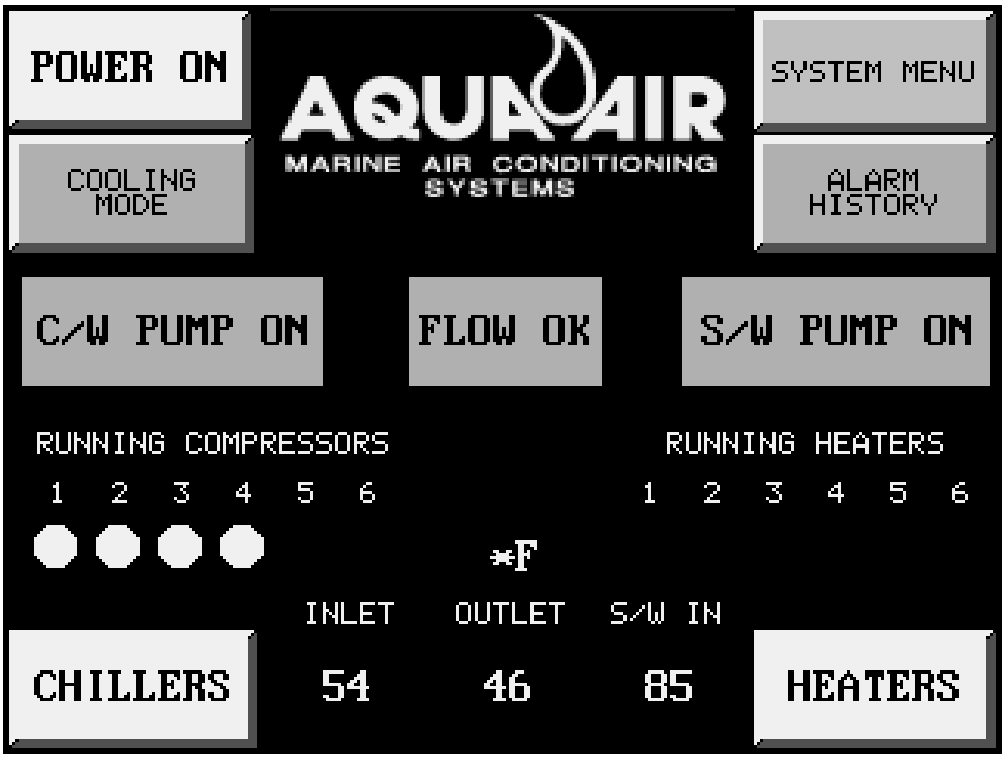
AQUA AIR

MARINE AIR CONDITIONING SYSTEMS



Touchscreen & PLC Control System

Operation Manual

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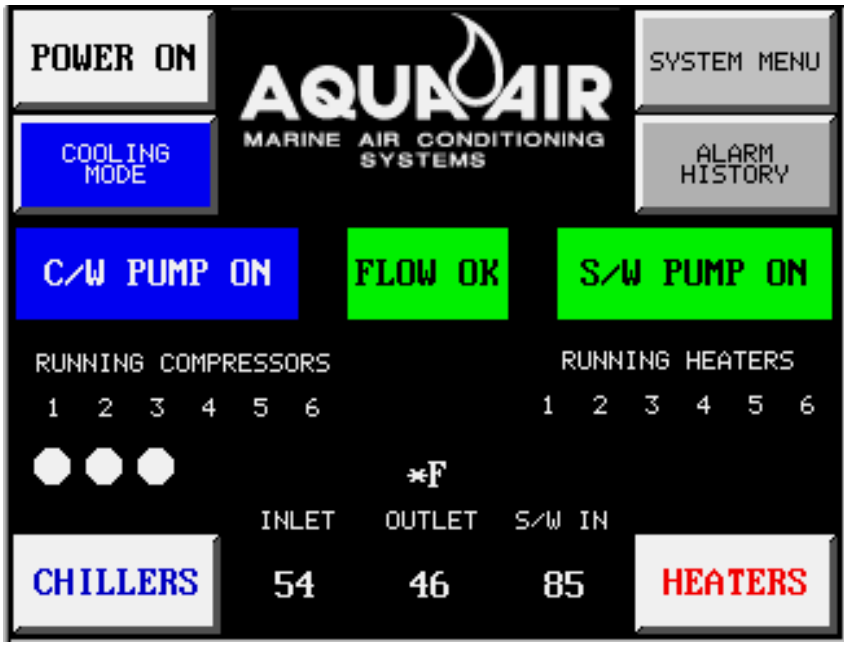
1

Introduction

AQUA-AIR
MARINE AIR CONDITIONING SYSTEMS

TOUCHSCREEN & PLC CHILLER CONTROL



The Aqua-Air® TS/PLC Touchscreen and PLC Control System, featured exclusively on Aqua-Air® chillers, is the latest revolutionary innovation in chiller technology by Aqua-Air®.

With in-house programming and renown Aqua-Air® chiller expertise you are assured of state-of-the-art control of your chiller unit.

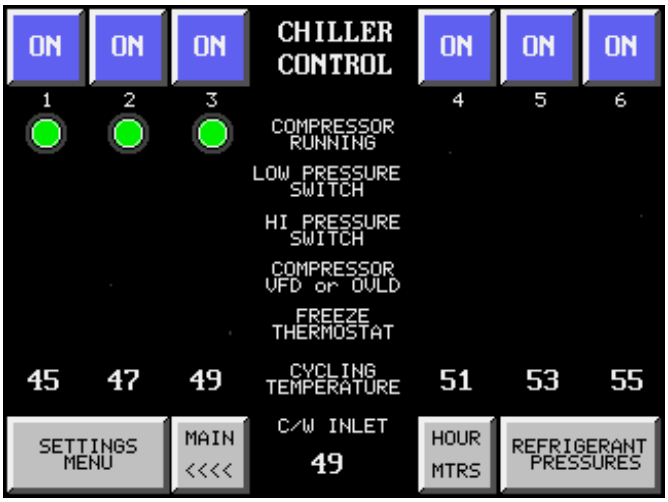
Utilizing industrial grade PLC's and touchscreens you are assured of years of trouble-free operation.

System Features

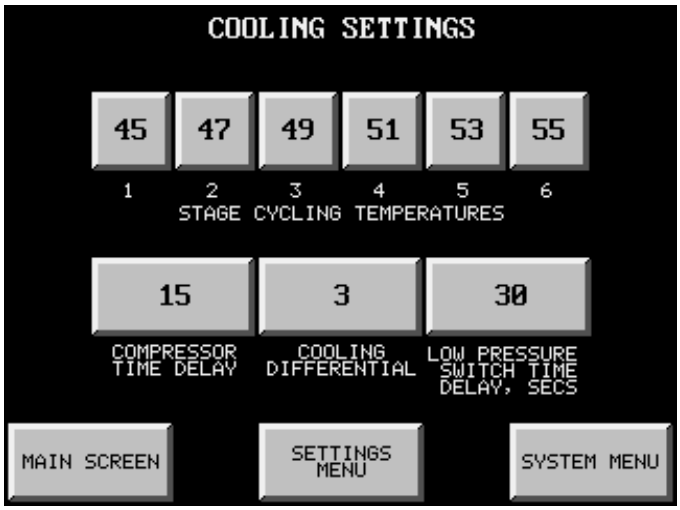
- User friendly graphical interface-no more cryptic two letter diagnostic codes
- Easy selection of system operating mode, cooling or heating
- Digital display of chillwater inlet and outlet temperatures
- Digital display of seawater inlet temperature
- Temperatures can be displayed in Fahrenheit or Centigrade
- Indicator lights showing the number of running compressors or heaters
- Running status of chillwater and seawater pumps
- Alarm History shows each alarm that has occurred with the most recent at the top
- Alarm Count lists all alarms and shows the total count for each one
- Alarms have date & time stamps showing alarm activation, when cleared, value at time of alarm, high and low limits and which limit was tripped
- Individual on-off control of each chiller and immersion heater element
- Digital display of chiller and heater cycling temperatures
- Indicator lights for low and high refrigerant pressure faults, freeze-up faults and compressor / variable frequency drive faults
- Hour meters for compressors, pumps and heaters
- Primary and secondary chillwater and seawater pump selection
- Optional seawater pump variable frequency drive control interface
- Factory default settings can be loaded at any time to return the system to a

standard baseline for troubleshooting purposes

< Individual stage cycling temperatures for both chillers and heaters
< Settings for compressor and heater time delays
< Automatic or manual alternating sequence selection
< Alternating sequence can be set to manually stay in any particular sequence
< Alternating period can be set from 1-999 hours
< Display of time remaining in current alternating sequence
< Touchscreen contrast is user adjustable for almost any lighting situation
< Diagnostics screen where you can individually energize all outputs and monitor all inputs
< Optional refrigerant suction and discharge pressure indication for each compressor
< Optional remote monitoring by the ships system via an Ethernet network utilizing the MODBUS protocol
< Optional remote touchscreen
< Optional color touchscreen
< Optional Global Link® Package allows Aqua-Air® engineers to remotely access your system via phone modem and aid in troubleshooting system problems.



Chiller Control Screen



Cooling Settings Screen

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Ph 305-884-8363 Fax 305-883-8549 Email sales@aquaair.com

TYPICAL TOUCHSCREEN / PLC SYSTEM

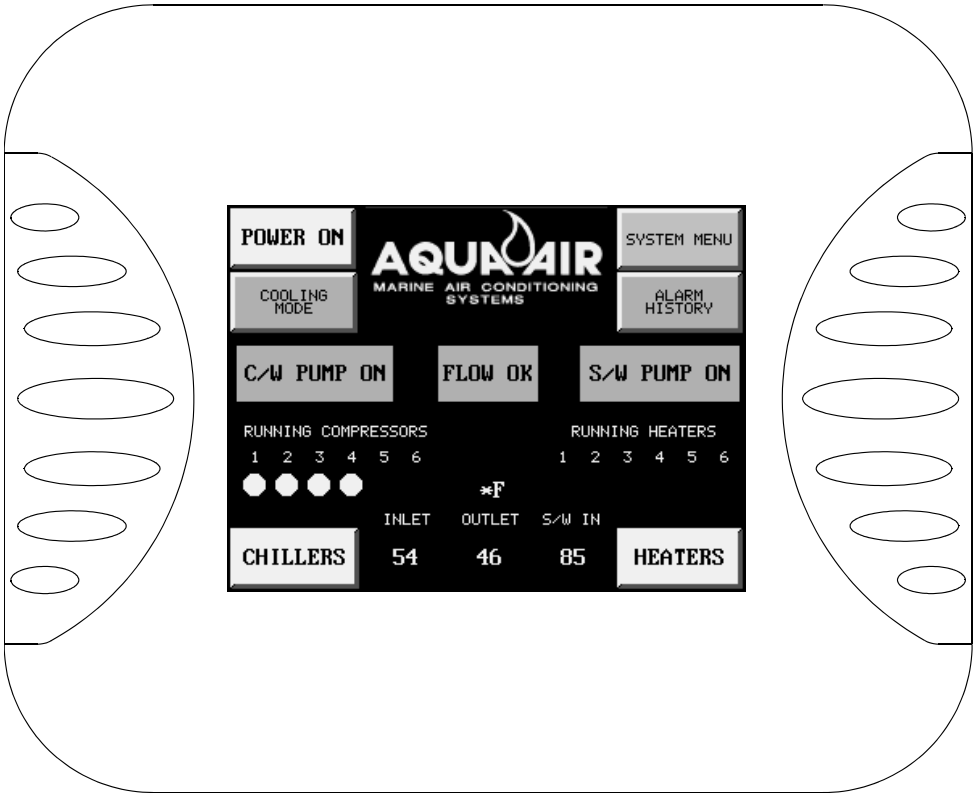
J:\GCD\TYPTSPLC.GCD
J:\DXF\TYPTSPLC.DXF

I:\WORDPFCT\PLC\TYPICALTSPLCSYSTEM.WPD

2

Touchscreens

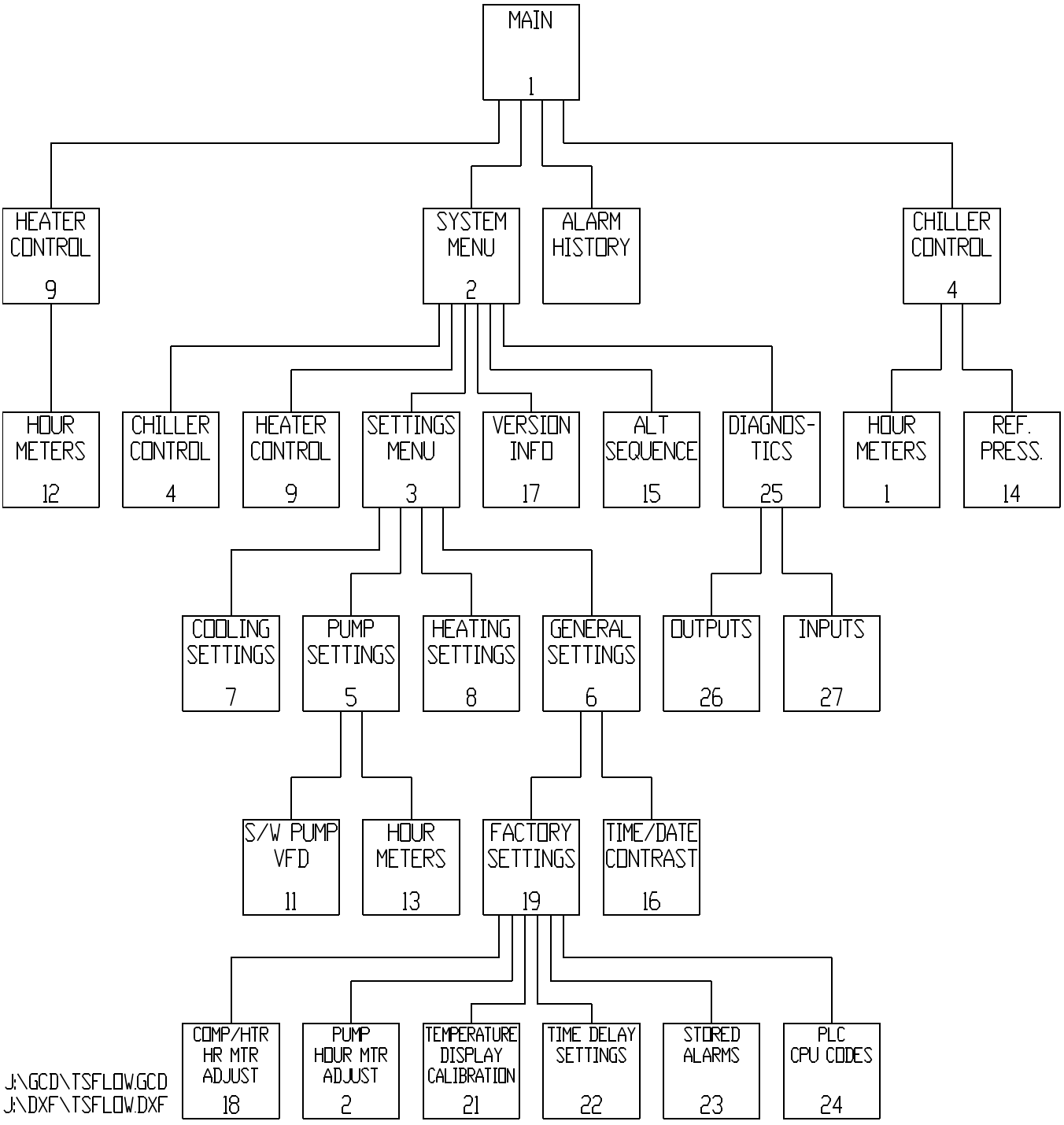
Touchscreen Interface



The Aqua-Air TS/PLC Series Touchscreen that is located on the front of the control panel for your chiller unit is what is known in the Industrial Control field as a HMI (Human-Machine Interface) unit. It provides a way to graphically represent the pushbuttons, indicator lights, numeric indicators, gauges and other indicating devices necessary to allow you to operate the unit. It is the component that interfaces between you, the operator, and the PLC which is actually controlling the components of the chiller.

The Touchscreen is comprised of not just one screen but many. One screen may lead to a dozen others or it may be the last in a line of screens. On the following page is a graphical representation of how all of the different screens are connected.

Touchscreen Screen Arrangement



i:\wordpfct\plc\touchscreen screen arrangement.wpd

Touchscreen Screen Listing

Screen Number	Description	Customer Use = C Factory Use Only = F	Notes
1	Main Screen	C	
2	System Menu	C	
3	Settings Menu	C	
4	Chiller Control	C	
5	Pump Settings	C	
6	General Settings	C	
7	Cooling Settings	C	
8	Heating Settings	C	
9	Heater Control	C	
10	Chiller Hour Meters	C	
11	Seawater Pump Frequency Drive Control	C	1
12	Heater Hour Meters	C	
13	Pump Hour Meters	C	
14	Refrigerant Pressures	C	2
15	Alternating Sequence	C	
16	Time, Date & Contrast Settings	C	
17	Version Information	C	
18	Compressor & Heater Hour Meter Adjustment	F	
19	Factory Settings Menu	F	
20	Pump Hour Meter Settings	F	
21	Temperature Display Calibration	F	
22	Time Delay Settings	F	
23	Stored Alarms	F	
24	PLC CPU Error Codes	F	
25	Diagnostics Menu	C	
26	Outputs	C	
27	Inputs	C	

Note 1 Only available on units configured for use with variable frequency drives on seawater pumps
Note 2 Only available on units with the refrigerant pressure transducer option

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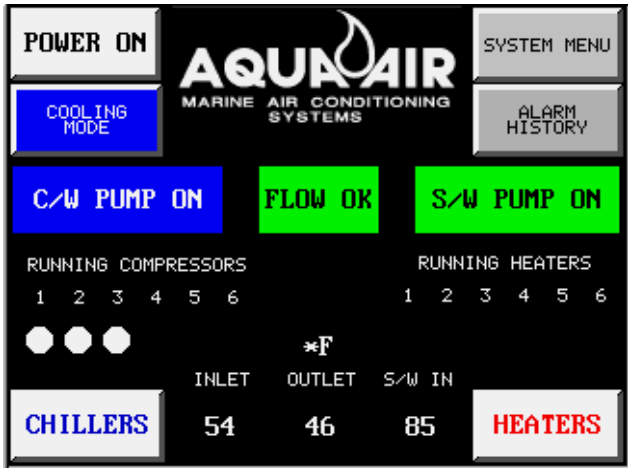
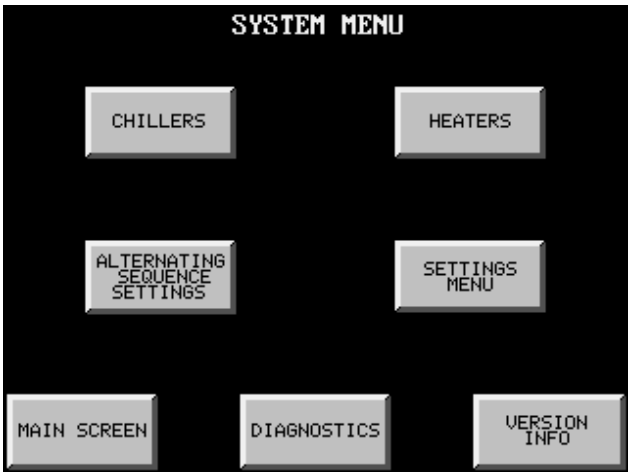
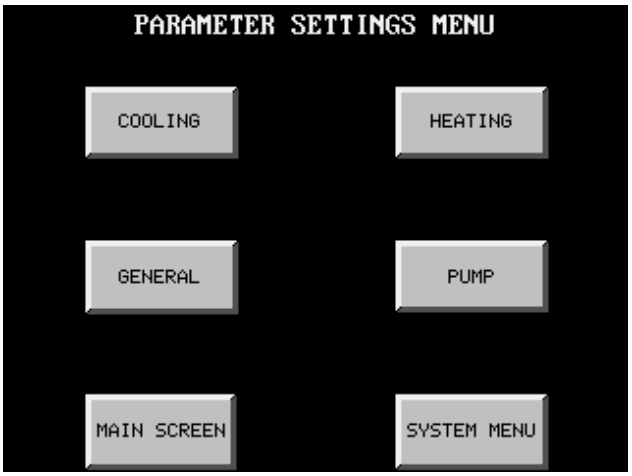
PLC Touchscreen Screens



