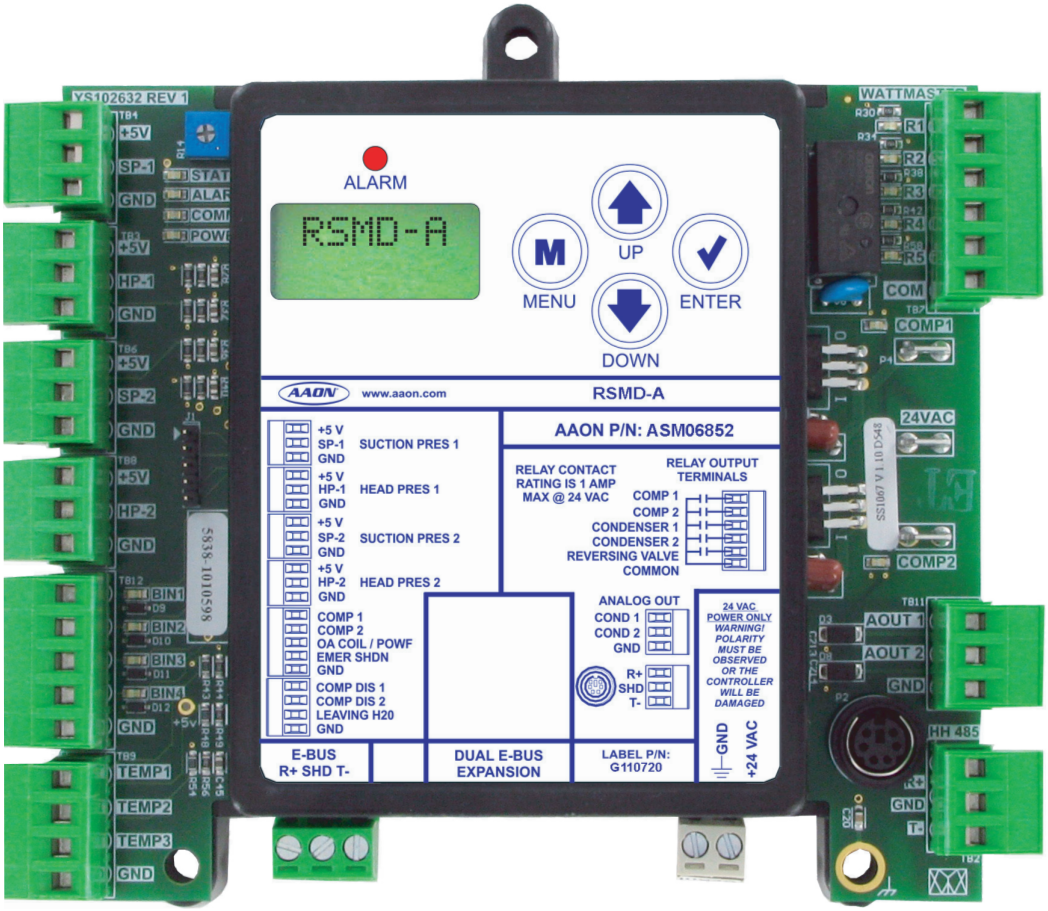
Compatible with
VCCX/VCCX-IP
Series

RSMD-A
Technical Guide

ASM06852
PIC32 Processor Software SS1168
RP2040 Processor Software SS3009



RSMD-A TECHNICAL GUIDE REVISION LOG	
REVISION AND DATE	**CHANGE**
Rev. A, June 21, 2024	Original

PRODUCT NAME PARTS REFERENCE	
PART DESCRIPTION	**PART NUMBER**
RSMD Module for RNA Units	ASM06852
Software for RSMD-A with RP2040 Processor	SS3009
Software for RSMD-A with PIC32 Processor	SS1168
VCCX-IP Controller	ASM07424
VCCX2 Controller	ASM01698
Prism 2	ASM02533
IP Module Kit	ASM01902
CommLink 5/CommLink 6	ASM01874/ASM07420
EBC E-BUS Cable Assembly E-BUS Power & Comm 1.5 Ft, 3 Ft, 10 Ft, 25 Ft, 50 Ft, 75 Ft, 100 Ft, 150 Ft, 250 Ft, and 1000 Foot 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)

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Rev. A

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General Information

Overview

The RSMD Module for RNA Units (RSMD-A) can monitor and control up to two compressors and one condenser. If there are two compressors being controlled, they must be in a tandem configuration. The module is designed for R410-A refrigerant.

The RSMD-A is for units that match all of the following criteria:

- one circuit
- compressors may be any mix of fixed or digital
- reheat is present on second circuit or both circuits

The RSMD-A is connected to the VCCX2/VCCX-IP Controller. Up to two RSMD-A Modules can be connected, depending on the size of the system. There are two E-BUS expansion ports which allow the use of communicating sensors and E-BUS modules.

The RSMD-A (ASM06852) uses either a PIC32 processor or a RP2040 processor. There is no functional difference between the two types of boards.

- The PIC32 processor requires software version SS1168.
- The RP2040 processor requires software version SS3009.

The software version is identified on the software label near the Status LED or using the Software Version screen.

WARNING: The correct software version must be used for all software upgrades. Loading the incorrect software could result in malfunction. Contact AAON Technical Support for assistance, if required.

Features

The RSMD-A Module:

- Modulates the compressors to satisfy the suction coil (saturated) temperature. The Suction Coil (Saturated) Temperature Setpoint is reset by the VCCX2/VCCX-IP Controller to maintain the supply air temperature during Cooling Mode. During Dehumidification Mode, it controls the compressors to directly maintain the Suction (Saturated) Temperature Setpoint.
- Modulates and stages the compressors to maintain a given Supply Air Temperature Setpoint when the heat pump is in Heating Mode.
- Modulates the condenser fans or valves to maintain the Head Pressure Setpoint.
- Provides alarms and safeties for the compressor and condenser operation.
- Allows connection of the USB Link to the module when required communication wire is run to the VCCX2/VCCX-IP Controller.
- Uses an integrated 2 x 8 LCD character display and four navigation buttons to show status of system operation, system setpoints, system configurations, sensors, and alarms.

Dimensions

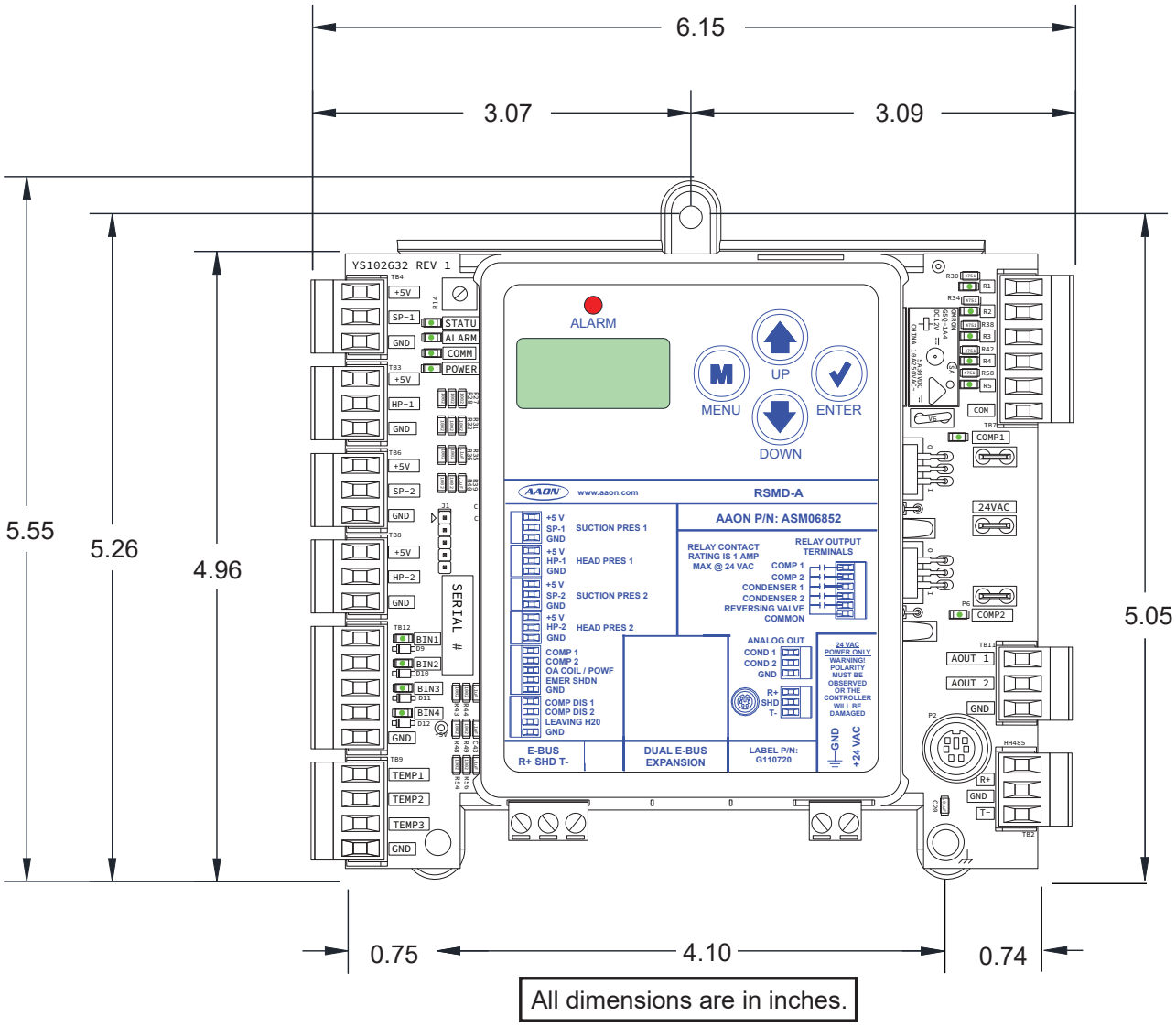


Figure 1: RSMD-A Dimensions

Electrical and Environmental Requirements

General

Correct wiring of the AAON unit controller and its modules is the most important factor in the overall success of the controller installation process. The AAON unit controller and modules are factory installed and wired at the AAON factory. Some of the following information may not apply if the system 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**.

ELECTRICAL AND ENVIRONMENTAL REQUIREMENTS

Control Device	Voltage	VA Load	Operating Temperature	Humidity (Non-Condensing)
RSMD-A Module	18-30 VAC	18	-22°F to 158°F -30ºC to 70ºC	0-95% RH
	Inputs		Resistive Inputs require 10KΩ Type 3 Thermistor	
			24 VAC Inputs provide 4.7kΩ Load	
	Outputs		Relay Outputs: 1 Amp maximum per output.	

