Water Source
Heat Pump X Module
Field Technical Guide
Overview

The OE334-26-WSHPX-A Water Source Heat Pump X (WSHP-X) Module monitors the compressors on an AAON® Water Source Heat Pump unit and can disable the compressors based on low Suction Pressure, Leaving Water Temperature, and Water Proof of Flow inputs. It also utilizes a Delay Timer to prevent the compressors from turning on at the same time.

The WSHP-X Module’s water circuit configuration can be either single or dual. There are eight R410-A glycol configurations for the WSHP-X Module—0%-40% in increments of 5%. There are two refrigerant selections—R410-A refrigerant and R-22 refrigerant. If R-22 refrigerant is selected, the glycol will automatically default to 0%.

The WSHP-X Module can be used stand-alone. It can also be connected to the VCM-X WSHP Controller or the SA Controller using the E-BUS Distribution Module or the module can be directly connected to the VCM-X WSHP E-BUS Controller or SA E-BUS Controller, allowing the Module to receive setpoints from the Controllers. See chart on page 2 for part numbers. Please note: The SA series of controllers only work with the R410-A dual water circuit configurations.

The WSHP-X Module requires a 24 VAC power connection with an appropriate VA rating.

NOTE: The WSHP-X Module is factory set for R410-A and 0% glycol.

Features

The WSHP-X Module provides the following:

- Can be operated stand-alone or connected to a VCM-X WSHP Controller or SA Controller using the E-BUS Distribution Module to E-BUS interface
- Can be directly connected to a VCM-X WSHP E-BUS Controller or SA E-BUS Controller
- Capable of controlling digital compressors when connected to a VCM-X WSHP Series Controller or SA Series Controller
- Monitors suction pressure, leaving water temperature, and water proof of flow
- Provides Delay Timer to prevent compressors from turning on at the same time
- Contains a 2x8 LCD character display and 4 buttons that allow for status display, setpoint changes, and configuration changes

NOTE: The WSHP-X Module contains no user-serviceable parts. Contact qualified technical personnel if your Module is not operating correctly.
**Environmental Requirements**

The WSHP-X 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 WSHP-X 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).

**Power Supply**

The WSHP-X Module requires a 24 VAC power connection with an appropriate VA rating.

If you will be connecting the WSHP-X Module to a VCM-X WSHP Series Controller or SA Series Controller, one of the most important checks to make before powering up the system for the first time is to make sure that the Controller is configured properly for your application. Refer to the VCM-X Controller Technical Guide, VCM-X Modular E-BUS Controller Technical Guide, SA Controller Technical Guide, or SA E-BUS Controller Technical Guide for more information.

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**WARNING:** Observe polarity! All boards must be wired GND-to-GND and 24 VAC-to-VAC. Failure to observe polarity could result in damage to the boards.

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**Figure 2: Water Source Heat Pump X Module Dimensions**

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Note: Height is 1.49 inches.
**Important Wiring Considerations**

Please read carefully and apply the following information when wiring the WSHP-X Module:

1. To operate the WSHP-X Module in Stand-Alone mode, you must connect power to the 24 V AC input terminal block. Do not allow wire strands to stick out and touch adjoining terminals. This could potentially cause a short circuit.

2. The 1 to 5 VDC signals for the Compressor modulation need to use 18-gauge shielded twisted pair cable, and the Drain wire must be the GND signal.

3. All 24 V AC wiring must be connected so that all ground wires remain common. Failure to follow this procedure can result in damage to the module and connected devices.

4. Be sure all modular wiring harness connectors are seated firmly in their respective modular connectors on the circuit board.

5. All wiring is to be in accordance with local and national electrical codes and specifications.

6. 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.

**Stand-Alone Wiring Single Water Circuit**

To operate the WSHP-X Module as Stand Alone, connect the Module to a 24 V AC power connection with an appropriate VA rating. See Figure 3 for wiring.

*Figure 3: Water Source Heat Pump X Module as Stand-Alone for Single Water Circuit*
To operate the WSHP-X Module as Stand Alone, connect the Module to a 24 VAC power connection with an appropriate VA rating. See Figure 4 for wiring.
E-BUS to WSHP-X Module Wiring

The WSHP-X Module connects to the E-BUS Distribution Module using a modular HSSC cable. The WSHP-X Module requires a 24 VAC power connection with an appropriate VA rating.

The E-BUS Distribution Module connects to the VCM-X WSHP Controller, VCM-X Expansion Module, SA Controller (Dual Water Circuit only), SA Expansion Module (Dual Water Circuit only), or 12 Relay Expansion Module using the I²C port. See Figure 5 on page 8 and Figure 7 on page 12 for wiring.

Any E-BUS Module can be connected to each of the four E-BUS Distribution Module’s output ports or can be daisy-chained together using HSSC cables.

If using a spliced terminal connection for longer runs, one module can be connected to the E-BUS Distribution Module and any additional modules would be daisy-chained to the first module. For more information, refer to the E-BUS Distribution Module Technical Guide.

VCM-X WSHP E-BUS or SA E-BUS Controller to WSHP-X Module Wiring

The WSHP-X Module connects to the E-BUS Controller using a modular HSSC cable. The WSHP-X Module requires a 24 VAC power connection with an appropriate VA rating. See Figure 6 on page 10 and Figure 8 on page 14 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 1/4, 1/2, 1, 2, 3, 4, and 5 Meter lengths and 100 and 150 Foot lengths.

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

Addressing

When the WSHP-X Module is connected to the E-BUS Distribution Module, set the WSHP-X Module’s address to 1. Set the address consecutively for each WSHP-X Module you are using.

NOTE: Address zero defaults to address 1.
VCM-X WSHP to WSHP-X Module Wiring for Single Water Circuit

The VCM-X WSHP Controller or SA Controller communicates with the WSHP-X Module using the E-BUS Distribution Module. See Figure 5 for wiring details.

NOTE: When using the WSHP-X Module, all compressors will be wired from the WSHP-X Module, not the VCM-X WSHP Controller.

Figure 5: VCM-X WSHP Controller to WSHP-X Module Wiring Diagram for Single Water Circuit
WARNING!!
Observe Polarity! All boards must be wired with GND-to-GND and 24 VAC-to-24 VAC. Failure to observe polarity could result in damage to the boards.

Figure 5, cont.: VCM-X WSHP Controller to WSHP-X Module Wiring Diagram for Single Water Circuit
VCM-X WSHP E-BUS or SA E-BUS Controller to WSHP-X Module Wiring for Single Water Circuit

The WSHP-X Module connects to the E-BUS Controller using a modular HSSC cable. The WSHP-X Module requires a 24 VAC power connection with an appropriate VA rating. See Figure 6 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: When using the WSHP-X Module, all compressors will be wired from the WSHP-X Module, not the VCM-X WSHP E-BUS Controller.

