VARC Chiller Control
Operations Manual

Dometic Group Marine Division
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L-3499 English
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INTRODUCTION

The Dometic VARC (Variable Chiller) controls is a microcontroller-based unit designed to control multiple chillers. This design allows the user flexibility in the application and improved controls and protection. The VARC Chiller uses a PID loop control to manage the capacity of the chiller in single or multistage application. This completely variable capacity chiller uses a VFD to modulate the speed of the compressor to achieve the desired chilled water setpoint. This allows the compressor to be ran at a minimum speed of 30Hz to a maximum of 240 Hz.

The VARC48 uses a precision PID (proportional integral derivative) loop control algorithm that modulates the compressor speed and balances chiller output with required load. This smooth operation eliminates large swings in current on the generator. The VARC48 also uses the advanced technology of an Electronic Expansion Valve (EEV). This provides more precise control of superheat across a broad range of conditions with no erratic swings as the valve reacts to temperature and pressure changes (no "hunting"). Using an advanced algorithm, superior superheat control is maintained over extreme operating conditions.

This application supports the following:

- Selection and sequencing of up to four chillers
- Selection and sequencing of one chilled water pump and one sea water pump
- Selection and sequencing of up to 4 EH heaters
- Sequencing of devices for runtime equalization
- Alarms and interlocks
- Load Shedding
- Troubleshooting help

The three main interfaces supported will be the LCD display, referred to as the PGD1 or PLDPRO display, and the HMI touchscreen.

Figure 1: PGD1 Button Description

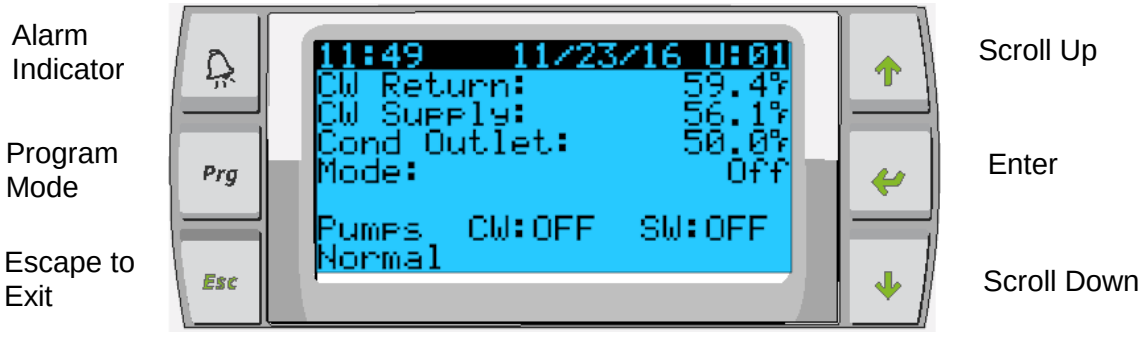


Figure 2: PLDPRO Button Description

PGD1 and PLDPRO NAVIGATION

Enter Button

The PGD1 controller screen will automatically boot up to the Main screen. This screen allows you to enable or disable the chiller by pressing the Enter button. Pressing the Enter button will take you to the area of screen you wish to modify. Press multiple times if required.

Scroll Up/Down Buttons

This button will be used to modify the value such as temperature setpoint or probe adjustment values. The Scroll Up or Scroll Down button will also navigate you from page to page of the controller. The flashing cursor must be in the upper left-hand corner for the page navigation. Pressing enter repeatedly will move it to that location.

Esc Button

The Esc button is used to exit your present screen and take you back one screen. Pressing it multiple times will take you back to the Main screen.

Prg Button

This button takes you to the system menus. Once at the menus, use the scroll buttons to scroll through the various options. Pressing enter will select that menu item.

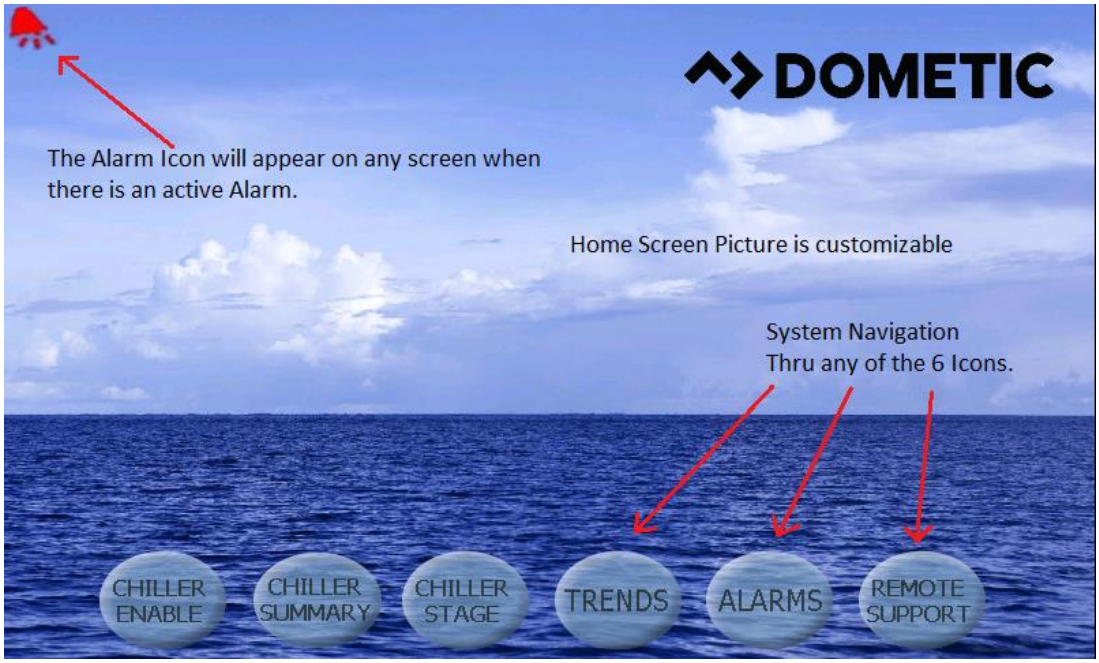
Alarm Button

This button will flash red if there is an active alarm. Pressing this button will take you to the active alarm screen to display the alarm. Once in the alarm screen, use the up/down buttons to scroll through alarms. The Alarm screen captures a snapshot of the system parameters at the time of the fault. Press and hold the Alarm button for 3 seconds to clear the active alarm if the fault has been corrected.

TOUCHSCREEN NAVIGATION

MAIN PAGE

Figure 3: Main Page



Chiller Enable

Touching this icon will take you to the chiller operational screen, where you can enter setpoints for both heating and cooling and monitor chilled water temperatures and pump current information.

Chiller Summary

Touching this icon will take you to the summary screen, where you can see the state of your HP, LP and FS and view your stage supply water temperature out for all available stages. Touching a stage on the screen will take you to that chiller stage for additional information.

Chiller Stage

Touching this icon will take you to the first stage, where the system refrigerant circuit and chilled water circuit can be monitored. This screen has multiple hotspots where all stage parameters can be viewed. If the system has the installed option, additional available hotspot icons will appear to view additional information. Forward and back buttons will navigate to the next stage.

Trends

Touching this icon will take you to the trending screen where you can view graphically how your system has been performing. The graph data is downloadable to a USB stick. Water temperatures and pressures as well as compressor current are available for graphing.

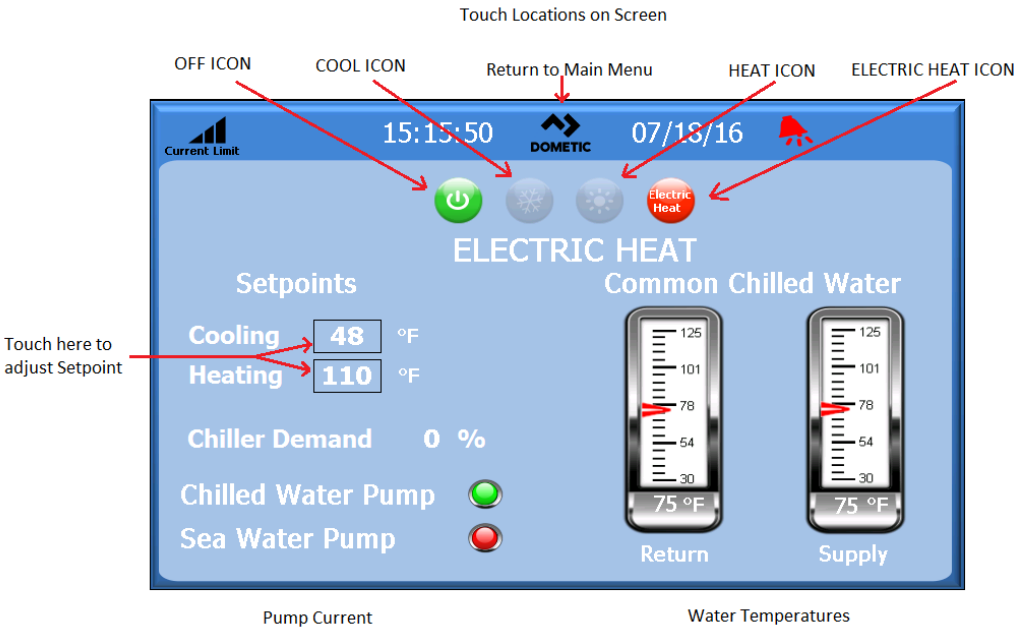
Alarms

Touching this icon will take you to the active alarm screen where alarms can be reviewed and cleared. Alarm history can also be viewed from here by using the navigation buttons on the top that take you to the alarm history. Using the drop-down menu will allow you to go back from minutes to months in the fault history. There is also an information icon that will take you to a help screen to display the possible causes of your alarm to aid in the troubleshooting of your system

Remote Support

Touching this icon takes you to the screen where you can enable a third party to view your system over an Internet connection via a VNC (Virtual Network Computing) server.

Figure 4: Touch Locations on Screen



Logo

The touchscreen logo is customizable. Pressing the logo will return you to the Main menu screen from any sub-screens. Some screens contain pop-up screens with information. To exit a pop-up, simply touch the X to close the screen.

Off Icon

Off icon will be illuminated only if the system is in a run state. Touch the Off icon to turn off the system.

Cool Icon

Cool will be illuminated only if the system is in cooling. Touch this icon to put the system in cool mode and the word cool will appear on the screen.

Heat Icon

Heat will be illuminated only if the system is in heating. Touch this icon to put the system in heat mode and the word heat will appear on the screen.

Electric Heat Icon

Only visible if option is installed. Electric Heat will be illuminated only if the system has electric heat enabled. Touch this icon to put the system in heat mode and the word heat will appear on the screen.

Setpoint Thermometers

These icons are touched to adjust the cooling or heating set points.

See Appendix 1 for complete touchscreen navigation.

GENERAL

The VARC chiller is a PLC based control system that uses a PID control loop to manage the capacity requirements of the system. This control loop allows for finite control to match the capacity of the chiller to the thermal load demand on the system. This system differs greatly from the on/off control of a standard chiller system, as it will modulate the speed of the compressor to increase or decrease its capacity allowing for reduced current consumption by the electrical system.

The chiller system will come programmed from the factory with the options enabled for that system. Although the system offers flexibility, these options can only be enabled by a factory representative.

The user will be able to select between Normal, Econo and Boost mode operation in single stage configuration. In a multistage configuration the user will also be able to select between Normal or Accelerated startup to bring the system chilled water temperature down faster or in the case of heat mode temperature higher.

The VARC controller is internally grounded with isolation between inputs and outputs. Additionally, the output relays offer double isolation so that different voltages can be used for groups of relays.

The system will utilize various sensor types for measuring analog temperatures and pressures. For temperature measurements, the system will use NTC type 10K@77° thermistors. Pressure transducers are ratiometric 0-650 PSI (45 bar) range for both suction and discharge monitoring.

DIGITAL INPUTS

Digital inputs are used to monitor the status of the protection circuits for the system.

Safety Inputs

All discrete inputs will be checked before the system will be enabled. Any faults detected on start-up must be verified and cleared via the VARC before system will start normal operation.

Chilled Water Flow Switch

With the system in either heating or cooling mode the Flow switch must be closed prior to system starting or a stage being enabled. In operation if Flow is lost for more than 10 consecutive seconds, the compressor or heat relay will be disabled. A flow switch fault will be recorded and displayed.

A CW Flow fault will be recorded and system will be in lockout and a manual restart will be required. The VARC will not allow the compressor or electric heat relay to be energized for the stage that has lost flow or the whole system if a common flow switch is being used.

Fault must be manually acknowledged via the VARC and cleared prior to re-enabling the system or stage.

Refrigerant High Side Pressure Limit

The VARC will immediately acknowledge an open circuit if the HI pressure switch is tripped and de-energize the compressor. It will record and display high pressure fault on the alarm screen. If the VARC detects a high pressure fault during operation, a HP fault will be displayed and recorded. The VARC will not allow the compressor relay to be re-energized, until switch is in the closed position.

The fault must be manually acknowledged via the VARC and cleared prior to re-enabling the system or stage.

ANALOG INPUTS

High Limit Temperature Setpoint

The high limit temperature sensor is continuously monitored whether in Cooling, Reverse Cycle or Electric Heat mode.

This sensor is used to detect a high temperature condition in the supply water from the chiller. If the chilled water temperature is sensed to be greater or equal to 125°F (51.7°C), all enabled compressor relays will be de-energized, turning off the compressor(s) if operating in reverse cycle mode. If electric heat is being used, all enabled heater relays will be de-energized, turning off the heating element(s).

As the temperature falls, the compressor or electric heat relay will re-energize when the temperature reaches 110°F (43.3°C).

A high temperature fault will be recorded and displayed if the system exceeds the alarm set point. In a high temperature situation, VARC will not allow the compressor or electric heat relay to be energized. The fault must be manually acknowledged on the active alarm screen and cleared prior to re-enabling the system or stage.

If a temperature sensor is bad or not connected, the VARC will display an alarm for that sensor.

Freeze Temperature Setpoint

The low limit temperature sensor is continuously monitored whether in Cooling, Reverse Cycle or Electric Heat mode.

This sensor is used to detect a freeze condition in the supply water of the chiller. If the chilled water temperature is sensed to be equal to or less than 38°F (3.3°C), then the compressor relay will be de-energized, shutting off the compressor. As the temperature rises, the compressor relay will re-energize when the temperature reaches 42°F (5.6°C).

A low temperature fault will be recorded and displayed if the system falls below the alarm set point. In a low temperature situation, VARC will not allow the compressor or electric heat relay to be energized. The fault must be manually acknowledged on the active alarm screen and cleared prior to re-enabling the system or stage.

If a temperature sensor is bad or not connected, the VARC will display an alarm for that sensor.

Condenser Freeze Protection

The system is equipped with a temperature sensor mounted to the condenser coil. This sensor is there to sense the coil temperature. In heat mode if the coil temperature drops below 40 °F, the VARC controls will automatically lower the speed of the compressor to half the speed that it was currently running. The display will indicate “Freeze Defrost” while performing this operation.

PRESSURE TRANSDUCERS

Suction Pressure

The suction pressure is continuously monitored by the VARC. If the suction pressure is below the alarm set point for longer than the programmed time delay, a fault will occur. This low suction fault will be recorded and displayed on the alarm screen.

The fault must be manually acknowledged via the VARC and cleared prior to re-enabling the system or stage.

Discharge Pressure

The discharge pressure is continuously monitored by the VARC. If the discharge pressure is above the alarm set point for longer than the programmed time, a fault will occur. This high pressure fault will be recorded and displayed on the alarm screen.

The fault must be manually acknowledged via the VARC and cleared prior to re-enabling the system or stage.

RELAY OUTPUTS

COMP – Compressor

VARC COMP output will provide switched power to the VFD enable pin for the compressor normal operation.

CWP – Chilled Water Pump

VARC CWP output will provide switched power to the contactor coils for the chilled water pump.

SWP – Sea Water Pump

VARC SWP output will provide switched power to the contactor coils for the sea water pump.

RV – Reversing Valve

VARC RV output will provide switched power to the coils for the reversing valve.

EH – Electric Heat

VARC EH output will provide switched power to the contactor coils for the electric heat.

Fault

Provides a Normally Open (NO) contact point. Any fault condition will close the NO contact. This output can be used to power a light, relay, or interface to a ship's monitoring system. The output on this terminal will be 230 VAC.

SYSTEM OVERVIEW

System Power-up

Software Revision

Upon applying power to the system, the display will indicate the software revision number or display it on the main status screen.

VARC is enabled and waiting for user selection.

MODBUS

The VARC comes with a 3 wire Modbus connection as part of the electrical box. This connection is used for multistage configuration, touchscreen and networking to a boat management system.

Startup

The VARC Chiller controller can be operated as a single or a multistage chiller plant. During initial setup, the system will be configured for the number of stages and the available options. System is set for Return water control but can be modified for Supply water control if needed. The user has the option to select between metric values being displayed or Imperial values being displayed during operation of the system.

In a multistage configuration the user will be able to change the different operating startup modes. The two startup modes are: normal stage startup or accelerated mode startup. The normal startup is when the system has a time delay between the staging up of the various stages. Stage one will be initiated and will start its operation once the PID determines that more capacity is required the second stage will be initiated. While in operation and the system has maintained the chilled water loop and the PID has determined that that no additional stage is required or has met capacity demand it will reduce the speed of the compressors. The compressors will operate at minimal speed to maintain the chilled water loop. If the speed of the compressor still exceeds the demand the stage with the most run hours will be turned off.

The VARC chiller allows the user to select between three operating modes. Econo mode, normal mode and boost mode. These three modes allow the user to have predefined current limits. The economy mode is the energy efficient mode where the compressor is limited to default five amp configuration. The normal mode is the typical mode of operation where the current limit is set to 9 Amps for both heat and cool modes. The boost mode allows the system to run at maximum capacity without current limitation other than the full limits of the frequency drives which is 12 amps.

Chilled water setpoint will be entered for Cool and Heat mode.
Once enabled, CW and SW pumps will be turned on for operation.

Operational Checks

Once the VARC is enabled the system will conduct pre-startup checks. The VARC program will check all CW flow switches for faults. The VARC will also check HP and LP (optional) switches for faults.
Individual stage faults will only disable that stage.

Compressor Startup

The VARC utilizes a BLDC compressor that is capable of operating at a very high frequency. This requires that the compressor have a ramped startup to establish proper lubrication as to not damage the compressor. This startup has a ramp time and a minimal speed operation that will last for 100 seconds to allow the compressor to properly warm-up before operating at maximum speed.

The compressor minimum on time is 100 seconds and minimum off time is also 100 seconds with a minimum time between starts of 120 seconds. These default parameters allow the compressor to operate in a safe mode that will not damage the compressor.

SETPOINTS

Cooling

Cooling setpoint is a VARC adjustable parameter from 42°F (5.56°C) (for Supply control and 48°F Return control) to 55°F (13°C) in one degree increments. To adjust the cooling setpoint, simply touch the VARC screen and change to desired new setpoint. In cooling mode, you will not be able to enter a number outside of this range.

Heating

Heating setpoint is a VARC adjustable parameter from 100°F (38°C) to 114°F (45.56°C) in one degree increments. To adjust the heating setpoint, simply touch the VARC screen and change to desired new setpoint. In heating mode you will not be able to enter a number outside of this range.

Compressor Staging Time

Compressor staging time is a VARC adjustable parameter where 2 modes are selectable between normal and accelerated staging. The accelerated staging is only available in a multistage configuration. The normal staging works the same as the on off system where there is a time delay between the multiple stages driven by the PID loop. The accelerated staging is only available during initial startup in a multistage configuration. This accelerated startup is when all available stages are turned on simultaneously. The stages will start the ramp-up process at the same time after the fixed startup delay. After this delay the units will ramp the maximum speed to achieve maximum capacity.

Run Mode – Cooling

Compressor rotation is active during run mode. The compressor with the lowest running hours will be enabled first and compressor with the highest running hours will be disabled first.

First stage will be enabled and the compressor will start after CW and SW flows are stable for 10 seconds (default).

First stage will continue to run for 1 minute before enabling the next stage. If the PID loop requires demand, then the next stage will be enabled with a startup delay of 3 minutes before running up to required speed.

Run Mode – Reverse Cycle Heating

Compressor rotation is active during run mode. The compressor with the lowest running hours will be enabled first and compressor with the highest running hours will be disabled first.

Enable Reverse Cycle Heat only for the system.

First stage heating will be enabled and the compressor will start after CW and SW flows are stable for 10 seconds.

First stage will continue to run for 5 minutes before enabling the next heater stage. If the PID loop requires demand, then the next stage will be enabled with a startup delay of 3 minutes before running up to required speed.

Run Mode – Electric Heating (optional heater barrel)

Heater rotation is active during run mode. The heater with the lowest running hours will be enabled first and the heater with the highest running hours will be disabled first.

Enable Electric Heat only for the system.

First stage will be enabled and the electric heater will start after CW flow is stable for 10 seconds.

First stage will continue to run for 5 minutes before enabling the next heater stage. If the PID loop requires demand then the next stage will be enabled.

OPERATIONAL MODES

PUMP OPERATION

Chilled Water Pump

The chilled water pump relay shall close if the system is in heat mode or cool mode. The pump will be enabled 5 seconds prior to the first stage being enabled. Pump will be on for continuous operation when system is enabled

Sea Water Pump

The sea water pump will have a selectable operating mode between continuous operation or cycle with compressor operation. The default configuration is to cycle with the demand.

The sea water pump relay shall close 5 seconds before the compressor starts in heating or cooling modes and will open 5 seconds after the last compressor cycle is completed. If immersion heating is available and used, the sea water pump will be disabled.

In a multistage configuration the pump outputs can be daisy chained at the back of the unit to supply power to the pumps. This will allow any stage to supply power to the pumps when being staged on and off and as a redundant control for the pumps.

Cooling Mode

Cooling mode is entered when Cool is selected on the touchscreen or with the display buttons. The system will automatically start cooling depending on temperature setpoint. The pumps will operate as described in the pump operation section.

- The board will energize the compressor relay if return water/supply water temperature is above the cooling setpoint and the staging delay has elapsed.
- The compressor will continue to run until the cooling setpoint has been reached or an alarm condition exists. A stage will have a minimum run time of 100 seconds before it can be turned off and a minimum off time of 120 seconds before it can be re-enabled. This minimum on time is required to ensure that the system is not cycling on and off and not allowing the compressor to properly warm-up. This ensures proper oil lubrication of the system
- If the system calls for a stage to be toggled on/off, the next available stage will be used that meets the staging criteria.
- Load shedding will occur in multistage operation when approaching chilled water setpoint.
- The reversing valve is toggled to relieve head pressure at the end of a compressor run cycle.

Heating Mode

Reverse Cycle Heating mode is entered when Heat is selected on the touchscreen or with the display buttons. The system will automatically start heating depending on the temperature setpoint. The pumps will operate as described in the pump operation section.