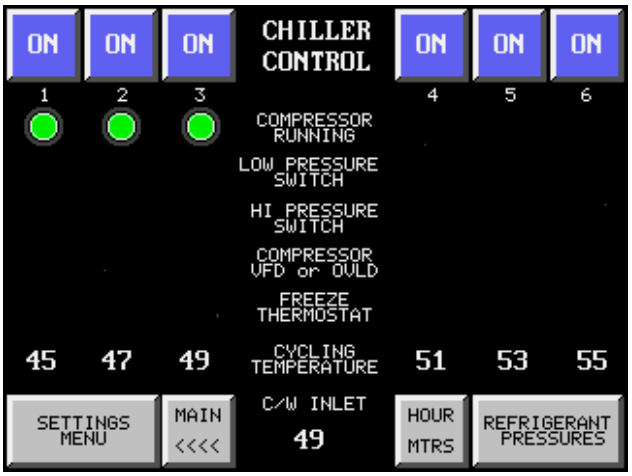
1. Main Screen



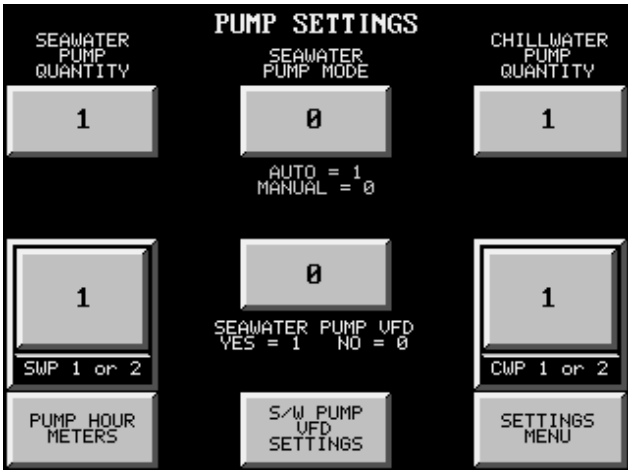
2. System Menu



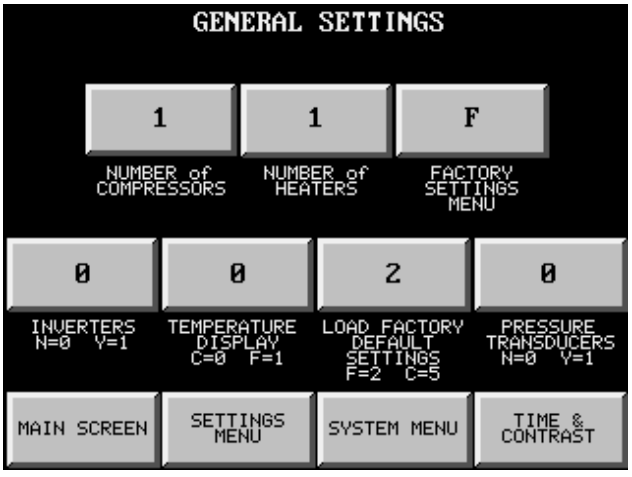
3. Settings Menu



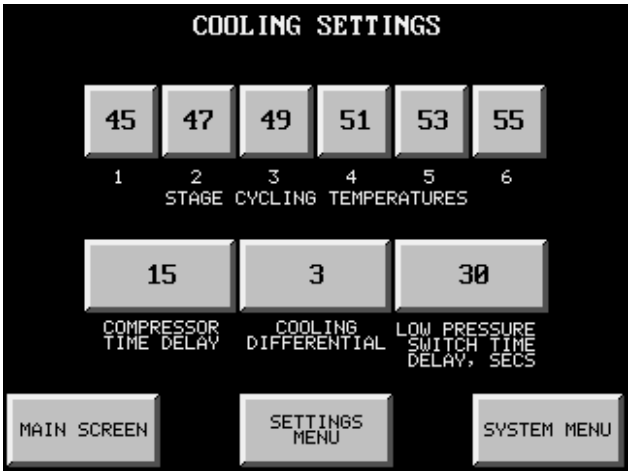
4. Chiller Control



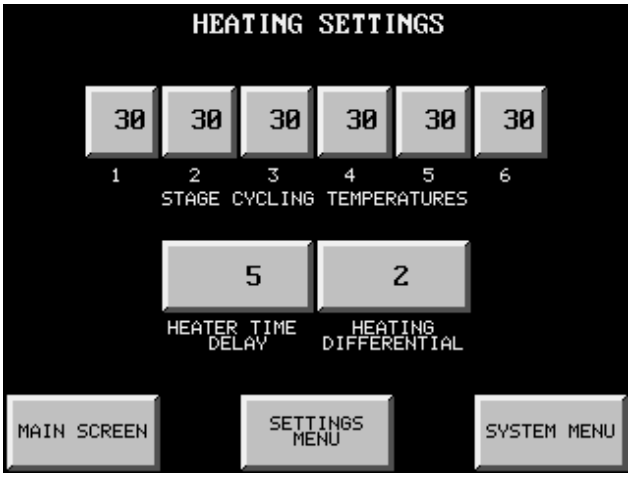
5. Pump Settings



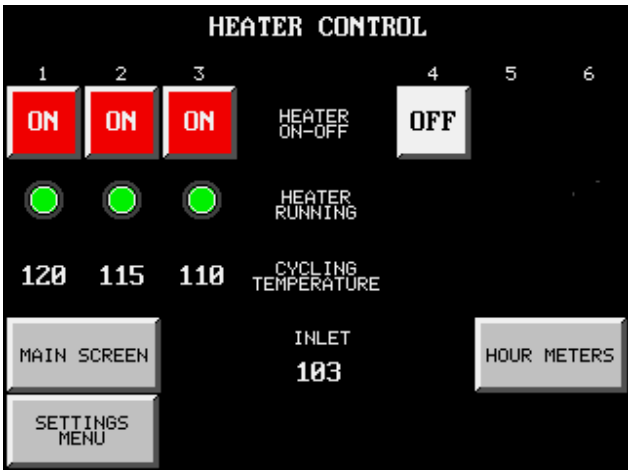
6. General Settings



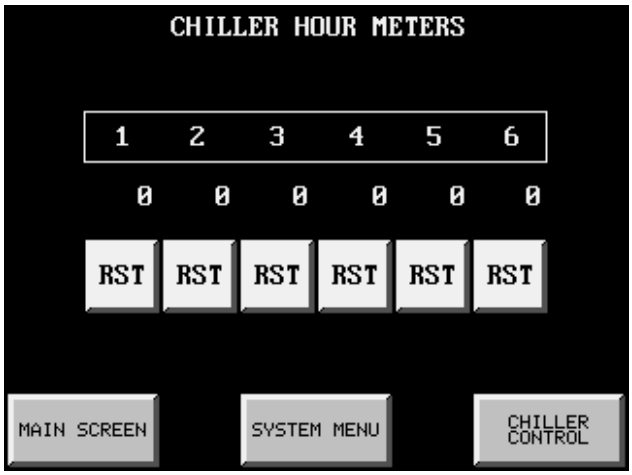
7. Cooling Settings



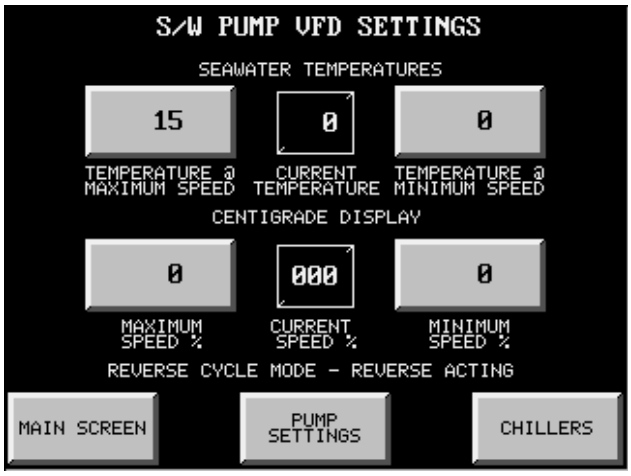
8. Heating Settings



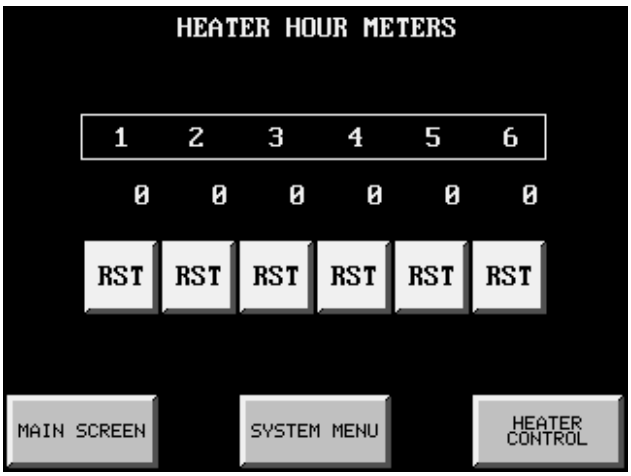
9. Heater Control



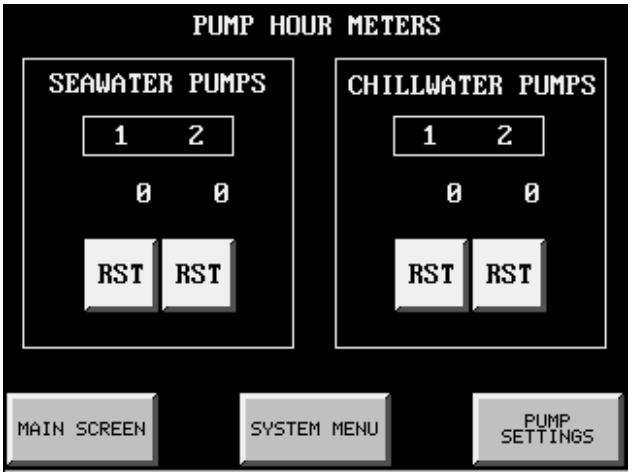
10. Chiller Hour Meters



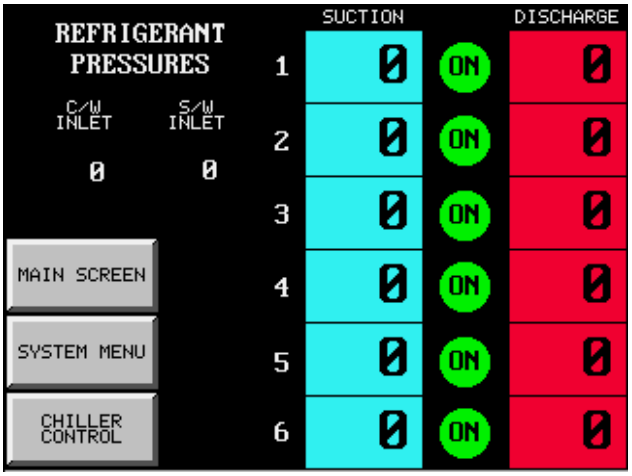
11. Seawater Pump VFD Control



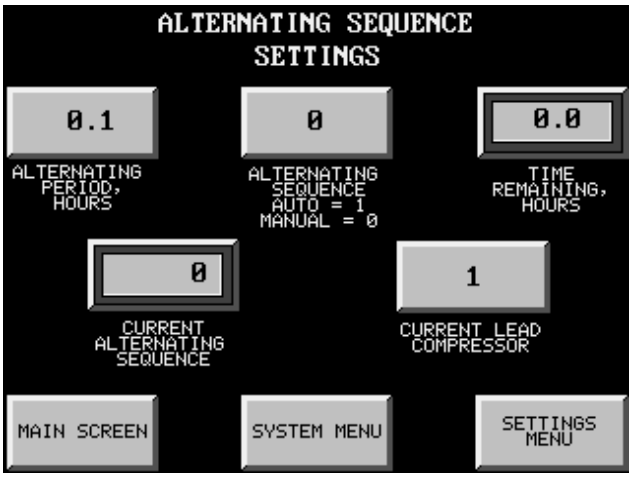
12. Heater Hour Meters



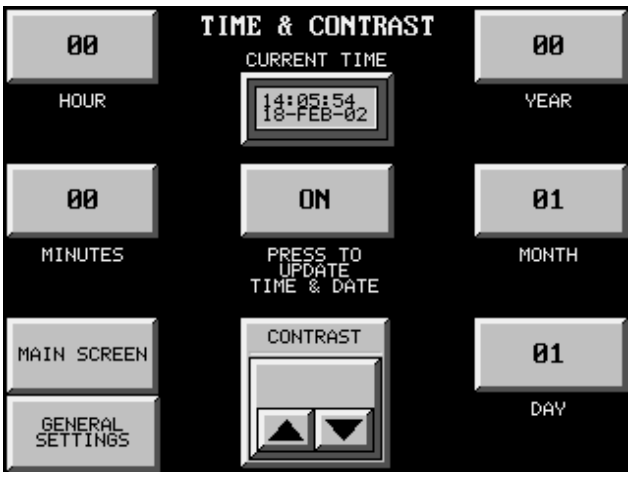
13. Pump Hour Meters



14. Refrigerant Pressures

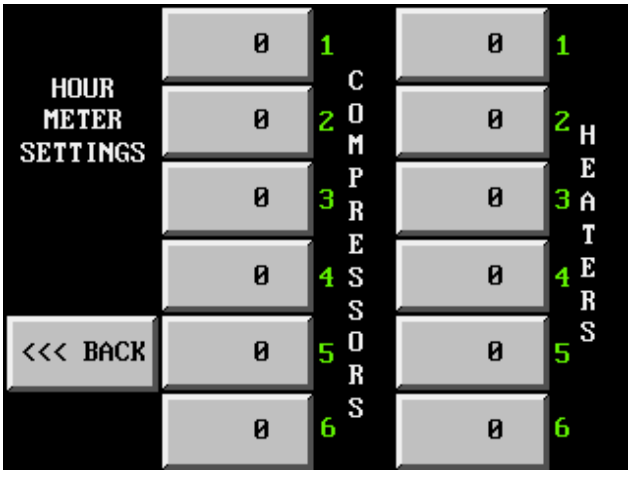


15. Alternating Sequence Settings

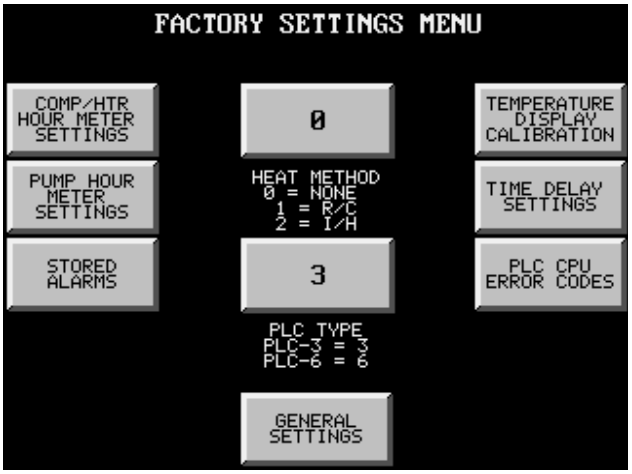


16. Time & Contrast Settings

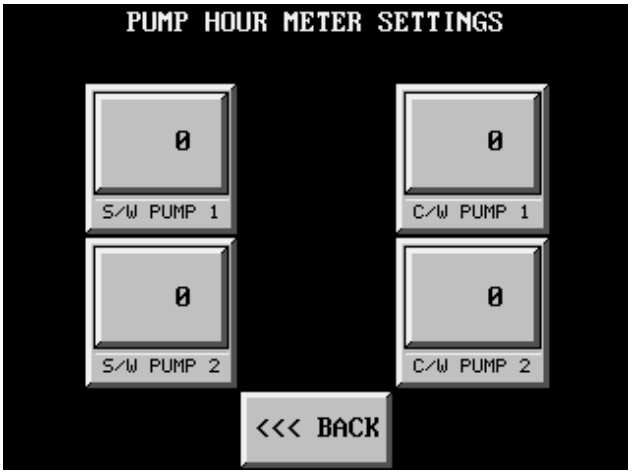
17. Version Information



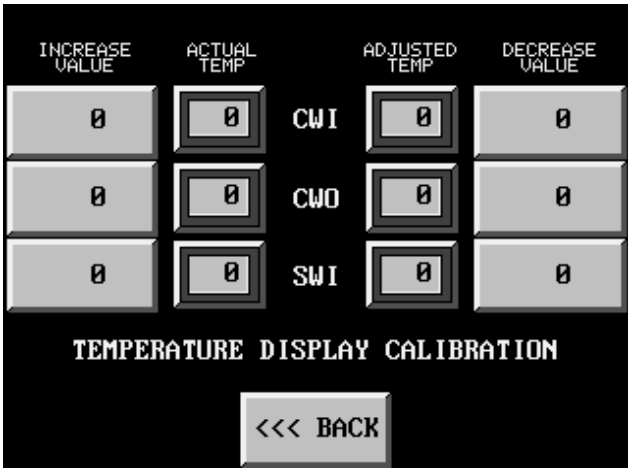
18. Compressor & Heater Hour Meter Adjustments



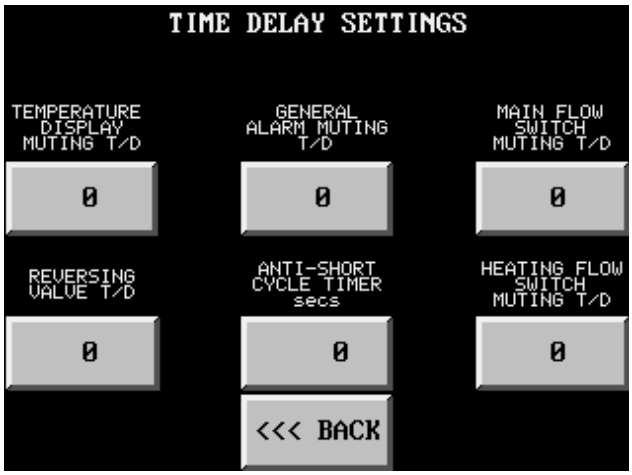
19. Factory Settings Menu



20. Pump Hour Meter Settings



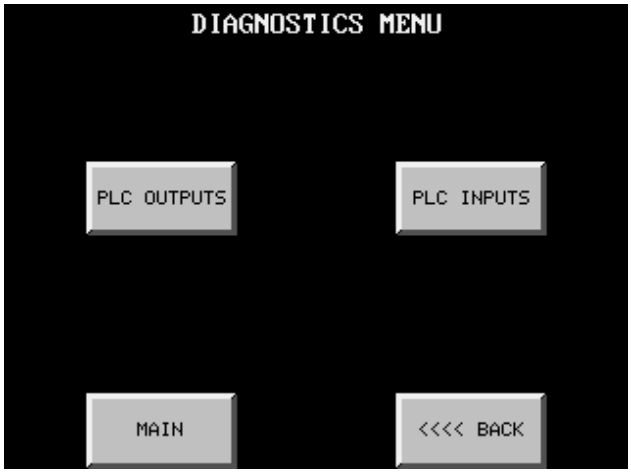
21. Temperature Display Calibration



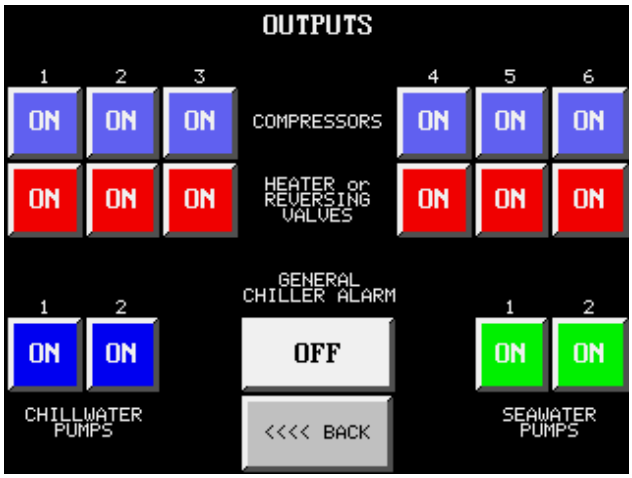
22. Time Delay Settings

23. Stored Alarms

24. PLC CPU Error Codes



25. Diagnostics Menu



26. PLC Outputs

27. PLC Inputs

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3

System Basics

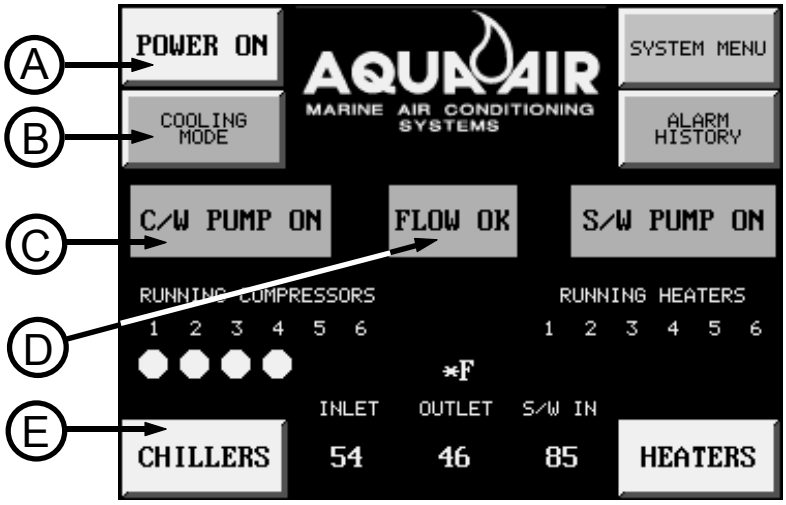
Starting the Chiller Unit in the Cooling Mode

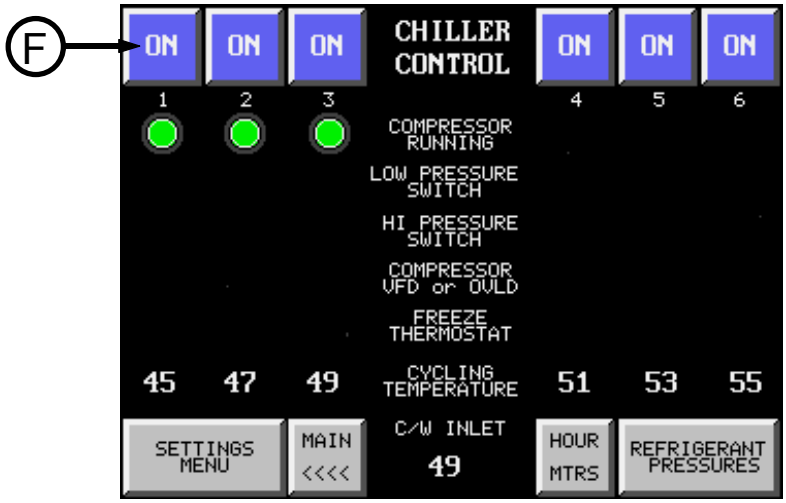
1. Verify that the seacock supplying water to the Seawater Pump(s) is on and that the sea strainer is clear of debris. If there are any isolation valves be sure that they are in the proper position for the Seawater Pump that will be run.

2. Turn on the Control Circuit circuit breaker (CCCB). The touchscreen will now display the Main screen.

3. Turn on the System Pump circuit breaker (SPCB)

4. Turn on the Seawater Pump circuit Breaker (SWPCB)





5. Turn on the Compressor circuit breakers (CCB#)

6. Press the POWER button (A) until it displays POWER ON.

7. Press the Mode Switch (B) until it displays COOLING MODE.

8. The Chillwater Pump light (C) should illuminate and then the Flow Switch light (D) should read FLOW OK.

9. Press the CHILLERS button (E) to go to the Chiller Unit Screen.

10. On the Chiller Unit Screen Press the Compressor Switches (F) until they read ON for the number of compressors that you want to run

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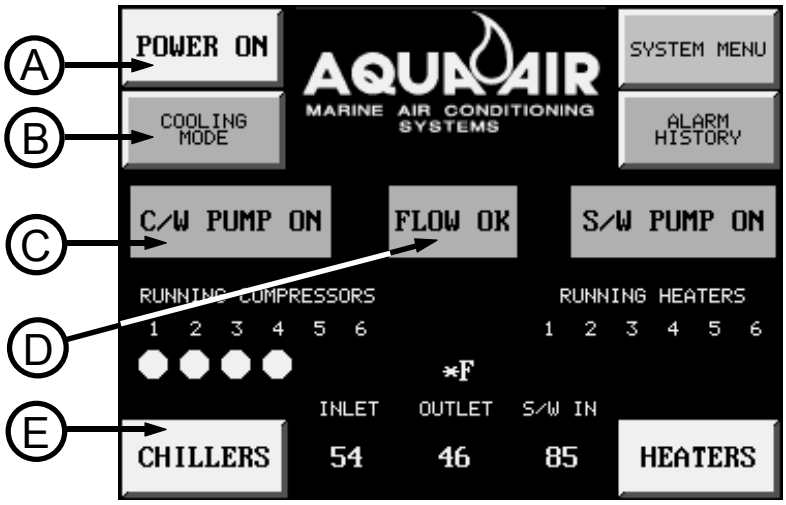
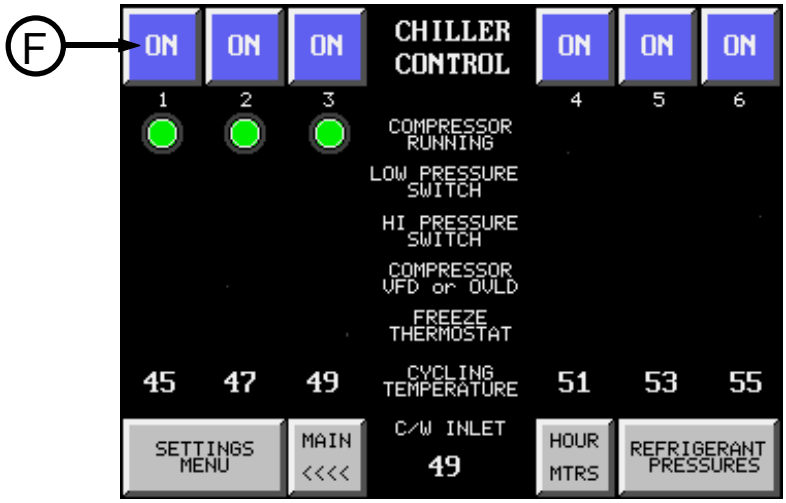
Starting the Chiller Unit in the Heating Mode
Reverse Cycle Units Only

1. Verify that the seacock supplying water to the Seawater Pump(s) is on and that the sea strainer is clear of debris. If there are any isolation valves be sure that they are in the proper position for the Seawater Pump that will be run.

2. Turn on the Control Circuit circuit breaker (CCCB). The touchscreen will now display the Main screen.

3. Turn on the System Pump circuit breaker (SPCB)





4. Turn on the Seawater Pump circuit Breaker (SWPCB)

5. Turn on the Compressor circuit breakers (CCB#)

6. Press the POWER button (A) until it displays POWER ON.

7. Press the Mode Switch (B) until it displays HEATING MODE.

8. The Chillwater Pump light (C) should illuminate and then the Flow Switch light (D) should read FLOW OK.

9. Press the CHILLERS button (E) to go to the Chiller Unit Screen.

10. On the Chiller Unit Screen Press the Compressor Switches (F) until they read ON for the number of compressors that you want to run

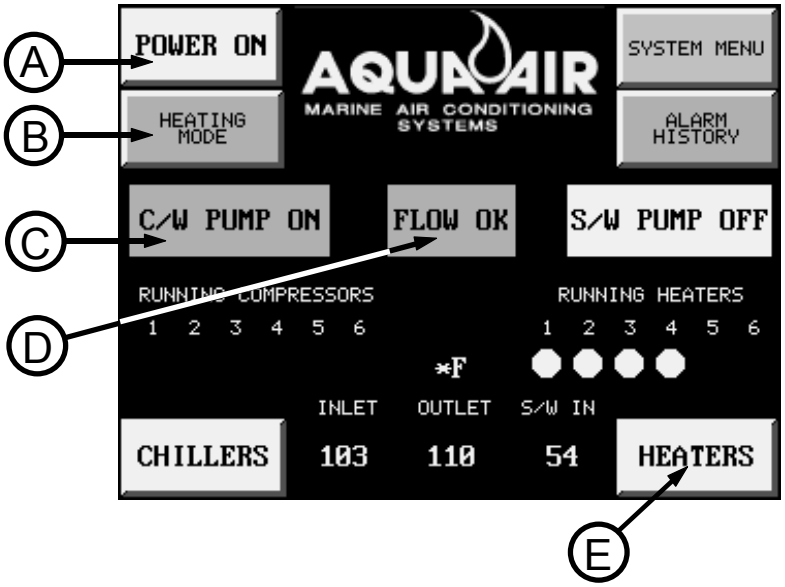
I:\wordpfct\chiller start rcheat mode.wpd

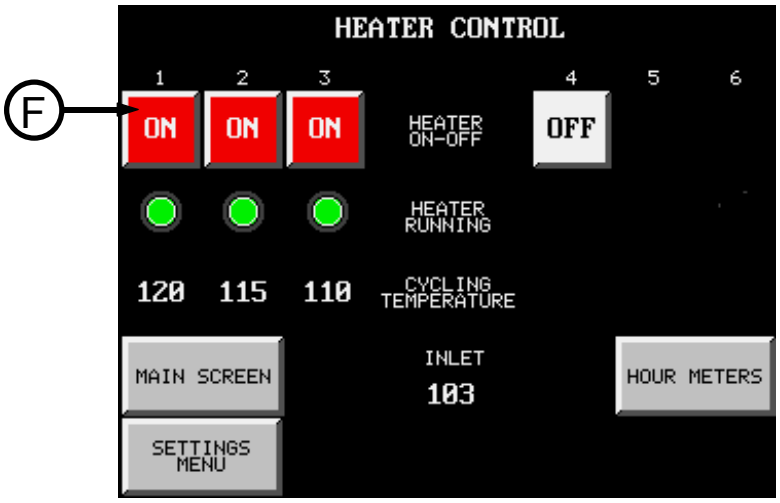
Starting the Chiller Unit in the Heating Mode
Immersion Heater Units Only

1. Turn on the Control Circuit circuit breaker (CCCB). The touchscreen will now display the Main screen.

2. Turn on the System Pump circuit breaker (SPCB)

3. Turn on the Immersion Heater circuit breakers (HECB#)





4. Press the POWER button (A) until it displays POWER ON.

5. Press the Mode Switch (B) until it displays HEATING MODE.

6. The Chillwater Pump light (C) should illuminate and then the Flow Switch light (D) should read FLOW OK.

7. Press the HEATERS button (E) to go to the Heater Control Screen.

8. On the Heater Control Screen Press the Heater Switches (F) until they read ON for the number of heater elements that you want to run

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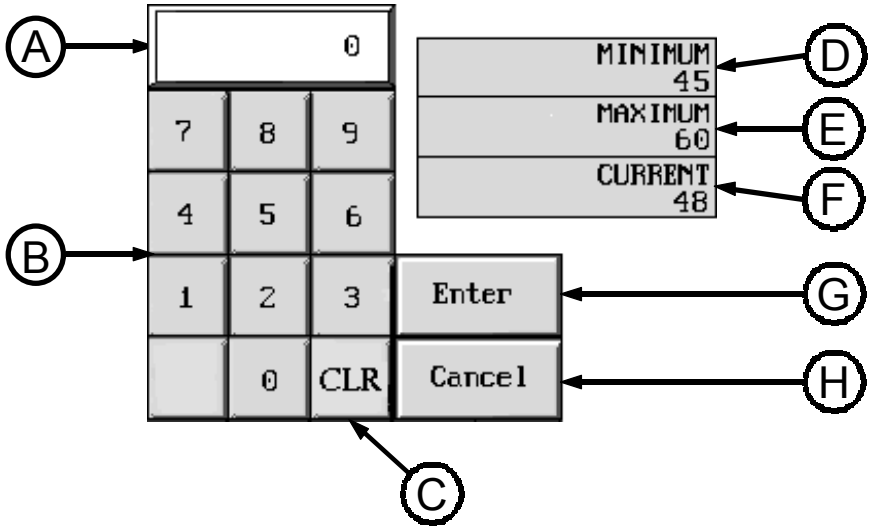
Numeric Data Entry Screen

On many of the screens there are Numeric Entry Keys used to enter a numeric variable. An example of this is entering a stage temperature or the number of compressors on a unit.

When you press the key to enter a numeric variable the keypad shown below appears:



On the right side of the screen the **MINIMUM** setting (D), **MAXIMUM** setting (E) and **CURRENT** setting (F) appear.

To change the current setting enter the new number directly from the keypad (B). The new number will appear in the window (A) at the top.

If you enter an incorrect number you can clear the entry by pressing the **CLR** key (C). You can then enter the correct number.

After entering the correct number press the **Enter** key (G).

If you do not want to make any changes to the current setting press the **Cancel** key (H)

I:\wordpfct\numeric data entry screen.wpd

Alarm History and Alarm Count

The first screen that appears (shown below) will show you the total alarms logged, the order in which they were logged, and the associated message. Press one of the buttons at the bottom of the screen to view more entries. Press **LINE UP** or **LINE DOWN** to select a particular alarm entry. Once an entry is highlighted, you may then press the **DTLS** button for more information about that entry (see below). Press the **ALARM COUNT** button to go to that screen (see below)
Press **CLEAR ALL** to clear the history. Press **EXIT** to quit.

ALARM HISTORY	TOTAL OF 04 ALARMS
ENTRY	**MESSAGE**
01	LOW REFRIGERANT PRESSURE CHILLER 1
02	FLOW SWITCH FAULT
03	INVERTER FAULT 5
04	FREEZE THERMOSTAT FAULT 4

ALARM COUNT	PAGE UP	PAGE DOWN	LINE UP	LINE DOWN	DTLS	CLEAR ALL	EXIT

The ALARM HISTORY DETAILS screen, shown below, provides information about the triggered alarm. Details include; when the alarm was triggered (ACTIVATED), the tag value that triggered the alarm (ACTUAL VALUE), and the set points (LOW LIMIT, HIGH LIMIT). The buttons allow you to **EXIT**, or switch to the previous (**PREV**) or **NEXT** entry.

ALARM HISTORY DETAILS

ENTRY NO. : 01

LOW REFRIGERANT PRESSURE CHILLER 1

ACTIVATED: 1:03:56 7-02-01

CLEARED:

ACTUAL VALUE: 40

HIGH/LOW/DIS LOW

LOW LIMIT: 40

HIGH LIMIT: 80

EXIT	PREV	NEXT

The Alarm Count screen, shown below, shows you the number of times a particular alarm has been triggered (activated). From this screen you can clear a particular alarm count or you can clear them all. Use the buttons at the bottom of the screen, to move through the list, exit, clear alarms, or return to alarm history.

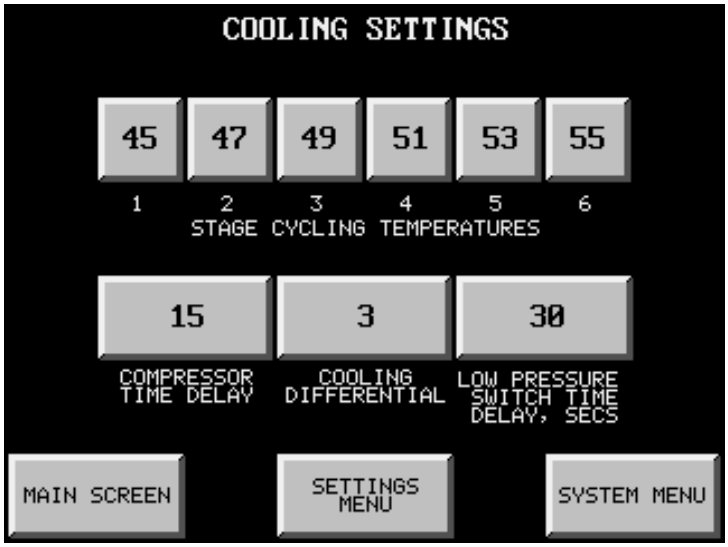
ALARM COUNT

ENTRY	COUNT	MESSAGE
01	00001	LOW REFRIGERANT PRESSURE CHILLER 1
02	00001	FLOW SWITCH FAULT
03	00001	INVERTER FAULT 5
04	00001	FREEZE THERMOSTAT FAULT 4

ALARM HISTORY	PAGE UP	PAGE DOWN	LINE UP	LINE DOWN	CLEAR	CLEAR ALL	EXIT

I:\wordpfct\alarm history and count.wpd

Cooling Settings



Setting the Stage Cycling Temperatures

The Stage Cycling Temperature is the temperature at which the compressor that is operating on that particular stage will cycle off. Press the STAGE CYCLING TEMPERATURES button. A numeric keypad will appear. Enter the stage temperature desired within the allowable range (see Programmable Parameters sheet) and press ENTER.