Figure 6: VCM-X E-BUS Controller to WSHP-X Module Wiring Diagram for Single Water Circuit
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.

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

For Stand Alone Applications, Connect To System Manager. For Network Applications Connect To Next Controller And/or MiniLink PD On Local Loop.

All Comm Loop Wiring Is Straight Thru T to T, R to R & SHLD to SHLD

Connect FRP Tubing To High Pressure Port (Bottom Tube) And Route To Static Pressure Pickup Probe Located In Unit Discharge. Leave Port Marked “Lo” Open To Atmosphere.

Connect To Digital Room Sensor And/or Digital CO₂ Sensor

Splice If Required

OE271 Static Pressure Transducer

Connect To Expansion Module(s) (When Used)

Figure 6, cont.: VCM-X E-BUS Controller to WSHP-X Module Wiring Diagram for Single Water Circuit

NOTE: All Relay Outputs Are Normally Open And Rated For 24 VAC Power Only. 1 Amp Maximum Load.

RS-485 COMMUNICATION LOOP. WIRE “R” TO “R”, “T” TO “T”, “SHLD” TO “SHLD”
WSHP-X Module
Installation & Wiring

VCM-X WSHP or SA Controller to WSHP-X Module Wiring for Dual Water Circuit

The VCM-X WSHP Controller or SA Controller communicates with the WSHP-X Module using the E-BUS Distribution Module. See Figure 7 for wiring details (VCM-X WSHP Controller shown).

NOTE: When using the WSHP-X Module, all compressors will be wired from the WSHP-X Module, not the VCM-X WSHP Controller or SA Controller.

Figure 7: VCM-X WSHP Controller to WSHP-X Module Wiring Diagram for Dual Water Circuit
WARNING!! Observe Polarity! All boards must be wired with GND-to-GND and 24 VAC-to-24 VAC. Failure to observe polarity could result in damage to the boards.

OE365-23-EBD E-BUS Distribution Module

OE334-26-WSHPX-A Water Source Heat Pump X Module

NOTE: ALL RELAY OUTPUTS ARE NORMALLY OPEN AND RATED FOR 24 VAC POWER ONLY

Figure 7, cont.: VCM-X WSHP Controller to WSHP-X Module Wiring Diagram for Dual Water Circuit

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WSHP-X Module

Installation and Wiring

VCM-X WSHP E-BUS or SA E-BUS Controller to WSHP-X Module Wiring for Dual Water Circuit

The WSHP-X Module connects to the E-BUS Controller using a modular HSSC cable. The WSHP-X Module requires a 24 V AC power connection with an appropriate VA rating. See Figure 8 below for wiring. (VCM-X WSHP E-BUS Controller shown.)

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:** When using the WSHP-X Module, all compressors will be wired from the WSHP-X Module, not the VCM-X WSHP E-BUS Controller or SA E-BUS Controller.

**WARNING!!**
Observe Polarity! All boards must be wired with GND-to-GND and 24 VAC-to-24 VAC. Failure to observe polarity could result in damage to the boards.

**NOTE:** All relay outputs are normally open and rated for 24 VAC power only.

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**Figure 8:** VCM-X E-BUS Controller to WSHP-X Module Wiring Diagram for Dual Water Circuit
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.

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

For Stand Alone Applications, Connect To System Manager. For Network Applications Connect To Next Controller And/OR MiniLink PD On Local Loop.

RELAY CONTACT RATING IS 1 AMP MAX @ 24 VAC

RS-485 COMMUNICATION LOOP. WIRE “R” TO “R”, “T” TO “T” “SHLD” TO “SHLD”

FAN RELAY 2
RELAY 3
RELAY 4
RELAY 5
RELAY COMMON

IC DIGITAL SENSOR 2
IC EXPANSION 2 STATIC PRESSURE ANALOG INPUT JUMPER SETTINGS MUST BE SET AS SHOWN FOR PROPER OPERATION

24 VAC POWER ONLY WARNING! POLARITY MUST BE OBSERVED OR THE CONTROLLER WILL BE DAMAGED

AI1 = SPC (SPACE TEMPERATURE SENSOR)
AI2
AI3
AI4
AI5
AI7
A01
A02 = SAT (SUPPLY AIR TEMPERATURE SENSOR) = RAT (RETURN AIR TEMPERATURE SENSOR) = OAT (OUTDOOR AIR TEMPERATURE SENSOR) = SUCTION PRESSURE SENSOR (FROM EXP. MODULE) = SPACE TEMPERATURE SENSOR SLIDE ADJUST OR VOLTAGE RESET SOURCE = ECONOMIZER (2-10 VDC OUTPUT) = SUPPLY FAN VFD (0-10 VDC OUTPUT)

LED BLINK CODES

LED NAME

0x0 STATUS1
0x1 STATUS2
0x0 NORMAL OPERATION 0 1
0x1 SAT FAIL 1 2
0x2 OAT FAIL 2 2
0x3 SPC FAIL 3 2
0x4 MODULE ALARM 4 2
0x1 MECH COOL FAIL 1 3
0x2 MECH HEAT FAIL 2 3
0x3 FAN PROOF FAIL 3 3
0x4 DIRTY FILTER 4 3
0x5 EMERGENCY SHUTDOWN 5 3
0x1 LOW SAT 1 4
0x2 HIGH SAT 2 4
0x3 CONT. TEMP COOL FAIL 3 4
0x4 CONT. TEMP HEAT FAIL 4 4
0x1 PUSH BUTTON OVR 1 5
0x2 ZONE OVR 2 5
0x0 OUTPUT FORCE ACTIVE 0 6

E-BUS CONNECTOR

HSSC Cable Connect To VCM-X E-BUS Port

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.

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

Figure 8, cont.: VCM-X E-BUS Controller to WSHP-X Module Wiring Diagram for Dual Water Circuit
Start-Up & Commissioning

General

In order to have a trouble free start-up, it is important to follow a few simple procedures. Before applying power for the first time, it is very important to run through a few simple checks.

One of the most important checks to make before powering up the system for the first time is to make sure that the VCM-X WSHP Series Controller or SA Series Controller is configured properly for your application. Refer to the VCM-X Controller Technical Guide, VCM-X Modular E-BUS Controller Technical Guide, SA Controller Technical Guide, or SA E-BUS Controller Technical Guide for more information.

A handheld Modular Service Tool, Modular System Manager, or System Manager Touch Screen connected to the VCM-X WSHP Series Controller or SA Series Controller will allow you to configure your application. Refer to the VCM-X Operator’s Interfaces Technical Guide, SA Operator Interfaces Technical Guide, or System Manager TS Technical Guide for more information.

NOTE: The SA Series Controller does not utilize the System Manager Touch Screen.

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 sensors required for your system are mounted in the appropriate location and wired into the correct terminals.