- The reversing valve relay will be energized to change the unit to operate in Reverse Cycle Heating mode.
- The VARC will energize the compressor relay if return/supply water temperature below the programmed heating setpoint and the staging delay has elapsed. The compressor will continue to run and the reversing valve will remain energized until the heating setpoint has been reached or an alarm condition exists. As setpoint is reached, the compressor will reduce its speed to maintain the water temperature. Once it has reached temperature and a hysteresis of 1 degree the unit will turn off the compressor. Once it has turned off the compressor the reversing valve will de- energize after a 2-second delay.
- A stage will have a minimum run time of 3 minutes before it can be turned off and a minimum off time of 3 minutes before it can be re-enabled. If the system calls for a stage to be toggled on/off, the next available stage will be used that meets the staging criteria.

Electric Heating mode is entered when Electric Heat is selected on the touchscreen or with the display buttons. The system will automatically start heating depending on the temperature setpoint.

- The VARC will energize the heater relay if return/supply water temperature is below the programmed setpoint and the staging delay has elapsed in a multistage configuration.

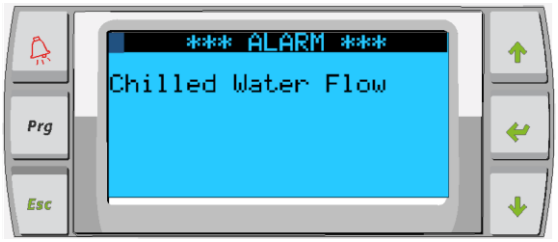
Status Screen Navigation

The main home screen is the status screen where the single stage operation can be reviewed or in a multistage configuration the user can scroll and see the values of the chilled water and other parameters of the additional stages. The user will simply use the down arrow key to scroll through the various parameters being displayed on the LCD screen. The LCD screen will also indicate on the main screen the mode of operation whether it is Econo or Normal mode.

Figure 5:

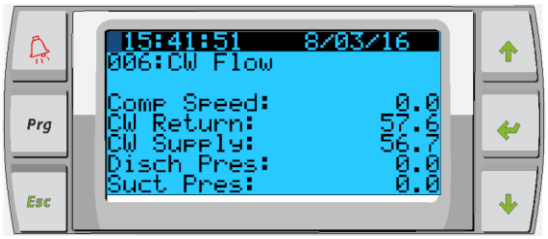
The main screen will also indicate if there is an alarm present on the system by flashing the word alarm in the lower right-hand corner. The smaller PLD Pro LCD screen also has an audible tone that you will hear when there is an alarm present on the system as well as display the word alarm in the lower right-hand corner.

Figure 6:



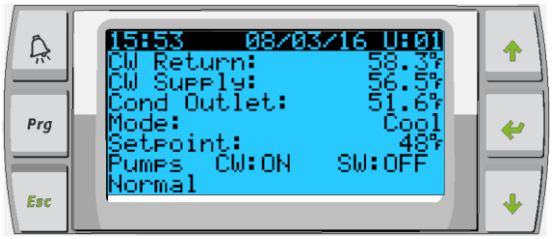
The alarm logger is used to see the alarm history and displays the compressor speed, the CW return & supply temperature, the discharge & suction pressure.

Figure 7:



The main screen will indicate the chilled water return temperature the chilled water supply temperature as well as the condenser outlet temperature which is the freeze control indicator for the condensers in heat mode.

Figure 8:

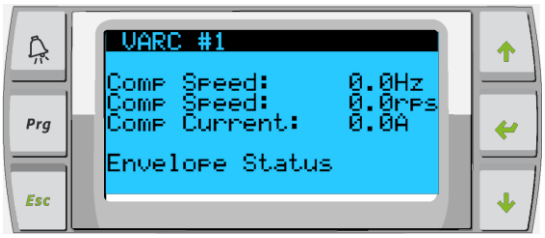


The additional screens following the main screen will contain information per Stage. The first screen includes the CW Supply & Return temperature, flow switch and high pressure Ok or Alarm.

Figure 9:

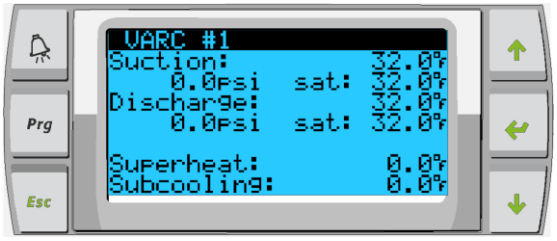
The next screen you are able to read compressor speed also contains information to let you know if the system is in a safety count down. Once this time has elapsed and other time delays have been met the system will start up. At the bottom of the screen the unit will display the envelope status for the operation of the compressor. The envelope status basically tells you if the unit is functioning within the control parameters for suction and discharge. If the system has a problem controlling the envelope the message will be displayed at the bottom of that screen.

Figure 10:



The next screen will contain the suction pressure information the discharge pressure information as well as the superheat and sub-cooling values being calculated by the system.

Figure 11:



The following screens contain the drive status, to access them press enter:

Figure 12:

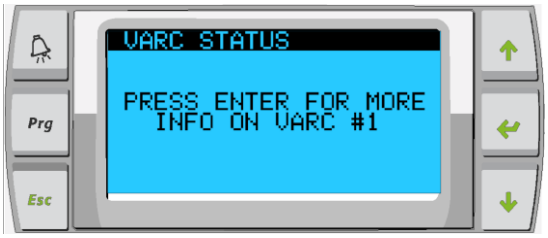
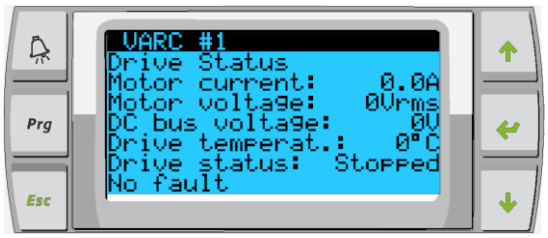


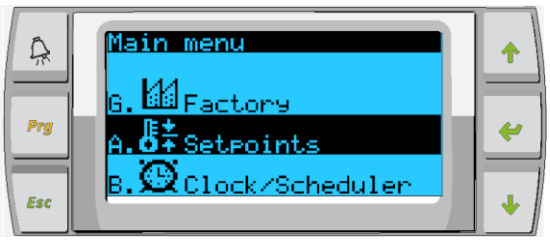
Figure 13:



The final screen will contain the image of the refrigerant circuit and contain the valve position information.

To change the setpoint of the chilled water. The user must press the program button and scroll to Menu item B. Setpoint. The password prompt will be displayed and 1234 must be entered to have access to change the value from the default.

Figure 14:



Main Menu Items: Screen Navigation Tree

Press enter to select items to view and up/down the screen will automatically return to the main status screen.

Menu A: On/Off Unit

- Unit Address: 1 (Default)
- Power By Display: ON (Default)
- Status: Unit ON

Menu B: Setpoints: Password required (1234)

- Heating Setpoint 110 (Default)
- Cooling Setpoint 48 (Default)

Current Limiting:

- Mode: Normal (Default) Econo or Boost
- Econo: 4 Amps
- Normal: 9 Amps

Configuration:

- Temperature Units: F (Default) Or C
- Pressure Units: PSI (Default) or Bar

Menu C: Clock/Scheduler

- Date: Change date here.
- Hour: Change time here.
- Day: Displayed

Next Screen:

- DST: Enabled (Default)
- Description Follows:

Menu D: Input/Output **View values or status of analog sensors, digital inputs or relay outputs.**

- A: Analog Inputs:
  - CW Return
  - Input B001: Actual Value
  - Scroll for additional sensor values with down arrow button then ESC to exit.
- B: Digital Inputs:
  - Flow Switch
  - DI 3 Status: Actual State (Open or Closed)
  - Scroll Down for additional active digital inputs. This will change depending on what is enabled in the system configuration.
- C: Relay Outputs:
  - SW Pump
  - Relay 1 Status: Actual State (ON or OFF)
  - Scroll Down for additional active relay outputs. This will change depending on what is enabled in the system configuration.
- D: Analog Outputs:
  - NOT USED

Menu E: Alarm History

Will capture the status of the following parameters at the time of the alarm. The most recent alarm will be shown. Use up arrow to to view previous alarms.

- Alarm will be displayed followed by:
- Comp Speed: Actual value
- CW Return: Actual value
- CW Supply: Actual value
- Discharge Pres: Actual value
- Suct Pres: Actual value

Menu F: Board Switch

This menu allows you to change to view additional boards and make changes to that particular board. This only applies to a multi-stage configuration when units are networked together.

- Unit Address: 1 (Default)
- Switch to unit: Desired board address

Menu G: Technician

Some subscreens will require a password. Please contact Dometic for service password.

Submenus:

Sub Menu A: Information

- The service contact information is available on this screen.
- Scroll to view additional firmware information.
- The next screen will contain the flash RAM information.
- The next screen will contain the power cycle status which indicates how many days the unit has been running in the last time it was turned off or on.
- The next screen will contain the Evo firmware information.
- The next screen will show the power plus firmware information.

Sub Menu B: Commission

- On this screen the technician will be able to enter the dealer contact information. The default contact information is the Dometic contact information. Then the user will select to update the information by selecting yes at the prompt.
- Then scroll to the next screen. On the screen the user will be asked to commission the system and must select between yes or no then press enter. This will save the information and once commissioned cannot be changed.

Sub Menu C: Working Hours

- Compressor
- Run hours: Actual
- Num Starts: Actual

Scroll to next screens to view pump and electric heat hours (optional if installed).

Sub Menu D: BMS Config

Used only for configuration system to work with STIIC network.

- BMS Port 1
- Protocol: Carel

Next screen

- BMS Port 1
- Adddress 1 (Default)
- Baud Rate 2400 (Default)

Sub Menu E: Service Settings

Sub Menu A: Working Hour Set

- Compressor
- Service Set Point: 0000h (Default) Can be used to set a service interval for system. Will display message on screen.
- Reset to Zero? NO (Default). Used to reset the run hours
- Run hours: Actual Value. Used to set the run hours if compressor or board has been replaced.

Scroll to view additional items such as the pumps and electric heat if installed.

Sub Menu B: Probe Adjustment

To be used for calibrating the installed temperature sensors or pressure transducers.

- CW Return
- Input B001
- Offsett 0.0 (Default)
- Value Actual Value

Scroll to view additional analog sensors for calibration.

Sub **Menu C: Control Loops**

This menu allows you to set the superheat setpoint and other PID parameters for the valve and drive.

NOTE: Do not make changes to the PID loops.

- Superheat
- Cool Setpoint: 10 F (Default)
- Heat Setpoint: 10 F (Default)

Next screen

- Setpoint SH: 10K (Default)
- LowSH thresh: 2.0K (Default)
- LOP thresh: -50.0 C (Default)
- MOP thresh: 26.0 C (Default)

Next screen

Modulating Setup (PID)

- Compressor
- Input Actual Value
- Output Actual Value
- Setpoint 8.9 (Default)
- Band: 11.0 (Default)
- Integration Time: 20 (Default)

Sub Menu D: User Save

This is used to save any user specific settings.

- Save? No (Default) Yes
- Restore? No (Default) Yes
- Enable Auto Save: Yes (Default) No

Next screen

This will clear the Alarm History. This is only to be used once the unit has been commissioned.

- Continue? No (Default) Yes

Sub Menu E: Stage Address

This menu is to be used in a multistage configuration to change the additional unit addresses. This is to be done so that there are no address conflicts when daisy chaining the additional unit mod bus connections. This must be done prior to connecting all the units together, via Modbus connections.

- pLAN Board Addressing

- Current Address: 1(Default)
- Change Address to: 1(Default)

Next Screen

- Unit Settings
- Num of Stages 1 (Default) Max 4

Sub Menu: F Stage Disable

This menu is to be used when in a multistage configuration. This allows a technician to take a stage off-line so that repairs can be made and the rest of the system be operational in auto mode. The system must be in an off state to enable stage control. Disabling a stage via breaker will cause system to go into a "Limp Mode".

- Maintenance
- Stage Control: No (Default) Yes.

If Enabled,

- Stage 1: Enabled (Default) Disabled
- Stage 2: Enabled (Default) Disabled
- Stage 3: Enabled (Default) Disabled
- Stage 4: Enabled (Default) Disabled

Sub Menu F: Manual Management

This menu allows the technician to manually operate the relay outputs as well as enable or disable analog sensors.

- **Sub Menu A: Analog Input**
  - CW Return
  - Manual Control B001: Off (Default) On
  - Manual Position: Value Desired
  - Value: Actual Value

  Scroll to adjust additional sensors

- **Sub Menu B: Digital Input**
  - Flow Switch
  - Manual DI 3: Off (Default) ON
  - Manual Position: Actual (Enter Desired Position)
  - DI Input Status: Actual Value

  Scroll to adjust additional inputs

- **Sub Menu C: Relay Output**
  - SW Pump
  - Manual Relay 1: OFF (Default) No
  - Manual Position: OFF (Enter Desired)
  - Relay Status: Actual Posi in tion

  Scroll to adjust additional Outputs

- **Sub Menu D:Analog Outputs**
  - **NOT USED**

Electrical Specifications

Line Voltage	208 To 240 VAC
Frequency	50 or 60 Hz
Phase	1 ph
Chilled Water Pump Output	12 Amps @ 230 V
Sea Water Pump Output	12 Amps @ 230 V
VFD Input	22 Amps @ 230 VAC
VFD Output	12 Amps @ 230 V
Max Breaker	25 Amps @ 230 VAC

Note: Increase breaker size to include pump current if running pumps directly off system.

Maximum Ambient Operating Temperature	140°F (60°C)
Maximum Rh Conditions	99% Non-Condensing

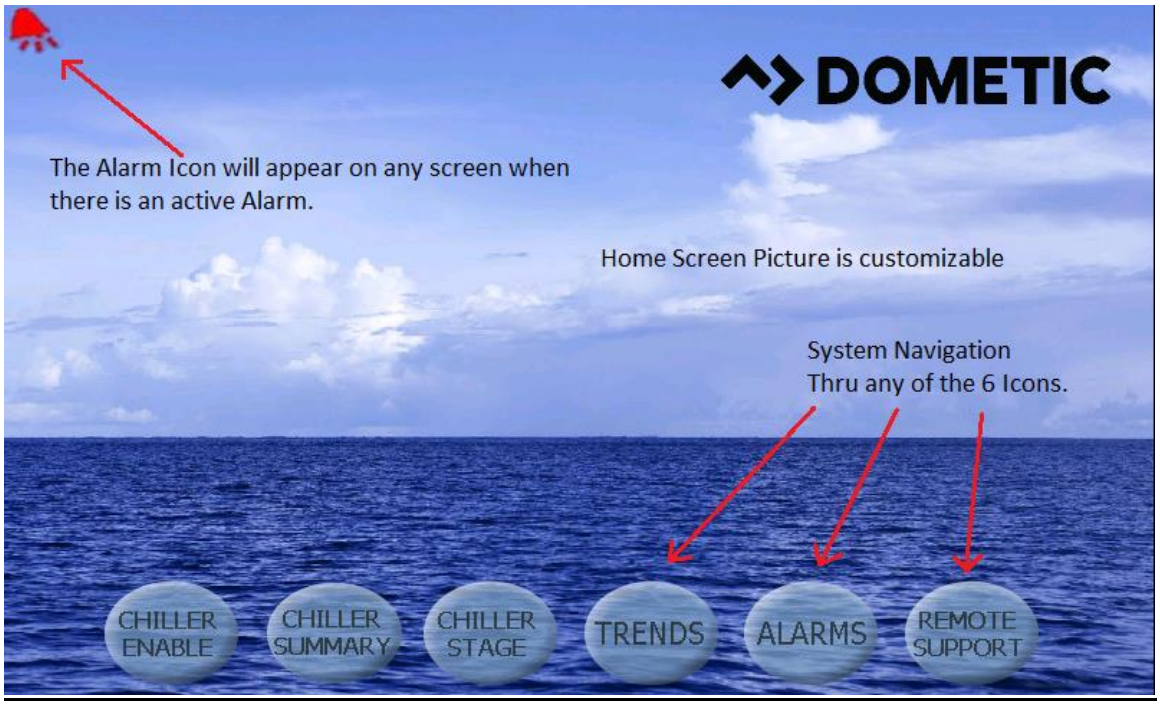
Installation Requirements:

Follow Standard Chiller Installation manual. In addition a recommended 8 to 10 inches keep out from the back of the unit in case the VFD must be removed.

Appendix I: Touchscreen Navigation

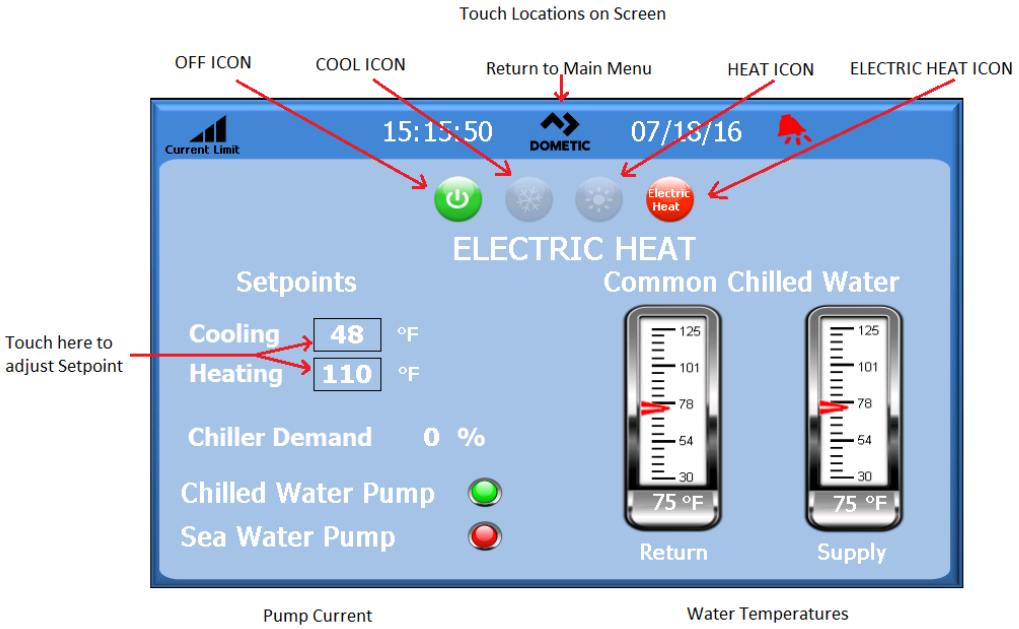
Main Page

Figure 15



Chiller Enable

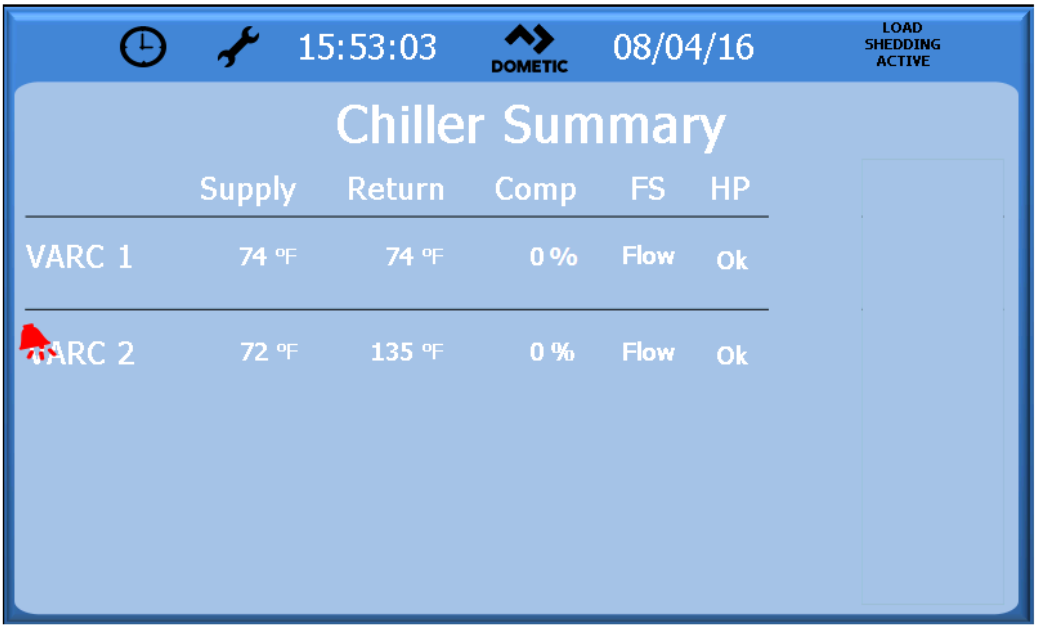
Figure 16



Chiller Setpoints

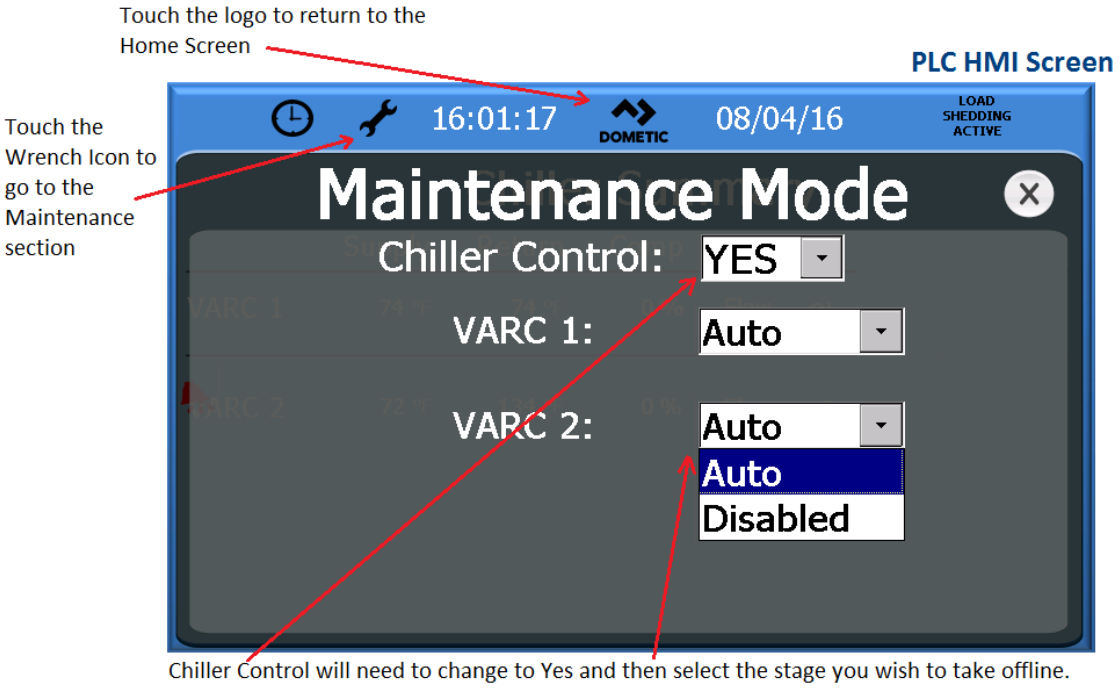
Figure 17

PLC HMI Screen



Chiller Summary screen will display the current status of each stage. It will also display if that stage is in Alarm Retry mode. Touching the VARC # will take you directly to that stage.

