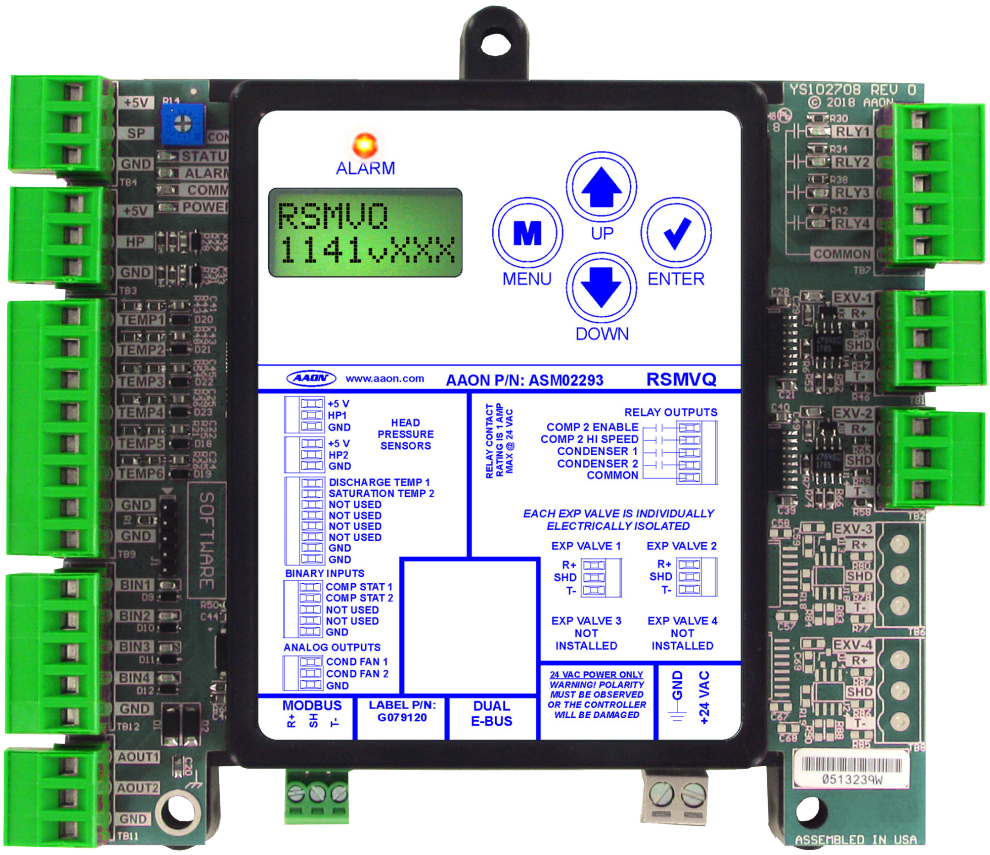
RSMVQ
Technical Guide



RSMVQ REVISION LOG	
REVISION AND DATE	**CHANGE**
Rev. A, April 12, 2021	Original
Rev. B, August 18, 2021	Formatting and Guide updates

RSMVQ PARTS REFERENCE	
PART DESCRIPTION	**PART NUMBER**
RSMVQ	ASM02293
VCCX2 Controller	ASM01698
Prism 2	ASM02533
IP Module Kit	ASM01902
CommLink 5	ASM01874
E-BUS Cable Assembly 1.5 ft., 3 ft., 10 ft., 25 ft., 50 ft., 75 ft., 100 ft., 150 ft., 250 ft., and 1000 ft. spool	G029440 (1.5 ft.), G012870 (3 ft.), G029460 (10 ft.), G045270 (25 ft.), G029510 (50 ft.), G029530 (75 ft.), G029450 (100 ft.), G029470 (150 ft.), V36590 (250 ft.), G018870 (SPOOL)
Modular Service Tool SD - Operator Interface	ASM01895

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AAON® P/N: G079110, Rev B

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RSMVQ Features and Applications

The Refrigerant System Module for VFD compressors with DMQ® Universal Superheat Control/Sensor (RSMVQ) monitors and controls one or two refrigeration circuits of the AAON unit. It is used in conjunction with the VCCX2 Controller. The RSMVQ module is designed for R410-A refrigerant.

The RSMVQ is for units with the following configurations:

1. One or two circuits with no reheat, reheat on the first circuit if one circuit, or reheat on both circuits if two circuits.
2. Must have one MODBUS-controlled VFD compressor on the first circuit.
3. Must have a fixed or two-step compressor on the second circuit.
4. Must have at least one DMQ® Electronic Expansion Valve (EXV).

Optional configurations include:

1. A single condenser fan output signal for two circuits or one condenser fan output signal per circuit.
2. Single or dual EXVs.

In addition, the RSMVQ cannot be used in a heat pump application (air-to-air or water-source) and cannot have multiple RSM modules.

The RSMVQ uses an E-BUS cable to connect to the VCCX2 Controller. Only one RSMVQ can be connected. There are two E-BUS expansion ports which allow connection to the VCCX2 Controller, communicating sensors, and other E-BUS modules.

The RSMVQ is configured using Prism 2 software.

The RSMVQ provides four analog inputs, two binary inputs, four relays, and two analog outputs. See **Figures 2 and 3, pages 8 and 9,** for wiring.

The RSMVQ provides the following:

- Modulates the compressors or controls staging to satisfy the Suction Coil (Saturated) Temperature. The Suction Coil (Saturated) Temperature Setpoint is reset by the VCCX2 Controller to maintain the Supply Air Temperature during Cooling Mode. During Dehumidification Mode, it controls the compressors to the Suction (Saturation) Temperature Setpoint.
- Modulates the condenser fan(s) to maintain the Head Pressure Setpoint.
- Monitors the performance of the Superheat Controller to maintain the Superheat Setpoint of each evaporator coil.
- Provides alarms and safeties for the compressor and condenser operation.
- Provides a 2 x 8 LCD character display and four buttons that allow for status of system operation, system setpoints, system configurations, sensors, alarms, and to change the module's address, if necessary.

RSMVQ Dimensions

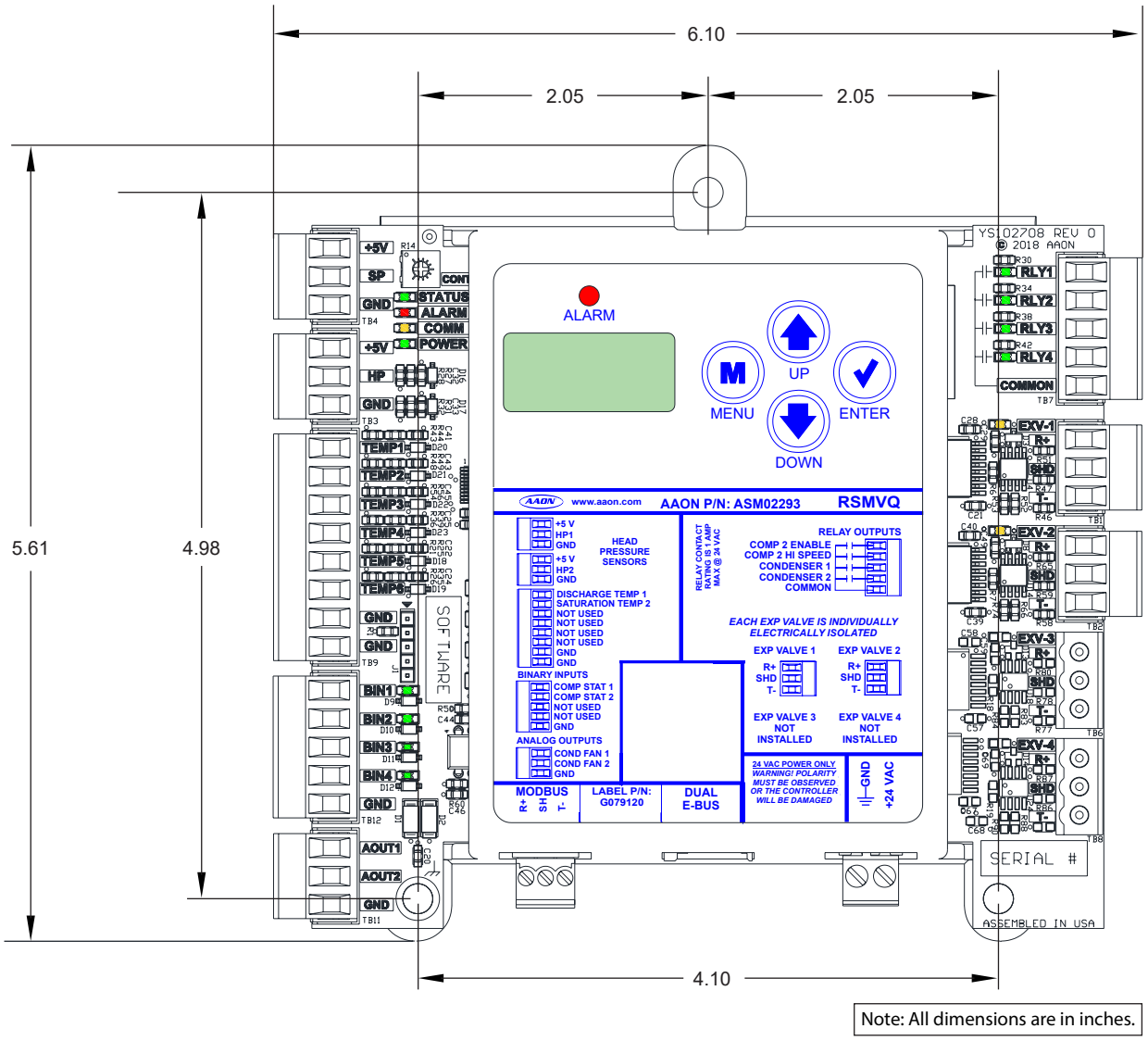


Figure 1: RSMVQ Dimensions

General

Correct wiring of the AAON unit controller and its modules is the most important factor in the overall success of the installation process. The AAON unit controller and modules are installed and wired at the AAON factory. Some of the following information may not apply to your installation if it was pre-wired at the factory. However, if troubleshooting of the controller or modules is required, it is a good idea to be familiar with the system wiring.

Wiring

The modules must be connected to an 18-30 VAC power source of the proper size for the calculated VA load requirements. All transformer sizing should be based on the VA ratings listed in **Table 1, this page**.