Table 1: 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 unit controller, RSMD-A, and any associated module.

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

- All wiring is to be in accordance with local and national electrical codes and specifications.
- All 24 VAC wiring must be connected so all ground wires remain common. Failure to follow this procedure can result in damage to the controller and connected devices.
- Minimum wire size for 24 VAC wiring is 18-gauge.
- Minimum wire size for all sensors is 24-gauge. Some sensors require two-conductor wire and some require three- or four-conductor wire.
- Minimum wire size for 24 VAC thermostat wiring is 22-gauge.
- Verify 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 cause a short circuit.
- When communication wiring is used to connect 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 an AAON distributor for information. If desired, Belden #82760 or equivalent wire may also be used.
- Recheck all wiring connections and terminations before applying power to the AAON unit controller, RSMD-A Modules, and any associated modules.

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, verify 24 VAC is 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.

Inputs Wiring

Wiring Overview

The RSMD-A provides three analog inputs, four binary inputs, five relays, and two analog outputs. See **Figure 2, this page** for inputs wiring and **Figure 3, page 9** for outputs wiring.

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.

Suction Pressure Transducer Wiring

The Suction Pressure Transducers must be wired as shown in **Figure 2, this page**. It is typically required for all VCCX2/VCCX-IP applications.

The Suction Pressure Transducers are used to measure suction pressure at the HVAC unit's DX evaporator coil suction line. This suction line pressure is converted to saturated refrigerant temperature. The saturated refrigerant temperature is used to properly control the compressors to maintain a given Suction Coil (Saturated) Temperature Setpoint. In Cooling Mode, the VCCX2/VCCX-IP resets the Suction Coil (Saturated) Temperature Setpoint to maintain a given Supply Air Temperature Setpoint. In Dehumidification Mode, the Suction Coil (Saturated) Temperature Setpoint is a user configurable setpoint that can be reset based on indoor humidity levels.

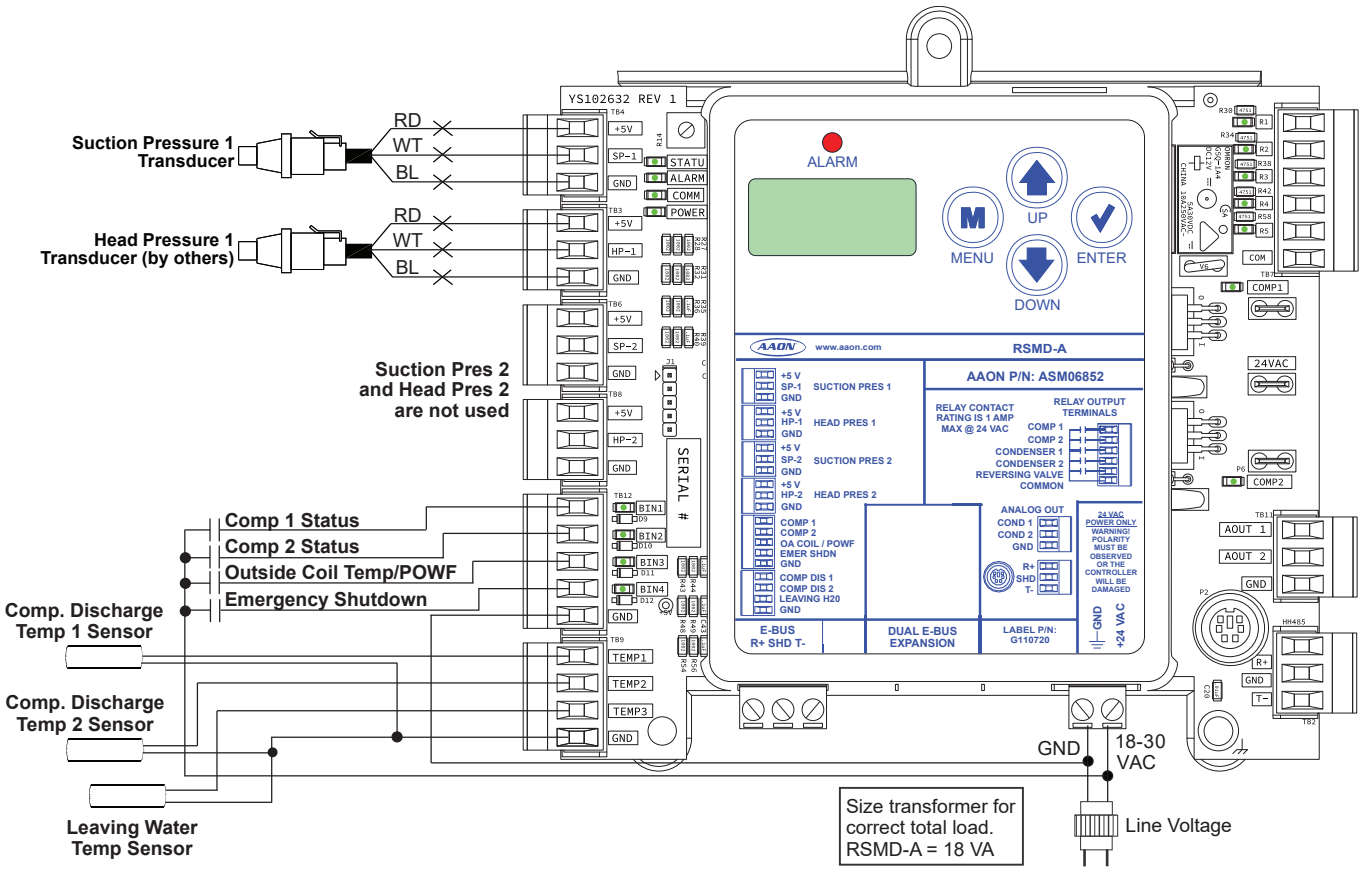


Figure 2: RSMD-A Inputs Wiring

Outputs Wiring

Head Pressure Control

The Head Pressure Transducers are used to measure head pressure at the discharge line. This head pressure is used to drive the condenser fans with a 0-10 VDC output signal to maintain a given Head Pressure Setpoint.

Compressor Discharge Sensors

The Digital Compressor Discharge Temperature Sensor monitors the discharge temperature from the digital compressor to protect against overheating.

Leaving Water Temperature Sensor

The Leaving Water Temperature Sensor is used to measure the leaving water temperature when used on a WSHP unit.

CAUTION: When installing the suction pressure transducer, the Shraeder port should be located in a vertical position of the suction line to prevent refrigerant oil from accumulating in the sensor.

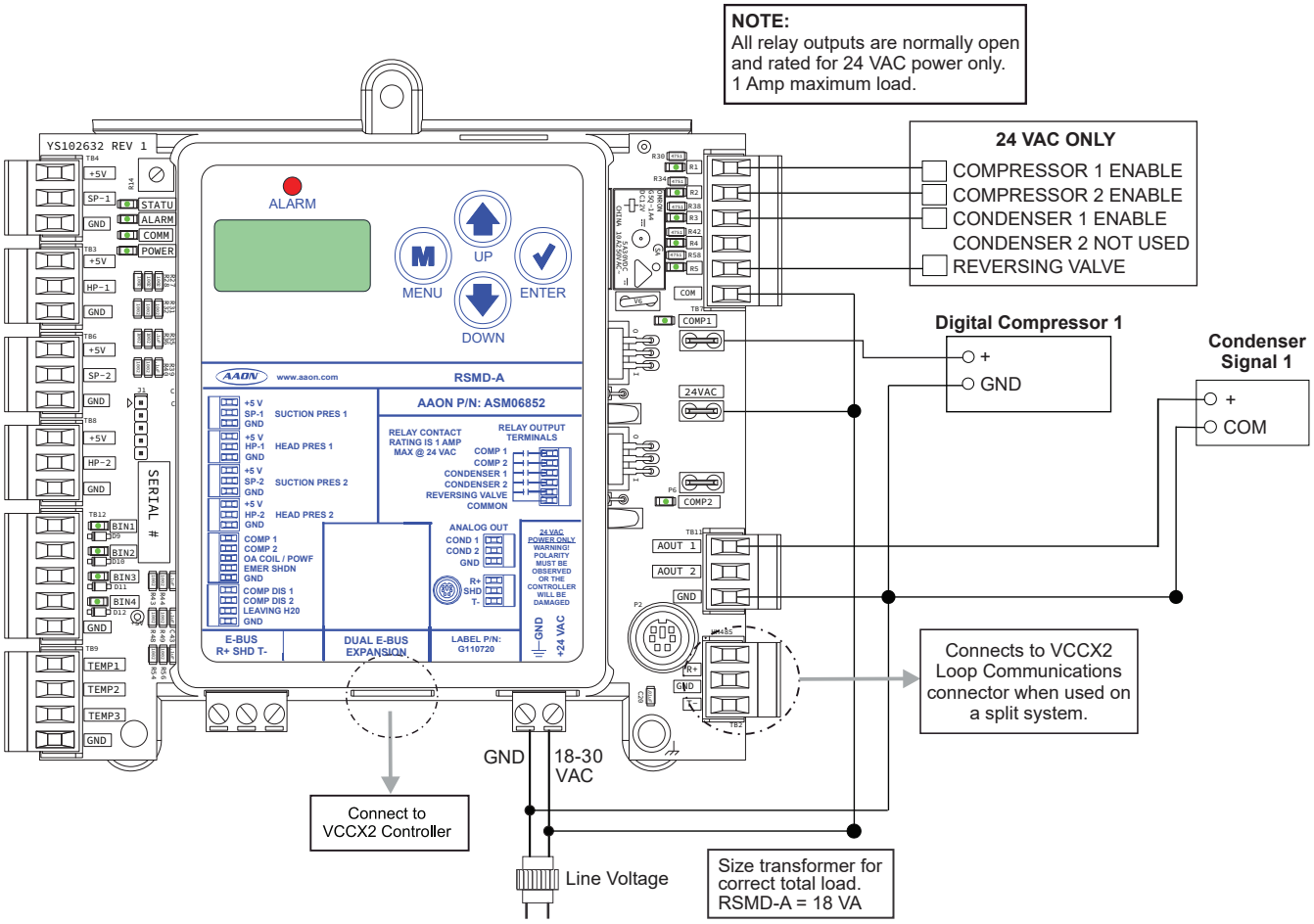


Figure 3: RSMD-A Outputs Wiring

Map

Inputs/Outputs Map

See **Table 2, this page,** for the RSMD-A inputs and outputs.

