

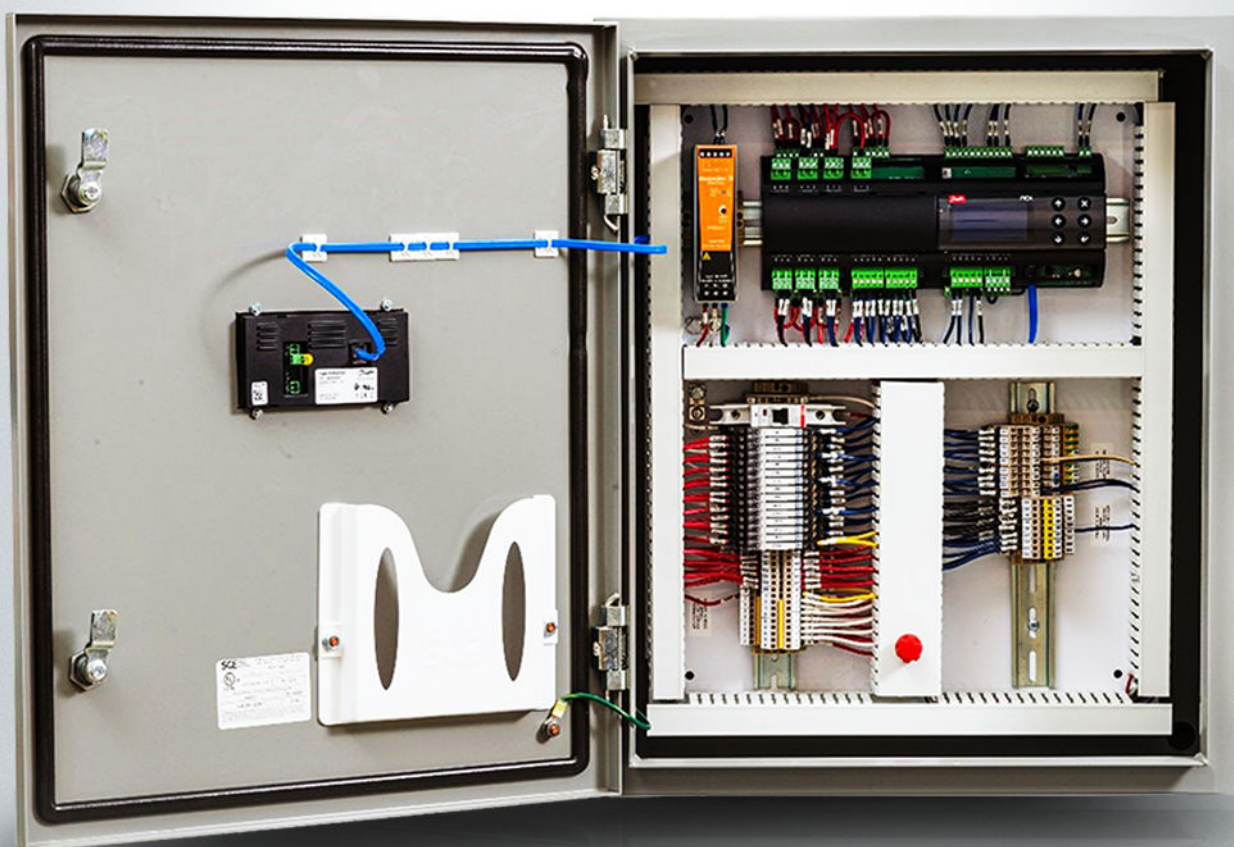
ENGINEERING
TOMORROW

Danfoss

Operating Guide

Condenser standard control Industrial Refrigeration Condenser Control Panels

Designed ready-to-mount-and-connect supply power, valves and sensors
needed for all standard industrial refrigeration condenser control applications



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Legal notice

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Product specification

Technical data and dimensions

Table 1: Technical data

Standards	UL/cUL listed	Units
Class of protection	Type 3R rated with front door display. Type 4 rated without front door display.	
Short circuit current rating	10 kA	kA
Ue Supply voltage	1 x 120 + N + PE	V AC
Ue Control voltage	120	V AC
Frequency	60	Hz
Dimensions (Height x Width x Depth)	24(H) x 20(W) x 8(D)	inches
Panel color – Painted steel	Painted ANSI 61 Gray outside. Painted white inside	
Temperature range ambient	-4 to +104	°F
Communication protocol	Modbus RTU, Modbus TCP, CANbus	
User interface	Optional LCD front door display. Controller LCD setup wizard	
Number of condenser fans controlled	1 to 8. Or 1 to 4 (optional)	
Number of condenser pumps controlled	1 to 4. Or 1 to 8 (optional)	

Ordering

Table 2: Ordering

Description	Front-door display	Code
Condenser Standard Control Panel – Painted Steel (Type 4)		128F0246
Condenser Standard Control Panel – Painted Steel (Type 3R)	■	128F0215
Condenser Standard Control Panel – Stainless Steel (Type 4)		128F0247
Condenser Standard Control Panel – Stainless Steel (Type 3R)	■	128F0223

NOTE:

This IOM document is dedicated to Condenser Standard Panels only.

Please contact a Danfoss Sales representative for more information on customized versions.

Introduction

Condenser Standard Control Panel

The Danfoss Condenser Standard Control Panels are distributed control logic panels designed specifically for industrial refrigeration condenser control applications. The panels control condensers with up to 8 fans and up to 4 pumps. The condenser application software is easily setup and configured on your laptop or via the panel's display navigation hardware.

There is 50+ condenser control application options that cover most industrial refrigeration condenser control requirements e.g.

- Sump heater control
- Sump level input
- VFD alarm
- Emergency pressure control system input
- Fan vibration alarm
- Staged capacity regulation
- Wet bulb condenser temperature target
- High pressure override
- Pump freeze protection

Standard features for Standard Condenser Control Panels

- Designed ready-to-mount-and-connect supply power and sensors needed for all standard industrial refrigeration condenser control applications
- High quality standardized panel electrical components
- Rigorously tested control sequences and algorithms
- Well laid-out Type 4 rated panels (Type 3R when front door display used)
- Modbus RTU and TCP communication
- Standardized documentation

Customized Condenser Standard Control Panel

Application-specific, energy-efficient control algorithms in each panel, achieve optimal condenser control for safe, efficient, trouble-free condenser operation. Please note that condenser power components such as motor starter protection, drives and contactors are not components contained within the Condenser Standard Control Panels. Please contact a Danfoss sales representative for customized options such as:

- Panel 'Type' rating offering
- VFD offering
- Starter offering for water pumps
- Contactor offering for panel heaters
- Load reactor offering for VFDs
- Sensor offering

NOTE:

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Condenser Control

The Condenser standard Panel controller will monitor the discharge pressure to that of the adjustable setpoint and provide adjustable delays to outputs for energizing and de-energizing the configured pumps and fans. The pumps and fans can be configured to turn-on in any sequence to regulate the pressure.

For example:

- Step 1 = Fan 1
- Step 2 = Fan 2
- Step 3 = Pump 1
- Step 4 = Fan 3
- Step 5 = Fan 4
- Step 6 = Pump 2
- Step 7 = Fan 5
- Step 8 = Fan 6
- Step 9 = Pump 3
- Step 10 = Fan 7
- Step 11 = Fan 8
- Step 12 = Pump 4

Panel Terminal Overview For Field Wiring

Table 3: Overview For Field Wiring

Terminal	Description	Comment
CB1	Power supply: 120 V AC/60 HZ/1-PH Source	H & N. Ground terminal
CR1-DI1	Sump level float	250 V AC/6 A field wiring
CR2-DI2	VFD alarm (energized safe)	250 V AC/6 A field wiring
CR3-DI3	Fan #1 auxiliary	250 V AC/6 A field wiring
CR4-DI4	Fan #2 auxiliary	250 V AC/6 A field wiring
CR5-DI5	Fan #3 auxiliary	250 V AC/6 A field wiring
CR6-DI6	Fan #4 auxiliary	250 V AC/6 A field wiring
CR7-DI7	Pump #1 auxiliary	250 V AC/6 A field wiring
CR8-DI8	Pump #2 auxiliary	250 V AC/6 A field wiring
CR9-DI9	Pump #3 auxiliary	250 V AC/6 A field wiring
CR10-DI10	Pump #4 auxiliary	250 V AC/6 A field wiring
CR11-DI11	Pump/Fan #5 auxiliary	250 V AC/6 A field wiring
CR12-DI12	Pump/Fan #6 auxiliary	250 V AC/6 A field wiring
CR13-DI13	Pump/Fan #7 auxiliary	250 V AC/6 A field wiring
CR14-DI14	Pump/Fan #8 auxiliary	250 V AC/6 A field wiring
CR15-DI15	EPCS input	250 V AC/6 A field wiring
CR16-DI16	Condenser fan vibration alarm (energized safe)	250 V AC/6 A field wiring
CR17-DI17	For factory installed thermostat and low water cut off switch for water heater control	250 V AC/6 A field wiring
DO1	Alarm	Dry contacts for customer connection
DO2	Sump heater control	Dry contacts for customer connection
DO3	Fan #1 start/run signal	Dry contacts for customer connection
DO4	Fan #2 start/run signal	Dry contacts for customer connection
DO5	Fan #3 start/run signal	Dry contacts for customer connection
DO6	Fan #4 start/run signal	Dry contacts for customer connection
DO7	Pump #1 start/run signal	Dry contacts for customer connection
DO8	Pump #2 start/run signal	Dry contacts for customer connection
DO9	Pump #3 start/run signal	Dry contacts for customer connection
DO10	Pump #4 start/run signal	Dry contacts for customer connection
DO11	Pump/Fan #5 start/run signal	Dry contacts for customer connection
DO12	Pump/Fan #6 start/run signal	Dry contacts for customer connection
DO13	Pump/Fan #7 start/run signal	Dry contacts for customer connection
DO14	Pump/Fan #8 start/run signal	Dry contacts for customer connection
AI1	Discharge pressure sensor 0–1000 psig	24 V 4–20 mA signal
AI2	Ambient temperature sensor	2-wire RTD = PT1000
AI3	Sump water temperature sensor	2-wire RTD = PT1000
AI4	Humidity sensor 0–100%	24 V 4–20 mA signal
AI5	Sump water level sensor – ratiometric – 0-138"	0.5 V DC–4.5 V DC
AO1	Speed control signal to VFD fan bank #1	0–10 V
AO2	Speed control signal to VFD fan bank #2	0–10 V
AO3	Speed control signal to VFD fan bank #3	0–10 V
AO4	Speed control signal to VFD fan bank #4	0–10 V
AO5	Speed control signal to VFD fan bank #5	0–10 V
AO6	Speed control signal to VFD fan bank #6	0–10 V

I/O Description

Digital INPUTS:

D11 (CR1): Sump Level Float

If employed for the sump, when input is energized, the water level in the basin is sufficient enough to turn on the heater if below heater low temperature setpoint. Sump makeup valve (DO15) is 'OFF'. When input is de-energized, the sump heater will turn 'OFF' no matter the what the temperature is, and the sump makeup valve (DO15) will turn 'ON'. Ensure parameter SMU = 0 or 2. If equal '2', inverts polarity of DI1.

D12 (CR2): Variable Frequency Drive Alarm

Input is energized under normal operating conditions of the VFD (variable frequency drive). A VFD alarm is issued when this input is de-energized and is displayed in active alarms on the controller. The VFD Alarm is automatically reset when input is re-energized. Multiple VFD alarms (N.C contacts) can be connected in series for alarm notification. Removal of jumper wire is required for use with VFD alarm. See electrical drawing.

D13 (CR3): Fan #1 Aux Run Contacts

This input must be energized for Fan #1 to run. Normally wired through an auxiliary contact on the motor starter. If at any time it drops out or is de-energized, a "Fan1 Aux Alarm" will be issued after the time set in parameter "Time Delay Aux Alarm" and the Fan will be shutdown. A manual reset of Aux alarm is required before the Fan can be re-energized.

D14 (CR4): Fan #2 Aux Run Contacts

This input must be energized for Fan #2 to run. Normally wired through an auxiliary contact on the motor starter. If at any time it drops out or is de-energized, a "Fan2 Aux Alarm" will be issued after the time set in parameter "Time Delay Aux Alarm" and the Fan will be shutdown. A manual reset of Aux alarm is required before the Fan can be re-energized.

D15 (CR5): Fan #3 Aux Run Contacts

This input must be energized for Fan #3 to run. Normally wired through an auxiliary contact on the motor starter. If at any time it drops out or is de-energized, a "Fan3 Aux Alarm" will be issued after the time set in parameter "Time Delay Aux Alarm" and the Fan will be shutdown. A manual reset of Aux alarm is required before the Fan can be re-energized.