Figure 18



CHILLER STAGE

Figure 19

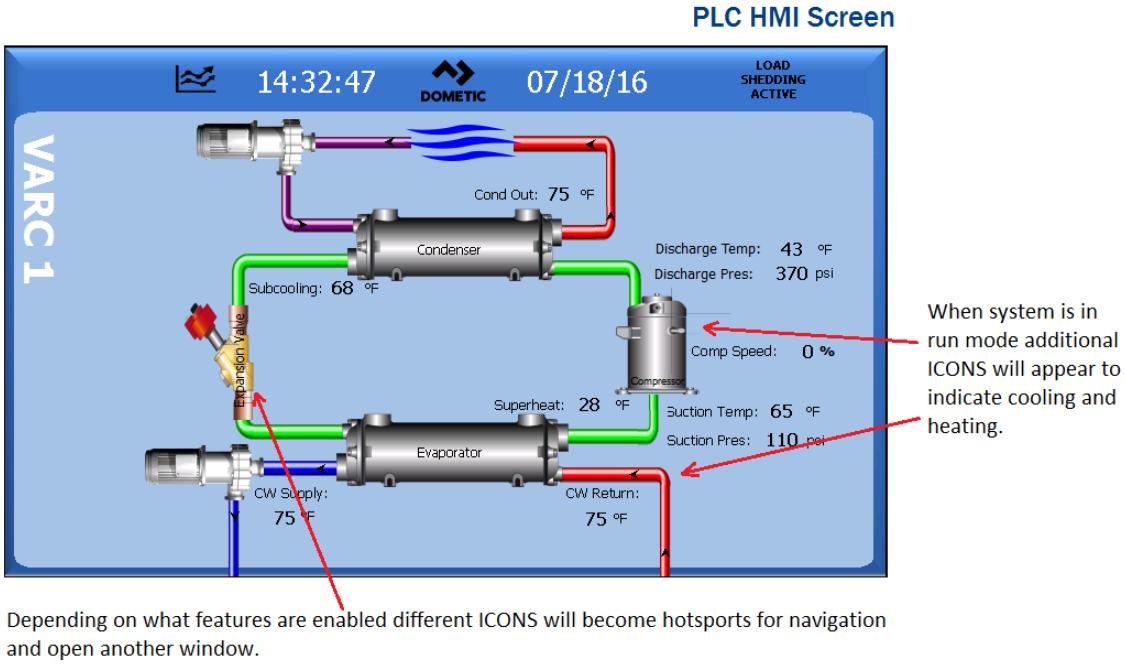


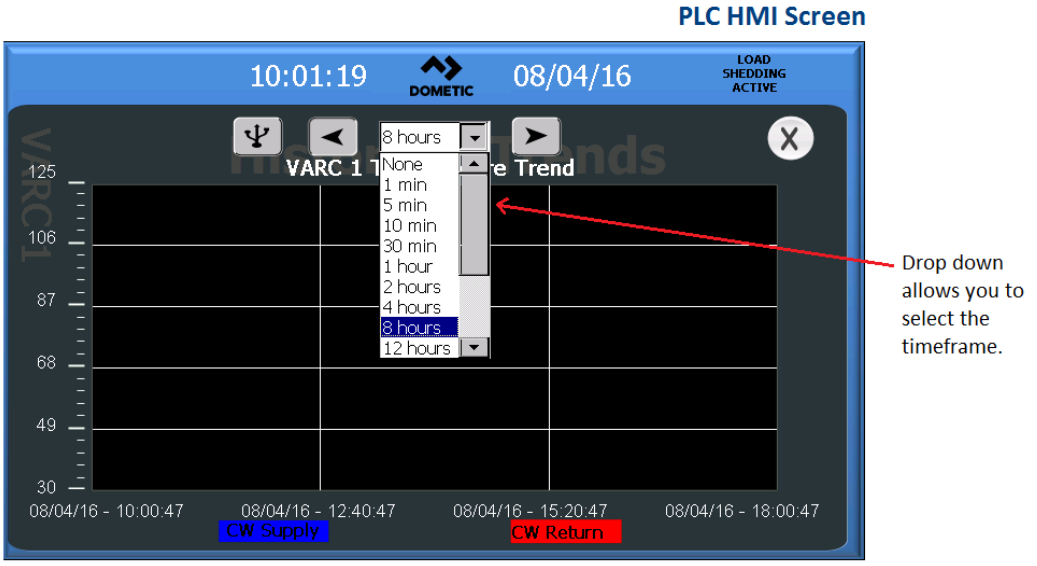
Figure 20

PLC HMI Screen

With an EEV installed you can monitor the valve position and view your suction pressure and temperature. Superheat setpoint and actual will be displayed.

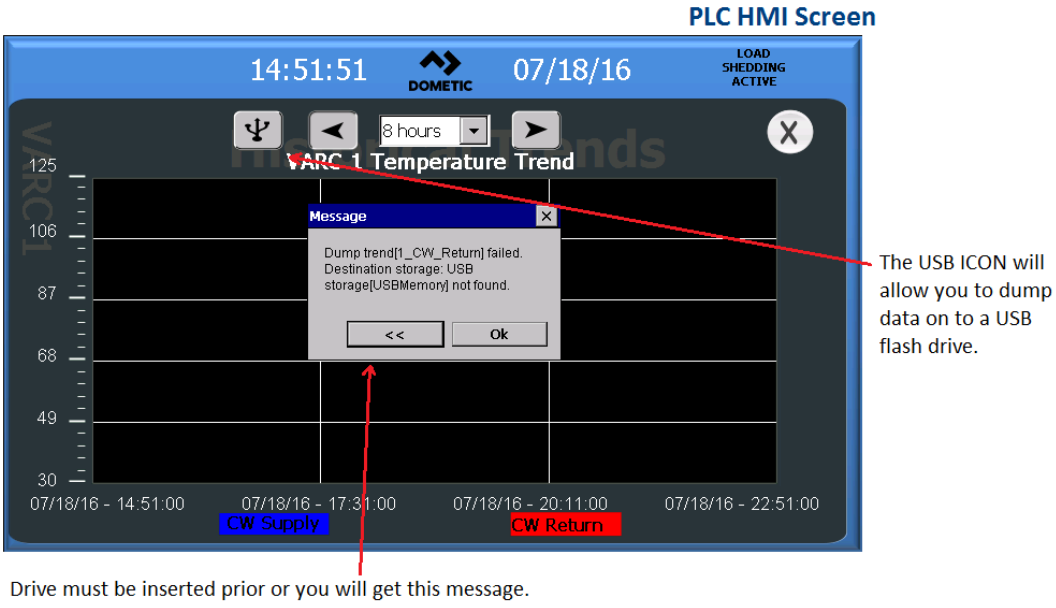
TRENDS

Figure 21



Data will be shown on graph back a month to review how the system has been operating.

Figure 22



Active Alarms

Figure 23

Alarm History

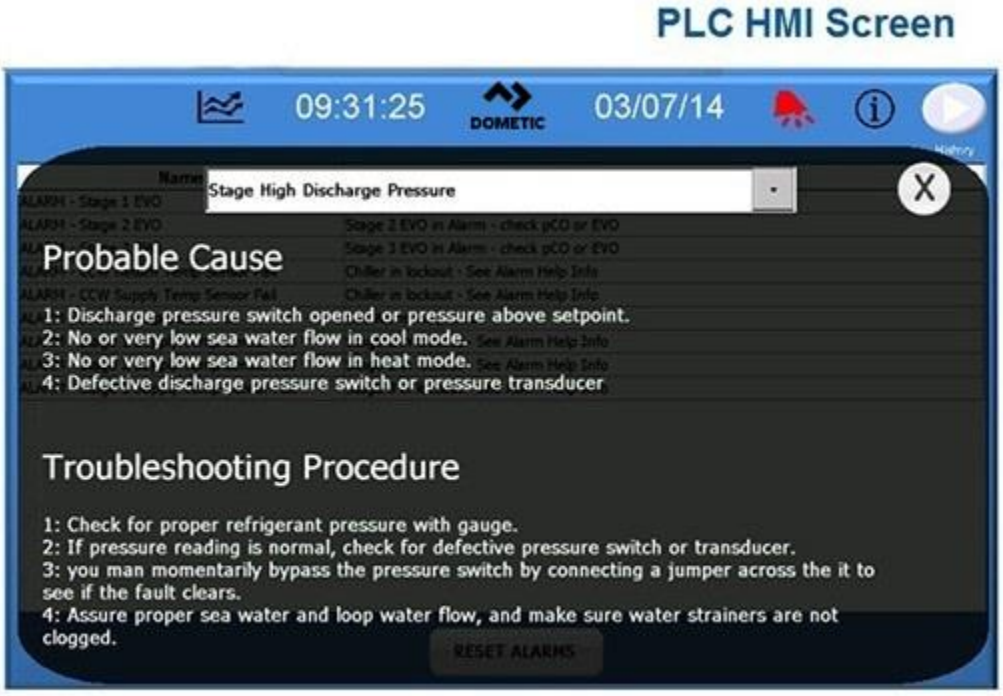
Figure 24

Alarm Help

Figure 25

Use drop down menu to get additional information on causes.

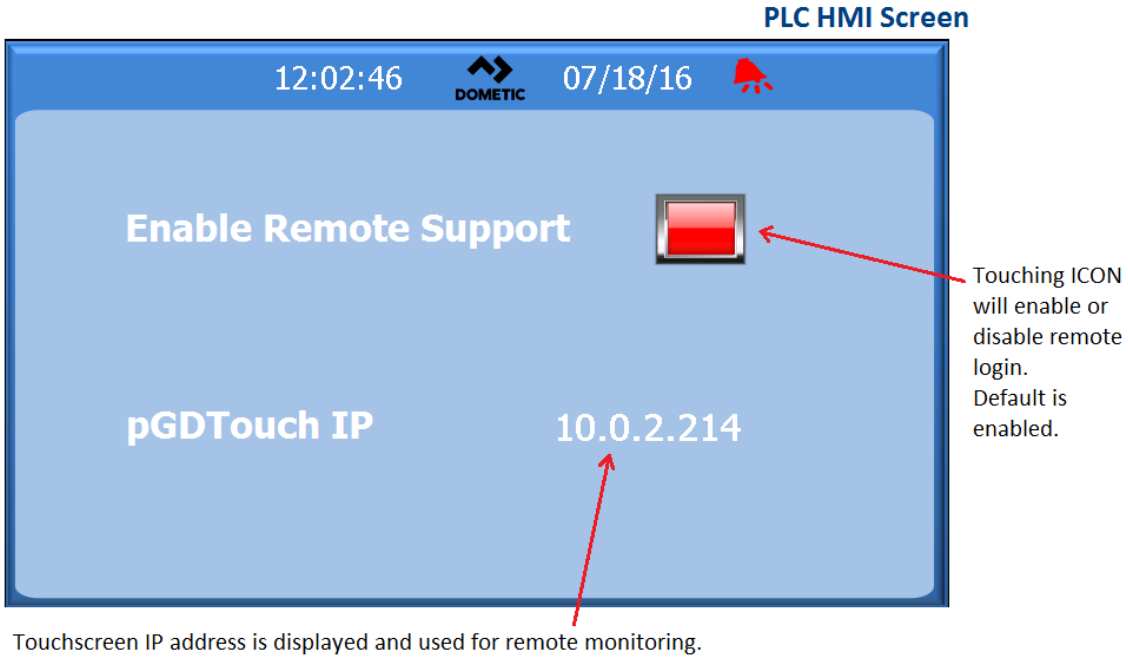
Figure 26



Use drop down menu to get additional information on causes.

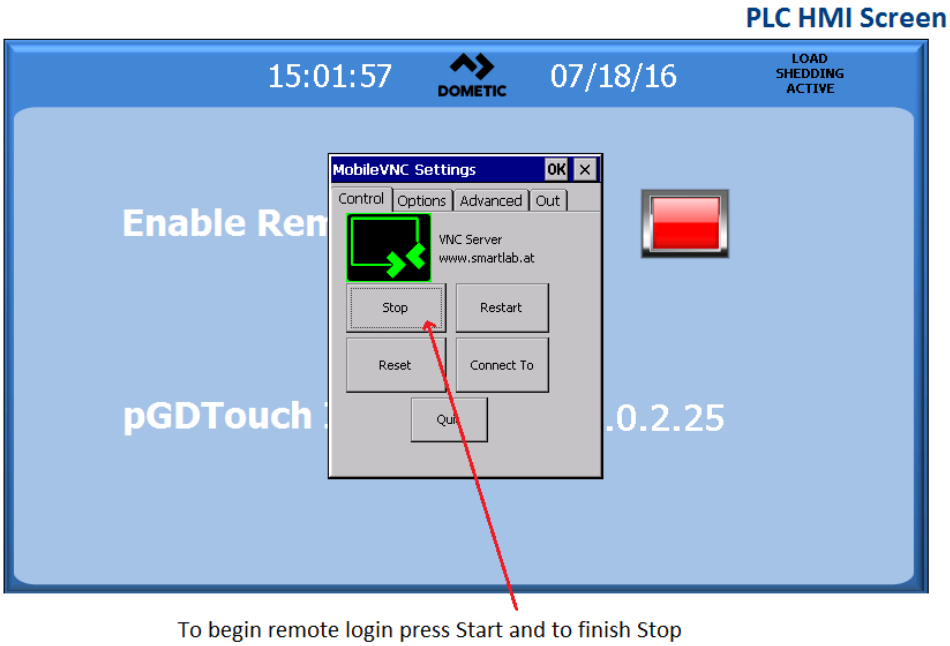
Remote Support

Figure 27



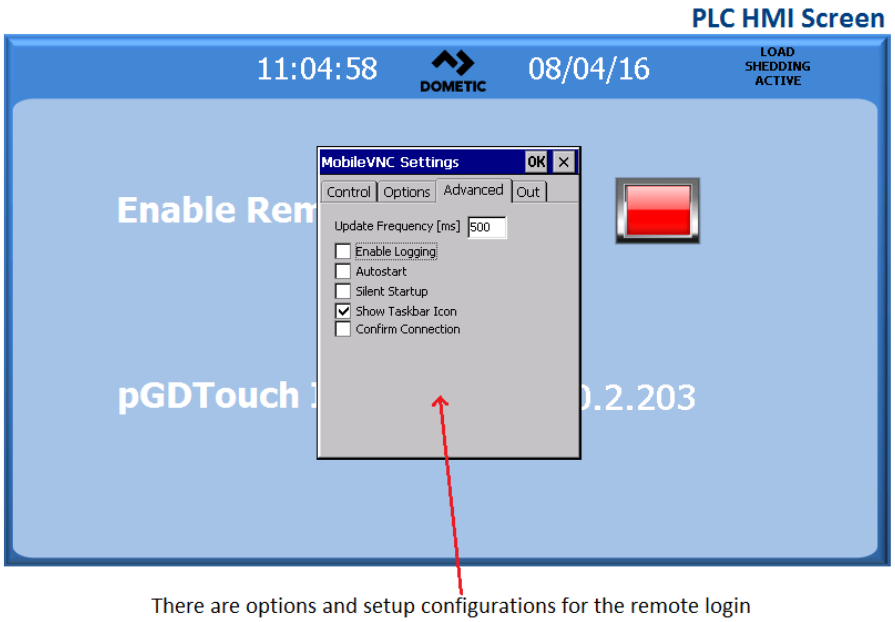
Remote Enable

Figure 28



REMOTE CONFIGURATION

Figure 29



Appendix II: PGD1 & PRO DISPLAY NAVIGATION TREE

Main Status Screen

Main Status Screen	
Mode	Off/Cool/Heat/ **El Ht***
CW Supply Temp	#.#°F
CW Return temp	#.#°F
CW Supply temp	#.#°F
Cond. Outlet temp	#.#°F
Mode	Off/Cool/Heat/**El Ht***
Main Mode Active*	
Stage #	**Auto/Disabled**
Pumps	
CW	On/Off
SW	On/Off
Chiller Status	Normal/Econo/Boost
Varc #1	
CW supply temp	#.#°F
CW return temp	#.#°F
Flow status	Ok/Alm/Off
High pressure status	Ok/Alm/Off
Electric Heat*	Ok/Alm/Off
EH FL*	Ok/Alm/Off
Compressor speed	#.# Hz
Compressor speed	#.# rps
Compressor Current	#.# A
Envelope Status	#
Suction	
Temperature	#.#°F
Pressure	#.# psi
Saturation Temp.	#.#°F
Discharge	
Temperature	#.#°F
Pressure	#.# psi
Saturation Temp.	#.#°F
Super heat temp	#.#°F
Subcooling temp	#.#°F
Varc #2-4 (repeat as above)	
Varc #1 information (will show the stage the display is connected to)	

Legend

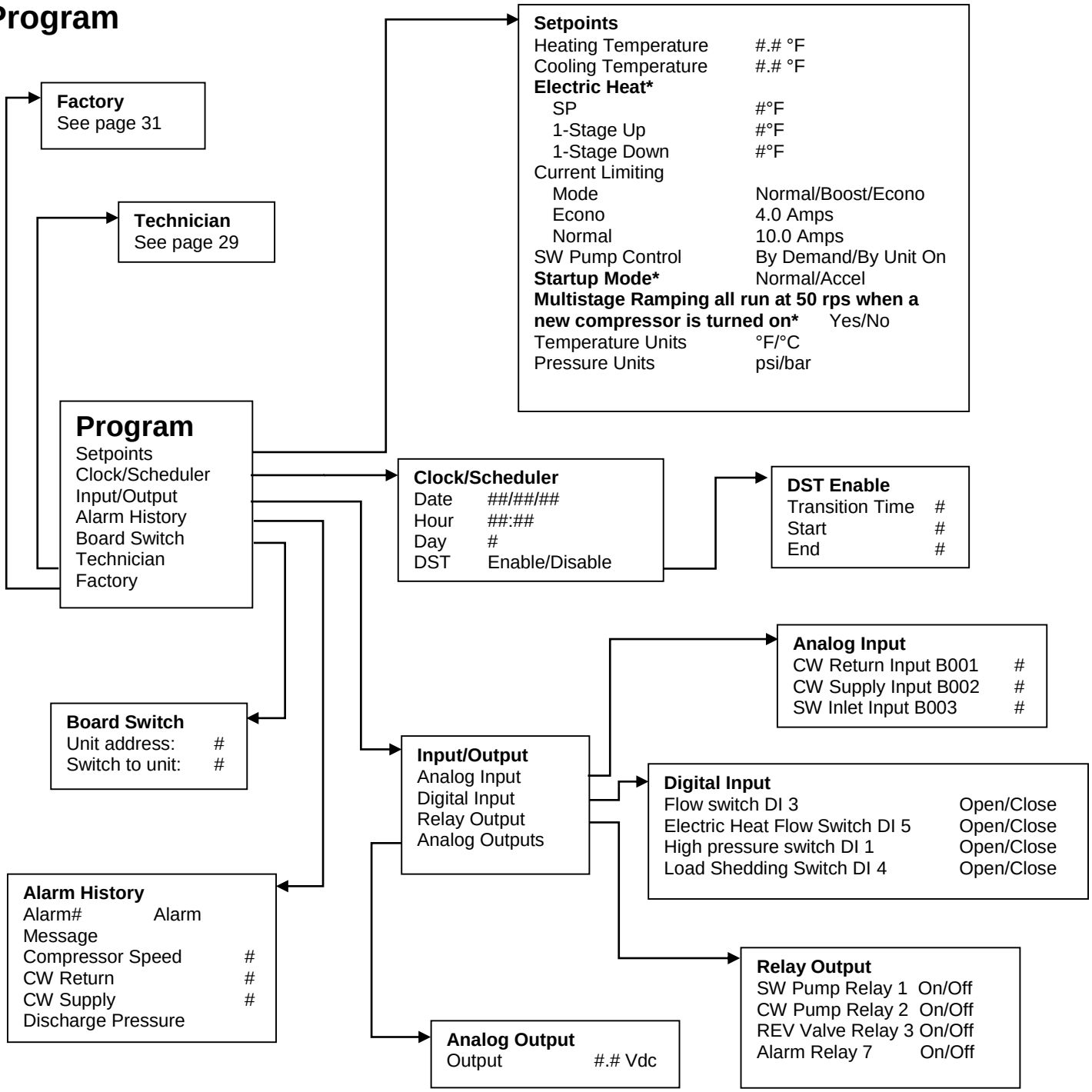
***** Asterisk indicates this item is only viewable when activated in the factory settings.

→ ☐ A solid box means that it is a submenu of the menu and needs to be accessed by pressing enter.

→ ⬚ A dotted box is a break out of the additional information that is contained below that menu category.