Setting the Cooling Differential

The Cooling Differential is the number of degrees that the chillwater must warm up, after cycling off on the stage cycling temperature, before the compressor will restart. Press the COOLING DIFFERENTIAL button. A numeric keypad will appear. Enter the cooling differential desired within the allowable range (see Programmable Parameters sheet) and press ENTER.

Setting the Compressor Time Delay

The Compressor Time Delay value is the delay, in seconds, between when a compressor is switched on (or after a power outage) and the compressor actually starts. The value entered is multiplied by the number of each stage to get the time delay for that stage. An example is if the time delay value is set for 15 seconds. Compressor 1 will start after 15 seconds, compressor 2 after 30, compressor 3 after 45 seconds, etc. Press the COMPRESSOR TIME DELAY button. A numeric keypad will appear. Enter the time delay value desired within the allowable range (see Programmable Parameters sheet) and press ENTER.

Setting the Low Pressure Switch Time Delay

The Low Pressure Switch Time Delay value is the delay, in seconds, between when the PLC detects a low refrigerant pressure condition and when the compressor is shut down because of the low refrigerant pressure condition. Press the LOW REFRIGERANT PRESSURE TIME DELAY button. A numeric keypad will appear. Enter the time delay value desired, within the allowable range (see Programmable Parameters sheet), and press ENTER.

Transfer to the Main Screen

Press the MAIN SCREEN button to go to the Main Screen.

Transfer to the Settings Menu

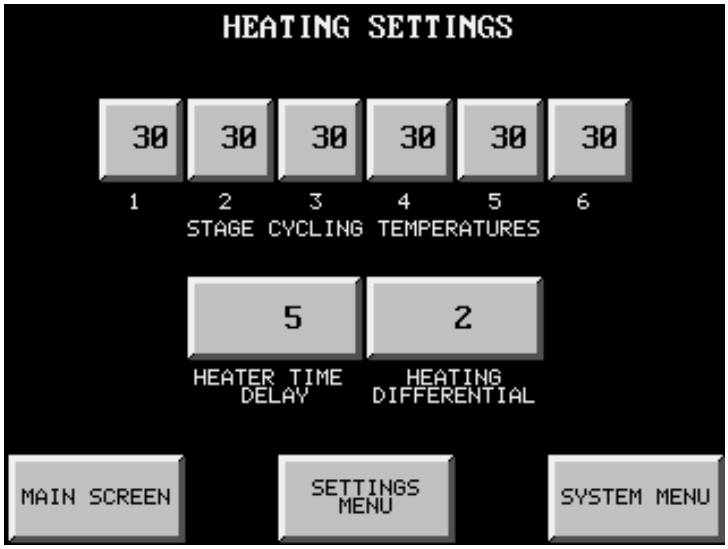
Press the SETTINGS MENU button to go to the Settings Menu.

Transfer to the System Menu

Press the SYSTEM MENU button to go to the System Menu.

I:\wordpfct\plc\coolingsettings7.wpd

Heating Settings



Setting the Stage Cycling Temperatures

The Stage Cycling Temperature is the temperature at which the compressor (for reverse cycle units or immersion heater) that is operating on that particular stage will cycle off. Press the STAGE CYCLING TEMPERATURES button. A numeric keypad will appear. Enter the stage temperature desired within the allowable range (see Programmable Parameters sheet) and press ENTER.

Setting the Heating Differential

The Heating Differential is the number of degrees that the chillwater must cool down, after cycling off on the stage cycling temperature, before the compressor (or immersion heater) will restart. Press the HEATING DIFFERENTIAL button. A numeric keypad will appear. Enter the heating differential desired within the allowable range (see Programmable Parameters sheet) and press ENTER.

Setting the Heater Time Delay

The Heater Time Delay value is the delay, in seconds, between when an immersion heater element is switched on (or after a power outage) and the immersion heater element is actually energized. The value entered is multiplied by the number of each stage to get the time delay for that stage. An example is if the time delay value is set for 15 seconds. Immersion heater 1 will start after 15 seconds, immersion heater element 2 after 30, immersion heater element 3 after 45 seconds, etc. Press the HEATER TIME DELAY button. A numeric keypad will appear. Enter the time delay value desired within the allowable range (see Programmable Parameters sheet) and press ENTER.

Transfer to the Main Screen

Press the MAIN SCREEN button to go to the Main Screen.

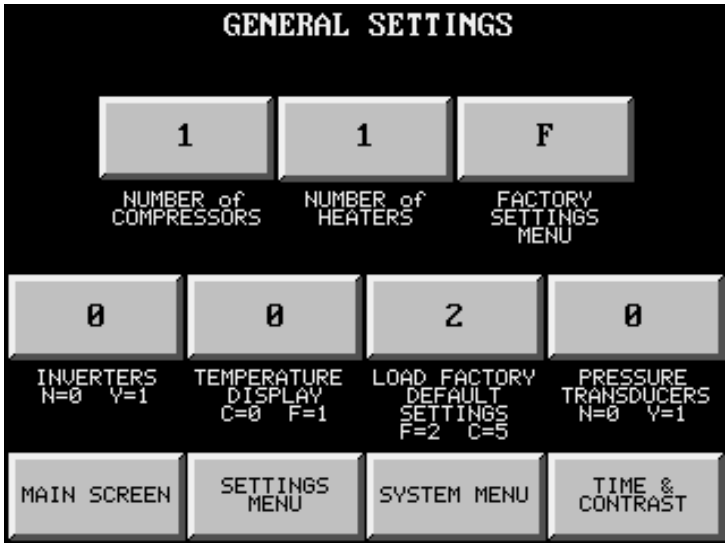
Transfer to the Settings Menu

Press the SETTINGS MENU button to go to the Settings Menu.

Transfer to the System Menu

Press the SYSTEM MENU button to go to the System Menu.

General Settings



Setting the Number of Compressors

Press the NUMBER OF COMPRESSORS button. A numeric keypad will appear. Enter a number 1-6 (equal to the number of compressors on the unit) and press ENTER.

Setting the Number of Heaters

Press the NUMBER OF HEATERS button. A numeric keypad will appear. Enter a number 1-6 (equal to the number of heaters on the unit) and press ENTER. The number of heaters refers to the number of heating stages that are located in the heater.

Transfer to the Factory Settings Menu

Press the F button to go to the Factory Settings menu. A numeric keypad will appear. Enter the pass code number and you will be transferred to the Factory Settings Menu.

Enabling the Inverter Option

Setting this option equal to 1 tells the PLC that the system is equipped with inverters on the compressors. Press the INVERTERS button. A numeric keypad will appear. Enter a 1 to enable the option, 0 for standard across-the-line starters and then press ENTER.

Setting the Temperature Display Type

All of the temperature display inputs and outputs can be set to display in either Fahrenheit or Centigrade. Press the TEMPERATURE DISPLAY button. A numeric keypad will appear. Enter a 1 for Fahrenheit, 0 for Centigrade and press ENTER. If you are changing the system after it has been commissioned by the factory, you will need to go back and change all of the temperature input values to the new unit of measure. For example, if the system was originally set for Fahrenheit, you will have to change temperature inputs, such as the cycling temperatures, to the new Centigrade values. It is recommended, in this situation, that you use the Load Factory Default Settings to input the new values.

Loading Factory Default Settings

At any time during the life of the system you can reload the factory default settings in either Fahrenheit or Centigrade format. Values will be loaded in according to the Programmable Parameter factory default setting listing. Press the Load Factory Default Settings button. A numeric keypad will appear. Enter a 2 for a Fahrenheit system, 5 for a Centigrade system. Press ENTER to save the settings. All of the programmable parameters will now be updated. Cycle the Control Circuit circuit breaker once to save all of the settings.

Enabling the Pressure Transducer Option

Setting this option equal to 1 tells the PLC that the system is equipped with refrigerant pressure transducers on the compressors. Press the PRESSURE TRANSDUCERS button. A numeric keypad will appear. Enter a 1 to enable the option, 0 for none and then press ENTER. With this option enabled the refrigerant suction and discharge pressures will be displayed on the Refrigerant pressures screen (14).

Transfer to the Main Screen

Press the MAIN SCREEN button to go to the Main Screen.

Transfer to the Settings Menu

Press the SETTINGS MENU button to go to the Settings Menu.

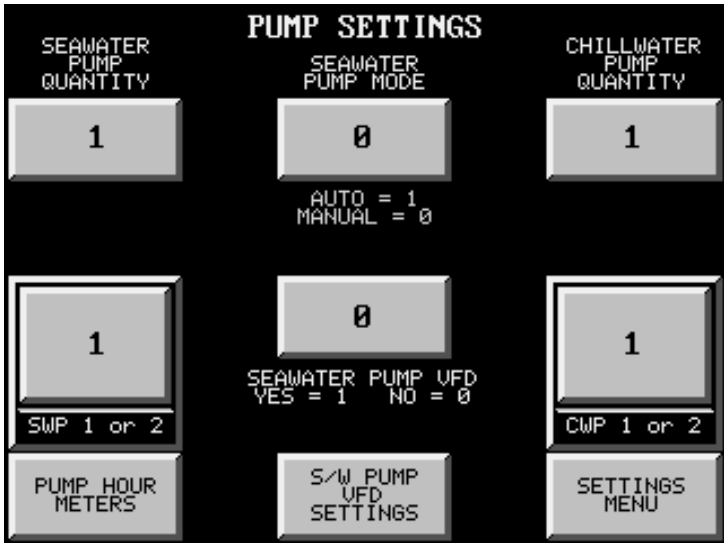
Transfer to the System Menu

Press the SYSTEM MENU button to go to the System Menu.

Transfer to the Time and Contrast Menu

Press the TIME & CONTRAST button to go to the Time & Contrast Menu.

Pump Settings



Setting the Number of Seawater Pumps

Press the SEAWATER PUMP QUANTITY button. A numeric keypad will appear. Enter 1 or 2 and press ENTER.

Selecting Seawater Pump 1 or 2

The SWP 1 or 2 button, used to select either Seawater Pump 1 or 2, will only appear if the Seawater Pump quantity is set for 2. Press the SWP 1 or 2 button. A numeric keypad will appear. Enter a 1 or 2 and press ENTER.

Setting the Number of Chillwater Pumps

Press the CHILLWATER PUMP QUANTITY button. A numeric keypad will appear. Enter 1 or 2 and press ENTER.

Selecting Chillwater Pump 1 or 2

The CWP 1 or 2 button, used to select either Chillwater Pump 1 or 2, will only appear if the Chillwater Pump quantity is set for 2. Press the CWP 1 or 2 button. A numeric keypad will appear. Enter a 1 or 2 and press ENTER.

Setting the Seawater Pump Mode

The seawater pump can be set to run constantly (MANUAL = 0) or to cycle with the compressors (AUTO = 1). Press the SEAWATER PUMP MODE button. A numeric keypad will appear. Enter a 1 for AUTO or 0 for MANUAL and press ENTER.

Enable Seawater Pump VFD (Variable Frequency Drive) option

If the system is equipped with a seawater pump VFD this option must be set. Press the SEAWATER PUMP VFD button. A numeric keypad will appear. Select 1 to enable this feature, 0 to disable this feature.

Transfer to the Seawater Pump VFD Settings Screen

Press the S/W PUMP VFD SETTINGS button

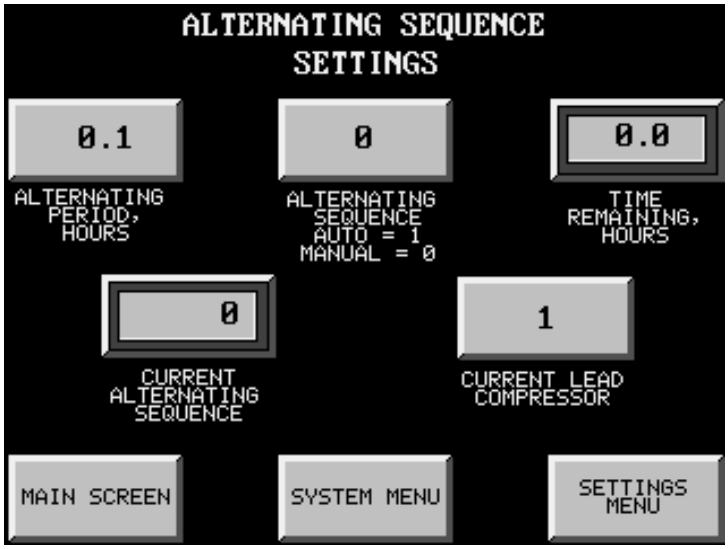
Transfer to the Pump Hour Meter Screen

Press the PUMP HOUR METER button

Transfer to the Settings Menu Screen

Press the SETTINGS MENU button

Alternating Sequence Settings



The purpose of the Alternating Sequence Setting Screen is to display current settings and to allow you to modify certain sequence parameters. The alternating sequences are all based upon the running time of the system. The system will rotate the sequence one position after the alternating period has elapsed. The amount of time remaining is always displayed in the TIME REMAINING, HOURS display. When the sequence changes it always moves ahead by one position. An example of this is a four compressor unit:

Lead Compressor	Running Order
1	1 - 2 - 3 - 4
2	2 - 3 - 4 - 1
3	3 - 4 - 1 - 2
4	4 - 1 - 2 - 3

The current alternating sequence is displayed in the CURRENT ALTERNATING SEQUENCE window.

Changing the Alternating Sequence Mode

The system can be set to automatically rotate the cycling sequence of the compressors according to the time period set in the Alternating Period (Auto) or it can be held in one sequence (Manual). Press the ALTERNATING SEQUENCE button. A numeric keypad will appear. Enter a 1 for Auto rotation or a 0 for manual rotation. Press ENTER to save.

Changing the Alternating Period, Hours

This setting determines how often the system rotates the compressor sequence. Press the ALTERNATING PERIOD, HOURS button. A numeric keypad will appear. Enter the time, in hours and tenth's of an hour, that you want the system to change. If you wanted it to rotate every 24 hours enter 24.0 using the numeric keypad. Press ENTER to save.

Changing the Current Lead Compressor

You can, at any time, change the lead compressor. Press the CURRENT LEAD COMPRESSOR button. A numerical keypad will appear. Enter the number of the compressor you want to be on stage one and press ENTER to save.

Transfer to the Main Screen

Press the MAIN SCREEN button to go to the Main Screen.

Transfer to the System Menu

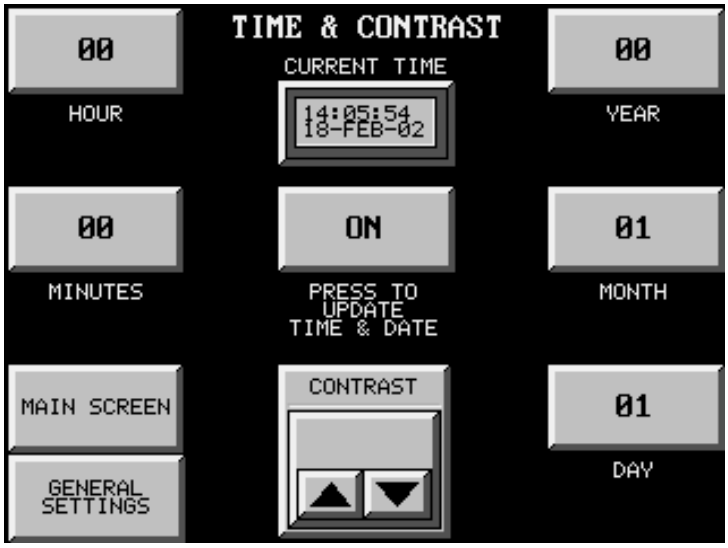
Press the SYSTEM MENU button to go to the System Menu.

Transfer to the Settings Menu

Press the SETTINGS MENU button to go to the Settings Menu.

I:\wordpfct\plc\altsequencescreen15.wpd

System Time, Date and Screen Contrast Settings



The purpose of this screen is to allow you to change the system time and date as necessary. Correct time and date settings are necessary as they are used to log faults in the alarm window. The time is stored in military format (2:30 in the afternoon is displayed as 14:30 hours). All settings for the time (hours and minutes) and date (day, month and year) must be updated **all at once**. Therefore, correct entries must be made in all five windows before the PRESS TO UPDATE TIME & DATE button is pushed. Once this button is pushed the current time and date will appear in the CURRENT TIME window.

The contrast setting changes the appearance of the LCD screen in different light conditions.

Changing the Hour Setting

Press the HOUR button. A numeric keypad appears. Enter the correct hour(0-23) and press ENTER to save.

Changing the Minutes Setting

Press the MINUTES button. A numeric keypad appears. Enter the correct minutes (0-59) and press ENTER to save.

Changing the Day Setting

Press the DAY button. A numeric keypad appears. Enter the correct day (0-31) and press ENTER to save.

Changing the Month Setting

Press the MONTH button. A numeric keypad appears. Enter the correct month (1-12) and press ENTER to save.

Changing the Year Setting

Press the YEAR button. A numeric keypad appears. Enter the correct year (last two digits only-for example 2002 would be entered as 02) and press ENTER to save.

Changing the Contrast

Press the CONTRAST up arrow to increase the contrast or the down arrow to decrease the contrast

Transfer to the Main Screen

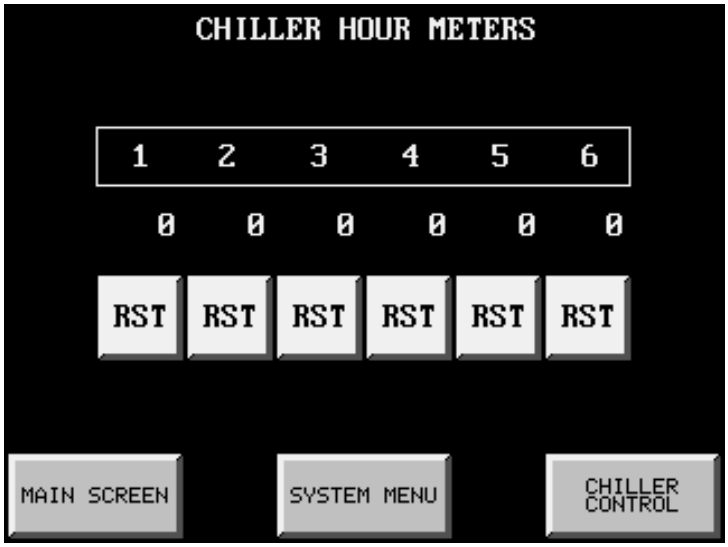
Press the MAIN SCREEN button to go to the Main Screen.

Transfer to the General Settings Menu

Press the GENERAL SETTINGS button to go to the General Settings Menu.

I:\wordpfct\plc\timedatecontrastscreen16.wpd

Chiller, Heater and Pump Hour Meter Display & Reset

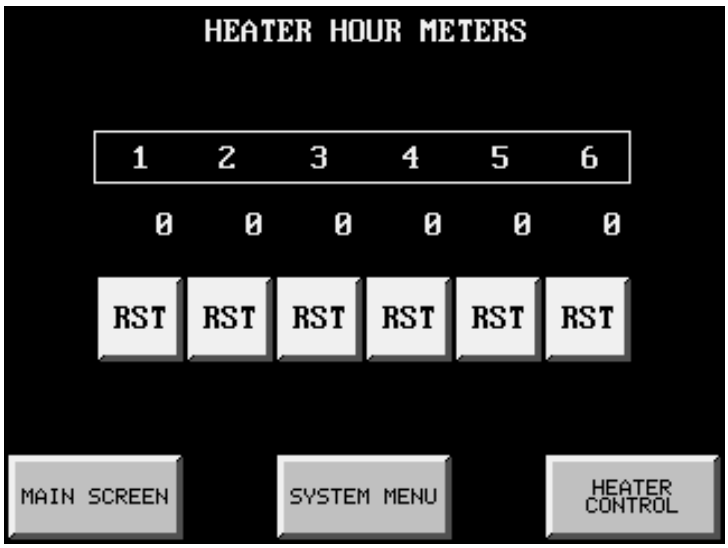


Resetting the Hour Meters

To zero out the hour meter indicator, press the RST button below the indicator. The value will now go to zero.

Transfer to the Main Screen

Press the MAIN SCREEN button to go to the Main Screen.



Transfer to the System Menu

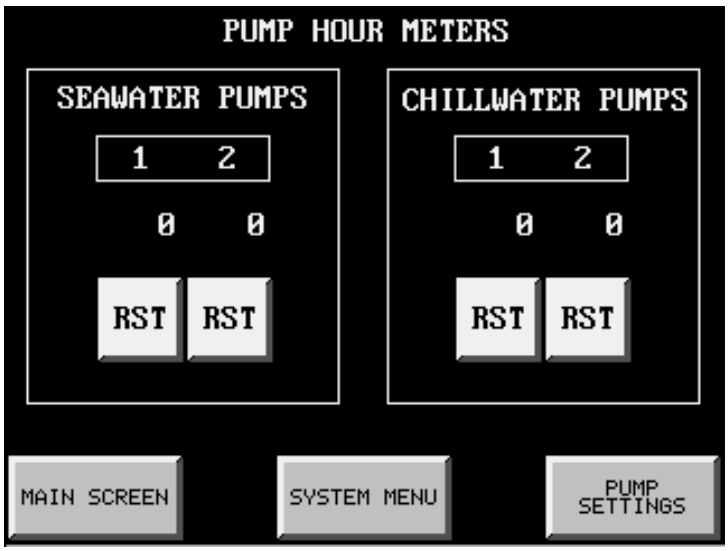
Press the SYSTEM MENU button to go to the System Menu.

Transfer to the Chiller Control Screen

Press the “CHILLER CONTROL” button

Transfer to the Heater Control Screen

Press the “HEATER CONTROL” button

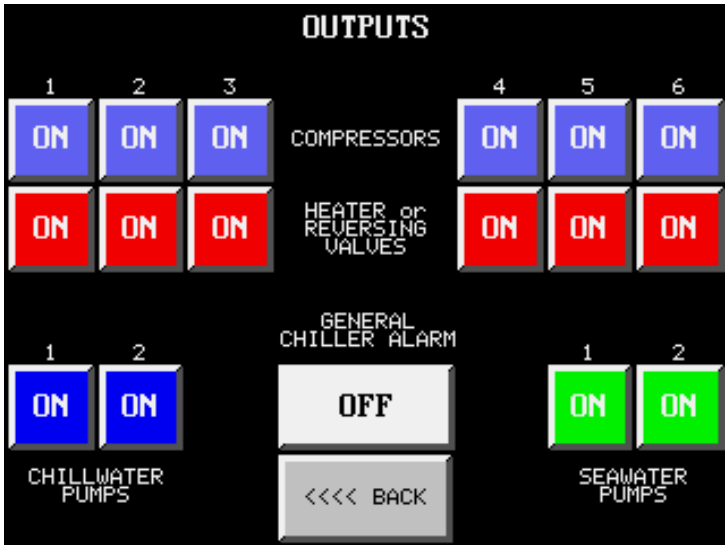


Transfer to the Pump Settings Screen

Press the “PUMP SETTINGS” button

I:\wordpfct\plc\hourmeterreset10-12-13.wpd

PLC Outputs Screen

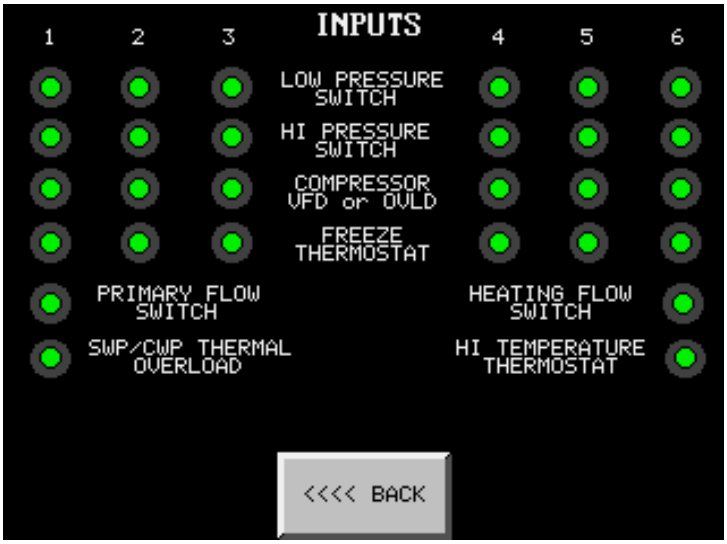


The purpose of this screen is to allow you to manually energize any of the PLC outputs. These can be used at any time during the operation of the unit. The switch is a momentary contact. This means that the output will only stay energized as long as you are pressing the button.

Returning to the Factory Settings Menu

Press the <<<<BACK button.

PLC Inputs Screen



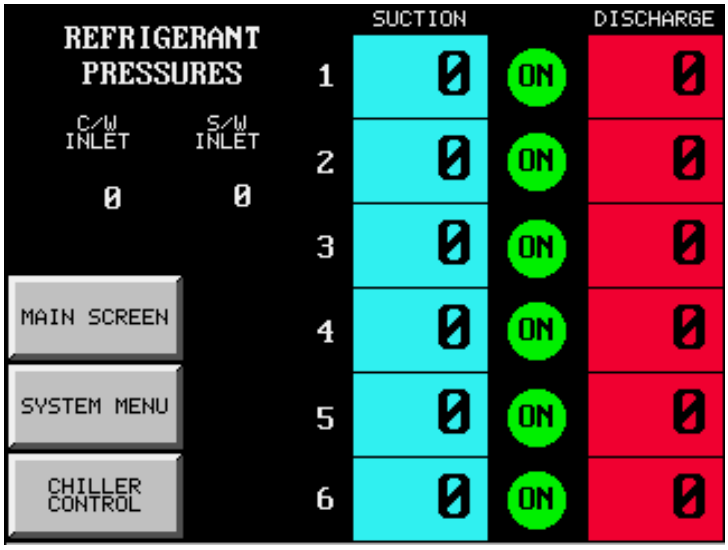
The purpose of this screen is to display the status of all of the PLC inputs. If the indicator is green the input is receiving a signal.

Returning to the Factory Settings Menu

Press the <<<<BACK button.

I:\wordpfct\plc\plcoutputsinputs26-27.wpd

Refrigerant Pressures Screen



The purpose of the Refrigerant Display screen is to display the refrigerant suction and discharge pressures for each compressor. This display is an option and will only be visible if the Refrigerant Pressure Transducer option has been selected.

Suction pressures are displayed on the left, discharge pressures are on the right. The light in the center indicates whether or not the pressures are being actively read by the PLC.

Incoming Seawater and Chillwater temperatures are displayed for troubleshooting purposes.

Transfer to the Main Screen

Press the MAIN SCREEN button to go to the Main Screen.

Transfer to the System Menu

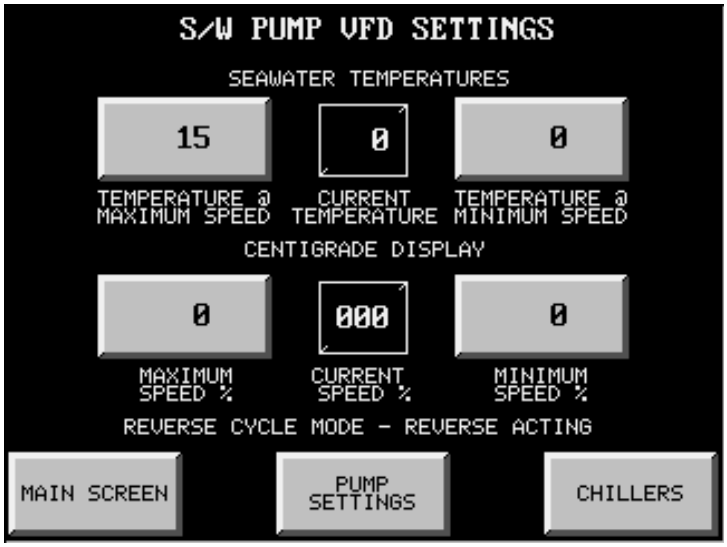
Press the SYSTEM MENU button to go to the System Menu.

Transfer to the Chiller Control Screen

Press the CHILLER CONTROL button to go to the Chiller Control Screen.

I:\wordpfct\plc\refrigerant pressures screen14.wpd

Seawater Pump VFD Settings



This screen controls the voltage/frequency output of the seawater pump VFD. This screen is only visible if the unit is equipped with the optional seawater pump VFD.

