Module
13 - Relays
14 - Terminal Blocks
15 - Fuses
16 - DC Power Supply
17 - Panel Heater (Field Installed)



Overview

The following are standard equipment on all Vapor Recovery Units that can be controlled or monitored:

- Pressure
  - Suction Pressure – Pressure of the gas measured at the inlet of the compressor.
- Discharge Pressure – Pressure of the gas at the outlet of the compressor. Measured at the oil separator.
  - Tank Suction Pressure – Pressure of the gas at the controlled point in the system.
- Temperature
  - Stabilizer Oil Temperature – Temperature of the Oil in the Stabilizer.
  - Oil Cooler Outlet – Temperature of the Oil coming out of the Oil Cooler.
  - Discharge Outlet Temperature – Temperature of the gas and oil mixture at the outlet of the compressor
- Amperage
  - Compressor VFD Amperage – Current draw by each Scroll Compressor motor.
  - Oil Cooler VFD Amperage – Current draw by the Oil Cooler Fan motor.
- Stabilizer Oil Heaters
- Scroll Compressor Motor(s)
- Oil Cooling Fan Motor
- Blow-case Blow-down valves
- Pressure Equalization Valve
- Selectable groups of set-points for varying operating conditions
- Daily EPA data collection
  - Tank Suction Pressure
  - Discharge Pressure
  - Stabilizer Operating Temperature
  - Compressor Run Time
  - Compressor Average RPM (while running)
  - Power Usage (kWH/Day)
  - Mechanical Availability

AUTO START-STOP

When enabled, the Auto Start-Stop feature will allow the VRU to cycle on and off based on the Tank Suction Pressure. Additional variables that factor in to Auto Start-Stop are described below:

- Compressor Start Pressure: The Tank Suction Pressure which will control the start of the compressor.
- Initial Runtime before VFD A7B Increases from Minimum Speed: Amount of time that the Scroll Compressors will run at the minimum speed (50%) before being controlled by the PLC's PID.
- Compressor Stop Pressure: The Tank Suction Pressure which will control the stop of the compressor.
- Minimum Stabilizer Oil Temperature: The Stabilizer Oil Temperature must be at a minimum 180°F before the compressors are allow to run.

When Auto Start-Stop control is enabled, it will function as follows:

1. Pressing the "Unit Start" Push-Button (push-button) on the HMI Main Screen will place the VRU in the Stand-By mode waiting for all permissives to be met.
2. Upon all of the permissives being met the VRU will start the Scroll Compressors.
3. The Scroll Compressors will continue to run with their speed varying based on where the Tank Suction Pressure is in relation to the Target Tank Suction Pressure set-point (and dead-band).
4. Normally the VRU will shut down when the Tank Suction Pressure falls below the Compressor Stop Tank Suction Pressure set-point and go back into the Stand-By mode waiting for re-start based on conditions.

COMPRESSOR VFD CONTROL

When a compressor starts the VFD controlling that compressor will be held at minimum speed (50%) for a set amount of time (Initial Run Time before VFD A&B Increases from Minimum Speed set-point). Once that initial time has expired the PLC will control the VFD speed via a PID control that monitors the Tank Suction Pressure and by adjusting the VFD speed tries to maintain that pressure.

If the Tank Suction Pressure is above the target Tank Suction Pressure (+ dead-band) the VFD speed will continue to increase until the target pressure has been obtained or the VFD reaches Maximum Speed (100%).

If the Tank Suction Pressure is below the target Tank Suction Pressure (- dead-band) the VFD speed will

continue to decrease until the target pressure has been obtained or the VFD reaches Minimum Speed (50%). If the Tank Suction Pressure continues to drop and fall below the Compressor Stop set-point the VRU will shut down.

SAFETIES

The Vapor Recovery Unit (VRU) controller continuously monitors operational and process data and annunciates an alarm and/or stops the machine if any condition becomes abnormal. Two levels of safeties exist when an abnormal condition is detected.

- Alarm: If active, alarms are annunciated on the VRU HMI in the Alarm Banner located on the Main Screen. An alarm serves only as a warning to the operator; if an alarm is active the machine is still allowed to run.
- Trip: If active, trips will shut the machine down or not allow the VRU to start. Trips are annunciated on the VRU HMI in the Trip Banner located on the Main Screen. Trips are also logged in the EPA Event List.

The "Alarm Reset" push-button on the HMI Main Screen will reset any active alarms or trips if the abnormal condition has been removed. For a comprehensive list of alarms and trips and possible causes, see the troubleshooting guide in this manual.

EMERGENCY STOP

The Emergency Stop circuit in the compressor control panel energizes the Master Control Relay, which provides power to PLC outputs that control heaters, motor starters, valves, etc. The Master Control Relay may be energized by pressing the "Control Power On" illuminated push-button on the door of the compressor control panel. When the Master Control Relay is energized, the "Control Power On" push-button will illuminate. The following conditions must be satisfied to energize the Master Control Relay:

- Emergency Stop push-button on the door of the compressor control panel must be pulled out.
- Any additional Emergency stops or safety devices tied in to the Emergency Stop circuit must be reset.
- The compressor PLC must be booted up and operational.
- The 24-volt DC power supplies in the compressor control panel must be powered up and OK.
- The "PLC Control Enable Relay" discrete PLC output must be energized

OIL HEATERS

Immersion Heaters in the oil stabilizer are controlled by the compressor PLC to maintain warm oil. The heaters cycle on and off to maintain a desired separator oil temperature range.

PRESSURE EQUALIZING SOLENOID

The equalizing solenoid opens whenever the compressors are stopped to equalize pressure between suction and discharge of the compressor.

AIR COOLED OIL COOLER (VFD TYPE)

The VFD type air cooled oil cooler is a heat exchanger that uses a fan running on a VFD to control the oil temperature at its outlet.

A PID controller adjusts the speed of the fan(s) to control the temperature at the outlet of the oil cooler. When the temperature of the oil at the outlet of the cooler exceeds the desired temperature plus a dead-band, the fan(s) will increase speed to add more cooling. When outlet temperature drops below the desired temperature minus a dead-band, the fan(s) will decrease speed.

- When the compressor is stopped, the oil cooler fan(s) will stop.
- When the compressor is running and the oil cooler outlet temperature rises above the "Oil Cooler Start" temperature set in the "Compressor Control Set-Points" screen, the fan(s) will start at a minimum speed.
- When the compressor is running and the oil cooler outlet temperature is above the dead-band, the PID controller will increase fan speed.
- When the compressor is running and the oil cooler outlet temperature is below the dead-band, the PID controller will decrease fan speed.

BLOW-CASE BLOWDOWN

The Vapor Recovery Unit (VRU) has a Blowcase Blowdown function that monitors the Scrubber for a High Level condition. If that condition occurs the PLC will enable the Blowcase Blowdown discrete output which in turn energizes the Balancing Line (NO) and Supply Line (NC) solenoids.

Typically a VRU contains Blowcase level switch that not only has a Blowcase High Level contact but also a Blowcase Low Level contact as well. When the Blowcase Low Level has been reached the Blowcase Blowdown discrete output is de-energized. If a VRU only contains a High Level contact then once that contact transitions by the level falling below the High Level then the Blowcase Blowdown discrete output will de-energize.

Main Menu Screen

While the MAIN SCREEN is the screen that the HMI powers up in, or is typically the HMI screen that the operator sets the HMI to, the MAIN MENU Screen is the screen used to navigate to all of other screens.

Note that some of the HMI screen navigation buttons are only accessible when the operator is logged in. The Login function requires a User Name and a Password. The user name to select is “MGR” and the password is “1”.

Not only is the Login needed to navigate to some screens but the operator must be logged in to change any of the set-points.

