



Two Condenser Head Pressure II Module Technical Guide

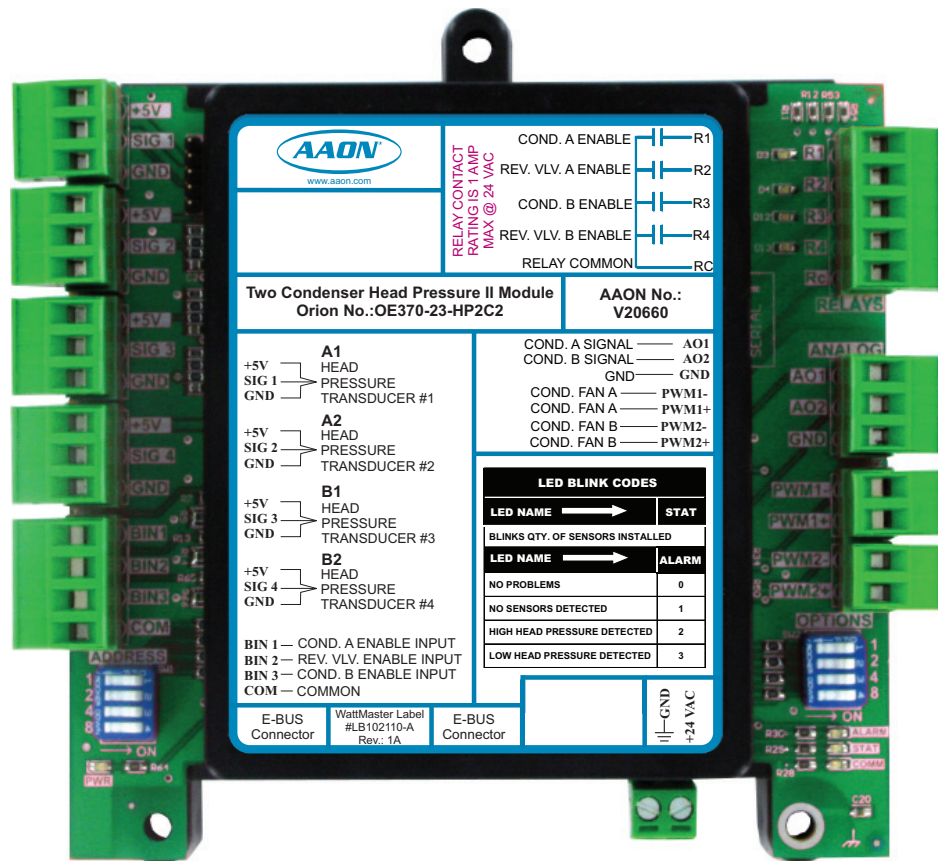


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PART NUMBER CROSS REFERENCE TABLE			
PART DESCRIPTION	ORION	AAON TULSA	AAON COIL
Two Condenser Head Pressure II Module - Tulsa	OE370-23-HP2C2	V20660	N/A
Two Condenser Head Pressure II Module - Coil	OE370-23-HP2C2-C	N/A	31426
VCM-X Modular E-BUS Controller - Tulsa	OE332-23E-VCMX-MOD-A	V07150	N/A
VCM-X Modular E-BUS Controller - Coil	OE332-23E-VCMX-MOD-C	N/A	30553
VCM-X WSHP E-BUS Controller - Tulsa	OE332-23E-VCMX-WSHP-A	V07140	N/A
VCM-X WSHP E-BUS Controller - Coil	OE332-23E-VCMX-WSHP-C	N/A	30526
SA E-BUS Controller - Tulsa	OE332-23E-SA-A	V07160	N/A
SA Expansion Module - Tulsa	OE333-23-SA-A	R96180	N/A



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Overview

The Two Condenser Head Pressure II Module (OE370-23-HP2C2) monitors four individual head pressure transducers and controls two Condenser Fans or Water Valves on units with two physically separate condenser sections. The highest reading of head pressure transducers 1 & 2 controls Condenser Signal A. The highest reading of head pressure transducers 3 & 4 controls Condenser Signal B. If this is a heat pump unit, the module is able to detect when the unit is in Heat Pump Heating mode and will force the condenser signal to 100% until it leaves this mode.

The Two Condenser Head Pressure II Module is designed to work stand-alone by using its OPTIONS dip switch to adjust the Head Pressure setpoint.

The Two Condenser Head Pressure II Module is directly connected to the VCM-X Modular E-BUS, VCM-X WSHP E-BUS or SA E-BUS Controller, allowing the Module(s) to receive setpoints from the Controller. See chart on **page 2** for part numbers.

When using the Two Condenser Head Pressure II Module with the RNE Controller, refer to the *RNE Controller Technical Guide*.

The Two Condenser Head Pressure II Module also provides a pulse width modulation (PWM) signal or voltage output signal to control the condenser fans.

The Two Condenser Head Pressure II Module requires a 24 VAC power connection with an appropriate VA rating.

Features

The Two Condenser Head Pressure II Module provides the following:

- Can be operated stand alone or up to (2) modules can be daisy-chained together and connected to a VCM-X Modular E-BUS, VCM-X WSHP E-BUS, or SA E-BUS Controller
- Monitors up to four individual head pressure transducers
- Provides control of Condenser Output Signals based on the highest reading of head pressure transducers
- Capable of monitoring a Reverse Valve Signal
- Forces Condenser Fans to 100% while in the Heat Pump Heating Mode

NOTE: The Two Condenser Head Pressure II Module contains no user-serviceable parts. Contact qualified technical personnel if your Module is not operating correctly.