Setting the Maximum Speed Temperature

This is the temperature that the seawater pump will begin to run at maximum speed in the cooling mode (the opposite will occur in the reverse cycle mode). To set the temperature press the TEMPERATURE @ MAXIMUM SPEED button. A numeric keypad will appear. Enter the temperature and press ENTER.

Setting the Maximum Speed %

This is maximum speed (as a percentage of total overall speed) that the pump will be running at when the water temperature reaches the Maximum Speed Temperature. Press the MAXIMUM SPEED % button. A numeric keypad will appear. Enter the speed percentage and press ENTER.

Setting the Minimum Speed Temperature

This is the temperature that the seawater pump will begin to run at minimum speed in the cooling mode (the opposite will occur in the reverse cycle mode). To set the temperature press the TEMPERATURE @ MINIMUM SPEED button. A numeric keypad will appear. Enter the temperature and press ENTER.

Setting the Minimum Speed %

This is minimum speed (as a percentage of total overall speed) that the pump will be running at when the water temperature reaches the Minimum Speed Temperature. Press the MINIMUM SPEED % button. A numeric keypad will appear. Enter the speed percentage and press ENTER.

Transfer to the Main Screen

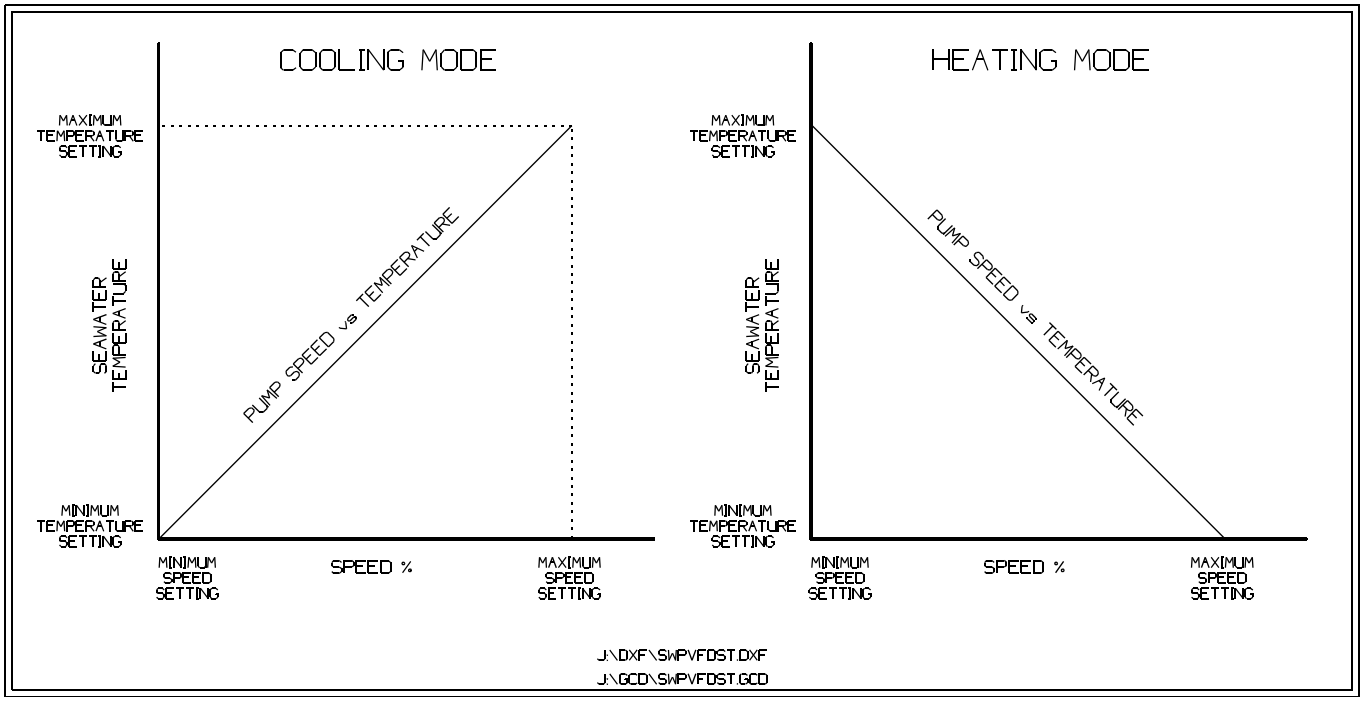
Press the MAIN SCREEN button to go to the Main Screen.

Transfer to the Pump Settings Screen

Press the PUMP SETTINGS button.

Transfer to the Chiller Control Screen

Press the CHILLERS button.



Operation of Seawater Pump VFD in Cooling and Heating (Reverse Cycle) Mode

4

Programmable Parameters

Programmable Parameters
Fahrenheit & Centigrade Systems

No.	PARAMETER DESCRIPTION	RANGE	FACTORY SETTING	SCREEN NUMBER	MEMORY LOCATION
1	Number of compressors	2-6	PLC-3 = 3 PLC-6 = 6	6	V2104
2	Number of Immersion Heater stages	2-6	0	6	V2105
3	Compressor time delay staging	5-120	15s	7	V2230
4	Heater time delay staging	5-120	15s	8	V3230
5	Alternating Sequence Mode	0 = manual 1 = auto	1	15	V4103
6	Lead compressor in alternating sequence	1-6	1	15	V4106
7	Compressor alternating sequence	1-6	1	15	CTA4
8	Alternating period, hours	1-999	24	15	V4100
9	Seawater Pump running mode	0 = manual 1 = auto	1	5	V4105
10	Chillwater Pump quantity	1-2	1	5	V2150
11	Chillwater Pump Selected	1-2	1	5	V2151
12	Seawater Pump quantity	1-2	1	5	V2152
13	Seawater Pump Selected	1-2	1	5	V2153
14	Compressors are Variable Frequency Drive (VFD) controlled	0 = No 1 = Yes	1	6	V2110
15	Seawater pump is Variable Frequency Drive (VFD) controlled	0 = No 1 = Yes	0	5	V2164
16	Maximum Seawater Pump VFD speed	0-100%	100	11	V2162
17	Minimum Seawater Pump VFD speed	0-100%	50	11	V2163
18	Low Refrigerant Pressure switch time delay	0-300s	30s	7	V2127
19	Refrigerant pressure transducers on unit	0 = No 1 = Yes	0	6	V2107

I:\wordpfct\programmable parameters 1-1.wpd

Programmable Parameters
Fahrenheit or Centigrade Systems

No.	PARAMETER DESCRIPTION	RANGE	FACTORY SETTING		SCREEN NUMBER	MEMORY LOCATION
			F = 2	C = 5		
50	Load Factory Defaults	2 = F/ 5 = C/	2	5	6	V2114
51	Temperature display	1 = F/ 0 = C/	1	0	6	V4104
52	Cooling Stage 1 set point	7-60	45	7	7	V2201
53	Cooling Stage 2 set point	7-60	47	8	7	V2202
54	Cooling Stage 3 set point	7-60	49	9	7	V2203
55	Cooling Stage 4 set point	7-60	51	10	7	V2204
56	Cooling Stage 5 set point	7-60	53	11	7	V2205
57	Cooling Stage 6 set point	7-60	55	12	7	V2206
58	Cooling differential	2-5	3	2	7	V2200
59	Heating Stage 1 set point	30-140	120	50	8	V3201
60	Heating Stage 2 set point	30-140	115	48	8	V3202
61	Heating Stage 3 set point	30-140	110	46	8	V3203
62	Heating Stage 4 set point	30-140	105	44	8	V3204
63	Heating Stage 5 set point	30-140	100	42	8	V3205
64	Heating Stage 6 set point	30-140	95	40	8	V3206
65	Heating differential	2-10	5	3	8	V3200
66	Temperature at which the seawater pump VFD will be operating at maximum speed	15-100	75	24	11	V2160
67	Temperature at which the seawater pump VFD will be operating at minimum speed	0-100	50	10	11	V2161

I:\wordpfct\programmable parameters 1-1.wpd

Factory Programmable Parameters

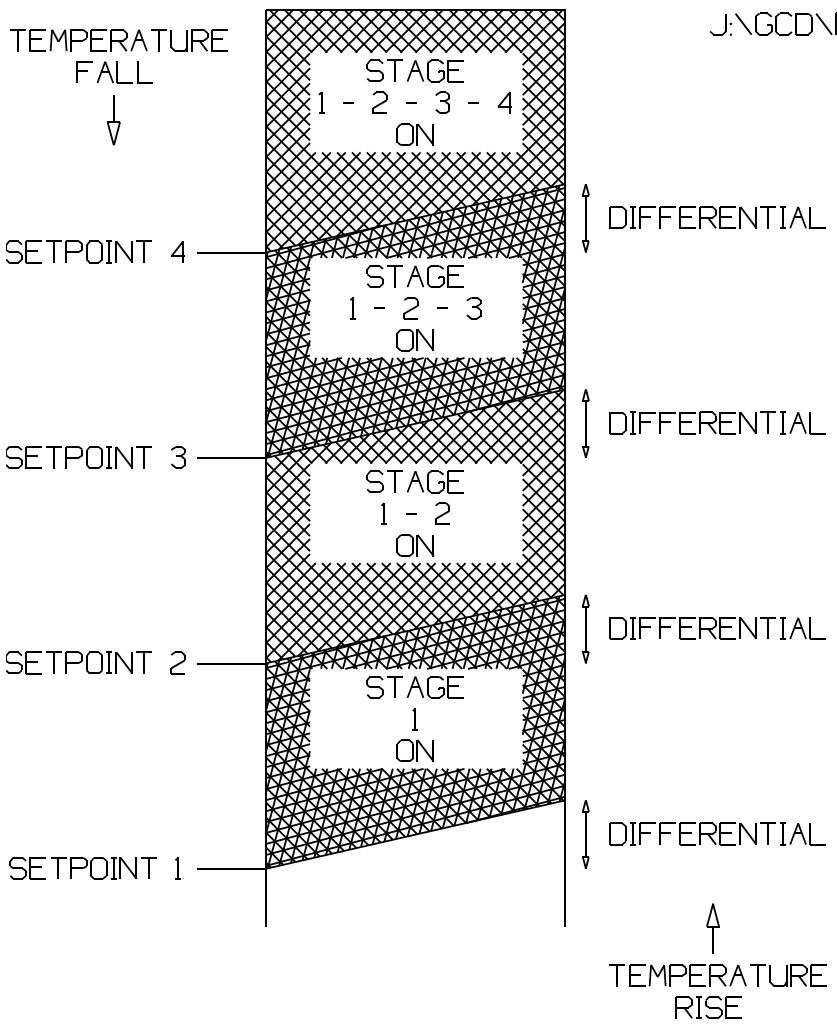
These parameters are only adjustable by Factory authorized personnel

No.	PARAMETER DESCRIPTION	RANGE	FACTORY SETTING	SCREEN NUMBER	MEMORY LOCATION
100	PLC Type	PLC-3 = 3 PLC-6 = 6	N/A	19	V2106
101	Heating Method	0 = None 1 = Reverse Cycle 2 = Immersion Heat	N/A	19	V4102
102	Main flow switch time delay	0-30	5s	22	V1750
103	Heating flow switch time delay	0-30	5s	22	V1751
104	General alarm muting time delay	0-100	5s	22	V1753
105	Temperature display muting time delay	0-30	5s	22	V1754
106	Reversing valve time delay at startup	0-10	5s	22	V1761
107	Anti-short cycle timer for compressors	0-300s	120s	22	V2240
108	Compressor Hour Meter 1	0-9999	N/A	18	V1711
109	Compressor Hour Meter 2	0-9999	N/A	18	V1712
110	Compressor Hour Meter 3	0-9999	N/A	18	V1713
111	Compressor Hour Meter 4	0-9999	N/A	18	V1714
112	Compressor Hour Meter 5	0-9999	N/A	18	V1715
113	Compressor Hour Meter 6	0-9999	N/A	18	V1716
114	Heater Hour Meter 1	0-9999	N/A	18	V1721
115	Heater Hour Meter 2	0-9999	N/A	18	V1722
116	Heater Hour Meter 3	0-9999	N/A	18	V1723
117	Heater Hour Meter 4	0-9999	N/A	18	V1724
118	Heater Hour Meter 5	0-9999	N/A	18	V1725
119	Heater Hour Meter 6	0-9999	N/A	18	V1726
120	Seawater Pump Hour Meter 1	0-9999	N/A	20	V1701
121	Seawater Pump Hour Meter 2	0-9999	N/A	20	V1702
122	Chillwater Pump Hour Meter 1	0-9999	N/A	20	V1671
123	Chillwater Pump Hour Meter 2	0-9999	N/A	20	V1672