REFRIGERATION SYSTEM MODULE FOR DIGITAL COMPRESSORS	
Analog Inputs	
SP-1	Suction Pressure 1 Transducer
HP-1	Head Pressure 1 Transducer
SP-2	Not Used
HP-2	Not Used
TEMP1	Compressor Discharge Temperature Sensor 1
TEMP2	Compressor Discharge Temperature Sensor 2 (used on heat pumps only)
TEMP3	Leaving Water Temperature Sensor
Binary Inputs	
BIN1	Compressor Status 1
BIN2	Compressor Status 2
BIN3	Outside Coil Temperature / Proof of Water Flow
BIN4	Emergency Shutdown
Analog Outputs (0-10 VDC)	
AOUT1	Condenser 1 Fan Signal
AOUT2	Not Used
Relay Outputs (24 VAC)	
R1	Compressor 1 Enable Relay
R2	Compressor 2 Enable Relay
R3	Condenser 1 Enable Relay
R4	Not Used
R5	Reversing Valve Relay

Table 2: RSMD-A Inputs and Outputs

Inputs and Outputs Descriptions

Analog Inputs

SP-1 - Suction Pressure Transducer
The Suction Pressure Transducer is used to measure suction pressure at the HVAC unit's DX evaporator coil suction line. This suction line pressure is converted to saturated refrigerant temperature. The saturated refrigerant temperature is used to properly control the compressors to maintain a given Suction Coil (Saturated) Temperature Setpoint. In Cooling Mode, the VCCX2/VCCX-IP resets the Suction Coil (Saturated) Temperature Setpoint to maintain a given supply air temperature setpoint. In Dehumidification Mode, the Suction Coil (Saturated) Temperature Setpoint is a user configurable setpoint that can be reset based on indoor humidity levels.

HP-1 - Head Pressure Transducer
The Head Pressure Transducer is used to measure head pressure at the discharge line. This head pressure is used to drive the condenser fans to maintain a given Head Pressure Setpoint.

TEMP1 - Compressor Discharge Temperature 1 Sensor Input
The Digital Compressor Discharge Temperature Sensors monitor the discharge temperature from the digital compressor to protect against overheating.

TEMP2 - Compressor Discharge Temperature 2 Sensor Input
The Digital Compressor Discharge Temperature Sensors monitor the discharge temperature from the digital compressor to protect against overheating. Used only on heat pumps.

TEMP3 - Leaving Water Temperature Sensor Input
This input monitors the condenser leaving water temperature and determines if the WSHP is operating in a safe water temperature range in Heating Mode.

Binary Inputs

NOTE: The binary inputs require wet contacts (24 VAC only) to recognize an active input. If dry contacts are used, the contact closure is not recognized.

BIN1 - Compressor 1 Status
This input is active if Compressor 1 is being commanded to run and all of the compressor safeties are closed.

BIN2 - Compressor 2 Status
This input is active if Compressor 2 is being commanded to run and all of the compressor safeties are closed.

BIN3 - Outside Coil Temperature / Proof of Water Flow Status
This input can be used for the following two options:

- **Air to Air Heat Pump -** This wet contact input monitors a defrost coil temperature switch on air to air heat pump units. If the compressors are operating in the Heating Mode and this switch closes, it initiates a Defrost Mode.
- **Water Source Heat Pump -** This wet contact input is for the proof of water flow switch. If the proof of water flow switch contact opens while the condenser valve is operating, the controller reacts to protect the system depending on the current mode of operation.

BIN4 - Emergency Shutdown
This wet contact input is used to initiate shutdown of the HVAC unit when a normally closed smoke detector (by others), Firestat (by others), or other shutdown condition (by others) contact is opened. The controller remains active and can initiate alarm relays.

Analog Outputs

AOUT1 - Condenser 1 Fan Signal
This 0-10 VDC output is used to control/modulate the Condenser 1 Fan / Valve to maintain the Head Pressure Setpoint.

Relay Outputs

R1 - Compressor 1 Enable
This relay enables the Compressor 1.

R2 - Compressor 2 Enable
This relay enables the Compressor 2.

R3 - Condenser 1 Enable
This relay enables the Condenser 1 Fan / Water Valve.

R5 - Reversing Valve Enable
This relay enables the Reversing Valve.

Prism 2 Configuration

Prism 2 software must be used to configure the RSMD-A Module.

The Prism 2 software simplifies unit setup by identifying type of compressor and condenser fan setup. In the Setpoints screens (*Unit Selection > Details Viewer > Setpoints > Open Setpoints*), click on the *RSMDMod* tab to bring up its configuration screen. **Figure 4, this page,** shows an example of what the screen might look like.

NOTE: The unit tonnage is the first number listed in the model number on the nameplate.

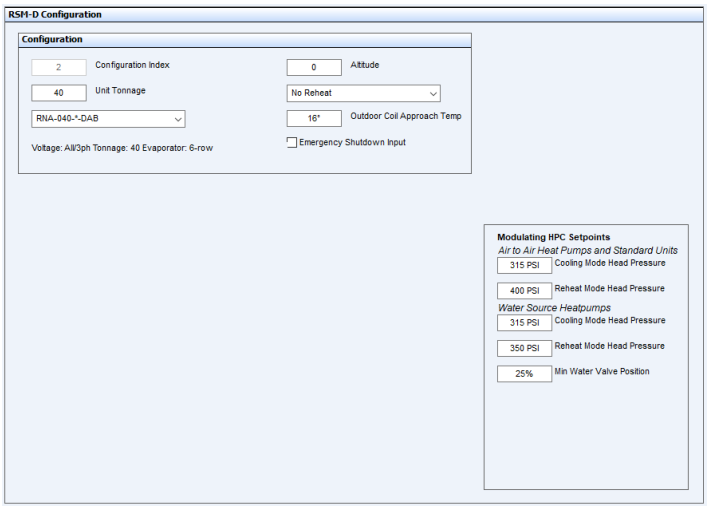


Figure 4: Prism 2 RSMD-A Configuration Screen

Enter the *Unit Tonnage* to see the model numbers for that tonnage. For all tonnages available, there are four options shown:

- RNA-XXX-*-AAA for non-heat pump units without digital compressors.
- RNA-XXX-*-AAB for heat pump units without digital compressors.
- RNA-XXX-*-DAA for non-heat pump units with digital compressors.
- RNA-XXX-*-DAB for heat pump units with digital compressors.

Once an option is selected the voltage, tonnage and the number of evaporator rows is shown.

Altitude

Enter the altitude of the location of the unit. An internet search for the altitude of the city in which the job is located is sufficient. The altitude entered is used for calculating the Saturated Suction Pressure Temperature.

Type of Reheat

Choose from the list of reheat options the type of reheat the unit has. The options are:

- No Reheat
- Reheat on Circuit 1
- Reheat on Circuit 2
- Reheat on both Circuits

Outdoor Coil Approach Temp

Enter the Outdoor Coil Approach Temperature setpoint. This setpoint is used during heat pump Heating Mode to modulate the condenser fan.

The Outdoor Coil Approach temperature is calculated by subtracting the saturated suction temperature from the outdoor air temperature. The condenser fan starts at maximum speed for the first two minutes or until the discharge pressure gets above 340 PSIG, whichever happens first.

After the fan's starting sequence is complete, it modulates the condenser fan to maintain the Outdoor Coil Approach Temperature setpoint. If the outdoor approach temperature is above the setpoint the fan will speed up. If the outdoor approach temperature is below the setpoint the fan will slow down.

Emergency Shutdown

Optional. Select *Emergency Shutdown Input* if Binary Input 4 on the RSMD-A is wired for it.

Modes of Operation

Cooling and Heating Modes

Staging of the compressors is determined by the Supply Air Temperature setpoint not being satisfied. Staging is met by turning the digital compressors and on/off compressor on or off, or the two-step compressor to low speed (two-thirds, 67%, capacity) or to high speed (full, 100%, capacity).

During Cooling Mode, the digital compressor modulation is determined from Saturation Temperature. During Heating Mode, the digital compressor modulation is determined from Supply Air Temperature.

Compressor envelope protections also affect the digital compressor modulation.

Dehumidification Operation

Dehumidification Mode control staging and digital modulation is determined using the Saturation Temperature from each circuit.

NOTE: At least one compressor will be active in Dehumidification Mode unless it shuts down because of an alarm fault

Head Pressure Control

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

The condenser fan starting speed varies based on outside air temperatures. At 40°F or colder the fan starts at 10%; at 70°F or warmer the fan starts at 100%. Starting speed adjusts linearly between 40ºF and 70ºF.

In Cooling Mode, the condenser fan modulates speeds to target the discharge pressure setpoint based on the highest running circuit it is controlling. This is also true for Dehumidification Mode and has a separate discharge pressure setpoint adjustable in Prism 2.

In Heat Pump Heating, the outside fan modulates speeds to target the outside approach temperature setpoint which is outside temperature minus the lowest saturation temperature of the running circuit it is controlling.

If the pressure exceeds 575 psig, the circuit shuts down in an attempt to fail before the mechanical high pressure switch opens. The circuit is allowed to restart after five minutes.

If no head pressure is detected on a circuit, the compressor is disabled and not allowed to run. If the head pressure reading is lost while circuit is on, the condenser signal goes to 100% until the compressor shuts down.

Stage Type 105 - Digital Plus Tandem On/Off Compressors

The RSMD-A uses different staging sequences depending on the unit configuration. Below are the different stage types the module can use.

Please see Table 5: Module Screens, Stage ID page 25.

- Stage Type 105 – Digital plus tandem on/off compressors.
- Stage Type 107 – Tandem digital compressor with on/off compressor plus tandem on/off compressors.
- Stage Type 200 – Tandem on/off compressors plus tandem on/off compressors.

Stage Type 105 – Digital Plus Tandem On/Off Compressors

Units affected

RNA-D 31 Ton

Modules

- Module 1(A)
  - Digital (A1)
- Module 2(B)
  - On/off (B1)
  - On/off (B2)

Stages for all modes

- Stage 0: All are off
- Stage 1: A1 is on; B1 and B1 are off
- Stage 2: A1 is off; B1 is off and B2 is on
- Stage 3: A1 is off; B1 and B1 are on
- Stage 4: A1 is on; B1 is off and B2 is on
- Stage 5: All are on

Cooling, Heating, and regular Dehumidification Mode

Stage 0 to 1 (A1 is on; B1 and B2 are off)

- No stage delay.
- Minimum off time has been met.
- Controlling temperature is above the staging window for cooling or below the staging window for heating.
- Digital compressor turns on at 100%.
- Dehumidification Mode, Digital compressor turns on immediately. No conditions needed.