WARNING: Observe polarity! All boards must be wired GND-to-GND and 24 VAC-to-VAC. Failure to observe polarity could result in damage to the boards.

Table 1: Unit Configurations Chart

<table>
<thead>
<tr>
<th>PERMUTATION</th>
<th>SYSTEM A</th>
<th>SYSTEM B</th>
<th>VCM-X WSHP CONFIGURATION</th>
<th>SA CONFIGURATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Comp A1</td>
<td>Comp A2</td>
<td>Comp B1</td>
<td>Comp B2</td>
</tr>
<tr>
<td>1</td>
<td>On/Off</td>
<td>On/Off</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>2</td>
<td>Digital</td>
<td>On/Off</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>3</td>
<td>Digital</td>
<td>Digital</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>4</td>
<td>On/Off</td>
<td>On/Off</td>
<td>On/Off</td>
<td>On/Off</td>
</tr>
<tr>
<td>5</td>
<td>Digital</td>
<td>On/Off</td>
<td>On/Off</td>
<td>On/Off</td>
</tr>
<tr>
<td>6</td>
<td>Digital</td>
<td>On/Off</td>
<td>Digital</td>
<td>On/Off</td>
</tr>
<tr>
<td>7</td>
<td>Digital</td>
<td>Digital</td>
<td>Digital</td>
<td>Digital</td>
</tr>
</tbody>
</table>

In the Cooling Mode, the Compressors will stage in the following order:

**Permutations 1, 2 & 3:** Compressor A1 -> Compressor A2
**Permutations 4:** Compressor A1 -> Compressor B1 -> Compressor A2 -> Compressor B2
**Permutations 6:** Compressor A1 & Compressor B1 -> Compressor A2 -> Compressor B2
**Permutations 7:** Compressor A1 & Compressor B1 -> Compressor A2 & Compressor B2

In the Dehumidification Mode, the Compressors will stage in the following order:

**Permutation 4:** Compressor A1 & Compressor B1 -> Compressor A2 -> Compressor B2

All other permutations in the Dehumidification Mode stage as described in the Cooling Mode.
General

The following inputs and outputs are available on the WSHP-X Module. See Table 2 below to reference the Input/Output Map.

### Binary Inputs

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Compressor A1 Enable (BIN 1)</td>
</tr>
<tr>
<td>2</td>
<td>Compressor A2 Enable (BIN 2)</td>
</tr>
<tr>
<td>3</td>
<td>Compressor B1 Enable (BIN 3)</td>
</tr>
<tr>
<td>4</td>
<td>Compressor B2 Enable (BIN 4)</td>
</tr>
<tr>
<td>5</td>
<td>Heat Enable (BIN 5)</td>
</tr>
<tr>
<td>6</td>
<td>Water Proof of Flow System A (BIN 6)</td>
</tr>
<tr>
<td>7</td>
<td>Water Proof of Flow System B (BIN 7)</td>
</tr>
</tbody>
</table>

### Analog Inputs

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Suction Pressure A1 (Pres 1)</td>
</tr>
<tr>
<td>2</td>
<td>Suction Pressure A2 (Pres 2)</td>
</tr>
<tr>
<td>3</td>
<td>Suction Pressure B1 (Pres 3)</td>
</tr>
<tr>
<td>4</td>
<td>Suction Pressure B2 (Pres 4)</td>
</tr>
<tr>
<td>5</td>
<td>Leaving Water Temperature System A (T1)</td>
</tr>
<tr>
<td>6</td>
<td>Leaving Water Temperature System B (T2)</td>
</tr>
</tbody>
</table>

### Analog Outputs (1-5 VDC or 0-10 VDC)

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Digital Stage 1 (Compressors A1 &amp; B1) (AOUT1)</td>
</tr>
<tr>
<td>2</td>
<td>Digital Stage 2 (Compressors A2 &amp; B2) (AOUT2)</td>
</tr>
</tbody>
</table>

**NOTE:** Analog Outputs are not used on Stand Alone Application

### Relay Outputs (24 VAC)

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Compressor A1 Enable Output (RLY1)</td>
</tr>
<tr>
<td>2</td>
<td>Compressor A2 Enable Output (RLY2)</td>
</tr>
<tr>
<td>3</td>
<td>Compressor B1 Enable Output (RLY3)</td>
</tr>
<tr>
<td>4</td>
<td>Compressor B2 Enable Output (RLY4)</td>
</tr>
<tr>
<td>5</td>
<td>Alarm Output (RLY5)</td>
</tr>
</tbody>
</table>

**WSHP-X Module Setpoints**

The WSHP-X Module setpoints are preset at AAON and are based on the unit’s design as well as the type of coolant being used in the water loop. See Tables 3 & 4 for default settings.

**NOTE:** These are default settings only. The setpoints may be different based on the unit’s design and coolant being used.

### Water-Only Default Setpoints

<table>
<thead>
<tr>
<th>Description</th>
<th>R410-A</th>
<th>R22</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNSAFE SUCTION</td>
<td>40 PSIG</td>
<td>20 PSIG</td>
</tr>
<tr>
<td>LOW SUCTION HEAT MODE</td>
<td>100 PSIG</td>
<td>57 PSIG</td>
</tr>
<tr>
<td>LOW SUCTION COOL MODE</td>
<td>85 PSIG</td>
<td>57 PSIG</td>
</tr>
<tr>
<td>LOW LEAVING WATER TEMP</td>
<td>37°F</td>
<td>37°F</td>
</tr>
</tbody>
</table>

**NOTE:**

- **Binary Inputs:**
  - BIN 1: Compressor A1 Enable
  - BIN 2: Compressor A2 Enable
  - BIN 3: Compressor B1 Enable
  - BIN 4: Compressor B2 Enable
  - BIN 5: Heat Enable
  - BIN 6: Water Proof of Flow System A
  - BIN 7: Water Proof of Flow System B

- **Analog Inputs:**
  - Pres 1: Suction Pressure A1
  - Pres 2: Suction Pressure A2
  - Pres 3: Suction Pressure B1
  - Pres 4: Suction Pressure B2
  - T1: Leaving Water Temperature System A
  - T2: Leaving Water Temperature System B

- **Analog Outputs:**
  - AOUT1: Digital Stage 1 (Compressors A1 & B1)
  - AOUT2: Digital Stage 2 (Compressors A2 & B2)

- **Relay Outputs:**
  - RLY1: Compressor A1 Enable
  - RLY2: Compressor A2 Enable
  - RLY3: Compressor B1 Enable
  - RLY4: Compressor B2 Enable
  - RLY5: Alarm

- **Water-Only Default Setpoints:**
  - UNSAFE SUCTION: 40 PSIG for R410-A, 20 PSIG for R22
  - LOW SUCTION HEAT MODE: 100 PSIG for R410-A, 57 PSIG for R22
  - LOW SUCTION COOL MODE: 85 PSIG for R410-A, 57 PSIG for R22
  - LOW LEAVING WATER TEMP: 37°F

**Table 2: WSHP-X Module Inputs & Outputs**
**WSHP-X Module**

**Sequence of Operation**

### Stand-Alone Input Commands

#### Compressor On/Off

A 24 volt signal to Binary Inputs #1-4 initiates each Compressor’s On function. The source for this signal would typically come from Y1 to Y4 calls from the thermostat.