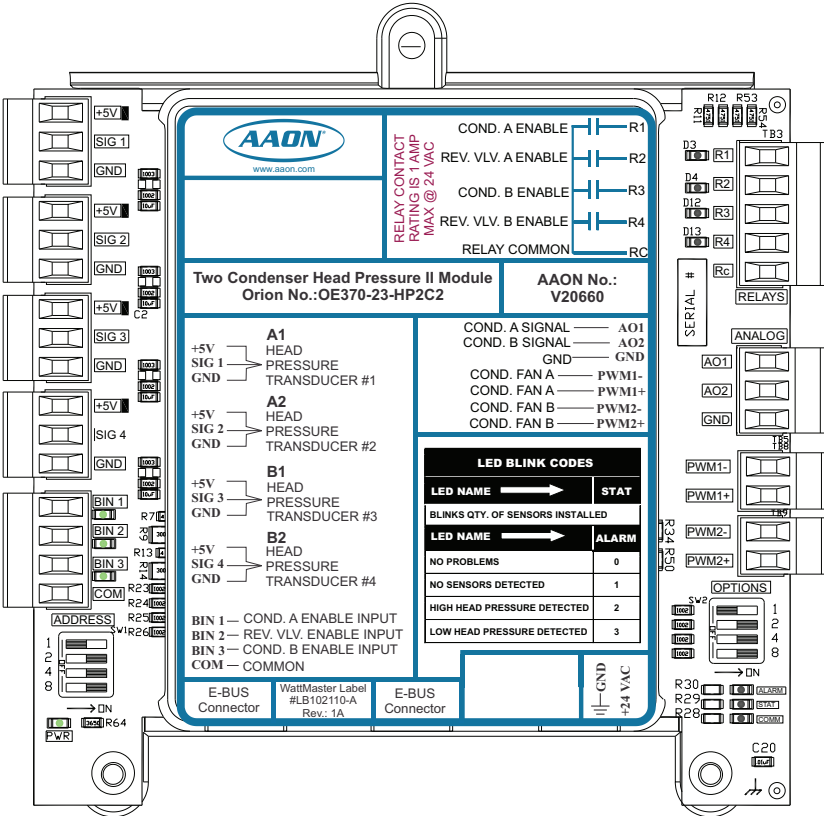


Figure 1: Two Condenser Head Pressure II Module

INSTALLATION & WIRING

Mounting and Wiring Considerations

Environmental Requirements

The Two Condenser Head Pressure II Module needs to be installed in an environment that can maintain a temperature range between -30°F and 150°F and not exceed 90% RH levels (non-condensing).

Mounting

The Two Condenser Head Pressure II Module is housed in a plastic enclosure. It is designed to be mounted by using the 3 mounting holes in the enclosure base. It is important to mount the module in a location that is free from extreme high or low temperatures, moisture, dust, and dirt. Be careful not to damage the electronic components when mounting the module.

See **Figure 2** for Module dimensions (in inches).

Important Wiring Considerations

Please read carefully and apply the following information when wiring the Two Condenser Head Pressure II Module:

1. To operate the Two Condenser Head Pressure II Module, you must connect power to the 24 VAC input terminal block.
2. Each Pressure Transducer must have its own 18-gauge shielded twisted pair cable. The Drain Wire must be the “Gnd” signal for the transducer.
3. When the Analog Output is being used to control the Condenser Fan Speed or Water Valve Percentage, the cable must be 18-gauge shielded wire, and the Drain Wire must be the “Gnd” signal.
4. If the Pulse Width Modulation (PWM) Output is being used to directly control the ECM 142 motor, the wires do not need to be shielded and can be any 18-gauge wire.

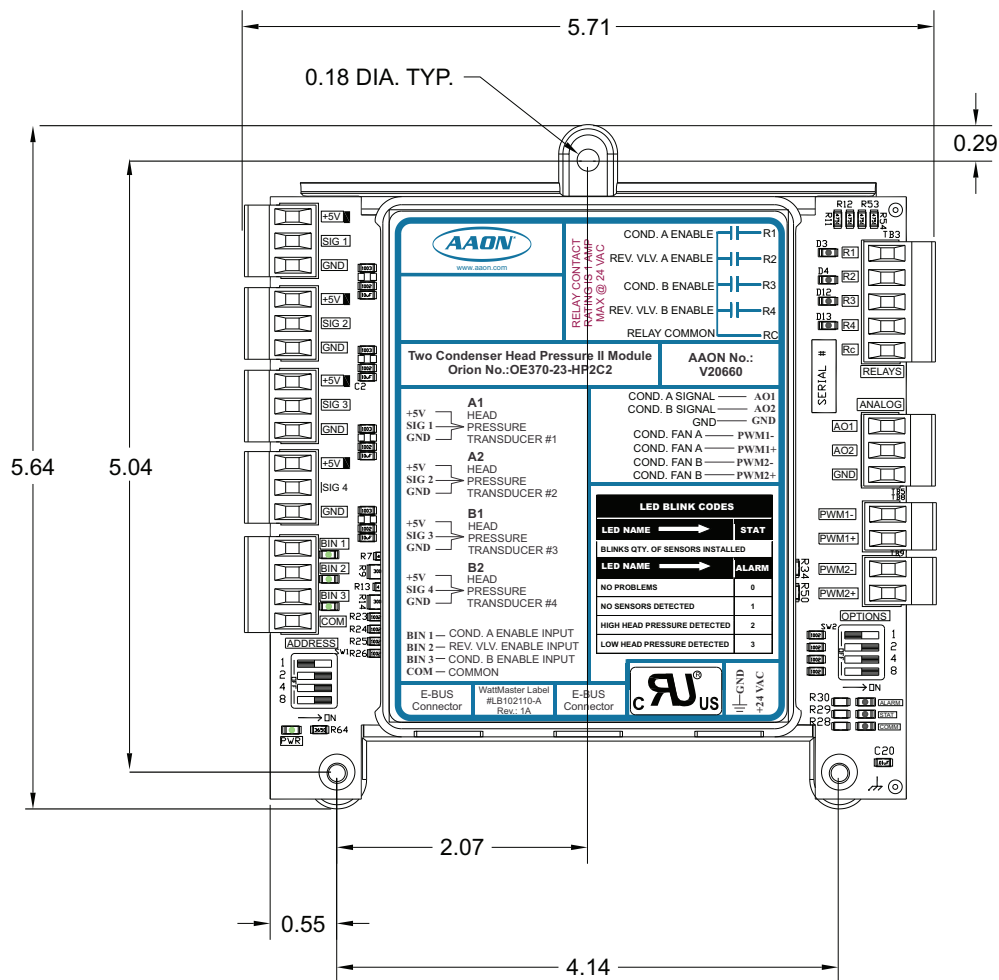


Figure 2: Two Condenser Head Pressure II Module Dimensions

- Check all wiring leads at the terminal block for tightness. Be sure that wire strands do not stick out and touch adjacent terminals. Confirm that all transducers required for your system are mounted in the appropriate location and wired into the correct terminals.