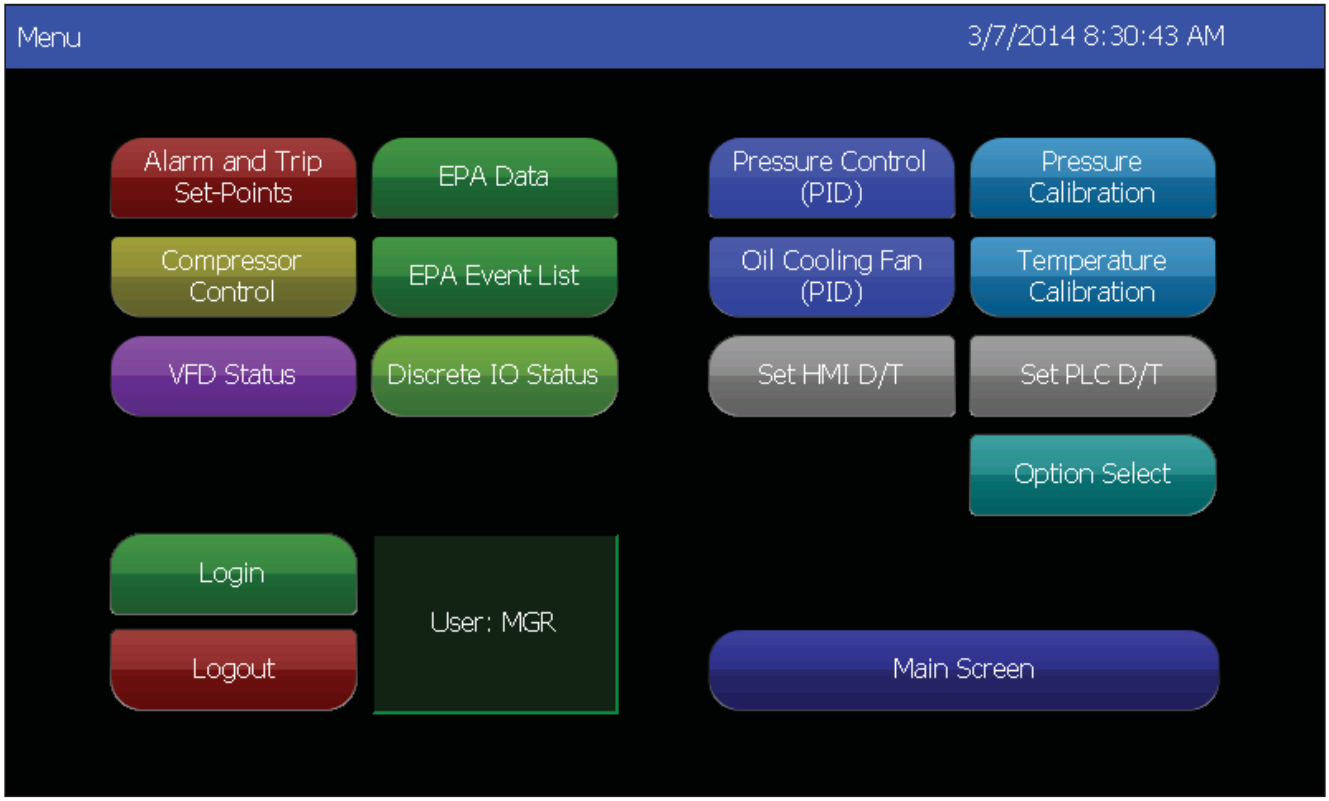


Figure 3-1. Main Menu Screen

Main Screen

The Vapor Recovery Unit (VRU) has an HMI that contains several screens. The Main screen is the screen that is opened at power up and also the screen that an operator would normally leave open.

This Main screen contains VRU system status information that allow an operator to view critical data.

TRIP BANNER

This is the Red Banner located towards the top of the screen just below the screen name. Whenever there is an active Trip this banner will become visible and display all active Trips. The banner will cycle through each active Trip allowing each to be displayed for 2 seconds before the next Trip is displayed.

Note that anytime a Trip occurs the Vapor Recovery Unit will shut down. All trips must be reset before the VRU is allowed to start again.

ALARM BANNER

This is the yellow banner located just below the red trip banner. Whenever there is an active Alarm this banner will become visible and display all active Alarms. The banner will cycle through each active Alarm allowing each to be displayed for 2 seconds before the next Alarm is displayed.

Note that anytime an Alarm occurs the Vapor Recovery Unit will not shut down. Alarms serve as a warning to the operator that the VRU outside of a desired range but not enough to shut it down. The VRU not only will remain running should an alarm occur but also can re-start with an active alarm.

STATUS BANNER

This is the green banner located just below the yellow alarm banner. The purpose of the Status Banner is to display information to the operator as to what the VRU is doing or what it is waiting for. This banner is not affected directly by the Alarm Reset since it is for informational purposes only.

ELAPSED RUNTIME AND COMPRESSOR STARTS

The VRU monitors runtime and displays the elapsed time that it has run in Hours and Minutes. Also every time that the VRU starts the compressors a “Compressor Start” is logged and displayed.

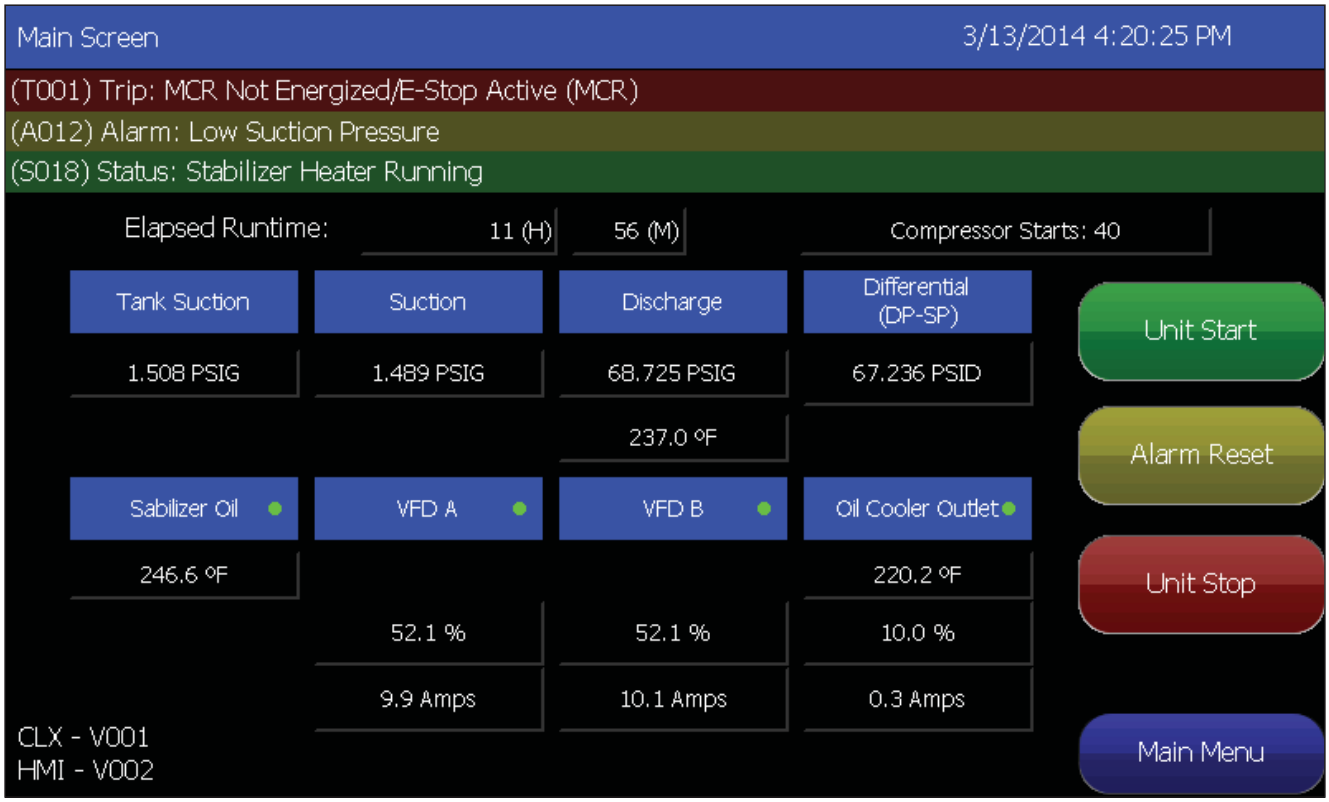


Figure 3-2. Main Screen

TANK SUCTION PRESSURE

The Tank Suction Pressure is the pressure that the VRU monitors for starting and stopping the compressors. It is also monitored and used by the PLC to regulate the speed at which the Compressor (A & B) VFDs are run at.

SUCTION PRESSURE

The Suction Pressure differs from the Tank Suction Pressure in that it is used only for a safety (Alarm and Trip) as well as used to calculate the VRU differential pressure (also a safety).

DISCHARGE PRESSURE

The Discharge Pressure is used not only as a safety but also to calculate the Differential Pressure (also a safety).

DISCHARGE TEMEPRATURE

The Discharge Temperature is used for as a safety.

DIFFERENTIAL (DP-SP) PRESSURE

The Differential Pressure is in the units of (PSID) and is the Discharge Pressure minus the Suction Pressure. The Differential Pressure is used as a VRU safety.

STABILIZER OIL TEMPERATURE

The Stabilizer Oil Temperature is monitored. It is used to control the Stabilizer Oil Heaters based on operator set-points. It is also used as a run permissive (the Oil Temperature must be at least 150°F) before the VRU can start a compressor. The Stabilizer Oil Temperature is also a VRU safety.

VFD A and VFD B SPEED COMMAND

The percentage of commanded speed is displayed. This is the value that the PLC's PID controller commands the compressor VFD(s) to run. Both VFD A and VFD B run at the same time and at the same speed.

VFD A and VFD B AMPARAGE

The PLC reads each Compressor VFD running current over Ethernet. It is used for safeties as well as for EPA data.

OIL COOLER OUTLET VFD SPEED COMMAND

The percentage of commanded speed is displayed. This is the value that the PLC's PID controller commands the Oil Cooler Fan VFD to run.

OIL COOLER OUTLET VFD AMPARAGE

The PLC reads the Oil Cooling Fan VFD running current over Ethernet. It is used for safeties as well as for EPA data.

UNIT START

The UNIT START button on the HMI is used to start the VRU. Initially the VFR will be in the Stand-By mode until all of the run permissive are met.

UNIT STOP

The UNIT STOP button on the HMI is used to stop the VRU at anytime. Once the UNIT STOP button is pressed the VRU will not re-start unless the UNIT START button is pressed to put the VRU back into the Stand-By Mode.

ALARM RESET (FAULT RESET)

The ALARM RESET (FAULT RESET) button on the HMI has three functions when pressed.

1. Will clear Alarms when the conditions that caused the alarm are no longer are preset.
2. Will clear Trips when the conditions that caused the trip are no longer are preset.
3. Will send a reset command each VFD (over Ethernet) to reset a VFD Fault if one is present.