Stage 1 to 4 (A1 is on; B1 is off and B2 stages on)

- Digital compressor was at 100%.
- Stage delay has been met.
- Controlling temperature is above the staging window for cooling or below the staging window for heating.
- Digital compressor drops to 50% and B2 compressor turns on.

Stage 4 to 5 (A1 is on; B1 stages on and B2 is on)

- Digital compressor was at 100%.
- Stage delay has been met.
- Controlling temperature is above the staging window for cooling or below the staging window for heating.
- Digital compressor drops to 50% and B1 compressor turns on.

Stage 5 to 4 (A1 is on; B1 stages off and B2 is on)

- Digital compressor was at min %.
- Stage delay has been met.
- Controlling temperature is below the staging window for cooling or above the staging window for heating.
- Digital compressor resets to 50% and B1 compressor turns off.

Stage 4 to 1(A1 is on; B1 is off and B2 stages off)

- Digital compressor was at min %.
- Stage delay has been met.
- Controlling temperature is below the staging window for cooling or above the staging window for heating.
- Digital compressor resets to 50% and B2 compressor turns off.

Stage 1 to 0 (A1 stages off, B1 and B2 are off)

- Digital compressor was at min %.
- Stage delay has been met.
- Controlling temperature is below the staging window for cooling or above the staging window for heating.
- Digital compressor turns off.

Reheat only on second circuit in Dehumidification Mode

Stage 2 (A1 is off; B1 is off and B2 is on)

- B2 on immediately, no conditions needed.

Stage 2 to 3 (A1 is off; B1 stages on and B2 is on)

- Stage delay has been met.
- Controlling temperature is above the staging window.
- Or, reheat valve at maximum and supply air temperature at least two degrees below setpoint.

Stage 3 to 5 (Digital compressors stages on; B1 and B2 are on)

- Stage delay has been met.
- Controlling temperature is above the staging window.
- Turn on digital compressor at 100%.

Stage 5 to 4 (A1 is on; B1 stages off and B2 is on)

- Stage delay has been met.
- Digital compressor is less than or equal to 50% and reheat valve is less than or equal to 50%.
- Turn off B1 compressor and reset digital compressor to 50%.

Stage 5 to 3 (A1 stages off; B1 and B2 are on) or Stage 4 to 3 (A1 stages off; B1stages on; B2 is on)

- Digital compressor at minimum %.
- Controlling temperature is below the staging window.
- Stage delay has been met.

Stage 3 to 2 (A1 is off; B2 is on; B1stages off)

- Stage delay has been met.
- Controlling temperature is below the staging window.
- B2 compressor not allowed to stage off in Dehumidification.

Transitioning

To Dehumidification

- Stage 1 is not a valid dehumidification stage.
- If in stage 1, go directly to stage 2.

To Cool/Heat Mode

- Stage 2 (or 3) is not valid cool/heat stage.
- If in stage 2 (or 3), go directly to stage 4.

Stage Type 107 – Tandem Digital with On/Off Compressor plus Tandem On/Off Compressors

Units affected

- RNA-D 40 Ton

Modules

- Module 1(A)
  - Digital (A1)
  - On/off (A2)
- Module 2(B)
  - On/off (B1)
  - On/off (B2)

Stages for all modes

- Stage 0: All are off
- Stage 1: A1 is on; A2, B1 and B1 are off
- Stage 2: A1, A2, B2 are off; B1 is on
- Stage 3: A1 and A2 are off; B1 and B2 are on
- Stage 4: A1 and B1 are on; A2 and B2 are off
- Stage 5: A1 and B2 are on, A2 and B1 are off
- Stage 6: A1, B1, and B2 are on; A2 is off
- Stage 7: A1, A2, and B2 are on; B1 is off
- Stage 8: All are on

Cooling, Heating, and regular Dehumidification Mode Stage Up

Stage 0 to 4 (A1 and B1 stage on; A2 and B2 are off)

- No stage delay.
- Minimum off time has been met.
- Controlling temperature is above the staging window for cooling or below the staging window for heating.
- Digital compressor turns on at 100% and B1 compressor turns on.

Stage 4 to 6 (A1 and B1 are on; A2 is off; B2 stages on)

- Digital compressor was at 100%.
- Stage delay has been met.
- Controlling temperature is above the staging window for cooling or below the staging window for heating.
- B2 compressor turns on.

Stage 6 to 8 (A1, B1 and B2 are on; A2 stages on)

- Digital compressor was at 100%.
- Stage delay has been met.
- Controlling temperature is above the staging window for cooling or below the staging window for heating.
- Digital compressor drops to 50% and A2 compressor turns on.

Cooling and Heating Stage Down

Stage 8 to 7 (A1, A2 and B2 are on; B1 stages off)

- Digital compressor was at min %.
- Stage delay has been met.
- Controlling temperature is below the staging window for cooling or above the staging window for heating.
- Digital compressor resets to 50% and B1 compressor turns off.

Stage 7 to 6 (A1 and B2 are on; A2 stages off; B1 stages on)

- Digital compressor was at min %.
- Stage delay has been met.
- Controlling temperature is below the staging window for cooling or above the staging window for heating.
- Digital compressor resets to 100%. B1 stages back on and A2 compressor turns off.

Stage 6 to 5 (A1 and B2 are on; A2 is off; B1 stages off)

- Digital compressor was at 30%.
- Stage delay has been met.
- Controlling temperature is below the staging window for cooling or above the staging window for heating.
- Digital compressor resets to 50% and B2 compressor turns off.

Stage 5 to 4 (A1 is on; A2 and B2 are off; B1 stages on)

- Digital compressor was at 30 %.
- Stage delay has been met.
- Controlling temperature is below the staging window for cooling or above the staging window for heating.
- Digital compressor resets to 50%, B1 compressor stages on and B2 compressor turns off.

Stage 4 to 1(A1 is on; A2 and B2 are off; B1 stages off)

- Digital compressor was at 30 %.
- Stage delay has been met.
- Controlling temperature is below the staging window for cooling or above the staging window for heating.
- Digital compressor resets to 50% and B1 compressor turns off.

Stage 1 to 0 (A2, B1 and B2 are off; A1 stages off)

- Digital compressor was at min %.
- Stage delay has been met.
- Controlling temperature is below the staging window for cooling or above the staging window for heating.
- Digital compressor turns off.

Stage Type 107 – Tandem Digital with On/Off Compressor plus Tandem On/Off Compressors

Regular Dehumidification Stage Down

Stage 8 to 6 (A1, B1 and B2 are on; A2 stages off)

- Digital compressor was at min %.
- Stage delay has been met.
- Controlling temperature is below the staging window.
- Digital compressor resets to 100%. A2 compressor turns off.

Stage 6 to 4 (A1 and B1 are on; A2 is off; B2 stages off)

- Digital compressor was at 30%.
- Stage delay has been met.
- Controlling temperature is below the staging.
- Digital compressor resets to 50% and B2 compressor turns off.

Stage 4 to 1(A1 is on; A2 and B2 are off; B1 stages off)

- Digital compressor was at 30 %.
- Stage delay has been met.
- Controlling temperature is below the staging window.
- Digital compressor resets to 50% and B1 compressor turns off.
- A1 compressor not allowed to stage off in Dehumidification.

If the outdoor air temperature is above 80ºF, the stage up sequence does the following:

Stage 0 to 5 (A1 and B2 stage on; A2 and B1 are off)

- No stage delay.
- Minimum off time has been met.
- Controlling temperature is above the staging window for cooling or below the staging window for heating.
- Digital compressor turns on at 100% and B2 compressor turns on.

Stage 5 to 7 (A1 and B2 are on; A2 stages on; B1 is off)

- Digital compressor was at 100%.
- Stage delay has been met.
- Controlling temperature is above the staging window for cooling or below the staging window for heating.
- Digital compressor drops to 50% and A2 compressor turns on.

Stage 7 to 8 (A1, A2 and B2 are on; B1 stages on)

- Digital compressor was at 100%.
- Stage delay has been met.
- Controlling temperature is above the staging window for cooling or below the staging window for heating.
- Digital compressor drops to 50% and B1 compressor turns on.

Reheat only on second circuit in Dehumidification Mode

Stage 2 (A1, A2 and B2 are off; B1 stages on)

- B1 on immediately, no conditions needed.

Stage 2 to 4 (A2 and B2 are off; B1 is on; A1 stages on)

- Stage delay has been met.
- Controlling temperature is above the staging window.
- Or, reheat valve at maximum and supply air temperature at least two degrees below setpoint.
- Turn on digital compressor at 100%.

Stage 4 to 6 (A1 and B1 are on; A2 is off; B2 stages on)

- Stage delay has been met.
- Controlling temperature is above the staging window.
- Turn on B2 compressor.

Stage 6 to 8 (A1, B1 and B2 are on; A2 stages on)

- Digital compressor is less than or equal to 50% and reheat valve is less than or equal to 50%.
- Turn on A2 compressor and reset digital compressor to 50%.

Stage 8 to 6 (A1, B1 and B2 are on; A2 stages off)

- Digital compressor was at min %.
- Stage delay has been met.
- Controlling temperature is below the staging window.
- Digital compressor resets to 50% and A2 compressor turns off.

Stage 6 to 3 (A2 is off; B1 and B2 are on; A1 stages off)

- Digital compressor at minimum %.
- Controlling temperature is below the staging window.
- Stage delay has been met.
- Digital compressor stages off.

Stage 3 to 2 (A1 and A2 are off; B1 is on; B2 stages off)

- Stage delay has been met.
- Controlling temperature is below the staging window.
- B2 compressors turns off, B1 compressor not allowed to stage off in Dehumidification.

Transitioning

To Dehumidification

- Stage 1 is not a valid dehumidification stage.
- If in stage 1, go directly to stage 2.

To Cool/Heat Mode

- Stage 2 (or 3) is not valid cool/heat stage.
- If in stage 2 (or 3), go directly to stage 4.

Stage Type 200 – Tandem On/Off Compressors plus Tandem On/Off Compressors plus Tandem On/Off Compressors

Units affected

- RNA-D 31, 40, 50, 60, 70 Ton

Modules

- Module 1(A)
- On/off (A1)
- On/off (A2)
- Module 2(B)
- On/off (B1)
- On/off (B2)

Stages for all modes

- Stage 0: All are off
- Stage 1: A1 is on; A2, B1 and B1 are off
- Stage 2: A2 is on; A1, B1 and B2 are off
- Stage 3: B2 is on; A1, A2 and B1 are off
- Stage 4: B1 and B2 are on; A1 and A2 are off
- Stage 5: A1 and A2 are on, B1 and B2 are off
- Stage 6: A1, A2, and B1 are on; B2 is off
- Stage 7: A1, B1, and B2 are on; A2 is off
- Stage 8: A2, B1, and B2 are on; A1 is off
- Stage 9: A1, A2, and B2 are on; B1 is off
- Stage 10: All are on

Cooling, Heating, and regular Dehumidification Mode Staging

Stage 0 to 1 (A2, B1 and B2 are off; A1 stages on)

- No stage delay.
- Minimum off time has been met.
- Controlling temperature is above the staging window for cooling or below the staging window for heating.
- A1 compressor turns on.