WARNING: Be sure all controllers and modules are powered down before connecting or disconnecting HSSC cables.

Stand-Alone Wiring

To operate the Two Condenser Head Pressure II Module as Stand Alone, connect the Module to a 24 VAC connection with an appropriate VA rating. See **Figure 3** for wiring.

Check all wiring leads at the terminal block for tightness. Be sure that wire strands do not stick out and touch adjacent terminals. Confirm that all transducers required for your system are mounted in the appropriate location and wired into the correct terminals.

Condenser Type Selection

As shown in **Figure 3**, set ADDRESS Dip Switch 1 to ON for water cooled or to OFF for air cooled. Refer to **page 8** for further instructions.

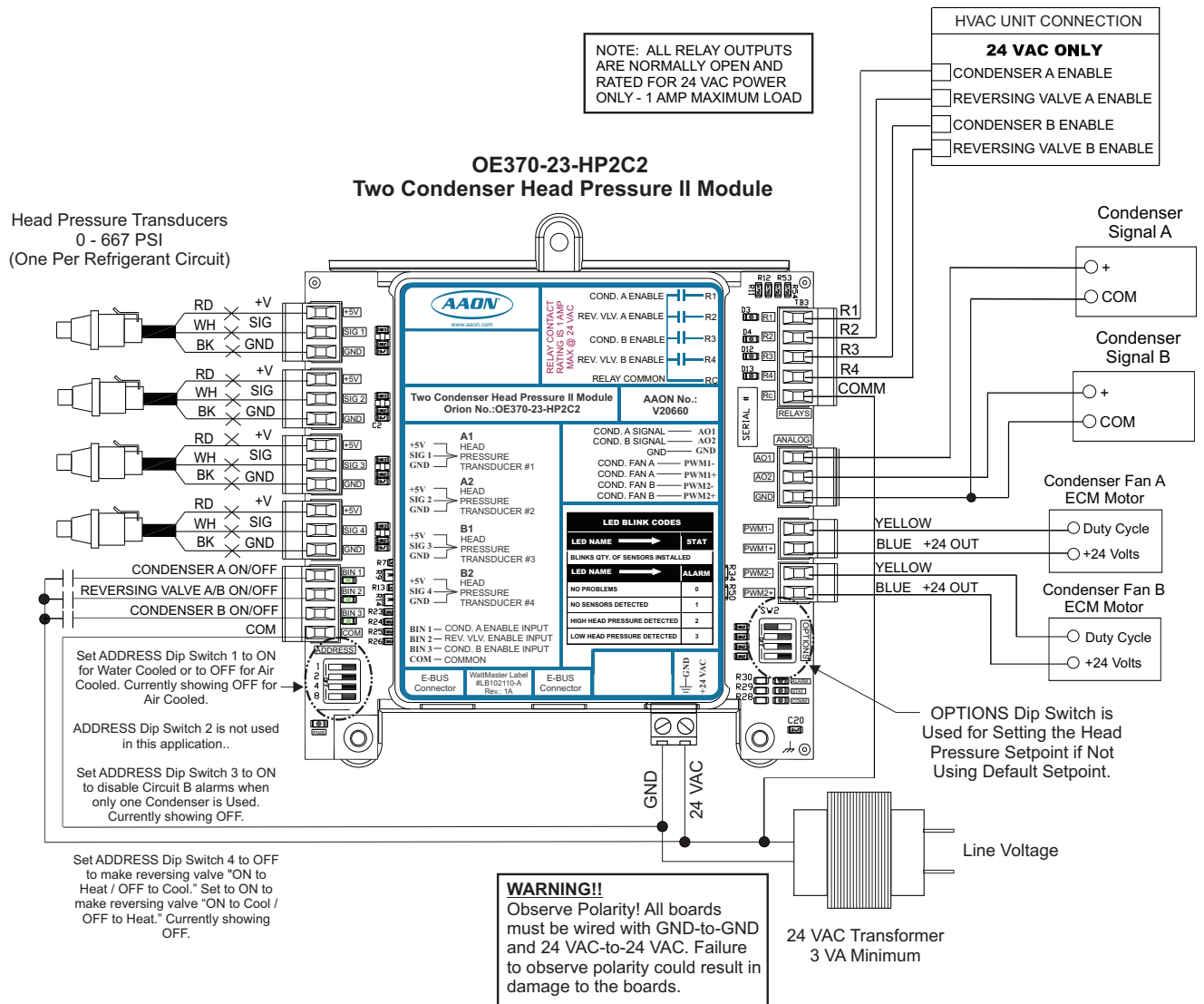


Figure 3: Two Condenser Head Pressure II Module Wiring Diagram (Stand-Alone)

INSTALLATION & WIRING

E-BUS Controller to Two Condenser Head Pressure II Module Wiring

VCM-X Modular E-BUS, VCM-X WSHP E-BUS or SA E-BUS Controller to Two Condenser Head Pressure II Module Wiring

Up to (2) Two Condenser Head Pressure II Modules can be daisy-chained together and connected to the E-BUS Controller using a modular HSSC cable. The Two Condenser Head Pressure II Module requires a 24 VAC power connection with an appropriate VA rating. See Figure 4 below for wiring.