Compressor Control Screen

The Compressor Control screen contains set-points used to control the VRU. These set-points are entered at the time of VRU commissioning and typically are left alone unless the control parameters of the system have changed.

Note that all BLUE displays also allow the data points to changed but only when an operator has properly logged into the HMI. If the operator has not logged in the set-points are read only (not read/write).

COMPRESSOR START PRESSURE

The Compressor Start Pressure set-point is the pressure that the Tank Suction Pressure (actual value is displayed to the right) must reach before the compressors are commanded to automatically run (provided that all of the run permissives are also met).

COMPRESSOR STOP PRESSURE

The Compressor Stop Pressure set-point is the pressure that the Tank Suction Pressure must fall to before the compressors are commanded to automatically stop.

COMPRESSOR ACTUAL PRESSURE

The Vapor Recovery Unit (VRU) Tank Suction Pressure is displayed to the right of the Start and Stop set-points for reference purposes.

STABILIZER OIL HEATER SET-POINT

This set-point is the Target Temperature of the Oil in the Stabilizer. If the actual temperature is below this set-point (-DB) the PLC will command the Oil Heaters to energize.

STABILIZER OIL HEATER DEADBAND

This is a value that is referenced to the Stabilizer Oil Heater set-Point which is used to calculate an actual Start and Stop value for the Oil Heaters to operate from.

TANK SUCTION PRESSURE SET-POINT

This is the target Tank Suction Pressure that the PLC's PID controller will use to compare against the actual Tank Suction Pressure.

Figure 3-3. Compressor Control Screen

TANK SUCTION PRESSURE DEADBAND

This is a value that is referenced to the Tank Suction Pressure set-point which is used to calculate a dead-band around the target where no change in compressor VFD speed will occur.

TANK SUCTION PRESSURE

The Vapor Recovery Unit (VRU) Tank Suction Pressure is displayed to the right of the Tank Suction Pressure Set-point and Dead-Band set-points for reference purposes.

INITIAL RUN TIME BEFORE VFD A/B INCREASE FROM MINIMUM SPEED

This initial runtime set-point is used to set a time (in seconds) whereupon when the compressors are started their speed will be held at minimum (50%) to allow the compressor oil to stabilize in the compressors before additional load is placed on them. Once this time has expired the Compressor VFD(s) will follow the speed reference command as determined by the PLC's PID controller.

OIL COOLER TEMPERATURE: START

If the Oil Cooler Temperature rises to or above this set-point the Oil Cooler Fan (VFD) will start.

OIL COOLER TEMPERATURE: TARGET

Once the Oil Cooler Fan has started the PLC's PID controller for the Cooling Fan will regulate the fan speed based on what the actual Oil Cooler Temperature is as compared to the Target set-point and vary the speed of the speed reference command to the Fan VFD.

OIL COOLER TEMPERATURE: DEADBAND

This is a value that is referenced to the Oil Cooler Temperature set-point which is used to calculate a dead-band around the target where no change in compressor VFD speed will occur.

VFD A&B ACCEL/DECEL RATE

The acceleration and acceleration rates for the Compressor VFDs are written down to each of the VFDs. These rates control how fast the VFDs can change their running speed when a change in speed reference from the PLC's PID controller occurs.

OIL COOLER VFD ACCEL/DECEL RATE

The acceleration and acceleration rates for the Oil Cooler VFD are written down to the VFD. These rates control how fast the VFD can change its running speed when a change in speed reference from the PLC's PID controller occurs.

Alarm and Trip Setpoints Screen

The Alarm and Trip set-points are used as safeties for the protection of the Vapor Recovery Unit. These Alarms and Trips are compared against the actual (real time) values of the signals.

ALARMS

There are two types of Alarms, Low and High.

- Low Alarm - For a Low Alarm to occur the Actual value being monitored must drop below the Low Alarm set-point. Once that occurs the appropriate Low Alarm will be triggered and then displayed in the MAIN SCREEN's Alarm Banner (till it has been reset). The VRU will continue to run with a Low Alarm active.
- High Alarm - For a High Alarm to occur the Actual value being monitored must rise above the High Alarm set-point. Once that occurs the appropriate High Alarm will be triggered and then displayed in the MAIN SCREEN's Alarm Banner (till it has been re-set). The VRU will continue to run with a High Alarm active.

TRIPS

There are two types of Trips, Low-Low and High-High.

- Low-Low Trip - For a Low-Low Trip to occur the Actual value being monitored must drop below the Low-Low Trip set-point. Once that occurs the VRU will shut down and the appropriate Low-Low Trip will be triggered and then displayed in the MAIN SCREEN's Trip Banner (till it has been reset). The Trip will also be recorded in the EPA Event List.
- High=High Trip - For a High-High Trip to occur the Actual value being monitored must rise above the High-High Trip set-point. Once that occurs the VRU will shut down and the appropriate High-High Trip will be triggered and then displayed in the MAIN SCREEN's Trip Banner (till it has been reset). The Trip will also be recorded in the EPA Event List.
- Re-starting the VRU after a Trip has occurred.
  - When the VRU the start command is lost.
  - Reset all Trips. The VRU cannot run with an active Trip.
  - Press the "Unit Start" to put the VRU in Stand-By mode awaiting all run permissives to become true.

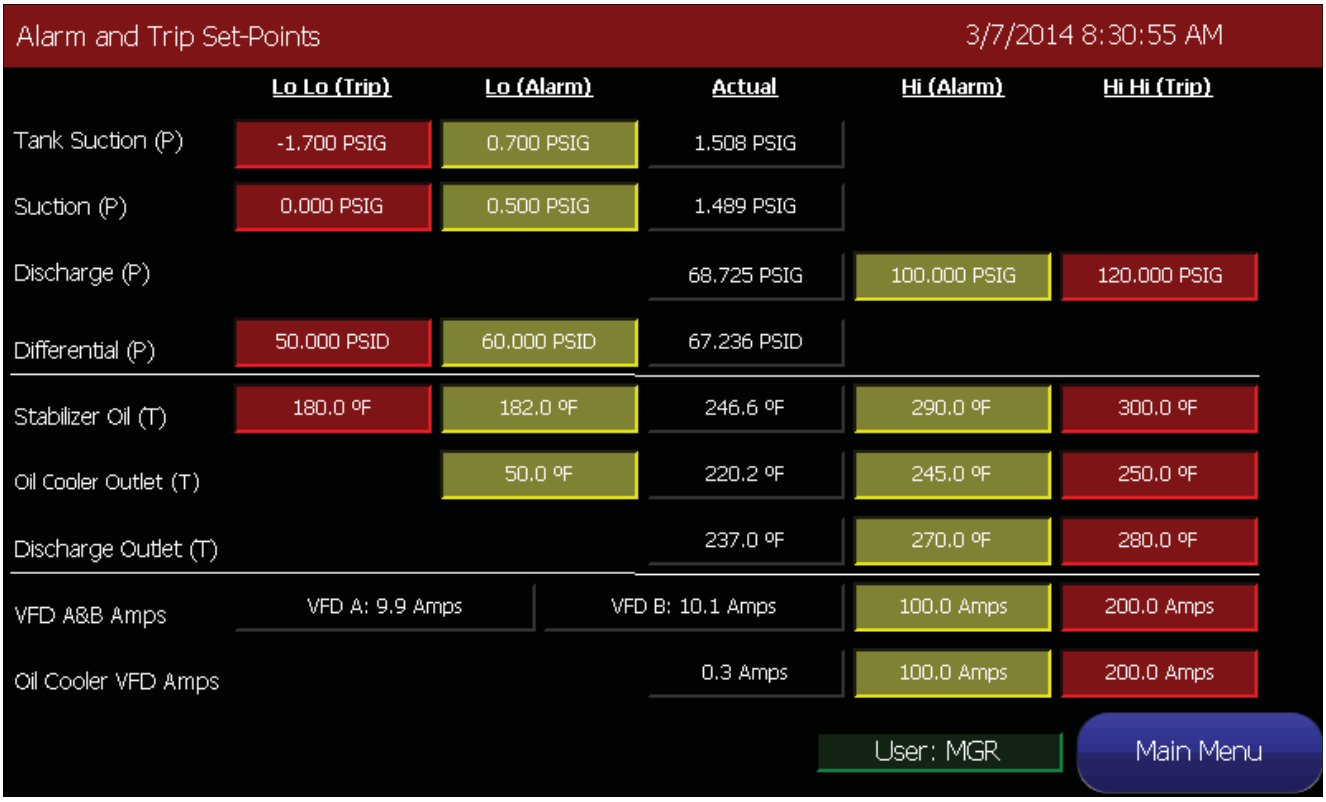


Figure 3-4. Alarms and Trips Setpoint Screen

Pressure Calibration Screen

The PRESSURE CALIBRATION screen is used at the VRU's commissioning, or if a pressure sensor has to be replaced. The purpose of this screen is to set the Raw calibration of the Analog Channel to the settings on the sensor. There is an offset to adjust the Calibrated (Base Units) by using the ± Offset set-point. The calibrated pressure is PSIG.

There is a selection on how you want your pressure units displayed throughout the rest of the HMI. The Display Actual Values are what the Alarms, Trips and Compressor control settings are compared to.

Differential pressure, which is a calculated value of Discharge - Suction Pressure, must use pressures with the same units. The Displayed units of both the Suction and Discharge can be selected in different units. Differential units are always in PSID (PSI differential).