D16 (CR6): Fan #4 Aux Run Contacts

This input must be energized for Fan #4 to run. Normally wired through an auxiliary contact on the motor starter. If at any time it drops out or is de-energized, a "Fan4 Aux Alarm" will be issued after the time set in parameter "Time Delay Aux Alarm" and the Fan will be shutdown. A manual reset of Aux alarm is required before the Fan can be re-energized.

D17 (CR7): Pump #1 Aux Run Contacts

This input must be energized for Pump #1 to run. Normally wired through an auxiliary contact on the motor starter. If at any time it drops out or is de-energized, a "Pump #1 Aux Alarm" will be issued after the time set in parameter "Time Delay Aux Alarm" and the Fan will be shutdown. A manual reset of Aux alarm is required before the Fan can be re-energized.

D18 (CR8): Pump #2 Aux Run Contacts

This input must be energized for Pump #2 to run. Normally wired through an auxiliary contact on the motor starter. If at any time it drops out or is de-energized, a "Pump #2 Aux Alarm" will be issued after the time set in parameter "Time Delay Aux Alarm" and the Fan will be shutdown. A manual reset of Aux alarm is required before the Fan can be re-energized.

D19 (CR9): Pump #3 Aux Run Contacts

This input must be energized for Pump #3 to run. Normally wired through an auxiliary contact on the motor starter. If at any time it drops out or is de-energized, a "Pump #3 Aux Alarm" will be issued after the time set in parameter "Time Delay Aux Alarm" and the Fan will be shutdown. A manual reset of Aux alarm is required before the Fan can be re-energized.

D10 (CR10): Pump #4 Aux Run Contacts

Condenser Standard Control

This input must be energized for Pump #4 to run. Normally wired through an auxiliary contact on the motor starter. If at any time it drops out or is de-energized, a "Pump #4 Aux Alarm" will be issued after the time set in parameter "Time Delay Aux Alarm" and the Fan will be shutdown. A manual reset of Aux alarm is required before the Fan can be re-energized.

DI11 (CR11): Fan/Pump #5 Aux Run Contacts

This input must be energized for Fan#5 or Pump #5 to run. Normally wired through an auxiliary contact on the motor starter. If at any time it drops out or is de-energized, a "Fan #5 or Pump #5 Aux Alarm" will be issued after the time set in parameter "Time Delay Aux Alarm" and the pump will be shutdown. A manual reset of Aux alarm is required before the pump can be re-energized.

DI12 (CR12): Fan/Pump #6 Aux Run Contacts

This input must be energized for Fan#6 or Pump #6 to run. Normally wired through an auxiliary contact on the motor starter. If at any time it drops out or is de-energized, a "Fan #6 or Pump #6 Aux Alarm" will be issued after the time set in parameter "Time Delay Aux Alarm" and the pump will be shutdown. A manual reset of Aux alarm is required before the pump can be re-energized.

DI13 (CR13): Fan/Pump #7 Aux Run Contacts

This input must be energized for Fan #7 or Pump #7 to run. Normally wired through an auxiliary contact on the motor starter. If at any time it drops out or is de-energized, a "Fan #7 or Pump #7 Aux Alarm" will be issued after the time set in parameter "Time Delay Aux Alarm" and the pump will be shutdown. A manual reset of Aux alarm is required before the pump can be re-energized.

DI14 (CR14): Fan/Pump #8 Aux Run Contacts

This input must be energized for Fan #8 or Pump #8 to run. Normally wired through an auxiliary contact on the motor starter. If at any time it drops out or is de-energized, a "Fan #8 or Pump #8 Aux Alarm" will be issued after the time set in parameter "Time Delay Aux Alarm" and the pump will be shutdown. A manual reset of Aux alarm is required before the pump can be re-energized.

DI15 (CR15): EPCS – Emergency Pressure Control System

When this input is energized, all configured output stages will turn on to take action against a high pressure detection from the EPCS. This action will help bring the discharge pressure down rapidly to prevent a relief valve from letting go and releasing refrigerant into the facility or environment. Once de-energized, the pressure control will return to normal operation allowing the condenser stages to turn off normally. If using EPCS input, may optionally reverse polarity of DI15 to be energized safe in the INPUT/OUTPUT configuration parameter.

DI16 (CR16): Condenser Fan Vibration Alarm

This input is energized under normal operation from the condenser fan(s) vibration normally closed contacts (connected in series if more than one fan). A "Vibration Fan" alarm will be issued when input is de-energized. This alarm will also activate the general alarm output DO1. It will also be listed in the "active alarms" menu parameter. When this input is re-energized, the alarm will reset automatically and DO1 will de-activate. Removal of jumper wire is required for use with VFD alarm. See electrical drawing.

Digital OUTPUTS:

DO1: General Alarm

Output is energized on any alarm. Output is de-energized when all active alarms are cleared and reset.

DO2: Sump Heater Control

Controls the sump heater. Output is energized when water temperature is below parameter "Sump Water Temp ON SP" and water level (inches) is above parameter "Sump Hi Water Level Heater ON SP" or if employing a float switch, DI 1 is energized. Output will de-energize If water level falls below parameter "Sump Lo Water Level Heater OFF SP" temperature or if employing a float switch, DI 1 is de-energized or if water temperature rises above parameter "Sump Water Temp OFF SP".

DO3: Fan #1 Start

As configured in any stage capacity in parameters > Condenser Stage configuration, output will energize at stage capacity if condenser discharge pressure is above parameter "Condenser Pressure SP" + parameter "Stage band". Output will de-energize at stage capacity when discharge pressure is below "Condenser Pressure SP" + parameter "Stage band".

DO4: Fan #2 Start

As configured in any stage capacity in parameters > Condenser Stage configuration, output will energize at stage capacity if condenser discharge pressure is above parameter "Condenser Pressure SP" + parameter "Stage band". Output will de-energize at stage capacity when discharge pressure is below "Condenser Pressure SP" + parameter "Stage band".

DO5: Fan #3 Start

As configured in any stage capacity in parameters > Condenser Stage configuration, output will energize at stage capacity if condenser discharge pressure is above parameter "Condenser Pressure SP" + parameter "Stage band". Output will de-energize at stage capacity when discharge pressure is below "Condenser Pressure SP" + parameter "Stage band".

DO6: Fan #4 Start

As configured in any stage capacity in parameters > Condenser Stage configuration, output will energize at stage capacity if condenser discharge pressure is above parameter "Condenser Pressure SP" + parameter "Stage band". Output will de-energize at stage capacity when discharge pressure is below "Condenser Pressure SP" + parameter "Stage band".

DO7: Pump #1 Start

As configured in any stage capacity in parameters > Condenser Stage configuration, output will energize at stage capacity if condenser discharge pressure is above parameter "Condenser Pressure SP" + parameter "Stage band". Output will de-energize at stage capacity when discharge pressure is below "Condenser Pressure SP" + parameter "Stage band".

DO8: Pump #2 Start

As configured in any stage capacity in parameters > Condenser Stage configuration, output will energize at stage capacity if condenser discharge pressure is above parameter "Condenser Pressure SP" + parameter "Stage band". Output will de-energize at stage capacity when discharge pressure is below "Condenser Pressure SP" + parameter "Stage band".

DO9: Pump #3 Start

As configured in any stage capacity in parameters > Condenser Stage configuration, output will energize at stage capacity if condenser discharge pressure is above parameter "Condenser Pressure SP" + parameter "Stage band". Output will de-energize at stage capacity when discharge pressure is below "Condenser Pressure SP" + parameter "Stage band".

DO10: Pump #4 Start

As configured in any stage capacity in parameters > Condenser Stage configuration, output will energize at stage capacity if condenser discharge pressure is above parameter "Condenser Pressure SP" + parameter "Stage band". Output will de-energize at stage capacity when discharge pressure is below "Condenser Pressure SP" + parameter "Stage band".

DO11: Fan/Pump #5 Start

As configured in any stage capacity in parameters > Condenser Stage configuration, output will energize at stage capacity if condenser discharge pressure is above parameter "Condenser Pressure SP" + parameter "Stage band". Output will de-energize at stage capacity when discharge pressure is below "Condenser Pressure SP" + parameter "Stage band". Output will also de-energize when outdoor air temperature is below parameter "Low Ambient SP"

DO12: Fan/Pump #6 Start

As configured in any stage capacity in parameters > Condenser Stage configuration, output will energize at stage capacity if condenser discharge pressure is above parameter "Condenser Pressure SP" + parameter "Stage band". Output will de-energize at stage capacity when discharge pressure is below "Condenser Pressure SP" + parameter "Stage band". Output will also de-energize when outdoor air temperature is below parameter "Low Ambient SP"

DO13: Fan/Pump #7 Start

As configured in any stage capacity in parameters > Condenser Stage configuration, output will energize at stage capacity if condenser discharge pressure is above parameter "Condenser Pressure SP" + parameter "Stage band". Output will de-energize at stage capacity when discharge pressure is below "Condenser Pressure SP" + parameter "Stage band". Output will also de-energize when outdoor air temperature is below parameter "Low Ambient SP"

DO14: Fan/Pump #8 Start

Condenser Standard Control

As configured in any stage capacity in parameters > Condenser Stage configuration, output will energize at stage capacity if condenser discharge pressure is above parameter "Condenser Pressure SP" + parameter "Stage band". Output will de-energize at stage capacity when discharge pressure is below "Condenser Pressure SP" + parameter "Stage band". Output will also de-energize when outdoor air temperature is below parameter "Low Ambient SP"

DO15: Sump Makeup Valve

Output will energize when Sump Float DI1 is de-energized and for a period of time set in parameter "VD1" or if using a pressure switch for water level sensing according to parameter "SMO".

Analog INPUTS:

AI1: Discharge Pressure Sensor

Sensor measures the discharge pressure and outputs a 4–20 mA linear signal across its range to this input.

AI2: Outdoor Ambient Temperature RTD

Disabled by default, the PT1000 RTD measures the ambient air temperature at the condenser and outputs linear resistance across its range to this input. 32 °F = 1000 ohms; 70 °F = 1082 ohms.

Must be enabled for wet bulb functionality.

AI3: Sump Water Temperature RTD

Enabled by default, the PT1000 RTD measures the temperature of the water in the basin and outputs a linear resistance across its range to this input. 32 °F = 1000 ohms; 70 °F = 1082 ohms. Set low and high temperature setpoints for turning on and off the water heater.

AI4: Humidity Sensor

Optional. Disabled by default, the sensor measures the humidity level at the condenser and outputs 4–20 mA linear signal across its range (0–100%) to this his input. Must be enabled for wet bulb functionality.

AI5: Sump Water Pressure Sensor

Optional. Sensor measures the water pressure in the sump basin and outputs a .5–4.5 V ratio-metric signal across its range with a 5 V supply to this input. Used for water makeup and heater control. Recommended - LM sensor LM31-F-005PG or equivalent. Optionally, may use other sensors with higher pressure ranges (higher water levels), but output is 5 V maximum with 5 V supply. Set parameter SMU = 1 or P.T to enable.

Analog OUTPUTS:

AO1 to AO6: VFD Fan Speed - Bank #1 to #6

0–10V output, that is connected to a variable frequency drive (VFD) AI that controls the fan(s) motor speed.

General Operation Principals

Sequencer - Stage Capacity regulation

The cut-in capacity is controlled by a signal from the discharge pressure sensor and the target reference point that includes a set stage band.

In the stage (NZ) or dead band, no capacity increase, or decrease will occur. In other words, no pumps or fans will be energized. When the pressure drops above or below the stage band, the controller will increase or decrease fan speed to regulate pressure, if after some time it cannot get discharge pressure to target pressure, a cut-in or cut-out of another stage (fan or pump depending on config) will occur.

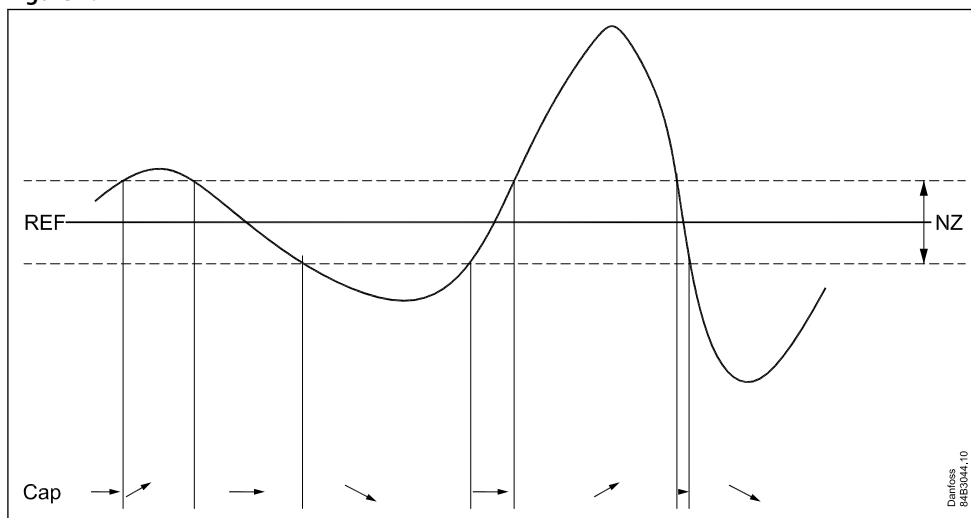
When the pressure is higher than the "Target + Stage band" cut-in of a pump or fan is permitted.