Control Device	Voltage	VA Load	Operating Temperature	Humidity (Non-Condensing)
RSMVQ	18-30 VAC	18	-22°F to 158°F -30ºC to 70ºC	0-95% RH
	Inputs		Resistive Inputs require 10KΩ Type III Thermistor	
			24 VAC Inputs provide 4.7KΩ Load	
	Outputs		Relay Outputs: 1 amp maximum per output.	

Table 1: RSMVQ Electrical and Environmental Requirements

NOTE: If the temperature at the controller is below -4ºF (-20ºC), the display refresh rate could be less responsive.

WARNING: When using a single transformer to power more than one controller or expansion module, the correct polarity must always be maintained between the boards. Failure to observe correct polarity will result in damage to the AAON unit controller, RSMVQ, and any associated module.

Please carefully read and apply the following information when wiring the unit controller, RSMVQ, and any associated module.

1. All wiring is to be in accordance with local and national electrical codes and specifications.
2. All 24 VAC wiring must be connected so that all ground wires remain common. Failure to follow this procedure can result in damage to the controller and connected devices.
3. Minimum wire size for 24 VAC wiring should be 18-gauge.
4. Minimum wire size for all sensors should be 24-gauge. Some sensors require two-conductor wire and some require three-or four-conductor wire.
5. Minimum wire size for 24 VAC thermostat wiring should be 22-gauge.
6. Be sure all wiring connections are properly inserted and tightened into the terminal blocks. Do not allow wire strands to stick out and touch adjoining terminals which could potentially cause a short circuit.
7. When communication wiring is used to interconnect AAON unit controllers together or to connect to other communication devices, all wiring must be plenum-rated, minimum 18-gauge, two-conductor, twisted pair with shield. AAON can supply communication wire that meets this specification and is color coded for the network or local loop. Please consult your AAON distributor for information. If desired, Belden #82760 or equivalent wire may also be used.
8. Before applying power to the AAON unit controller, RSMVQ Modules, and any associated modules, be sure to recheck all wiring connections and terminations thoroughly.

Powering Up

When the controller and modules are first powered up, the POWER LED should light up and stay on continuously. If it does not light up, check to be sure you have 24 VAC connected to the controller, that the wiring connections are tight, and they are wired for the correct polarity. The 24 VAC power must be connected so all ground wires remain common. If after making all these checks, the POWER LED does not light up, please contact AAON Controls Support for assistance.

RSMVQ Inputs Wiring

RSMVQ Wiring

The RSMVQ uses an E-BUS cable to connect to the VCCX2 Controller. Only one RSMVQ can be connected. There are two E-BUS expansion ports which allow connection to the VCCX2 Controller, communicating sensors, and other E-BUS modules.

The RSMVQ uses four analog inputs, two binary inputs, four relays, and two analog outputs. See **Figure 2, this page,** for inputs wiring and **Figure 3, page 9,** for outputs wiring.

Head Pressure Control

The RSMVQ can monitor the Head Pressure Transducers and control condenser fans to maintain a Head Pressure Setpoint. The condenser fans will be controlled with a 0-10 VDC output signal.

Condenser and Compressor Configuration Options

Please see **pages 31-34** for condenser and compressor configuration details.

WARNING: Observe polarity! All boards must be wired with GND-to-GND and 24 VAC-to-24 VAC. Failure to observe polarity will result in damage to one or more of the boards. Expansion modules must be wired in such a way that the expansion modules and the controller are always powered together. Loss of power to the expansion module will cause the controller to become inoperative until power is restored to the expansion module.

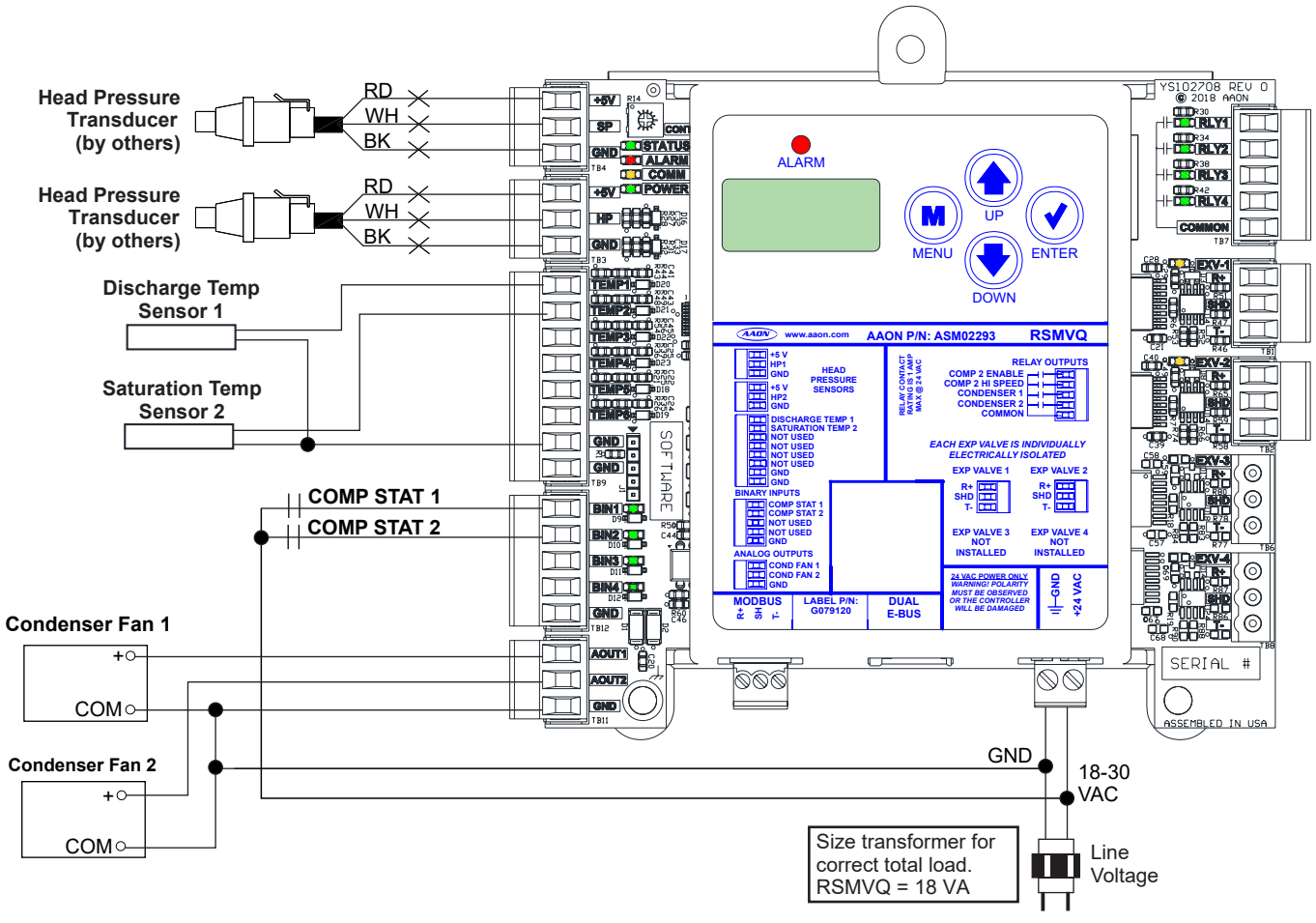


Figure 2: RSMVQ Inputs Wiring

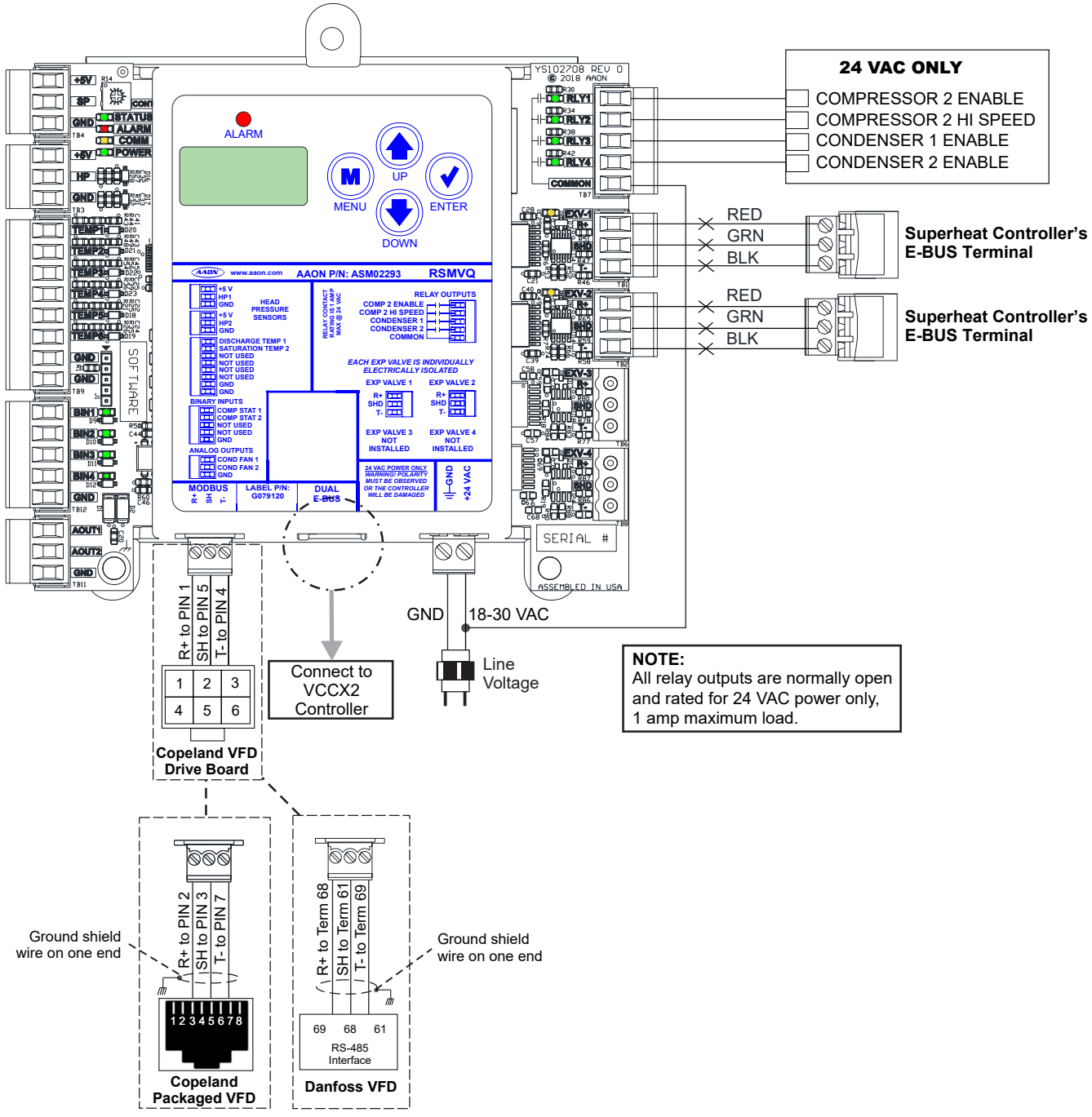


Figure 3: RSMVQ Outputs Wiring

RSMVQ Module Inputs/Outputs Map

Inputs/Outputs Map

See **Table 2, this page,** for the RSMVQ inputs and outputs.