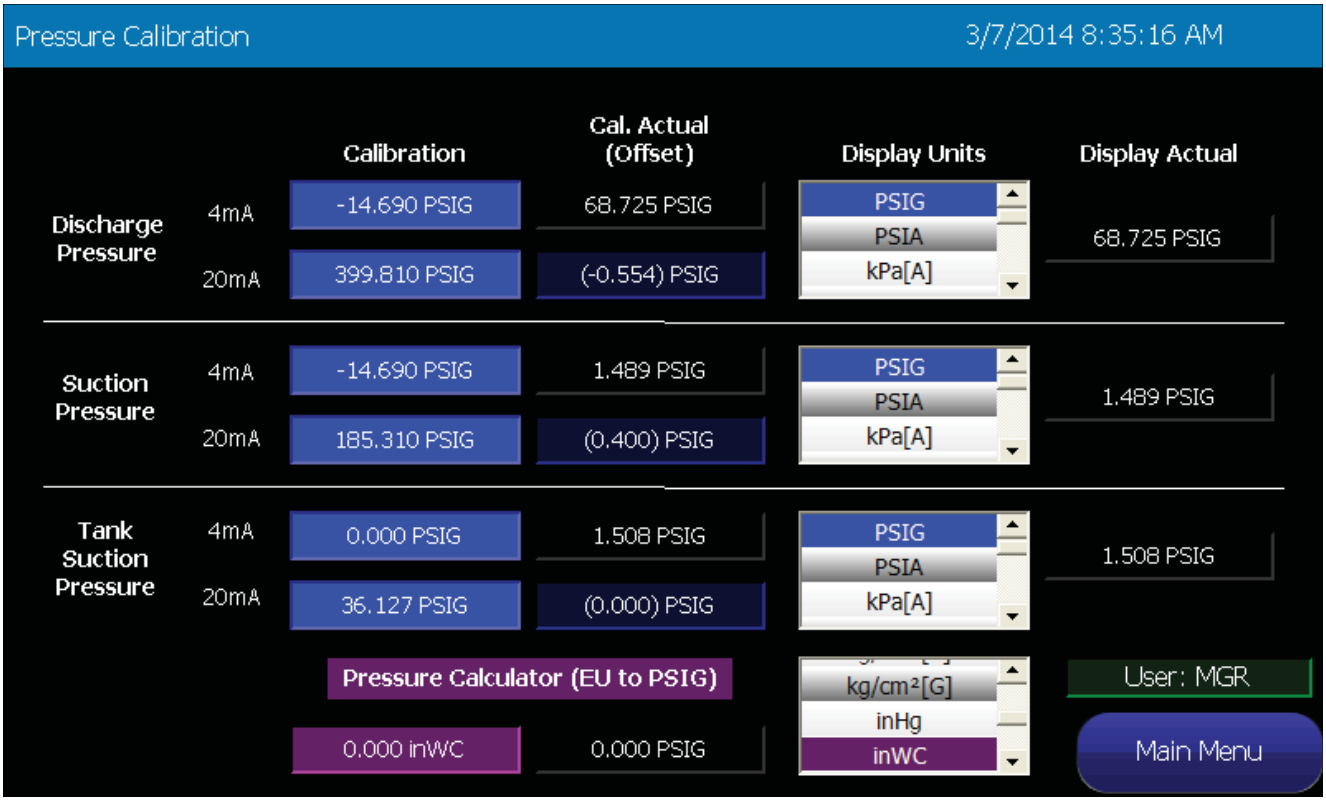


Figure 3-5. Pressure Calibration Screen

Temperature Calibration Screen

The TEMPERATURE CALIBRATION screen is used to set an offset to the RAW temperature from the RTD Inputs.

Figure 3-6. Temperature Calibration Screen

Pressure Control - PID Screen

The PRESSURE CONTROL – PID screen allows the operator to tune the PID that controls Compressor VFD(s) speed reference signal and how it reacts to the Tank Suction Pressure.

Typically the PID is set-up at the time of commissioning and do not need to be further modified.

TANK SUCTION PRESSURE SET-POINT

This is the target pressure that the PLC's PID controller will use to compare against the actual Tank Suction Pressure.

DEADBAND

This is a value that is referenced to the Tank Suction Pressure set-point which is used to calculate an error range above and below the target where no change in compressor VFD speed will occur.

VFD SPEED (%)

This is the speed reference signal that the PID controller is sending to the Compressor VFDs (50-100%).

LOOP UPDATE TIME

Time in seconds (or fractions of a second) for how the PID instruction should recalculate the commanded speed reference signal for the Compressor VFDs.

PROPORTIONAL GAIN (Kp)

The PID Instruction is selected to run in Independent Mode. In the Independent Mode the Proportional Gain is unit less.

INTEGRAL GAIN (Ki)

The PID Instruction is selected to run in Independent Mode. In the Independent Mode the Integral Gain Ki or Ti (Reset Gain) units are (1/sec).

DERRIVATIVE GAIN (Kd)

The PID Instruction is selected to run in Independent Mode. In the Independent Mode the Derivative Gain is in seconds.

Figure 3-7. Pressure Control - PID Screen

MINIMUM SPEED (%)

This is the lowest speed that the Compressor VFD speed reference can go (50%).

TANK SUCTION PRESSURE ACTUAL

The Vapor Recovery Unit (VRU) Tank Suction Pressure is the pressure that the VRU is controlling to.

ERROR

The Error is the difference between the actual Tank Suction Pressure and the target pressure.

Oil Cooling Fan - PID Screen

The OIL COOLING FAN – PID screen allows the operator to tune the PID controls the Oil Cooling Fan speed reference signal and how it reacts to the Oil Cooler Outlet temperature.

Typically the PID is set-up at the time of commissioning and do not need to be further modified.

TARGET OIL TEMPERATURE SET-POINT

This is the target temperature that the PLC's PID controller will use to compare against the actual Oil Cooler Outlet temperature.

DEADBAND

This is a value that is referenced to the Oil Cooler Outlet temperature set-point which is used to calculate an error range above and below the target where no change in Oil Cooling Fan VFD speed will occur.

VFD SPEED (%)

This is the speed reference signal that the PID controller is sending to the Oil Cooling Fan VFD.

LOOP UPDATE TIME

Time in seconds (or fractions of a second) for how the PID instruction should recalculate the commanded speed reference signal for the Oil Cooling Fan VFDs.

PROPORTIONAL GAIN (Kp)

The PID Instruction is selected to run in Independent Mode. In the Independent Mode the Proportional Gain is unit less.

INTEGRAL GAIN (Ki)

The PID Instruction is selected to run in Independent Mode. In the Independent Mode the Integral Gain Ki or Ti (Reset Gain) units are (1/sec).

DERRIVATIVE GAIN (Kd)

The PID Instruction is selected to run in Independent Mode. In the Independent Mode the Derivative Gain is in seconds.

Figure 3-8. Oil Cooling Fan - PID Screen

MINIMUM SPEED (%)

This is the lowest speed that the Oil Cooling Fan VFD speed reference can go (10%).

TANK SUCTION PRESSURE ACTUAL

The Vapor Recovery Unit (VRU) Oil Cooler Outlet temperature is the temperature that the VRU is controlling to.

ERROR

The Error is the difference between the actual Oil Cooler Outlet temperature and the target temperature.

Discrete IO Status Screen

The purpose of the DISCRETE IO STATUS Screen is to allow the operator to view the status of the incoming signals as well as the status of the discrete PLC outputs.

Note that some of the Input signals have been inverted from their actual physical state and will be noted as such.

DC INPUTS

Master Control Relay (CRMA)

Whenever the Master Control Relay is energized this input should be on. It is used as a permissive for a compressor to start or run. A loss of the MCR input will cause the VRU to fault.

Status message "(S020) Compressor in Standby Mode waiting for MCR relay Input" is associated with this input.

Customer Trip Input

The Customer Trip Input is an optional input that is a optional customer defined trip. From the factory this input has jumper installed which must be removed if used on-site. A loss of the Customer Trip Input will cause the VRU to fault.

Status message "(S021) Compressor in Standby Mode waiting for Customer Trip Input" and Trip message "(T002) Trip: Customer Trip Input (Off) (Rem. Trip)" are associated with this input.

Remote Run Permissive

The Remote Run Permissive is an optional input that is a permissive for a compressor to start. From the factory this input has jumper installed which must be removed if used on-site.

Status messages "(S002) Status: Waiting for Remote Run Permissive" and "(S022) Compressor in Standby Mode waiting for Remote Run Permissive Input" are associated with this input.

Compressor A Running

Input is true whenever the VFD/Starter for Compressor A is energized.

Status message "(S004) Status: VFD A Motor Running (VFD A Run)" is associated with this input.