Stage 1 to 2 (B1 and B2 are off; A1 stages off and A2 stages on)

- Stage delay has been met.
- Controlling temperature is above the staging window for cooling or below the staging window for heating.
- A1 compressors turns off and A2 compressor turns on.

Stage 2 to 5 (A2 is on; B1 and B2 are off; A1 stages on)

- Stage delay has been met.
- Controlling temperature is above the staging window for cooling or below the staging window for heating.
- A1 compressor turns on.

Stage 5 to 6 (A1 and A2 are on; B2 is off; B1 stages on)

- Stage delay has been met.
- Controlling temperature is above the staging window for cooling or below the staging window for heating.
- B1 compressor turns on.

Stage 6 to 9 (A1 and A2 are on; B1 stage off; B2 stages on)

- Stage delay has been met.
- Controlling temperature is above the staging window for cooling or below the staging window for heating.
- B1 compressor turns off and B2 compressor turns on.

Stage 9 to 10 (A1, A2 and B2 are on; B1 stages on)

- Stage delay has been met.
- Controlling temperature is above the staging window for cooling or below the staging window for heating.
- B1 compressor turns on.

Stage 10 to 9 (A1, A2 and B2 are on; B1 stages off)

- No stage delay.
- Minimum off time has been met.
- Controlling temperature is below the staging window for cooling or above the staging window for heating.
- B1 compressor turns off.

Stage 9 to 6 (A1 and A2 are on; B1 stages on; B2 stages off)

- Stage delay has been met.
- Controlling temperature is below the staging window for cooling or above the staging window for heating.
- B1 turns on and B2 compressor turns off.

Stage 6 to 5 (A1 and A2 are on; B2 is off; B1 stages off)

- Stage delay has been met.
- Controlling temperature is below the staging window for cooling or above the staging window for heating.
- B1 compressor turns off.

Stage 5 to 2 (A2 is on; B1 and B2 are off; A1 stages off)

- Stage delay has been met.
- Controlling temperature is below the staging window for cooling or above the staging window for heating.
- A1 compressor turns off.

Stage 2 to 1 (B1 and B2 are off; A2 stages off; A1 stages on)

- Stage delay has been met.
- Controlling temperature is below the staging window for cooling or above the staging window for heating.
- A2 compressor turns off and A1 compressor turns on.

Stage Type 200 – Tandem On/Off Compressors plus Tandem On/Off Compressors plus Tandem On/Off Compressors

Stage 1 to 0 (A2, B1 and B2 are off; A1 stages off)

- Stage delay has been met.
- Controlling temperature is below the staging window for cooling or above the staging window for heating.
- A1 compressor turns off.

Cooling, Heating, and regular Dehumidification Mode Stage Up when controlling temp is 6 or more degrees away from setpoint in first 15 minutes of compressor operation.

Stage 0 to 1 (A2, B1 and B2 are off; A1 stages on)

- No stage delay.
- Minimum off time has been met.
- Controlling temperature is above the staging window for cooling or below the staging window for heating.
- A1 compressor turns on.

Stage 1 to 5 (A1 is on; B1 and B2 are off; A2 stages on)

- Stage delay has been met.
- Controlling temperature is above the staging window for cooling or below the staging window for heating.
- A2 compressor turns on.

Stage 5 to 9 (A1 and A2 are on; B1 is off; B2 stages on)

- Stage delay has been met.
- Controlling temperature is above the staging window for cooling or below the staging window for heating.
- B2 turns on.

Stage 9 to 10 (A1, A2 and B2 are on; B1 stages on)

- Stage delay has been met.
- Controlling temperature is above the staging window for cooling or below the staging window for heating.
- B1 compressor turns on.

Stage 10 to 9 (A1, A2 and B2 are on; B1 stages off)

- No stage delay.
- Minimum off time has been met.
- Controlling temperature is below the staging window for cooling or above the staging window for heating.
- B1 compressor turns off.

Stage 9 to 5 (A1 and A2 are on; B1 is off; B2 stages off)

- Stage delay has been met.
- Controlling temperature is below the staging window for cooling or above the staging window for heating.
- B2 compressor turns off.

Stage 5 to 1 (B1 and B2 are off; A1 is on; A2 stages off)

- Stage delay has been met.
- Controlling temperature is below the staging window for cooling or above the staging window for heating.
- A2 compressor turns off and A1 compressor turns on.

Stage 1 to 0 (A2, B1 and B2 are off; A1 stages off)

- Stage delay has been met.
- Controlling temperature is below the staging window for cooling or above the staging window for heating.
- A1 compressor turns off.

Reheat only on second circuit in Dehumidification Mode

Stage 0 to 3 (A1, A2 and B1 are off; B2 stages on)

- No stage delay.
- Minimum off time has been met.
- Controlling temperature is above the staging window.
- B2 compressor turns on.

Stage 3 to 4 (A1 and A2 are off; B2 is on; B1 stages on)

- Stage delay has been met.
- Controlling temperature is above the staging.
- B1 compressor turns on.

Stage 4 to 7 (A2 is on; B1 and B2 are on; A1 stages on)

- Stage delay has been met.
- Controlling temperature is above the staging window.
- A1 compressor turns on.

Stage 7 to 8 (B1 and B2 are on; A1 stages off; A2 stages on)

- Stage delay has been met.
- Controlling temperature is above the staging.
- A1 compressor turns off and A2 compressor turns on.

Stage 8 to 10 (A2, B1 and B2 are on; A1 stages on)

- Stage delay has been met.
- Controlling temperature is above the staging.
- A1 compressor turns on.

Stage 10 to 7 (A1, B1 and B2 are on; A2 stages off)

- No stage delay.
- Minimum off time has been met.
- Controlling temperature is below the staging window.
- A2 compressor turns off.

Stage Type 200 – Tandem On/Off Compressors plus Tandem On/Off Compressors plus Tandem On/Off Compressors

Stage 7 to 4 (B1 and B2 are on; A2 is off; A1 stages off)

- Stage delay has been met.
- Controlling temperature is below the staging window.
- A1 compressor turns off.

Stage 4 to 3 (A1 and A2 are off; B2 is on; B1 stages off)

- Stage delay has been met.
- Controlling temperature is below the staging window.
- B1 compressor turns off. B2 compressor not allowed to stage off in Dehumidification.

Transitioning

To 2nd Circuit Dehumidification

- Stage 0, 1, 2, 5, 6, and 9 are not valid dehumidification stages.
- If in stages 0, 1, 2, or 5 go directly to stage 3.
- If in stage 6, go directly to stage 7.
- If in stage 9, go directly to stage 8

To Cool/Heat Mode

- Stage 3, 4, 7 and 8 are not valid cool/heat stage.
- If in stage 3 or 4, go directly to stage 2.
- If in stage 7 or 8, stage up to stage 10 or down to stage 6.

Envelope Protection

Compressor manufacturer specifications require the compressor to operate within its given operating envelope to maintain the life and longevity of the compressor. Some envelopes also have areas within that limit the minimum/maximum operating speeds. Min/max speeds may also be limited based on the requirements of the unit's total capacity. Prism 2 interface allows the ability to see real time envelope plotting while the compressor is running.

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

The digital compressor is set to 67% at any stage event. Therefore, whenever a staging event occurs, the digital compressor position is 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.

Figures 5 and 6, this page, are examples of compressor envelopes.

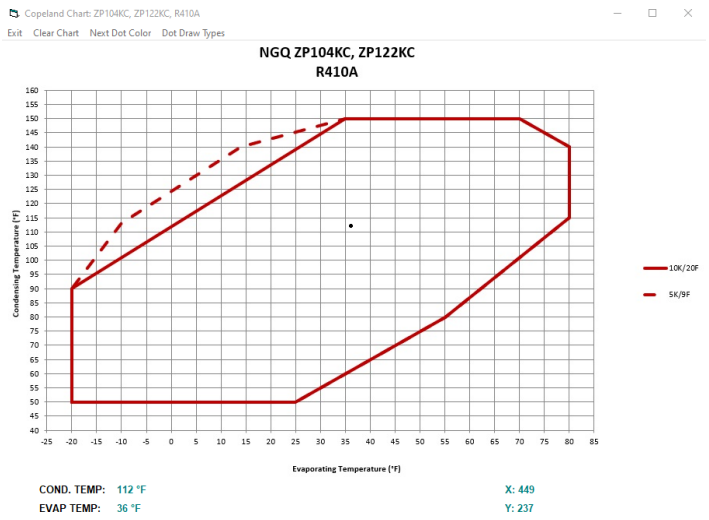


Figure 5: Copeland ZP104KC, ZP122KC, and R410A Envelope

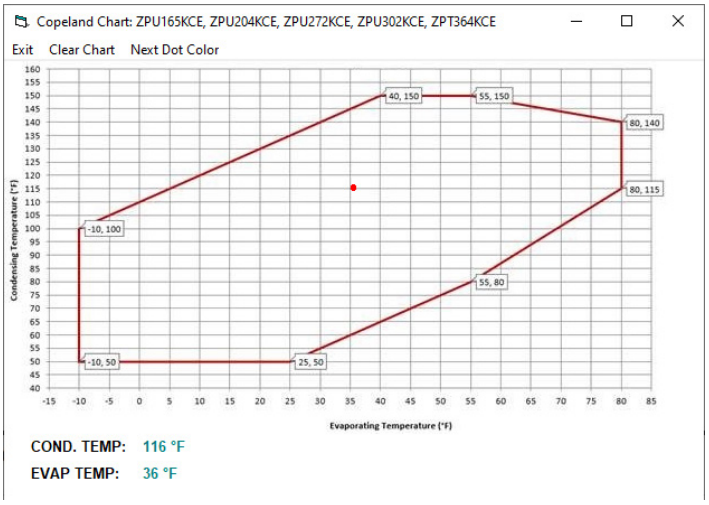


Figure 6: Copeland ZPU165KCE, ZPU204KCE, ZPU302KCE and ZPT364KCE Envelope

LCD Display Screen and Navigation Keys

The LCD display screens and buttons allow viewing of status and alarms, and enable force modes. See **Figure 7, this page,** and refer to **Table 3, this page,** for descriptions.