#### Heat Enable On/Off

A 24 volt signal on this input indicates the unit is in the Heating Mode. Typically, the source for this signal is the “O” call from the thermostat.

#### Water Proof of Flow System On/Off

A 24 volt signal to Binary Inputs #6-7 indicates Water Proof of Flow for each system.

#### Suction Pressure Analog Inputs

Sensors from Analog Inputs #1-4 correlate with the Suction Pressure of each Compressor (250 PSI).

#### Leaving Water Temperature Thermistor Inputs

T1 correlates with Compressors A1 & A2 (RLY1 and RLY2). T2 correlates with Compressors B1 & B2 (RLY3 and RLY4).

### Input Commands (VCM-X WSHP or SA Connection)

**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 the VCM-X WSHP 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 the VCM-X WSHP or SA has been removed.

#### Compressor On/Off

Instead of a physical input signaling the Compressor On/Off function, the VCM-X WSHP Series Controller or SA Series Controller communications drives the Compressor On/Off function.

#### Heat Enable On/Off

As with the Compressor On/Off function, the VCM-X WSHP Series or SA Series Controller communicates to the Module that it is in Heat Mode.

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### Table 4: Factory-Set Default Setpoints - Glycol

<table>
<thead>
<tr>
<th>Description</th>
<th>R22 0% Glycol</th>
<th>R410-A 0% Glycol</th>
<th>R410-A 5% Glycol</th>
<th>R410-A 10% Glycol</th>
<th>R410-A 15% Glycol</th>
<th>R410-A 20% Glycol</th>
<th>R410-A 25% Glycol</th>
<th>R410-A 30% Glycol</th>
<th>R410-A 35% Glycol</th>
<th>R410-A 40% Glycol</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNSAFE SUCTION</td>
<td>20 PSIG</td>
<td>40 PSIG</td>
<td>40 PSIG</td>
<td>40 PSIG</td>
<td>40 PSIG</td>
<td>40 PSIG</td>
<td>40 PSIG</td>
<td>40 PSIG</td>
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<tr>
<td>LOW SUCTION</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>HEAT MODE</td>
<td>57 PSIG</td>
<td>100 PSIG</td>
<td>93 PSIG</td>
<td>87 PSIG</td>
<td>82 PSIG</td>
<td>75 PSIG</td>
<td>65 PSIG</td>
<td>58 PSIG</td>
<td>49 PSIG</td>
<td>45 PSIG</td>
</tr>
<tr>
<td>LOW SUCTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COOL MODE</td>
<td>57 PSIG</td>
<td>85 PSIG</td>
<td>85 PSIG</td>
<td>85 PSIG</td>
<td>85 PSIG</td>
<td>85 PSIG</td>
<td>85 PSIG</td>
<td>85 PSIG</td>
<td>85 PSIG</td>
<td>85 PSIG</td>
</tr>
<tr>
<td>LOW LEAVING WATER TEMP</td>
<td>37ºF</td>
<td>37ºF</td>
<td>34ºF</td>
<td>30ºF</td>
<td>27ºF</td>
<td>20ºF</td>
<td>15ºF</td>
<td>9ºF</td>
<td>2ºF</td>
<td>0ºF</td>
</tr>
</tbody>
</table>

---

**Unsafe Suction**

50 PSIG 40 PSIG 40 PSIG 40 PSIG 40 PSIG 40 PSIG 40 PSIG 40 PSIG 40 PSIG 40 PSIG

**Low Suction**

Heat Mode 57 PSIG 100 PSIG 93 PSIG 87 PSIG 82 PSIG 75 PSIG 65 PSIG 58 PSIG 49 PSIG 45 PSIG

Cool Mode 57 PSIG 85 PSIG 85 PSIG 85 PSIG 85 PSIG 85 PSIG 85 PSIG 85 PSIG 85 PSIG 85 PSIG

Leaving Water Temperature

37ºF 37ºF 34ºF 30ºF 27ºF 20ºF 15ºF 9ºF 2ºF 0ºF
Modes of Operation

NOTE: See the Unit Configurations Chart on page 16 for more information about compressor staging.

Digital Stage 1 / Digital Stage 2

On units with two Digital Scroll Compressors, the first compressor (A1) will be designated as Digital Stage 1 and the second compressor (A2) will be designated as Digital Stage 2.

On units with four Digital Scroll Compressors, there may be instances where compressor numbers on the module do not correlate with the mechanical compressors’ numbers. Therefore, Digital Stage 1 refers to the first set of Digital Scroll Compressors (A1/B1) that will stage on together and Digital Stage 2 refers to the second set of Digital Scroll Compressors (A2/B2) that will stage on together. Please refer to AAON’s wiring diagram for specific wiring of the unit.

Compressor Operation (Heat/Cool)

A compressor can energize if the following is true:

1. There is 24 V AC applied to the appropriate Binary Input for the Compressor.
2. If two compressors are enabled simultaneously, a 5 second staging delay will occur.
3. Suction Pressure is above the Low Suction Pressure Cooling (Heating) Setpoint.
4. Proof of Flow for the appropriate water loop is made.
5. Leaving Water Temp is above the Leaving Water Safety Setpoint (Heating Only).
6. A minimum off time of 3 minutes is met for that compressor.

NOTE: If the WSHP-X Module receives a signal on the Heat Enable input, it will operate using the Heating Mode Setpoints.

Cooling Mode

NOTE: Control of digital compressor(s) is only available when the WSHP-X Module is connected to the VCM-X WSHP Series Controller or SA Series Controller.

Fixed Compressors Only

When a Cool Signal is received, the WSHP-X Module will go into Cooling Mode. Once Proof of Water Flow has been made, they will sequentially stage according to Table 1 on page 16, using Stage Up and Stage Down delays to maintain the Supply Air Setpoint that is broadcast from the VCM-X WSHP Series Controller or SA Series Controller.

Digital Scroll Compressor Control

When a Cool Signal is received, the WSHP-X Module will go into Cooling Mode. Once Proof of Water Flow has been made and a start-up delay has been met, Compressor A1 (and B1*) will energize and Digital Stage 1 Analog Output will go to 50% and modulate as necessary to maintain the Supply Air Temperature at the Active Supply Air Setpoint that is broadcast from the VCM-X WSHP Series Controller or SA Series Controller.