Varc # 1 Information	
Compressor Capacity Regulator	
Required Capacity	%
Actual Capacity	%
Actual Speed	rps
Drive Status	
Motor Current	#.# A
Motor Voltage	# Vrms
DC Bus Voltage	# V
Drive Temperature	# °F
Drive Status	Stopped
Fault	
Flow Diagram	
Super Heat	# °F
Compressor	# °F
TXV Open	# %
Steps	# stp
EEV	# psi
Std-by temp	# °F

Program


Factory
See page 31
Technician
See page 29
Program
Setpoints
Clock/Scheduler
Input/Output
Alarm History
Board Switch
Technician
Factory
Setpoints
Heating Temperature #.# °F
Cooling Temperature #.# °F
Electric Heat*
SP #°F
1-Stage Up #°F
1-Stage Down #°F
Current Limiting
Mode Normal/Boost/Econo
Econo 4.0 Amps
Normal 10.0 Amps
SW Pump Control By Demand/By Unit On
Startup Mode* Normal/Accel
Multistage Ramping all run at 50 rps when a new compressor is turned on* Yes/No
Temperature Units °F/°C
Pressure Units psi/bar
Clock/Scheduler
Date ##/##/##
Hour ##:##
Day #
DST Enable/Disable
DST Enable
Transition Time #
Start #
End #
Board Switch
Unit address: #
Switch to unit: #
Input/Output
Analog Input
Digital Input
Relay Output
Analog Outputs
Analog Input
CW Return Input B001 #
CW Supply Input B002 #
SW Inlet Input B003 #
Digital Input
Flow switch DI 3 Open/Close
Electric Heat Flow Switch DI 5 Open/Close
High pressure switch DI 1 Open/Close
Load Shedding Switch DI 4 Open/Close
Alarm History
Alarm# Alarm Message
Compressor Speed #
CW Return #
CW Supply #
Discharge Pressure
Analog Output
Output #.# Vdc
Relay Output
SW Pump Relay 1 On/Off
CW Pump Relay 2 On/Off
REV Valve Relay 3 On/Off
Alarm Relay 7 On/Off

Program/Technician

Commission
Enter contact info
Name ####
Telephone No. ###-###-####
Update info? Yes/No
Commission date ##:## ##/##/##
Commission system? Yes/No

BMS Configuration
BMS Port No. #
Protocol ###### (scroll to select)
Address #
Baud Rate #####

Technician
Information
Commission
Working Hours
BMS Configuration
Service Settings
Manual Management
Pump Control

Information
Service Contact Phone ###-###-####
Commission Date ##:## ##/##/##
VARC type #
Version & Date #.# ##/##/##
BIOS & Date #.# ##/##/##
Boot & Date #.# ##/##/##
Flash Ram # Kb
T memory #
Cycle/s # ms
Power Cycle Status
Last Off Time ##/##/## ##:##:##
Last On Time ##/##/## ##:##:##
Length Time off Days: # Hrs: ## Min: ##
EVO no.
FW Version #.#
Service Version #.#
Power+ no.1
Boot release #
FW release #
FW checksum #
MC release #

Working Hours

	Run Hours	Number Starts
Compressor	# h	#
Chilled Water Pump	# h	#
Seawater Pump	# h	#

Service Settings
See page 30

Pump Control
CW Pump
Manual Enable On/Off
Manual Position On/Off
Action Status On/Off

Manual Management
Analog Input
Digital Input
Relay Output
Compressor & EEV

Analog Input

	Manual Control	Manual Pos.	Status Value
CW Return	B001 On/Off	#.#	#.#
CW Supply	B002 On/Off	#.#	#.#
SW Inlet	B003 On/Off	#.#	#.#

Digital Input

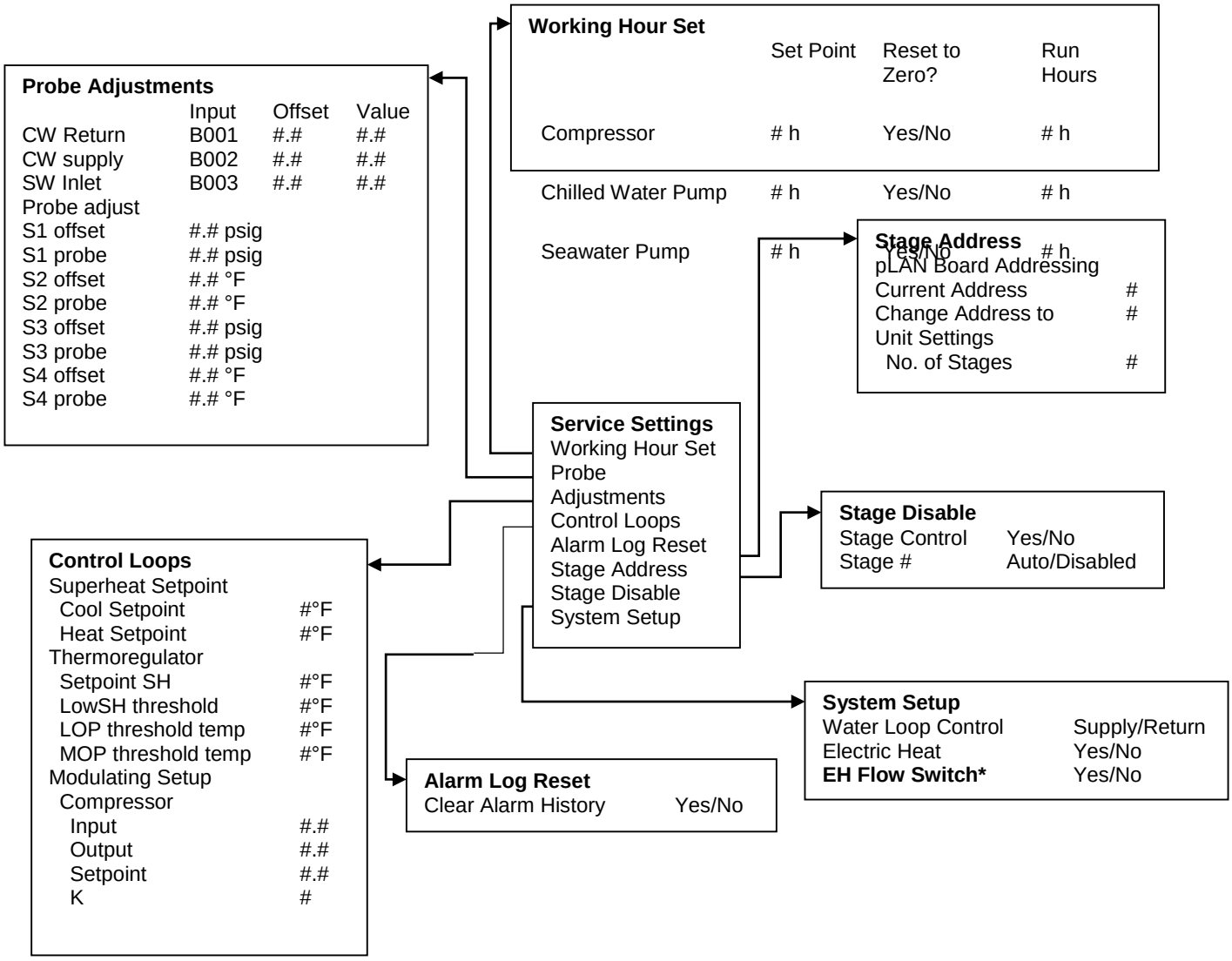
	Manual Control	Manual Pos.	Status Value
Flow	DI 3 On/Off	Open/Close	Open/Close
El. Heat Flow	DI 5 On/Off	Open/Close	Open/Close
High pressure	DI 1 On/Off	Open/Close	Open/Close
Load shedding	DI 4 On/Off	Open/Close	Open/Close

Compressor & EEV
Enable manual valve position Yes/No
Manual Valve position # steps
Compressor
Mode Auto/Manual
Manual Speed #.# rps
Required cap. #.# %
Actual cap. #.# %
Actual Speed #.# rps

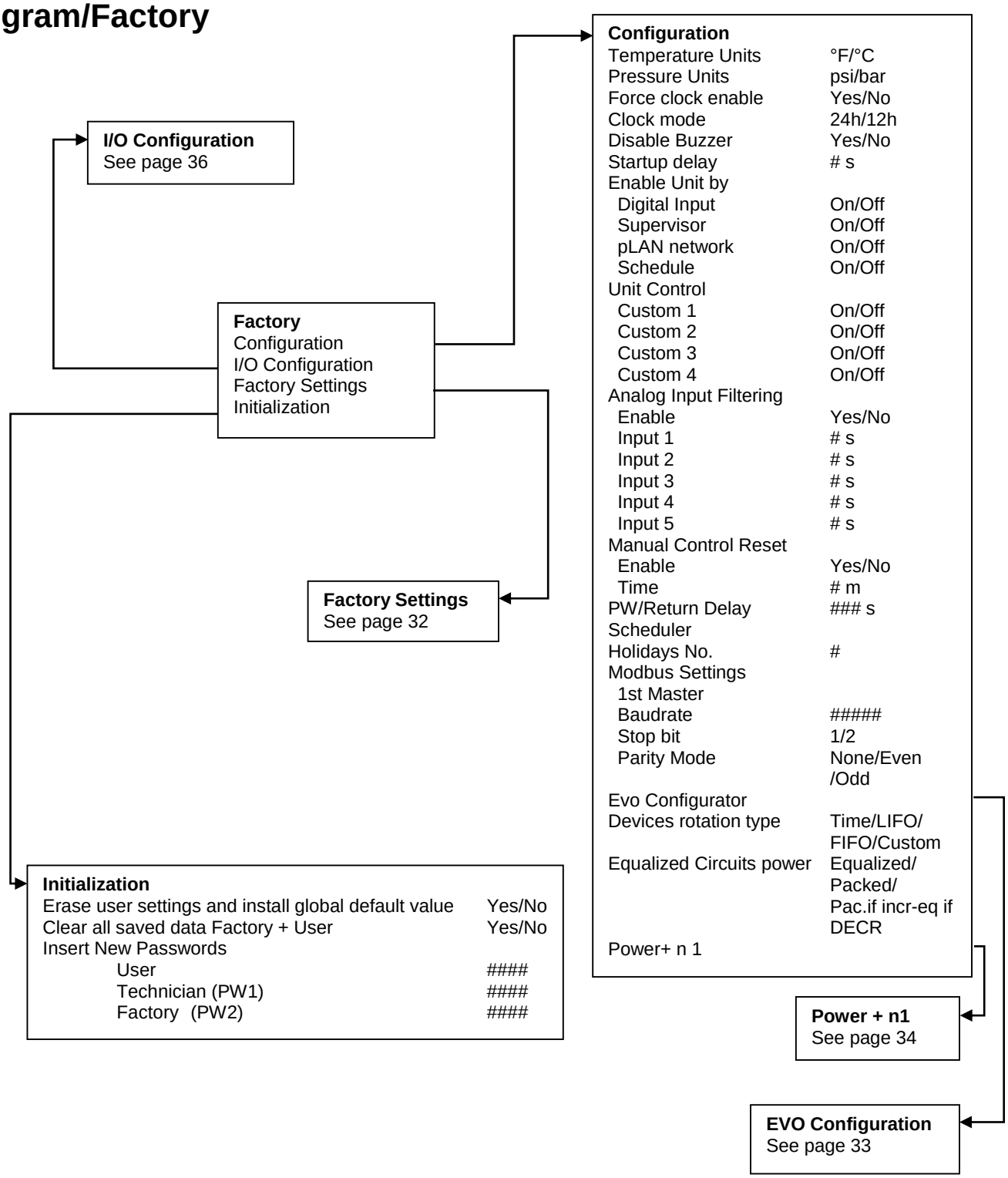
Relay Output

	Manual Control	Manual Pos.	Status Value
SW Pump	Relay 1 On/Off	On/Off	On/Off
CW Pump	Relay 2 On/Off	On/Off	On/Off
Rev valve	Relay 3 On/Off	On/Off	On/Off
Alarm	Relay 7 On/Off	On/Off	On/Off

Program/Technician/Service Settings



Program/Factory



Program/Factory/Factory Settings

Factory Settings	
VARC Type	None/VARC48/ 60/72/96
Compressor	Based on VARC type
Refrigerant	Based on compressor
Power type	230 V / 16 A
Power set	230 V / 30 A
Set Defaults	Yes/No
Control Temp	CCW supply/ CCW return
No. of stages	#
Electric Heat (EH)	Yes/No
Power Cycle	Retain Mode/Off
Logo	Select appropriate
Background	Select appropriate
Flow Switch	Yes/No
High Pressure Switch	Yes/No
Low Pressure Switch	Yes/No
EH Flow Switch*	Yes/No
Load Shedding	Yes/No
SW Temperature Inlet	Yes/No
SW Pump settings	
Control	By demand/ By unit on
Off Delay	# s
CW Pump settings	
Flow Prove Delay	# s
Off Delay	# s
Reversing valve	
RV delay time	# s
RV toggle time	# s
Electric Heat*	
Stage Up delay	# s
Stage Down delay	# s
Compressor	
Alarm Retry Setup	

Compressor	
Econo mode SW	Yes/No
Minimum On	# s
Minimum Off	# s
Min Time between Starts	# s
Load Up Time	# s
Frost Protection	
Condenser Setpoint	#.#°F
Condenser Band	#.#°F
Compressor Speed	#.# rps
Control	Direct/Reverse/Both P/PID/P+I
K	#.#
Minimum	#
Maximum	#
DBd	#.#
Out	#

Alarm Retry Setup

Temperature Limits

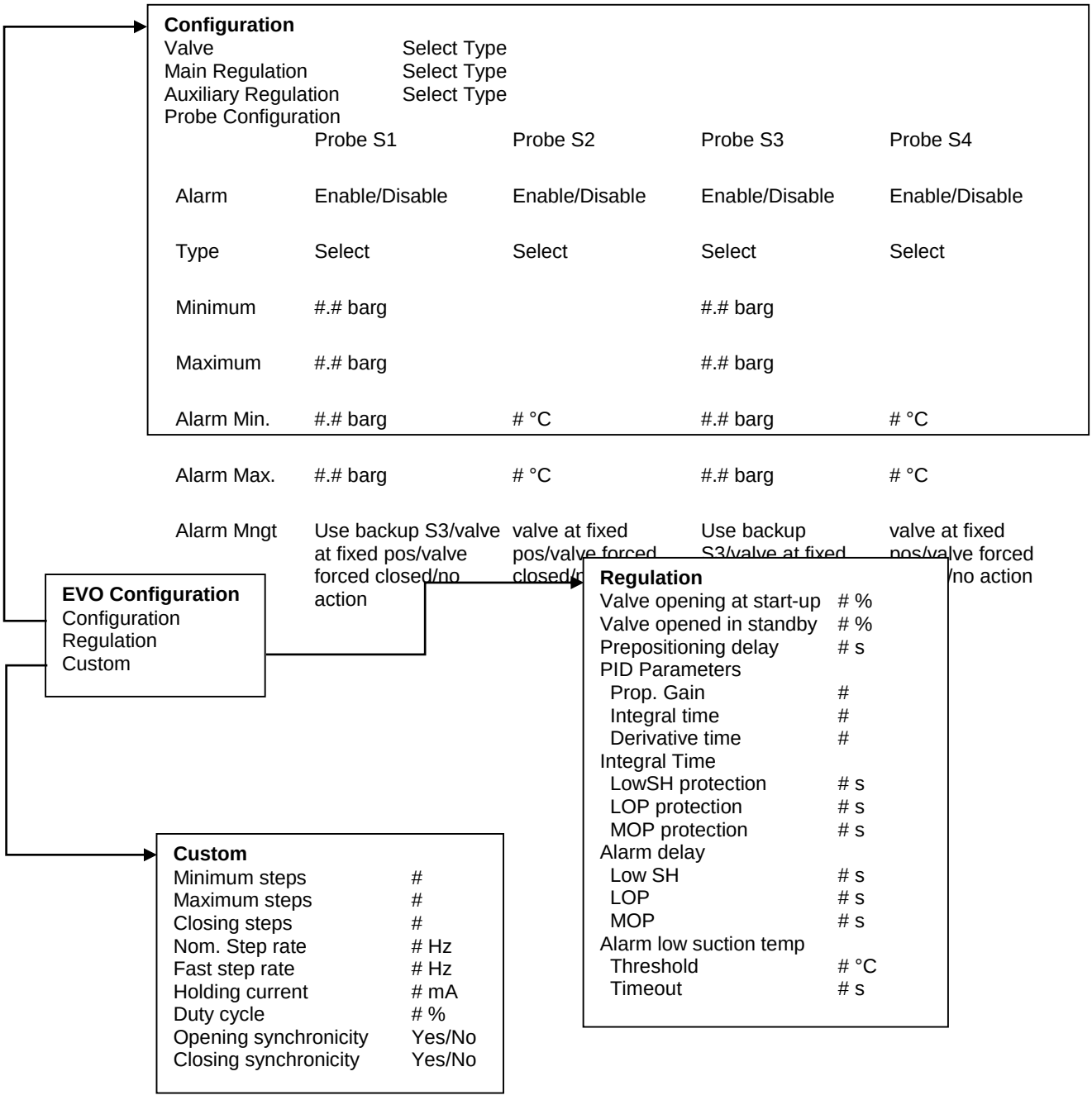
	Set Pt.	Off Band	Retries	Set Dis	Status
CW High	#.#°C	#.#°F	#/## m	# s	#/## m
CW Freeze	#.#°C	#.#°F	#/## m	# s	#/## m

Flow Alarm Delay

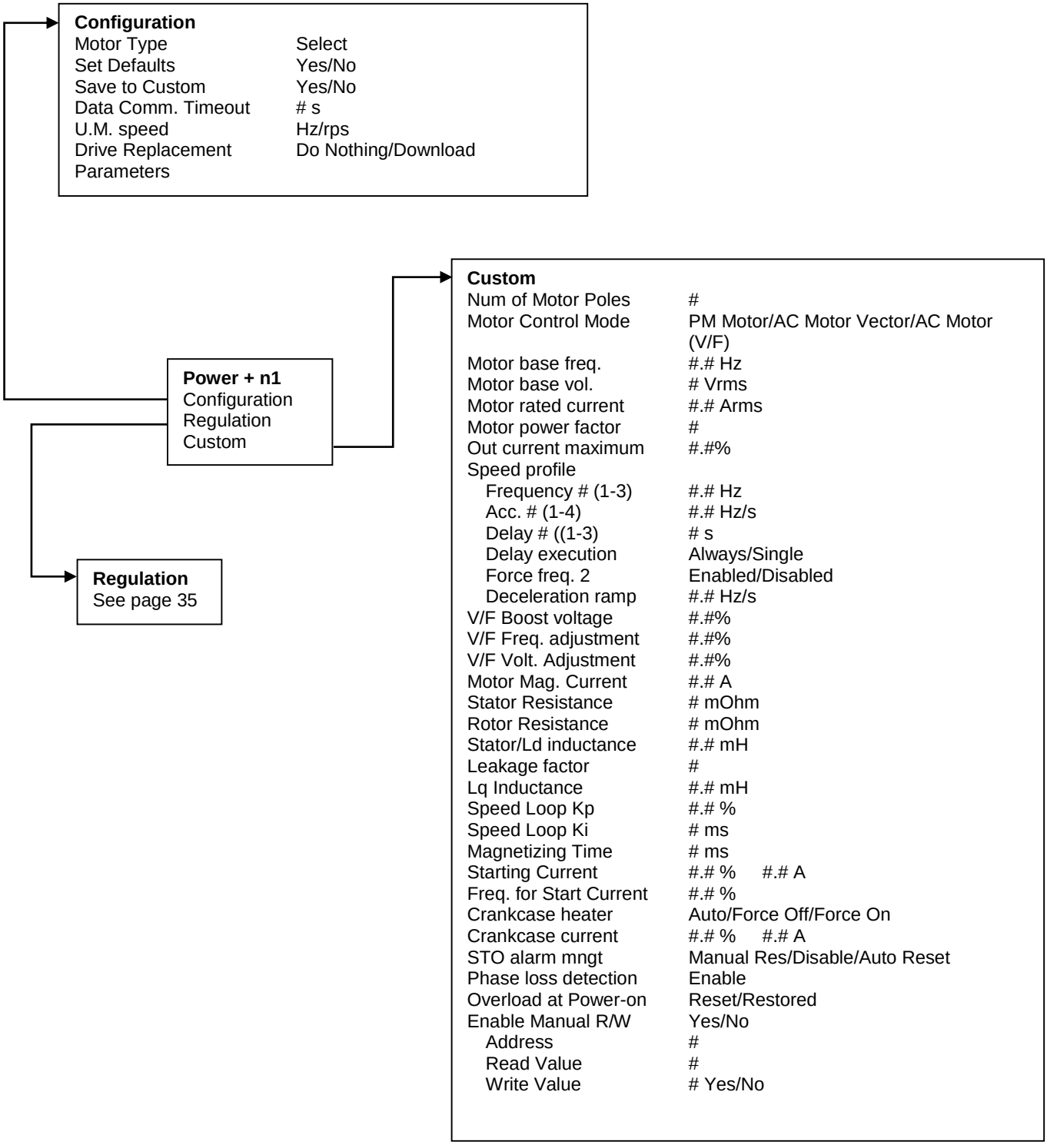
	Delay	Retries	Set Disable	Status
CW	# s	#/## m	# s	#/## m
Electric Heat	# s	#/## m	# s	#/## m

High Discharge Pressure	
Set point	#.# bar
Retrys	#/## m
Set Disable	# s
Status	#/## m
High Pressure Switch	
Retrys	#/## m
Set Disable	# s
Status	#/## m
Low Suction Pressure	
Cool Set Point	#.# bar

Program/Factory/Configuration/EVO Configuration



Program/Factory/Configuration/Power + n1

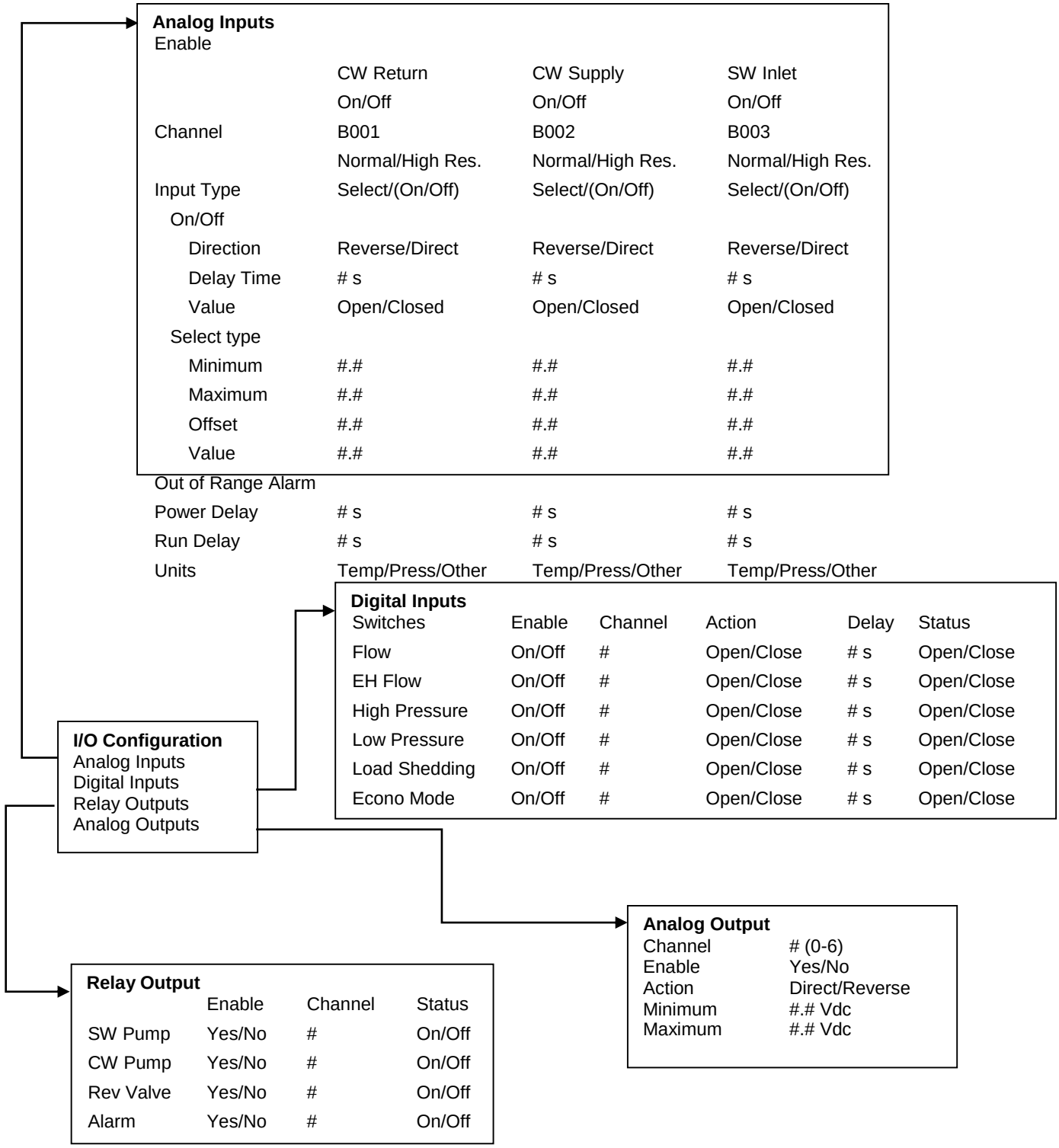


Program/Factory/Configuration/Power + n1 /Regulation

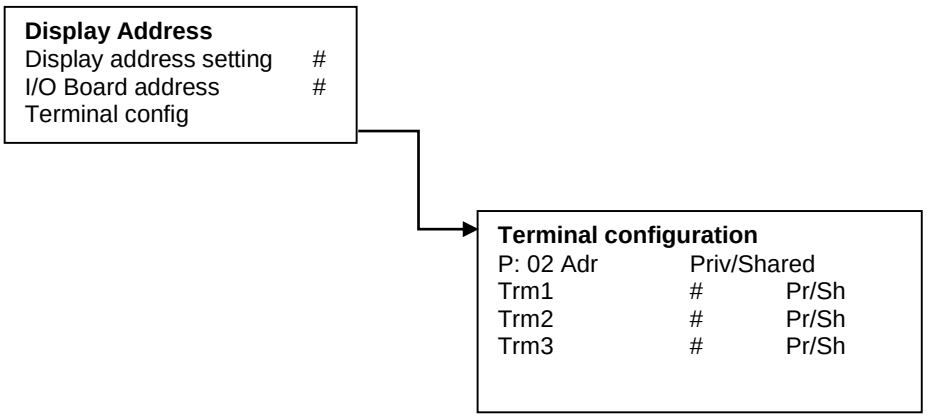
Regulation		
Output frequency min	#.# Hz	
Output frequency max	#.# Hz	
Skip frequency set #(1-3)	#.# Hz	
Skip frequency band #(1-3)	#.# Hz	
Switching frequency	# kHz	
Switching frequency derating	Disabled/Enabled	
Speed derating mode	#	
Stop mode	Ramp/Coast	
Reverse Speed	Disabled/Enabled	
Flying Start	Disabled/Enabled	
Relay Configuration	Select	
PTC Alarm	Disabled/Enabled	
PTC Alarm delay	# s	
Compressor Regulator		
Start-up pressure differential control		
Max pressure diff. admitted	#.# bar	
Equalization mode	Equalization valve/EEV Pre-opening	
Start-up failure control		
Pressure diff. min. variation	#.# bar	
Control period	# s	
Restart delay	# s	
Max Retry #	#	
Speed Management		
Start-up forced speed	#.# rps	
Max speed	#.# rps	
Min speed	#.# rps	
Deceleration rate	#.# rps/s	
Acceleration rate	#.# rps/s	
Switch-off rate	#.# rps/s	
Envelope Control		
Speed reduction rate	#.# rps/s	
Min speed admitted	#.# rps	
Out of env. Alarm timeout	# s	
Low press. diff. alarm timeout	# s	
Discharge Gas Control High Discharge Temp.		
Limit	#.# °C	
Alarm	#.# °C	
Speed Control due to Discharge Gas		
Action Distance	#.# °C	
Action Pause	# s	
Comp. Speed Reduction	#.# %	
EEV Regulation		
Mode	Suction	
Superheat/Discharge/Temp./Disch. Superheat		
Discharge Temp Probe Comp Time	#.# s	
Discharge	Super Heat	Temperature
Setpoint	#.# °C	#.# °C
Offset	#.# °C	#.# °C
Hysterisis	#.# °C	#.# °C
Envelope Control - Low ratio management		
By EEV closing	Yes/No	
By compressor speed	Yes/No	