REFRIGERATION SYSTEM MODULE FOR VFD HEAT PUMP COMPRESSORS	
Analog Inputs	
1	Head Pressure Transducer 1 (HP1)
2	Head Pressure Transducer 2 (HP2)
3	Discharge Temperature 1 (TEMP1)
4	Saturation Temperature 2 (TEMP2)
Binary Inputs	
1	Compressor Status 1 (BI1)
2	Compressor Status 2 (BI2)
Analog Outputs (0-10 VDC)	
1	Condenser Fan 1 (AO1)
2	Condenser Fan 2 (AO2)
EXV COMM Ports	
1	Expansion Valve 1 (EXV-1)
2	Expansion Valve 2 (EXV-2)
Binary Outputs (24 VAC)	
1	Compressor 2 Enable Relay (RLY1)
2	Compressor 2 High Speed Relay (RLY2)
3	Condenser 1 Enable Relay (RLY3)
4	Condenser 2 Enable Relay (RLY4)
Communication Terminals	
DUAL E-BUS	2 E-BUS Ports
MODBUS	MODBUS Communication Terminal Block

Table 2: RSMVQ Inputs and Outputs

RSMVQ Inputs and Outputs

+5 - VDC Power

This output is a 5 VDC output that supplies power to the Head Pressure Transducer 1.

HP1 - Head Pressure Transducer 1

The Head Pressure Transducer is used to measure Head Pressure at the discharge line. This Head Pressure is used to drive Condenser Fan 1 to maintain a given Head Pressure Setpoint.

+5 - VDC Power

This output is a 5 VDC output that supplies power to the Head Pressure Transducer 2.

HP2 - Head Pressure Transducer 2

The Head Pressure Transducer is used to measure Head Pressure at the discharge line. This Head Pressure is used to drive Condenser Fan 2 to maintain a given Head Pressure Setpoint.

TEMP1 - Discharge Temperature Sensor 1

This sensor is the Discharge Line Temperature Sensor for Circuit 1. It is the G010470 Thermistor 10K ohm strap-on pipe sensor. It is strapped to the discharge line immediately after the VFD compressor and is used as a safety against high compressor temperatures. Units with Copeland™ VFDs have the Discharge Line Temperature Sensor wired directly to the drive. Units with Danfoss VFDs will have a Discharge Line Temperature Sensor wired to TEMP 1 of the RSMVQ.

TEMP2 - Saturation Temperature Sensor 2

This sensor is the Suction Saturation Temperature Sensor for Circuit 2. It is the G049490 Thermistor 10K strap-on pipe sensor. It is strapped to the evaporator coil immediately after the Thermal Expansion Valve (TXV) and is used to measure the Suction Saturation Temperature of the second circuit.

BI1 - Compressor Status 1

A wet contact closure (24 VAC) on this input indicates Compressor 1 is running. Typically, the source for this is a relay output from the VCCX2. If BI1 opens, a compressor alarm will be generated. Compressor 1 relay needs to be configured on the VCCX2 as “A1 Compressor Run Status.”

BI2 - Compressor Status 2

A wet contact closure (24 VAC) on this input indicates Compressor 2 is running. Typically, the source for this is a relay output from the auxiliary contact on the compressor starter. If BI2 opens, Compressor 2 Enable relay and Compressor 2 High Speed Enable relay will de-energize and a compressor alarm will be generated.

NOTE: The binary inputs require wet contacts (24 VAC only) to recognize an active input. If you provide dry contacts, the contact closure will not be recognized.

AO1 - Condenser Fan 1 VFD Signal

This is a direct acting output signal that is used to modulate the Condenser Fan 1 VFD (0-10 VDC signal) on an air cooled unit.

AO2 - Condenser Fan 2 VFD Signal

This is a direct acting output signal that is used to modulate the Condenser Fan 2 VFD (0-10 VDC signal) on an air cooled unit.

EXV-1 - Electronic Expansion Valve

The EXV-1 is the communications port for EXV setpoints and status communications.

EXV-2 - Electronic Expansion Valve

The EXV-2 is the communications port for EXV setpoints and status communications.

RLY1 - Compressor 2 Enable

This relay turns on Compressor 2.

RLY2 - Compressor 2 High Speed Enable

This relay enables high speed on Compressor 2.

RLY3 - Condenser 1 Enable

This relay enables Condenser Fan 1.

RLY4 - Condenser 2 Enable

This relay enables Condenser Fan 2.

Cooling Mode and Dehumidification Operation

Cooling Mode Operation

Cooling Mode control staging is determined by the Supply Air Temperature. Staging is met by turning the on/off compressor on or off and the two-step compressor to low speed or high speed.

VFD compressor modulation is determined from Saturation Temperature and Supply Air Temperature. If the Supply and Saturation Temperatures are above their respective Setpoints, the compressors will modulate up. If the Supply or Saturation Temperatures are below their Setpoints, the compressors will modulate down. Envelope and/or current protections also affect the VFD compressor modulation.

Staging Up

1. If the Supply Air Temperature is above the Setpoint, Compressor 1 VFD will turn on at the recommended manufacturer's speed for one minute. Compressor 1 VFD will modulate anytime thereafter if it is running.
2. If the Supply Air Temperature is above the setpoint plus window, and Compressor 1 VFD is at 100% of its capacity, Compressor 2 will turn on at low speed and Compressor 1 will be reset to 67% of its range (min to max). Compressor 1 VFD will modulate anytime thereafter if it is running.
3. If the Supply Air Temperature remains above the Setpoint plus window, and Compressor 1 VFD is at 100% of its capacity, Compressor 2 will be set to high speed and Compressor 1 will be reset to 67% of its range (min to max).

Staging Down

1. If the Supply Air Temperature is below the Setpoint plus window and Compressor 1 VFD is at minimum capacity, Compressor 2 will be set to low speed and Compressor 1 will be reset to 67% of its range (min to max).
2. If the Supply Air Temperature remains below the Setpoint plus window, and Compressor 1 VFD is at minimum capacity, Compressor 2 will be turned off and Compressor 1 will be reset to 67% of its range (min to max).
3. If the Supply Air Temperature continues to remain below the Setpoint plus window, and Compressor 1 VFD is at minimum capacity, Compressor 1 will be turned off.
4. If the Supply Air Temperature rises above the Setpoint and Compressor 1 VFD's minimum off time has been met, Compressor 1 will be turned back on.

Dehumidification Operation

Dehumidification Mode control staging/modulation is determined by using the lowest saturation temperature from each circuit. Circuit 1 uses Superheat Controller Saturation Temperature and Circuit 2 uses the Saturation Coil Temperature Sensor (Temp 2 input) mounted after the TXV.

Staging Up

1. Staging begins when the RSMVQ Module obtains the Reheat Valve position and Reheat Supply Air Error from the AAON unit controller. Compressor 1 VFD will turn on at the manufacturer's recommended speed for one minute. Compressor 1 VFD will modulate any time thereafter based on the Saturation Temperature (lowest of both circuit's readings).
2. If the Saturation Temperature (lowest of both circuits' readings) is above the Setpoint plus window, Compressor 2 will turn on at low speed.
3. If the Saturation Temperature (lowest of both circuits' readings) is above the Setpoint plus window, If the Saturation Temperature of Circuit 2 is above the Setpoint plus window, Compressor 1 VFD is at 67% of its range min to max, the reheat valve is at 100%, and the Supply Air Temperature is below the Reheat Setpoint, Compressor 2 will be set to high speed.

Staging Down

1. If the Saturation Temperature of Circuit 2 is below the Setpoint plus window, Compressor 1 VFD is below 50% (adjustable), and the reheat valve is below 50%, Compressor 2 will be set to low speed.
2. If the Saturation Temperature of Circuit 1 is below the Setpoint plus window and Compressor 1 VFD is at minimum, Compressor 1 will be staged off.

NOTE: Compressor 2 cannot be turned off in Dehumidification Mode unless failed on alarm fault.

Envelope Protection

The minimum operating speed reference is read from the VFD and can change depending on where the compressor is operating within its envelope.

The VFD compressor is set to 67% at any stage event. Therefore, whenever a staging event occurs, the VFD compressor position will be reset to the middle point of the modulation range. This allows the compressor enough modulation time before making another staging event to try to avoid cycling between staging events.