I:\wordpfct\programmable parameters 1-1.wpd

5

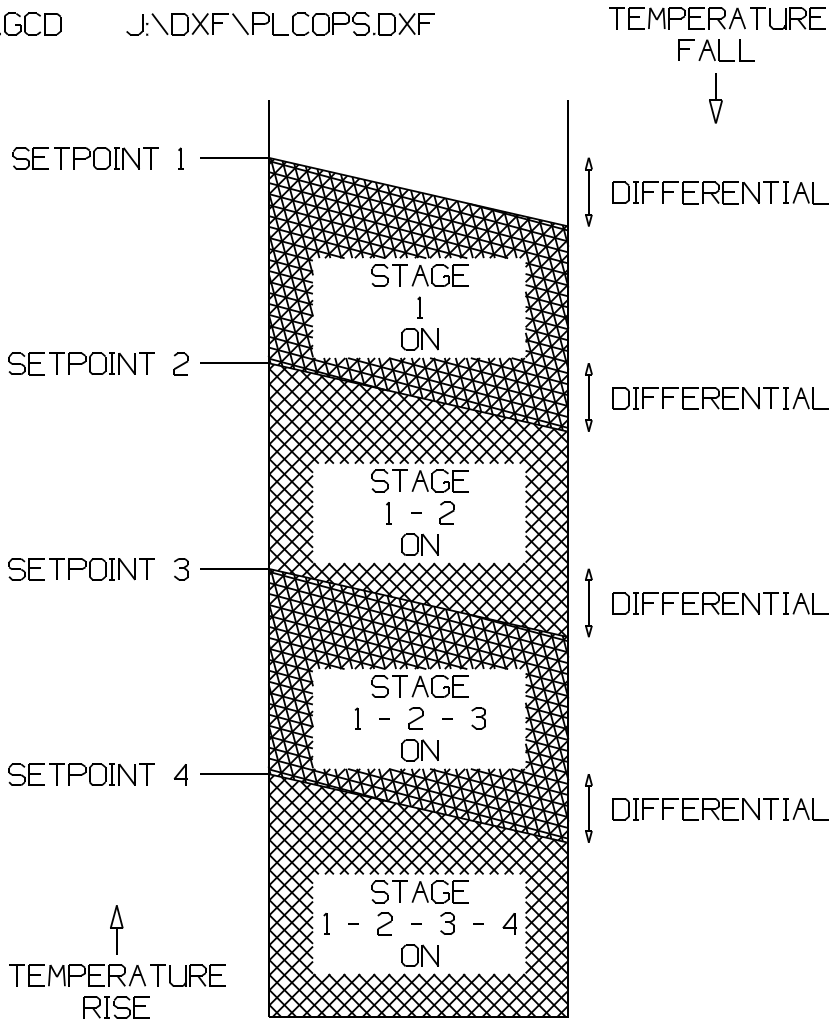
System Operation Diagrams



J:\GCD\PLCOPS.GCD

COOLING MODE

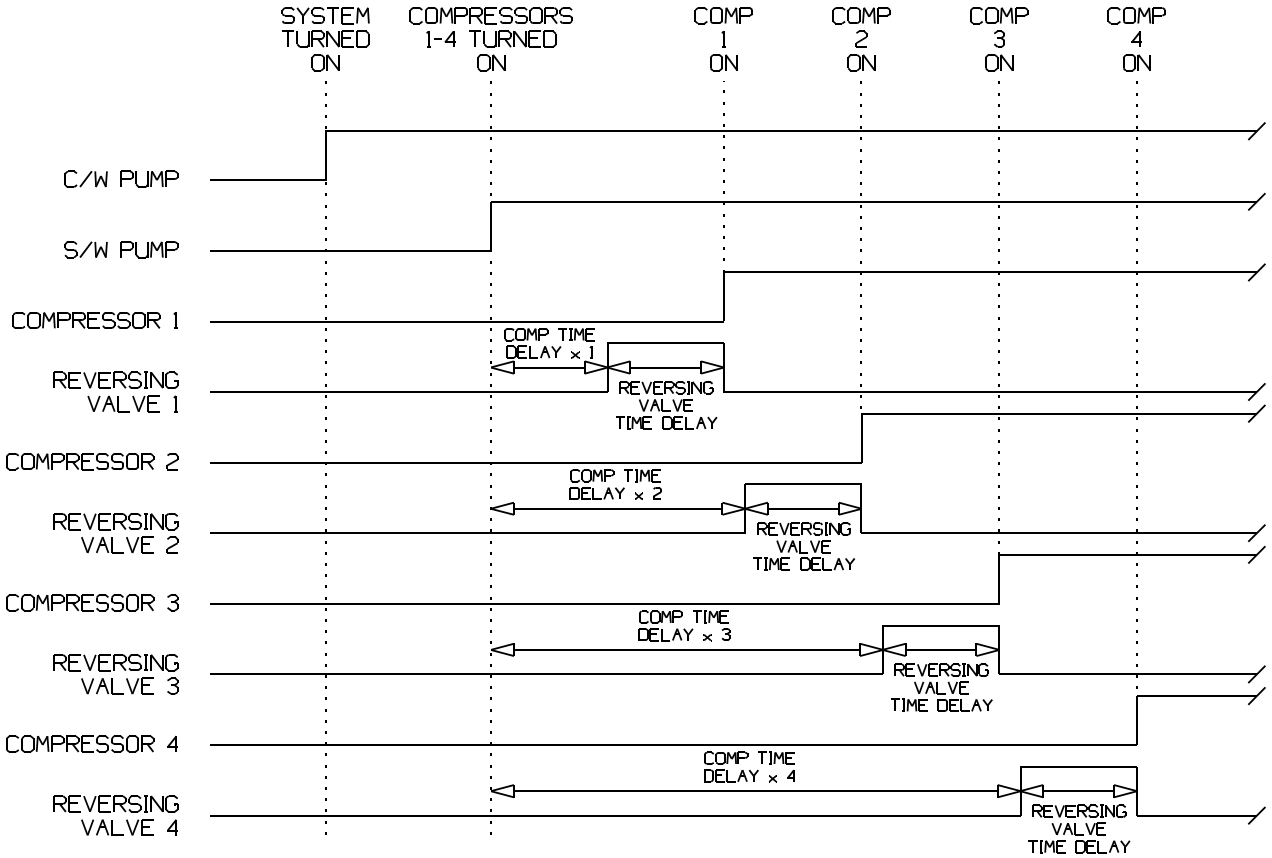
J:\DXF\PLCOPS.DXF



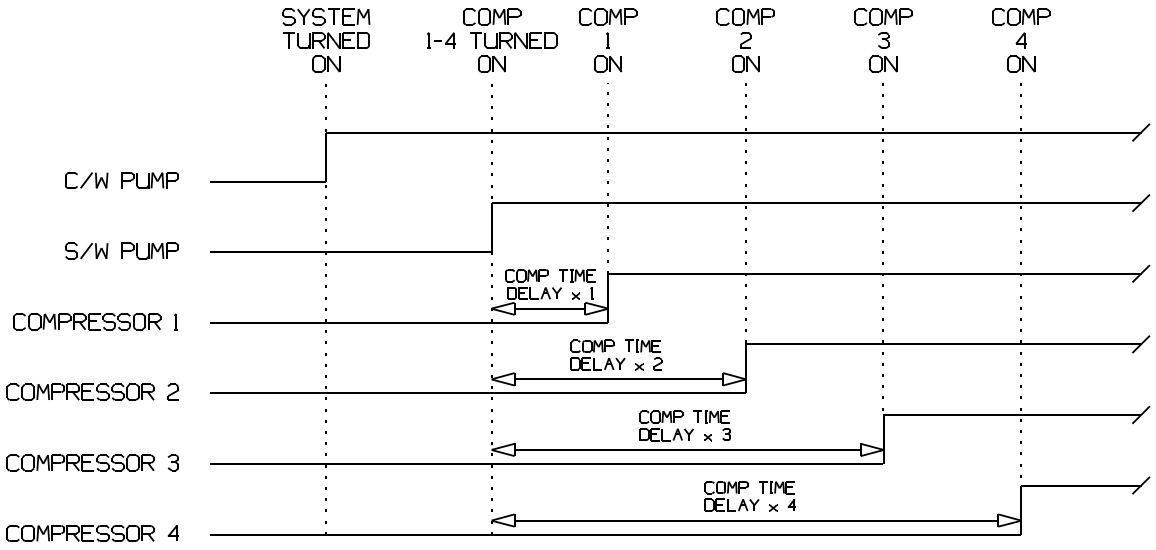
HEATING MODE

SYSTEM STAGE OPERATION

I:\wordpfct\plc\plcops.wpd

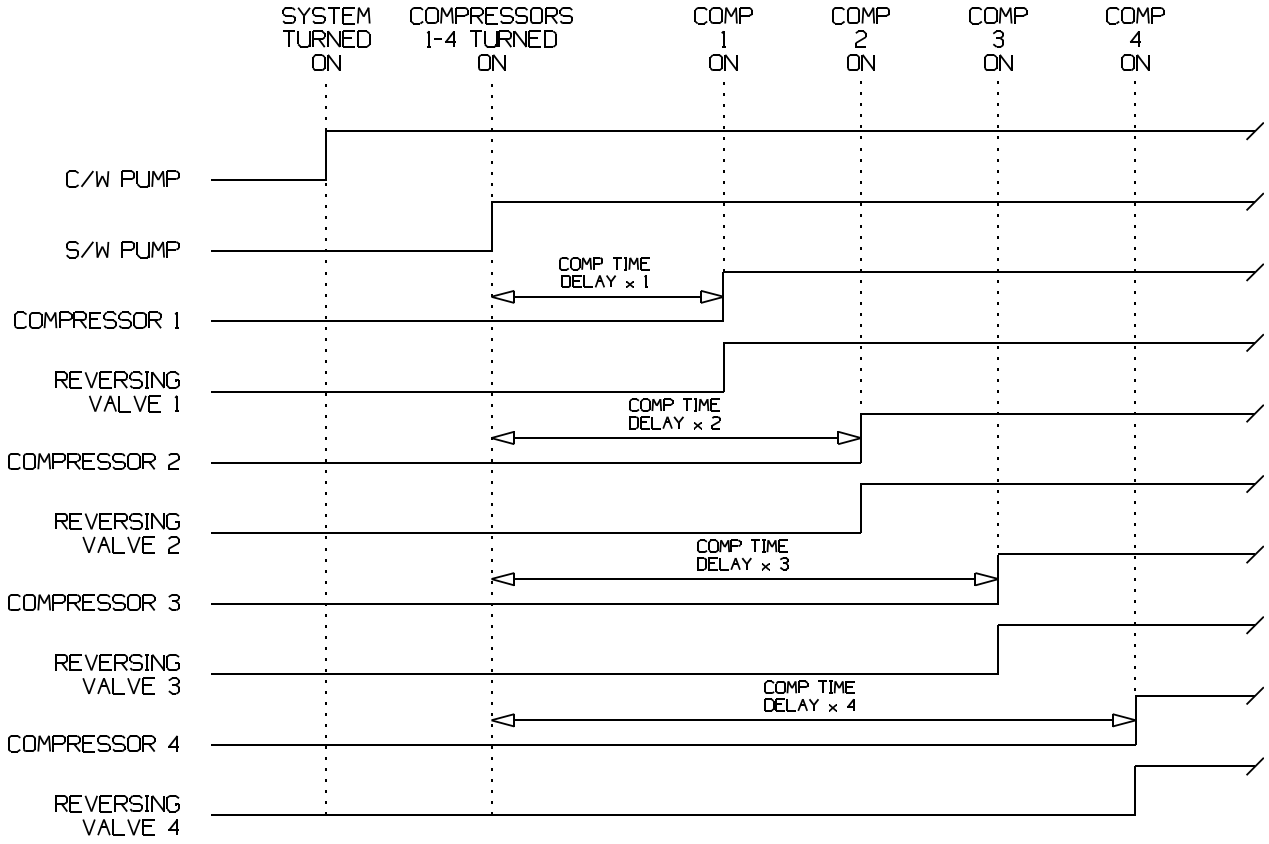


COOLING MODE, REVERSE CYCLE SYSTEM
INITIAL SYSTEM STARTUP

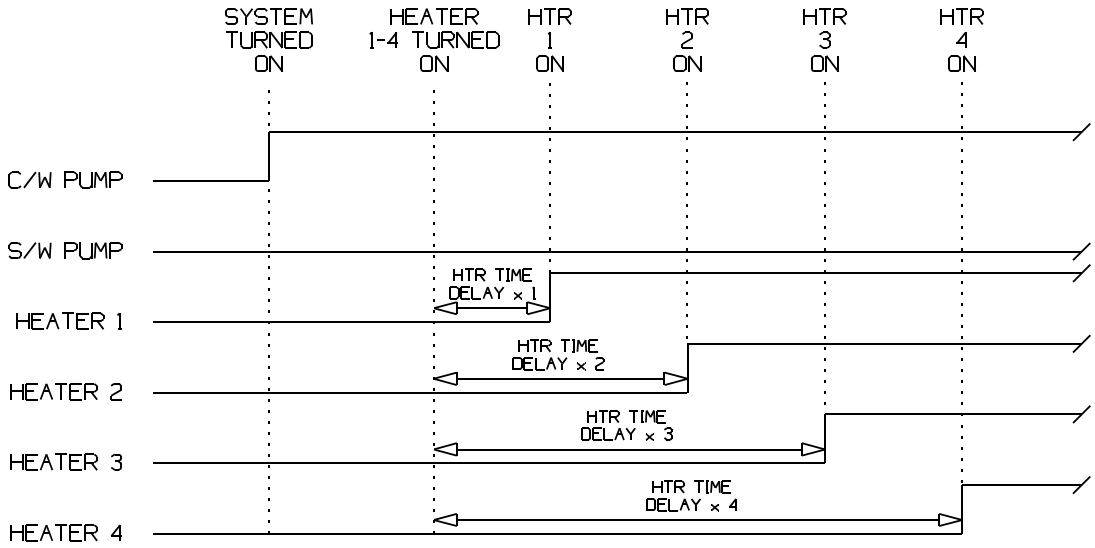


COOLING MODE, NON-REVERSE CYCLE SYSTEM
INITIAL SYSTEM STARTUP

J:\DXF\PLCOPS-1.DXF

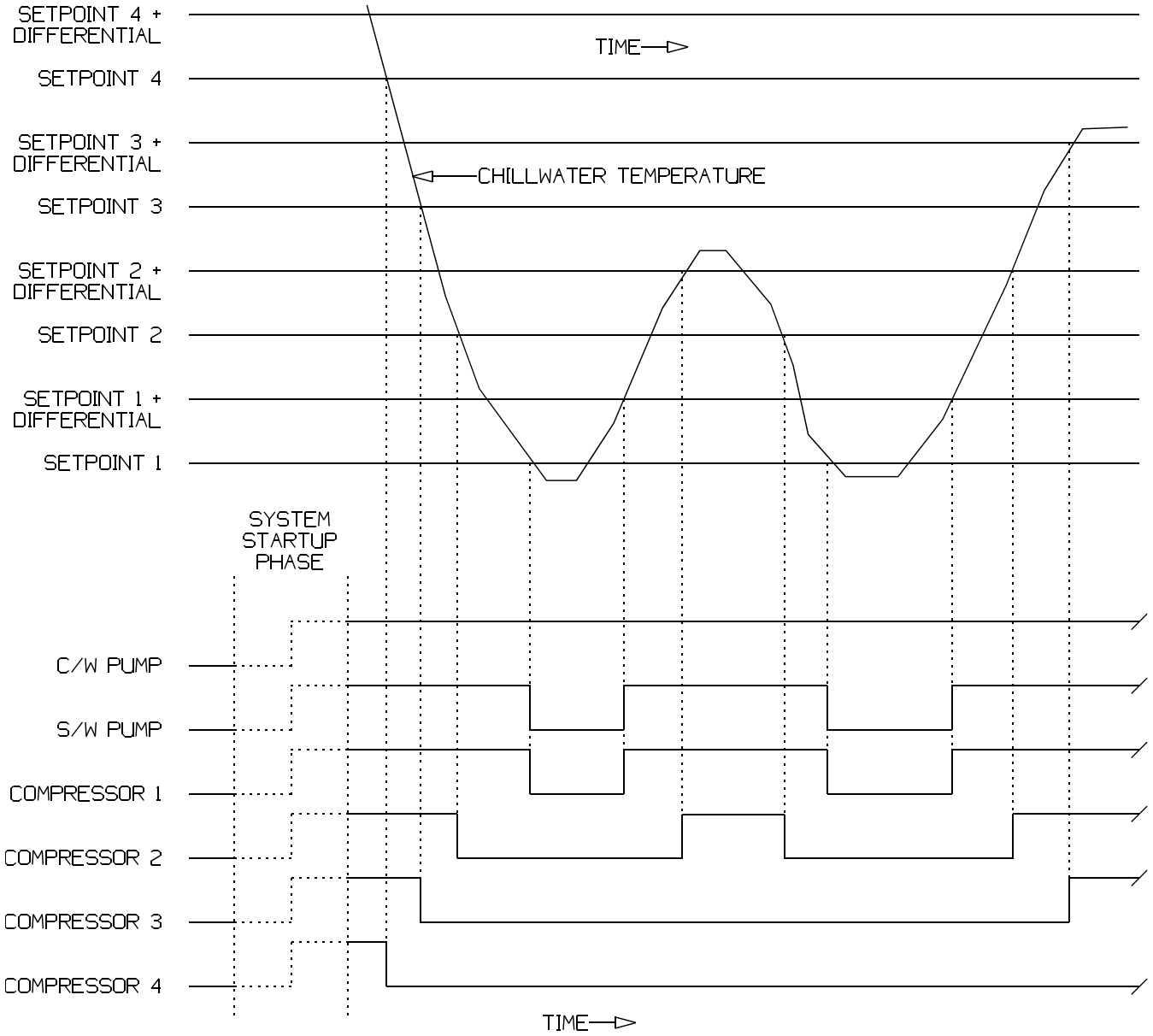


HEATING MODE, REVERSE CYCLE SYSTEM
INITIAL SYSTEM STARTUP



HEATING MODE, IMMERSION HEAT SYSTEM
INITIAL SYSTEM STARTUP

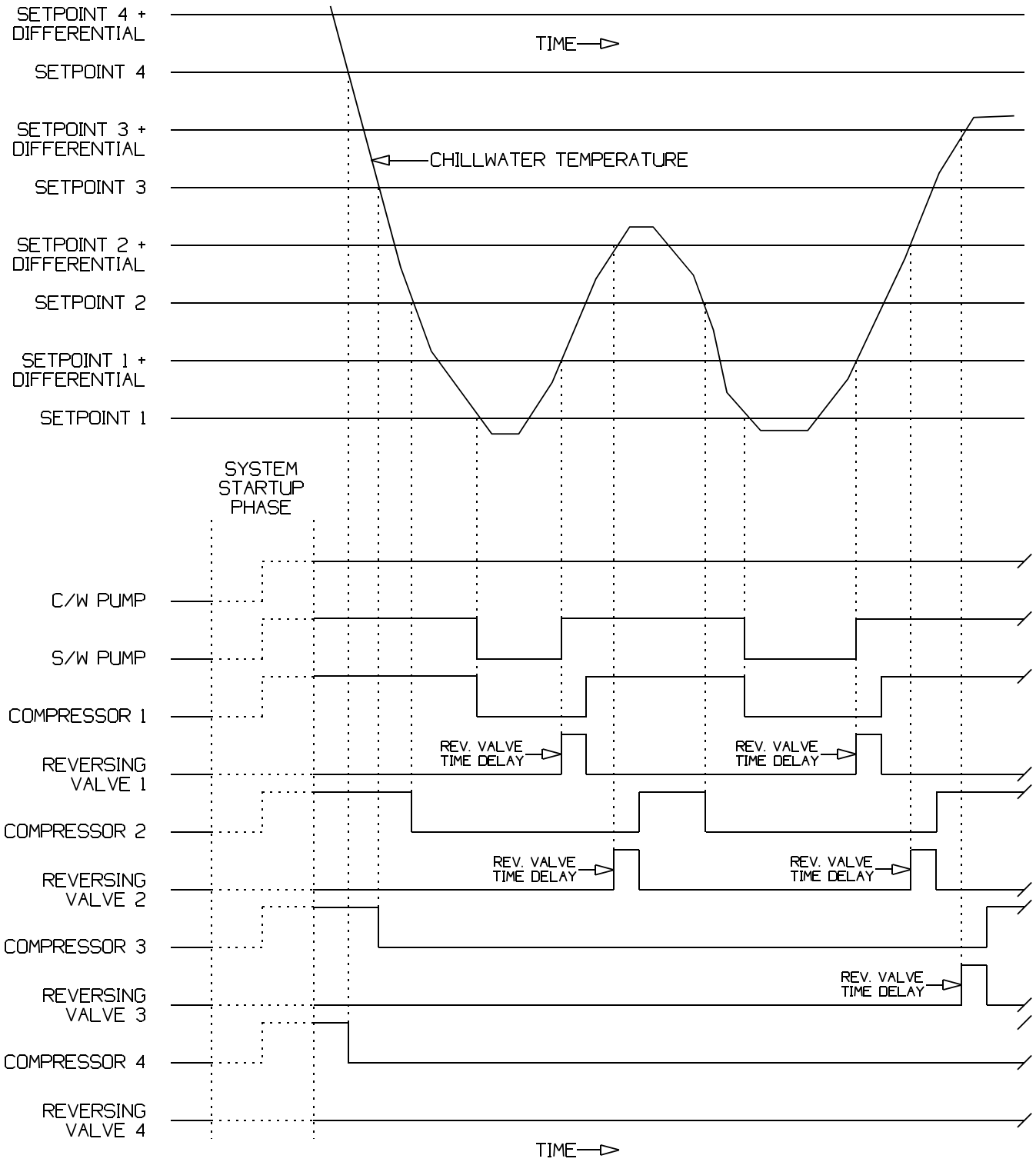
J:\DXF\PLCOPS-2.DXF



EXAMPLE ASSUMES A 4 STAGE, REVERSE CYCLE SYSTEM. ROTATION SEQUENCE 1 (1-2-3-4)
SEAWATER PUMP SET TO CYCLE WITH THE COMPRESSORS (AUTO)

COOLING MODE, NON-REVERSE CYCLE SYSTEM
COOLING MODE OPERATION

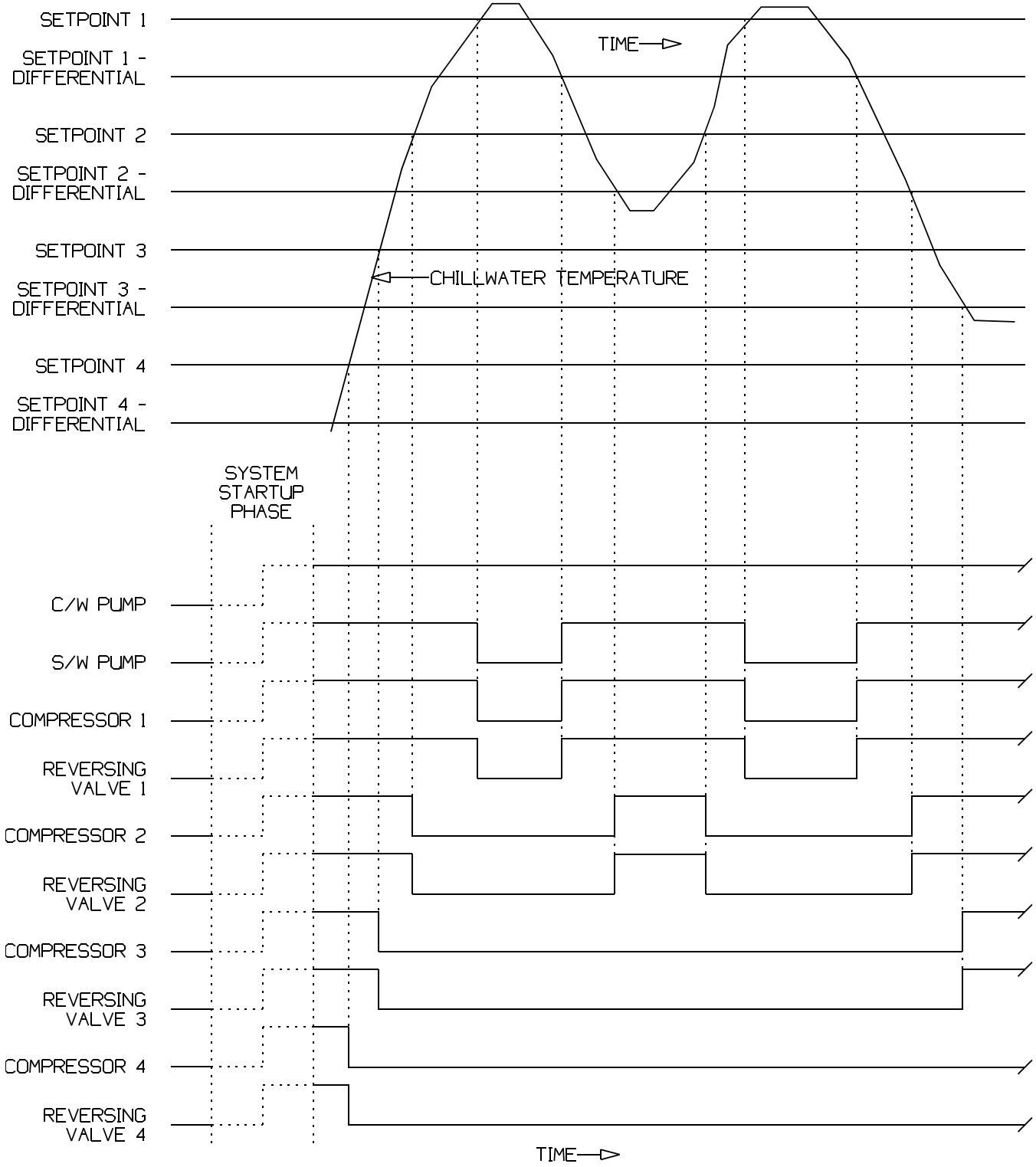
J:\DXF\PLCOPS-3.DXF



EXAMPLE ASSUMES A 4 STAGE, REVERSE CYCLE SYSTEM, ROTATION SEQUENCE 1 (1-2-3-4)
SEAWATER PUMP SET TO CYCLE WITH THE COMPRESSORS (AUTO)

COOLING MODE, REVERSE CYCLE SYSTEM
COOLING MODE OPERATION

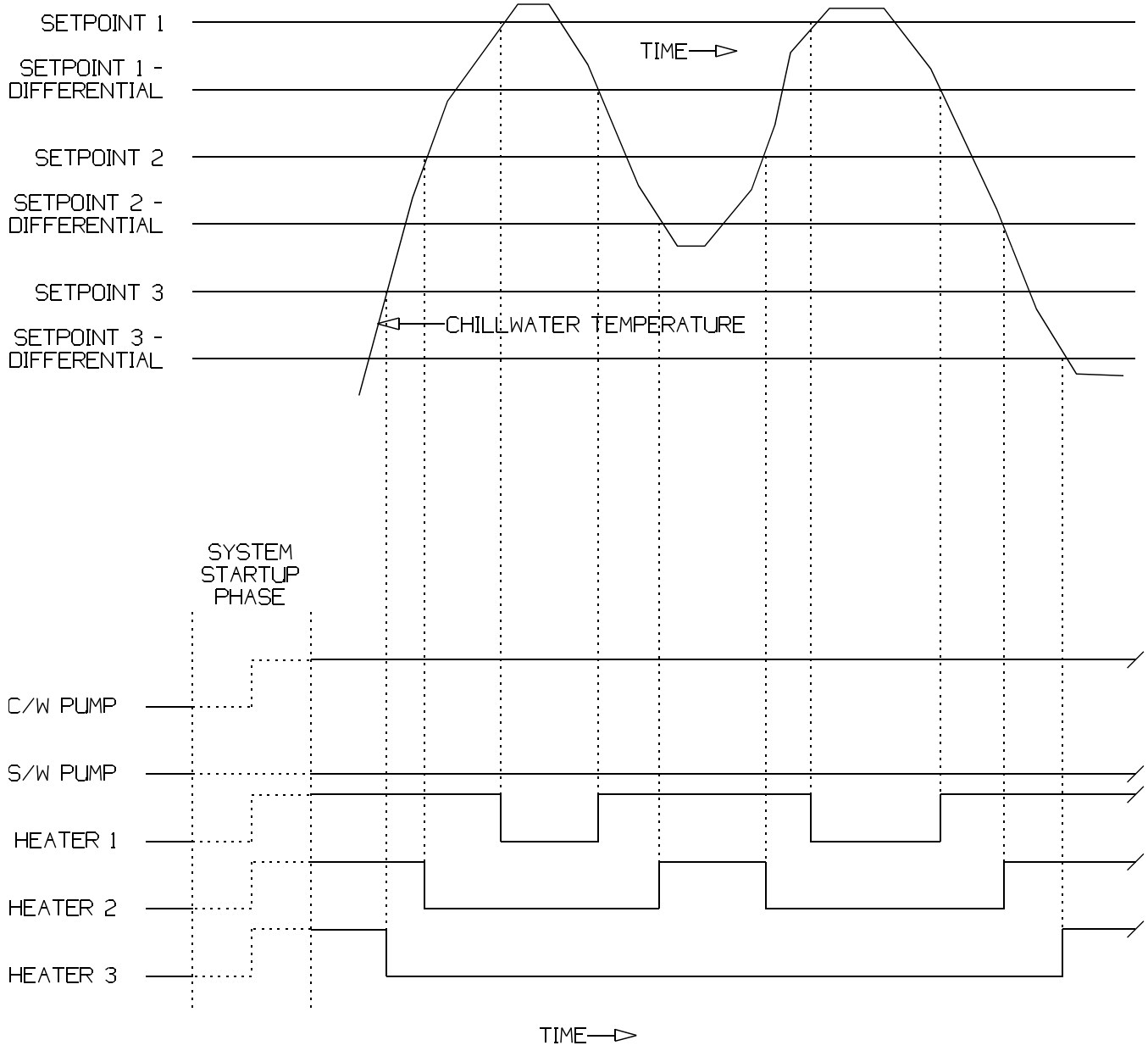
J:\DXF\PLCOPS-4.DXF



EXAMPLE ASSUMES A 4 STAGE, REVERSE CYCLE SYSTEM, ROTATION SEQUENCE 1 (1-2-3-4)
SEAWATER PUMP SET TO CYCLE WITH THE COMPRESSORS (AUTO)

HEATING MODE, REVERSE CYCLE SYSTEM
HEATING MODE OPERATION

J:\DXF\PLCOPS-5.DXF



EXAMPLE ASSUMES A 3 STAGE, IMMERSION HEAT SYSTEM, ROTATION SEQUENCE 1 (1-2-3)