When the pressure is lower than the "Target - Stage band" cut-out of a pump or fan is permitted.

When the pressure is within the Stage band, process regulation will continue with the currently activated equipment (fans or pumps).

12 Stages can be configured, with a maximum of (8) fans and (4) pumps or (8) pumps and (4) fans.

Figure 1:



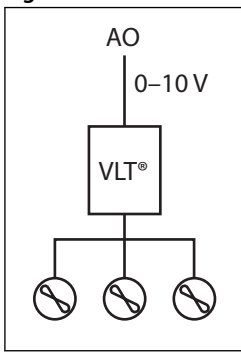
Fan control

The fans are staged on incrementally using the controller’s relay outputs and are speed-controlled via the controller’s analog output 0–10 V. Speed control is varied 0–100% of VFD min-max reference according to the stage capacity and the PI (proportional – Integral) controlled output. The PI is active (speed control) when condenser discharge pressure is outside of stage band thresholds.

User has ability to adjust the minimum and maximum fan speed to the VFD, although all the fans will run at the same adjustable speed according to the (PI) when more or less capacity is required to control the discharge pressure. Fan speed will increase for more capacity and decrease for less capacity. There are a total of (6) available analog outputs to use for VFD(s) speed control.

Set minimum (V1L) and maximum (V1H) speed in Parameters > Fan Speed Control. Default minimum speed is 20% and maximum default is 100%.

Figure 2:



Sump Water Heater Control

If employing the water pressure transmitter, the sump heater will turn ON when the water level in column exceeds sump water level set in parameter “Sump Water Heater - Water Level ON” and water temperature is below the temperature set in parameter “Sump Water Heater - Temp ON”. The sump heater will turn OFF when water temperature falls below the value set in parameter “Sump Water Heater - Temp OFF” or when temperature rises above value set in parameter “Sump Water Heater -Temp OFF”. If employing a float switch and water temperature is below setpoint, heater turns on when the float switch is closed and water level is OK. If float switch is de-energized or breaks open, water heater will turn off.

Sump Water Makeup - Solenoid Valve Control

If employing sump float switch, sump solenoid valve DO15 will energize when DI1 is de-energized and after a period of time set in parameter VD1 “Sump makeup valve delay ON”. Accordingly, sump solenoid valve will de-energize when sump float is re-energized on DI1 and after a period of time set in parameter VD2 “Sump Makeup valve Delay OFF”. If employing a water level pressure sensor, sump solenoid valve D015 will energize or open when water level in column drops below water level set in parameter SMO and will de-energize or close when water level in column rises above water level set in parameter SMC.

Wet-Bulb Condenser Pressure Target Option with Approach

Wet-bulb temperature is the lowest temperature a portion of air can acquire by evaporative cooling only. When air is at its maximum (100%) humidity, the wet-bulb temperature is equal to the normal air temperature (dry-bulb temperature). As the humidity decreases, the wet-bulb temperature becomes lower than the normal air temperature. In essence there are only two variables that need to be known, air temperature or dry-bulb temperature which is the temperature given by a thermometer not exposed to direct sunlight, and humidity, the ratio of how much water vapor is in the air to how much it could contain at a given temperature. So, by translating this to a pressure, it gives the lowest pressure an evaporative condenser can achieve. Wet-bulb control makes sure that the target pressure is achievable for the current ambient conditions. For example, if the setpoint is 150 PSI but the temperature and humidity are high the best the evaporative condenser can do is 170 PSI. Without wet-bulb control the system will turn everything on in an attempt to hit the 150 PSI. With wet-bulb control, the system will adjust the target to something that is reachable and then control based on the actual load on the system. The wet-bulb approach setpoint parameter is used to put in an offset from the calculated wet-bulb temperature so as to ensure that the system can make that pressure.

High Pressure Override (HPO)

High Pressure Override - When the discharge pressure rises above the “High Pressure Override SP” in parameters, all of the configured fans and pumps in the sequencer will stage on in shorter cycles to try and bring the pressure down. Pumps will turn on regardless of outdoor ambient temperature. This feature is commonly used at startup of the system when high pressure is present.

Application

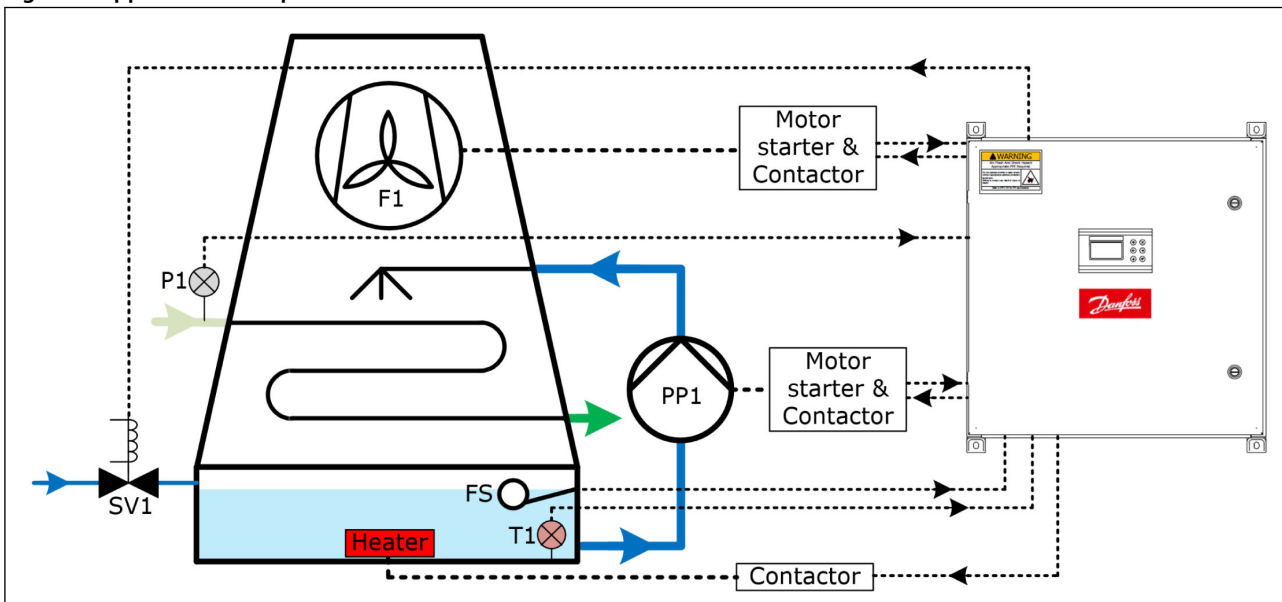
Examples of Condenser control applications

Application example 1: Small Evaporative Condenser

In Fig. 3 below, the Condenser Standard Panel the following is controlled:

- 1 x Fan: On/off fan control energized when the discharge pressure is above the condensing pressure setpoint. A motor starter auxiliary contact (not part of the standard panel offering) monitors if the energized. An alarm will be activated if at any time the power drops out and the fan will be shutdown
- 1 x Pump: On/off pump control energized when the discharge pressure is below the condensing pressure setpoint. A motor starter auxiliary contact (not part of the standard panel offering) monitors if the energized. An alarm will be activated if at any time the power drops out and the pump will be shutdown
- Freely programmable sequencing of fan-pump stages
- Discharge pressure transmitter (P1)
- Water temperature heater
- Water temperature sensor (T1)
- Sump level float switch (FS) that will allow energizing of the water heater

Figure 3: Application example 1



Panel terminal	Description
DO2	Sump Heater Control. Controls the sump heater. Output is energized when water temperature is below parameter "Sump Water Temp ON" and water level (inches) is above parameter "Sump Hi Water Level Heater ON" or if employing a float switch, DI 1 is energized. Output will de-energize if water level falls below parameter "Sump Lo Water Level Heater OFF" temperature or if employing a float switch, DI 1 is de-energized or if water temperature rises above parameter "Sump Water Temp OFF".
DO3	Fan #1 (F1) Start. As configured in any stage capacity in parameters > Condenser Stage configuration, output will energize at stage capacity if condenser discharge pressure is above parameter "Condenser Pressure SP" + parameter "Stage band". Output will de-energize at stage capacity when discharge pressure is below "Condenser Pressure SP" + parameter "Stage band".
DO7	Pump #1 (P1) Start. As configured in any stage capacity in parameters > Condenser Stage configuration, output will energize at stage capacity if condenser discharge pressure is above parameter "Condenser Pressure SP" + parameter "Stage band". Output will de-energize at stage capacity when discharge pressure is below "Condenser Pressure SP" + parameter "Stage band".
CR1 (DI1)	Sump level float switch. When the sump level float switch FS input is energized, the water level in the basin is sufficient enough to turn on the heater if below heater low temperature setpoint. Sump makeup valve SV1 (DO15) is 'OFF'. When input is de-energized, the sump heater will turn 'OFF' no matter the what the temperature is, and the sump makeup valve (DO15) will turn 'ON'. Ensure parameter SMU = 0 or 2.
CR3 (DI3)	Fan #1 Aux Run Contacts. This input must be energized for Fan F1 to run. Normally wired through an auxiliary contact on the motor protection starter. If at any time it drops out or is de-energized, a "Fan1 Aux Alarm" will be issued after the time set in parameter "Time Delay Aux Alarm" and the Fan will be shutdown. A manual reset of Aux alarm is required before the Fan can be re-energized.

Condenser Standard Control

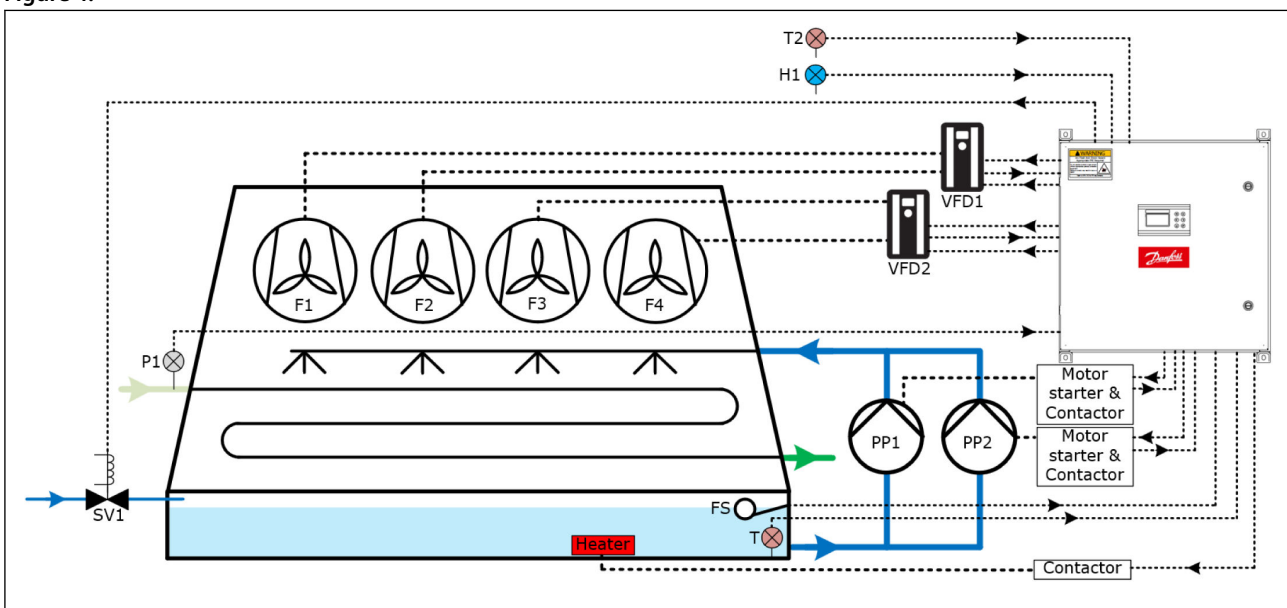
Panel terminal	Description
CR7 (DI7)	Pump #1 Aux Run Contacts. This input must be energized for Pump PP1 to run. Normally wired through an auxiliary contact on the motor protection starter. If at any time it drops out or is de-energized, a "Pump #1 Aux Alarm" will be issued after the time set in parameter "Time Delay Aux Alarm" and the Fan will be shutdown. A manual reset of Aux alarm is required before the Fan can be re-energized.
AI1	Discharge Pressure Sensor: Sensor measures the discharge pressure and outputs a 4–20 mA linear signal across its range to this input
AI3	Sump Water Temperature RTD – Enabled by default, the PT1000 RTD measures the temperature of the water in the basin and outputs a linear resistance across its range to this input. 32 °F = 1000 ohms; 70 °F = 1082 ohms. Set low and high temperature setpoints for turning on and off the water heater