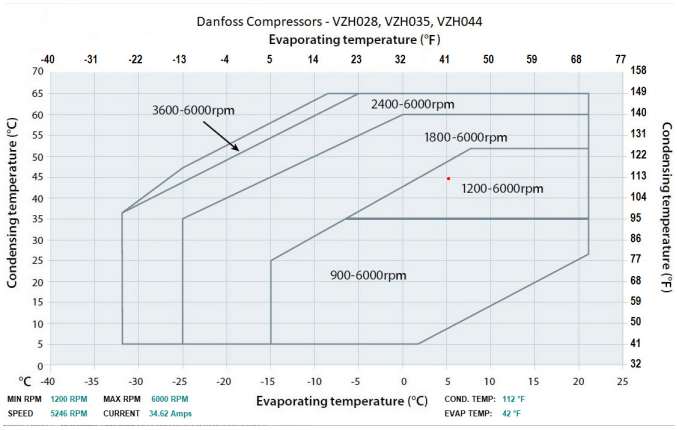


Figure 4: Danfoss VZH028, VZH035, VZH044 Envelope

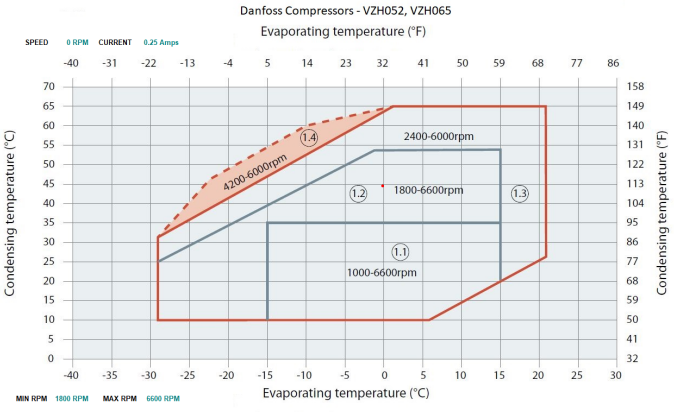


Figure 5: Danfoss VZH052 and VZH065 Envelope

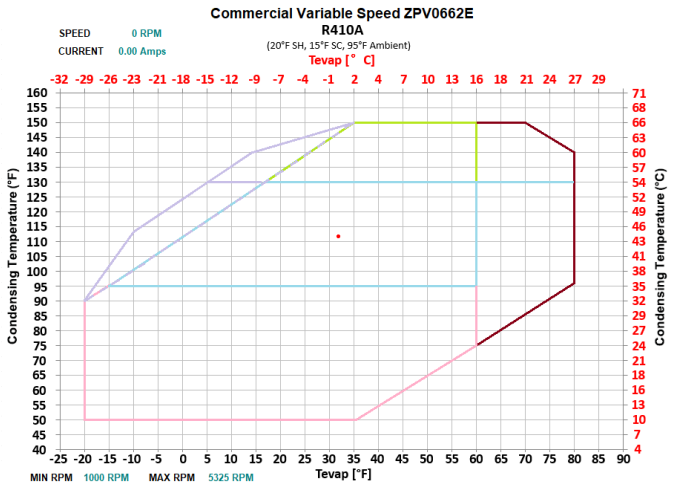


Figure 6: Copeland™ ZPV0662E Envelope

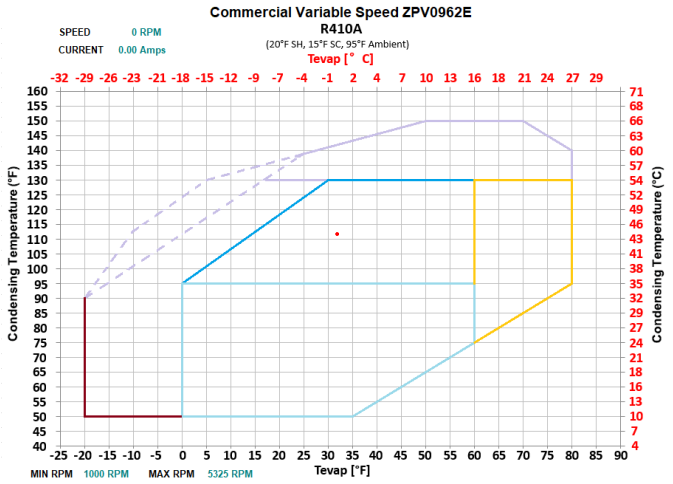


Figure 7: Copeland™ ZPV0962E Envelope

Electronic Expansion Valve Operation and Head Pressure Control

Electronic Expansion Valve Operation

EXV operation is fully integrated into the Superheat Controller. The Superheat Controller will measure suction pressure and temperature to determine superheat and will automatically modulate the EXV to maintain the configured superheat. The RSMVQ will communicate with the Superheat Controller to set the desired Superheat Setpoint and to retrieve operational data for display and trending purposes.

Head Pressure Control

The RSMVQ can monitor a head pressure transducer and control a condenser fan to maintain a Head Pressure Setpoint.

A condenser relay is commanded on when the first compressor is enabled. The condenser fan will be controlled with a 0-10 VDC output signal. When the condenser signal first activates, it maintains at 100% for 10 seconds.

In the Cooling Mode, the condenser signal will modulate to maintain the Cooling Head Pressure Setpoint. The signal can modulate between 15% and 100%. If the head pressure exceeds 550 psig, the condenser control signal will immediately go to 100% and a high head pressure alarm will be generated. The alarm will be deactivated when the head pressure drops below 540 psig.

In the Dehumidification Mode, the Condenser Output Signal controls to the Reheat Head Pressure Setpoint. High head pressure conditions produce the same effects as in the Cooling Mode.

If no head pressure sensor is detected, the Condenser Output Signal will be maintained at 100%.

During condenser fan head pressure control, the Head Pressure Setpoint will decrease when the VFD compressor speed decreases. See **Table 3, this page.**

Compressor Speed	Head Pressure Setpoint (340 default - adjustable)
25% or lower	260 psig
25 - 100%	260 - 340 psig
100%	340 psig

Table 3: Compressor Speed/Head Pressure

LCD Display Screen and Navigation Keys

The LCD display screens and buttons allow you to view status and alarms, and enable force modes. **See Figure 8, this page,** and refer to **Table 4 and Table 5, this page,** for key functions.

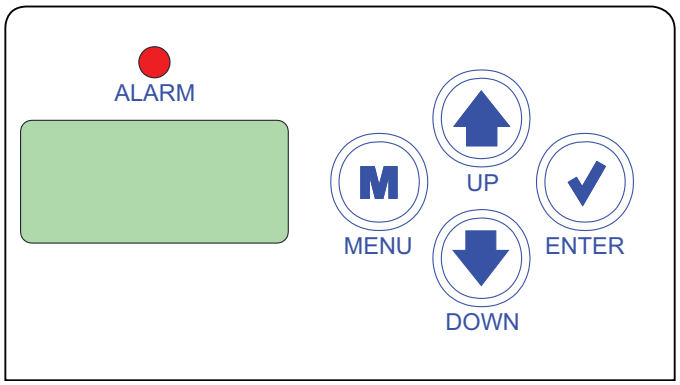


Figure 8: LCD Display and Navigation Keys

Navigation Key	Key Function
MENU 	Use the MENU key to move through screens within Main Menu categories and return to the Main Menu while at other screens.
UP 	Use this key to adjust setpoints and change configurations.
DOWN 	Use this key to adjust setpoints and change configurations.
ENTER 	Use the ENTER key to navigate through the Main Menu Screen categories.

Table 4: Navigation Key Functions

Editing Key	Key Function
UP or DOWN 	Use the UP or DOWN key to enter Edit Mode on a user-adjustable screen. Edit Mode is indicated by the underscore appearing on the screen. **NOTE:** Entering Edit Mode will also adjust the value up one (UP key) or down one (DOWN key), so you may have to readjust the value.
ENTER 	Use the ENTER key to move through the digits in the screen when editing a numeric value. An extended press of the ENTER key saves your edits no matter the location of the editing cursor within the digits. Press the ENTER key to save a non-numeric value such as Hi Speed Network.
MENU 	The MENU key cancels editing when in Edit Mode. The screen you were editing will return to its original value and the underscore will disappear. A second press of the MENU key will return you to the Main Menu.

Table 5: Editing Key Functions

Main Screens Map

RSMVQ Main Screens Map

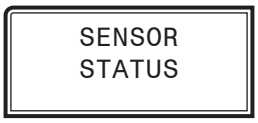
Refer to the following map when navigating through the LCD Main Screens. To scroll through the screens, press the **<MENU>** button.

Press ✓ to scroll through REFRIG MODULE screens.

Press **M** to go to SYSTEM STATUS screens.

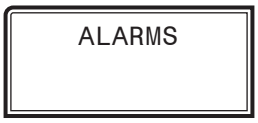
Press ✓ to scroll through SYSTEM STATUS screens.

Press **M** to go to SENSOR STATUS screens.



Press ✓ to scroll through SENSOR STATUS screens.

Press **M** to go to ALARMS screens.



Press ✓ to scroll through ALARMS screens.

Press **M** to go to ALARM HISTORY screens.

Press ✓ to scroll through ALARM HISTORY screens.

Press **M** to go to SETPOINT STATUS screens.

Press ✓ to scroll through SETPOINT STATUS screens.

Press **M** to go to VFD MENU screens.

Note: There are three separate VFD menus. The one that appears is dependent on your unit's configuration.

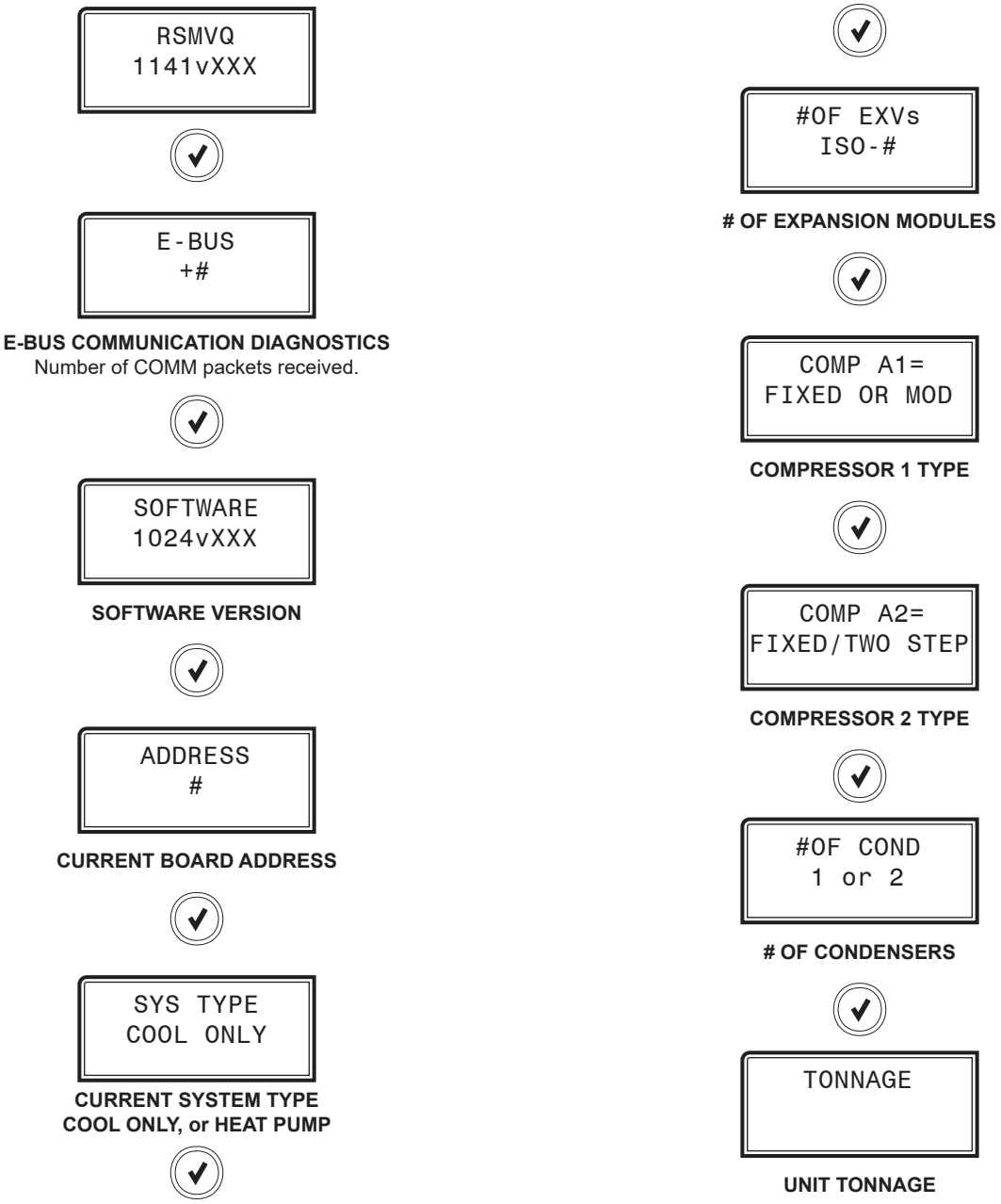
Press ✓ to scroll through VFD MENU screens.