When Digital Stage 1 reaches 100%, a stage up timer is started. If Digital Stage 1 stays at 100% for the stage up timer, Compressor A2 (and B2*) will energize and both Digital Stage 1 and Digital Stage 2 outputs will go to 50% and will begin to modulate together.

If both systems are energized and they go below 30% and the Supply Air is below the Supply Air Setpoint by the Cooling Stage Window value, the stage down timer is started. If the systems remain below 30% for the duration of the stage down timer, Digital Stage 2 will deactivate and Digital Stage 1 will go to 60%. Digital Stage 1 will stage down if it is at 0% for the duration of the stage down timer.

* If configured for 4 modulating compressors.

Heat Pump Heating Mode

Heating Mode works the same as Cooling Mode except the Reversing Valve is switched and the sequence is opposite. Compressors modulate up when below the Heating Supply Air Setpoint and modulate down when above the setpoint.

Dehumidification Mode

Fixed Compressors Only

In the Dehumidification Mode, if this unit has only fixed compressors, they will sequentially stage according to Table 1 on page 16 to maintain the Suction Pressure Setpoint. Compressors A1 & B1 will stage on together first followed sequentially by A2 & then B2. Stage Up and Stage Down delays will apply.

Digital Scroll Compressor Control

In Dehumidification Mode, compressors will be controlled to maintain the Suction Pressure Temperature Setpoint. Digital Stage 1—Compressor A1 (and B1*) will modulate up to 100% before Digital Stage 2—Compressor A2 (and B2*) can be energized. When Digital Stage 2 is energized, Digital Stage 1 will be locked at 100%.

* If configured for 4 modulating compressors.

Staging Delays

Staging Delays minimum run times and minimum off times are sent from the VCM-X WSHP Series Controller or SA Series Controller.
The WSHP-X Controller allows you to make configuration changes, view status, change setpoints, create force modes, and perform diagnostics using the keypad next to the LCD display. See Figure 9 and refer to Table 5 for descriptions.

**Figure 9: LCD Display and Navigation Keys**

<table>
<thead>
<tr>
<th>Navigation Key</th>
<th>Key Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>MENU</td>
<td>Use the MENU key to navigate through the Main Menu Screens</td>
</tr>
<tr>
<td>UP</td>
<td>Use this key to adjust setpoints and change configurations. This key is also used to turn Valve Force Mode on.</td>
</tr>
<tr>
<td>DOWN</td>
<td>Use this key to adjust setpoints and change configurations. This key is also used to turn Valve Force Mode off.</td>
</tr>
<tr>
<td>ENTER</td>
<td>Use the Enter key to move through screens within Main Menu categories. Also, use this key to save setpoints and configuration changes.</td>
</tr>
</tbody>
</table>

**Table 5: Navigation Key Functions**
**Main Screens Map**

Refer to the following map when navigating through the LCD Main Screens. The first screen is the address screen. To scroll through the rest of the screens, press the `<MENU>` button.

- **ADDRESS #**
- **WSHP AAON**
  - Press to scroll through WSHP Screens.
- **ALARMS**
  - Press to scroll through ALARMS Screens.
  - Press to go to STATUS SYSTEM A Screens.
  - Press to scroll through STATUS SYSTEM A Screens.
  - Press to go to STATUS SYSTEM B Screens.
  - Press to scroll through STATUS SYSTEM B Screens.
- **SETPOINT**
  - Press to go to SETPOINT Screens.
  - Press to scroll through SETPOINT Screens.

**WSHP Screens**

Refer to the following map when navigating through the Main Screens. From the WSHP AAON Screen, press `<ENTER>` to scroll through the screens.

- **WSHP AAON**
  - **S/A or COMM MODE or COM T/O ERROR**
    - In Stand-Alone Mode, the screen will only display S/A MODE.
    - In Communications Mode, the screen will display COMM MODE and the items below will scroll through the screen:
      1. Number of good packets being received. This will roll over after 9999. Example: +XXXX
      2. Number of checksum errors. This will stop at 9999. Example: C-XXXX
      3. Number of packet length errors. This will stop at 9999 until power is cycled. Example: P-XXXX
- **SOFTWARE**
  - **1053v100**
- **CURRENT SOFTWARE VERSION**
- **H2O CNFG**
  - **SINGLE or DUAL**
- **WATER CIRCUIT CONFIGURATION**
  - **SINGLE** (Typical for AAON Coil) or **DUAL** (Typical for AAON Tulsa)
- **REV VALV**
  - **OFF=COOL or OFF=HEAT**
- **REVERSING VALVE CONFIGURATION**
  - **OFF=COOL** (No signal on reversing valve input equals cool mode)
  - **OFF=HEAT** (No signal on reversing valve input equals heat mode)
- **ADDRESS #**
Alarm Screens

Refer to the following map when viewing the Alarm Screens. These screens will display automatically when alarms are present.

ALARMS

The alarms are as follows:

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

**COMPRESSOR LOCKOUT (1-4):**
- If a circuit’s Suction Pressure falls below the Low Suction Pressure Setpoint for longer than one minute twice within a two hour window, 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 5 seconds, that circuit’s compressor will locked out. Power will need to be cycled to restart the unit.
- If the Leaving Water Temperature falls below setpoint, the last compressor will be locked out until the Leaving Water Temperature rises 6 degrees above setpoint.
- The Leaving Water Temperature remains below setpoint for 1 minute or falls 3 degrees below setpoint. This alarm will disable when the leaving water temperature rises 12 degrees above the setpoint.

**LOW H2O:** The Leaving Water Temperature has dropped below setpoint. This alarm will disable when the leaving water temperature rises 6 degrees above the setpoint.

**NO PROOF OF FLOW:** There is a call for a compressor and there is no Proof of Flow Input Enable for more than 3 minutes or if during Heat Pump heating, the Proof of Flow Enable is open for more than 2 seconds. This alarm will disable when Proof of Flow is enabled.

**LOW SUCTION PRESSURE:** The Circuit’s Suction Pressure has dropped below the Low Suction Pressure for longer than one minute. This alarm will disable ten minutes after Suction Pressure rises above the setpoint.
System Status A Screens

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

**SYSTEM STATUS A**

Status Screens shown below will scroll automatically if LCD display is left on this screen for 20 seconds.

**SYSTEM A, COMPRESSOR 1**
This screen displays the current status of the A1 Compressor.

- **OFF**
- **PENDING:** Compressor is off, but a request is made to be on, but the minimum off time has not been met.
- **ON:** HEAT or Cool
- **REASON FOR FAILURE:** Low Pres, Lockout, Low H2O, No Flow

**SYSTEM A, COMPRESSOR 2**
This screen displays the current status of the A2 Compressor.

- **OFF**
- **PENDING:** Compressor is off, but a request is made to be on, but the minimum off time has not been met.
- **ON:** HEAT or Cool
- **REASON FOR FAILURE:** Low Pres, Lockout, Low H2O, No Flow

**H2O TEMP**

LEAVING WATER TEMPERATURE READING OR "NO SENSOR"

PO FLOW
YES or NO

PROOF OF WATER FLOW

A1 PRES
XXX

SYSTEM A, COMPRESSOR 1 PRESSURE READING

A2 PRES
XXX or NOT USED

SYSTEM A, COMPRESSOR 2 PRESSURE READING
If Single Water Configuration, this screen will display "NOT USED."