Application example 2: Larger Evaporative Condenser

In Fig. 4 below, in the Condenser Standard Panel the following is controlled:

- 4 x Fans with 2 x VFDs (not part of the standard panel offering): (2) 0–10 V modulating signals. Fan bank 1 output to VFD1 and Fan bank 2 output to VFD2. Stage VFD1 on when the discharge pressure is above the condensing pressure setpoint. Fan1 start/run to VFD 1 run input with Fan bank 1 modulating voltage output to VFD1 for speed control. If after a certain amount of time, pressure remains above setpoint, Fan 2 will stage on and start VF2 with a Fan bank 2 modulating voltage output for speed control. If an alarm occurs on any VFD's, the fan will be shut down and an alarm will be issued on the controller. An auxiliary contact on the VFD to the controller will monitor if VFD is running or not
- 2 x Pumps: On/off pump control energized when the discharge pressure is below the condensing pressure setpoint. A motor starter auxiliary contact (not part of the standard panel offering) monitors if the energized. An alarm will be activated if at any time the power drops out and the pump will be shutdown
- Freely programmable sequencing of fan-pump stages.
- Discharge pressure transmitter (P1) for high pressure override function i.e. stage-on of fans and pumps in short cycles to attempt to bring the pressure down
- Water temperature heater
- Water temperature sensor (T1)
- Sump level float switch (FS) that will allow energizing of the water heater
- Outdoor ambient temperature (T2) – required for wet bulb control functions
- Outdoor humidity sensor (T2) – required for wet bulb control functions
- Wet bulb control function making sure that the target condensing pressure can be achieved by adjusting the target condensing pressure instead of excessive fan and pump usage
- Sump water makeup solenoid valve control: Activates when the sump float switch is deenergized after a user-defined period

Figure 4:



Condenser Standard Control

Panel terminal	Description
DO2	Sump Heater Control. Controls the sump heater. Output is energized when water temperature is below parameter "Sump Water Temp ON SP" and water level (inches) is above parameter "Sump Hi Water Level Heater ON SP" or if employing a float switch, DI 1 is energized. Output will de-energize if water level falls below parameter "Sump Lo Water Level Heater OFF SP" temperature or if employing a float switch, DI 1 is de-energized or if water temperature rises above parameter "Sump Water Temp OFF SP"
DO3	Fan #1 (F1 & F2) to VFD1 start/run DI. As configured in any stage capacity in parameters > Condenser Stage configuration, output will energize at stage capacity if condenser discharge pressure is above parameter "Condenser Pressure SP" + parameter "Stage band". Output will de-energize at stage capacity when discharge pressure is below "Condenser Pressure SP" + parameter "Stage band"
DO4	Fan #2 (F3 & F4) to VFD2 start/run DI. As DO3
DO7	Pump #1 (P1) Start. As configured in any stage capacity in parameters > Condenser Stage configuration, output will energize at stage capacity if condenser discharge pressure is above parameter "Condenser Pressure SP" + parameter "Stage band". Output will de-energize at stage capacity when discharge pressure is below "Condenser Pressure SP" + parameter "Stage band"
DO8	Pump #2 (P2) Start. As DO7
CR1 (DI1)	Sump level float switch. When the sump level float switch FS input is energized, the water level in the basin is sufficient enough to turn on the heater if below heater low temperature setpoint. Sump makeup valve SV1 (DO15) is 'OFF'. When input is de-energized, the sump heater will turn 'OFF' no matter the what the temperature is, and the sump makeup valve (DO15) will turn 'ON'. Ensure parameter SMU = 0 or 2. If equal '2', inverts polarity of DI1
CR2 (DI2)	Optional VFD fault/alarm connection. Note: VFD alarm contacts may be connected in series to this input so that an alarm will be issued if any VFD has a fault
CR3 (DI3)	Fan #1 Aux Run Contacts. This input must be energized for Fan F1 & F2 to run. Normally wired through an auxiliary contact on the VFD. If at any time it drops out or is de-energized, a "Fan1 Aux Alarm" will be issued after the time set in parameter "Time Delay Aux Alarm" and the Fan will be shutdown. A manual reset of Aux alarm is required before the Fan can be re-energized
CR4 (DI4)	Fan #2 Aux Run Contacts. This input must be energized for Fan F3 & F4 to run. As DI3
CR7 (DI7)	Pump #1 Aux Run Contacts. This input must be energized for Pump PP1 to run. Normally wired through an auxiliary contact on the motor starter. If at any time it drops out or is de-energized, a "Pump #1 Aux Alarm" will be issued after the time set in parameter "Time Delay Aux Alarm" and the Fan will be shutdown. A manual reset of Aux alarm is required before the Fan can be re-energized
CR8 (DI8)	Pump #2 Aux Run Contacts. This input must be energized for Pump PP2 to run. As DI7
AI1	Discharge Pressure Sensor: Sensor measures the discharge pressure and outputs a 4–20 mA linear signal across its range to this input
AI2	Outdoor Ambient Temperature RTD. Disabled by default, the PT1000 RTD measures the ambient air temperature at the condenser and outputs linear resistance across its range to this input. 32 °F = 1000 ohms; 70 °F = 1082 ohms. Must be enabled for wet bulb functionality
AI3	Sump Water Temperature RTD. Enabled by default, the PT1000 RTD measures the temperature of the water in the basin and outputs a linear resistance across its range to this input. 32 °F = 1000 ohms; 70 °F = 1082 ohms. Set low and high temperature setpoints for turning on and off the water heater
AI4	Humidity Sensor. Disabled by default, the sensor measures the humidity level at the condenser and outputs 4–20 mA linear signal across its range (0–100%) to this his input. Must be enabled for wet bulb functionality
AO1	VFD Fan Speed - Bank #1 – 0–10 V output, that is connected to a VFD's AI that controls the fan motors' (F1 & F2) speed
AO2	VFD Fan Speed - Bank #1 – 0–10 V output, that is connected to a VFD's AI that controls the fan motors' (F3 & F4) speed

Application example 3: Larger Condenser with fan-only

In Fig. 5 below, in the Condenser Standard Panel the following is controlled:

- 4 x Fans with 2 x VFDs (not part of the standard panel offering): (2) 0–10 V modulating signals. Fan bank 1 output to VFD1 and Fan bank 2 output to VFD2. Stage VFD1 on when the discharge pressure is above the condensing pressure setpoint. Fan1 start/run to VFD1 run input with Fan bank 1 modulating voltage output to VFD1 for speed control. If after a certain amount of time, pressure remains above setpoint, Fan 2 will stage on and start VF2 with a Fan bank 2 modulating voltage output for speed control. If an alarm occurs on any VFD's, the fan will be shut down and an alarm will be issued on the controller. An auxiliary contact on the VFD to the controller will monitor if VFD is running or not
- Freely programmable sequencing of fan stages
- Discharge pressure transmitter (P1) for high pressure override function i.e. stage-on of fans and in short cycles to attempt to bring the pressure down
- Emergency Pressure Control System (EPCS) input. When energized, this will run all fans at full speed to reduce the condensing pressure. After de-energizing, the discharge pressure control will return to normal
- Condenser fan vibration alarm. When de-energized, the general alarm (DI01) will also be activated, and a 'Vibration Alarm' will be issued

Condenser Standard Control

Figure 5: Application example 3

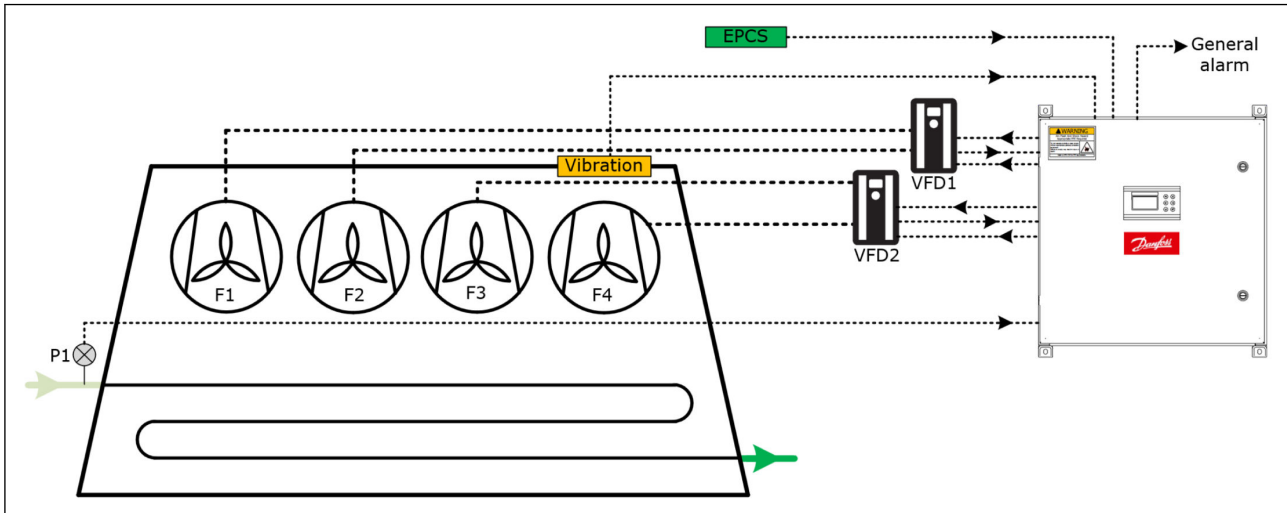


Table 4: Panel terminal description

Panel terminal	Description
DO1	General Alarm. Output is energized on any alarm. Output is de-energized when all active alarms are cleared and reset.
DO3	Fan #1 (F1 & F2) Start. As configured in any stage capacity in parameters > Condenser Stage configuration, output will energize at stage capacity if condenser discharge pressure is above parameter "Condenser Pressure SP" + parameter "Stage band". Output will de-energize at stage capacity when discharge pressure is below "Condenser Pressure SP" + parameter "Stage band"
DO4	Fan #2 (F3 & F4) Start. As DO3
CR3 (DI3)	Fan #1 Aux Run Contacts. This input must be energized for Fan F1 & F2 to run. Normally wired through an auxiliary contact on the VFD. If at any time it drops out or is de-energized, a "Fan1 Aux Alarm" will be issued after the time set in parameter "Time Delay Aux Alarm" and the Fan will be shutdown. A manual reset of Aux alarm is required before the Fan can be re-energized.
CR15 (DI15)	EPCS - Emergency Pressure Control System. When this input is energized, all the configured output stages will turn on to take action against a high pressure detection from the EPCS. This action will help bring the discharge pressure down rapidly to prevent a relief valve from letting go and releasing refrigerant into the facility or environment. Once de-energized, the pressure control will return to normal operation allowing the condenser stages to turn off normally. If using EPCS input, may optionally reverse polarity of DI15 to be energized safe in the INPUT/OUTPUT configuration parameter.
CR16 (DI16)	Condenser Fan Vibration Alarm. This input is energized under normal operation from the condenser fan(s) vibration normally closed contacts (connected in series if more than one fan). A "Vibration Fan" alarm will be issued when input is de-energized. This alarm will also activate the general alarm output DO1. It will also be listed in the "active alarms" menu parameter. When this input is re-energized, the alarm will reset automatically and DO1 will de-activate. Removal of jumper wire is required for use with VFD alarm. See electrical drawing.
AI1	Discharge Pressure Sensor: Sensor measures the discharge pressure and outputs a 4-20 mA linear signal across its range to this input
AO1	VFD Fan Speed - Bank #1 - 0-10 V output, that is connected to a VFD's AI that controls the fan motors' (F1 & F2) speed
AO2	VFD Fan Speed - Bank #1 - 0-10 V output, that is connected to a VFD's AI that controls the fan motors' (F3 & F4) speed