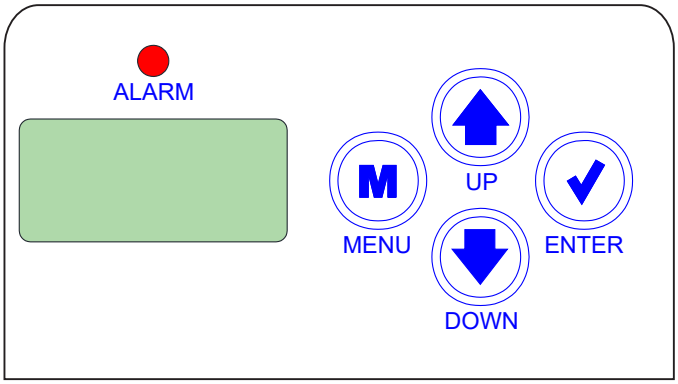
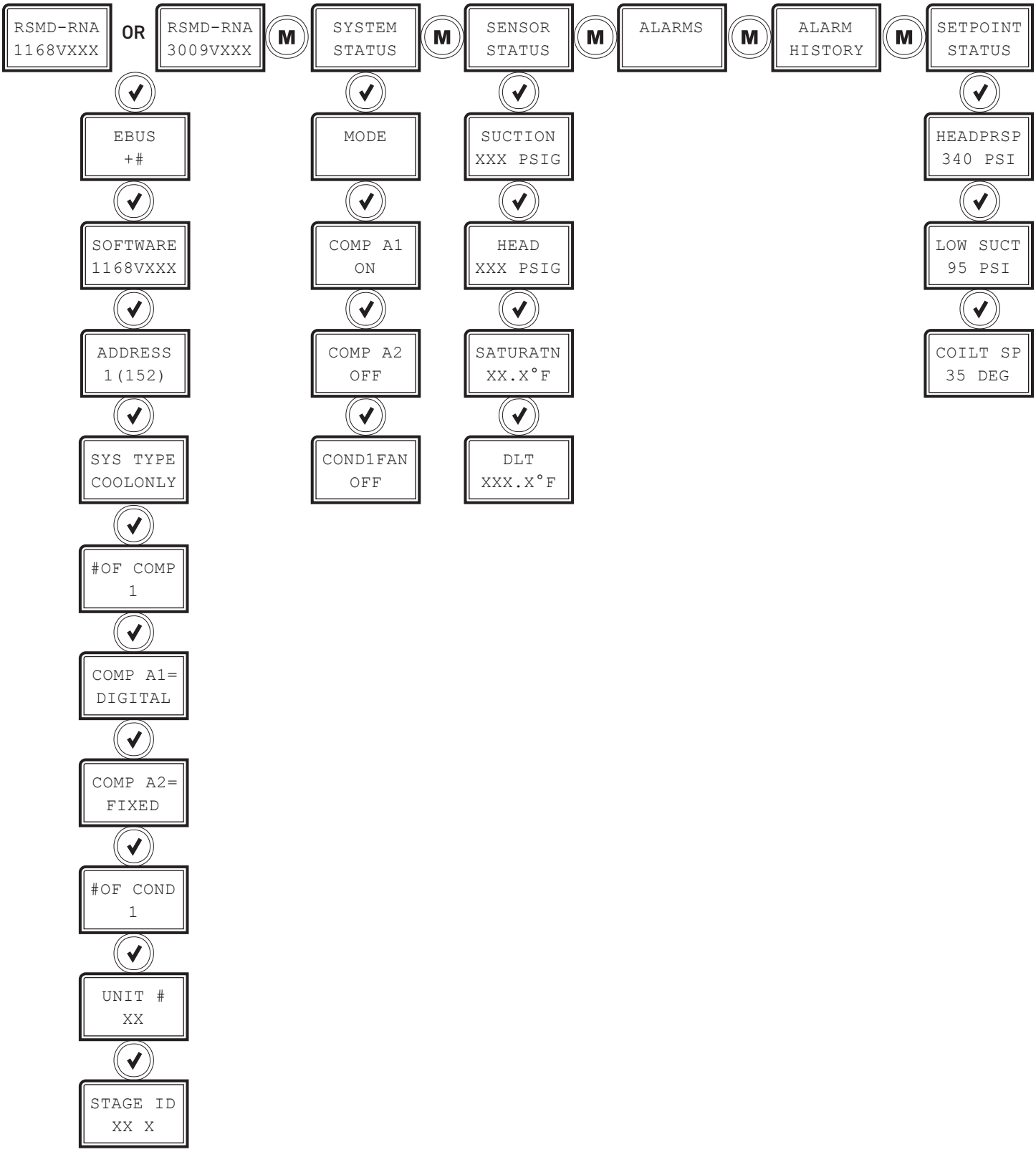


Figure 7: LCD Display and Navigation Keys

NAVIGATION KEY FUNCTIONS	
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 3: Navigation Key Functions

Screens Map


RSMD-RNA 1168VXXX
OR
RSMD-RNA 3009VXXX
M
SYSTEM STATUS
M
SENSOR STATUS
M
ALARMS
M
ALARM HISTORY
M
SETPOINT STATUS
EBUS +#
SOFTWARE 1168VXXX
ADDRESS 1(152)
SYS TYPE COOLONLY
#OF COMP 1
COMP A1= DIGITAL
COMP A2= FIXED
#OF COND 1
UNIT # XX
STAGE ID XX X
MODE
COMP A1 ON
COMP A2 OFF
COND1FAN OFF
SUCTION XXX PSIG
HEAD XXX PSIG
SATURATN XX.X°F
DLT XXX.X°F
HEADPRSP 340 PSI
LOW SUCT 95 PSI
COILT SP 35 DEG

Screen Descriptions

Main Screens

Refer to the following table when navigating through the LCD Main Screens.

Press the **<MENU>** button to navigate between the top level screens. Press the **<ENTER>** button to scroll through the next level screens,

MAIN SCREENS	
Screen Text	**Description**
RSMD-RNA 1168VXXX **or** **RSMD-RNA 3009VXXX**	Refrigeration module screens. The second line shows the software number and its version.
SYSTEM STATUS	System status screens
SENSOR STATUS	Sensor status screens
NO ALARMS	Alarm status screens. Screen shows NO ALARMS if no alarms are active.
NO ALARM HISTORY	Alarm history screens. Screen shows NO ALARM HISTORY if no alarms have been activated.
SETPOINT STATUS	Setpoint status screens

Table 4: Main Screens

The RSMD-A (ASM06852) uses either a PIC32 processor or a RP2040 processor. There is no functional difference between the two types of boards.

- The PIC32 processor requires software version SS1168.
- The RP2040 processor requires software version SS3009.

The software version is identified on the software label near the Status LED or using the Software Version screen.

WARNING: The correct software version must be used for all software upgrades. Loading the incorrect software could result in malfunction. Contact AAON Technical Support for assistance, if required.

Screen Descriptions

Module Screens

Refer to the following table when navigating through the module screens. From the RSMVHPQ screen, press **<ENTER>** to scroll through the screens.

MODULE SCREENS	
Screen Text	**Description**
RSMD-RNA 1168VXXX **or** **RSMD-RNA 3009VXXX**	Refrigeration module screens. The second line shows the software number and its version.
MODULE SCREENS	
Screen Text	**Description**
EBUS +XXX	E-BUS communication. XXX equals the number of COMM packets received. The number increases as packets are received.
SOFTWARE 1168vXXX	Current software version. The second line shows the software number and its version. Access the protected screens from this screen by holding the **<UP>** button for five seconds.
ADDRESS 1(152)	Current board address The first number is the board address. The number in the parenthesis is the EBUS address.
SYS TYPE COOLONLY	Current system type. Possible options for the second line are: • COOLONLY • HEATPUMP
#OF COMP X	The number of compressors configured. The X equals only 1 or 2, depnding on how many compressors the system is configured for.
COMP A1 DIGITAL	If second address, this will read COMP B1. The first compressor installed can be fixed or digital. The screen will read either DIGITAL or FIXED."
COMP A2 FIXED	Used only if second compressor is installed. If second address this will read COMP B2. The second compressor installed will always be fixed.
#OF COND X	Number of condensers controlled by this module.
UNIT # XXX	Units numbered 1 through XXX. Shows which unit has been selected. Matches the unit # shown in Prism 2.
STAGE ID X X	Stage type and current stage number. The first number is the stage type (105, 107, 200). The second number is the current stage that is active (0-10).

Table 5: Module 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 STATUS SCREENS	
Screen Text	**Description**
SYSTEM STATUS	System status screens
MODE OFF	System mode. Options are: • MIN RUN • OFF • COOLING • HEATING • DEHUM • FORCED
COMP A1 ON	ON/OFF or MOD% ON/OFF: Compressor is on or off. MODULATING %: 0-100%
COMP A2 OFF	ON, OFF, FORCED ON/OFF: Compressor is on or off. FORCED: Compressor is forced on or off from a hidden screen.
COND1FAN OFF	OFF / MOD% OFF: Condenser is off. MOD: Modulating at 0-100%

Table 6: System Status Screens

Screen Descriptions

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.

SENSOR STATUS SCREENS	
Screen Text	**Description**
SENSOR STATUS	Sensor status screens
SUCTION XXX PSIG	Suction pressure reading from input. Measured in PSIG.
HEAD XXX PSIG	Head pressure reading from input. Measured in PSIG.
SATURTN XXX.X°F	Calculated saturation coil temperature from suction pressure input. Measured in degrees Fahrenheit.
DLT X XXX.X°F	Discharge line temperature from TEMP1 input. Measured in degrees Fahrenheit.

Table 7: Sensor Status Screens

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.

SETPOINT STATUS SCREENS	
Screen Text	**Description**
SETPOINT STATUS	Setpoint Status screens
HEADPRSP XXX PSIG	Head Pressure Setpoint. Valid range is 260-475 psig. Default is 340 psig. Measured in PSIG.
LOW SUCT XX PSIG	Low Suction Pressure Setpoint. Default is 95 psig. Measured in PSIG.
COILT SP XX.XºF	Coil Temperature Setpoint. Valid range is 35-70ºF. Default is 35ºF.Measured in degrees Fahrenheit.