AOUT1
X%

ANALOG OUTPUT 1 PERCENT
0 - 100%

AOUT2
X%

ANALOG OUTPUT 2 PERCENT
0 - 100%
System Status B Screens

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

If System B is disabled, the above screen will appear.

Status Screens shown below will scroll automatically if LCD display is left on this screen for 20 seconds.

SYSTEM B, COMPRESSOR 1
This screen displays the current status of the B1 Compressor.

OFF
PENDING: Compressor is off, but a request is made to be on, but the 1 minimum off time has not been met.
ON: HEAT or Cool
REASON FOR FAILURE: Low Pres, Lockout, Low H2O, No Flow

SYSTEM B, COMPRESSOR 2
This screen displays the current status of the B2 Compressor.

OFF
PENDING: Compressor is off, but a request is made to be on, but the 1 minimum off time has not been met.
ON: HEAT or Cool
REASON FOR FAILURE: Low Pres, Lockout, Low H2O, No Flow

H2O TEMP
NO SENSR

LEAVING WATER TEMPERATURE READING
OR “NO SENSOR”

PO FLOW
YES or NO

PROOF OF WATER FLOW

B1 PRES
XXX or NOT USED

SYSTEM B, COMPRESSOR 1 PRESSURE READING

B2 PRES
XXX or NOT USED

SYSTEM B, COMPRESSOR 2 PRESSURE READING
If Single Water Configuration, this screen will display “NOT USED.”

AOUT1
X%

ANALOG OUTPUT 1 PERCENT
0 - 100%

AOUT2
X%

ANALOG OUTPUT 2 PERCENT
0 - 100%
Setpoint Status Screens

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

NOTE: The following screens are Status Screens. The Setpoints can’t be changed from these screens.

---

Setpoint Screens

SETPOINTS

LOWSP HT
XXX-XXX PSI

LOW SUCTION PRESSURE HEAT MODE SETPOINT
See Table below.

<table>
<thead>
<tr>
<th>Glycol %</th>
<th>Low Suction Heat Setpoint</th>
<th>Glycol %</th>
<th>Low Suction Heat Setpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>0% (R22)</td>
<td>57 PSI</td>
<td>20%</td>
<td>75 PSI</td>
</tr>
<tr>
<td>0% (410A)</td>
<td>100 PSI</td>
<td>25%</td>
<td>65 PSI</td>
</tr>
<tr>
<td>5%</td>
<td>93 PSI</td>
<td>30%</td>
<td>58 PSI</td>
</tr>
<tr>
<td>10%</td>
<td>87 PSI</td>
<td>35%</td>
<td>49 PSI</td>
</tr>
<tr>
<td>15%</td>
<td>82 PSI</td>
<td>40%</td>
<td>45 PSI</td>
</tr>
</tbody>
</table>

LOWSP CL
57 PSI or 85 PSI

LOW SUCTION PRESSURE COOL MODE SETPOINT
See Table below.

<table>
<thead>
<tr>
<th>Refrigerant</th>
<th>Low Suction Cool Setpoint</th>
<th>Refrigerant</th>
<th>Low Suction Cool Setpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>R410A</td>
<td>85 PSI</td>
<td>R22</td>
<td>57 PSI</td>
</tr>
</tbody>
</table>

UNSAFESP
40 PSI

UNSAFE SUCTION PRESSURE SETPOINT
See Table below.

<table>
<thead>
<tr>
<th>Refrigerant</th>
<th>Unsafe Suction Setpoint</th>
<th>Refrigerant</th>
<th>Unsafe Suction Setpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>R410A</td>
<td>40 PSI</td>
<td>R22</td>
<td>20 PSI</td>
</tr>
</tbody>
</table>

GLYCOL
xx%

GLYCOL SETPOINT
0%, 5%, 10%, 15%, 20%, 25%, 30%, 35%, 40%

REFRIGINT
410A or R22

REFRIGERANT
401A or R22
(If R22, Glycol Setpoint will default to 0%)

LOW H2O
XX DEG

LOW LEAVING WATER TEMPERATURE SETPOINT
See Table below.

<table>
<thead>
<tr>
<th>Glycol %</th>
<th>Low Leaving Water Temperature Setpoint</th>
<th>Glycol %</th>
<th>Low Leaving Water Temperature Setpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>0% (R22)</td>
<td>37 ºF</td>
<td>20%</td>
<td>20 ºF</td>
</tr>
<tr>
<td>0% (410A)</td>
<td>37 ºF</td>
<td>25%</td>
<td>15 ºF</td>
</tr>
<tr>
<td>5%</td>
<td>34 ºF</td>
<td>30%</td>
<td>9 ºF</td>
</tr>
<tr>
<td>10%</td>
<td>30 ºF</td>
<td>35%</td>
<td>2 ºF</td>
</tr>
<tr>
<td>15%</td>
<td>27 ºF</td>
<td>40%</td>
<td>0 ºF</td>
</tr>
</tbody>
</table>
Safety Monitoring for Single Water Circuit

Proof of Flow

1. If there is a call for a compressor and there is no Proof of Flow Input Enable:
   - The module will wait up to 3 minutes to activate the Proof of Flow Alarm LED(s) which will blink the code indicating failure.

2. If the compressor(s) is (are) running and contact is opened for 2 seconds during Heat Pump Heating:
   - Compressor(s) will be turned off.

3. If the compressor(s) are running and contact is opened for 2 seconds during Cooling:
   - Proof of Flow Input will be ignored.
   - No alarm will be generated.

Low Suction Pressure Detection

1. If any Circuit’s Suction Pressure falls below the Low Suction Pressure Setpoint for longer than 1 minute, then the following will occur:
   - The compressor(s) on that circuit will turn off.
   - Alarm LED will indicate Low Suction Pressure.
   - Compressor(s) will be enabled again after 10 minutes if Suction Pressure rises above setpoint.

2. If any Circuit’s Suction Pressure falls below the Low Suction Pressure Setpoint for longer than 1 minute a second time within a two hour window, then the following will occur:
   - The compressor(s) on that circuit will be locked out.
   - Alarm LED will indicate a Compressor Lockout.
   - Manual reset or change of mode (i.e., Cool to Heat) must occur to reset back to normal operation.