General alarms available

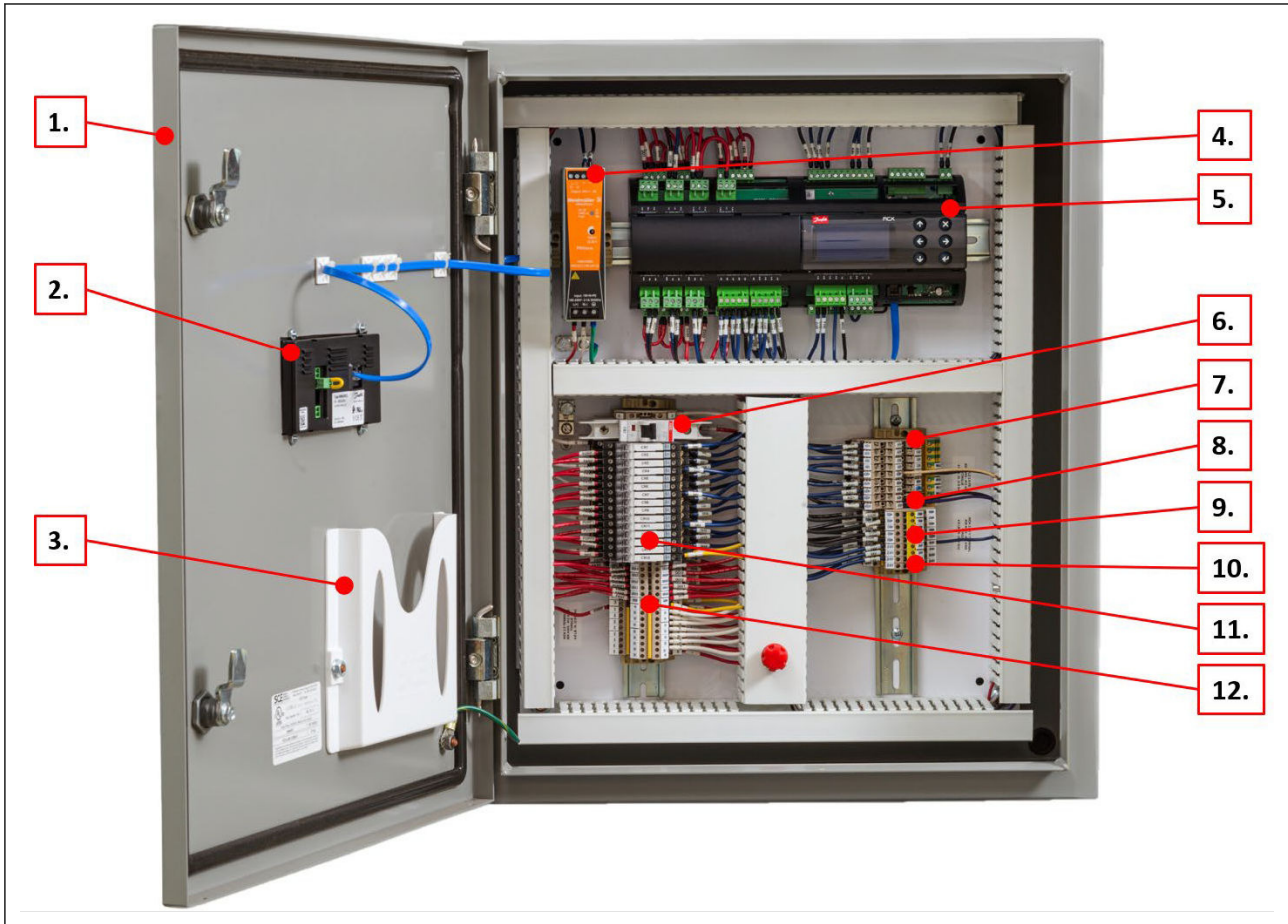
- If a sensor is enabled, a loss of signal from sensor will activate an alarm and be registered in “Active Alarms”
- Auxiliary relays or run contacts detect the running of a fan or pump
- Freeze Protection for pumps - An adjustable outdoor low-ambient temperature lockout to cut off pumps
- VFD alarm Input
- External Alarm Output
- High Pressure Override (HPO) Input
- Emergency Pressure Control System (EPCS) Input
- Condenser Fan Vibration Alarm Input
- Sump Make-up Valve control Output

Condenser Standard Panel Component layout

Condenser Standard Panel Component Layout

For comprehensive wiring details please refer to the detailed wiring diagram that is delivered complete with the Condenser standard Panels.

Figure 6: Standard Panel Component Layout



1	Type 4 rated for displayed model. Otherwise, customizable
2	Front door LCD display (back side visible only)
3	Wiring diagram holder
4	Power supply
5	Configurable controller with I/O
6	Miniature circuit breaker
7	#26 - #12 AWG AO terminals
8	#26 - #12 AWG AI terminals
9	#26 - #12 AWG COM terminals
10	#26 - #12 AWG 24 V DC terminals
11	#26 - #10 AWG and #26 - #12 120 V contact relays (DI/DO)
12	DO dry contacts for customer connections

Condenser Standard Panel Mounting Instructions

Figure 7: Standard Panel Mounting Instructions

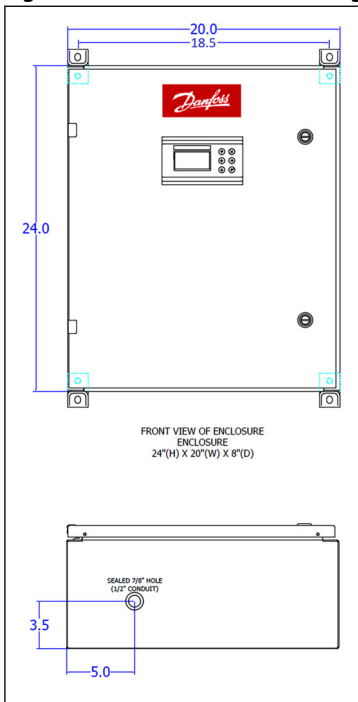
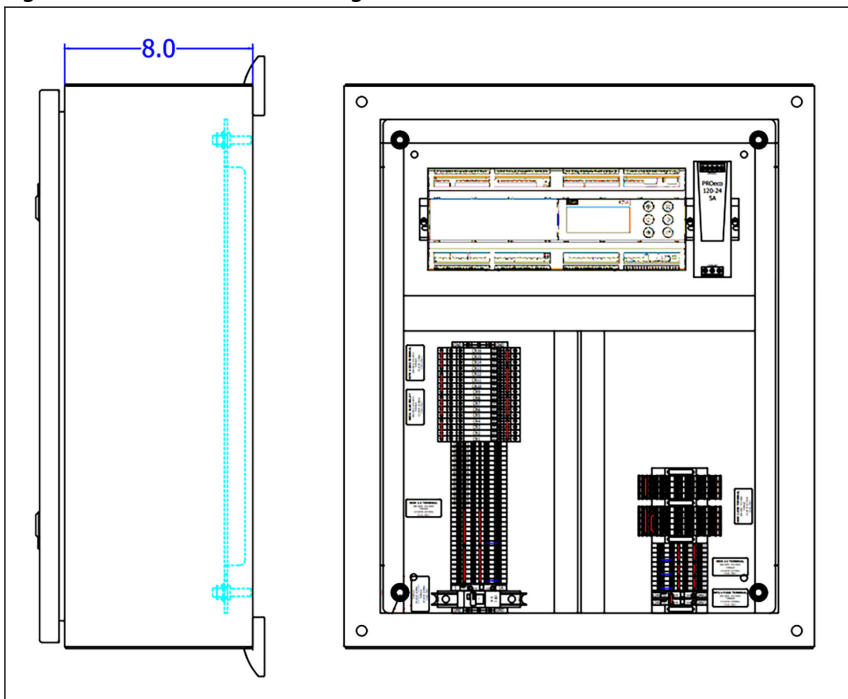


Figure 8: Standard Panel Mounting Instructions

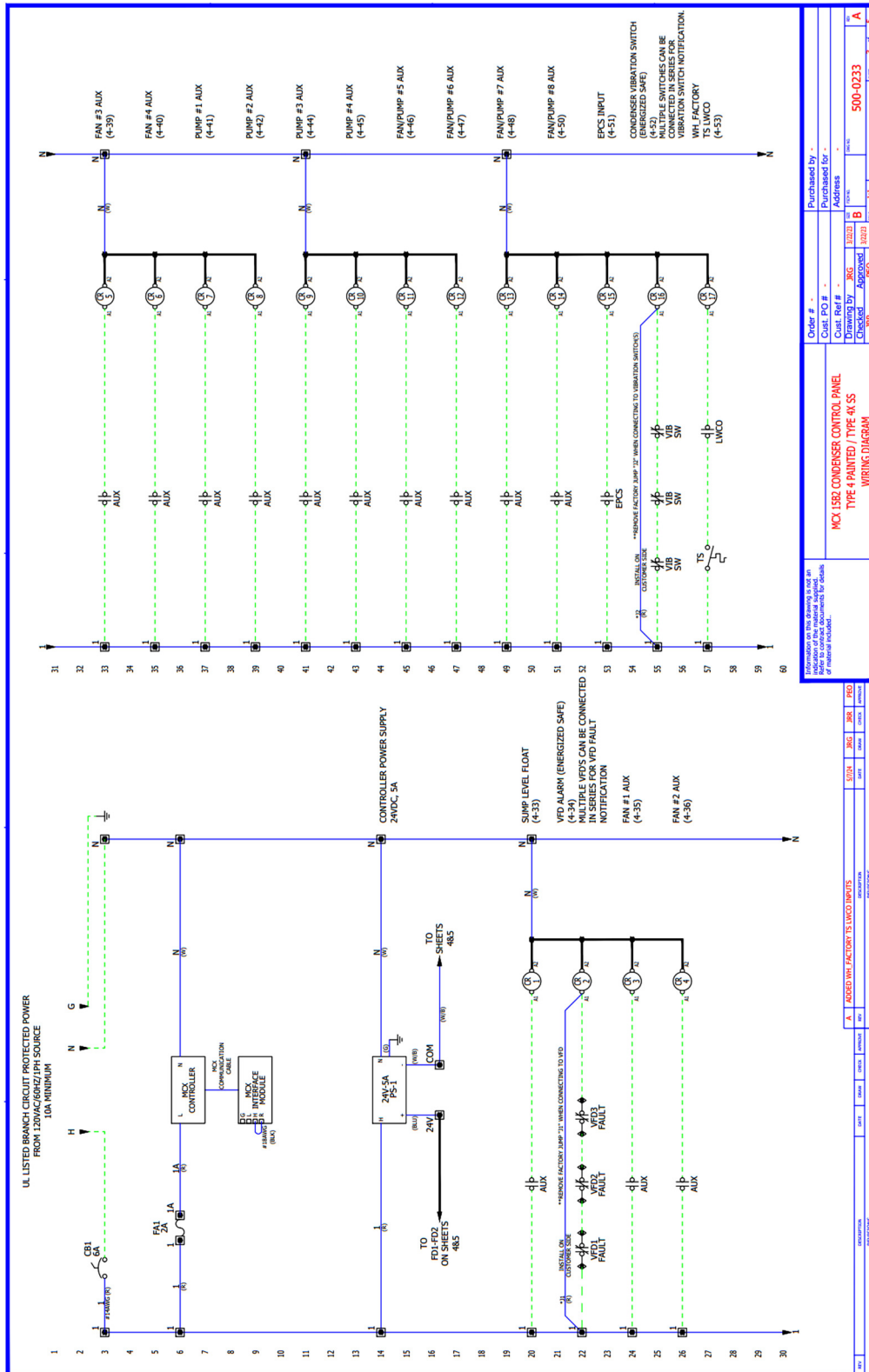


Condenser Standard Panel: External wiring considerations: Signal wiring and Fieldbus

- The wiring of Modbus RTU (RS485) must be carried out in accordance with the standard ANSI/TIA/EIA-485-A-1998. Galvanic separation shall be provided for segments crossing buildings. Common ground shall be used for all devices on the same network inclusive router, gateways etc. All bus connections in the cables are made with twisted pair wires. The recommended cable type for this is AWG 22/0.32 mm²
- If the cable length exceeds 1200 meters (1312 yards) a repeater must be inserted. One repeater must be added for every 32 controllers
- If the data communication cable runs through an electrically noisy environment which impairs the data signal, one or more repeaters must be added to stabilize the signal
- When configuring Modbus devices on the control bus, the highest device address that can be used is 120 (max 120 Modbus control devices in total)
- The wires are looped from device to device and must observe polarity. A is connected to A and B is connected to B
- The shield must be connected and complete a path from the device, all controllers, and any repeaters. The shield must not be connected to earth ground
- Remember to terminate the RS485 network following the last physical device