Any E-BUS Module can be connected to the E-BUS Controller's E-BUS port or can be daisy-chained together using HSSC cables.

NOTE: Contact Factory for the correct HSSC cable length for your application. Cables are available in ¼, ½, 1, 2, 3, 4, and 5 Meter lengths and 100 and 150 Foot lengths.

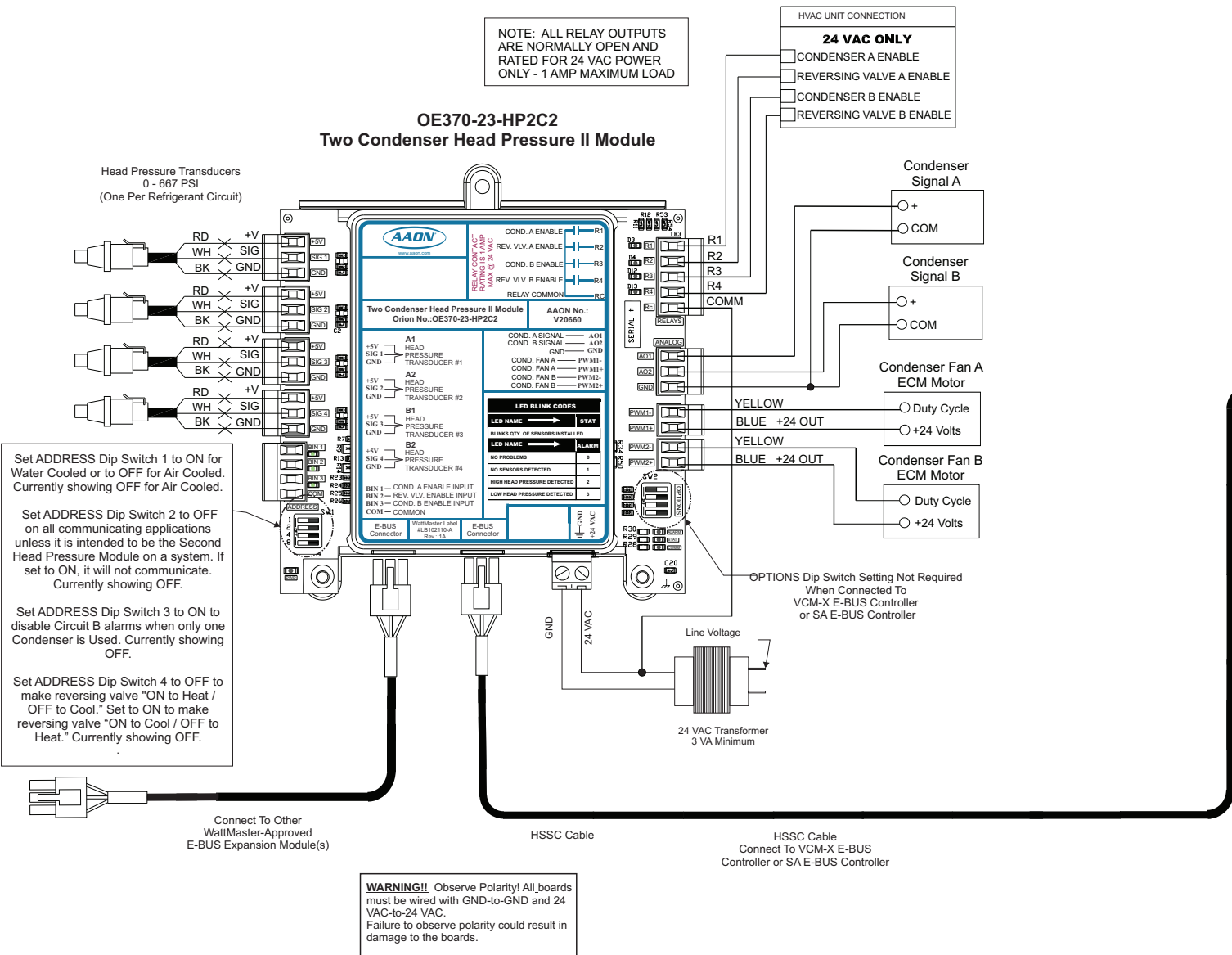


Figure 4: VCM-X E-BUS Controller to Two Condenser Head Pressure II Module Wiring Diagram

E-BUS Controller to Two Condenser Head Pressure II Module Wiring

WARNING: Be sure all controllers and modules are powered down before connecting or disconnecting HSSC cables.