Press **M** to go to EXV TYPE screens.

Press ✓ to scroll through EXV TYPE screens.

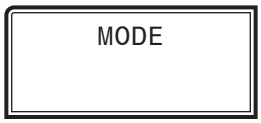
RSMVQ Module Screens

Refer to the following map when navigating through the RSMVQ Screens. From the RSMVQ MODULE Screen, press **<ENTER>** to scroll through the screens.

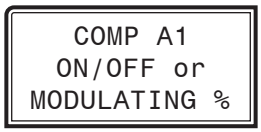


System Status Screens

Refer to the following map when navigating through the System Status Screens. From the SYSTEM STATUS Screen, press **<ENTER>** to scroll through the screens.

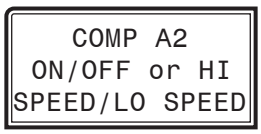


SYSTEM MODE
MIN RUN, OFF, COOLING, HEATING, DEHUM, or FORCED



COMPRESSOR 1
ON/OFF or MODULATING %

FIXED ON/OFF: Compressor is on or off.
MODULATING %: 0-100%

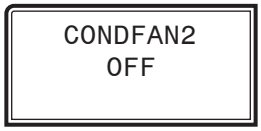


COMPRESSOR 2
ON, OFF, HI SPEED, or LO SPEED

FIXED ON/OFF: Compressor is on or off.
TWO STEP: High Speed or Low Speed

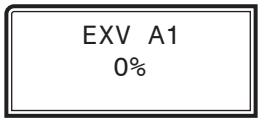
CONDENSER 1
COND FAN, NOT USED, or OFF

COND FAN MODULATING PERCENTAGE: 0-100%

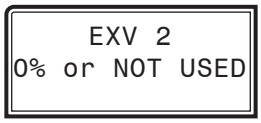


CONDENSER 2
COND FAN, NOT USED, or OFF

COND FAN MODULATING PERCENTAGE: 0-100%



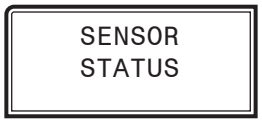
EXV VALVE POSITION
0-100%

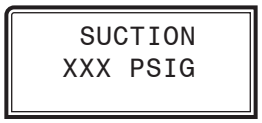


EXV VALVE 2 POSITION
0-100% or NOT USED

Sensor Status Screens

Refer to the following map when navigating through the Sensor Status Screens. From the SENSOR STATUS Screen, press **<ENTER>** to scroll through the screens.





SUCTION PRESSURE READING FROM INPUT

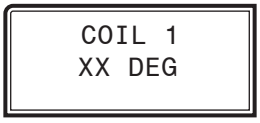
HEAD PRESSURE 1 READING FROM INPUT

HEAD PRESSURE 2 READING FROM INPUT

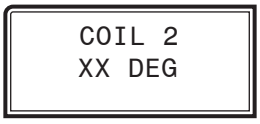
CURRENT SUPERHEAT 1 CALCULATION

CURRENT SUPERHEAT 2 CALCULATION

DISCHARGE LINE TEMP 1 READING FROM INPUT
Only appears if configured for DANFOSS.

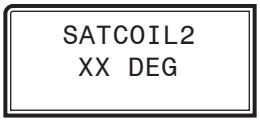


COIL TEMPERATURE 1



COIL TEMPERATURE 2

CALCULATED COIL TEMPERATURE
(Saturated Temperature)



SATURATION LINE: TEMP 2 READING FROM INPUT
Only appears if configured for two compressors/circuits.

Alarms Screen

If an alarm is present, the ALARM LED above the LCD display will light up red and blink. The alarms will display and scroll automatically from the ALARMS screen when alarms are present.

NO ALARMS: This will be shown if there are no current alarms.

DMQ NOT DETECTED: This will be shown if no communication exists between the RSM and DMQ.

EBUS SLAVE (SLV) TIMEOUT: This alarm indicates that communication has been lost between the RSMVQ and the AAON controller. This can be the result of a bad cable, a missing cable, or the module not being configured properly.

NO SUCTION PRESSURE TRANSDUCER (SUCT) DETECTED: This alarm indicates the Suction Pressure Transducer is not detected by the system. The system will shut down due to unsafe suction safety and will retry after five minutes.

NO HEAD PRESSURE TRANSDUCER (HEAD) DETECTED: This alarm indicates the Head Pressure Transducer is not detected by the system. This will cause the condenser to go to 100%.

COMPRESSOR (COMP) 1 FAULT: This alarm will occur if the compressor fails to run 45 seconds after the relay is activated or if the signal is lost after activation. This will cause an alarm and will shut down the compressor (relay). The system will retry after five minutes.

COMPRESSOR (COMP) 2 FAULT: This alarm will occur if the compressor fails to run 45 seconds after the relay is activated or if the signal is lost after activation. This will cause an alarm and will shut down the compressor (relay). The system will retry after five minutes.

HIGH HEAD PRESSURE (HP) DETECTED: This indicates a High Head Pressure Alarm condition which is activated when the Head Pressure rises above 550 psig. This will cause the condenser to go to 100%.

LOW SUCTION PRESSURE FAILURE: This alarm will occur if suction pressure stays below the Low Suction Pressure Setpoint for one minute or falls below 40 psig for five seconds. This alarm will shut down the system. The system will retry after five minutes.

LOW SUCTION PRESSURE (SP) DETECTED: This alarm will occur if suction pressure falls below the Low Suction Pressure Setpoint for 20 seconds. The system will try to protect by lowering compressor modulation percentage.

LOW SUPERHEAT 1 (SH1) DETECTED: This alarm will be activated when the Superheat is less than 4ºF for two minutes during normal operation or four minutes during the first 10 minutes. The system will shut down and will retry after five minutes.

LOW SUPERHEAT 2 (SH2) DETECTED: This alarm will be activated when the Superheat is less than 4ºF for two minutes during normal operation or four minutes during the first 10 minutes. The system will shut down. The system will shut down and will retry after five minutes.

COIL 1 TEMP 1 FAILURE: This alarm will occur if the coil temperature is not within operable range (below -32ºF or above 310ºF). This could be the result of a bad sensor or faulty wiring. This alarm will shut down the system. The system will reset after five minutes if the sensor is detected.

COIL 2 TEMP 2 FAILURE: This alarm will occur if the coil temperature is not within operable range (below -32ºF or above 310ºF). This could be the result of a bad sensor or faulty wiring. This alarm will shut down the system. The system will reset after five minutes if the sensor is detected.

COMP VFD FAULT: This alarm will occur if the Copeland™ VFD compressor communicates through E-BUS that it has shut down due to a fault condition. The compressor module will attempt to reset the fault after five minutes if the compressor sends the signal that it is okay to reset the fault.

LOH2OTMP—Low Leaving H_2O Temp

NOH2OFLO—Proof of Water Flow

HIGH SUPERHEAT 1 (SH1) WARNING: If Superheat 1 is above 25ºF for two minutes, this alarm will appear on the module only. It will not be sent to the main controller to display on Prism 2.

HIGH SUPERHEAT 2 (SH2) WARNING: If Superheat 2 is above 25ºF for two minutes, this alarm will appear on the module only. It will not be sent to the main controller to display on Prism 2.

HIGH SUPERHEAT 1 (SH1) FAILURE: If Superheat 1 is above 30ºF for 10 minutes, it will turn off the compressors. It will retry after five minutes. If it fails twice in two hours, it will lock out the compressors.

HIGH SUPERHEAT 2 (SH2) FAILURE: If Superheat 2 is above 30ºF for 10 minutes, it will turn off the compressors. It will retry after five minutes. If it fails twice in two hours, it will lock out the compressors.

HIGH SUPERHEAT LOCKOUT: If the module fails on High Superheat twice in two hours, it will lock out the compressors.

MODBUS TIMEOUT: Indicates there is no communication between the RSMVQ and Compressor VFD.

DANFOSS VFD: Indicates an alarm on the Danfoss VFD.

HI DISCH LINETEMP: If discharge line temperature is above 260ºF, the compressor will back off. If the temperature doesn't drop below 260ºF after one minute, the compressor will turn off. Discharge line temperature needs to drop below 150ºF for the compressor to come back after it has been off for at least five minutes. If this occurs three times in two hours, the compressor will be locked out until the module is reset.

UNIT CFG MISMATCH: Indicates that either the wrong compressor model or unit tonnage is configured.

Alarm History Screens

The ALARM HISTORY Screen displays past alarms, if any, and how long ago the last of each type occurred. From the ALARM HISTORY Screen, press **<ENTER>** to scroll through the history screens.