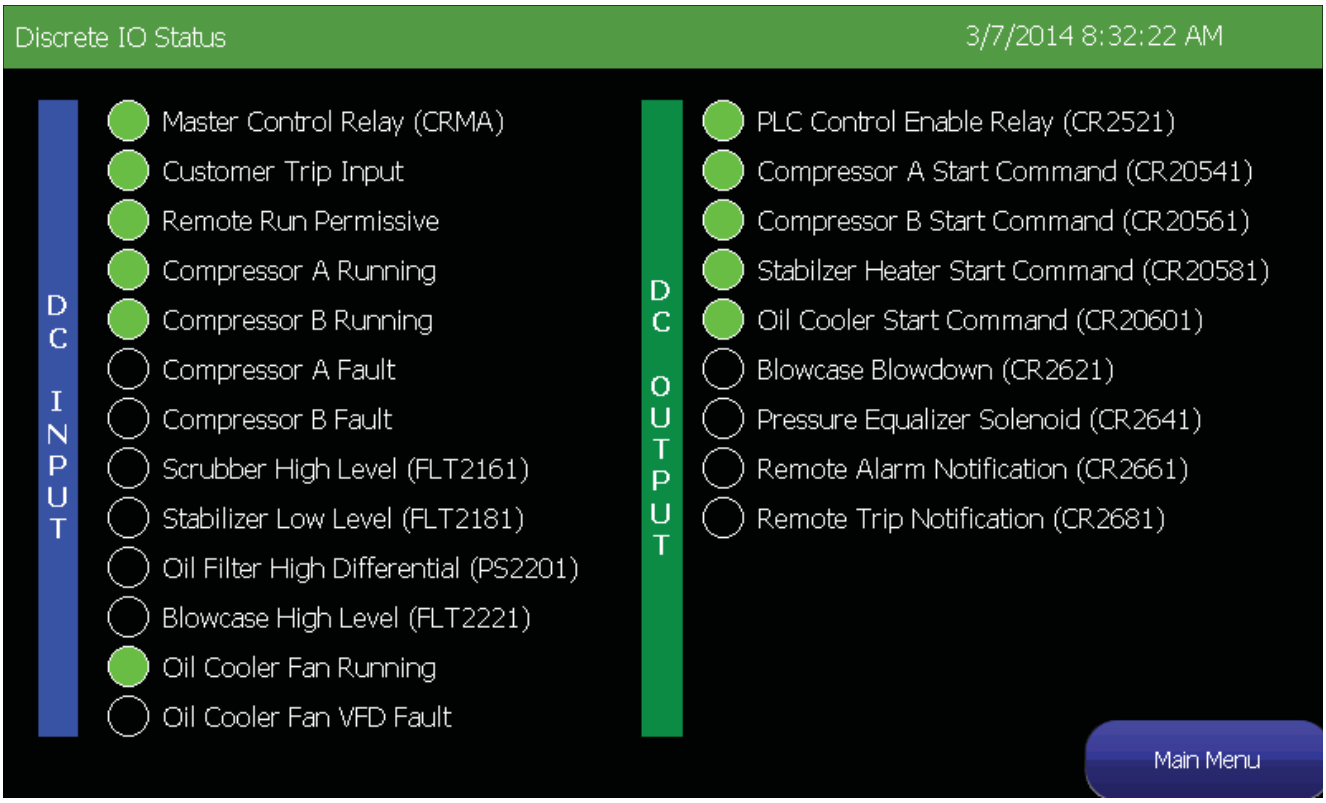


Figure 3-9. Discrete IO Status Screen

Compressor B Running

Input is true whenever the VFD/Starter for Compressor B is energized.

Status message "(S005) Status: VFD B Motor Running (VFD B Run)" is associated with this input.

Compressor A Fault

This input actually monitors the Compressor A Drive Ok contact of VFD A. Normally this input is on (for Drive Ok) but it is inverted for use in the PLC as a Drive Fault.

Trip message "(T004) Trip: VFD A Drive Fault (VFD A Fault)" is associated with this input.

Compressor B Fault

This input actually monitors the Compressor B Drive Ok contact of VFD B. Normally this input is on (for Drive Ok) but it is inverted for use in the PLC as a Drive Fault.

Trip message (T005) Trip: VFD B Drive Fault (VFD B Fault)" is associated with this input.

Scrubber High Level

This input monitors the level of the Scrubber for a High Level state. Upon a high level the Blowcase Blowdown output is energized controlling the Balancing Line and Supply Line solenoids.

Stabilizer Low Level

This input monitors the Stabilizer for a low oil level. Should a low level be detected the Stabilizer Heaters will be prevented from being enabled. This input is normally high and opens on a low condition. This input is inverted for use in the PLC. When lit this indicates a Low Level.

Trip message " (T007) Trip: Stabilizer Low Level Trip" is associated with this input.

Oil Filter High Differential

This input monitors the differential pressure at the Oil Filter. This input is normally high signifying normal differential pressure and is inverted in the PLC. The indicator on denotes a high differential condition.

Alarm message "(A008) Alarm: Oil Filter High Differential Pressure (PDSHH100)" and Trip message "(T008) Trip: Oil Filter High Differential Pressure (PDSHH100)" are associated with this input.

Blowcase High Level

The Blowcase High Level is used to drive an alarm and a trip. The Alarm is triggered when there is a high level for 5 seconds continuously. The Trip message is triggered when there is a high level for 30 seconds continuously.

Alarm message "(A010) Alarm: Blowcase High Level (LSH300)" and Trip message "(T010) Trip: Blowcase High Level (LSH300)" are associated with this input.

Oil Cooler Fan Running

Input is true whenever the Oil Cooler Fan VFD/Starter is energized.

Status message "(S008) Status: Oil Cooler Running (OC Run)" is associated with this input.

Oil Cooler Fan Vfd Fault

This input actually monitors the Oil Cooling Fan Drive Ok contact of the VFD. Normally this input is on (for Drive Ok) but it is inverted for use in the PLC as a Drive Fault.

Trip message "(T009) Trip: Oil Cooler VFD Fault (OC VFD Fault)" is associated with this input.

DC OUTPUTS

PLC Control Enable Relay

Once the CLX processor has determined to be ok and a one second delay has occurred enable the PLC control Enable Relay to allow the operator to enable the Master Control Relay (MCR) via the white PB on the Control Panel. Loss of this signal will make the MCR drop out.

Compressor A Start Command

Upon the VRU in the Stand-By Mode and all conditions to run being true, a start command is sent to the VFD for compressor A.

Compressor B Start Command

Upon the VRU in the Stand-By Mode and all conditions to run being true, a start command is sent to the VFD for compressor A.

Stabilizer Heater Start Command

The STABILIZER HEATER START COMMAND utilizes two set-points from the Compressor Control HMI screen. The "Stabilizer Oil Heater – Set-Point" and the "Stabilizer Heater – Dead-band" are used to develop a Start and Stop temperature for the Stabilizer Heater Start Command.

Oil Cooler Start Command

The OIL COOLER START COMMAND is enabled whenever the compressors are running and there is a need for the Oil Cooler VFD to run.

Blowcase Blowdown

The BLOWCASE BLOWDOWN command is initiated upon the detection of a Scrubber High Level condition. Upon a high level the Blowcase Blowdown output is energized controlling the Balancing Line and Supply Line solenoids.

Pressure Equalizer Solenoid

The PRESSURE EQUALIZATION SOLENOID is energized whenever the compressors are not running. This is used to equalize the Discharge to Suction pressure.

Remote Alarm Notification

This output is enabled whenever an active Alarm is present. Any active Alarm will be displayed on the HMI's MAIN SCREEN. This output is optionally used by the customer for their own purpose.

Remote Trip Notification

This output is enabled whenever an active Trip is present. Any active Trip will be displayed on the HMI's MAIN SCREEN. This output is optionally used by the customer for their own purpose.

VFD Status Screen

The VFD STATUS Screen is used to display an overall status of the three VFDs that the VRU uses.

VFD A FAULT, VFD B FAULT, & VFD OIL COOLER FAULT

These three banners are driven off of the VFD alarm/trip codes and display's not only the numerical code but a brief description of the event. This data is read from the VFD(s) over Ethernet.

- VFD Fault Codes
  - (000) No VFD Fault
  - (001) DC bus under voltage (UU***)
  - (002) DC bus over voltage (OU)
  - (003) AC instantaneous over current (OI.AC**)
  - (004) Braking resistor instantaneous current trip (OI.br**)
  - (006) External trip (Et)
  - (007) Over-speed (O.SPd)
  - (018) Auto-tune stopped before completion (tunE)
  - (019) I2t on braking resistor (It.br)
  - (020) I2t on drive output current (It.AC)
  - (021) Drive over-heat (IGBT junctions) based on thermal model (O.ht1)
  - (022) Drive over-heat based on heat-sink temperature (O.ht2)
  - (024) Motor thermistor trip (th)
  - (026) +24V or Digital output overload (O.Ld1*)
  - (027) Drive over-heat (O.ht3)
  - (028) Analog input 1 current mode: current loss (cL1)
  - (030) Serial comms timeout (SCL)
  - (031) Internal drive EEPROM failure (EEF)
  - (032) High input voltage phase imbalance or input phase loss (PH)
  - (033) Failure to measure stator resistance (rS)
  - (035) Trip initiated from the control word (CL.bt)
  - (040-089) User trip (t040-t089)
  - (090) Divide by zero (t090)
  - (091) Access to non-existent parameter (t091)