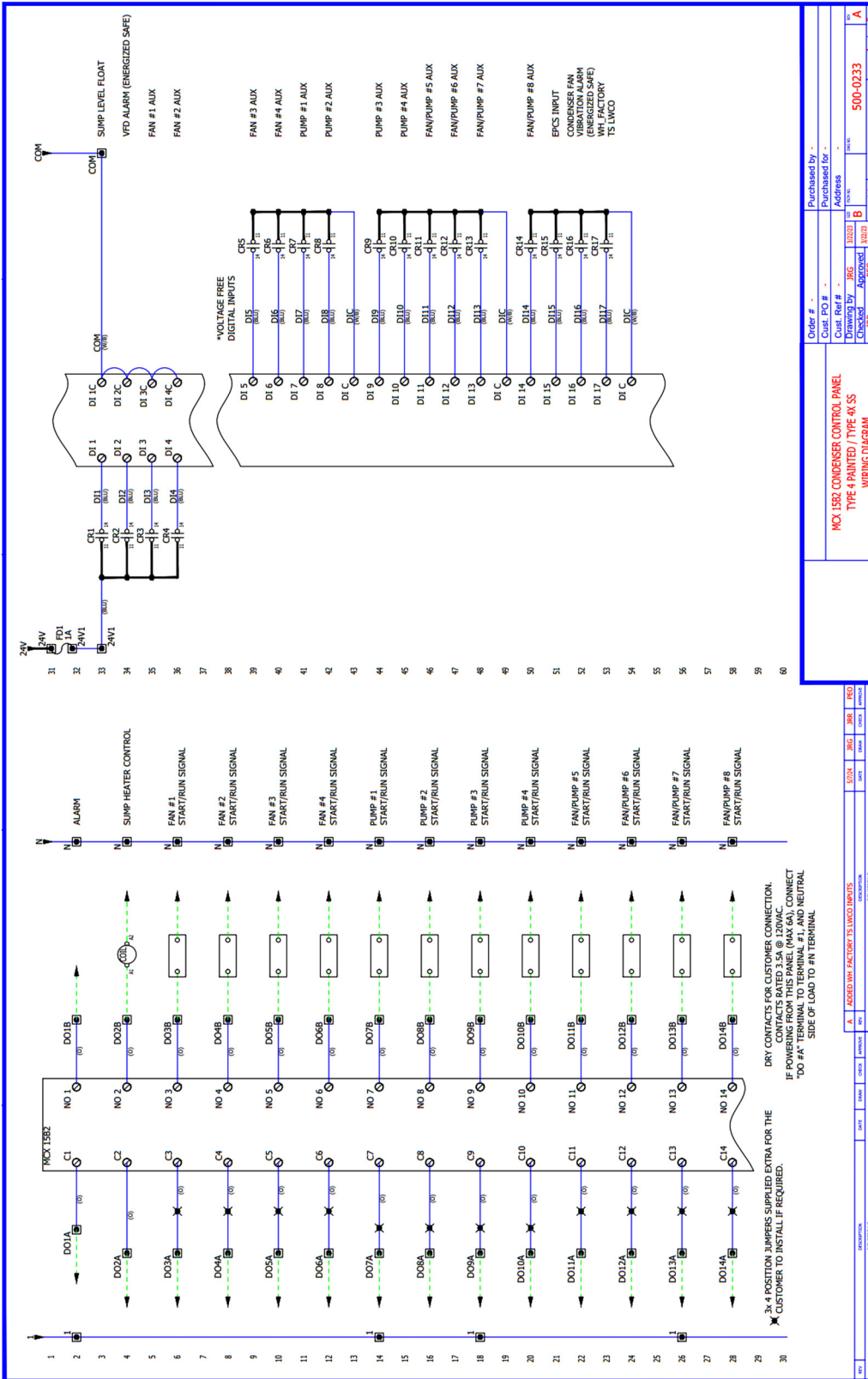
Condenser Standard Panel: Wiring Diagram – Power supply and Control Relays

Figure 9: Wiring Diagram – Power supply and Control Relays



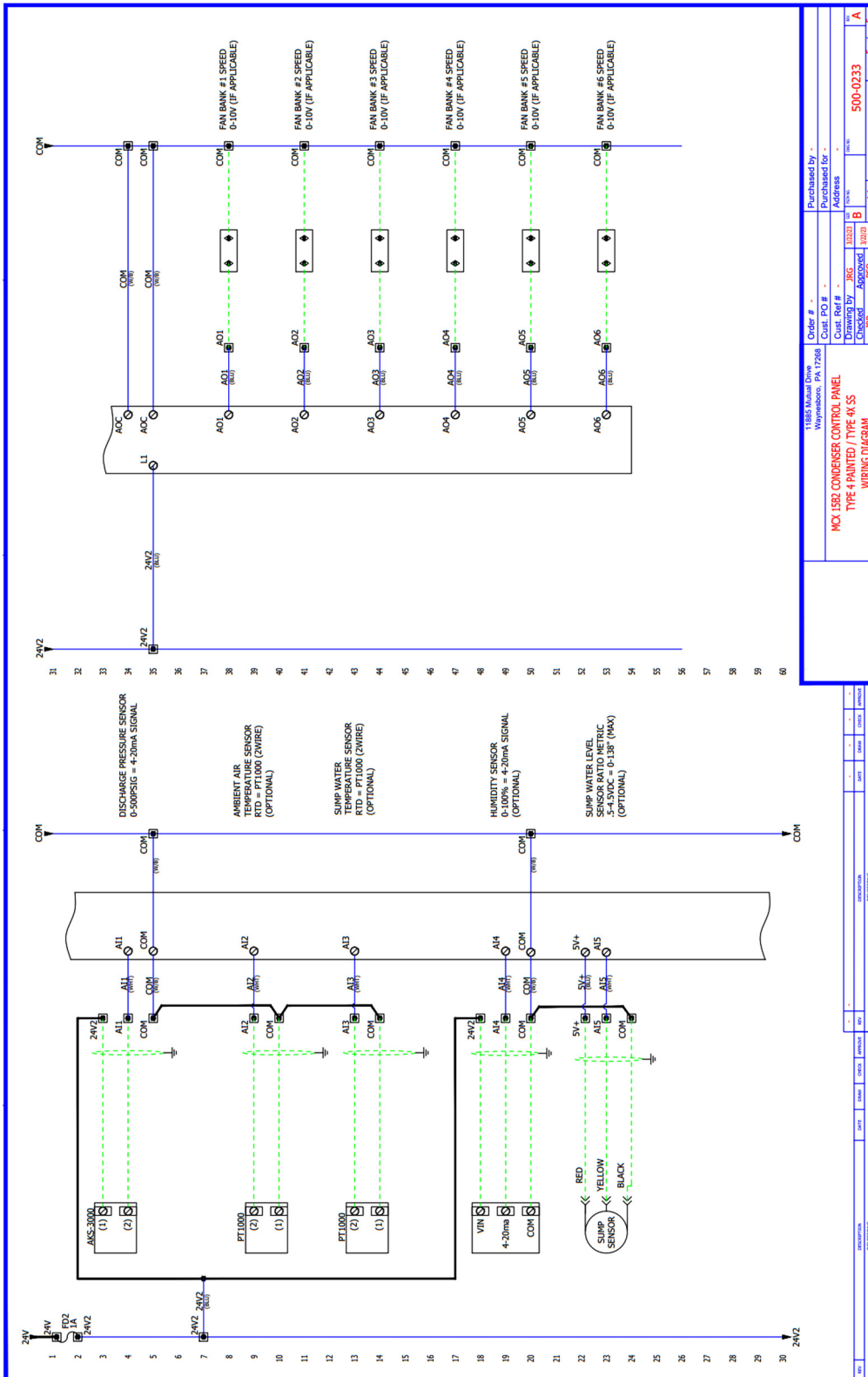
Condenser Standard Panel: Wiring Diagram – DO and DI

Figure 10: Wiring Diagram – DO and DI



Condenser Standard Panel: Wiring Diagram – AO and AI

Figure 11: Wiring Diagram – AO and AI



11855 Mutual Drive Houston, TX 77066		Order #	Purchased by
MOY 1582 CONDENSER CONTROL PANEL TYPE 4 PAINTED / TYPE 4X SS		Order PO #	Purchased for
WIRING DIAGRAM		Chart Ref #	Address
Created by	JRS	Created by	JRS
Checked by	JRS	Checked by	JRS
Released by	JRS	Released by	JRS
Rev	1.1	Rev	1.1
Part #	500-0233	Part #	500-0233
Rev	A	Rev	A

Controller Quick Startup

Step 01

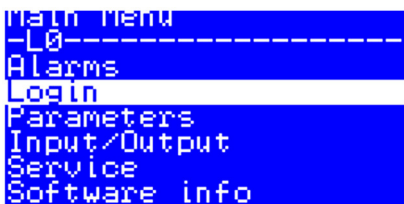
After connecting all external panel components e.g. sensors, power up the panel by energizing CB1.

Step 02

The Condenser Controller then needs to be configured.

Step 03

The configuration screens are accessed by pressing the Enter button (lower right button) on the controller. Select Login and enter the password (default: 300) on the following screen. Note that every time the Main Status Screen is visible the password entered is cleared and must be reentered to access the password protected items.



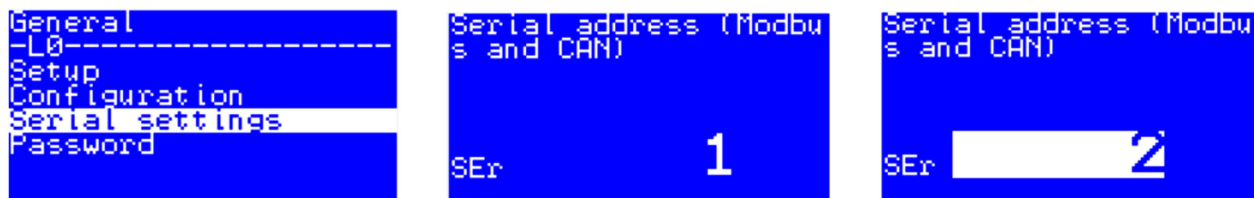
Step 04

The Condenser Controller serial address and baud rate may need to be changed. Press ENTER on Main Menu to put controller in Edit mode, then use the Up/Down arrows to scroll to the parameter you want to change. Press enter to edit parameter and scroll up or down or left to right to change value. Press ENTER to save.

For addressing, select: Parameters

For addressing, select: General

For addressing, select: Serial Settings to edit the Modbus communication address of the controller



For baud rate, select

Baud rate and parity may be changed by scrolling down the menu. Baud rate may also be changed via Modbus register 3080 and Serial Communication setting may be changed via Modbus register 3081.

NOTE:

The default Modbus serial communication settings on the all the controllers from the factory are as follows:

Condenser controller's default comm settings	
Baud rate	19200 bps
Parity	None
Data bits	8
Stop bit	1

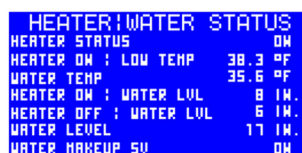
General: Navigating the front door display

The front door HMI gives an overview of the system status and can easily be navigated via the arrow buttons. The displays give us easy to understand information about the:

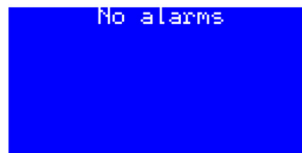
- Active alarms
- The status of the condenser