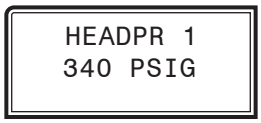
The Alarm will appear on the first line and the second line will display how long ago each alarm last occurred. The alarms listed on the ALARMS screen will be abbreviated as shown below.

CL TMP 1—Coil Temp 1 Failure
CL TMP 2—Coil Temp 2 Failure
COMP 1 FL—Compressor 1 Not Running
COMP 2 FL—Compressor 2 Not Running
HP SENSE—No Head Pressure 1 Sensor Detected
HIGH HP—High Head Pressure Detected
LOW SP—Low Suction Pressure Detected
LOW SH1—Low Superheat 1 Detected
LOW SH2—Low Superheat 2 Detected
COMM T/O—E-BUS Slave Timeout
SP SENSE—No Suction Pressure Sensor Detected
UNSAFESP—Unsafe Suction Pressure Detected
LOH2OTMP—Low Leaving H_2O Temp
NOH2OFLO—Proof of Water Flow
HI SH1—High Superheat 1 Failure
HI SH2—High Superheat 2 Failure
MODBUS—MODBUS Not Detected
DF VFD—Danfoss VFD Not Detected
HI DT—High Discharge Temperature Detected
HP2 SENSE—No Head Pressure 2 Sensor Detected

NOTE: The screen will display minutes for the first 60 minutes of alarm occurrence, hours for the next 72 hours of alarm occurrence, and days for the next 30 days of alarm occurrence. After 30 days, the alarm will clear. Alarm history is not stored in memory. If power is lost, the alarms will clear.

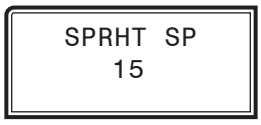
Setpoint Status Screens

Refer to the following map when navigating through the Setpoint Status Screens. From the SETPOINT STATUS Screen, press **<ENTER>** to scroll through the screens.

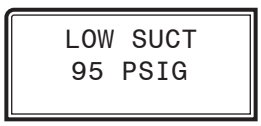


HEAD PRESSURE SETPOINT 1
Valid range is 260-475 psig. Default is 340 psig.

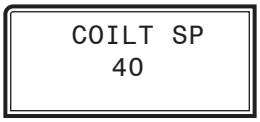
HEAD PRESSURE SETPOINT 2
Valid range is 260-475 psig. Default is 340 psig.



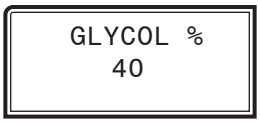
SUPERHEAT SETPOINT SETTING
Valid range is 1-30ºF. Default is 15ºF.



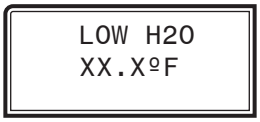
LOW SUCTION PRESSURE SETPOINT SETTING
Default is 95 psig.



COIL TEMPERATURE SETPOINT SETTING
Valid range is 35-70ºF. Default is 40ºF.



GLYCOL PERCENTAGE SETPOINT SETTING
Valid range is 35-70%. Default is 40%.
Only appears if configured as WSHP.

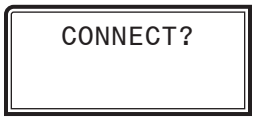


LOW H_2O SETPOINT SETTING
Automatically resets based on Glycol %.
Only appears if configured as WSHP.

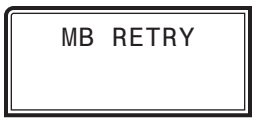
Copeland™ Packaged VFD Screens

Refer to the following map when navigating through the Copeland™ Packaged VFD Screens. From the COPELAND Screen, press **<ENTER>** to scroll through the screens.

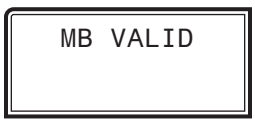
COPELAND™ COMPRESSOR MODEL
NOCONFIG or ZPV0662E or ZPV0962E.



CONNECTION STATUS
YES or NO. VFD is connected and communicating with the RSMVQ.



MB RETRY
Totals if it is missing communication packet information.



MB VALID
Totals if it receives good communication packet information.

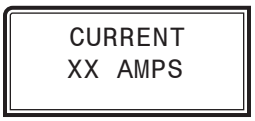
VFD COMPRESSOR
Enabled or Disabled.

SPEED COMMAND
Commanded speed in rpm.

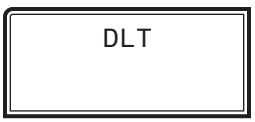
SPEED FEEDBACK
Speed feedback read from the VFD in rpm.

MAXIMUM RPM
Maximum speed programmed into the VFD in rpm.

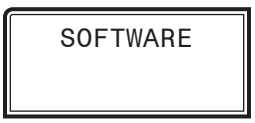
ALARM CODE
Alarm code is read from the VFD.



CURRENT AMPS
Live current read from VFD in amps.



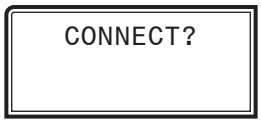
DISCHARGE LINE TEMPERATURE
Discharge line temp read from VFD in Fahrenheit.



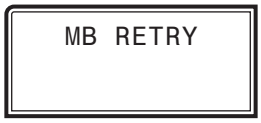
SOFTWARE VERSION
Software version read from VFD.

Danfoss VFD Screens

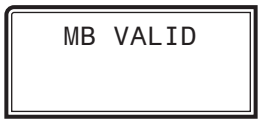
Refer to the following map when navigating through the Danfoss VFD Screens. From the Danfoss Comp Screen, press **<ENTER>** to scroll through the screens.



CONNECTION STATUS
YES or NO. VFD is connected and communicated to the RSMVQ.



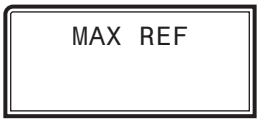
MB RETRY
Totals if it is missing communication packet information.



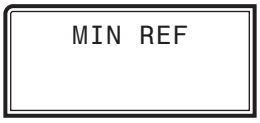
MB VALID
Totals if it receives good communication packet information.

VFD COMPRESSOR
Displays a value read from VFD showing status and configuration information. Then it will display each bit of information separately.

COMPRESSOR COMMAND
Compressor percentage commanded to VFD.

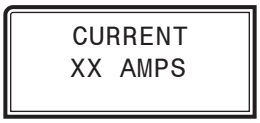


MAXIMUM SPEED
Maximum speed programmed into the VFD in RPM.

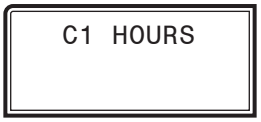


MINIMUM SPEED
NOT = 0! or CONFIRMED
Minimum speed programmed into the VFD. For proper speed command this should always say confirmed meaning it is set to zero.

ALARM CODE
Alarm codes are read from the VFD.



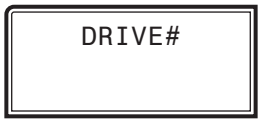
CURRENT AMPS
Live current read from VFD in amps.



COMPRESSOR RUNNING HOURS
Compressor running hours read from VFD.

VFD RUNNING HOURS
VFD running hours read from VFD.

MODEL NUMBER
Compressor model number read from VFD.



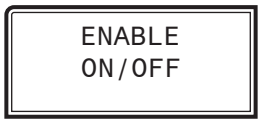
DRIVE NUMBER
Type of Danfoss VFD - CDS803 or CDS303.

Copeland™ VFD Screens

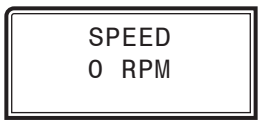
Refer to the following map when navigating through the Copeland™ VFD Screens. From the Copeland™ VFD Screen, press **<ENTER>** to scroll through the screens.

MINIMUM COMPRESSOR SPEED LIMIT
Minimum compressor envelope speed in rpm.

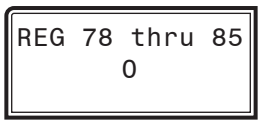
MAXIMUM COMPRESSOR SPEED LIMIT
Maximum compressor envelope speed in rpm.



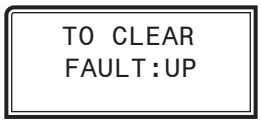
COMPRESSOR ENABLED
ON,OFF or NO RESP
Compressor enable read from VFD.



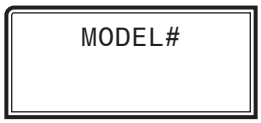
CURRENT SPEED OF COMPRESSOR
Compressor speed read from VFD in rpm.
When in Force Mode, speed can be adjusted from this screen by using the **<UP>** and **<DOWN>** buttons.



COPELAND™ VFD FAULT CODES 78 THROUGH 85
Used for troubleshooting faults. See Emerson's See Copeland™ manual for descriptions as applicable.



CLEAR FAULT
To clear faults at the VFD, press the **<UP>** button. Faults will automatically clear after five minutes on their own.



MODEL NUMBER
Displays compressor model number that is configured into the drive. Model number must match compressor to ensure safe speed limit and current limit operation.

CURRENT LIMIT SETPOINT CONFIGURED
Current limit threshold of specified compressor model in amps.

CURRENT AMPS
Live current reading of compressor in amps.

VFD STAT

VFD STAT
Displays code for VFD status register value. See Emerson's See Copeland™ manual for descriptions as applicable.

REG 10
XX.XX.XX

VFD SOFTWARE VERSION
Software version read from the VFD.

DMQ EXV Screens

Refer to the following map when navigating through the DMQ EXV Screens. From the EXV TYPE Screen, press **<ENTER>** to scroll through the screens.

EXV TYPE
DMQ

EXV1-4
DETECTED

EXV1-4
DETECTED or NODETECT
If DMQ is detected and communicating with RSMVQ
(each connected DMQ will be displayed on a separate screen)

DMQ1-4 PSI

DMQ1-4 SUCTION PRESSURE READING
Suction Pressure reading from DMQ1 through DMQ4
(each connected DMQ will be displayed on a separate screen)

Using RSMVQ LEDs to Verify Operation

The RSMD is equipped with LEDs that can be used to verify operation and perform troubleshooting. There are LEDs for communication, operation modes, and diagnostic codes. See **Figure 9, this page,** for the LED locations. The LEDs associated with these inputs and outputs allow you to see what is active without using a voltmeter. The LEDs and their uses are as follows:

Diagnostic LEDs

STATUS - If the software is running, this LED should blink at a rate of one blink per second.