Unsafe Suction Pressure Detection

If the Suction Pressure falls below the Unsafe Suction Setpoint for 5 seconds, the circuit’s compressor will be locked out immediately and will not be allowed to restart. You will need to reset the Power to restart the unit.

Low Leaving Water Temperature

NOTE: This safety monitoring is only performed in the Heat Mode.

1. If the Leaving Water Temperature falls below setpoint, the following will occur:
   - The last compressor will turn off.
   - Alarm LED will indicate Compressor Low Water Temp Shutoff.
   - Last compressor will be locked out until the Leaving temperature is 6 degrees above setpoint.

2. If the Leaving Water Temperature remains below setpoint for 1 minute or falls 3 degrees below setpoint, the following will occur:
   - All compressors will deactivate.
   - Alarm LED will indicate Compressor Low Water Temperature Shutoff.
   - All compressors will be locked out until the Leaving Temperature is 12 degrees above setpoint.
Safety Monitoring for Dual Water Circuit

Proof of Flow

1. If there is a call for a compressor and there is no Proof of Flow Input Enable:
   • The module will wait up to 3 minutes to activate the Proof of Flow Alarm LED(s) which will blink the code indicating failure.
   • Proof of Water Flow A will disable compressors A1 and A2.
   • Proof of Water Flow B will disable compressors B1 and B2.

2. If the compressor(s) is (are) running and contact is opened for 2 seconds during Heat Pump Heating:
   • Compressor(s) will be turned off.
   • Proof of Water Flow A will disable compressors A1 and A2.
   • Proof of Water Flow B will disable compressors B1 and B2.

3. If the compressor(s) are running and contact is opened for 2 seconds during Cooling:
   • Proof of Flow Input will be ignored.
   • No alarm will be generated.

Low Suction Pressure Detection
1. If any Compressor’s Suction Pressure falls below the Low Suction Pressure Setpoint for longer than 1 minute, then the following will occur:
   • The compressor will turn off.
   • Alarm LED will indicate Low Suction Pressure.
   • Compressor will be enabled again after 10 minutes if Suction Pressure rises above setpoint.

2. If any Compressor’s Suction Pressure falls below the Low Suction Pressure Setpoint for longer than 1 minute a second time within a two hour window, then the following will occur:
   • That compressor will be locked out.
   • Alarm LED will indicate a Compressor Lockout.
   • Manual reset or change of mode (i.e., Cool to Heat) must occur to reset back to normal operation.

Unsafe Suction Pressure Detection
If the Suction Pressure falls below the Unsafe Suction Setpoint for 5 seconds, the compressor will be locked out immediately and will not be allowed to restart. You will need to reset the Power to restart the unit.

Low Leaving Water Temperature
NOTE: This safety monitoring is only performed in the Heat Mode.

On the larger units, there are two separate condenser/water sections and each section (water system) has its own Leaving Water Temperature Sensor. Each sensor will only affect the compressors associated with that condenser/water section. The description below describes System A. System B works the same but will affect Compressors B1 & B2.

1. If the Leaving Water Temperature for System A falls below setpoint, the following will occur:
   • Compressor A2 will deactivate if active.
   • Alarm LED will indicate Compressor A2 Low Water Temp Shutoff.
   • Compressor A2 will be locked out until the Leaving temperature is 6 degrees above setpoint.

2. If the Leaving Water Temperature for System A remains below setpoint for 1 minute or falls 3 degrees below setpoint, the following will occur:
   • Compressor A1 will deactivate.
   • Alarm LED will indicate Compressor A1 & A2 Low Water Temperature Shutoff.
   • Both Compressors will be locked out until the Leaving Temperature is 12 degrees above setpoint.
**Temperature Sensor Testing**

The following sensor voltage and resistance tables are 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 below each chart when checking sensors.

<table>
<thead>
<tr>
<th>Temp (°F)</th>
<th>Resistance (Ohms)</th>
<th>Voltage @ Input (VDC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10</td>
<td>93333</td>
<td>4.620</td>
</tr>
<tr>
<td>-5</td>
<td>80531</td>
<td>4.550</td>
</tr>
<tr>
<td>0</td>
<td>69822</td>
<td>4.474</td>
</tr>
<tr>
<td>5</td>
<td>60552</td>
<td>4.390</td>
</tr>
<tr>
<td>10</td>
<td>52500</td>
<td>4.297</td>
</tr>
<tr>
<td>15</td>
<td>45902</td>
<td>4.200</td>
</tr>
<tr>
<td>20</td>
<td>40147</td>
<td>4.095</td>
</tr>
<tr>
<td>25</td>
<td>35165</td>
<td>3.982</td>
</tr>
<tr>
<td>30</td>
<td>30805</td>
<td>3.862</td>
</tr>
<tr>
<td>35</td>
<td>27140</td>
<td>3.737</td>
</tr>
<tr>
<td>40</td>
<td>23874</td>
<td>3.605</td>
</tr>
<tr>
<td>45</td>
<td>21094</td>
<td>3.470</td>
</tr>
<tr>
<td>50</td>
<td>18655</td>
<td>3.330</td>
</tr>
<tr>
<td>52</td>
<td>17799</td>
<td>3.275</td>
</tr>
<tr>
<td>54</td>
<td>16956</td>
<td>3.217</td>
</tr>
<tr>
<td>56</td>
<td>16164</td>
<td>3.160</td>
</tr>
<tr>
<td>58</td>
<td>15385</td>
<td>3.100</td>
</tr>
<tr>
<td>60</td>
<td>14681</td>
<td>3.042</td>
</tr>
<tr>
<td>62</td>
<td>14014</td>
<td>2.985</td>
</tr>
<tr>
<td>64</td>
<td>13382</td>
<td>2.927</td>
</tr>
<tr>
<td>66</td>
<td>12758</td>
<td>2.867</td>
</tr>
<tr>
<td>68</td>
<td>12191</td>
<td>2.810</td>
</tr>
<tr>
<td>69</td>
<td>11906</td>
<td>2.780</td>
</tr>
<tr>
<td>70</td>
<td>11652</td>
<td>2.752</td>
</tr>
<tr>
<td>71</td>
<td>11379</td>
<td>2.722</td>
</tr>
<tr>
<td>72</td>
<td>11136</td>
<td>2.695</td>
</tr>
<tr>
<td>73</td>
<td>10878</td>
<td>2.665</td>
</tr>
</tbody>
</table>

**Table 5, cont.: Temperature/Resistance for Type III 10K Ohm Thermistor 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.

If the voltage is above 5.08 VDC, then the sensor or wiring is “open.” If the voltage is less than 0.05 VDC, then the sensor or wiring is shorted.
OE275-01 Suction Pressure Transducer Testing for R-22 & R410-A Refrigerant

The Evaporator Coil Temperature is calculated by converting the Suction Pressure to Temperature. The Suction Pressure is obtained by using the OE275-01 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 WSHP-X Module. Read voltage with a meter set on DC volts. If the temperature/voltage or pressure/voltage readings do not align closely with the chart, your Suction Pressure Transducer is probably defective and will need to be replaced.