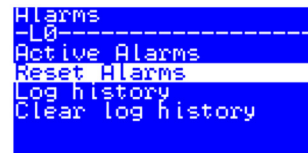
Home



Status



Active Alarms



Alarms

Modbus Table

Parameters > Condenser Setup

Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	Read-Write	Modbus Address
Parameters > Condenser Setup								
cFP	Condenser Fan/Pump Configuration	Decide on Fan/Pump configuration of condenser Maximum (12) stage configuration: 0 = (8) fans (4) pumps – 8F4P 1 = (8) pumps (4) fans – 8P4F	0	1	8F4P	Enum	RW	3001
C10	Condenser Pressure SP bar	Condenser discharge pressure setpoint - bar Sets the target pressure for the condenser to maintain *Must be configured	0	100.0	13.0	bar	RW	3002
P10	Condenser Pressure SP psi	Condenser discharge pressure setpoint - psi Sets the target pressure for the condenser to maintain *Must be configured	0	1000	100	Psi	RW	3003
C07	Stage band bar	Stage band around Condenser Setpoint bar Sets a band above and below the Condenser target where no regulation or stage activation of a fan or pump will occur	0	20.0	0.3	bar	RW	3004
P07	Stage band psi	Stage band around Condenser Setpoint psi Sets a band above and below the Condenser target where no regulation or stage activation of a fan or pump will occur	0	300.0	5.0	Psi	RW	3005
C06	High Pressure Override SP bar	High Pressure Override Setpoint If condenser pressure is greater than setpoint, all configured steps or outputs will be cycled ON within one second of each other	0	100.0	11.7	bar	RW	3006
P06	High Pressure Override SP psi	High Pressure Override Setpoint If condenser pressure is greater than setpoint, all configured steps or outputs will be cycled ON within one second of each other	0	1500	170.0	Psi	RW	3007
C32	Cond Discharge Sensor Hi Range bar	High range value of discharge pressure sensor	0.0	100.0	12.0	bar	RW	3008
P32	Cond Discharge Sensor Hi Range Psi	High range value of discharge pressure sensor	0.0	1500	250.0	Psi	RW	3009
C33	Cond Discharge Sensor Lo Range bar	Low range value of discharge pressure sensor	-5.0	20.0	-1.0	bar	RW	3010
P33	Cond Discharge Sensor Lo Range Psi	Low range value of discharge pressure sensor	-75	100	0.0	Psi	RW	3011
WB1	Wet Bulb ON/OFF	Activate Wet Bulb When set to “ON” the wet bulb pressure will become the condenser target. Wet bulb calculation is based on ambient air temperature and humidity. If there is a sensor fault, condenser target will revert to the setpoint set in parameter C10 0 = OFF 1 = ON	0	1	OFF	Enum	RW	3012
OTS	Outdoor Temp Sensor Option	Outdoor Ambient Temperature Sensor Option RTD PT1000 is employed if enabled. Must be enabled for “Wet bulb” functionality. Sensor installed at condenser 0 = Disable 1 = PT1000	0	1	PT1000	Enum	RW	3013
HSS	Humidity Sensor Option	Humidity Sensor Option Must be enabled for “Wet bulb” functionality. By default, sensor is disabled. Sensor (4–20 mA) installed at condenser 0 = Disable 1 = Enable	0	1	Disable	Enum	RW	3014

Condenser Standard Control

Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	Read-Write	Modbus Address
WB2	Wet Bulb Approach °F	Wet Bulb Offset Temperature added to final Wet Bulb Temperature calculation This will affect the Wet Bulb pressure target value	0	100.0	0.0	°F	RW	3015
WB3	Wet Bulb Approach °C	Wet Bulb Offset Temperature added to final Wet Bulb Temperature calculation This will affect the Wet Bulb pressure target value	-17.7	50.0	-17.0	°C	RW	3016
Y08	Gas Type	Select the refrigerant gas for the condenser 0-R12 1-R22 2-R134a 3-R502 4-R717 5-R13 6-R131b1 7-R23 8-R500 9-R503 10-R114 11-R142b 12-Invalid 13-R32 14-R227ea 15-R401a 16-R507a 17-R402a 18-R404a 19-R407c 20-R407a 21-R407b 22-R410a 23-R170 24-R290 25-R600 26-R600a 27-R744 28-R1270 29-R417a 30-R422a 31-R413a 32-R422d 33-R427a 34-R438a 35-R513a 36-R407a 37-R1234ze 38-R1234yf 39-R448a 40-R449 41-R452a	0	41	4	Enum	RW	3017

Parameters > Condenser Stage CFG 8F4P & CFG 8P4F

Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	Read-Write	Modbus Address
Parameters > Condenser Stage CFG 8F4P								
c12	Stage1Config	Configure Stage 1 (first to turn-on) for one of the following: 0 - Fan1 4 - Fan5 8 - Pump1 16 - Disable 1 - Fan2 5 - Fan6 9 - Pump2 2 - Fan3 6 - Fan7 10 - Pump3 3 - Fan4 7 - Fan8 11 - Pump4 Note: All stage configurations should have a unique piece of equipment assigned. (i.e., not duplicated), except for "Disable" "Disable" will turn OFF equipment configured at that stage even in a HPO situation. The stage will be "Disabled" or removed from the sequencer. Never select 'No Sel' (12-15)	0	11	0 - Fan1		RW	3020
c13	Stage2Config	Configure Stage 2 – see c12 parameter above for selection	0	11	1 - Fan2		RW	3021
c14	Stage3Config	Configure Stage 3 – see c12 parameter above for selection	0	11	8 - Pump1		RW	3022

Condenser Standard Control

Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	Read-Write	Modbus Address
c15	Stage4Config	Configure Stage 4 – see c12 parameter above for selection	0	11	16 – Disable		RW	3023
c16	Stage5Config	Configure Stage 5 – see c12 parameter above for selection	0	11	16 – Disable		RW	3024
c17	Stage6Config	Configure Stage 6 – see c12 parameter above for selection	0	11	16 – Disable		RW	3025
c19	Stage7Config	Configure Stage 7 – see c12 parameter above for selection	0	11	16 – Disable		RW	3026
c20	Stage8Config	Configure Stage 8 – see c12 parameter above for selection	0	11	16 – Disable		RW	3027
c21	Stage9Config	Configure Stage 9 – see c12 parameter above for selection	0	11	16 – Disable		RW	3028
c22	Stage10Config	Configure Stage 10 – see c12 parameter above for selection	0	11	16 – Disable		RW	3029
c23	Stage11Config	Configure Stage 11 – see c12 parameter above for selection	0	11	16 – Disable		RW	3030
c24	Stage12Config	Configure Stage 12 – see c12 parameter above for selection	0	11	16 – Disable		RW	3031
c09	Stage Time Inc Dec	Stage time delay before an increase in capacity or a decrease in capacity If more or less capacity is requested, this is the Time delay before next stage is turned on or off Gives condenser discharge pressure time to settle before the next stage is turned on or off	0	120	30	s	RW	3032
c11	Time delay Aux Alarm	Time delay before an Auxiliary Alarm is set Sets time delay before an Aux alarm is set Gives time for the run contacts to close on the fan/pump starter contactor before an Alarm is set	0	100	7	s	RW	3033

Parameters > Condenser Stage CFG 8P4F

d12	Stage1Config	Configure Stage 1 (first to turn-on) for one of the following: 0 - Fan1 8 – Pump1 12 – Pump5 16 - Disable 1 - Fan2 9 – Pump2 13 – Pump6 2 - Fan3 10 – Pump3 14 – Pump7 3 - Fan4 11 – Pump4 15 – Pump84 Note: All stage configurations should have a unique piece of equipment assigned. (i.e., not duplicated), except for “Disable” “Disable” will turn OFF equipment configured at that stage even in a HPO situation. The stage will be “Disabled” or removed from the sequencer. Never select ‘No Sel’ (4-7)	0	11	0 – Fan1		RW	3034
d13	Stage2Config	Configure Stage 2 – see d12 parameter above for selection	0	11	1 – Fan2		RW	3035
d14	Stage3Config	Configure Stage 3 – see d12 parameter above for selection	0	11	8 – Pump1		RW	3036
d15	Stage4Config	Configure Stage 4 – see d12 parameter above for selection	0	11	16 – Disable		RW	3037
d16	Stage5Config	Configure Stage 5 – see d12 parameter above for selection	0	11	16 – Disable		RW	3038
d17	Stage6Config	Configure Stage 6 – see d12 parameter above for selection	0	11	16 – Disable		RW	3039
d19	Stage7Config	Configure Stage 7 – see d12 parameter above for selection	0	11	16 – Disable		RW	3040
d20	Stage8Config	Configure Stage 8 – see d12 parameter above for selection	0	11	16 – Disable		RW	3041
d21	Stage9Config	Configure Stage 9 – see d12 parameter above for selection	0	11	16 – Disable		RW	3042
d22	Stage10Config	Configure Stage 10 – see d12 parameter above for selection	0	11	16 – Disable		RW	3043
d23	Stage11Config	Configure Stage 11 – see d12 parameter above for selection	0	11	16 – Disable		RW	3044

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Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	Read-Write	Modbus Address
d24	Stage12Config	Configure Stage 12 – see d12 parameter above for selection	0	11	16 – Disable		RW	3045
d09	Stage Time Inc Dec	Stage time delay before an increase in capacity or a decrease in capacity If more or less capacity is requested, this is the Time delay before next stage is turned on or off Gives condenser discharge pressure time to settle before the next stage is turned on or off	0	120	30	s	RW	3032
d11	Time delay Aux Alarm	Time delay before an Auxiliary Alarm is set Sets time delay before an Aux alarm is set Gives time for the run contacts to close on the fan/pump starter contactor before an Alarm is set	0	100	7	s	RW	3033

Parameters > Sump Water Makeup, Sump Water Heater, Fan Speed Regulation & Pump Control

Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	Read-Write	Modbus Address
Parameters > Sump Water Makeup								
SMU	Sump Water Makeup – Control	Sump Water Makeup – Control Decide which sensor to employ for water makeup 0 = Float Switch N.O 1 = Pressure Transmitter 2 = *Disable *Disables water makeup valve. Disables heater control unless SH1 is set to '2' or Factory thermostat LWCO	0	1	1 - PT	Enum	RW	3046
VD1	Sump Makeup Delay OPEN Solenoid Valve	Sump Makeup Delay “OPEN” solenoid valve set-point When employing a float switch (FS), sets the delay time when the water makeup valve will open	0	120	5	s	RW	3047
VD2	Sump Makeup Delay CLOSE Solenoid Valve	Sump Makeup Delay “CLOSE” solenoid valve set-point When employing a float switch (FS), sets the delay time when the water makeup valve will close	0	120	5	s	RW	3048
SMO	Sump Makeup Water Level OPEN Solenoid Valve	Sump Makeup Water Level “OPEN” Solenoid Valve When employing a water pressure transmitter (PT), sets the water level in inches when the water makeup valve will open	0	100	5	In	RW	3049
SMC	Sump Makeup Water Level CLOSE Solenoid Valve	Sump Makeup Water Level “CLOSE” Solenoid Valve When employing a water pressure transmitter (PT), sets the water level in inches when the water makeup valve will close	0	2000	20	In	RW	3050
B28	Sump Water Pressure Transmitter Max bar	Sump Pressure Transmitter bar max Set according to pressure transmitter specification (0.25 bar) or 250 mbars = 100 inches of water	0	2.0	.25	bar	RW	3051
C28	Sump Water Pressure Transmitter Max Psi	Sump Pressure Transmitter PSI max Set according to pressure transmitter specification 5 PSI = 138 inches of water	0	30.0	5.00	Psi	RW	3052
SHV	Sump Water Pressure Transmitter Voltage Hi	Sump Pressure Transmitter Voltage Hi range Default: +5 V to terminal for supply of transmitter and Hi output range of transmitter 4.5 V. *Take precautions if not using default settings for transmitter	0	10.0	4.5	V	RW	3053
SLV	Sump Water Pressure Transmitter Voltage Lo	Sump Pressure Transmitter Voltage Lo range Default: +5 V to terminal to supply transmitter and Lo output range of transmitter 0.5 V. *Take precautions if not using default settings for transmitter	0	2.0	.5	V	RW	3054
Parameters > Sump Water Heater								
SH1	Sump Water Temp Sensor - Control	Sump Water Temperature Sensor – Control Enables the A13 for PT1000 RTD to measure water temperature 0 = Disable (not used, disables alarm) 1 = PT1000 RTD 2 = Factory* *Use factory installed thermostat and LWCO on condenser. DI17 input/DO2 output. See drawings for more detail. Heater icon on main display = 'ON'	0	1	PT1000		ENUM	3059

Condenser Standard Control

Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	Read-Write	Modbus Address
C25	Sump Water Temp ON	Sump Water Heater Temperature "ON" Setpoint Water temperature at which the sump heater will turn ON	0 0	59.0 15.0	38.3 3.5	°F °C	RW	3060
C26	Sump Water Temp OFF	Sump Water Heater Temperature "OFF" Setpoint Water temperature at which the sump heater will turn OFF	0 0	59.0 15.0	43.7 6.5	°F °C	RW	3061
C29	Sump Water Heater - Water Level Heater OFF	Sump Heater Water level setpoint Low Sets the water level that the Sump heater will deactivate Prevents heater from being ON when there is not enough water in the sump to heat * Use with water pressure sensor only	0	20	6	In	RW	3062
C30	Sump Water Heater - Level Heater ON	Sump Heater Water level setpoint High Sets the Water level that the Sump Heater will activate when the temperature is at or below the level set in parameter C25 *Use with water pressure sensor only	0	30	8	In	RW	3063