ALARM (on board) - If the RSMVQ Module does not receive communications for more than one minute, this LED will light up, the relays will turn off, and the analog outputs will go to 0 VDC.

ALARM (above LCD display) - This red LED will light up and stay lit when there is an alarm present. The type of alarm will display on the LCD display. The ALARM LED also blinks when the expansion valve is initializing at startup.

COMM - Every time the RSMVQ Module receives a valid E-BUS request from the VCCX2 Controller, this LED will blink on and then off, signifying that it received a valid request and responded.

POWER - This LED will light up to indicate that 24 VAC power has been applied to the controller.

Binary Input LEDs

BI1 - This green LED will light up when Compressor Status 1 contact is closed.

BI2 - This green LED will light up when Compressor Status 2 switch is closed.

BI3 - This green LED will light up when the Outdoor Coil Temperature switch is closed.

BI4 - This green LED will light up when the Emergency Shutdown switch is closed.

Relay LEDs

RLY1 - RLY4 - These green LEDs will light up when the relays are enabled and will stay lit as long as they are active.

RSMVQ Stepper Motor Valve LED

EXV-1 - This yellow LED will blink to indicate communication to the Superheat Controller. If the LED is on solid, that indicates no communication to the Superheat Controller.

EXV-2 - This yellow LED will blink to indicate communication to the Superheat Controller. If the LED is on solid, that indicates no communication to the Superheat Controller.

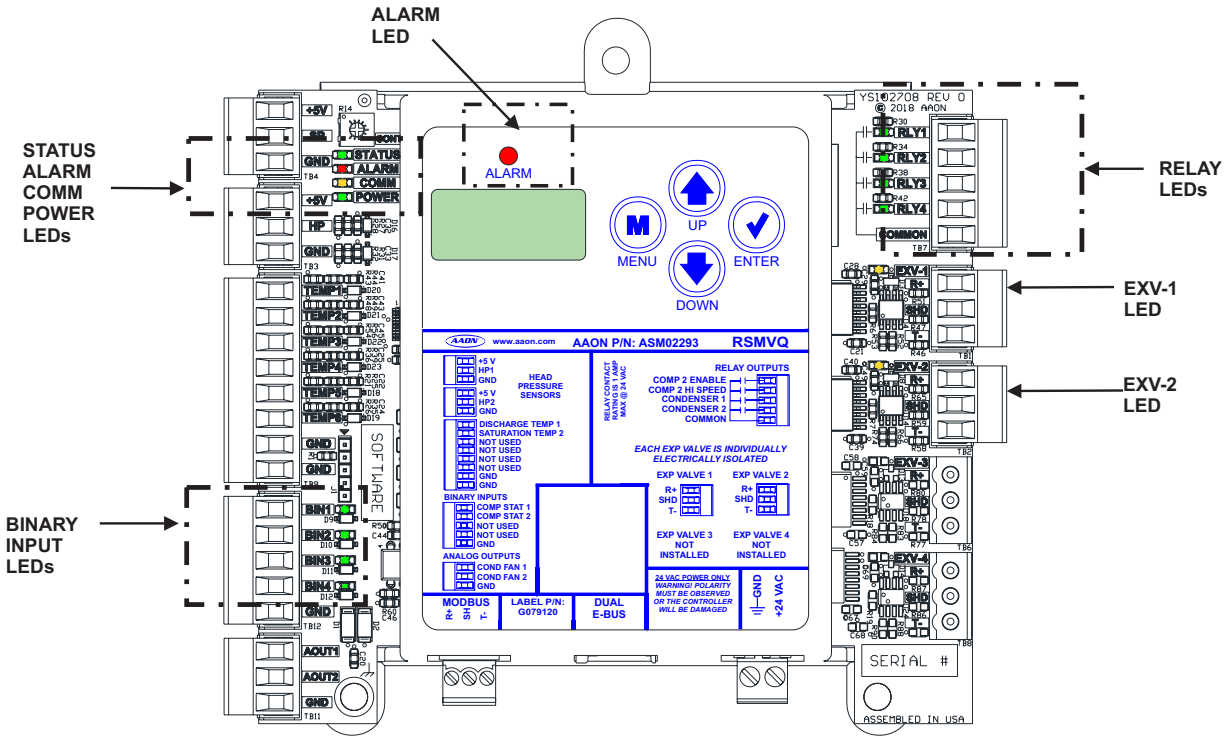


Figure 9: RSMVQ LED Locations

Coil Temperature Sensor Testing

The **Temperature, Resistance, and Voltage for Type III Sensors table, Table 6 below,** is provided to aid in checking sensors that appear to be operating incorrectly. Many system operating problems can be traced to incorrect sensor wiring. Be sure all sensors are wired per the wiring diagrams in this manual.

If the sensors still do not appear to be operating or reading correctly, check voltage and/or resistance to confirm that the sensor is operating correctly per the tables. Please follow the notes and instructions that appear after the chart when checking sensors.

Thermistor Sensor Testing Instructions

Use the resistance column to check the thermistor sensor while disconnected from the controllers (not powered).

Use the voltage column to check sensors while connected to powered controllers. Read voltage with meter set on DC volts. Place the "-" (minus) lead on the GND terminal and the "+" (plus) lead on the sensor input terminal being investigated.

Temperature – Resistance – Voltage for Type III 10 K Ohm Thermistor Sensors

Temp (ºF)	Temp (ºC)	Resistance (Ohms)	Voltage @ Input (VDC)	Temp (ºF)	Temp (ºC)	Resistance (Ohms)	Voltage @ Input (VDC)
-10	-23.3	93333	4.51	**72**	22.2	11136	2.635
-5	-20.6	80531	4.45	**73**	22.8	10878	2.605
0	-17.8	69822	4.37	**74**	23.3	10625	2.576
5	-15	60552	4.29	**75**	23.9	10398	2.549
10	-12.2	52500	4.2	**76**	24.4	10158	2.52
15	-9.4	45902	4.1	**77**	25	10000	2.5
20	-6.6	40147	4.002	**78**	25.6	9711	2.464
25	-3.9	35165	3.891	**80**	26.7	9302	2.41
30	-1.1	30805	3.773	**82**	27.8	8893	2.354
35	1.7	27140	3.651	**84**	28.9	8514	2.3
40	4.4	23874	3.522	**86**	30	8153	2.246
45	7.2	21094	3.39	**88**	31.1	7805	2.192
50	10	18655	3.252	**90**	32.2	7472	2.139
52	11.1	17799	3.199	**95**	35	6716	2.009
54	12.2	16956	3.143	**100**	37.8	6047	1.884
56	13.3	16164	3.087	**105**	40.6	5453	1.765
58	14.4	15385	3.029	**110**	43.3	4923	1.65
60	15.6	14681	2.972	**115**	46.1	4449	1.54
62	16.7	14014	2.916	**120**	48.9	4030	1.436
64	17.8	13382	2.861	**125**	51.7	3656	1.339
66	18.9	12758	2.802	**130**	54.4	3317	1.246
68	20	12191	2.746	**135**	57.2	3015	1.159
69	20.6	11906	2.717	**140**	60	2743	1.077
70	21.1	11652	2.691	**145**	62.7	2502	1.001
71	21.7	11379	2.661	**150**	65.6	2288	0.931

NOTE: If the voltage is above 4.88 VDC, then the sensor or wiring is "open." If the voltage is less than 0.05 VDC, then the sensor or wiring is shorted.

Table 6: Temperature, Resistance, and Voltage for Type III Sensors

Head Pressure Transducer

If you suspect there is a problem related to the head pressure transducer, measurements can be taken at the HP terminal. See **Table 7, this page**.

Head Pressure Transducer Chart			
Voltage	**Pressure**	**Voltage**	**Pressure**
0.5	0	**2.6**	350
0.6	17	**2.7**	367
0.7	33	**2.8**	384
0.8	50	**2.9**	400
0.9	67	**3.0**	417
1.0	83	**3.1**	434
1.1	100	**3.2**	450
1.2	117	**3.3**	467
1.3	133	**3.4**	484
1.4	150	**3.5**	500
1.5	167	**3.6**	517
1.6	183	**3.7**	534
1.7	200	**3.8**	550
1.8	217	**3.9**	567
1.9	233	**4.0**	584
2.0	250	**4.1**	600
2.1	267	**4.2**	617
2.2	283	**4.3**	634
2.3	300	**4.4**	650
2.4	317	**4.5**	667
2.5	334		

Table 7: Head Pressure Transducer Chart

Single Condenser Per Module

In Single Condenser Per Module wiring configuration, the Condenser Signal is wired to AO1 and the RLY3 is enabled. Refer to the figures below for Prism 2 configuration and Modular Service Tool Screen selection.

RSMVQ Condenser Options Configuration Screen

```
RSM#1 CONFIGURATION
 Condenser Options
  1 Cond per RSMV
USE < or > TO CHANGE
```

Select the "1 Cond per RSMV" option on the above handheld Modular Service Tool screen.

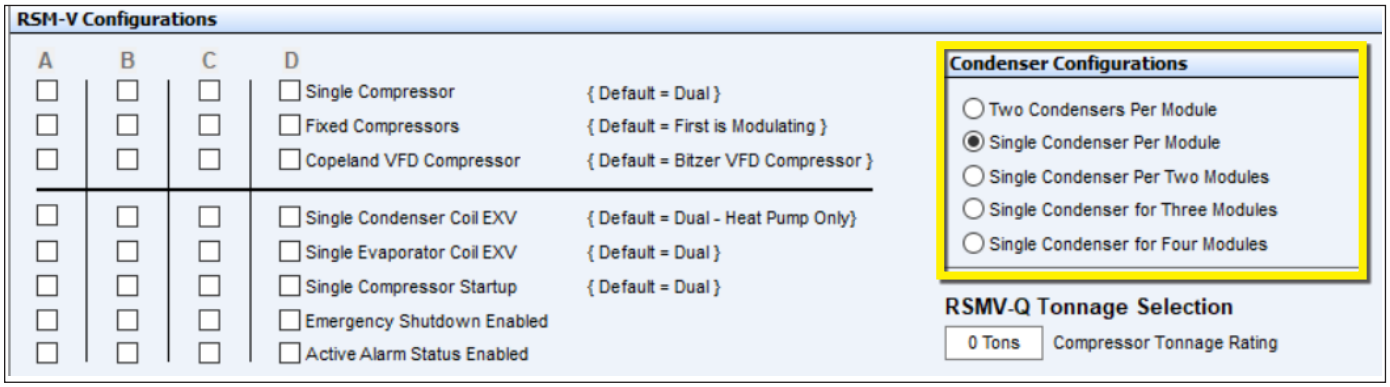


Figure 10: Prism 2 - Single Condenser Module Configuration

Two Condensers Per Module

In Two Condensers Per Module wiring configuration, the Condenser Signals are wired to AO1 and AO2 and RLY3 and RLY4.