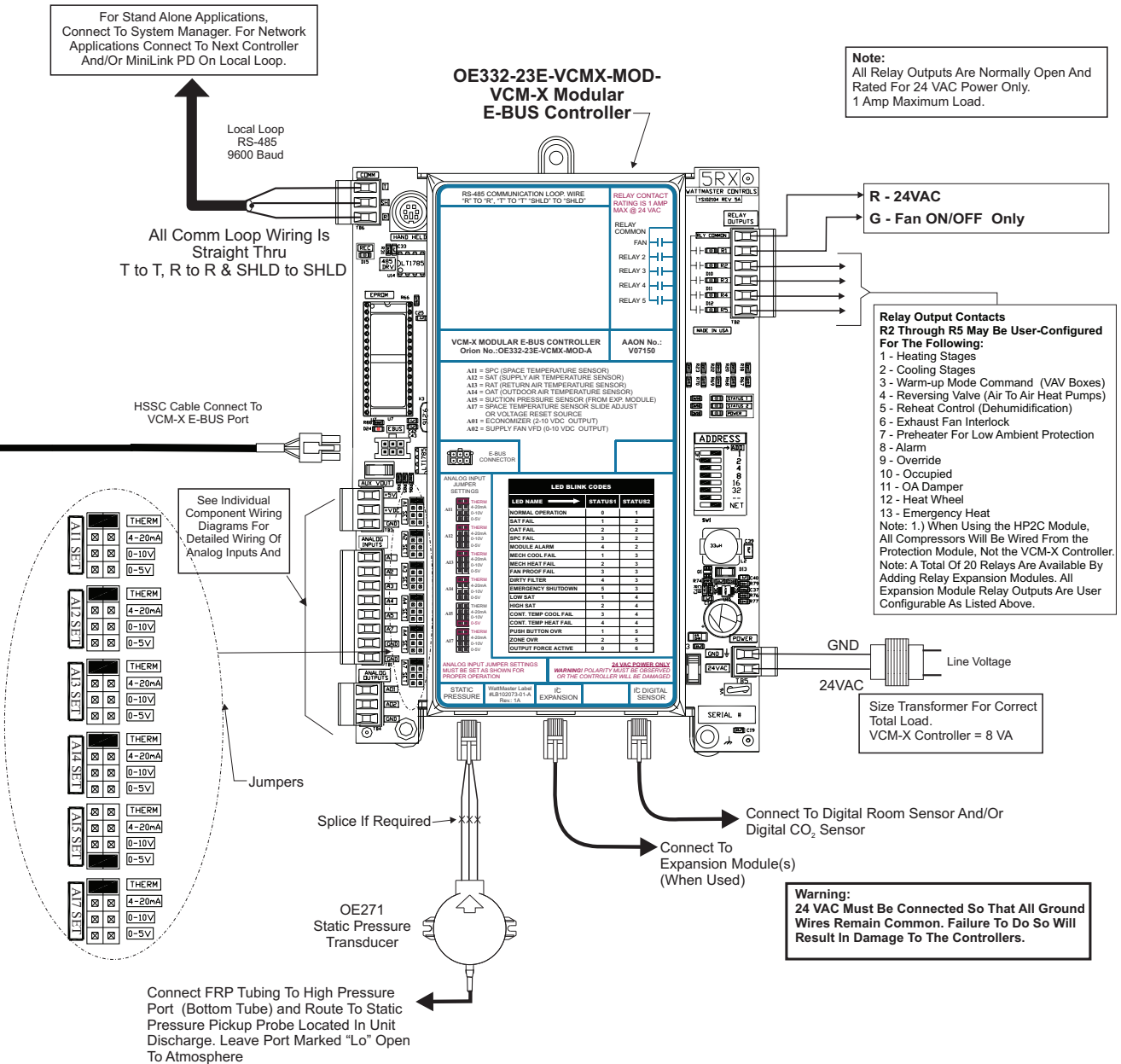


Figure 4, cont.: VCM-X E-BUS Controller to Two Condenser Head Pressure Module II Wiring Diagram

SEQUENCE OF OPERATION

Stand-Alone Input Commands

General

The following inputs and outputs are available on the Two Condenser Head Pressure II Module. See **Table 1** below to reference the Input/Output Map.

Binary Inputs	
1	Condenser Fan A On/Off (24 VAC Wet Input)
2	Reversing Valve On/Off (24 VAC Wet Input)
3	Condenser Fan B On/Off (24 VAC Wet Input)
Binary Outputs	
1	Condenser A Enable Relay (Dry Contact Output Rated for 24 VAC)
2	Reversing Valve A Enable (Dry Contact Output Rated for 24 VAC)
3	Condenser B Enable Relay (Dry Contact Output Rated for 24 VAC)
4	Reversing Valve B Enable (Dry Contact Output Rated for 24 VAC)
Analog Inputs	
1	Head Pressure #1 (0-667 PSI Sensor)
2	Head Pressure #2 (0-667 PSI Sensor)
3	Head Pressure #3 (0-667 PSI Sensor)
4	Head Pressure #4 (0-667 PSI Sensor)
Analog Outputs (0-10 or 2-10 VDC)	
1	Condenser Signal A (AOUT 1)
2	Condenser Signal B (AOUT 2)
PWM Inputs	
1	ECM 142 PWM Input (0-100% Duty Cycle)
2	ECM 142 PWM Input (0-100% Duty Cycle)

Table 1: Two Condenser Head Pressure II Module Inputs & Outputs

Stand-Alone Input Commands

Condenser Fan A On/Off

A 24 volt signal to Binary Input #1 initiates the Condenser Fan A Enable function. Typically, the source for this signal is the “Y” call from the thermostat calling for a compressor to run.

Reversing Valve On/Off

A 24 volt signal to Binary Input #2 indicates the reversing valve has been energized and initiates the Reversing Valve Enable On indication function. Typically, the source for this signal is the “O” call from a thermostat or other controller.

Condenser Fan B On/Off

A 24 volt signal to Binary Input #3 initiates the Condenser Fan B Enable function. Typically, the source for this signal is the “Y” call from the thermostat calling for a compressor to run.

Head Pressure Setpoint

The Head Pressure Setpoint is set using the OPTIONS Dip Switches. See **Table 2**. The Default Setpoint for an Air Cooled Condenser is 340 for 410-A refrigerant. The Default Setpoint for a Water Cooled Condenser is 235 for 410-A refrigerant. Set the OPTIONS Dip Switch to 0 if using these Default Settings. See “ADDRESS Dip Switch” below. **You must cycle power after setting Dip Switch values.**

NOTE: The only setpoint available for adjustment by the contractor is the **Head Pressure Setpoint**. The rest of the setpoints described can only be changed by the factory.

ADDRESS Dip Switch Settings for Condenser Type Selection

When using the OPTIONS Dip Switch to set the Head Pressure Setpoint, you must also set the ADDRESS Dip Switch to designate the type of condenser you are using.

Set ADDRESS Dip Switch 1 to ON for a Water Cooled Condenser or to OFF for an Air Cooled Condenser.

If set to ON for a Water Cooled Condenser, the Analog Condenser Output Signal will be 2-10 VDC for the Water Valve. If set to OFF for an Air Cooled Condenser, the Analog Condenser Output Signal will be 0-10 VDC for the Condenser Fan.