EEV Pre-opening *	
Max. Equalization time	## s
EEV opening	##.# %

Program/Factory/IO Configurations



Display Address



Appendix III Multistage setup

The VARC can be supplied as a standalone chiller or it can be supplied as part of a staged system.

The factory default setting is set as a standalone chiller.

When supplied as part of a modular system the following connections need to be configured.

- CW & SW connections between each stage.
- Network connections between each stage. Physical and network addressing.
- Ensuring Firmware is identical between each stage.
- Remote control panel configuration.

This document aims to cover all of the above and to run through setting the time, date and unit of measurement as well as the Boat builder logo (touch screen control only)

Chillers supplied on a frame package will be configured and wired as part of the build process.

Please also note that as part of a correctly configured multistage system there is no need to set differential/hysteresis settings.

Initial Wiring

Seawater and chilled water pumps are wired directly to VARC 1 with no need for pump relays.

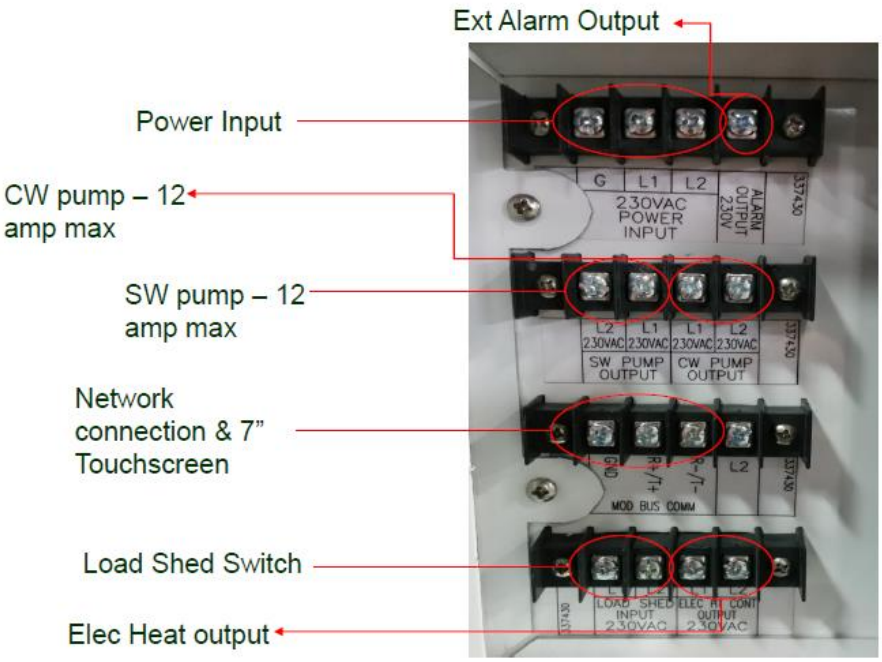
These are connected to the terminals on the front of chiller 1, remove power cover and connect as per labelled connections.

Each chiller stage requires a connection to the seawater and chilled water pump. Three core electrical cable needs to link chiller 1 to chiller 2, chiller 2 to chiller 3 etc for both the seawater and CW connections

Network connections also need to be wired from the Network connection ports. Chiller 1 to Chiller 2, Chiller 2 to Chiller 3 etc

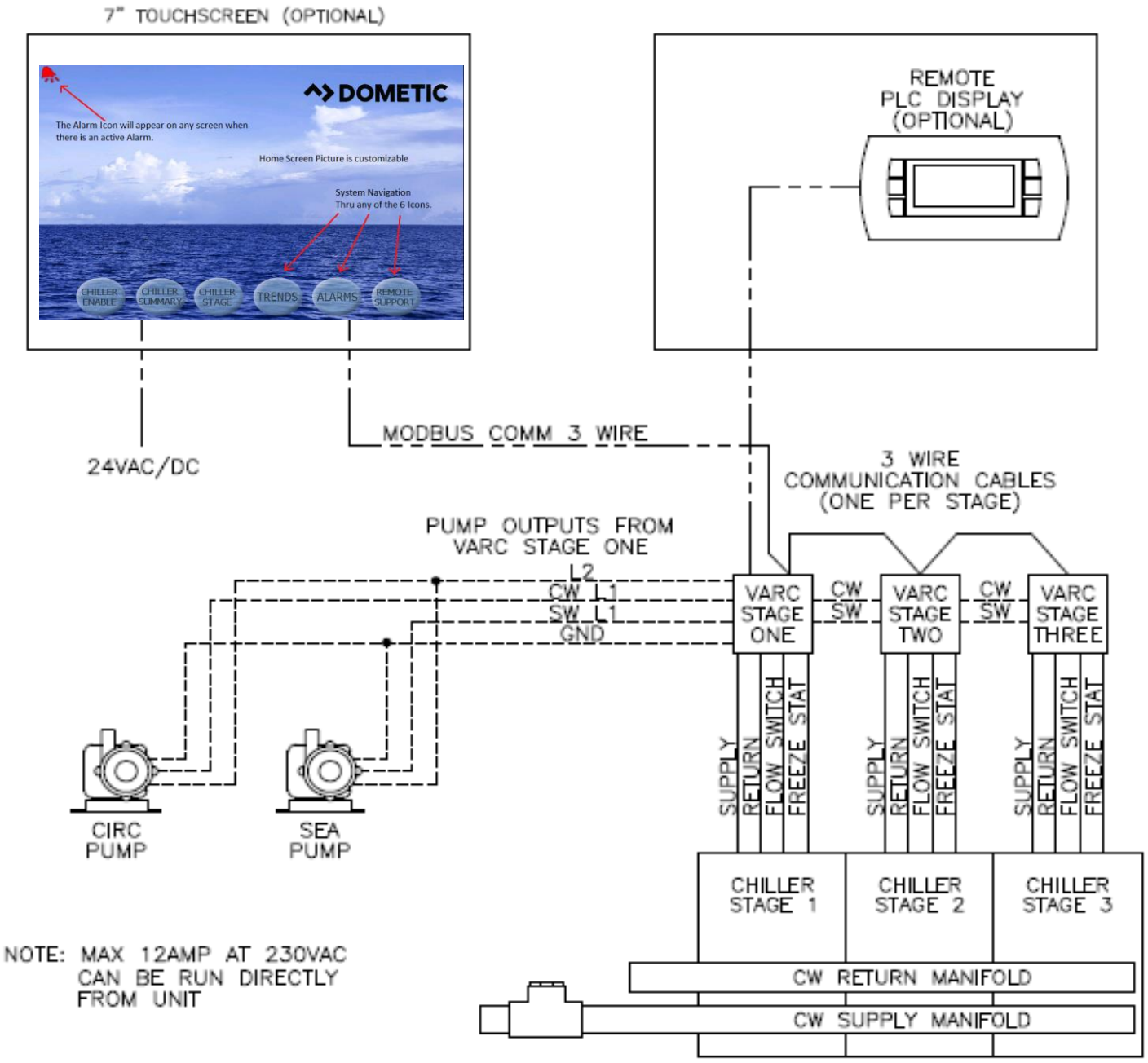
Please refer to the basic wiring diagram on the next page for clarification

Electrical Connections



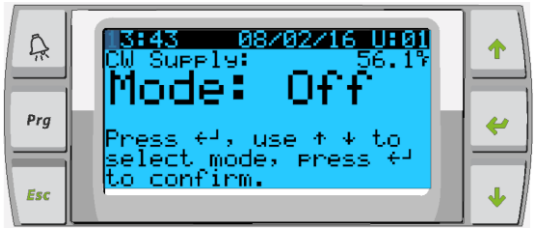
Please refer to the basic wiring diagram on the next page for clarification

Basic wiring diagram

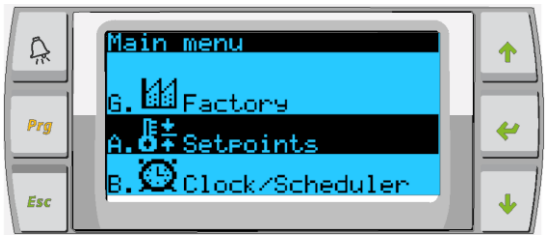


Ensuring the Firmware of each chiller is compatible

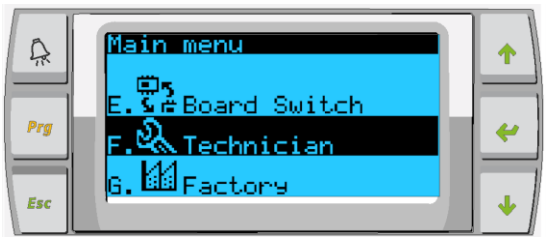
Chillers should come with the correct firmware preloaded. However, it is worth checking the versions match as incompatible firmware can seem to work during initial setup then but cause networking problems later down the line.



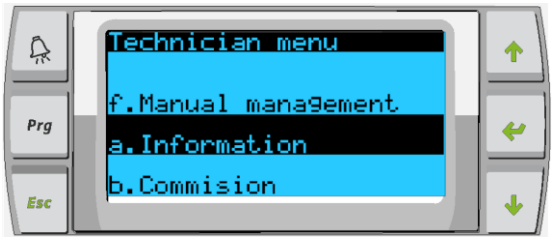
Main Screen



Press Prg button to the left



Scroll up or down to Technician, if prompted for a password, 3156



Select Information

Scroll down for Version

Repeat for each stage and ensure **VER.:** is the same for each stage

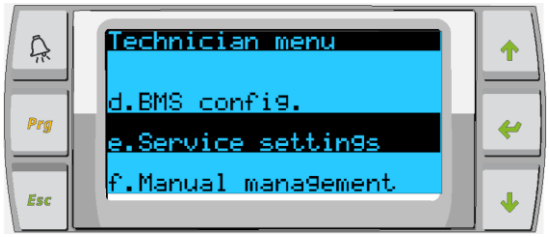
Repeat for each stage.

In the unlikely event there is a difference between stages, PCB firmware will require re-flashing by a Dometic approved engineer

Networking (1 of 3)

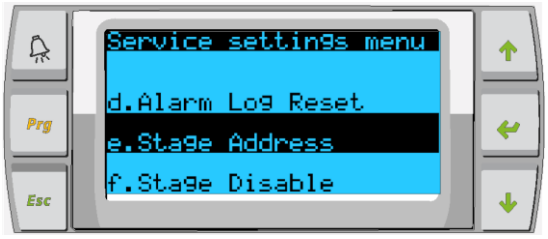
When setting up the stages for networking, you need to ensure the chillers are not connected, via Modbus connections. Stage one requires minimal changes so start with stage 2 leaving stage 1 till last. Power off all stages except stage 2. Go into program on standard PLDPRO control

Go to Technician



Scroll down

Enter Technician Password
3156



Go to stage address

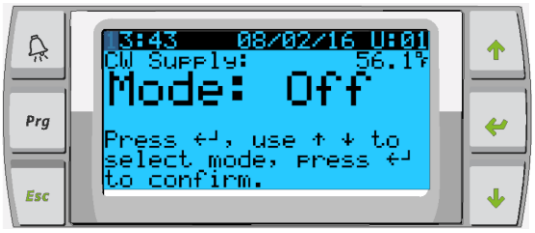
Hit enter, change address to 2 for chiller 2. 3 for chiller 3 etc.

Exit screen back to main menu and you will see confirmation of change in the top right hand corner of the main screen. “U:02” or “U:03”

Complete the next step of networking before moving on to the next chiller stage.

Please note when configuring the stages, they must not be able to communicate with each other.

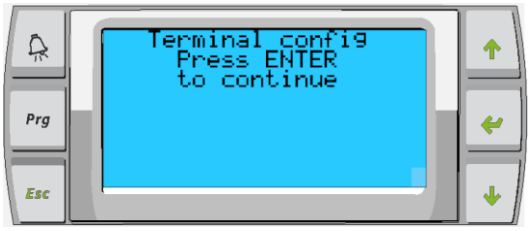
Networking (2 of 3)



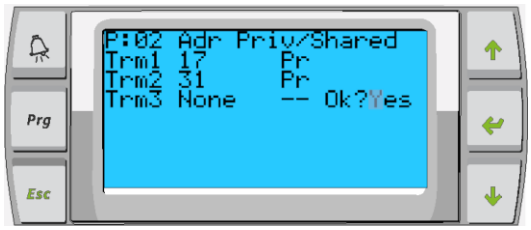
Step 1

Press and hold Up, Down and Enter simultaneously until screen changes, about 6 seconds

Chiller stage 2 needs to have a display address of 17, chiller stage 3 will be 18 and 4 will be 19. I/O Board address should reflect the change you have just made



At this point screen may go blank, if it does, start from step 1 again (above) and ensure display address and I/O board address is correct for stage. Press enter to go into the terminal config settings



Trm1 = 17 for stage 2, 18 if stage 3 etc… and Pr

ID 32 & Sh - this will allow for PGD1 control if used.

ID 31 & Pr – this will allow for touchscreen if used.

Only enable controls that are being utilized in the working system.

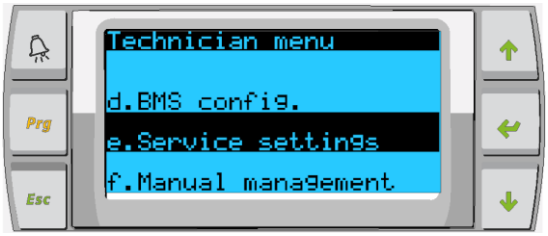
Press enter until you get to OK? Change to Yes to save settings.

Power down stage and repeat process for all stages, once all complete. Turn on stage 1 and repeat this page (only) ensuring Trm1 = 16 Pr

Networking (3 of 3)

Turn on all stages and individually make the following changes to

Go to Technician



Scroll down

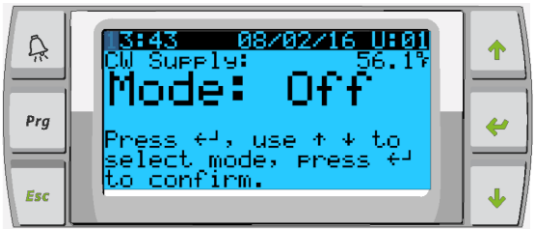
Enter Technician Password
3156

Go to stage address

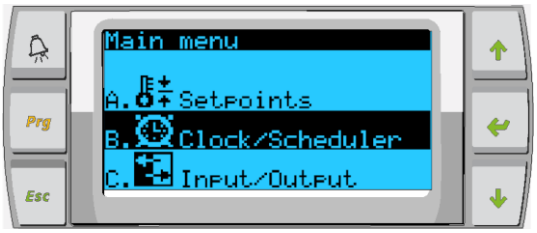
Press enter until the cursor is on “Num of stages” change from 1 to the correct number of stages for current system.
Repeat for all stages.

Appendix IV Configuration & Setup

Setting Time and Date



Press Prg button



Scroll to Clock/Scheduler and press

Press enter, notice the cursor flashes on the date field mm/dd/yyyy.

Use the up and/or down keys to select the correct month. Hit enter the press up and/or down to select the correct day.

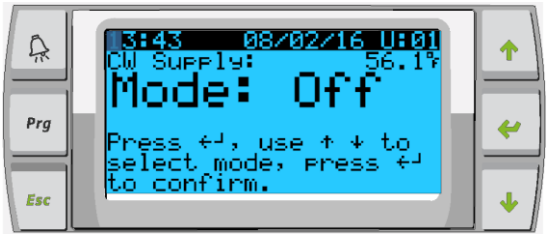
Press enter to select the year and/or up down buttons to select the correct year.

Press enter again and the cursor drops down to the “Hour”

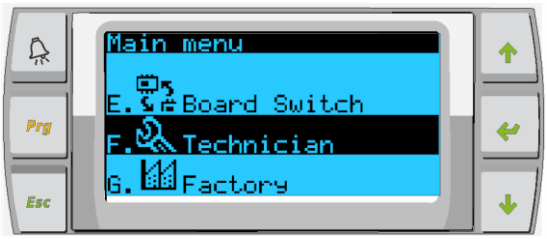
Use the up and down keys to select the correct hour, then minute

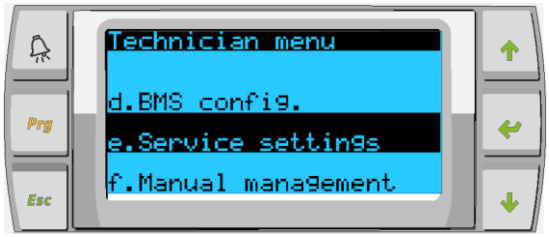
Cursor goes back to the “Clock” title. Settings have been saved and you can exit to main screen. Daylight Saving is enabled by default. Scroll down from the clock screen if you wish to disable.

Enabling Electric Heat

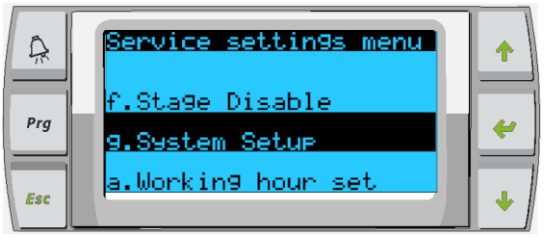


Press Prg button





Enter service password
3156

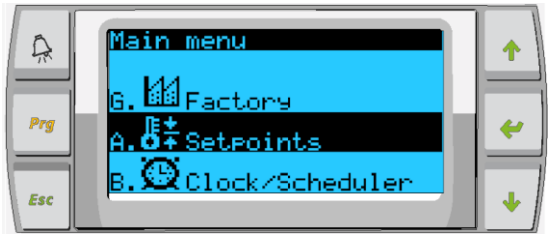


Scroll down to Electric Heat, enter to select, up or down to toggle setting.

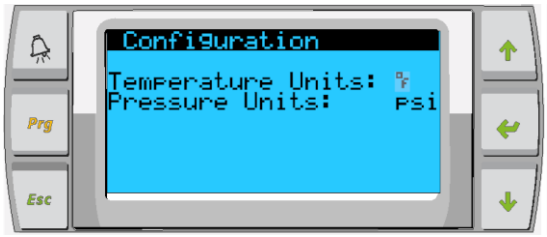
Enter to save

Select Unit of Temperature

Press Prg button



Go to Setpoints



Scroll down to Temperature Units screen. Hit enter to select. Up or down button to toggle between options.

Once changed, hit enter to return the cursor to the top of the screen.