HEATING MODE, IMMERSION HEAT SYSTEM
HEATING MODE OPERATION

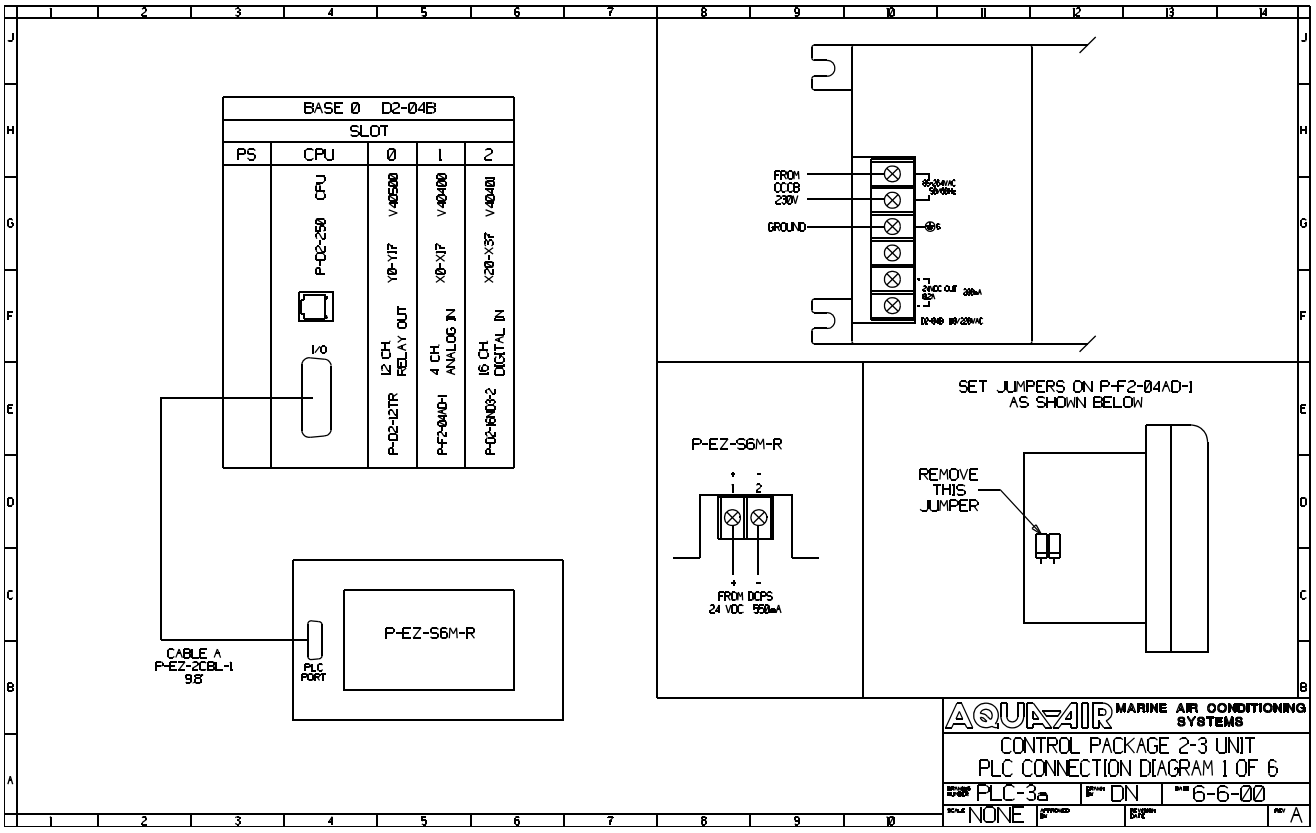
J:\DXF\PLCOPS-6.DXF

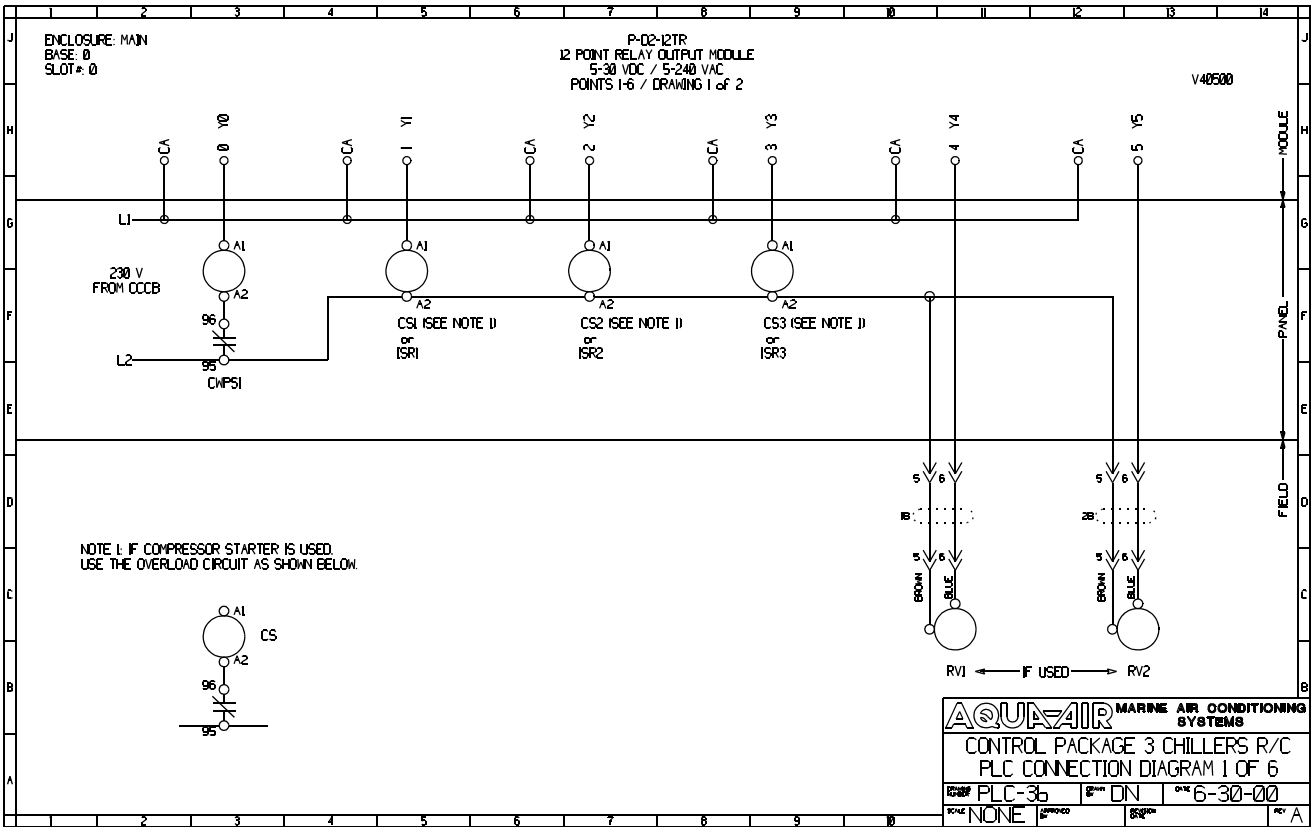
I:\WORDPFCT\PLC\PLCOPS.WPD

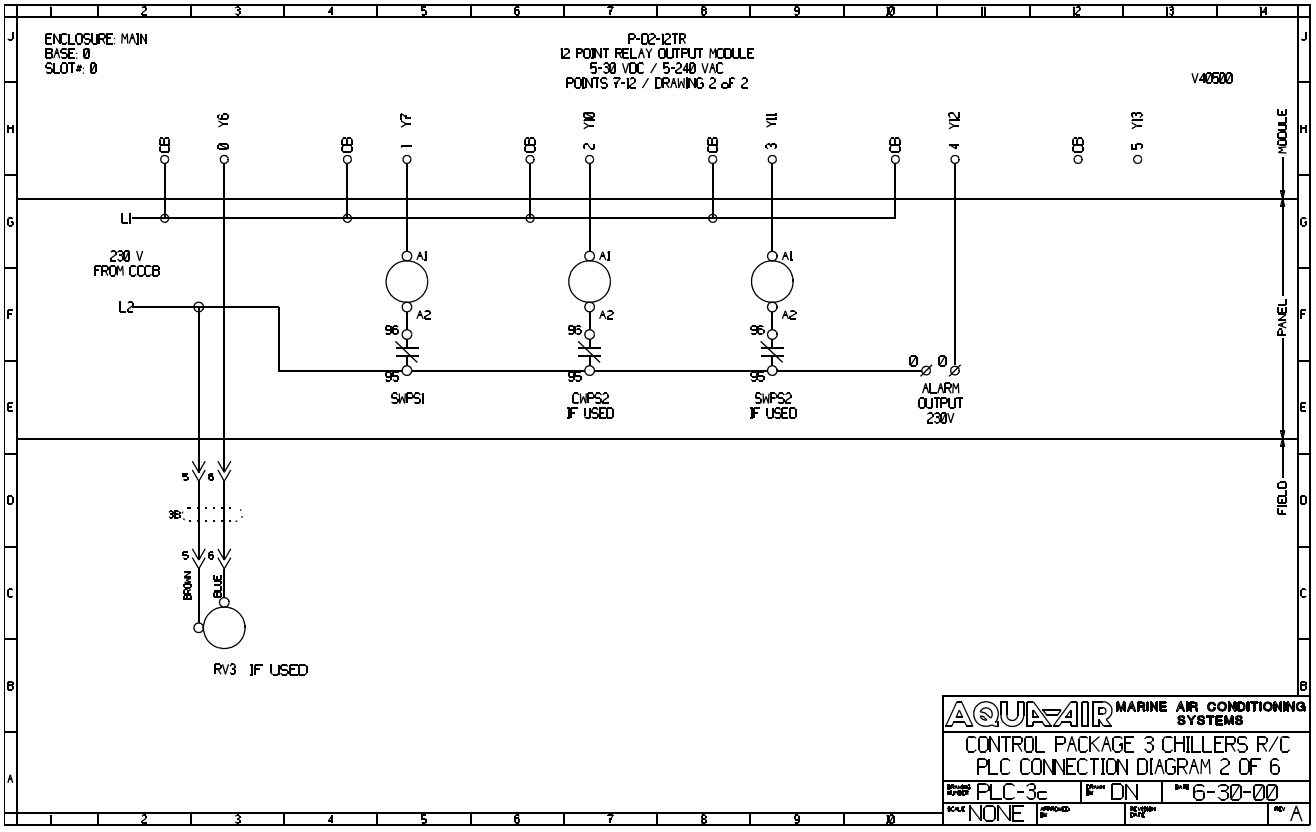
6

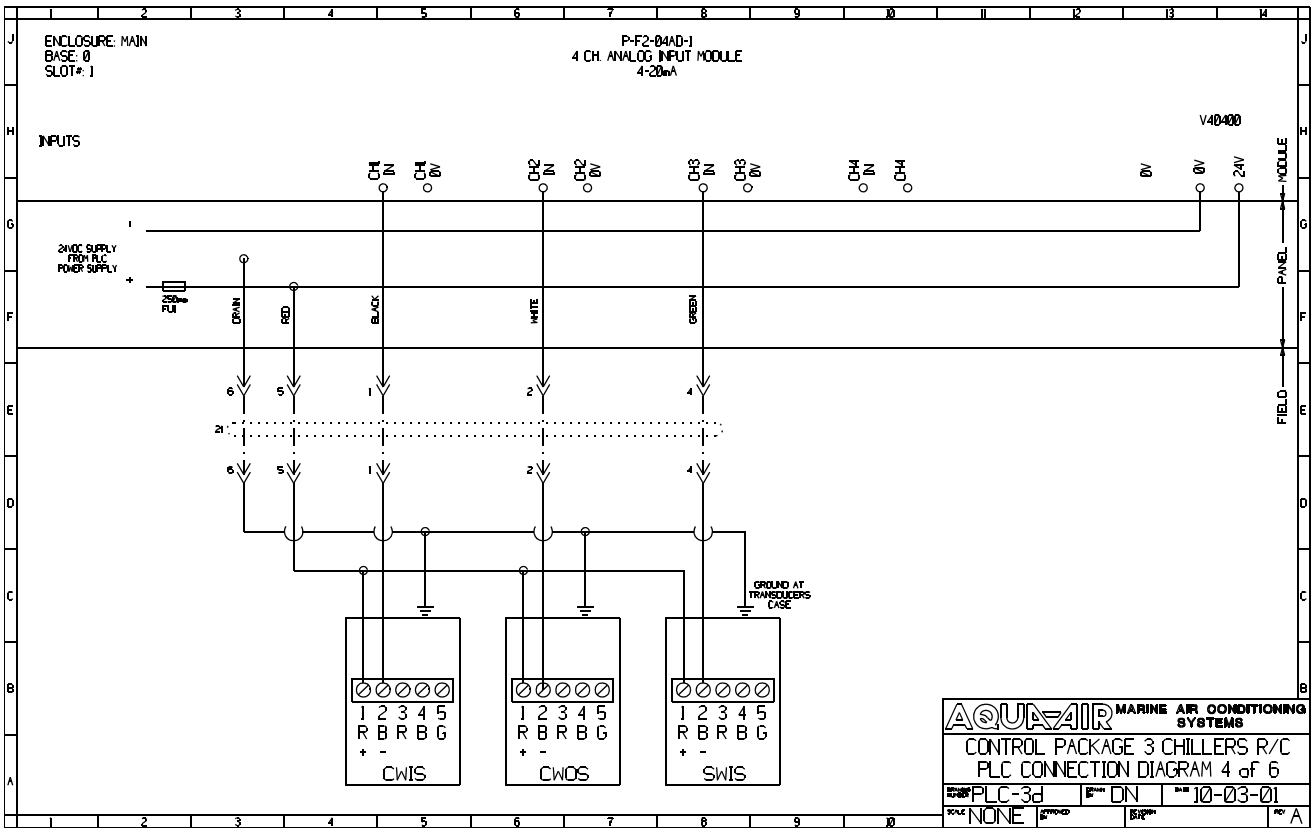
Typical Wiring Schematics

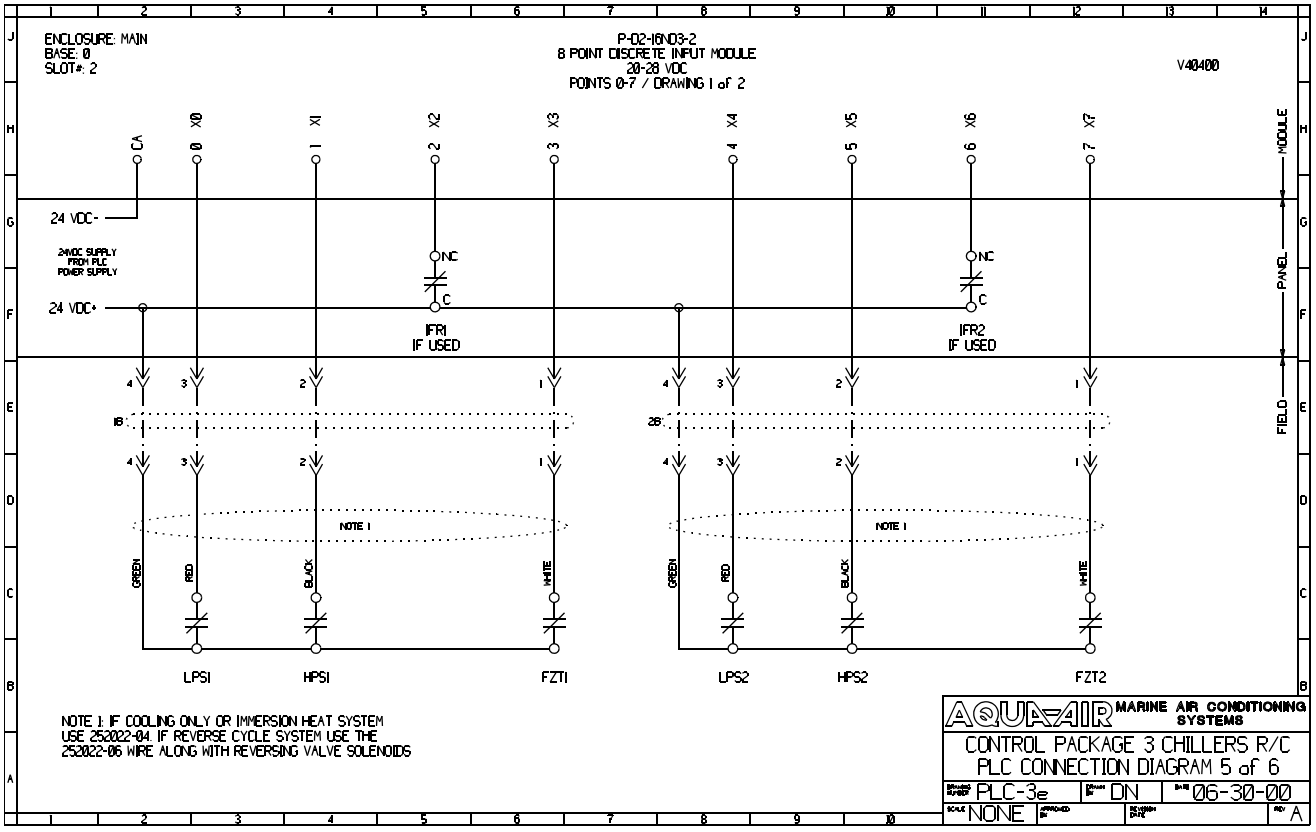
TYPICAL PLC SYSTEM WIRING SCHEMATIC FOR UP TO THREE 2-5 TON CHILLERS

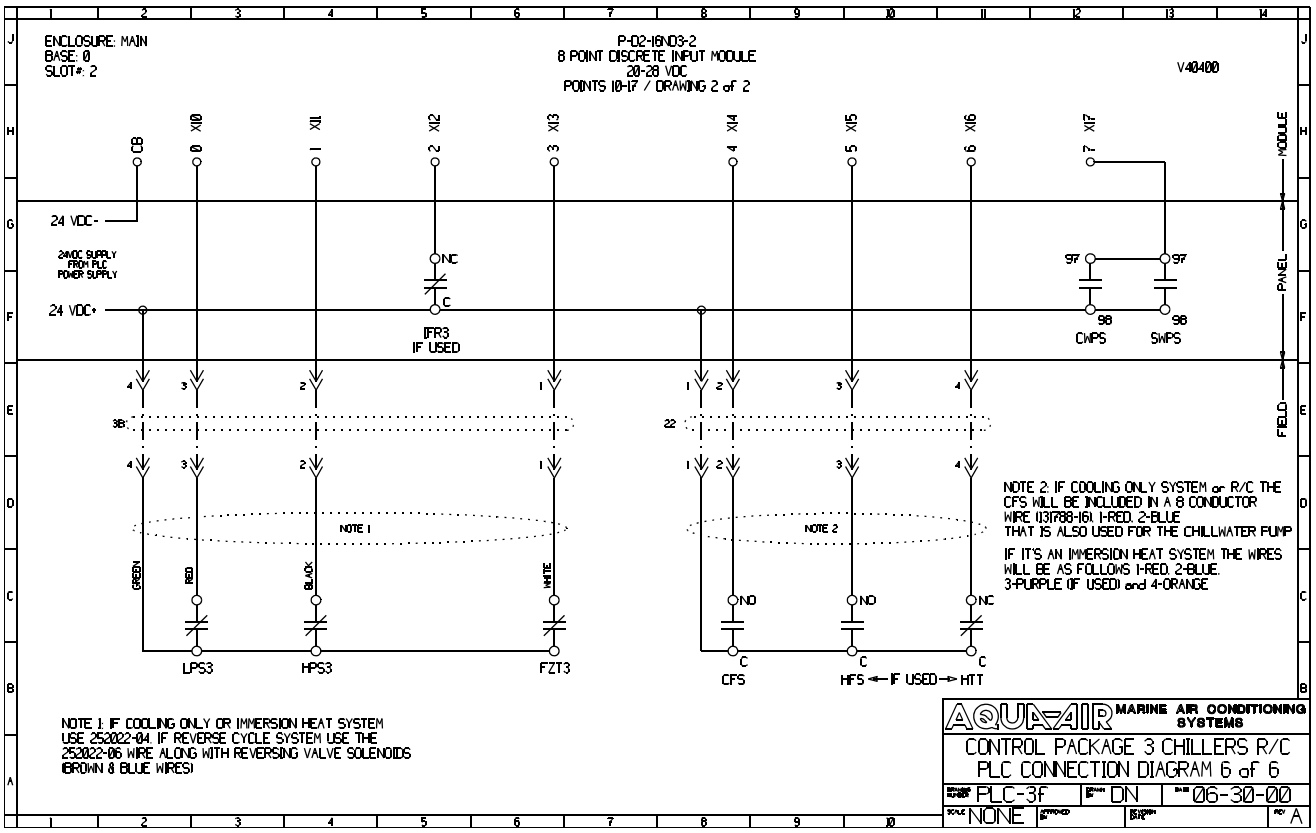





ENCLOSURE: MAIN
BASE: 0
SLOT#: 0
P-02-12TR
12 POINT RELAY OUTPUT MODULE
5-30 VDC / 5-240 VAC
POINTS 7-12 / DRAWING 2 of 2
V40500
MODULE
PANEL
FIELD
L1
L2
230 V
FROM CCCB
SWPS1
CWPS2
IF USED
SWPS2
IF USED
ALARM
OUTPUT
230V
RV3 IF USED
BROWN
BLUE
AQUA-AIR
MARINE AIR CONDITIONING SYSTEMS
CONTROL PACKAGE 3 CHILLERS R/C
PLC CONNECTION DIAGRAM 2 OF 6
PLC-3c
DN
6-30-00
NONE
A

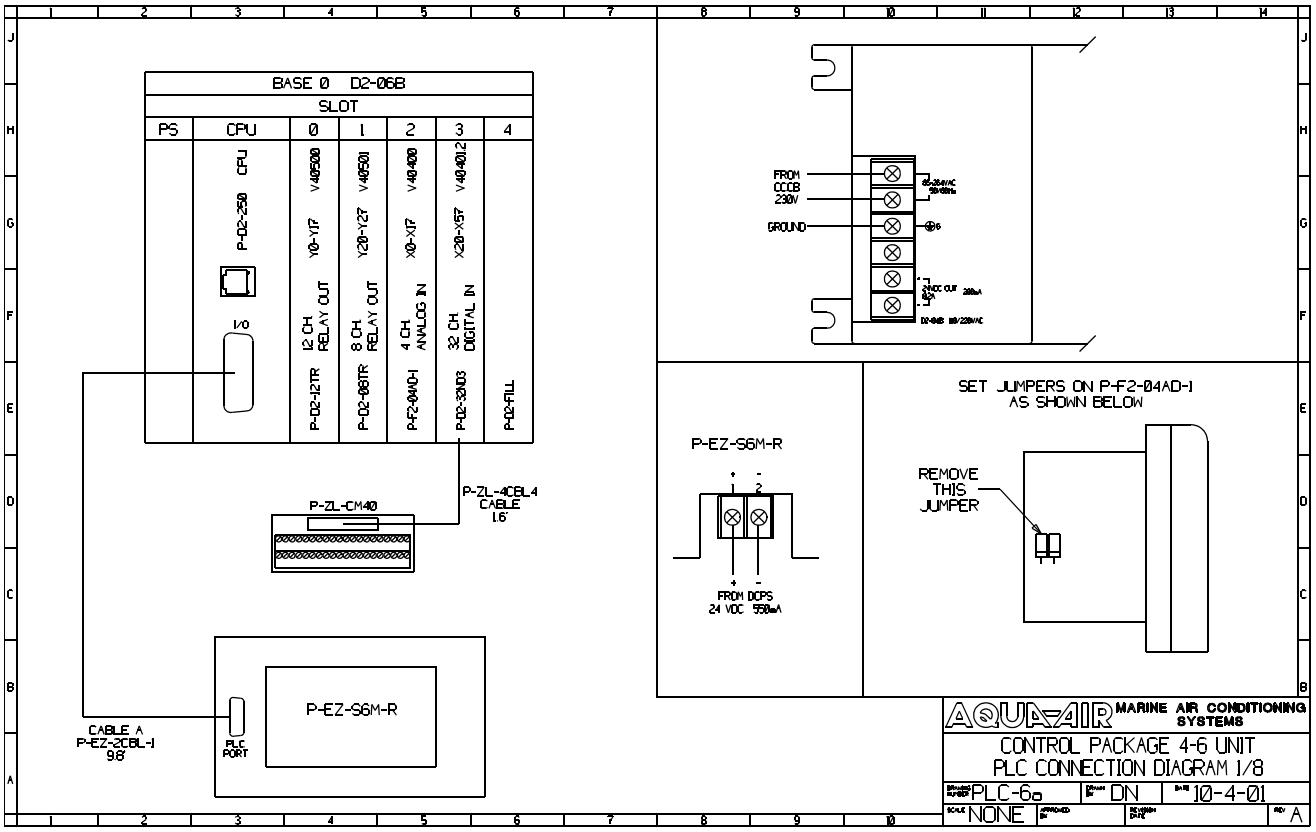

ENCLOSURE: MAIN
BASE: 0
SLOT#: 1
P-F2-04AD-1
4 CH. ANALOG INPUT MODULE
4-20mA
V40400
INPUTS
MODULE
PANEL
FIELD
24VDC SUPPLY
FROM PLC
POWER SUPPLY
DRAIN
RED
BLACK
WHITE
GREEN
GROUND AT
TRANSDUCERS
CASE
CWIS
CWOS
SWIS
AQUA-AIR
MARINE AIR CONDITIONING SYSTEMS
CONTROL PACKAGE 3 CHILLERS R/C
PLC CONNECTION DIAGRAM 4 of 6
PLC-3d
DN
10-03-01
NONE
A