You must cycle power after setting Dip Switch values. See **Figure 3 or 4** for ADDRESS Dip Switch location and **Table 3** for Setting information.

VCM-X Input Commands and Modes of Operation

Input Commands (VCM-X Connection)

Condenser A & B On/Off

Instead of a hard wired input signal to the Condenser Enable input, the VCM-X Modular Controller, VCM-X WSHP Controller, or SA Controller communicates to the Module via E-BUS communications. This signal indicates the compressor(s) are called to run and drives the condenser A & B On/Off function.

Reversing Valve Enable A & B On/Off

As with the Condenser Signal On/Off function, the VCM-X Modular Controller, VCM-X WSHP Controller, or SA Controller communicates to the Module via E-BUS communications and signals that the reversing valve has been energized and that heating has been enabled.

NOTE: When the term “ON” is used, it means there is either 24 VAC on the appropriate Binary Input or a call-to-run signal is being received from a VCM-X series or SA series controller. When the term “OFF” is used, it means there is either 0 VAC on the appropriate Binary Input or the call-to-run signal from a VCM-X series or SA series controller has been removed.

Sensor Reading Routine

The Two Condenser Head Pressure Module is used on units with two physically separate condenser sections. Up to (2) Head Pressure Sensors can be monitored in each section. The highest of the two readings in each section will be used to control the condenser fan(s) in that section.

Air from the condenser fan(s) in each section flows through both condenser coils. As a result, if you modulate the fan(s) based on the highest reading, you will have enough air flow for both coils.

The highest reading of Head Pressure Sensors 1 & 2 controls Condenser Fan A. The highest reading of Head Pressure Sensors 3 & 4 controls Condenser Fan B.

Modes of Operation

OFF Mode

The Head Pressure Control Board is in the OFF Mode when the Condenser Input Signals are “OFF.” In this mode, all relays are off, the Analog Output is 0 VDC, and the PWM Output is 0% Duty Cycle.

Cooling Mode

If the Head Pressure Controller has been configured for the Reversing Valve to be energized in the Cooling Mode and to Fail to the Heat Mode (Dipswitch 4 is set ON), then the Head Pressure Controller will be in the Cooling Mode when one or both of the Condenser Signal inputs is “ON” and the Reversing Valve Enable Signal is “ON”. In this circumstance, the Reversing Valve Enable Relay Output(s) will energize for indication purposes.

If the Head Pressure Controller has been configured for the Reversing Valve to be energized in the Heating Mode and to Fail to the Cool Mode (Dipswitch 4 is set OFF), then the Head Pressure Controller will be in the Cooling Mode when one or both of the Condenser Signal inputs is “ON” and the Reversing Valve Enable Signal is “OFF”.

The Condenser Enable Relays will energize to enable the Condenser Fans or Water Valves. In a water system, the Water Flow Valve will start at 75% for 3 minutes. The Condenser Output Signals will then automatically adjust between 0 and 100% to maintain the desired Head Pressure Setpoint. The Condenser Output Signals can be a 0-10 VDC, 2-10 VDC or 0-100% PWM signal provided by the appropriate output. Both outputs mirror each other.

Heating Mode

If the Head Pressure Controller has been configured for the Reversing Valve to be energized in the Cooling Mode and to Fail to the Heat Mode (Dipswitch 4 is set ON), then the Head Pressure Controller will be in the Heating Mode when one or both of the Condenser Signal inputs is “ON” and the Reversing Valve Enable Signal is “OFF”.

If the Head Pressure Controller has been configured for the Reversing Valve to be energized in the Heating Mode and to Fail to the Cool Mode (Dipswitch 4 is set OFF), then the Head Pressure Controller will be in the Cooling Mode when one or both of the Condenser Signal inputs is “ON” and the Reversing Valve Enable Signal is “ON”. In this circumstance, the Reversing Valve Enable Relay Output(s) will energize for indication purposes.

In this mode, the Condenser Output Signals will go to 100% and remain there until it leaves the Heating Mode.

NOTE: The Reversing Valve Dipswitch 4 setting determines whether the Reversing Valve Dipswitch 4 Relay is ON to Heat / OFF to Cool or ON to Cool / OFF to Heat.

NOTE: The Reversing Valve Enable outputs are for indication only and are not wired to anything.

SEQUENCE OF OPERATION

OPTIONS Dip Switch Settings

OPTIONS Dip Switch Settings	Head Pressure Setpoint	
	Air Cooled Condenser	Water Cooled Condenser
Binary Value	R410-A	R410-A
0	340 (DEFAULT)	235 (DEFAULT)
1	260	210
2	270	220
3	280	230
4	290	240
5	300	250
6	310	260
7	320	270
8	330	280
9	340	290
10	350	300
11	360	310
12	370	320
13	380	330
14	390	340
15	400	350

Table 2: OPTIONS Dip Switch/Head Pressure Setpoint Settings for Stand-Alone Operation

ADDRESS Dip Switch 1 Settings		
Switch 1	Default SP	Description of Default Head Pressure Setpoint
OFF	340	Air Cooled Condenser using R410-A Refrigerant
ON	235	Water Cooled Condenser using R410-A Refrigerant
Switch 1 determines Air or Water Cooled Condenser		
NOTE: You must cycle power after setting Dip Switch values.		

Table 3: ADDRESS Dip Switch 1 Condenser Type Settings

ADDRESS Dip Switch 2 Settings	
Switch 2	Description
OFF	Set to OFF if Using only (1) Head Pressure Module or if this is Module 1 when Using (2) Head Pressure Modules.
ON	Set to ON if this is Module 2 when Using (2) Head Pressure Modules.

Table 4: ADDRESS Dip Switch 2 Address Settings When in Communicating Mode

ADDRESS Dip Switch 3 Settings	
Switch 3	Description
OFF	Enable Circuit B Alarm
ON	Disable Circuit B Alarm when only one condenser is used.