Table 8: Setpoint Status Screens

Alarms Screens

If an alarm is present, the ALARM LED above the LCD display lights up red and blinks. The Alarms display and scroll automatically from the ALARMS screen when alarms are present. The alarms are as follows:

ALARMS SCREENS	
Screen Text	**Description**
ALARMS	Alarms Status screens
NO ALARMS	This is shown if there are no current alarms.
EBUS SLV TIMEOUT	This alarm indicates communication has been lost between the RSMD-A and the main controller.
NO SUCT DETECTED	No Suction Pressure Detected. This alarm indicates the Suction Pressure Transducer is not detected by the system. The module goes into alarm and shuts down the compressor.
NO HEAD DETECTED	No Head Pressure Detected. If no head pressure is detected on a circuit, the compressor is disabled and not allowed to run. If the head pressure reading is lost while circuit is on, the condenser signal goes to 100% until the compressor shuts down.
HIGH HP DETECTED	High Head Pressure Detected. This alarm indicates a high head pressure alarm condition which is activated when the head pressure rises above 550 psi. This causes the condenser to go to 100%. If the head pressure rises above 575 psig, the circuit will be disabled.
LOW SP FAILURE	Low Suction Pressure Failure. This alarm occurs if suction pressure stays below the Low Suction Pressure Setpoint for one minute or falls below 40 psi for five seconds. This alarm shuts down the system. Power must be cycled to clear the alarm.
LOW SP DETECTED	Low Suction Pressure Detected. This alarm occurs if suction pressure falls below the Low Suction Pressure Setpoint for 20 seconds. The system will try to protect itself by lowering compressor modulation percentage.
DIGCOMPx FAIL	This alarm occurs if the discharge temperature causes a compressor cutoff to occur.
COMP FAULT	Compressor Fault. This alarm occurs if the compressor fails to run 45 seconds after the relay is activated or if the signal is lost after activation. This causes an alarm and shuts down the compressor enable relay. The system will retry after five minutes.
COMPx BADTEMP	Compressor Bad Temperature. This alarm occurs if the Discharge Temperature Sensor measures less than -40ºF or more than 356ºF. This will cause an alarm and will shut down the compressor enable relay. The system will retry after five minutes.
COMPx CUTOFF	Compressor Cutoff. This alarm occurs if the Discharge Temperature Sensor measures more than 265ºF. This will cause an alarm and will shut down the compressor enable relay. The system can be restarted after 30 minutes.
COMP LOCKOUT	Compressor Lockout. This alarm occurs if an active cutoff happens five times within a four-hour period, the compressor will be locked out. Power must be cycled to clear the alarm. • If a circuit's suction pressure falls twice within a two hour window below the Low Suction Pressure Setpoint for longer than one minute each time, the compressor on that circuit will be locked out. Manual reset or change of mode is required to return to normal operation. • If the suction pressure falls below the Unsafe Suction Setpoint for five seconds, that circuit's compressor will be locked out. Power will need to be cycled to restart the unit. • If the Leaving Water Temperature falls below the setpoint, the last compressor will be locked out until the Leaving Water Temperature rises 6ºF above the setpoint. The Leaving Water Temperature remains below the setpoint for one minute or falls 3ºF below the setpoint. This alarm will disable when the Leaving Water Temperature rises 12ºF above the setpoint.
NO WATER FLOW	No Proof of Water Flow. This alarm occurs if there is a call for a compressor and the proof of flow binary input does not see 24 VAC for more than three minutes or if during Heat Pump Heating Mode, the proof of flow binary input is open for more than two seconds. This alarm will disable when the proof of flow binary input is enabled.
LOW H2O TEMP	Low Water Temperature. This alarm occurs if both compressors are on and water temperature goes below setpoint, Compressor 2 will fail. If both compressors are on and water temperature goes 3ºF below the setpoint, both compressors will fail. If Compressor 2 is off or failed and water temperature is still low for one minute, Compressor 1 will also fail. This alarm disables when the Leaving Water Temperature rises 6ºF above the setpoint.
EMERGNCY SHUTDOWN	Emergency Shutdown. This alarm occurs if the Emergency Shutdown Binary Input is not activated. This alarm shuts off the compressors.
COMPx FALSE	Compressor False Active Input. This alarm occurs if the compressor enable relay is off but the compressor status binary input is activated for 60 seconds.
ENVELOPE FAULT	If the compressor was running out of its operating envelope for three consecutive minutes, this fault will occur and the compressor will be turned off. The system will retry after five minutes.

Table 9: Alarms Screens

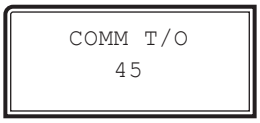
Alarm History Screens

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 first line is the ALARM NAME.

The second line shows how long ago each alarm last occurred. The screen displays:

- minutes for the first 60 minutes of alarm occurrence
- hours for the next 72 hours of alarm occurrence
- days for the next 30 days of alarm occurrence



EXAMPLE SCREEN
EBUS SLV TIMEOUT occured 45 minutes ago

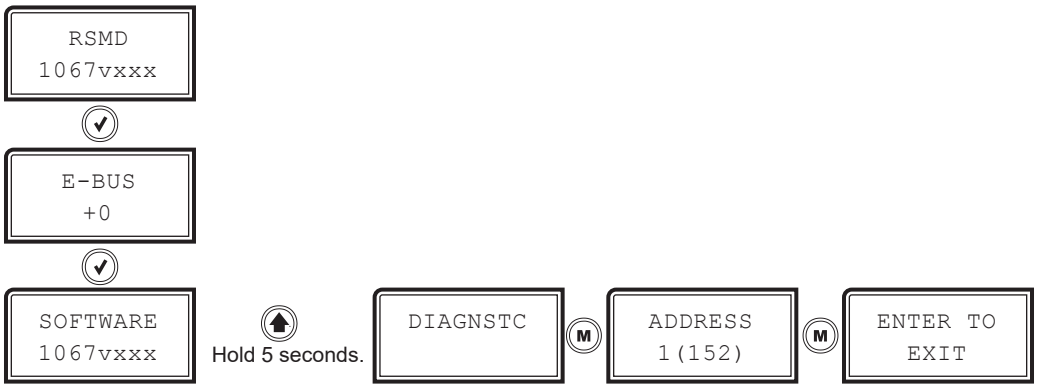
Alarms clear after 30 days.

NOTE: Alarm history is not stored in memory. So, if power is lost, the alarms will clear.

The ALARM HISTORY screens follow the same sequence as the ALARMS screens but are abbreviated differently to allow space to show the time since last occurrence.

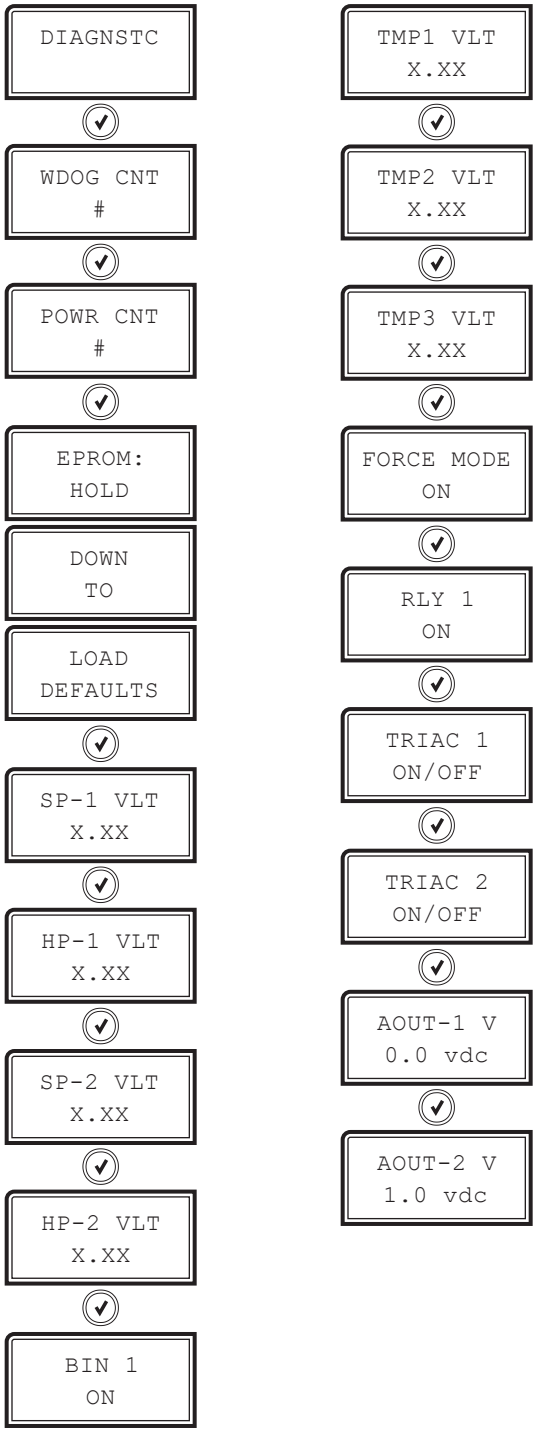
Protected Screens Map

Refer to the following map when navigating through the LCD Protected Screens. From the RSMD-A Screen, press **<ENTER>** twice to get to the Software Screen. Then hold the **<UP>** button for five seconds. To scroll through the rest of the screens, press the **<MENU>** button. The PROTECT SCREENS map is the following:



Diagnostic Screens Map

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



Diagnostic Screens

Refer to **Table 11, this page,** when navigating through the Diagnostic Screens. From the DIAGNSTC Screen, press **<ENTER>** to scroll through the screens.

DIAGNOSTIC SCREENS	
Screen Text	**Description**
DIAGNSTC	Diagnostic screens
WDOG CNT	Watchdog Timer. Displays the number of times the board has been reset due to watchdog timer overview.
POWR CNT	Power Loss Count. Displays the number of times the board has been reset due to power loss.
SP-1 VLT	Suction Pressure Transducer 1 Voltage. Displays the current voltage of the Suction Pressure Transducer 1.
HP-1 VLT	Head Pressure Transducer 1 Voltage. Displays the current voltage of the Head Pressure Transducer 1.
SP-2 VLT	Suction Pressure Transducer 2 Voltage. Displays the current voltage of the Suction Pressure Transducer 2.
HP-2 VLT	Head Pressure Transducer 2 Voltage. Displays the current voltage of the Head Pressure Transducer 2.
BIN 1	Binary Inputs #1 - #4. Displays the current status of each Binary Input.
TMP1 VLT	Coil Temperature Sensor 1 Voltage. Displays the current voltage of Coil Temperature Sensor 1.
TMP2 VLT	Coil Temperature Sensor 2 Voltage. Displays the current voltage of Coil Temperature Sensor 2.
TMP3 VLT	Coil Temperature Sensor 3 Voltage. Displays the current voltage of Coil Temperature Sensor 3.
FORCE MODE	Force Mode. Displays the current status of Force Mode. Values are ON/OFF.
RLY 1	If Force Mode is on, the following screens will appear. Relays 1 - 5 Force Mode. Press the **<UP>** or **<DOWN>** buttons to select ON or OFF for each relay.
TRIAC 1	TRIAC 1. Displays the current status of Digital Compressor 1. Values are ON/OFF.
TRIAC 2	TRIAC 2. Displays the current status of Digital Compressor 2. Values are ON/OFF.
AOUT-1 V	Condenser Signal 1 Force. 0.0 to 10.0 = Active Force Mode. Press the **<UP>** or **<DOWN>** buttons to increase and decrease the value.
AOUT-2 V	Condenser Signal 2 Force. 0.0 to 10.0 = Active Force Mode. Press the **<UP>** or **<DOWN>** buttons to increase and decrease the value.