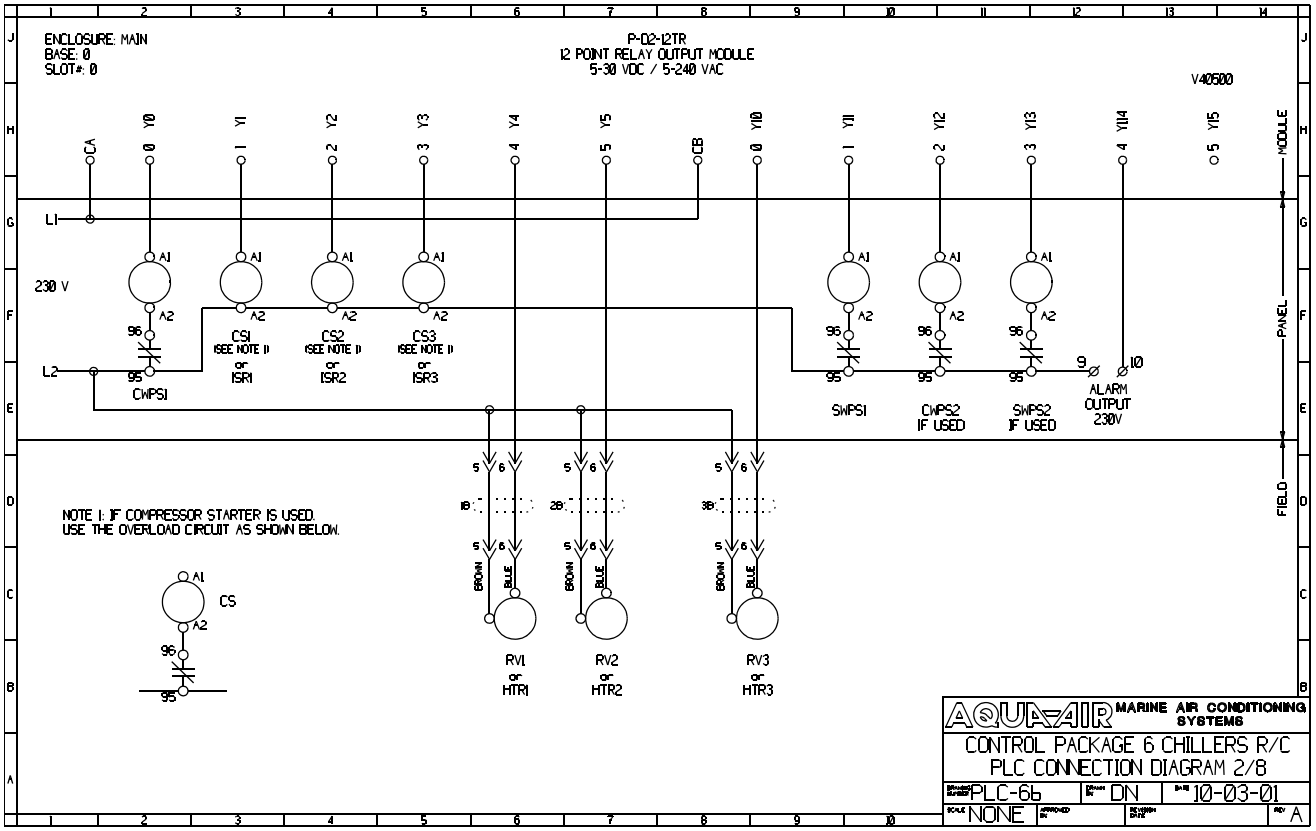


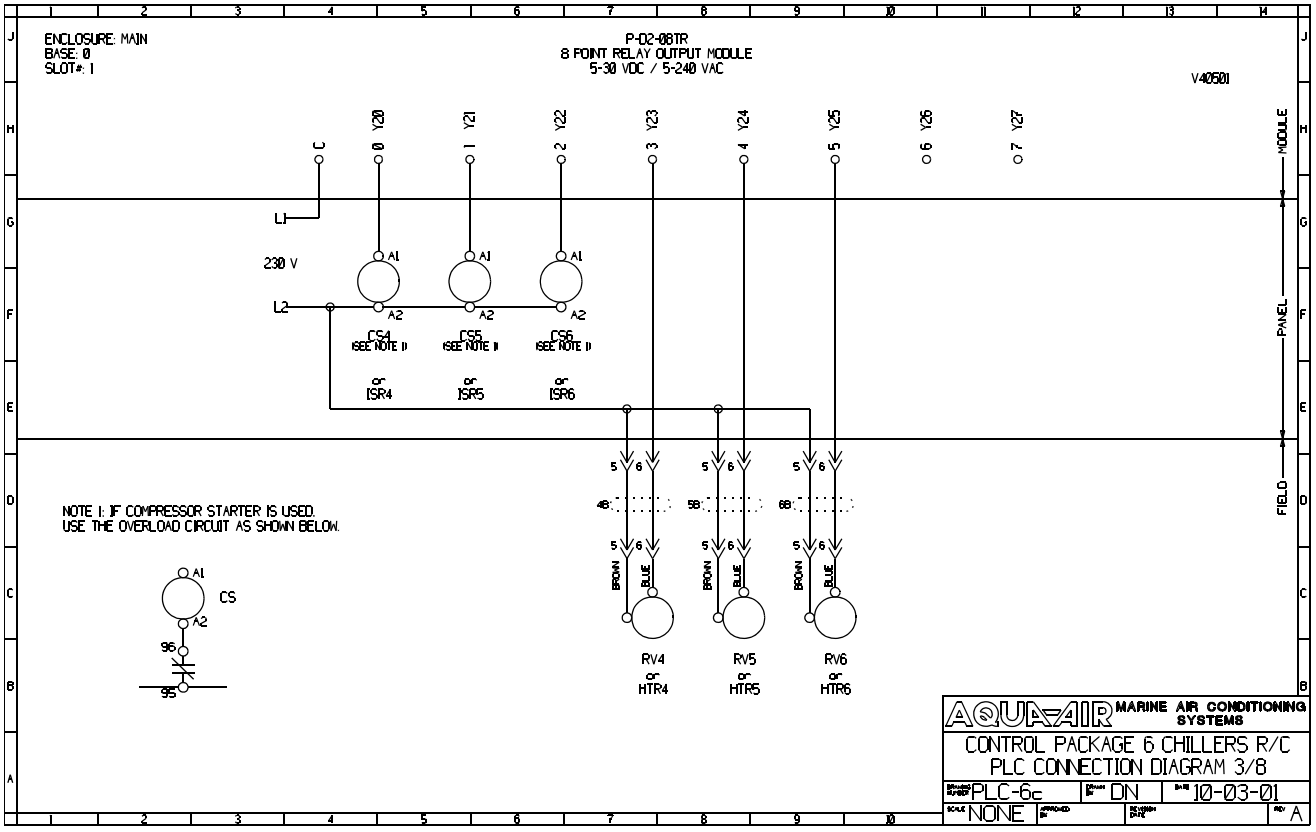


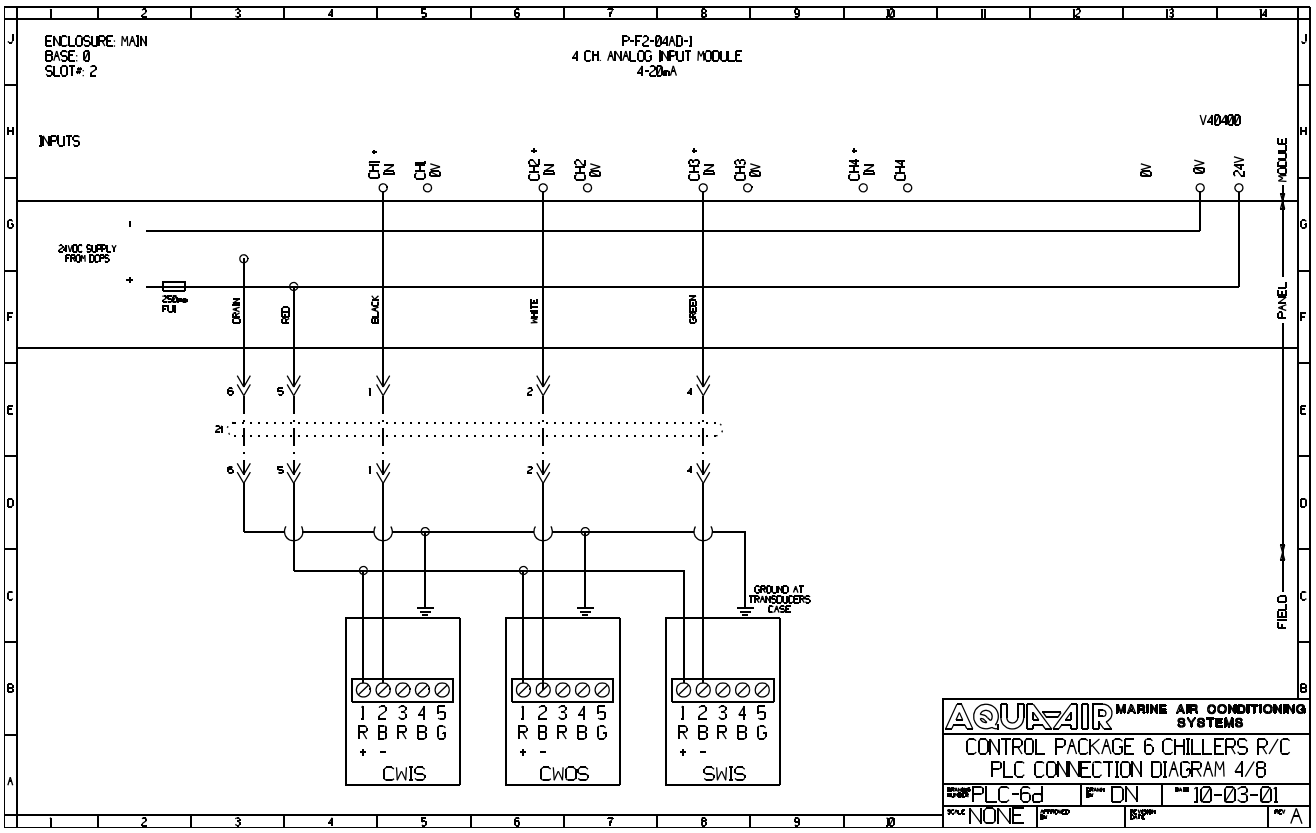
I:\WORDPFCT\PLC\PLC-3 SYSTEM.WPD

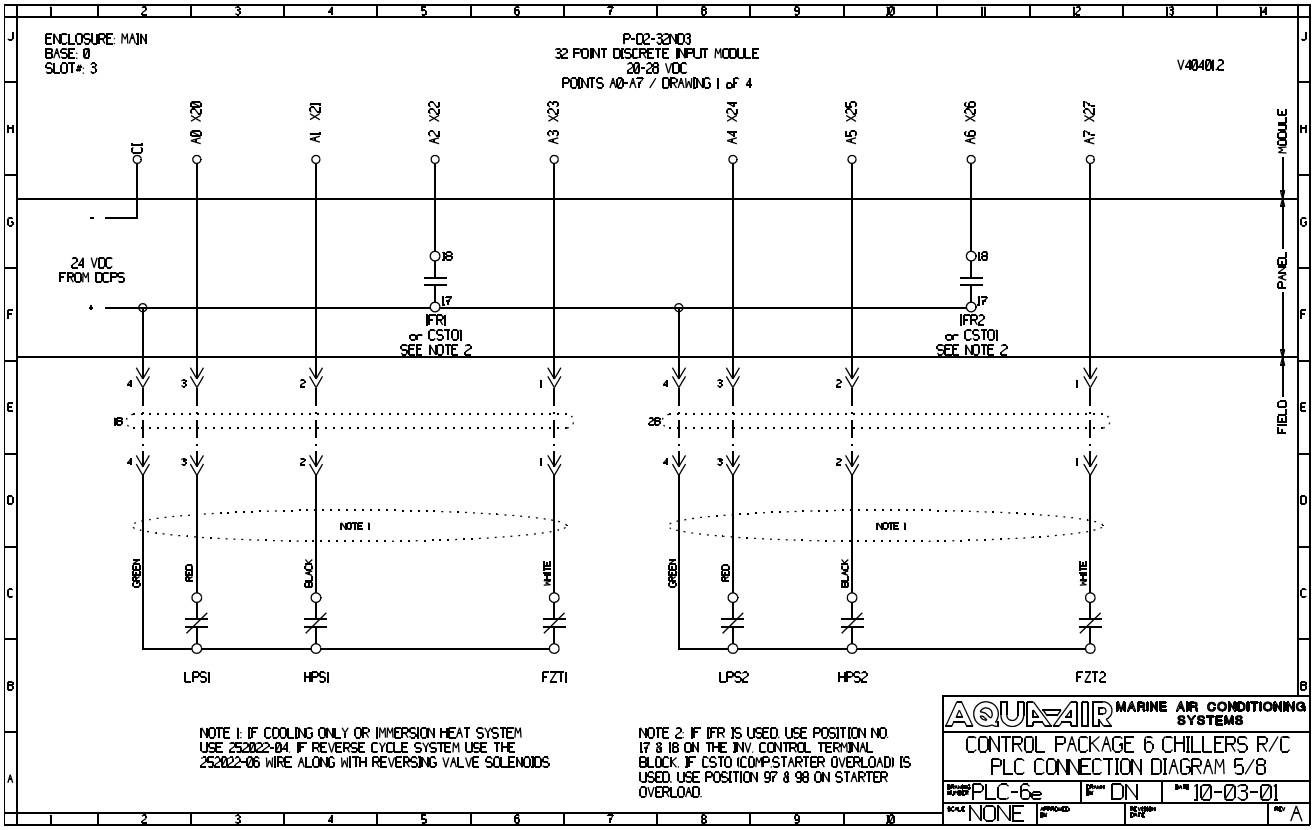
TYPICAL PLC SYSTEM WIRING SCHEMATIC FOR UP TO SIX 2-5 TON CHILLERS

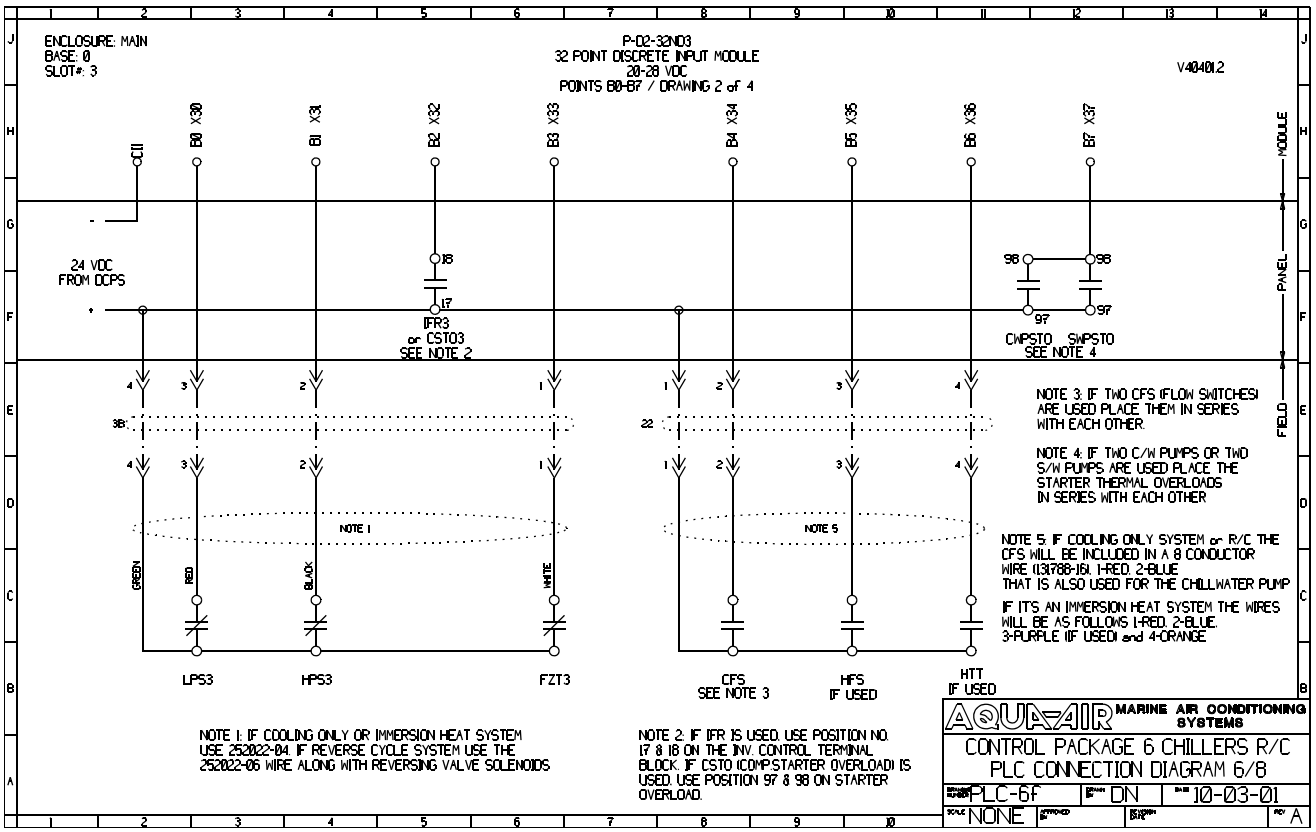


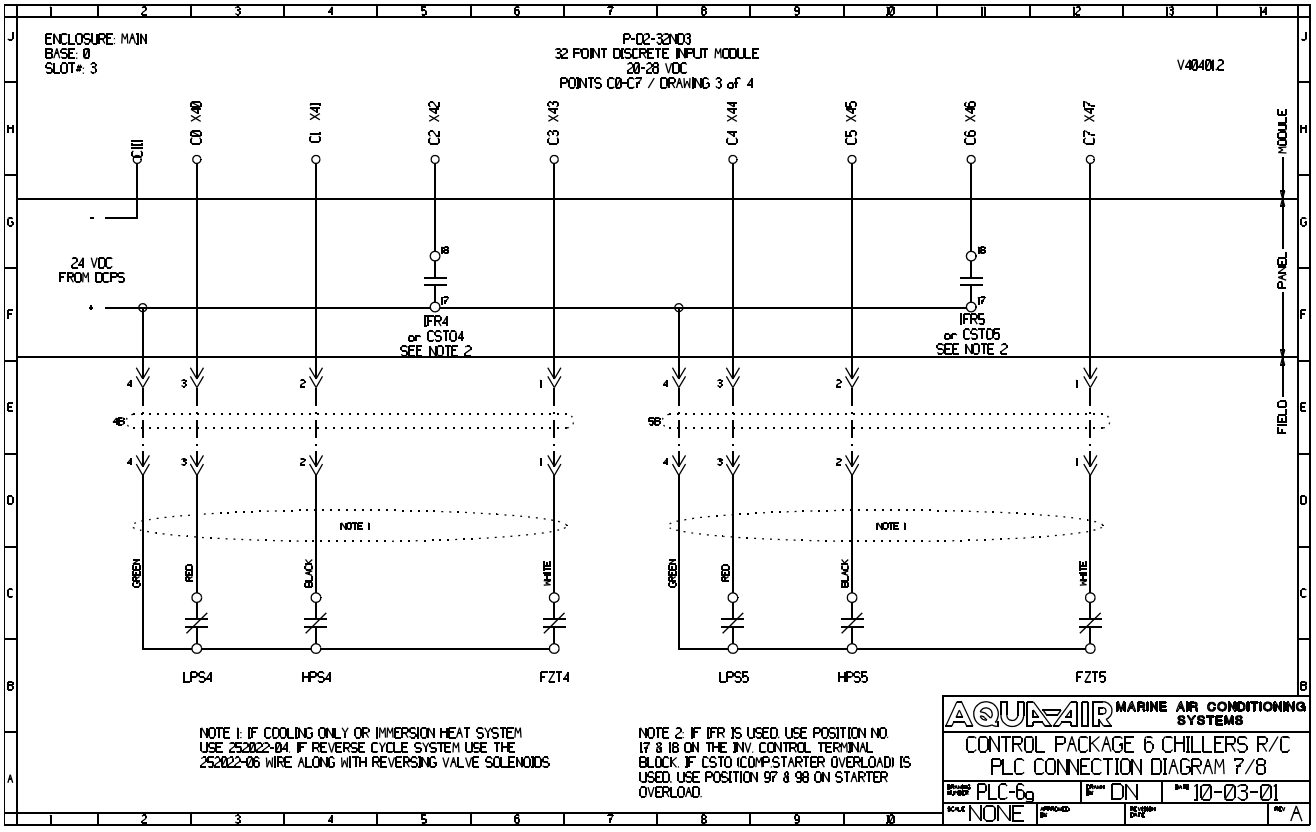


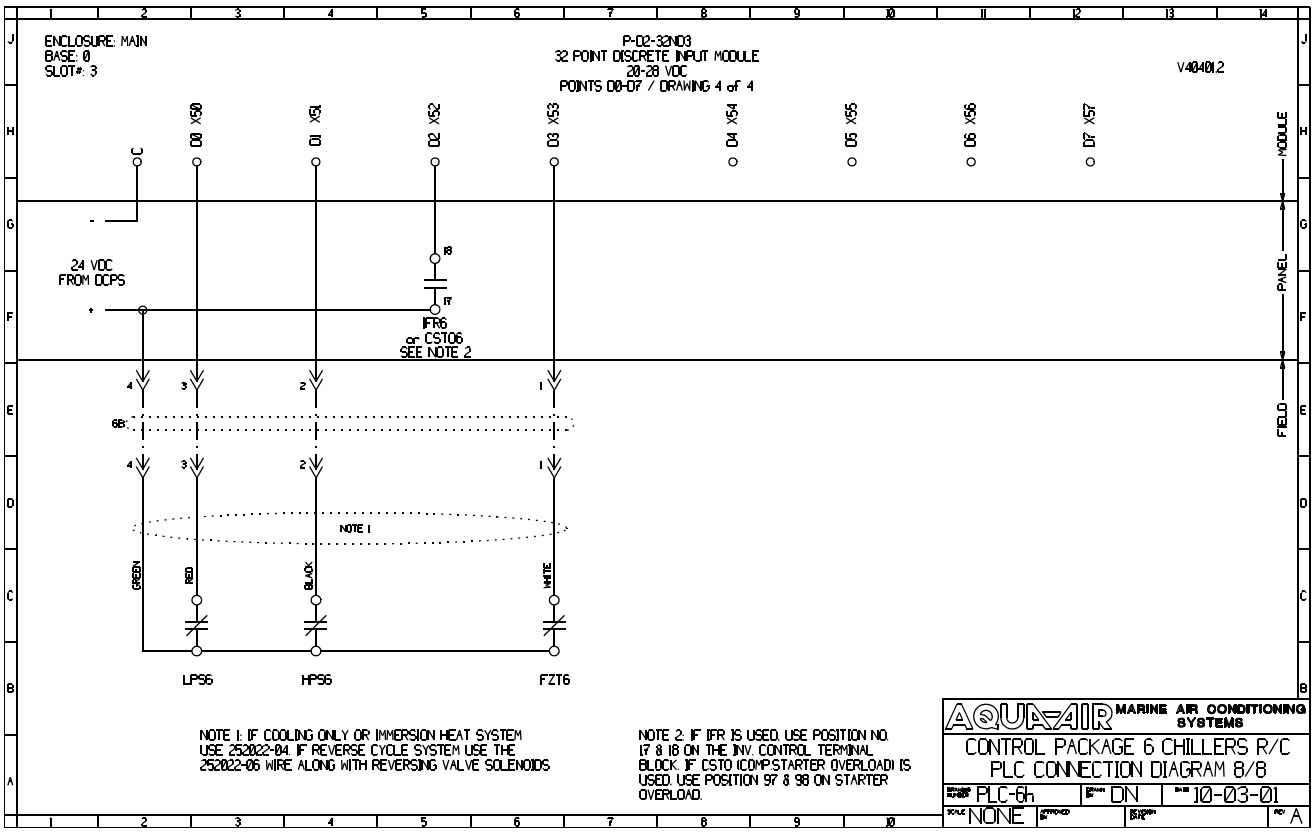

ENCLOSURE: MAIN
BASE: 0
SLOT#: 1
P-D2-08TR
8 POINT RELAY OUTPUT MODULE
5-30 VDC / 5-240 VAC
V40501
Y20
Y21
Y22
Y23
Y24
Y25
Y26
Y27
C
MODULE
PANEL
FIELD
L1
230 V
L2
A1
A2
CS4
(SEE NOTE 1)
OR
ISR4
CS5
(SEE NOTE 1)
OR
ISR5
CS6
(SEE NOTE 1)
OR
ISR6
BROWN
BLUE
RV4
OR
HTR4
RV5
OR
HTR5
RV6
OR
HTR6
NOTE 1: IF COMPRESSOR STARTER IS USED,
USE THE OVERLOAD CIRCUIT AS SHOWN BELOW.
CS
96
95
AQUA-AIR
MARINE AIR CONDITIONING SYSTEMS
CONTROL PACKAGE 6 CHILLERS R/C
PLC CONNECTION DIAGRAM 3/8
PLC-6c
DN
10-03-01
NONE
A


ENCLOSURE: MAIN
BASE: 0
SLOT#: 2
P-F2-04AD-1
4 CH. ANALOG INPUT MODULE
4-20mA
V40400
INPUTS
CH1 IN
CH1 0V
CH2 IN
CH2 0V
CH3 IN
CH3 0V
CH4 IN
CH4
0V
0V
24V
MODULE
PANEL
FIELD
24VDC SUPPLY
FROM DOPS
250mA
FUSE
DRAIN
RED
BLACK
WHITE
GREEN
GROUND AT
TRANSDUCERS
CASE
1 2 3 4 5
R B R B G
+ -
CWIS
CWOS
SWIS
AQUA-AIR
MARINE AIR CONDITIONING SYSTEMS
CONTROL PACKAGE 6 CHILLERS R/C
PLC CONNECTION DIAGRAM 4/8
PLC-6d
DN
10-03-01
NONE
A


ENCLOSURE: MAIN
BASE: 0
SLOT#: 3
P-02-32ND3
32 POINT DISCRETE INPUT MODULE
20-28 VDC
POINTS A0-A7 / DRAWING 1 of 4
V4040L2
CI1
A0 X20
A1 X21
A2 X22
A3 X23
A4 X24
A5 X25
A6 X26
A7 X27
MODULE
PANEL
FIELD
24 VDC
FROM DCPS
IFR1
or CST01
SEE NOTE 2
IFR2
or CST01
SEE NOTE 2
NOTE 1
GREEN
RED
BLACK
WHITE
LPS1
HPS1
FZT1
LPS2
HPS2
FZT2
NOTE 1: IF COOLING ONLY OR IMMERSION HEAT SYSTEM USE 252022-04. IF REVERSE CYCLE SYSTEM USE THE 252022-06 WIRE ALONG WITH REVERSING VALVE SOLENOIDS.
NOTE 2: IF IFR IS USED, USE POSITION NO. 17 & 18 ON THE INV. CONTROL TERMINAL BLOCK. IF CST01 (COMP STARTER OVERLOAD) IS USED, USE POSITION 97 & 98 ON STARTER OVERLOAD.
AQUA-AIR MARINE AIR CONDITIONING SYSTEMS
CONTROL PACKAGE 6 CHILLERS R/C
PLC CONNECTION DIAGRAM 5/8
PLC-6e
DN
10-03-01
NONE
A

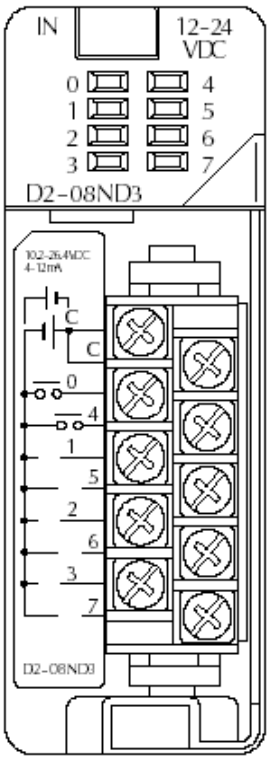

ENCLOSURE: MAIN
BASE: 0
SLOT#: 3
P-02-32ND3
32 POINT DISCRETE INPUT MODULE
20-28 VDC
POINTS B0-B7 / DRAWING 2 of 4
V4040L2
CI1
B0 X30
B1 X31
B2 X32
B3 X33
B4 X34
B5 X35
B6 X36
B7 X37
MODULE
PANEL
FIELD
24 VDC
FROM DCPS
IFR3
or CST03
SEE NOTE 2
CWPST0 SWPST0
SEE NOTE 4
NOTE 1
GREEN
RED
BLACK
WHITE
LPS3
HPS3
FZT3
CFS
SEE NOTE 3
HFS
IF USED
HTT
IF USED
NOTE 5
NOTE 1: IF COOLING ONLY OR IMMERSION HEAT SYSTEM USE 252022-04. IF REVERSE CYCLE SYSTEM USE THE 252022-06 WIRE ALONG WITH REVERSING VALVE SOLENOIDS.
NOTE 2: IF IFR IS USED, USE POSITION NO. 17 & 18 ON THE INV. CONTROL TERMINAL BLOCK. IF CST01 (COMP STARTER OVERLOAD) IS USED, USE POSITION 97 & 98 ON STARTER OVERLOAD.
NOTE 3: IF TWO CFS (FLOW SWITCHES) ARE USED, PLACE THEM IN SERIES WITH EACH OTHER.
NOTE 4: IF TWO C/W PUMPS OR TWO S/W PUMPS ARE USED, PLACE THE STARTER THERMAL OVERLOADS IN SERIES WITH EACH OTHER.
NOTE 5: IF COOLING ONLY SYSTEM or R/C, THE CFS WILL BE INCLUDED IN A 8 CONDUCTOR WIRE (131788-16), 1-RED, 2-BLUE THAT IS ALSO USED FOR THE CHILLWATER PUMP.
IF IT'S AN IMMERSION HEAT SYSTEM THE WIRES WILL BE AS FOLLOWS 1-RED, 2-BLUE, 3-PURPLE (IF USED) and 4-ORANGE.
AQUA-AIR MARINE AIR CONDITIONING SYSTEMS
CONTROL PACKAGE 6 CHILLERS R/C
PLC CONNECTION DIAGRAM 6/8
PLC-6f
DN
10-03-01
NONE
A

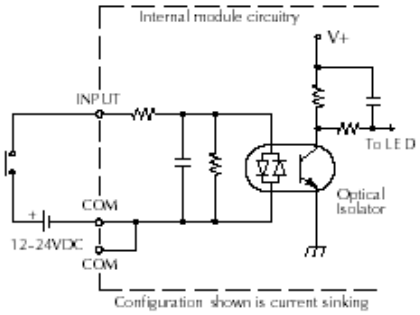




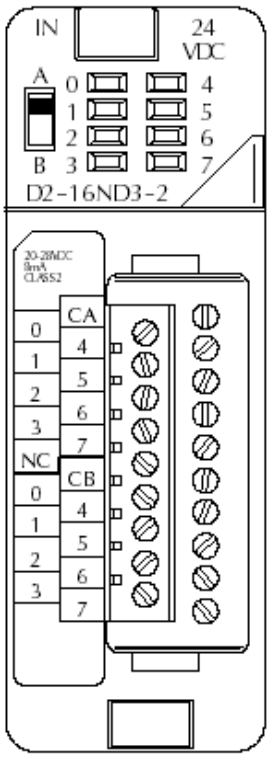
I:\WORDPFCT\PLC\PLC-6 SYSTEM.WPD

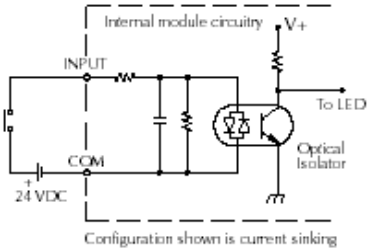
Digital Input Cards



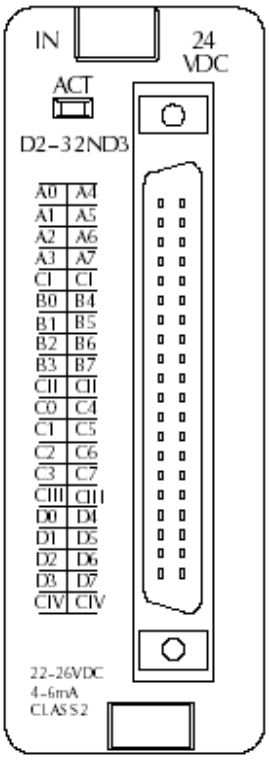


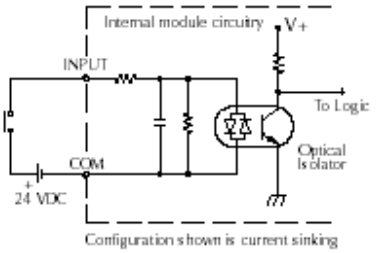
P-D2-08ND3
DIGITAL INPUT
8 POINT
24 VDC



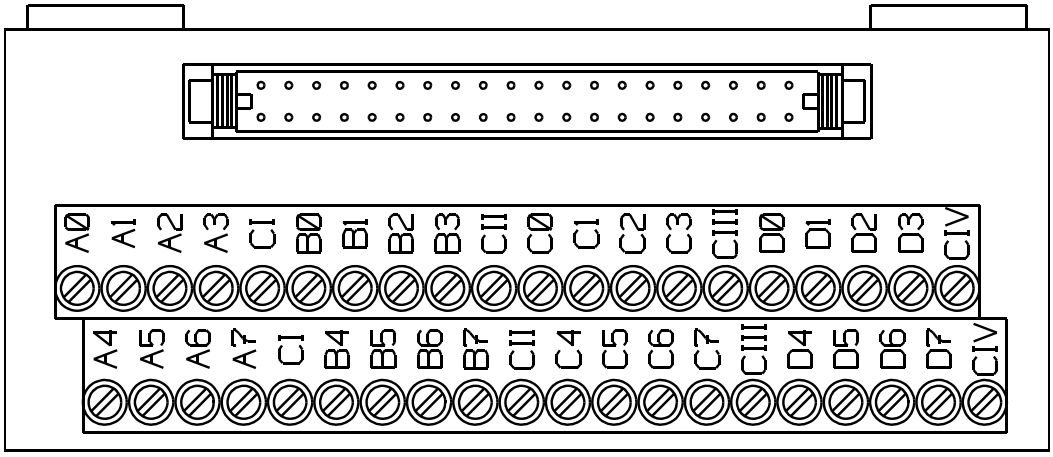


P-D2-16ND3-2
DIGITAL INPUT
16 POINT
24 VDC



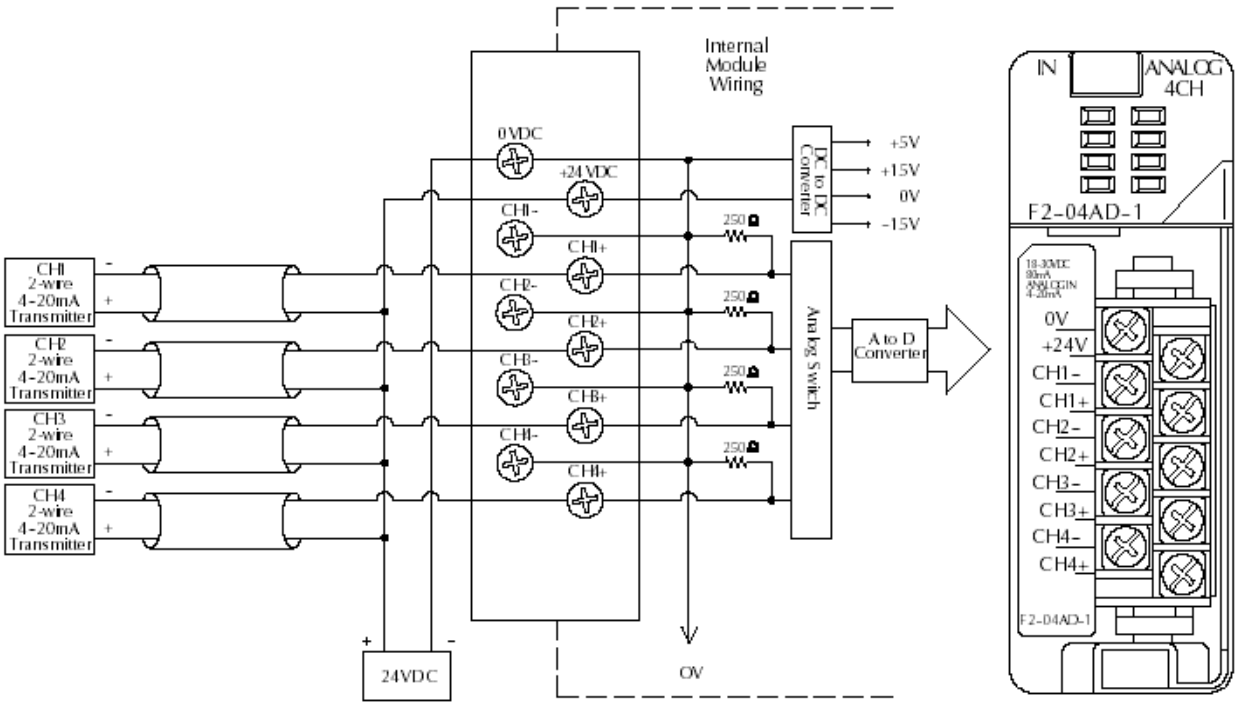


P-D2-32ND3
DIGITAL INPUT
32 POINT
24 VDC

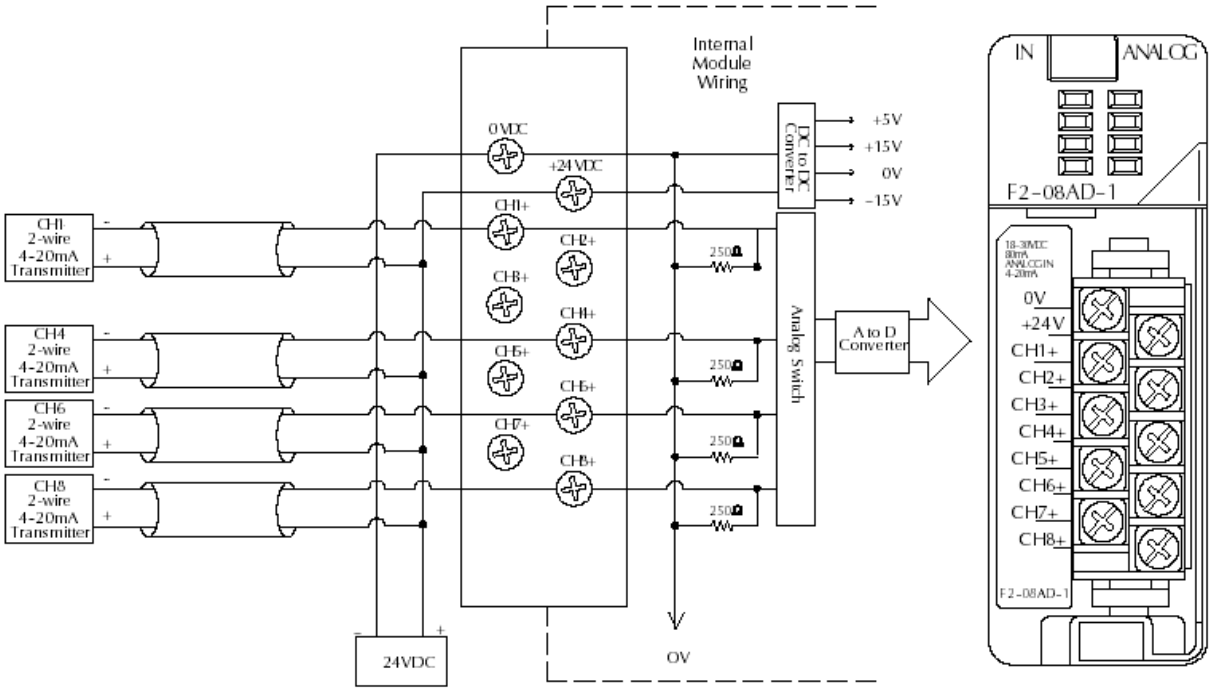


P-ZL-CM40
40 POSITION WIRING INTERFACE CONNECTOR MODULE
CONNECTED VIA P-ZL-4CBL4 CABLE TO P-D2-32ND3 CARD

Analog Input Cards

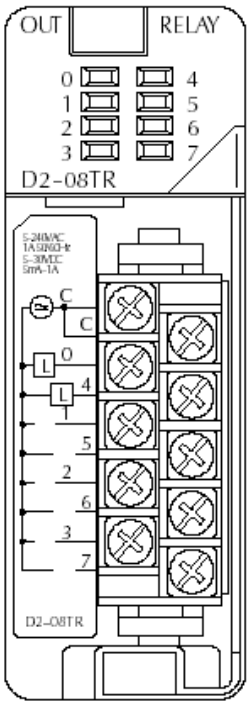


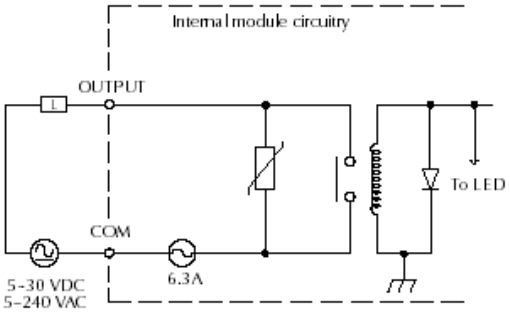
P-F2-04AD-1 ANALOG INPUT 4-20 mA 4 CHANNEL



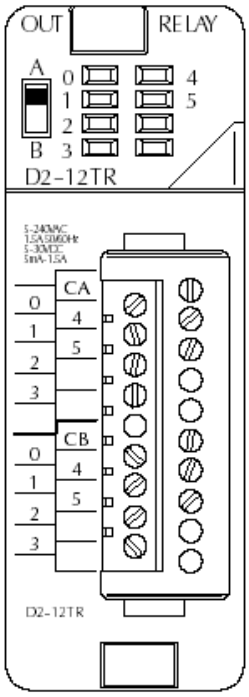
P-F2-08AD-1 ANALOG INPUT 4-20mA 8 CHANNEL