Refer to the figures below for Prism 2 configuration and Modular Service Tool Screen selection.

RSMVQ Condenser Options Configuration Screen

```
RSM#1 CONFIGURATION
 Condenser Options
  2 Cond per RSMV
USE < or > TO CHANGE
```

Select the “2 Cond per RSMV” option on the above handheld Modular Service Tool screen.

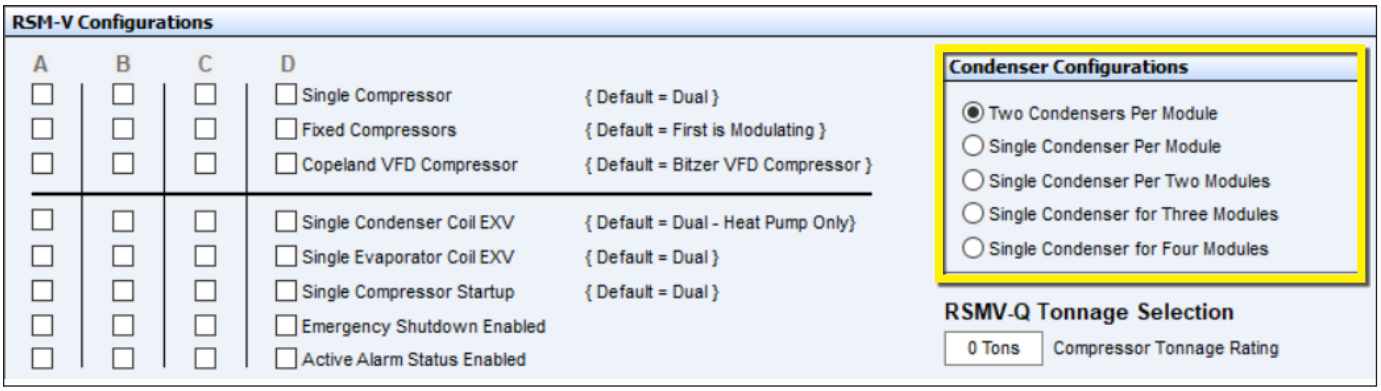


Figure 11: Prism 2 - Two Condensers Module Configuration

Prism 2 Compressor Type Selection

Refer to **Figure 12, this page,** for setting RSMVQ compressor type selection.

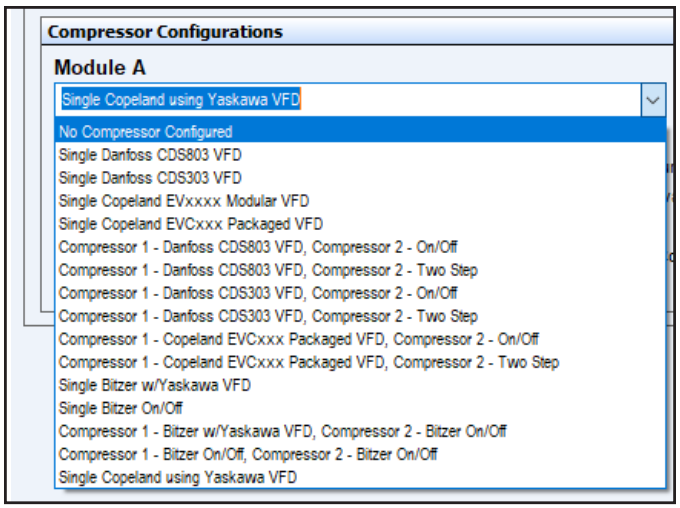


Figure 12: RSMVQ Module A Compressor Type

You must select the type of compressor(s) you are using from the list below:

- Single Danfoss CDS803 VFD
- Single Danfoss CDS303 VFD
- Single Copeland™ EVxxxx Modular VFD
  NOTE: You must also select the model number.
  See **Figure 13, this page**.
- Single Copeland™ EVCxxx Packaged VFD
  NOTE: You must also select the model number.
  See **Figure 13, this page**.
- Compressor 1 - Single Danfoss CDS803 VFD,
  Compressor 2 - On/Off
- Compressor 1 - Single Danfoss CDS803 VFD,
  Compressor 2 - Two-Step
- Compressor 1 - Single Danfoss CDS303 VFD,
  Compressor 2 - On/Off
- Compressor 1 - Single Danfoss CDS303 VFD,
  Compressor 2 - Two-Step
- Compressor 1 - Copeland™ EVCxxx Packaged VFD,
  Compressor 2 - On/Off
  NOTE: You must also select the model number.
  See **Figure 13, this page**.
- Compressor 1 - Copeland™ EVCxxx Packaged VFD,
  Compressor 2 - Two-Step
  NOTE: You must also select the model number.
  See **Figure 13, this page**.

Copeland™ Compressor Model Selection

Refer to **Figure 13, this page,** in selecting the Copeland™ Compressor Model.

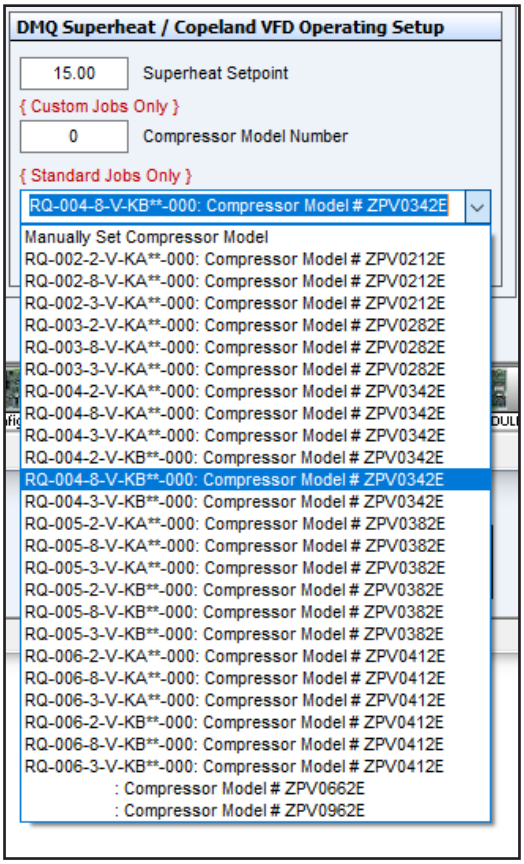


Figure 13: Miscellaneous Setpoints Screen - Copeland™ Model Selection

After selecting the Copeland™ compressor model, you need to click the **<Update Copeland>** button and confirm that the model number is correct in the RSMVQ's LCD Compressor screen. If it does not appear correctly, try cycling power to the RSMVQ.

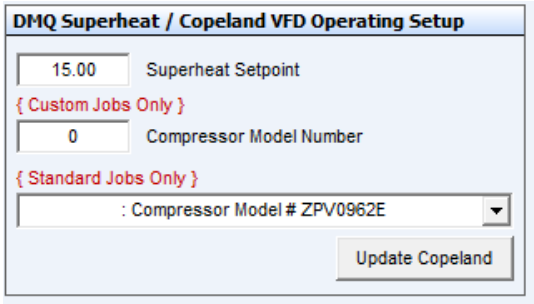


Figure 14: Update Copeland™

Unit Tonnage Selection and Compressor Type Specification Table

Unit Tonnage Selection

You must enter the tonnage for the unit you are controlling. Please refer to **Table 8, this page,** to figure out unit tonnage for the compressor(s) on your system. This is found on the RSMV Configuration Screen.

Refer to **Table 8, this page,** for compressor type unit tonnage and minimum and maximum compressor speeds.

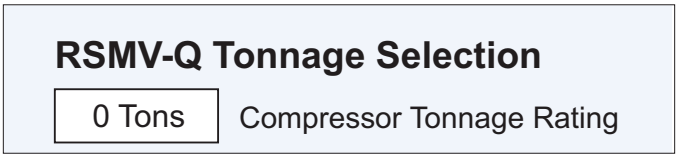


Figure 15: RSMVQ Unit Tonnage Selection

COMPRESSOR TYPE SPECIFICATIONS TABLE			
Compressor Type(s)	**Unit Tonnage**	**Minimum VFD Compressor Speed* (RPM)**	**Maximum VFD Compressor Speed* (RPM)**
Single Danfoss CDS803 VFD	7	900	5250
Single Danfoss CDS303 VFD	8	1000	5100
Single Copeland EVxxxx Modular VFD	Determined by Compressor Model		
Single Copeland EVCxxx Packaged VFD	Determined by Compressor Model		
Compressor 1 - Danfoss CDS803 VFD Compressor 2 - On/Off	9	900	5100
	13	900	5610
Compressor 1 - Danfoss CDS803 VFD Compressor 2 - Two Step	11	900	5100
Compressor 1 - Danfoss CDS303 VFD Compressor 2 - On/Off	N/A	N/A	N/A
Compressor 1 - Danfoss CDS303 VFD Compressor 2 - Two Step	15	1000	5800
Compressor 1 - Copeland EVCxxx Packaged VFD Compressor 2 - On/Off	30	1200	4700
Compressor 1 - Copeland EVCxxx Packaged VFD Compressor 2 - Two-Step	20	1000	4900
	25	1200	5500
NOTE: *Speed limits given are before compressor envelope limits are set. See page 13 for envelope limit information.			

Table 8: Compressor Type Specification Table

RSMVQ Technical Guide
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AAON Controls Support: 866-918-1100
Monday through Friday, 7:00 AM to 5:00 PM
Central Standard Time

Controls Support website:
www.aaon.com/controlstechsupport

AAON Factory Technical Support: 918-382-6450
techsupport@aaon.com

NOTE: Before calling Technical Support, please have the model and serial number of the unit available.

PARTS: For replacement parts, please contact your local AAON Representative.

2425 South Yukon Ave • Tulsa, OK • 74107-2728
Ph: (918) 583-2266 • Fax: (918) 583-6094
AAON P/N: **G079110**, Rev. B