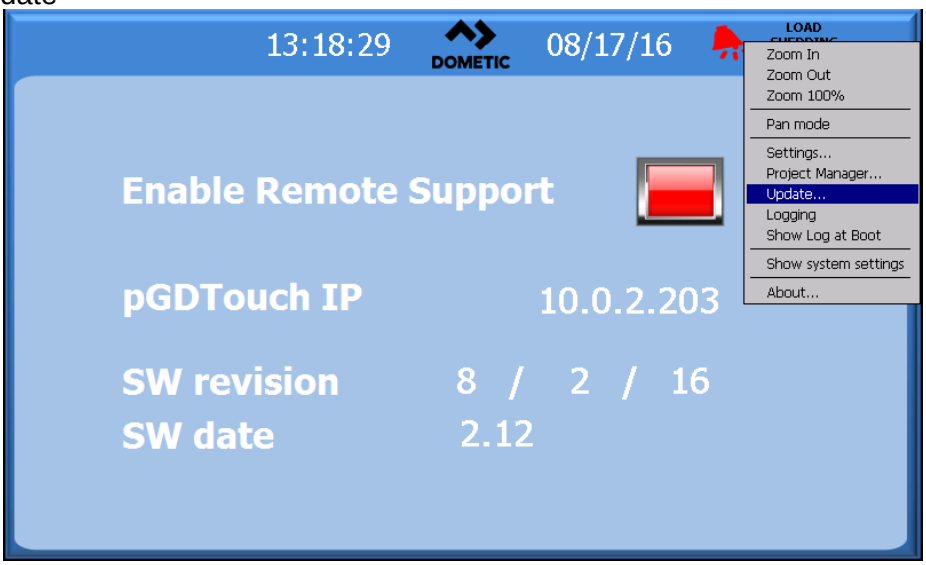
You will need to make this change to all stages for it to correctly reflect temp readings on remote display

HMI Setup

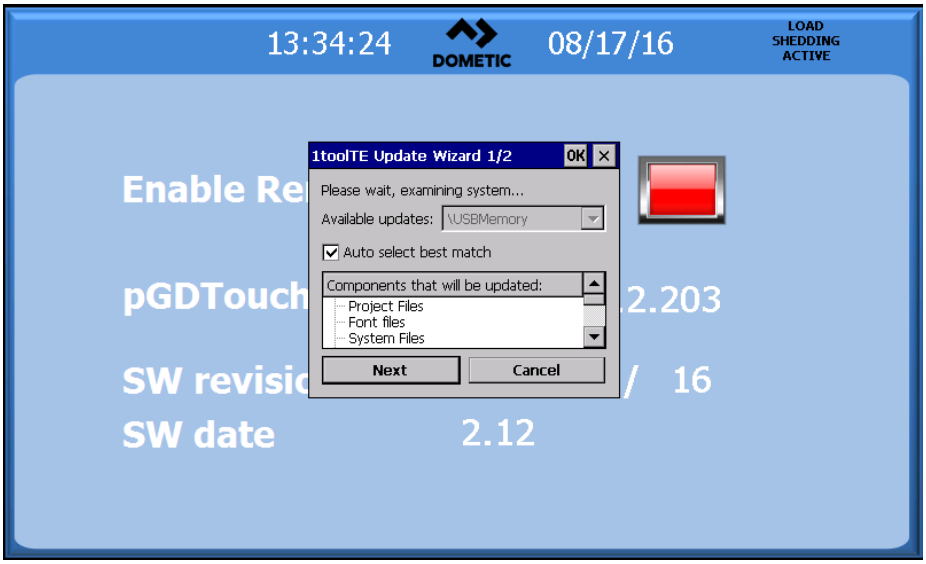
Uploading program

To setup the correct program onto the touchscreen follow the steps.

1. Locate USB port located on the back side of the screen.
2. Insert USB memory
3. On the touch screen hold your finger on the screen until a pop window is displayed.
4. Select update



5. Another pop-up will appear and check the box that says Auto select best match and press next



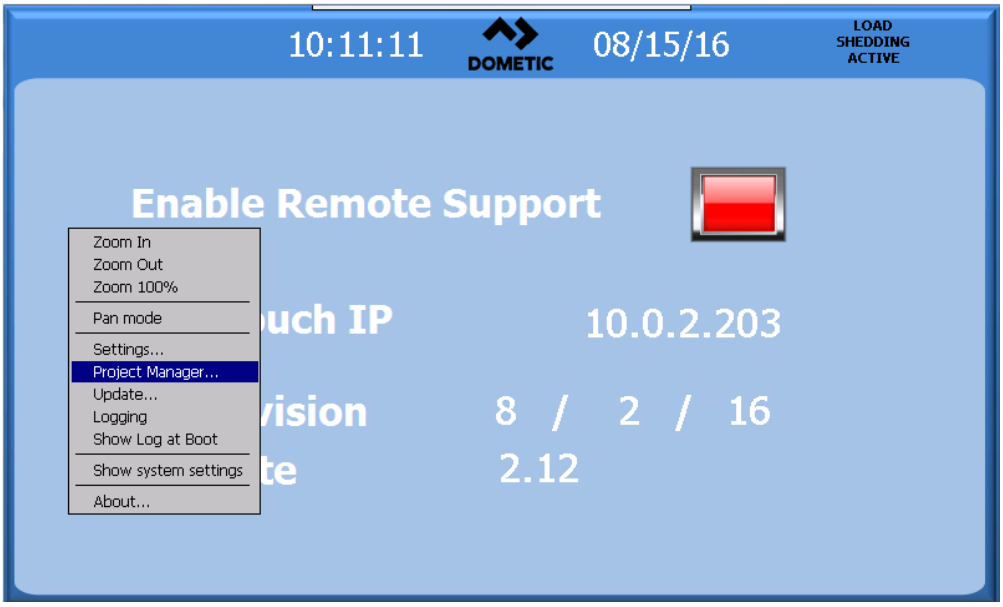
6. Once the screen is updated there will be a reboot. Once completed the screen will display the main screen. Remove USB.

Deleting old program:

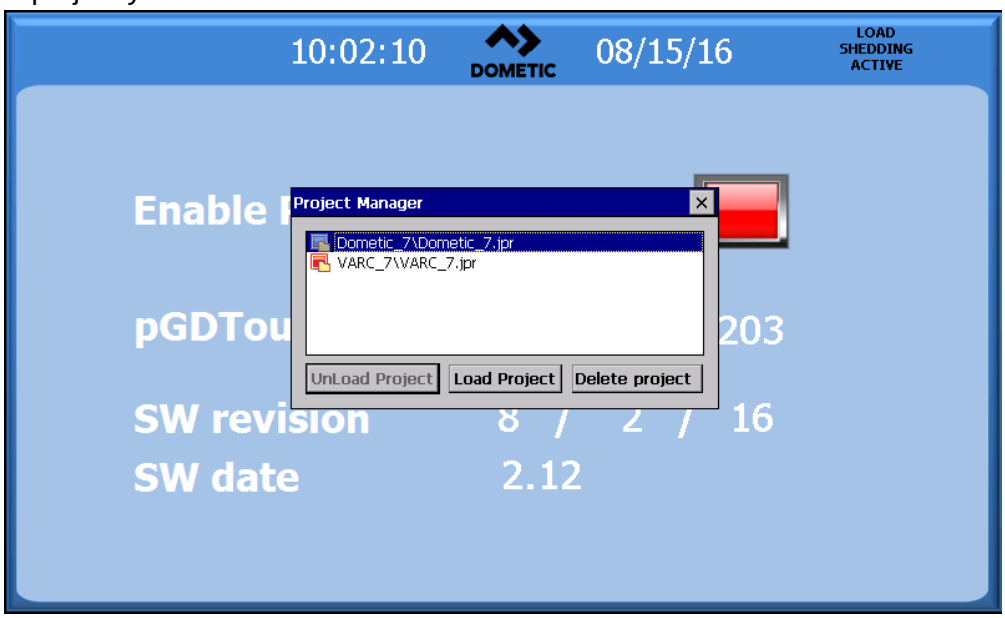
1. Project manager

a. On the touch screen hold your finger on the screen until a pop window is displayed.

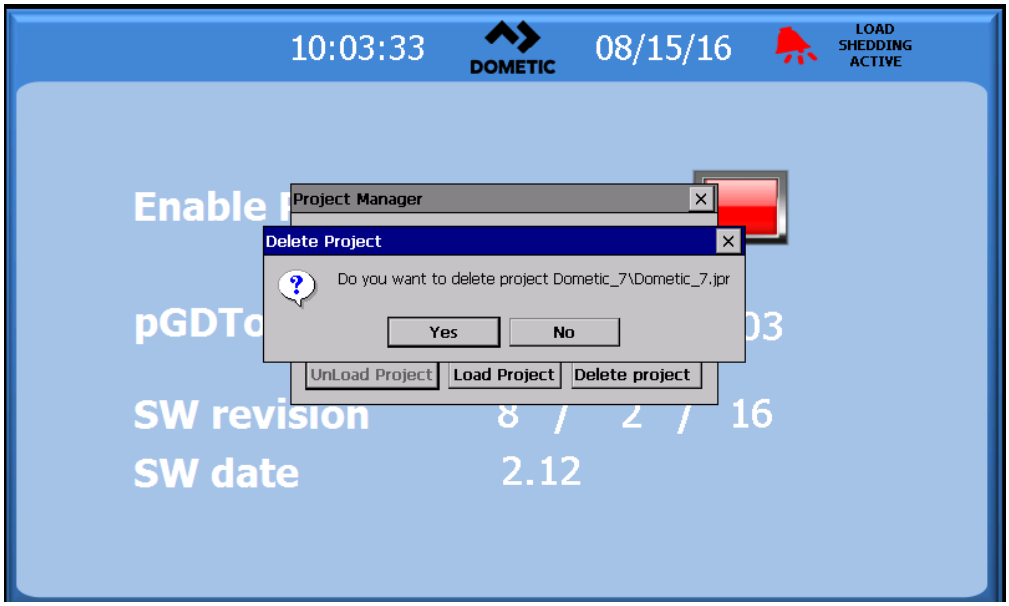
b. Select Project Manager



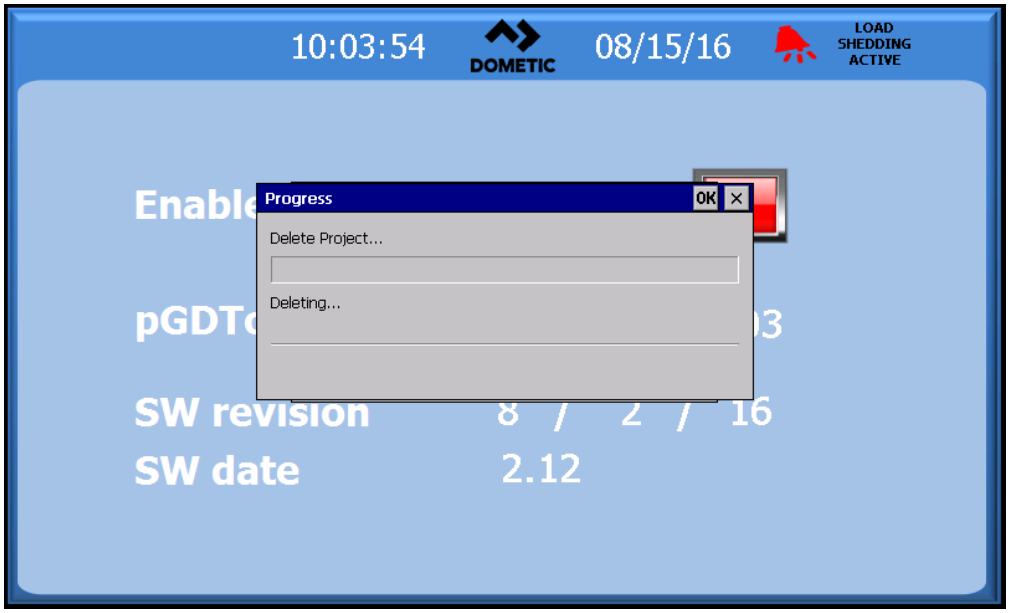
2. Select the project you wish to delete.



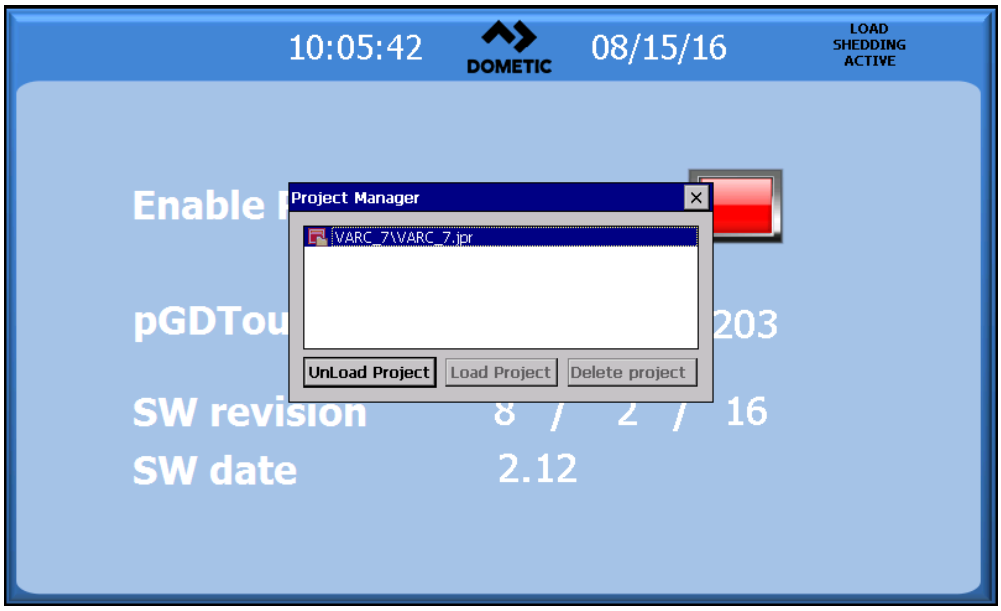
3. Click delete project, then click yes to confirm.



4. The screen will display the following as it in progress of deleting:

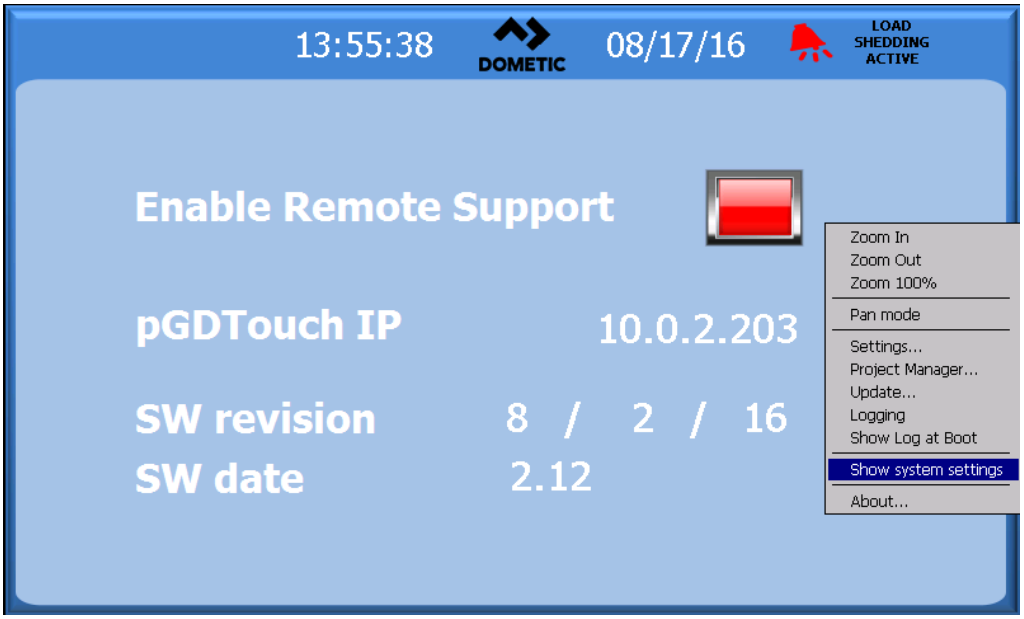


5. Once the project is deleted, the project manager screen will not display the project any longer. Click X to exit out of the project manager window.

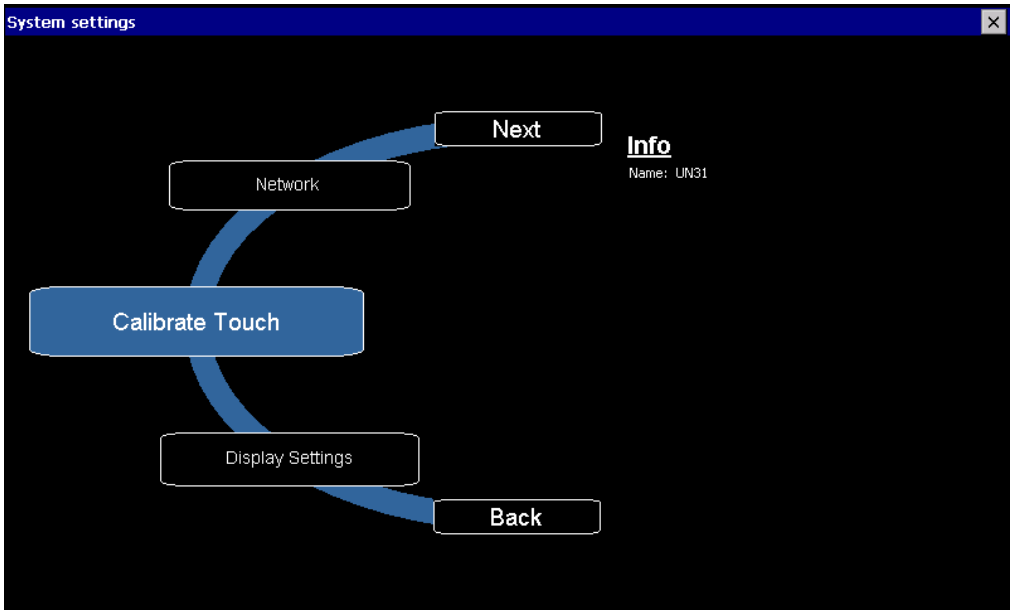


Setting Screen Address, Time & Backlight:

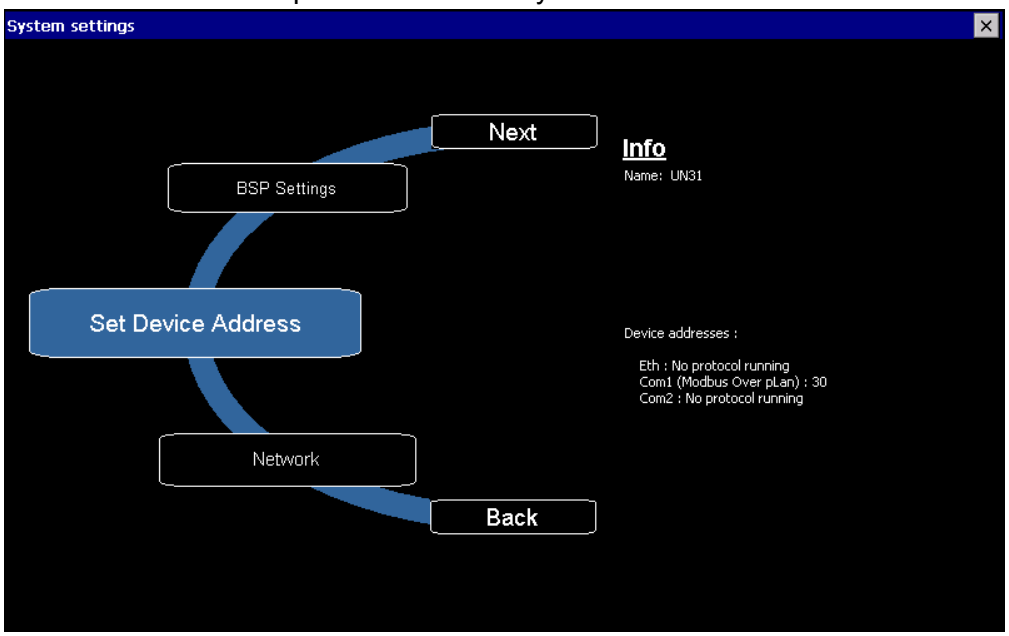
1. Find a spot on the Touchscreen that is not a hot spot. Touch the screen until you get a pop-up. See below.



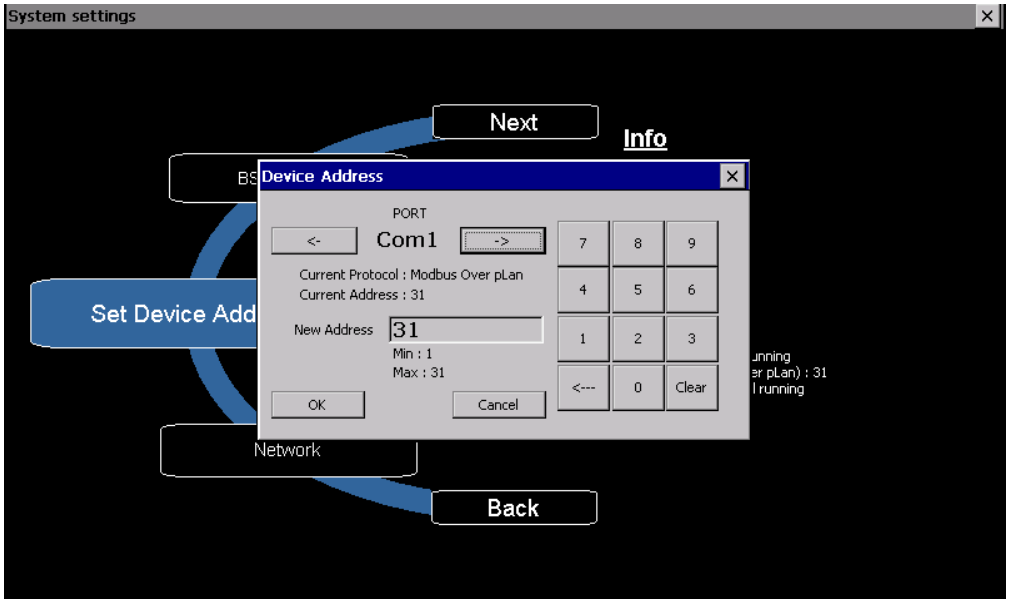
2. Select: Show system settings.



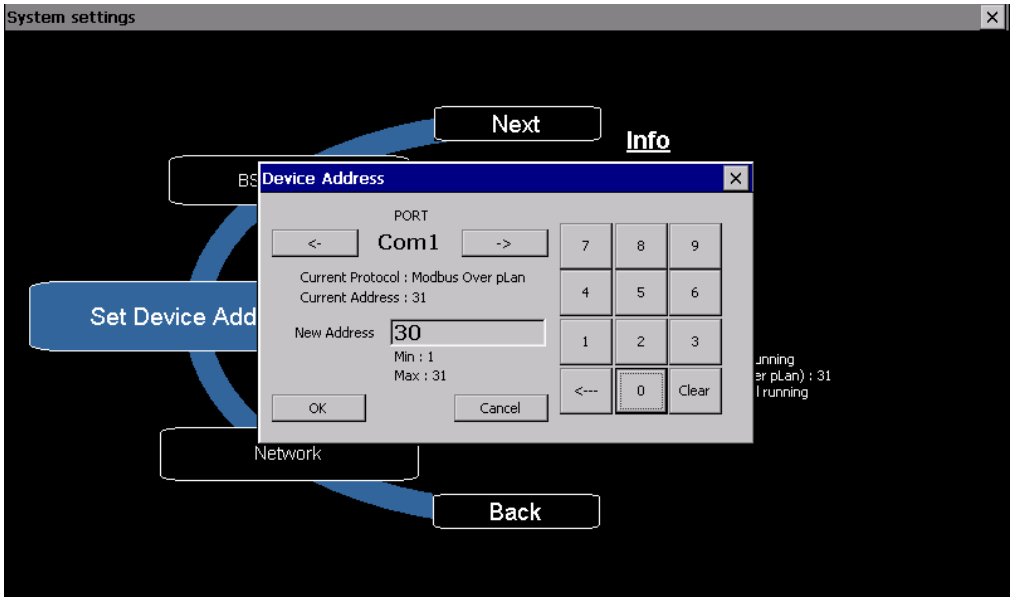
3. Use the Next or Back button to spin the wheel until you find “Set Device Address”.