Parameters > Fan Speed Regulation

Ad1	Fan PI Dead band Psi	Fan Dead band around Condenser Setpoint - Psi Sets a band above and below the Condenser target where no Fan speed regulation or PI control will occur. Speed is locked within the band when the condenser pressure equals setpoint pressure. Set to something equal to or less than Stage Band P07	0	50.0	3.0	Psi	RW	3064
Bd1	Fan PI Dead band bar	Fan Dead band around Condenser Setpoint - bar Sets a band above and below the Condenser target where no Fan speed regulation or PI control will occur. Speed is locked within the band when the condenser pressure equals setpoint pressure. Set to something equal to or less than Stage Band C07	0	5.0	.2	Bar	RW	3065
Ad3	Fan PI Proportional Gain	Fan PI Proportional Band	0	100	12.0		RW	3066
Ad2	Fan PI Integral Time	Fan PI Integral Time	0	120	8	s	RW	3067
V1L	VFD Fan Speed Minimum	VFD Fan Speed Minimum (all VFD's)	0	75.0	20.0	%	RW	3068
V1H	VFD Fan Speed Maximum	VFD Fan Speed Maximum (all VFD's)	0	100.0	100.0	%	RW	3069

Parameters > Pump Control

c18	Pumps OFF Temperature °C	Pumps OFF Temperature Setpoint Temperature at which the pumps will shutdown	0.0	10.0	3.5	°C	RW	3072
f18	Pumps OFF Temperature °F	Pumps OFF Temperature Setpoint Temperature at which the pumps will shutdown	10.0	75.0	36.0	°F	RW	3074
c34	Pumps ON Temperature °C	Pumps ON Temperature Setpoint Temperature at which the pumps will turn back on	0.0	25.0	5.0	°C	RW	3073
f34	Pumps ON Temperature °F	Pumps ON Temperature Setpoint Temperature at which the pumps will turn back on	10.0	75.0	40.0	°F	RW	3075

Parameters > General

Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	Read-Write	Modbus Address
Parameters > General > Configuration								
AOF	Alarm relay active if unit in OFF	Alarm relay active if unit in OFF 0 = NO 1 = YES	0	1	1 = YES	Enum	RW	3078
Parameters > General > Serial Settings								
Ser	Serial address (Modbus and Can)	Serial Modbus and Can address/drop number	0	100	1		RW	3079
bAU	Serial baudrate (Modbus)	Serial Baudrate 0 - 0 1 - 1200 2 - 2400 3 - 4800 4 - 9600 5 - 14400 6 - 19200 7 - 28800 8 - 38400	0	8	6	Enum	RW	3080

Condenser Standard Control

Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	Read-Write	Modbus Address
COM	Serial Settings	Serial Communications settings 0 – 8N1 1 – 8E1 2 – 8N2	0	2	0	Enum	RW	3081
Parameters > General > Password								
L01	Password Level 1	Password for level one parameter access	0	999	100		RW	3082
L02	Password Level 2	Password for level two parameter access	0	999	200		RW	3083
L03	Password Level 3	Password for level three parameter access	0	999	300		RW	3084
Parameters > General > Setup								
Y01	ON/OFF	Controller ON/OFF System ON or OFF 0 = OFF 1 = ON	0	1	1	Enum	RW	3085
Y05	Measurement Units	Measurement Units 0 = Metric 1 = US	0	1	1	Enum	RW	3086
Y07	Restore default parameters	Restore Factory Default Parameters 0 = NO 1 = YES	0	1	0	Enum	RW	3087
Parameters > Advanced Menu (level 3)								
AD1	Discharge Pressure Sensor Fault	Discharge Pressure Sensor Fault – event 0 = All Stages enabled 1 = As is	0	1	All on	Enum	RW	3092
AD2	Discharge Pressure Sensor Filter	Discharge Pressure Sensor Filter 0 = no filter 1 = 2 sample average 2 = 4 sample average 3 = 16 sample average	0	3	1		RW	3093
AD3	Humidity Sensor Filter	Humidity Sensor Filter 0 = no filter 1 = 2 sample average 2 = 4 sample average 3 = 16 sample average	0	3	0		RW	3094
AD4	Sump Water Pressure Sensor Filter	Sump Water Pressure Sensor Filter 0 = no filter 1 = 2 sample average 2 = 4 sample average 3 = 16 sample average	0	3	0		RW	3095
Service > Pumps RS RT Hours								
RTC	RTC setup	Set time of Real Time Clock						
PRC	Pumps RS RT Hours	Reset pumps current run-time hours Normally done when first starting up pumps or replacing a pump						

Other Modbus Registers

Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	Read-Write	Modbus Address
Other Modbus Registers>								
V05	Alarm Active	Active Alarm D01 status. Any alarm active. 0 = NO 1 = YES	0	1			RO	8102
C01	Reset Alarms	Reset Alarms Reset Manual Alarms Note: alarm must be cleared (no fault or error) for reset	0	2	0		RW	1859
V07	Outdoor Temperature	Outdoor Ambient Temperature	-100	300		°C	RO	8106
V22	Fan1 Active	Fan 1 Active DO3 = ON	0	1			RO	8118
V23	Fan2 Active	Fan 2 Active DO4 = ON	0	1			RO	8120
V24	Fan3 Active	Fan 3 Active DO5 = ON	0	1			RO	8122

Condenser Standard Control

Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	Read-Write	Modbus Address
V31	Fan4 Active	Fan 4 Active DO6 = ON	0	1			RO	8137
V32	Fan5 Active	Fan 5 Active DO7 = ON	0	1			RO	8139
V33	Fan6 Active	Fan 6 Active DO8 = ON	0	1			RO	8141
V34	Fan7 Active	Fan 7 Active DO9 = ON	0	1			RO	8143
V35	Fan8 Active	Fan 8 Active DO10 = ON	0	1			RO	8145
V25	Pump1 Active	Pump 1 Active DO11 = ON	0	1			RO	8124
V26	Pump2 Active	Pump 2 Active DO12 = ON	0	1			RO	8126
V27	Pump3 Active	Pump 3 Active DO13 = ON	0	1			RO	8131
V30	Pump4 Active	Pump 4 Active DO14 = ON	0	1			RO	8135
V27	Fan Speed	Fan Speed 0-10V	0	1000		V	RO	8402
V28	Low Ambient Pumps OFF	Low Ambient Outdoor Temperature Pumps OFF 0 = Outdoor ambient Temp OK 1 = Outdoor ambient Low "Pumps held OFF"	0	1			RO	8131
V66	Stage Power	Stage Power Power output capacity 0 – 100%	0	1000		%	RO	8130
V51	Water Level Status	Water Level Status Water Level is sufficiently high enough for sump heater to turn ON. 0 = Low 1 = OK	0	1			RO	8159
V55	Wet Bulb Temperature	Wet Bulb Temperature	0	200		°F	RO	8163
V56	Humidity	Humidity Value	0	100		%	RO	8165
V88	Wet Bulb Relative Pressure Psi	Wet Bulb Relative Pressure PSI	-20	250		Psi	RO	8167
V59	Water Level in Column Inches	Inches of water in sump column Water level in the sump column	0	2000		In	RO	8168
V62	Water Temp	Water Temperature in the sump	-30	170		°C	RO	8171
V61	Condenser Discharge Pressure	Condenser Discharge Pressure	0	500		Psi	RO	8172
V61	Wet Bulb Active	Wet Bulb Condenser Pressure Setpoint Active Wet Bulb pressure setpoint will be Active when Wet Bulb is set to ON in parameter WB1. Humidity and Ambient temperature sensors must be working. If one of the sensors has a fault, the pressure setpoint will revert to the condenser setpoint, set in parameter C10. 0 = NO 1 = YES	0	1			RO	8173
V62	Main Discharge Pressure SP	Main Discharge Pressure Setpoint Currently Active condenser setpoint target (WB1 or C10 parameter SP)	-15	250		Psi	RO	8175

Alarms

Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	Read-Write	Modbus Address
Alarms>								
E01	Condenser Discharge Pressure Sensor Fault	Condenser Discharge Pressure Sensor Fault 0 = Not active 1 = Active	0	1			RO	1901 .09
E02	Water Temp Sensor Fault	Water Temperature Sensor Fault	0	1			RO	1901 .10
E03	Outdoor Temp Sensor Fault	Outdoor Ambient Temperature Sensor Fault	0	1			RO	1901 .11
E04	Water Pressure Sensor Fault	Water Pressure Sensor Fault	0	1			RO	1901 .12
E05	Humidity Sensor Fault	Humidity Sensor Fault	0	1			RO	1902 .11

Condenser Standard Control

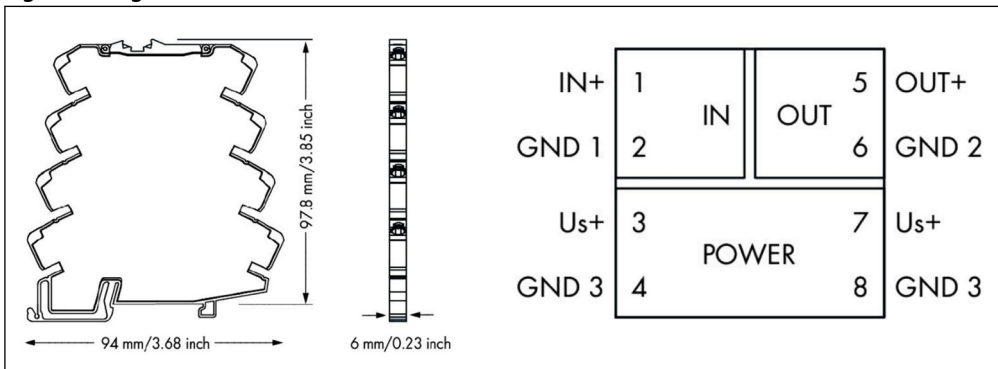
Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	Read-Write	Modbus Address
A01	General Alarm	General Alarm – any alarm active	0	1			RO	1901 .08
A02	VFD Alarm	Variable Frequency Drive Alarm	0	1			RO	1901.13
A03	High Pressure Alarm	High Pressure / Head Safety Alarm	0	1			RO	1902.09
A04	Fan1 Aux Alarm	Fan 1 Auxiliary-run contacts Alarm	0	1			RO	1901 .14
A05	Fan2 Aux Alarm	Fan 2 Auxiliary-run contacts Alarm	0	1			RO	1902 .10
A06	Fan3 Aux Alarm	Fan 3 Auxiliary-run contacts Alarm	0	1			RO	1901 .03
A11	Fan4 Aux Alarm	Fan 4 Auxiliary-run contacts Alarm	0	1			RO	1901 .04
A12	Fan5 Aux Alarm	Fan 5 Auxiliary-run contacts Alarm	0	1			RO	1901 .05
A13	Fan6 Aux Alarm	Fan 6 Auxiliary-run contacts Alarm	0	1			RO	1901 .06
A14	Fan7 Aux Alarm	Fan 7 Auxiliary-run contacts Alarm	0	1			RO	1901 .07
A15	Fan8 Aux Alarm	Fan 8 Auxiliary-run contacts Alarm	0	1			RO	1902 .08
A07	Pump1 Aux Alarm	Pump 1 Auxiliary-run contacts Alarm	0	1			RO	1901 .15
A08	Pump2 Aux Alarm	Pump 2 Auxiliary-run contacts Alarm	0	1			RO	1901 .00
A09	Pump3 Aux Alarm	Pump 3 Auxiliary-run contacts Alarm	0	1			RO	1901 .01
A10	Pump4 Aux Alarm	Pump 4 Auxiliary-run contacts Alarm	0	1			RO	1901 .02
A16	Condenser Fan Vibration Alarm	Condenser Fan Vibration Alarm	0	1			RO	1902.12
A17	EPCS Alarm	Emergency Pressure Control System Alarm	0	1			RO	1902.13
A22	Pump5 Aux Alarm	Pump5 Auxiliary-run contacts Alarm	0	1			RO	1902.14
A23	Pump6 Aux Alarm	Pump6 Auxiliary-run contacts Alarm	0	1			RO	1902.15
A24	Pump7 Aux Alarm	Pump7 Auxiliary-run contacts Alarm	0	1			RO	1902.00
A25	Pump8 Aux Alarm	Pump8 Auxiliary-run contacts Alarm	0	1			RO	1902.01

Accessory: Signal conditioners

The Condenser Standard Control Panel analog output signals from its controllers are 0–10 V type from the factory. It is possible to purchase signal conditioners as accessories from Danfoss that can be installed and wired by the customer (please contact a Danfoss sales representative). Signal conditioners change the analog output signal at the panel terminal from 0–10 V to 4–20 mA. The following is a quick overview as to how this may be done.

Wire the power terminal available (24 V and COM) in the panel to the signal conditioner power terminals and wire the correct AO terminals (AO1 through AO6 and COM) to the input side of the signal conditioner. Please read the signal conditioner instructions beforehand. The 4–20 mA device may now be wired to the output side of the signal conditioner.

Figure 12: Signal conditioners



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