Table 10: Diagnostic Screens

ADDRESS SCREEN

Address Screen

CURRENT BOARD ADDRESS
Configure the address according to which refrigerant circuit this module represents—1=A OR 2=B

Number in parentheses is E-BUS address.
Module 1's address is 152
Module 2's address is 153

LED Diagnostics

Using LEDs To Verify Operation

The RSMD-A 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 8, this page** for the LED locations. The LEDs associated with these inputs and outputs show 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 blinks at a rate of one blink per second.

ALARM (above LCD display)
This red LED lights up and stays lit when there is an alarm present. The type of alarm displays on the LCD display.

COMM
Every time the module receives a valid E-BUS request from the VCCX2/VCCX-IP Controller, this LED blinks on and then off, signifying that it received a valid request and responded.

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

Binary Input LEDs

BIN1
This green LED lights up when Compressor Status 1 contact is closed.

BIN2
This green LED lights up when Compressor Status 2 switch is closed.

BIN3
This green LED lights up when the Outside Coil Temperature switch is closed.

BIN4
This green LED lights up when the Emergency Shutdown switch is closed.

Relay LEDs

R1, R2, R3, R5
These green LEDs light up when the relays are enabled and stay lit as long as they are active. R4 is not used.

Digital Compressor LEDs

COMP1
This green LED lights up when Digital Compressor 1 is unloading.

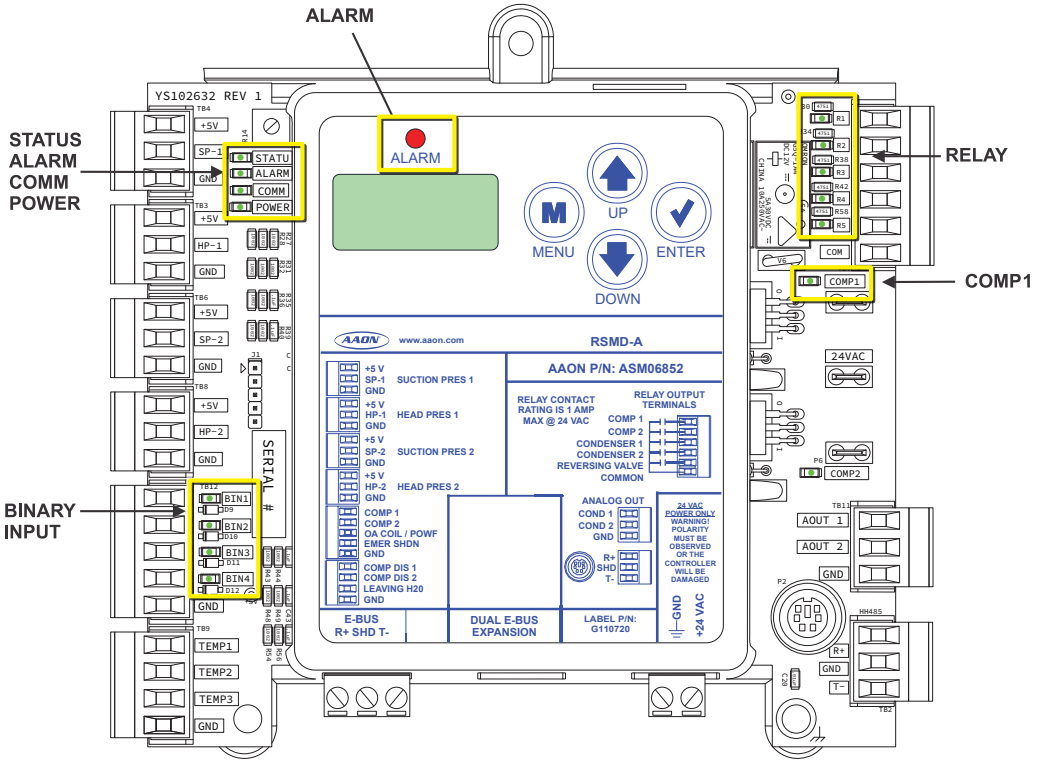


Figure 8: RSMD-A LED Locations

Suction Pressure Transducer Testing for R410-A Refrigerant

The Evaporator Coil Temperature is calculated by converting the Suction Pressure to Temperature. The Suction Pressure is obtained by using the Suction Pressure Transducer, which is connected into the suction line of the compressor.

Use the voltage column to check the Suction Pressure Transducer while connected to the RSMD-A Module(s). The VCCX2/VCCX-IP and the RSMD-A Module(s) must be powered for this test. Read voltage with a meter set on DC volts. Place the positive lead from the meter on the SP1/SP2 terminal located on the RSMD-A Module(s) terminal block. Place the negative lead from the meter on the ground (GND) terminal located adjacent to the SP1/SP2 terminal on the RSMD-A Module(s) terminal block. Use a refrigerant gauge set and/or an accurate electronic thermometer to measure the temperature or suction line pressure near where the Suction Pressure Transducer is connected to the suction line.

Measure the voltage at the SP1/SP2 and GND terminals and compare it to **Table 11, this page**. The chart is based on exactly 5.00 volts being supplied to the transducer. If the supply voltage is less than or greater than 5.00, the signal voltage will be slightly more or less than the chart. If the signal voltage is within ± 0.20 volts, the Suction Pressure Transducer is functioning within normal parameters. If not, contact AAON Technical Support for further troubleshooting.

See **Table 11, this page**. The table shows a temperature range from 20°F to 80°F. For troubleshooting purposes, the DC voltage readings are also listed with their corresponding temperatures and pressures.

SUCTION PRESSURE TRANSDUCER COIL PRESSURE TEMPERATURE AND VOLTAGE CHART FOR R410-A REFRIGERANT

Temperature (°F)	Temperature (°C)	Pressure (psi)	Signal DC Volts
21.19	-6.1	80.94	1.8
24.49	-4.4	87.16	1.9
27.80	-2.8	93.39	2.0
30.99	-1.1	99.62	2.1
33.89	0.6	105.84	2.2
36.80	2.2	112.07	2.3
39.71	3.9	118.29	2.4
42.30	5.6	124.52	2.5
44.85	6.7	130.75	2.6
47.39	8.3	136.97	2.7
49.94	9.4	143.2	2.8
52.23	11.1	149.42	2.9
54.50	12.2	155.65	3.0
56.76	13.3	161.88	3.1
59.03	15	168.10	3.2
61.17	16.1	174.32	3.3
63.19	17.2	180.55	3.4
65.21	18.3	186.78	3.5
67.23	19.4	193.00	3.6
69.24	20.6	199.23	3.7
71.15	21.7	205.46	3.8
72.95	22.2	211.68	3.9
74.76	23.3	217.91	4.0
76.57	24.4	224.14	4.1
78.37	25.6	230.36	4.2
80.18	26.7	236.59	4.3

Table 11: Coil Pressure/Voltage/Temp for Suction Pressure Transducers - R410-A Refrigerant

Temperature Sensor Testing

Copeland Discharge Thermistor Temperature Sensor Testing

Table 12, this page, 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 table. Please follow instruction 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 GND terminal and the "+" (plus) lead on the sensor input terminal being investigated.

NOTE: If the voltage is above 4.98 VDC, then the sensor or wiring is "open." If the voltage is less than 0.38 VDC, then the sensor or wiring is shorted.

DISCHARGE THERMISTOR TEMPERATURE/RESISTANCE							
Temp (ºF)	Temp (ºC)	Resistance (K Ohms)	Voltage @ Input (VDC)	Temp (ºF)	Temp (ºC)	Resistance (Ohms)	Voltage @ Input (VDC)
-40	-40	2889.60	4.98	**167**	75	12.73	2.80
-31	-35	2087.22	4.97	**176**	80	10.79	2.59
-22	-30	1522.20	4.96	**185**	85	9.20	2.39
-13	-25	1121.44	4.95	**194**	90	7.87	2.19
-4	-20	834.72	4.94	**203**	95	6.77	2.01
5	-15	627.28	4.92	**212**	100	5.85	1.84
14	-10	475.74	4.89	**221**	105	5.09	1.68
23	-5	363.99	4.86	**230**	110	4.45	1.53
32	0	280.82	4.82	**239**	115	3.87	1.39
41	5	218.41	4.77	**248**	120	3.35	1.25
50	10	171.17	4.72	**257**	125	2.92	1.12
59	15	135.14	4.65	**266**	130	2.58	1.02
68	20	107.44	4.57	**275**	135	2.28	0.92
77	25	86.00	4.47	**284**	140	2.02	0.83
86	30	69.28	4.36	**293**	145	1.80	0.76
95	35	56.16	4.24	**302**	150	1.59	0.68
104	40	45.81	4.10	**311**	155	1.39	0.61
113	45	37.58	3.94	**320**	160	1.25	0.55
122	50	30.99	3.77	**329**	165	1.12	0.50
131	55	25.68	3.59	**338**	170	1.01	0.45
140	60	21.40	3.40	**347**	175	0.92	0.42
149	65	17.91	3.20	**356**	180	0.83	0.38
158	70	15.07	3.00				

Table 12: Discharge Thermistor Temperature/Resistance

Temperature Sensor Testing

Sensor Voltage and Resistance

The following sensor voltage and resistance table is provided to aid in checking sensors that appear to be operating incorrectly. See **Table 13, this page**. 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 instructions 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 GND terminal and the "+" (plus) lead on the sensor input terminal being investigated.

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.

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

Table 13: 0-5V Temperature Sensor - Voltage & Resistance for Type III Sensors

Head Pressure Transducer

If there is a suspected problem related to the Head Pressure Transducer, voltage and pressure readings can be taken at the head pressure terminal. See **Table 14, 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 14: Head Pressure Transducer Chart

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AAON Controls Support:
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Controls Support website:
www.aaon.com/aaon-controls-technical-support

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.

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