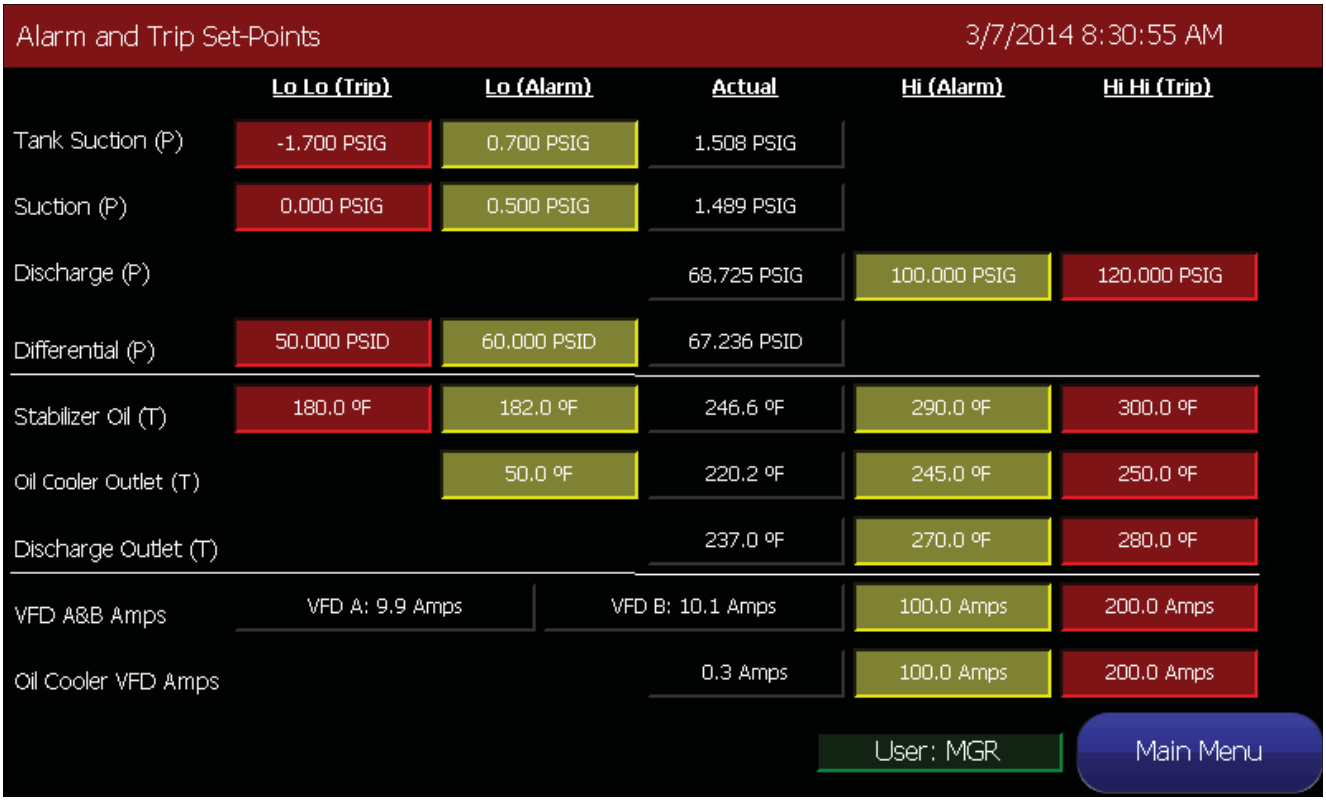


Figure 3-10. VFD Status Screen

- (092) Write to a read only parameter (t092)
- (094) Write a value to a parameter which is out of range (t094)
- (095) Virtual memory stack overflow (t095)
- (096) Invalid operating system call (t096)
- (097) Enabled with no LogicStick inserted or LogicStick removed (t097)
- (098) Invalid instruction (t098)
- (099) Invalid function block argument (t099)
- (100) Drive reset (-)
- (102) Power module rectifier over temperature (O.ht4)
- (182) SmartStick data error (C.Err)
- (183) Data does not exist (C.dAt)
- (185) SmartStick read/write fail (C.Acc)
- (186) Rating change (C.rtg)
- (189) Overload on current loop input (analog input 1). (O.cL)
- (199) Destination parameter clash (dESt)
- (200) Solutions Module hardware fault (SL.HF)
- (201) Solutions Module watchdog timeout (SL. tO)
- (202) Solutions Module error (SL.Er)
- (203) Solutions Module not installed (SL.nF)
- (204) Solutions Module different installed (SL.dF)
- (220) Power stage - code error (HF20)
- (221) Power stage - unrecognized frame size (HF21)
- (222) OI failure at power up (HF22)
- (223) DSP software overrun (HF23)
- (224) Not used (HF24)
- (225) DSP Communications failure (HF25)
- (226) Soft start relay failed to close (HF26)
- (227) Power stage thermistor fault (HF27)
- (228) Power circuit thermistor 2 or 3 fault/internal fan fault (HF28)
- (229) Fan failure (current too high) (HF29)
- (230) DCCT wire break trip from power module (HF30)
- (231) Internal capacitor bank fan failure (size 4 and larger) (HF31)
- (232) Power circuit temperature feedback multiplexor failure (HF32)

MOTOR VOLTAGE

This is the Motor Voltage while running.

MOTOR SPEED

This is the Motor Speed in RPM while running.

MOTOR ACTIVE CURRENT

This is the Motor Current while running.

OUTPUT POWER

This is the Motor kilowatts (kW) while running. Total output power of the drive (positive for power flow out of the drive's output terminals). Output power of the drive is calculated from the in phase components of voltage and current such that the total real power output is measured.

VFD COMMUNICATIONS

This is the Ethernet communications status between the VFD and the CLX processor. The status needed to run in "Ok" (or Running).

- Standby - The controller is powering up.
- Faulted - Any of the MODULE object's connections to the associated module fail. This value should not be used to determine if the module failed because the MODULE object leaves this state periodically when trying to reconnect to the module. Instead, test for Running state (16#4000). Check for Fault Code not equal to 0 to determine if a module is faulted. When Faulted, the Fault Code and Fault Info attributes are valid until the fault condition is corrected.
- Validating - The MODULE object is verifying MODULE object integrity prior to establishing connections to the module.
- Connecting - The MODULE object is initiating connections to the module.
- Running - All connections to the module are established and data is successfully transferring.
- Shutting down - the MODULE object is in the process of shutting down all connections to the module.
- Inhibited - The MODULE object is inhibited (the inhibit bit in the Mode attribute is set).
- Waiting - The parent MODULE object upon which this MODULE object depends is not running

EPA Data Screen

The EPA DATA Screen shows data as it is being collected today as well as the data that was recorded for the previous day.

TANK SUCTION PRESSURE (AVERAGE)

This is the average Tank Suction Pressure over a 24 hour period only while a compressor is running.

DISCHARGE PRESSURE (AVERAGE)

This is the average Discharge Pressure over a 24 hour period only while a compressor is running.

STABILIZER OPERATING TEMPERATURE (AVERAGE)

This is the average Stabilizer Operating Temperature over a 24 hour period only while a compressor is running.

COMPRESSOR RUN TIME (RUNNING TOTAL)

The total time the VRU was running (in hours) over a 24 hour period.

COMPRESSOR RPM (AVERAGE)

This is the average Compressor RPM over a 24 hour period only while a compressor is running.

POWER USAGE (KWH/DAY)

This is the totalized value over a 24 period of the three VFD kW signals.

MECHANICAL AVAILABLITY (%)

The amount of time that the VRU is not Tripped (whether running or not). Should ever the VRU be tripped it is not available to run.

EPA RECORD (YEAR)

This is the year of the daily record.

EPA RECORD (MONTH)

This is the month of the daily record.

EPA RECORD (DAY)

This is the day of the month of the daily record.

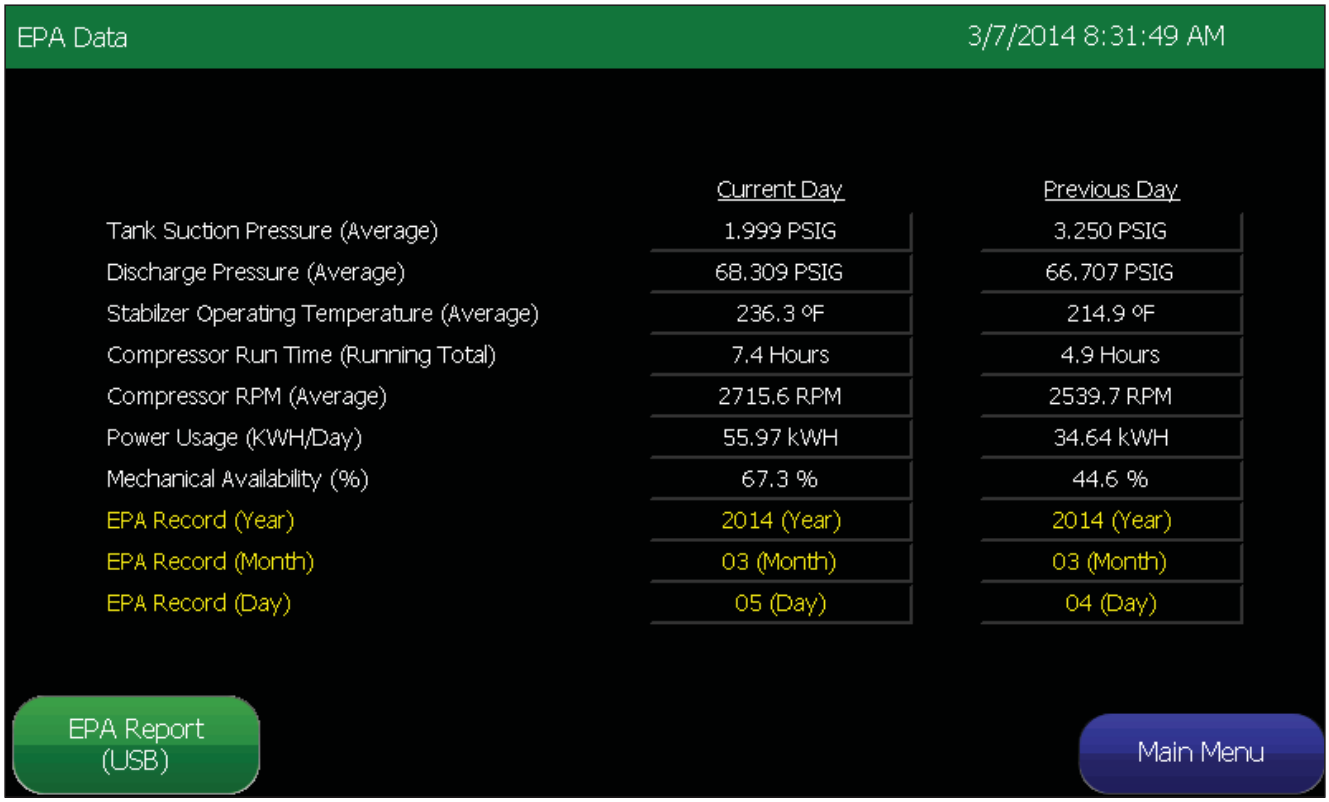


Figure 3-11. EPA Data Screen

EPA Event List Screen

The EPA EVENT LIST Screen only logs Trip level events. It holds the last 100 Trip events.