4. Press the “Set Device Address” button and you will get another screen.

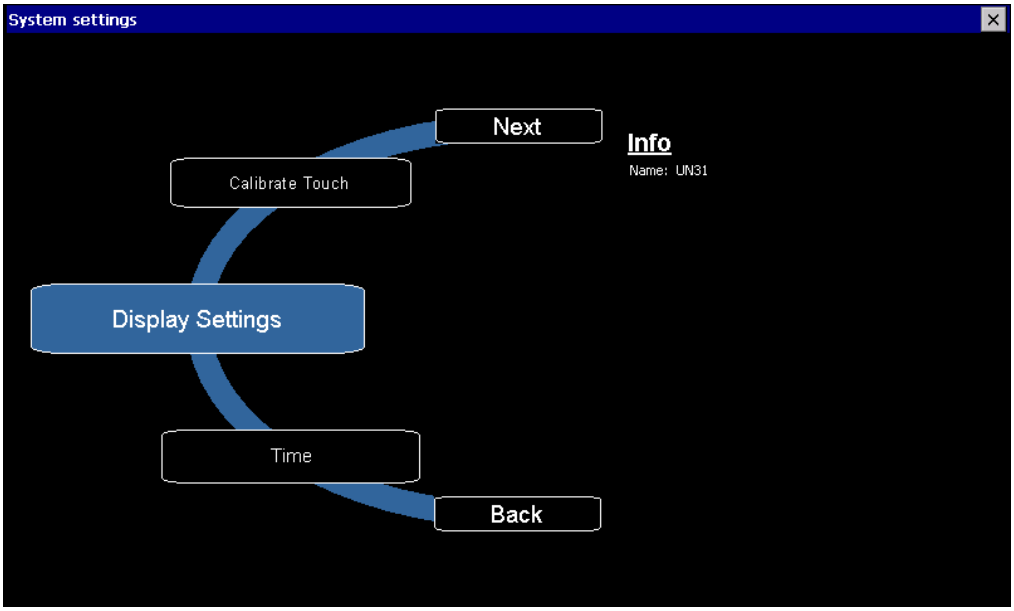


5. Touch the arrow button to select Com1 and change the 31 to 30.

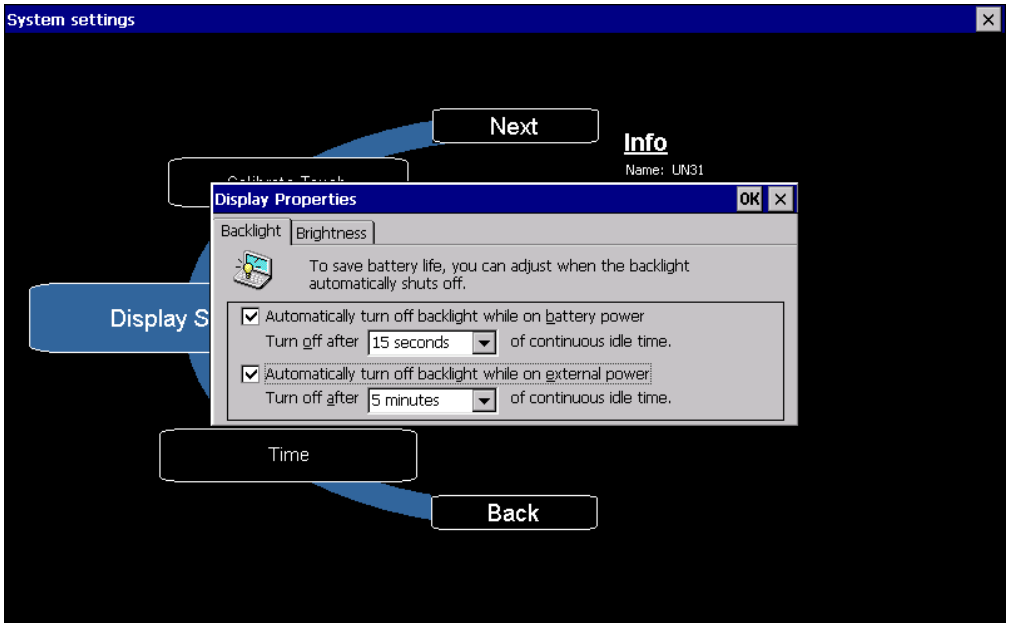


6. Then press ok to save changes, and click X to close the Device Address window.

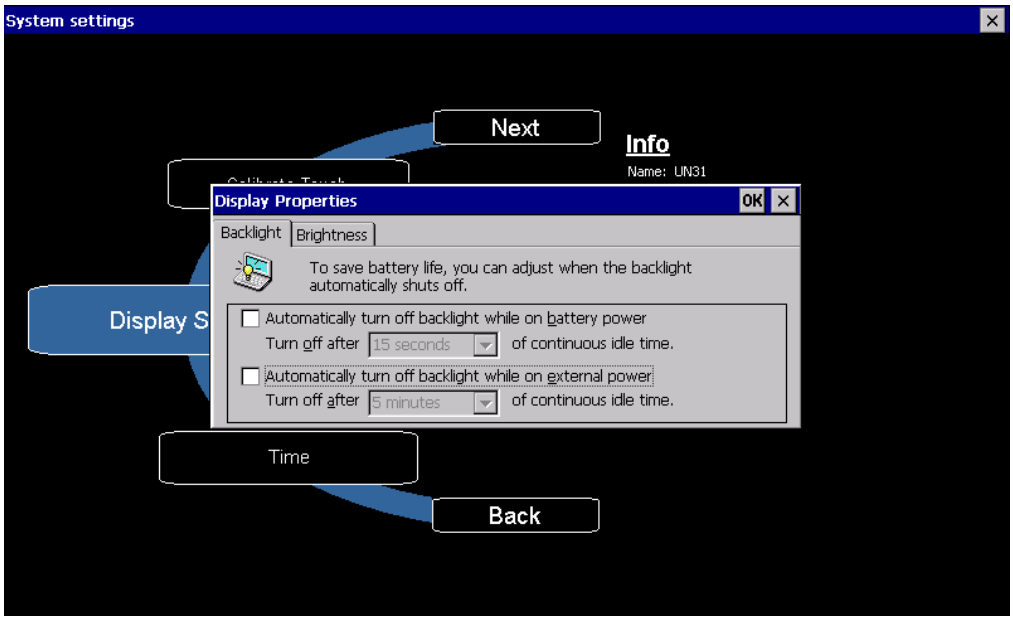
7. Use Next or Back to scroll to Display Settings.



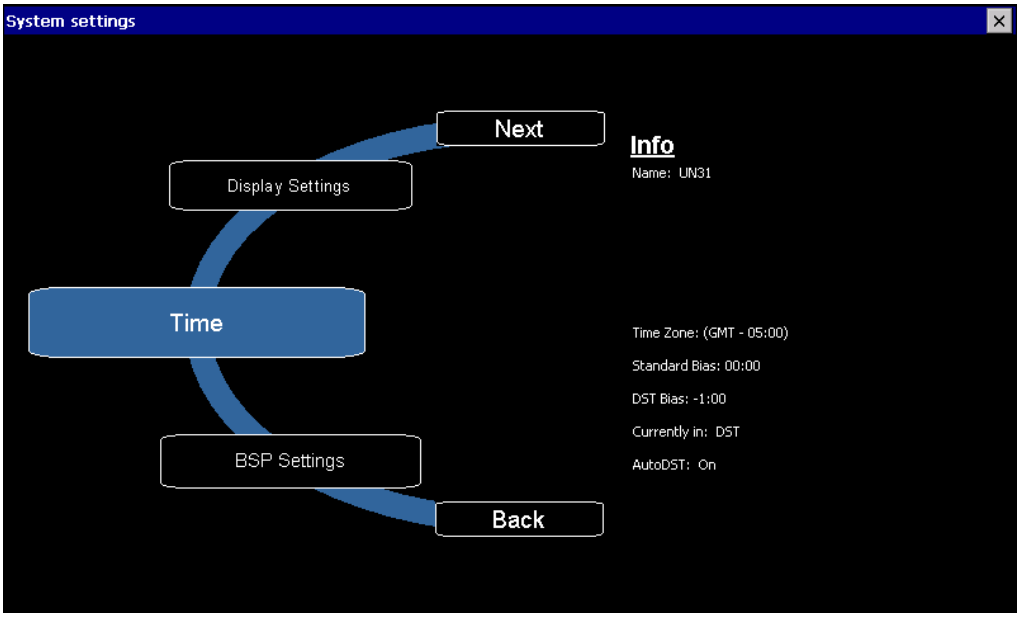
8. Select Display Settings



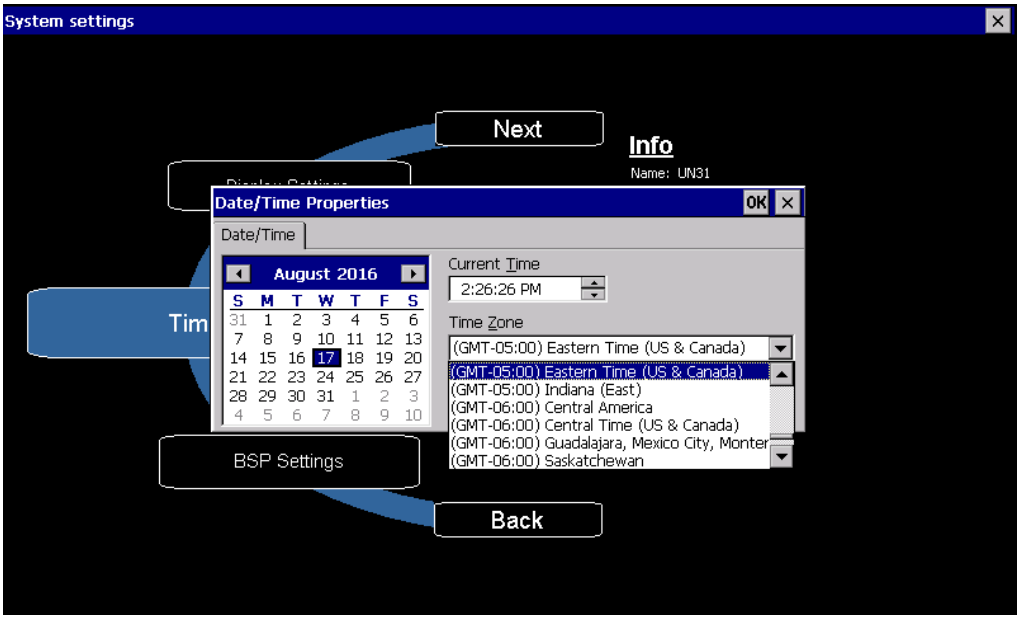
9. Click on the checkmark to automatically turn off backlight while on battery power and external power, so they are not enabled as shown below.



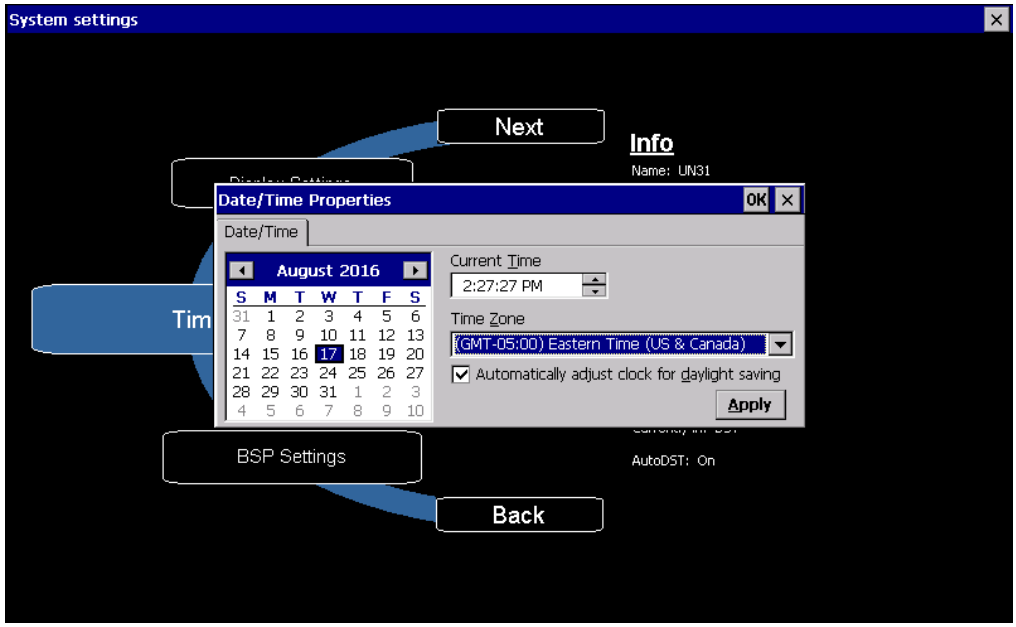
10. Press OK, then click X.
11. Now press Next to scroll to Time.



12. The Date/Time Properties window will pop-up. Look at the time zone, and select Eastern Time.

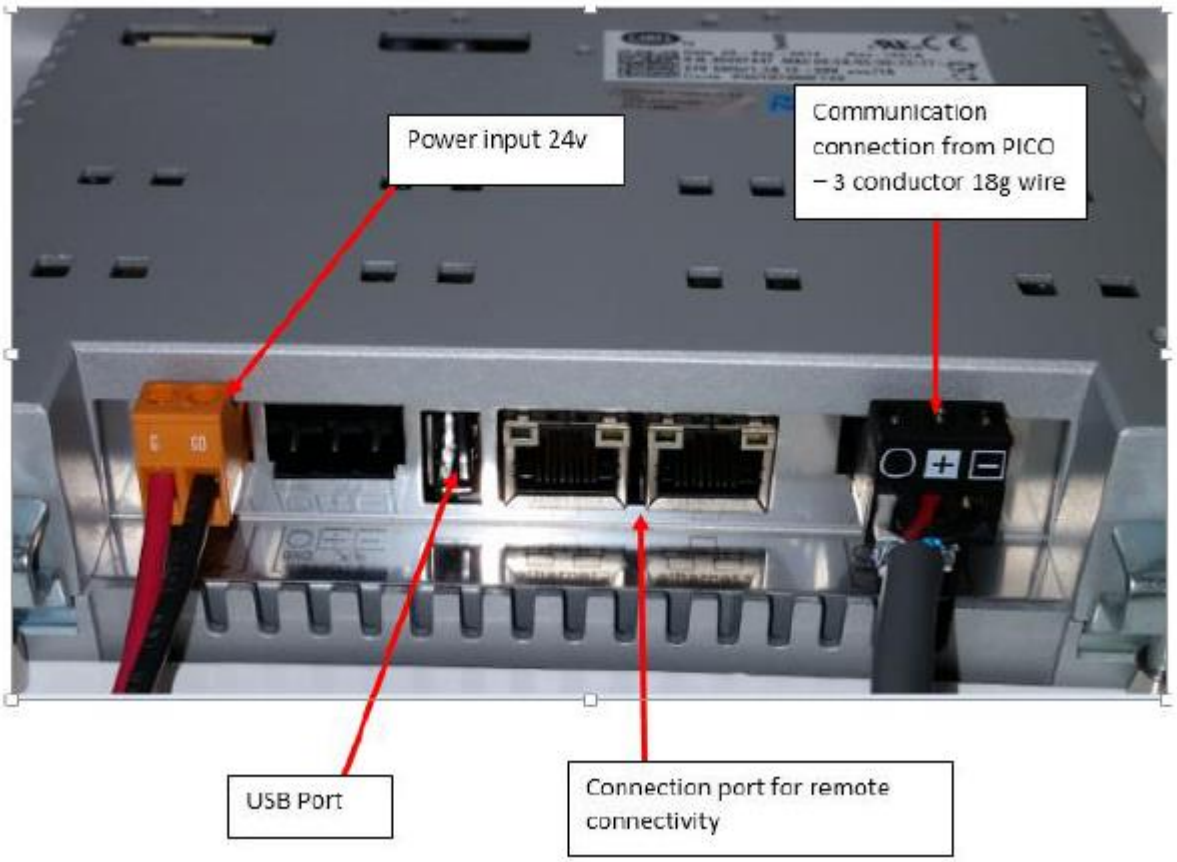


13. The Current Time should show the correct time, press OK then X to close window.

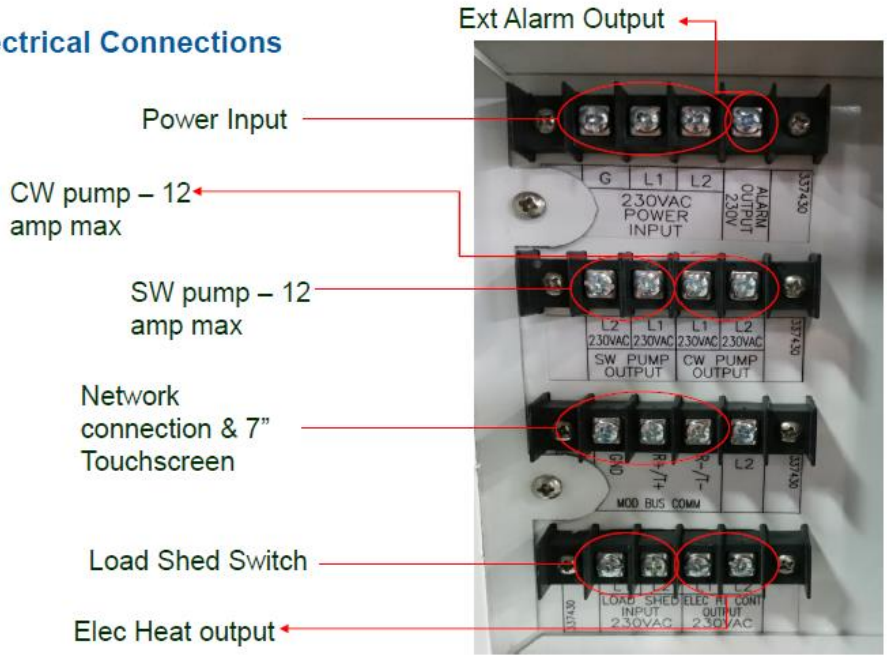


7” touch screen connection

When connecting the 7” touchscreen remote screen. Ensure you have a 24 Vdc supply to power the display and that the 3 core communication cable is correctly plugged into Serial port 1 not port 2.



3 core communication cable terminates on to Terminal Bus 3 (Modbus Com) on chiller 1

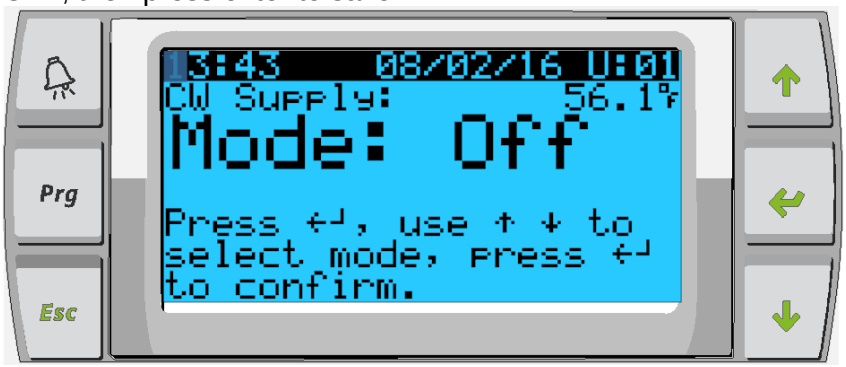


Activating Maintenance Mode

Maintenance mode is a tool in the PLC software that allows the user to disable any of the stages in the system. This allows for ease of troubleshooting and maintenance on one unit, while maintaining full functionality for the other stages. Find below the instructions to access maintenance mode.

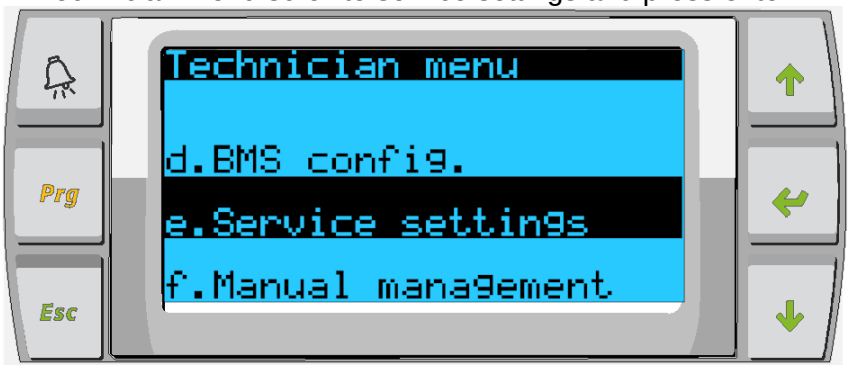
Enabling via PGD1 Display

1. Ensure unit mode is set to OFF. In the main screen, press enter and scroll up/down to select OFF, then press enter to save.



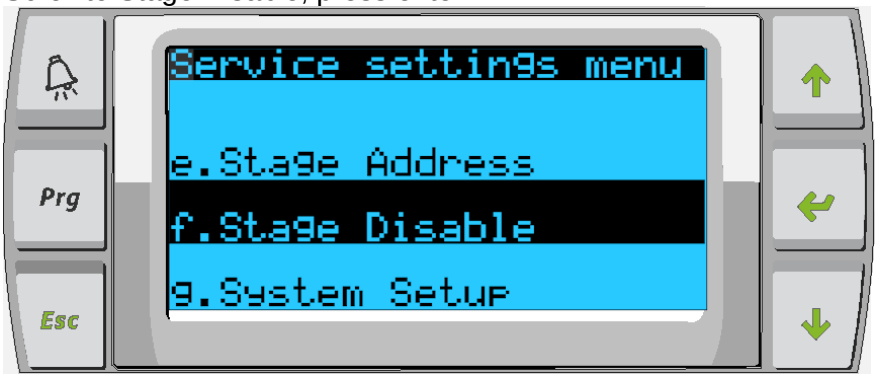
2. To access the maintenance mode menu, press Prg and scroll to technician, press enter.

3. In Technician menu scroll to service settings and press enter.

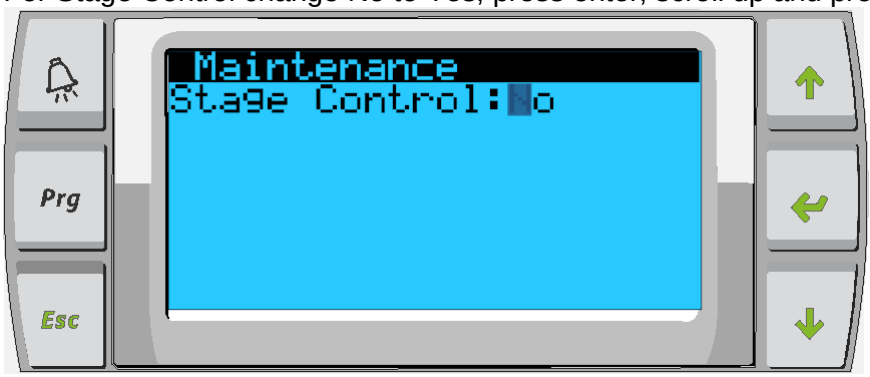


4. Enter the service password to continue: 3156.

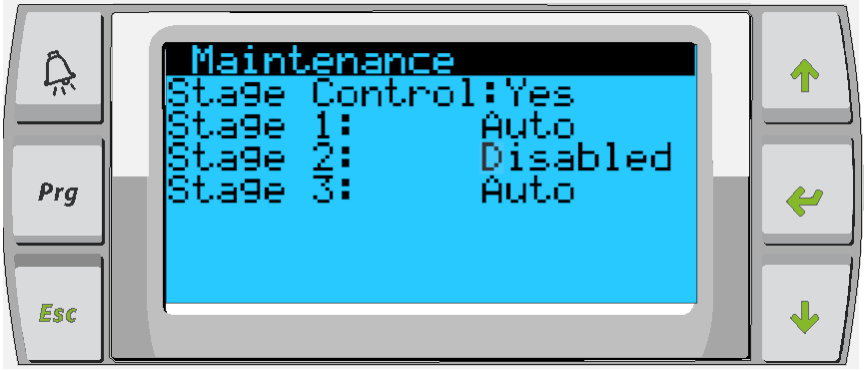
5. Scroll to Stage Disable, press enter.