Table 5: ADDRESS Dip Switch 3 Settings

ADDRESS Dip Switch 4 Settings	
Switch 4	Description
OFF	Reversing Valve On to Heat/ Off to Cool
ON	Reversing Valve On to Cool/ Off to Heat

Table 6: ADDRESS Dip Switch 4 Settings for Reversing Valve

Head Pressure Module Valve / Fan Position Troubleshooting

Head Pressure Module Valve/Fan Position Troubleshooting

If configured for Water valve:

Aout Signal is 2 to 10 volts.

2 volts = 0% valve position or fully closed

10 volts = 100% valve position or fully open

PWM signal is not used for water valve but does modulate.

At Startup for cooling, valve will open to 75% or 8 volts for 3 minutes then will modulate to try to maintain head pressure setpoint.

For heating, valve will open and stay at 100%.

If configured for Air Condenser Fan:

Aout Signal is 0 to 10 volts.

Minimum fan speed is 1 volt. (10%)

Maximum fan speed is 10 volts. (100%)

Anything less than 1.5 volts the fan will be off.

PWM signal is 0 to 100%

PWM+ (to ground) will always read 24 vdc.

PWM- (to ground) can be measured for volts dc and this formula will tell you the percentage signal: $(24 - \text{measured value})/24$ (measured value = PWM- to ground)

PWM-

0 volts = 100% fan speed

6 volts = 75% fan speed

12 volts = 50% fan speed

18 volts = 25% fan speed

20.4 volts = 15% fan speed

Above 20.4 volts = 0% fan speed

At Startup for cooling, fan will start at 100% for 3 minutes and then will modulate to try to maintain head pressure setpoint.

For heating, fan will run and stay at 100%.

Safeties:

If the head pressure signal is above 500 PSIG, fan will go to 100% (high pressure safety).

If the head pressure signal is below 1 PSIG, fan will go to 100% (assuming bad sensor).

If the head pressure rises 50 PSI above setpoint, the condenser signal will go to 100%.

Troubleshooting for Stand-Alone Mode

Troubleshooting for Stand-Alone Mode

If you suspect or encounter general problems during operation of the Two Condenser Head Pressure II Module while in Stand Alone Mode, follow the Troubleshooting Flowchart in **Figure 5** below.

**Head Pressure Control
Troubleshooting Flowchart
(Stand-Alone Mode)**

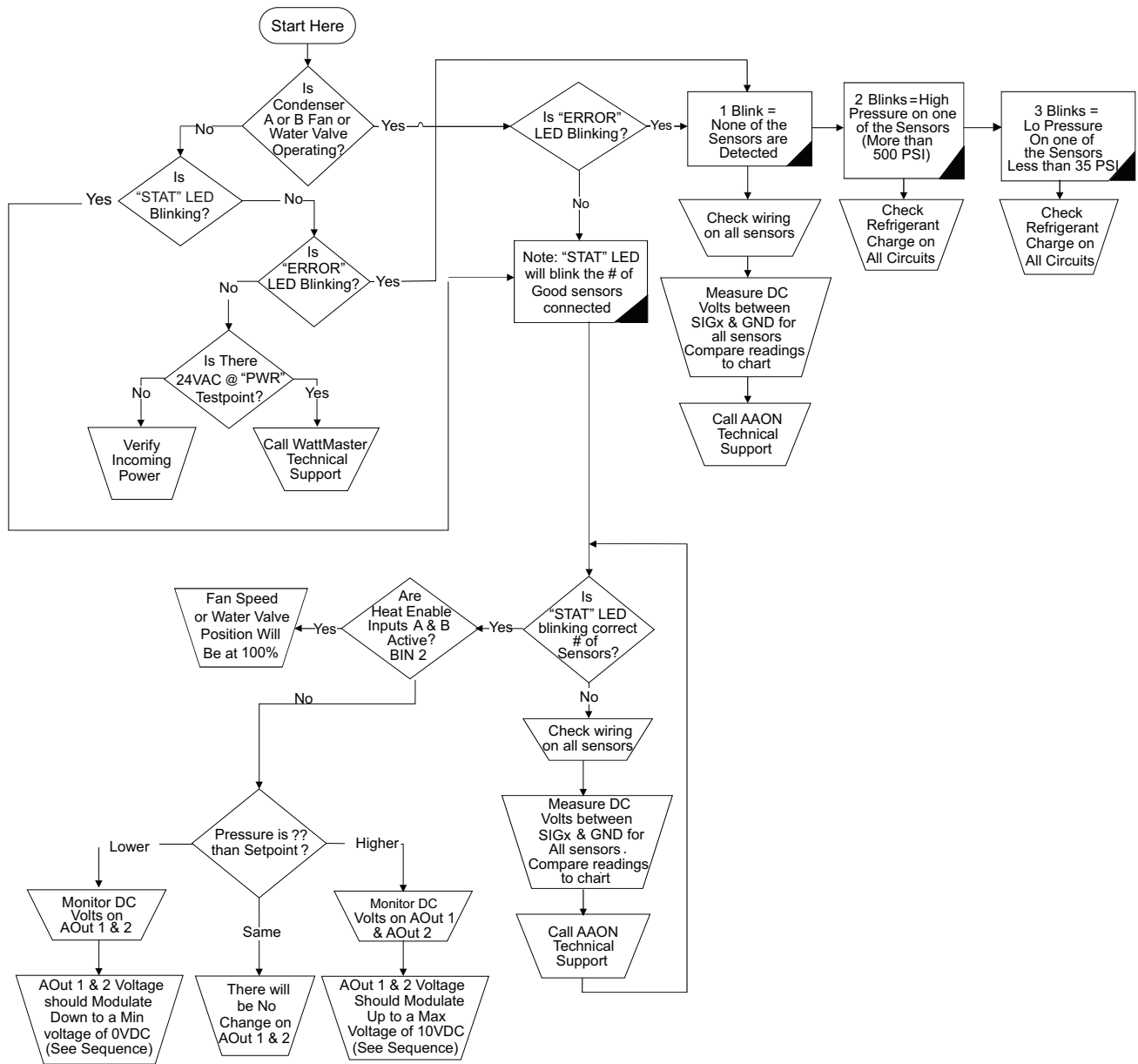


Figure 5: Two Condenser Head Pressure II Module Troubleshooting Diagram

TROUBLESHOOTING

Pressure Transducer Troubleshooting and LEDs

Pressure Transducer Troubleshooting

If you suspect there is a problem with the Module related to pressure transducer measurements, reference **Table 7** below.