If multiple trips occur at the same time all will be logged.

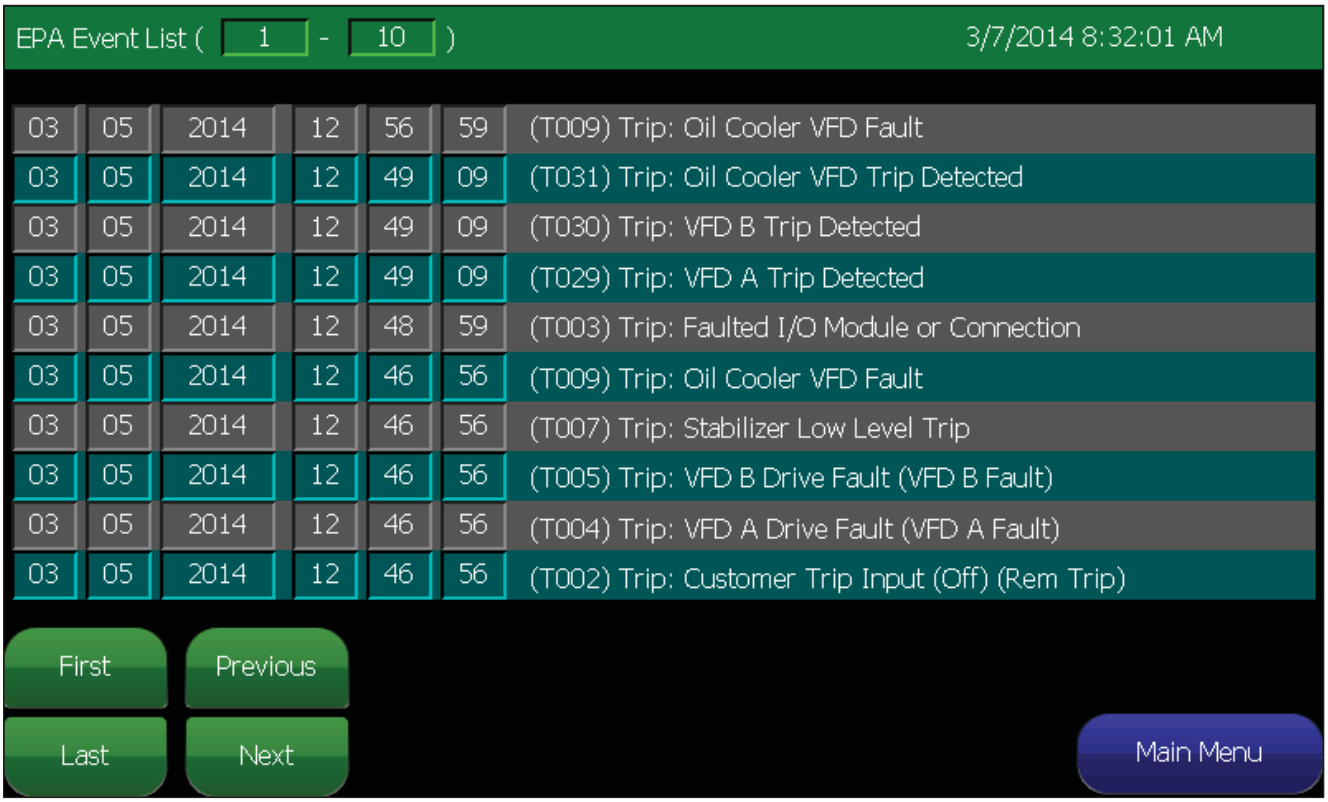


Figure 3-12. EPA Event List Screen

Options Screen

The OPTIONS Screen is only accessible when logged in. From this screen there is one option to select which is the Auto Restart On Power-Up. That option when selected will allow the a VRU that was either in the Stand-By Mode or with a compressor running to re-start on a power up. Should this option be de-selected the VRU will drop out of the Stand-By mode requiring an operator to press the Start button on the HMI's Main Screen.

The "Clear EPS Event List" allows an operator to clear out the EPA Event List if needed. Typically this may be done after start up to clear out Trips that may have occurred while setting set-points and calibration.

Figure 3-13. Options Screen

Set PLC Date & Time Screen

This screen allows an operator to set the CLX (PLC) Date and Time to whatever value they desire. Typically this screen is used at start-up or due to Daylight Savings Time. This Date and Time are what is logged into the EPA Event List logs.

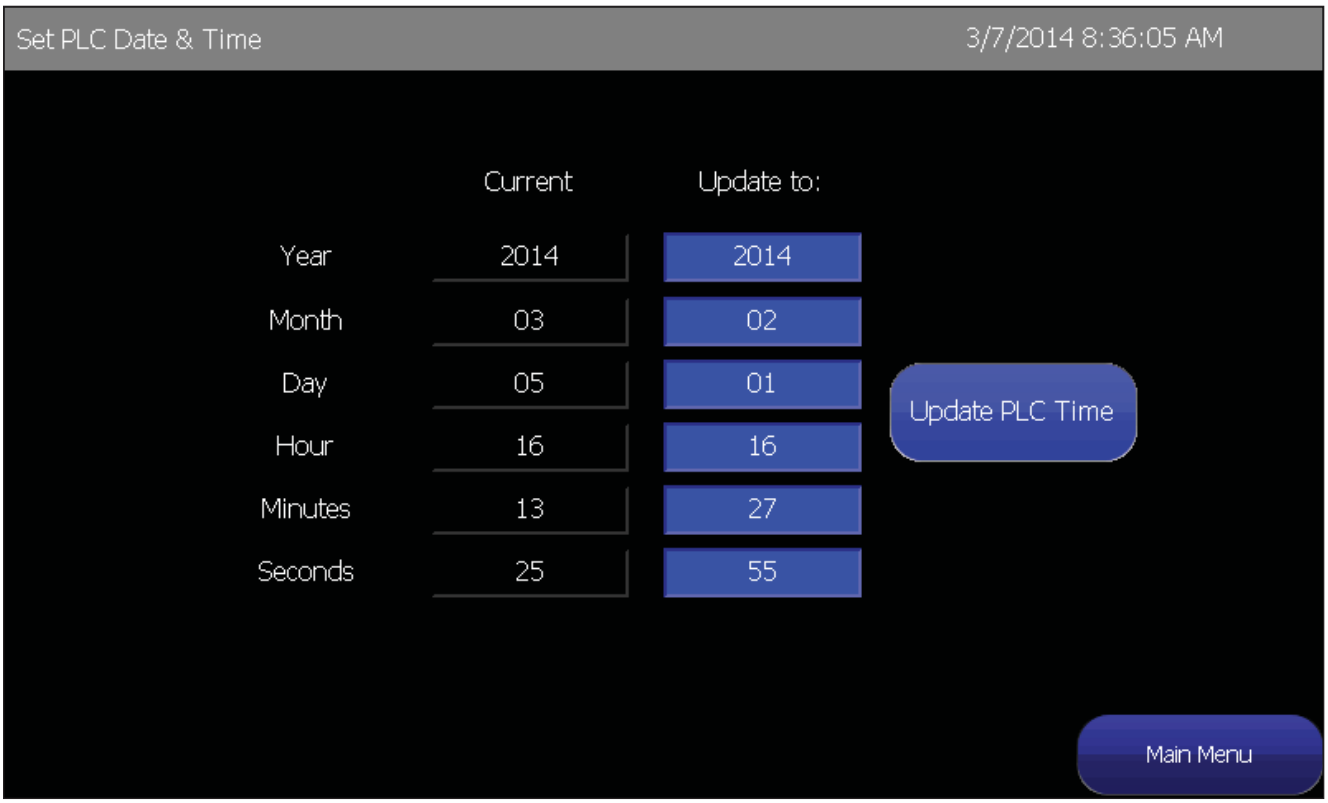


Figure 3-14. Set PLC Date & Time Screen

Alarm Messages

Message: (A008) Alarm: Oil Filter High Differential Pressure.

Cause: Oil Filter High Differential (PS2201) is detected.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (A010) Alarm: Blowcase High Level.

Cause: Blowcase High Level (FLT2221) is detected.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (A011) Alarm: High Discharge Pressure.