6. For Stage Control change No to Yes, press enter, scroll up and press enter.



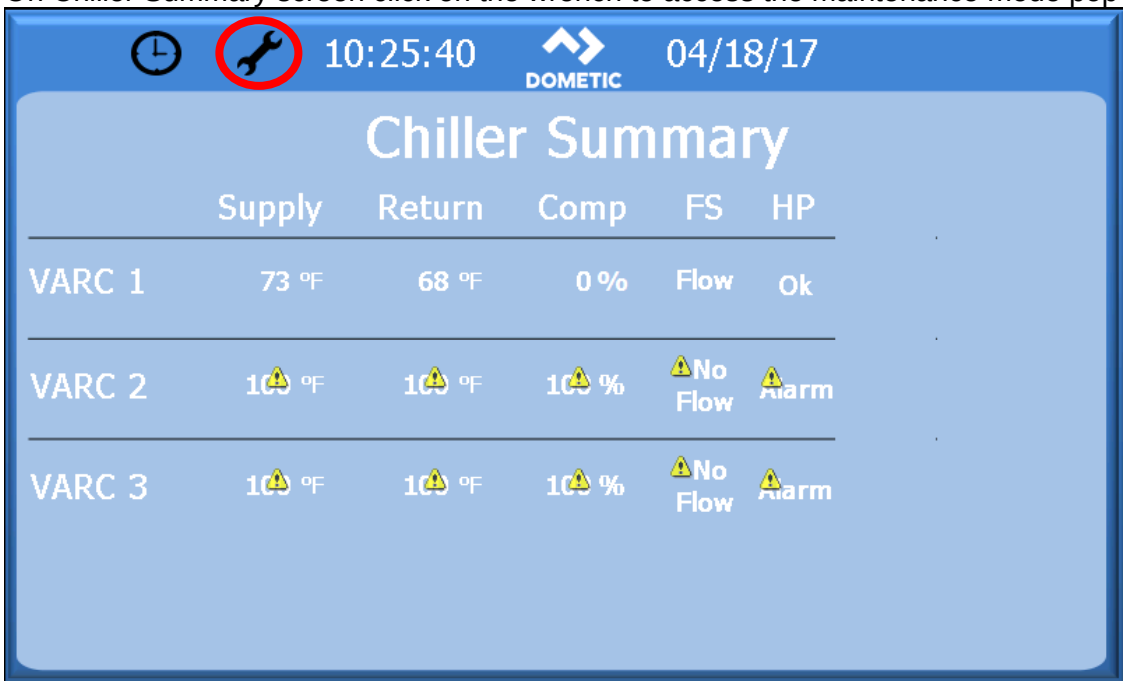
7. The different stages will display on the screen press enter to access each stage and scroll up/down to change from Auto to Disabled.



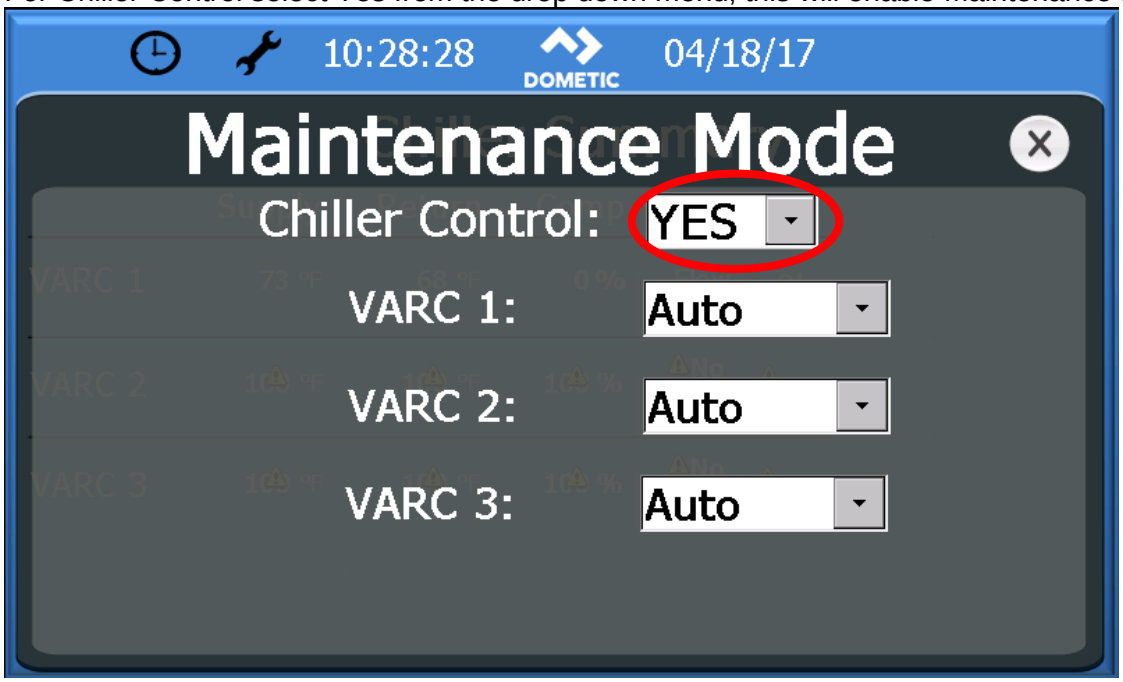
Enabling via Touchscreen

1. Tap the touchscreen to view the menu buttons, and select Chiller Summary.

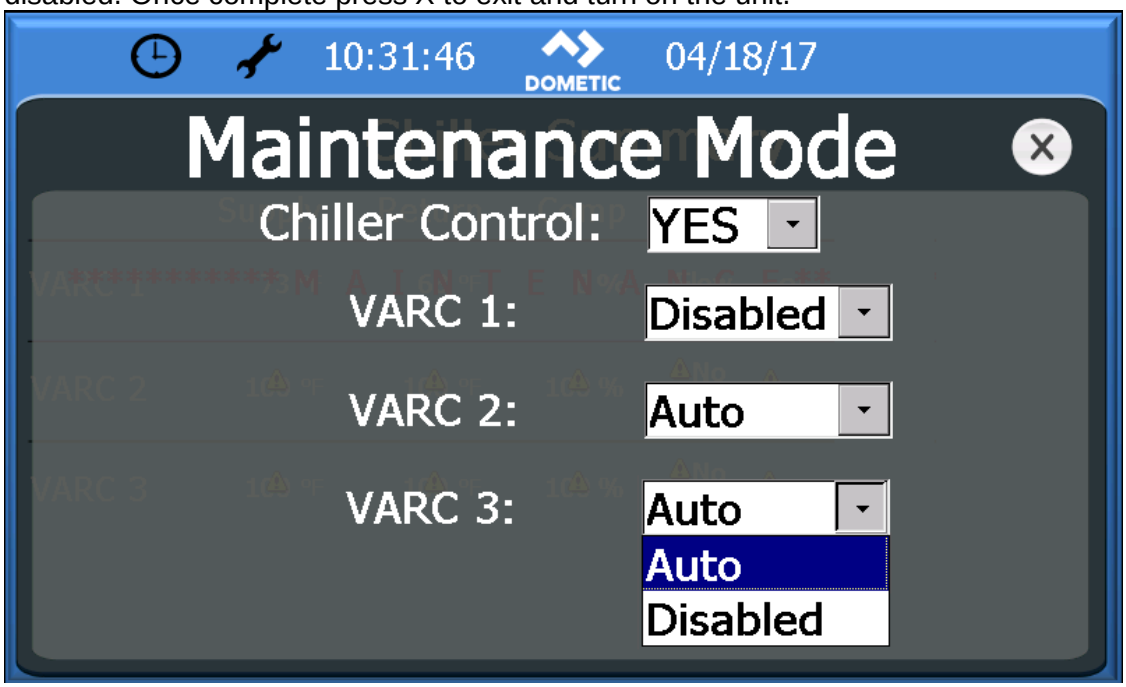
2. On Chiller Summary screen click on the wrench to access the maintenance mode pop-up.



3. For Chiller Control select Yes from the drop down menu, this will enable Maintenance Mode.



4. To disable a stage click on the drop down menu to the right of the stage number and select disabled. Once complete press X to exit and turn on the unit.



Appendix V Alarm Table

Alarm description	Reset	Delay	Alarm relay	System Action	Corrective Action
Chilled Water Supply Sensor Failure	Manual	Immediate	Yes	Shuts off Unit	Check sensor for shorts and opens and compare temperature reading with digital thermometer
Chilled Water Return Sensor Failure	Manual	Immediate	Yes	Shuts off Unit	Check sensor for shorts and opens and compare temperature reading with digital thermometer
Sea Water Inlet Sensor Failure	Manual	Immediate	Yes	Warning Signal	Check sensor for shorts and opens and compare temperature reading with digital thermometer
Chilled Water Supply High	Manual	10 sec	Yes	Turns off compressor or heat relay	Check for low water flow due to restrictions or pump wear
Chilled Water Supply Low	Manual	10 sec	Yes	Turns off compressor or heat relay	Check for low water flow due to restrictions or pump wear
Sea Water Inlet Low	Manual	10 sec	Yes	Warning Signal	Low temperature due to geographical climate
Chilled Water Flow	After 3 retries every 30 mins, must be reset Manually	Immediate	Yes	Turns off compressor or heat relay	Check for proper loop water flow and make sure strainers are not clogged. Check for defective flow switch Bleed air out of the loop water Check loop water pump
High Discharge Pressure	After 3 retries every 30 mins, must be reset Manually	Immediate	Yes	Shut off Unit	Check for proper refrigerant pressure with gauge, if normal then check for defective pressure switch. Assure proper sea water and loop water flow and make sure water strainers are not clogged. Ensure system is not overcharged.
Low Suction Pressure	After 3 retries every 30 mins, must be reset Manually	60 sec	Yes	Shut off Unit	Check for proper refrigerant pressure with gauge, if normal then check for defective pressure switch. Assure proper sea water and loop water flow and make sure water strainers are not clogged. Ensure system is not undercharged.
Low Pressure Differential					Check EEV motor
Compressor Start Failure	After 5 times in 60 mins must be reset Manually	10 sec		Warning Signal	Check voltage to compressor. Check Power inverter.
Condenser Out Temperature Sensor Failure	Manual	Immediate		Warning Signal	Check sensor for shorts and opens and compare temperature reading with digital thermometer
High Discharge Gas Temperature	Automatic	30 sec		Warning Signal	Check for proper refrigerant pressure with gauge
EVD Evo Probes fault or disconnected (S1,S2,S3,S4)	Automatic	Immediate	Yes	Off compressor	Check condition of the wiring and connections

Alarm description	Reset	Delay	Alarm relay	System Action	Corrective Action
EVD EVO Low Superheat	Automatic	Immediate	Yes	Warning Signal	Check for proper refrigerant charge as the system may be overcharged. Check water for low flow. Check EEV movement and functionality.
EVD Evo Low Evaporation Temperature (LOP)	Automatic	Immediate	Yes	Warning Signal	Check water flows. Check refrigerant charge.
EVD Evo High Evaporation Temperature (MOP)	Automatic	Immediate	Yes	Warning Signal	Check refrigerant charge.
EVD Evo Low Suction Temperature	Automatic	Immediate	Yes	Warning Signal	Check refrigerant charge.
VARC # in Limp Mode	Automatic	Immediate	No	Warning Signal	Check that the PLC is setup for the correct # of stages, correct and cycle power to the system.
Frost Active	Manual	Immediate	Yes	Off compressor	Low temperature temp switch tripped. Check water flows. Check refrigerant charge.
Electric Heat Run Hours Exceeded			Yes	Off Heater	Check heater voltage
Envelope Alarm	Manual	60 sec	Yes	Off compressor	
Clock Board Fault or Not connected	Automatic	Immediate	Yes	Warning Signal	
Inverter model not compatible	After 15 retries every 60 mins, must be reset Manually				Make sure Power+ is being used
Power+ in Retry				Warning Signal	Check the power supply
Power+ Device Offline	Automatic	30 sec	Yes	Off compressor	
Power+ Fault					
Alarms Power+ n˚1 None 1:Overcurrent 2:Motor Overload 3:Overvoltage 4:Undervoltage 5:Over Temp 6:Under Temp 7:Overcurrent HW 8:Motor Overtemp 9:Drive Failure 10:CPU Error 11:Param Default 12:DC bus ripple 13:Data Comms Fault 14:Drive thermistor 15:Autotune fault	Manual	Immediate	Yes	Turns off compressor	Check the load Check network control devices and cables Check the input voltage and rectify the trouble. Using a 1000 V megger, check the motor and motor cables for ground faults. Check the input and output circuits for phase loss detection and rectify. Check the condition of the motor and load wiring.
Alarm description	**Reset**	**Delay**	**Alarm relay**	**System Action**	**Corrective Action**

Alarms Power+ n˚1 16:Drive disabled 17:Motor Phase 18:Fan Fault 19:Speed Fault 20:PFC Failure 21:Overvoltage 22:Undervoltage 23:STO Detection 24:Reserved 25:Ground Fault 26:CPU Sync 1 27:CPU Sync 2 28:Drive overload 29:Reserved … 99:Unexpected inverter stop	Manual	Immediate	Yes	Turns off compressor	Check the load Check network control devices and cables Check the input voltage and rectify the trouble. Using a 1000 V megger, check the motor and motor cables for ground faults. Check the input and output circuits for phase loss detection and rectify. Check the condition of the motor and load wiring.

Appendix VI Default Parameters

Parameter	VARC 48	VARC 60	VARC 72	Data Type
Cooling Setpoint CCW Return	48	48	48	Deg F
Cooling Setpoint CCW Supply	42	42	42	Deg F
Heating Setpoint	110	110	110	Deg F
Panasonic Compressor	5KD184XAB21	5JD420XAA22	5JD420XAA22	
Inverter part number	PSD1* 12 amp	PSD1* 12 amp	PSD1* 16 Amp	
Current Limit Setpoint According to Drive limit	12 Amps	12 Amps	16 Amps	
Econo Mode	4	6	6	Amps
Normal Mode	10	10	12	Amps
Superheat Setpoint				
Cool and Heat	10	10	10	Deg F
Factory Settings				
Control Temp mode	CCW Return	CCW Return	CCW Return	
Number of Stages	1	1	1	
Electric Heat	No	No	No	
Pwr Cycle	Retain Mode	Retain Mode	Retain Mode	
Electric Heat	No	No	No	
Logo	Dometic BLK	Dometic BLK	Dometic BLK	
Background	Ocean	Ocean	Ocean	
Flow Switch	Yes	Yes	Yes	
High Pressure Switch	Yes	Yes	Yes	
\ow Pressure Switch	No	No	No	
Load Shedding	Yes	Yes	Yes	
Condenser Monitoring	Yes	Yes	Yes	
Load Shedding	Yes	Yes	Yes	
SW Pump Settings				
Control	By Demand	By Demand	By Demand	
Off Delay	5	5	5	Seconds
CW Pump Settings				
Control	Continuous	Continuous	Continuous	
Flow Prove Delay	10	10	10	Seconds
Off Delay	5	5	5	Seconds
Reversing Valve				
RV Delay Time before Toggle Cool Mode	90	90	90	Seconds
RV Toggle Time	2	2	2	Seconds
RV Toggle Time	2	2	2	Seconds
Compressor				
Min On Time	60	60	60	Seconds
Min Off Time	180	180	180	Seconds
Compressor				
Min Time between Starts	180	180	180	Seconds
Load Up Time	10	10	10	
Parameter	**VARC 48**	**VARC 60**	**VARC 72**	**Data Type**
Compressor Frost Protection				

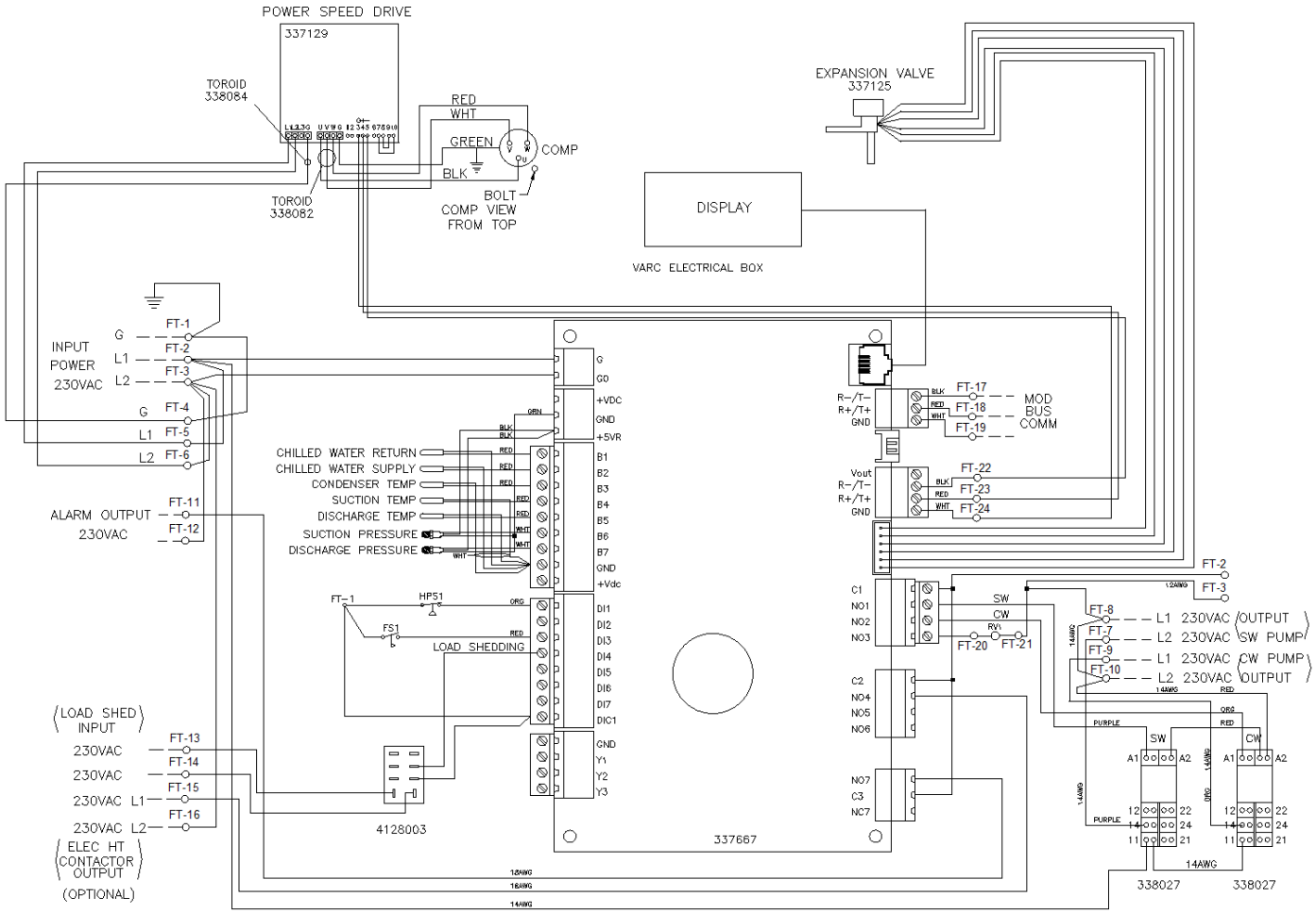
Cond Setpoint	36	36	36	Deg F
Cond Band	2.7	2.7	2.7	Deg F
Comp Speed	60	40	40	RPS
Compressor PID				
Cntrl	P	P	P	
K	20	20	20	
Int	0	0	0	Seconds
Alarm Setups				
CW High Temp Limit				
Setpoint	125	125	125	Deg F
Off Band (SP-)	15	15	15	Deg F
Retries	3	3	3	
Retry delay	30	30	30	Minutes
CW Freeze Limit				
Setpoint	38	38	38	Deg F
Off Band (SP+)	5.4	5.4	5.4	Deg F
Retries	3	3	3	
Retry delay	10	10	10	Minutes
CW Flow	10	10	10	Seconds
Retries	3	3	3	
Retry delay	10	10	10	Minutes
High Discharge Pressure	550	550	550	PSI
Retries	3	3	3	
Retry delay	30	30	30	Minutes
High Pressure Switch				
Retry	3	3	3	
Retry delay	30	30	30	Minutes
Low Suction Alarm				
Low Suction Pressure Cool	60	60	60	PSI
Low Suction Pressure Heat	60	60	60	PSI
Delay	180	180	180	Seconds
Retries	3	3	3	
Retry delay	30	30	30	Minutes
Inverter Alarms				
Retry	15	15	15	
Retry delay	60	60	60	Minutes
Disable	300	300	300	Seconds
Configuration Menu				
Temperature Units	Deg F	Deg F	Deg F	
Pressure Units	PSI	PSI	PSI	

Appendix VII I/O Table & Wiring Diagram

I/O #	Board I/O	Description
Analog Inputs		
AI-1	B1	Chilled Water Return
AI-2	B2	Chilled Water Supply
AI-3	B3	Condenser Outlet Refrigerant Temp
AI-4	B4	Suction Temperature
AI-5	B5	Discharge Temperature
AI-6	B6	Suction Pressure
AI-7	B7	Discharge Pressure
Digital Inputs		
DI-1	DI1	High Pressure Switch (Optional)
DI-2	DI2	Low Pressure Switch (Optional)
DI-3	DI3	Flow Switch
DI-4	DI4	Load Shedding Input
DI-5	DI5	Electric Heat Flow Switch
DI-6	DI6	Econo Mode Selection
DI-7	DI7	N/A
Analog Outputs		
AO-1	Y1	N/A
AO-2	Y2	N/A
AO-3	Y3	N/A
Digital Outputs		
DO-1	NO1	Seawater Pump
DO-2	NO2	Chilled Water Pump
DO-3	NO3	Reversing Valve
DO-4	NO4	Electric Heat
DO-5	NO5	N/A
DO-6	NO6	N/A
DO-7	NO7/NC7	Alarm

VARC Standard Wiring Diagram

Figure



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