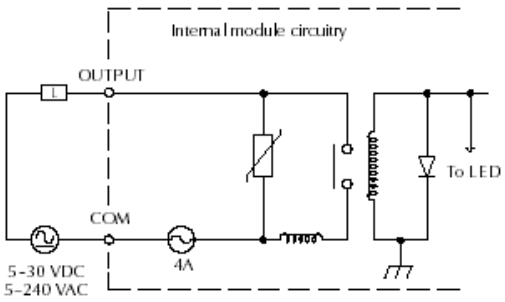
Relay Output Cards





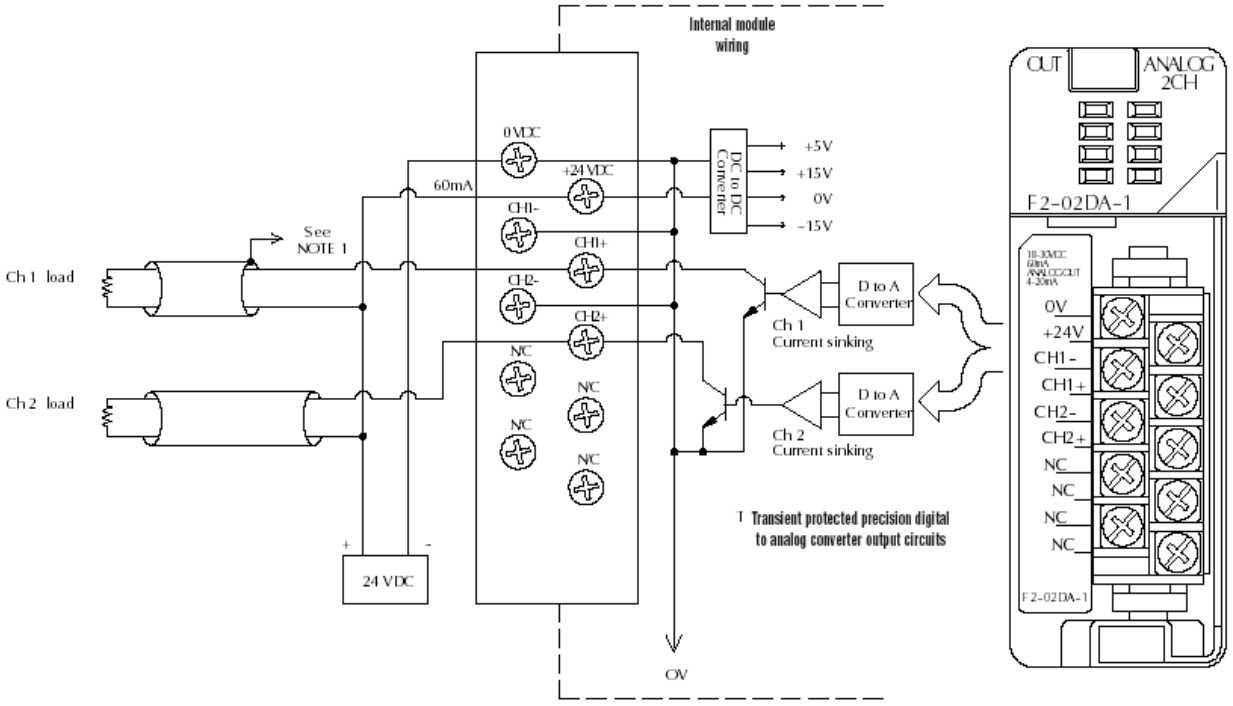
P-D2-08TR RELAY OUTPUT 8 POINT





P-D2-12TR RELAY OUTPUT 12 POINT

Analog Output Cards



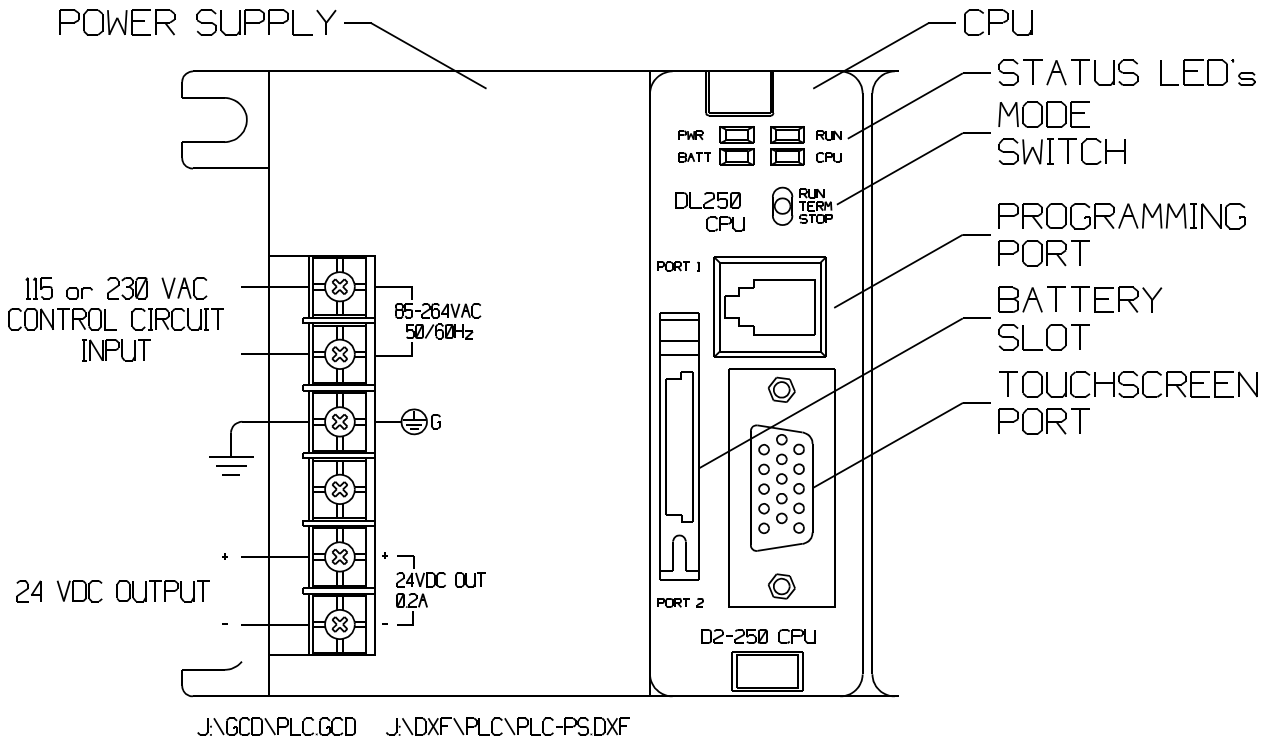
P-F2-02DA-1 ANALOG INPUT 4-20mA 2 CHANNEL

I:\WORDPFCT\PLC\PLC-CARD SCHEMATICS.WPD

7

Component Troubleshooting

PLC Power Supply and CPU Troubleshooting



CPU Indicators

The DL250 CPU has indicators (Status LED's) on the front to help you diagnose problems with the system. The table below gives a quick reference of potential problems associated with each status indicator. Following the table will be a more detailed analysis of each of the indicator problems.

Indicator	Status	Potential Problems
PWR	off	1. Insufficient control circuit voltage to the Power Supply 2. Power Supply / CPU is faulty 3. Other component such as an I/O module has power supply shorted
RUN	off	1. CPU programming error 2. Mode switch in STOP position
CPU	on	1. Electrical noise interference 2. CPU defective
BATT	on	1. CPU battery low 2. CPU battery missing or disconnected

PWR Indicator

There are three general reasons for the CPU power status LED (PWR) to be OFF:

1. Power to the Power Supply is incorrect or is not applied

If the voltage to the Power Supply is not correct, the CPU and/or base may not operate properly or may not operate at all. Use the following guidelines to correct the problem.

- Disconnect the control circuit power and check all incoming wiring for loose connections.
- If all of the connections are tight, reconnect the control circuit power and measure the voltage at the power supply terminal strip to insure that it is within specifications. If the voltage is not correct shut the system down and correct the problem.
- If all wiring is properly connected and the incoming power is within specifications required, the base power supply should be returned for repair.

2. The CPU is faulty

There is not a good check to test for a faulty CPU other than substituting a known good one to see if this corrects the problem. If you have experienced major power surges, it is possible the CPU and power supply have been damaged.

3. Other component(s) have the power supply shut down

It is possible a faulty module or external device using the system 5V can shut down the power supply. This 5V can be coming from the base or from the CPU communication ports.

To test for an external device causing the problem:

- Turn off the power to the Power Supply
- Disconnect all external devices (i.e. communications cables) from the CPU
- Reapply power to the system

If the power supply operates normally you may have either a shorted device or a shorted cable. If the power supply does not operate normally then test for an I/O module causing the problem by following the steps below:

- Turn off the power to the Power Supply
- Remove a module from the base
- Reapply power to the power supply

Continue doing this, one module at a time until the PWR LED operates normally or you run out of modules.

Bent base connector pins on the module can cause this problem. Verify that the connector is not the problem

RUN Indicator

If the CPU will not enter the Run mode (the RUN indicator is off), the problem is usually program related unless the CPU has a fatal error.

The Mode Switch must be in the TERM (Terminal) position at all times because of the touchscreen.

CPU Indicator

If the CPU indicator is on, a fatal error has occurred in the CPU. Generally, this is not a programming problem but an actual hardware failure. You can try power cycling the system to clear the error. If the error clears, monitor the system and determine what caused the problem. If power cycling the system does not correct the problem or if the problem returns, you should replace the CPU.

I:\wordpfct\plc\power supply&cpu-ts.wpd

Touchscreen Troubleshooting

If the touchscreen will not power up...

1. Verify that the wires from the DC power supply are tightly connected to the 24 VDC + and - connections on the back of the screen.
2. Verify that there is 24 VDC at the 24 VDC + and - connections on the back of the touchscreen.
3. If the Operation LED does not light it means there is either no power to the touchscreen or the internal power supply has failed. Check the power source or replace panel.
4. If the LED turns RED and stays RED it means the touchscreen has failed and the panel must be replaced.
5. If the LED flashes RED and then turns GREEN this indicates normal operation. If the display does not light after 10 seconds see Blank Display section below. If the display lights, operation is normal.

If the display is blank...

1. Display indicates NO SCREEN for 3 seconds after power-up. There is no program installed.
2. Push the extreme upper left and lower left corners of the touchscreen. If there is no change and the screen remains blank, replace the panel. If the SETUP screen appears and the screen is hard to read, adjust the contrast. If the SETUP screen appears normal, there is no program installed.

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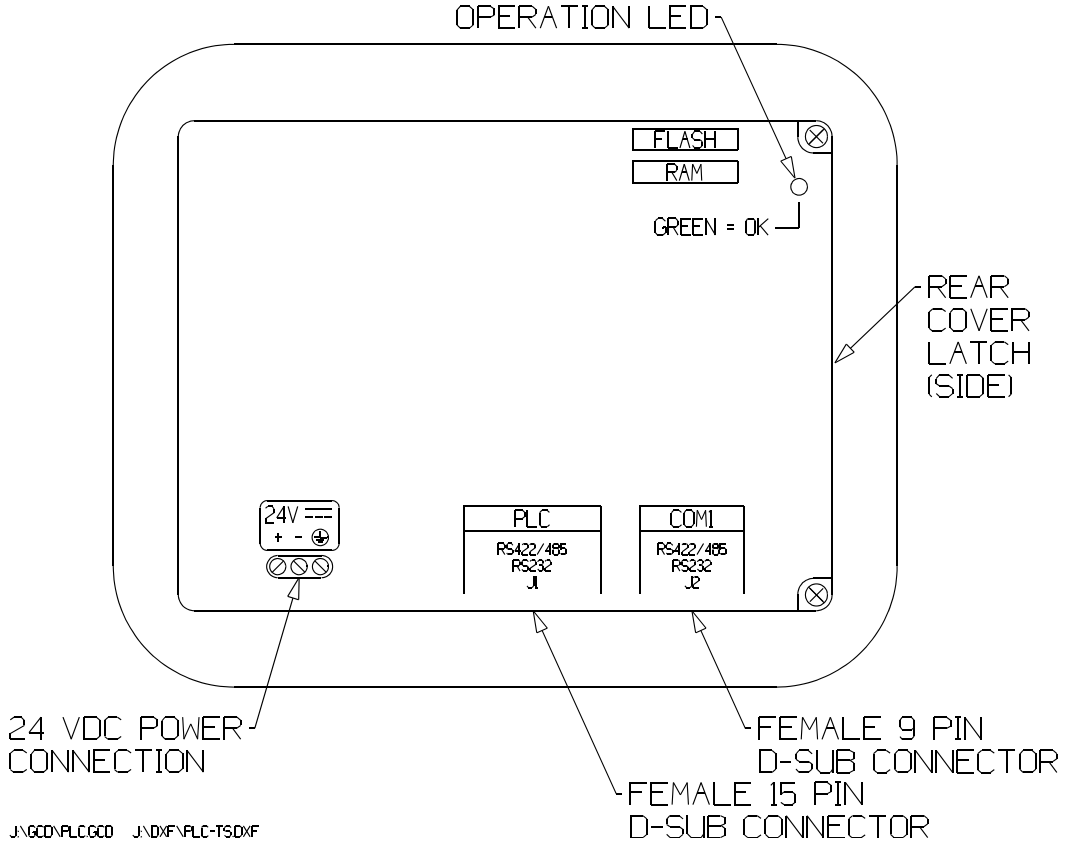
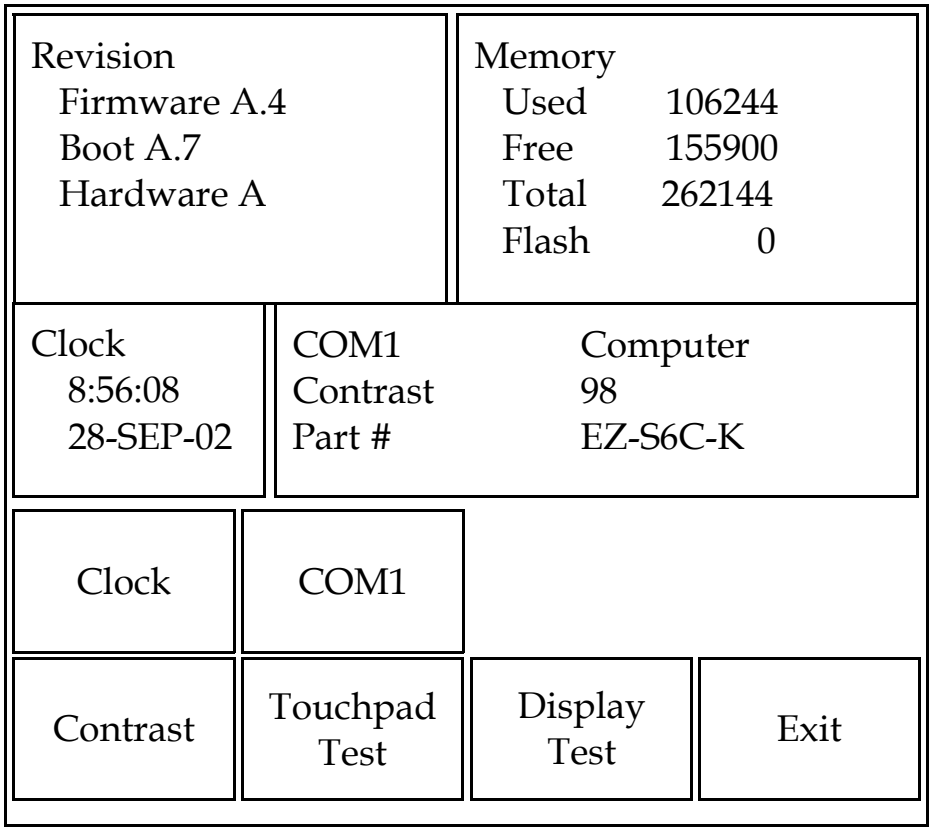
tstroubleshooting.wpd



Touchscreen Setup Screen

After the touchscreen is powered up, you may enter the Setup Mode by pressing the upper left and lower left touch cells on the panel screen. The following screen is displayed:



Information is displayed in the upper left hand corner about the current revision of the Firmware, Hardware and Boot program. Also shown is the amount of RAM memory - Used, Free and Total, and Flash Memory. Below that is displayed the time and date, whether the COM1 port is connected to a computer or a printer, and the current Contrast Setting. There are six buttons at the bottom of the screen. They are labeled Clock, COM1, Contrast, Touchpad Test and Exit. DO NOT USE THE CONTRAST, CLOCK OR COM1 BUTTONS! The COM1 setting will never change and the clock and contrast settings are accessed from screen 16 (Time, Date and Contrast).

Touchpad Cell Test Screen

0,0	0,1	0,2	0,3	0,4	0,5	0,6	0,7
1,0	1,1	1,2	1,3	1,4	1,5	1,6	1,7
2,0	2,1	2,2	2,3	2,4	2,5	2,6	2,7
3,0	3,1	3,2	3,3	3,4	3,5	3,6	3,7
4,0	4,1	4,2	4,3	4,4	4,5	4,6	4,7
5,0	5,1	5,2	5,3	5,4	5,5	5,6	Exit

J:\GCD\PLC.GCD J:\DXF\PLC-TSPD.DXF

Shown above is the Touchpad Cell Test Screen. There are 48 touch cells total (6x8). Each touch cell is numbered for reference. Press on each or any square to test that the cell is operating. It will beep and be highlighted after pressing to show that it has been tested. Press the cell again to deselect it. Press **Exit** in the lower right hand corner to quit.

Touchpad Display Test

J:\GCD\PLC.GCD J:\DXF\PLC-TSDT.DXF

The Display Test button is primarily used for production testing at the factory. Bands scroll horizontally and vertically across the screen during this test. It is used to check the pixel quality of the display before shipping the unit.

Exit Button

Press the Exit button to return to the Main Screen at any time.

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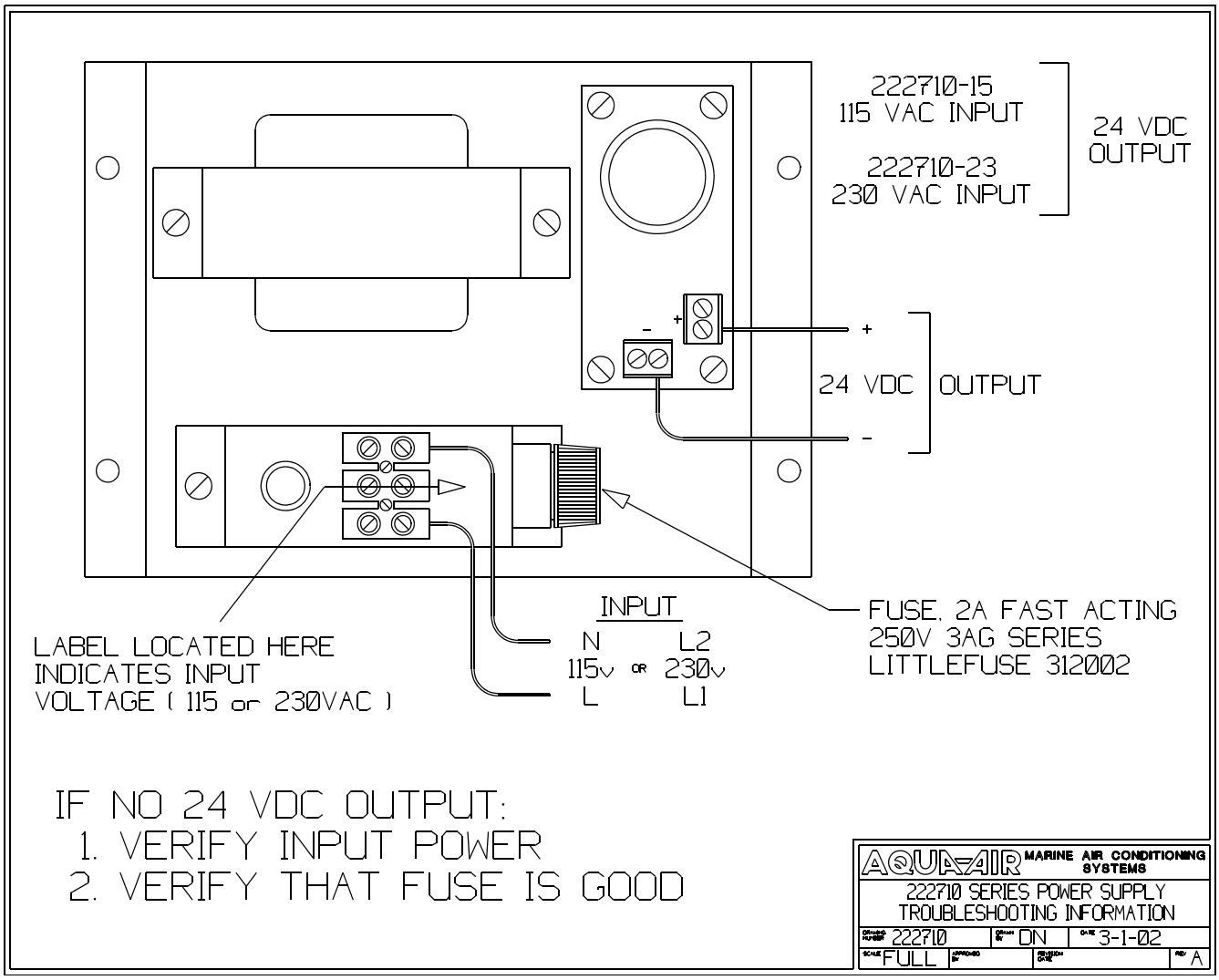
External Power Supply Troubleshooting



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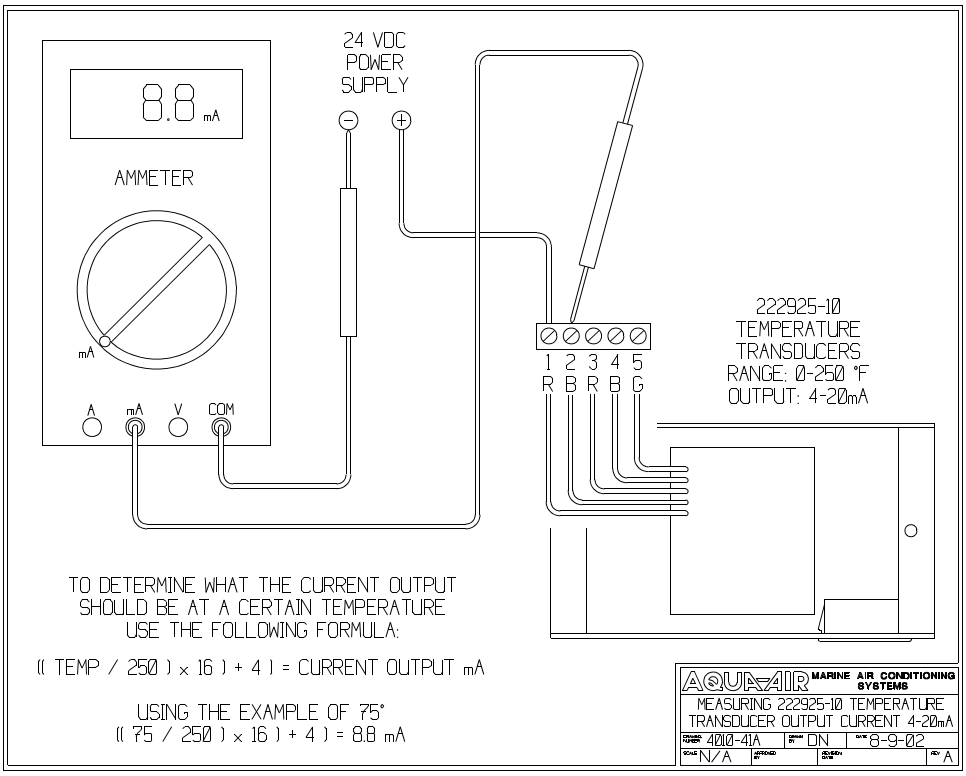
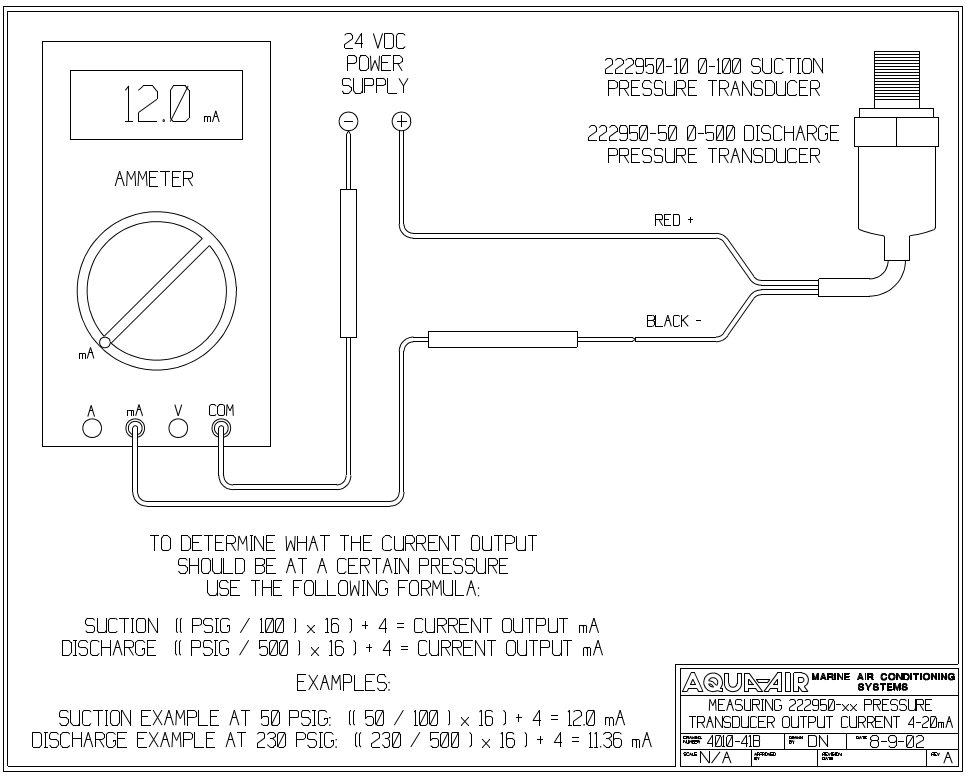
Temperature & Pressure
4-20 mA Transducer Troubleshooting



Temperature Transducer



Pressure Transducer

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PLC Alarm Code Listing

ALARM #	*ALARM CODE*	*ALARM DESCRIPTION*
1	ERROR CODE VALUE	ERROR CODE VALUE
2	PLC ERROR	PLC ERROR
3	PUMP STARTER FAULT	PUMP STARTER OVERLOAD FAULT
4	C/W FLOW FAULT	FLOW SWITCH FAULT
5	H/W FLOW FAULT	HOT WATER CIRCUIT FLOW SWITCH FLT
6	FRZ FAULT 1	FREEZE THERMOSTAT FAULT 1
7	FRZ FAULT 2	FREEZE THERMOSTAT FAULT 2
8	FRZ FAULT 3	FREEZE THERMOSTAT FAULT 3
9	FRZ FAULT 4	FREEZE THERMOSTAT FAULT 4
10	FRZ FAULT 5	FREEZE THERMOSTAT FAULT 5
11	FRZ FAULT 6	FREEZE THERMOSTAT FAULT 6
12	INV FAULT 1	INVERTER FAULT 1
13	INV FAULT 2	INVERTER FAULT 2
14	INV FAULT 3	INVERTER FAULT 3
15	INV FAULT 4	INVERTER FAULT 4
16	INV FAULT 5	INVERTER FAULT 5
17	INV FAULT 6	INVERTER FAULT 6
18	LPS1 FAULT	LOW REFRIGERANT PRESSURE CHILLER 1
19	LPS2 FAULT	LOW REFRIGERANT PRESSURE CHILLER 2
20	LPS3 FAULT	LOW REFRIGERANT PRESSURE CHILLER 3
21	LPS4 FAULT	LOW REFRIGERANT PRESSURE CHILLER 4
22	LPS5 FAULT	LOW REFRIGERANT PRESSURE CHILLER 5
23	LPS6 FAULT	LOW REFRIGERANT PRESSURE CHILLER 6
24	HPS1 FAULT	HIGH REFRIGERANT PRESS. CHILLER 1
25	HPS2 FAULT	HIGH REFRIGERANT PRESS. CHILLER 2
26	HPS3 FAULT	HIGH REFRIGERANT PRESS. CHILLER 3
27	HPS4 FAULT	HIGH REFRIGERANT PRESS. CHILLER 4
28	HPS5 FAULT	HIGH REFRIGERANT PRESS. CHILLER 5
29	HPS6 FAULT	HIGH REFRIGERANT PRESS. CHILLER 6
30	CTO1 FAULT	COMPRESSOR STARTER OVERLOAD 1
31	CTO2 FAULT	COMPRESSOR STARTER OVERLOAD 2
32	CTO3 FAULT	COMPRESSOR STARTER OVERLOAD 3
33	CTO4 FAULT	COMPRESSOR STARTER OVERLOAD 4
34	CTO5 FAULT	COMPRESSOR STARTER OVERLOAD 5
35	CTO6 FAULT	COMPRESSOR STARTER OVERLOAD 6
36	HTT FAULT	HIGH TEMP THERMOSTAT FAULT

ALARM #	ALARM CODE	ALARM DESCRIPTION
37	FORCED RUN MODE	PLC CPU IS IN RUN MODE
38	FORCED STOP MODE	PLC CPU IS IN STOP MODE
39	CRITICAL ERROR	PLC CPU CRITICAL ERROR
40	BATTERY LOW	PLC CPU BATTERY LOW
41	PROGRAM MEMORY ERROR	PLC CPU PROGRAM MEMORY ERROR
42	I/O ERROR	PLC I/O ERROR
43	COMMUNICATIONS ERROR	PLC CPU COMMUNICATIONS ERROR
44	COMPRESSOR OVERLOAD 1	COMPRESSOR OVERLOAD 1
45	COMPRESSOR OVERLOAD 2	COMPRESSOR OVERLOAD 2
46	COMPRESSOR OVERLOAD 3	COMPRESSOR OVERLOAD 3
47	COMPRESSOR OVERLOAD 4	COMPRESSOR OVERLOAD 4
48	COMPRESSOR OVERLOAD 5	COMPRESSOR OVERLOAD 5
49	COMPRESSOR OVERLOAD 6	COMPRESSOR OVERLOAD 6
50	OIL PRESSURE FAULT 1	OIL PRESSURE FAULT 1
51	OIL PRESSURE FAULT 2	OIL PRESSURE FAULT 2
52	OIL PRESSURE FAULT 3	OIL PRESSURE FAULT 3
53	OIL PRESSURE FAULT 4	OIL PRESSURE FAULT 4
54	OIL PRESSURE FAULT 5	OIL PRESSURE FAULT 5
55	OIL PRESSURE FAULT 6	OIL PRESSURE FAULT 6

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