Cause: Compressor Discharge Pressure w/Offset is greater than or equal to Discharge Pressure High (Alarm) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (A012) Alarm: Low Suction Pressure.

Cause: Compressor Suction Pressure w/Offset is less than or equal to Suction Pressure Low (Alarm) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (A013) Alarm: Low Differential Pressure.

Cause: Whenever the compressor has started a 30 second delay occurs before the monitoring if the Compressor Differential Pressure (DP-SP) is less than or equal to Differential Pressure Low (Alarm) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (A014) Alarm: Low Tank Suction Pressure.

Cause: Tank Suction Pressure w/Offset is less than or equal to Tank Suction Pressure Low (Alarm) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (A015) Alarm: Low Oil Cooler Outlet Temperature.

Cause: Oil Cooler Outlet Temperature is less than or equal to Oil Cooler Outlet Temperature Low (Alarm) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (A016) Alarm: High Oil Cooler Outlet Temperature.

Cause: Oil Cooler Outlet Temperature is greater than or equal to Oil Cooler Outlet Temperature High (Alarm) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (A017) Alarm: High Discharge Outlet Temperature.

Cause: Discharge Outlet Temperature is greater than or equal to Discharge Outlet Temperature Low-Low (Alarm) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (A018) Alarm: Low Stabilizer Oil Temperature.

Cause: Stabilizer Oil Temperature is less than or equal to Stabilizer Oil Temperature Low (Alarm) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (A019) Alarm: High Stabilizer Oil Temperature.

Cause: Stabilizer Oil Temperature is greater than or equal to Stabilizer Oil Temperature High (Alarm) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (A028) Alarm: Compressor VFD A High Motor Amps.

Cause: VFD A Motor Active Current (A) (Pr. 00.89) is greater than or equal to VFD A/B Amps High (Alarm) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (A029) Alarm: Compressor VFD B High Motor Amps.

Cause: VFD B Motor Active Current (A) (Pr. 00.89) is greater than or equal to VFD A/B Amps High (Alarm) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (A030) Alarm: Oil Cooler VFD High Motor Amps.

Cause: VFD Oil Cooler Motor Active Current (A) (Pr. 00.89) is greater than or equal to VFD Oil Cooler Amps High (Alarm) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Trip Messages

Message: (T001) Trip: MCR Not Energized/E-Stop Active (MCR).

Cause: Master Control Relay input is off.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T002) Trip: Customer Trip Input (Off) (Rem. Trip).

Cause: Customer Trip input is off.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T003) Trip: Faulted I/O Module or Connection.

Cause: An IO Module fault has been detected.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T004) Trip: VFD A Drive Fault (VFD A Fault).

Cause: Compressor VFD A has faulted.

Reset: Press Reset Alarm push-button to clear the VFD Fault and system Trip.

Message: (T005) Trip: VFD B Drive Fault (VFD B Fault).

Cause: Compressor VFD B has faulted.

Reset: Press Reset Alarm push-button to clear the VFD Fault and system Trip.

Message: (T007) Trip: Stabilizer Low Level Trip.

Cause: Stabilizer Low Level (FLT2181) detected.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T008) Trip: Oil Filter High Differential Pressure.

Cause: Oil Filter High Differential (PS2201) has been on for 30 seconds continuously.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T009) Trip: Oil Cooler VFD Fault.

Cause: Oil Cooler Fan VFD has faulted.

Reset: Press Reset Alarm push-button to clear the VFD Fault and system Trip.

Message: (T010) Trip: Blowcase High Level.

Cause: Blowcase High Level (FLT2221) has been on for 30 seconds continuously.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T011) Trip: High Discharge Pressure.

Cause: Compressor Discharge Pressure w/Offset is greater than or equal to Discharge Pressure High-High (Trip) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T012) Trip: Low Suction Pressure.

Cause: Compressor Suction Pressure w/Offset (EU) is less than or equal to Suction Pressure Low-Low (Trip) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T013) Trip: Low Differential Pressure.

Cause: Whenever the compressor has started a 30 second delay occurs before the monitoring if the Compressor Differential Pressure (DP-SP) is less than or equal to Differential Pressure Low-Low (Trip) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T014) Trip: Low Tank Suction Pressure.

Cause: Tank Suction Pressure w/Offset is less than or equal to Tank Suction Pressure Low-Low (Trip) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T016) Trip: High Oil Cooler Outlet Temperature.

Cause: Oil Cooler Outlet Temperature is greater than or equal to Oil Cooler Outlet Temperature High-High (Trip) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T017) Trip: High Discharge Outlet Temperature.

Cause: Discharge Outlet Temperature is greater than or equal to Discharge Outlet Temperature Low-Low (Trip) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T018) Trip: Low Stabilizer Oil Temperature.

Cause: Compressor Start (Run in Auto) = 1 and Stabilizer Oil Temperature is less than or equal to Stabilizer Oil Temperature Low-Low (Trip) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T019) Trip: High Stabilizer Oil Temperature.

Cause: Stabilizer Oil Temperature is greater than or equal to Stabilizer Oil Temperature High-High (Trip) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T020) Trip: Out of Range: Compressor Discharge Pressure.

Cause: Compressor Discharge Pressure Input Fault, Under-Range, or Over-Range.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T021) Trip: Out of Range: Compressor Suction Pressure.

Cause: Compressor Suction Pressure Input Fault, Under-Range, or Over-Range.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T022) Trip: Out of Range: Tank Suction Pressure.

Cause: Tank Suction Pressure Input Fault, Under-Range, or Over-Range.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T023) Trip: Runaway Protection Active.

Cause: Either a false start or an uncontrolled run has been detected.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T024) Trip: Out of Range: Oil Cooler Outlet Temperature.

Cause: Oil Cooler Outlet Temperature Input Fault, Under-Range, or Over-Range.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T025) Trip: Out of Range: Discharge Outlet Temperature.

Cause: Discharge Outlet Temperature Input Fault, Under-Range, or Over-Range.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T026) Trip: Out of Range: Stabilizer Oil Temperature.

Cause: Stabilizer Oil Temperature Input Fault, Under-Range, or Over-Range.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T029) Trip: VFD A Trip Detected.

Cause: There is a 10 second delay after system power up to allow establishing communications with VFD A. A loss in communications after the 10 second delay will cause a trip to occur.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T030) Trip: VFD B Trip Detected.

Cause: There is a 10 second delay after system power up to allow establishing communications with VFD B. A loss in communications after the 10 second delay will cause a trip to occur.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T031) Trip: Oil Cooler VFD Trip Detected.

Cause: There is a 10 second delay after system power up to allow establishing communications with the Oil Cooler VFD. A loss in communications after the 10 second delay will cause a trip to occur.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T032) Trip: Compressor VFD A High Motor Amps.

Cause: VFD A Motor Active Current is greater than or equal to VFD A/B High-High Amps (Trip) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T033) Trip: Compressor VFD B High Motor Amps.

Cause: VFD B Motor Active Current is greater than or equal to VFD A/B High-High Amps (Trip) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Message: (T034) Trip: Oil Cooler VFD High Motor Amps.

Cause: Oil Cooler VFD Motor Active Current is greater than or equal to Oil Cooler VFD High-High Amps (Trip) set-point.

Reset: Once the condition has cleared Press Alarm Reset push-button.

Status Messages

Message: (S001) Status: Compressor Started.

Cause: All conditions have been met for the Compressor to run.

Message: (S002) Status: Waiting for Remote Run Permissive.

Cause: Remote Run Permissive input is low.

Message: (S004) Status: VFD A Motor Running.

Cause: Compressor A Running input is high.

Message: (S005) Status: VFD B Motor Running.

Cause: Compressor B Running input is high.

Message: (S008) Status: Oil Cooler Running.

Cause: Oil Cooler Fan Running input is high.

Message: (S010) Status: Blowcase Blowdown Solenoid(s) Enabled.

Cause: Blowcase Blowdown (CR2621) out is on (Balancing Line (NO) Supply Line (NC)).

Message: (S018) Status: Stabilizer Heater Running.

Cause: Stabilizer Heater Start Command (CR20581) is on.

Message: (S020) Status: Compressor in Standby Mode waiting for MCR relay Input.

Cause: Compressor is in Standby Mode (Ready to Start) and waiting for the Master Control Relay (CRMA) to be energized.

Message: (S021) Status: Compressor in Standby Mode waiting for Customer Trip Input.

Cause: Compressor is in Standby Mode (Ready to Start) and waiting for the Customer Trip input on.

Message: (S022) Status: Compressor in Standby Mode waiting for Remote Run Permissive Input.

Cause: Compressor In Standby Mode (Ready to Start) and waiting for the Remote Run Permissive input on.

Message: (S023) Status: Compressor in Standby Mode waiting for Valid Compressor set-points.

Cause: Compressor In Standby Mode (Ready to Start) and waiting for the Alarm, Trip, and Compressor Control set-points order check to be OK.

Message: (S024) Status: Compressor in Standby Mode waiting on Low Tank Suction Start Pressure.

Cause: Compressor In Standby Mode (Ready to Start) and waiting for the Tank Suction Pressure w/Offset to be greater than or equal to the Compressor Tank Suction Pressure Start set-point.

Message: (S025) Status: Compressor in Standby Mode waiting for Stabilizer Temperature to be above target lower deadband.

Cause: Compressor In Standby Mode (Ready to Start) and waiting for the Stabilizer Oil Temperature to be greater than 180.