Pressure Sensor 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: Two Condenser Head Pressure II Module Transducer Chart

Using LEDs to Verify Operation

The Two Condenser Head Pressure II Module is equipped with LEDs that can be used to verify operation and perform troubleshooting. There are LEDs for communication, operation modes, diagnostic codes, and relays. The Two Condenser Head Pressure Module has eight LEDs—one for power, one for operation status, one for communication, one for alarms, and four for compressor relays. See **Figure 6** for the LED locations. The LEDs associated with these inputs and outputs allow you to see what is active without using a voltmeter.

① Status LEDs

“**COMM**” - This LED will light up to indicate Communications with the VCM-X series or SA series controller. If Communications are established, the COMM LED will blink. You should not see this LED light up in stand-alone mode, because there would be no communications with the VCM-X series or SA series controller.

“**ALARM**” - This is the diagnostic blink code LED. It will light up and blink out diagnostic codes. See **Table 8** below for Diagnostic Blink Code descriptions. The blink code descriptions are also located on the Module’s front cover.

No. of Blinks	Alarm
0	No Problems
1	No Sensors Detected
2	High Head Pressure Detected
3	Low Head Pressure Detected

Table 8: ALARM LED Blink Codes

“**STAT**” - This is the status blink code LED. It will light up and first blink the address of the Module. It will then blink out the quantity of sensors installed. See **Table 9** below for Status Blink Code descriptions. The blink code descriptions are also located on the Module’s front cover.

No. of Blinks	Status
Random	Blinks Quantity of Sensors Installed

Table 9: STAT LED Blink Codes

② Module LEDs

“**R1**” - This LED will light up whenever Condenser A Enable Relay is enabled and will stay lit as long as the relay is active.

“**R2**” - This LED will light up when the Reversing Valve A Enable Relay is enabled and will stay lit as long as the Reversing Valve A is active.

“**R3**” - This LED will light up whenever Condenser B Enable Relay is enabled and will stay lit as long as the relay is active.

“**R4**” - This LED will light up when the Reversing Valve B Enable Relay is enabled and will stay lit as long as the Reversing Valve B is active.

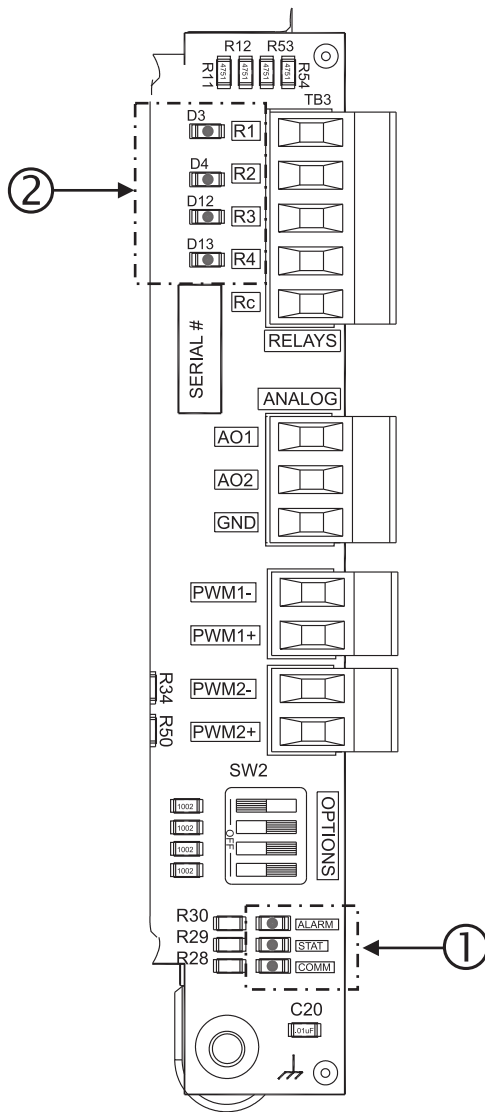


Figure 6: LED Locations

LED Diagnostics

“**PWR**” LED: When the Two Condenser Head Pressure II Module is powered up, the PWR LED (located below the address switches) should light up and stay on continuously. If it does not light up, check to be sure that the power wiring is connected to the board, the connections are tight, and the VCM-X series or SA series controller is powered. If after making all these checks, the PWR LED does not light up, the module is probably defective.

“**COMM**” LED: When the Two Condenser Head Pressure II Module is powered up while in Stand Alone Mode, the COMM LED does not light up. When the module is connected to a VCM-X series or SA series controller, the COMM LED should light up, indicating Communications. Each time Communications are detected, this LED should continuously blink on and off, for a half second. This LED should never stop checking for a Communications signal. If it does not light up, check to be sure that the power wiring is connected to the board, the connections are tight, and the VCM-X series or SA series controller is configured for Head Pressure Control and is powered up. If after making all these checks, the COMM LED does not light up, the board is probably defective.

“**STAT**” LED: As previously described, when the module is first powered up, the STAT LED will blink out the number of installed sensors

“**ALARM**” LED: As previously described, this LED will blink on and off to indicate alarms and diagnostics.

Other Checks

NOTE: The Two Condenser Head Pressure II Module contains no user-serviceable parts. Contact qualified technical personnel if your module is not operating correctly.



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