See the OE275-01 Suction Pressure Transducer, Pressure, Temperature, and Voltage Charts for R-22 and R410-A Refrigerant testing (Tables 6 & 7). The charts show a temperature range from 20°F to 80°F. For troubleshooting purposes, the DC Voltage readings are also listed with their corresponding temperatures and pressure.

### Table 6: Coil Pressure/Voltage/Temp for OE275-01 Suction Pressure Transducers - R-22 Refrigerant

<table>
<thead>
<tr>
<th>Temperature °F</th>
<th>Pressure PSI</th>
<th>Signal DC Volts</th>
<th>Temperature °F</th>
<th>Pressure PSI</th>
<th>Signal DC Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.00</td>
<td>31.13</td>
<td>1.0</td>
<td>55.32</td>
<td>93.39</td>
<td>2.0</td>
</tr>
<tr>
<td>20.00</td>
<td>37.36</td>
<td>1.1</td>
<td>58.86</td>
<td>99.62</td>
<td>2.1</td>
</tr>
<tr>
<td>20.46</td>
<td>43.58</td>
<td>1.2</td>
<td>62.13</td>
<td>105.84</td>
<td>2.2</td>
</tr>
<tr>
<td>25.71</td>
<td>49.80</td>
<td>1.3</td>
<td>65.27</td>
<td>112.07</td>
<td>2.3</td>
</tr>
<tr>
<td>30.84</td>
<td>56.03</td>
<td>1.4</td>
<td>68.42</td>
<td>118.29</td>
<td>2.4</td>
</tr>
<tr>
<td>35.41</td>
<td>62.26</td>
<td>1.5</td>
<td>71.39</td>
<td>124.52</td>
<td>2.5</td>
</tr>
<tr>
<td>39.98</td>
<td>68.49</td>
<td>1.6</td>
<td>75.20</td>
<td>130.75</td>
<td>2.6</td>
</tr>
<tr>
<td>44.00</td>
<td>74.71</td>
<td>1.7</td>
<td>77.00</td>
<td>136.97</td>
<td>2.7</td>
</tr>
<tr>
<td>48.00</td>
<td>80.94</td>
<td>1.8</td>
<td>79.80</td>
<td>143.20</td>
<td>2.8</td>
</tr>
<tr>
<td>51.78</td>
<td>87.16</td>
<td>1.9</td>
<td>80.00</td>
<td>149.42</td>
<td>2.9</td>
</tr>
</tbody>
</table>

### Table 7: Coil Pressure/Voltage/Temp for OE275-01 Suction Pressure Transducers - R410-A Refrigerant

<table>
<thead>
<tr>
<th>Temperature °F</th>
<th>Pressure PSI</th>
<th>Signal DC Volts</th>
<th>Temperature °F</th>
<th>Pressure PSI</th>
<th>Signal DC Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.19</td>
<td>80.94</td>
<td>1.8</td>
<td>59.03</td>
<td>168.10</td>
<td>3.2</td>
</tr>
<tr>
<td>24.49</td>
<td>87.16</td>
<td>1.9</td>
<td>61.17</td>
<td>174.32</td>
<td>3.3</td>
</tr>
<tr>
<td>27.80</td>
<td>93.39</td>
<td>2.0</td>
<td>63.19</td>
<td>180.55</td>
<td>3.4</td>
</tr>
<tr>
<td>30.99</td>
<td>99.62</td>
<td>2.1</td>
<td>65.21</td>
<td>186.78</td>
<td>3.5</td>
</tr>
<tr>
<td>33.89</td>
<td>105.84</td>
<td>2.2</td>
<td>67.23</td>
<td>193.00</td>
<td>3.6</td>
</tr>
<tr>
<td>36.80</td>
<td>112.07</td>
<td>2.3</td>
<td>69.24</td>
<td>199.23</td>
<td>3.7</td>
</tr>
<tr>
<td>39.71</td>
<td>118.29</td>
<td>2.4</td>
<td>71.15</td>
<td>205.46</td>
<td>3.8</td>
</tr>
<tr>
<td>42.30</td>
<td>124.52</td>
<td>2.5</td>
<td>72.95</td>
<td>211.68</td>
<td>3.9</td>
</tr>
<tr>
<td>44.85</td>
<td>130.75</td>
<td>2.6</td>
<td>74.76</td>
<td>217.91</td>
<td>4.0</td>
</tr>
<tr>
<td>47.39</td>
<td>136.97</td>
<td>2.7</td>
<td>76.57</td>
<td>224.14</td>
<td>4.1</td>
</tr>
<tr>
<td>49.94</td>
<td>143.2</td>
<td>2.8</td>
<td>78.37</td>
<td>230.36</td>
<td>4.2</td>
</tr>
<tr>
<td>52.23</td>
<td>149.42</td>
<td>2.9</td>
<td>80.18</td>
<td>236.59</td>
<td>4.3</td>
</tr>
<tr>
<td>54.50</td>
<td>155.65</td>
<td>3.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56.76</td>
<td>161.88</td>
<td>3.1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Technical Guide 29
Using LEDs to Verify Operation

The WSHP-X 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 Module has twenty LEDs—one used for power, one used for communications, one used for operation status, one used for alarms, five used for compressor relays, four used for Suction Pressure Transducer status, and seven used for Binary Input status. See Figures 10 & 11 on page 31 for the LED locations. The LEDs associated with these inputs and outputs allow you to see what is active without using a voltmeter.

Operation Status LEDs

“STATUS” - 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 Mode of Operation. See Table 8 below for Status Blink Code descriptions. The blink code descriptions are also located on the Module’s front cover. See Figure 10 for location.

<table>
<thead>
<tr>
<th>No. of Blinks</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Off Mode</td>
</tr>
<tr>
<td>2</td>
<td>Cool Mode</td>
</tr>
<tr>
<td>3</td>
<td>Heat Mode</td>
</tr>
</tbody>
</table>

Table 8: STATUS LED Blink Codes

“COMM” - This LED will light up to indicate Communications with the VCM-X WSHP Series Controller 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 WSHP Series Controller or SA Series Controller. See Figure 10 for location.

“ALARM” - This is the diagnostic blink code LED. It will light up and blink out diagnostic codes. See Table 9 below for Diagnostic Blink Code descriptions. The blink code descriptions are also located on the Module’s front cover. See Figure 10 for location.

<table>
<thead>
<tr>
<th>No. of Blinks</th>
<th>Alarm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Low Suction Pressure</td>
</tr>
<tr>
<td>2</td>
<td>Compressor Lockout</td>
</tr>
<tr>
<td>3</td>
<td>Water Flow Failure</td>
</tr>
<tr>
<td>4</td>
<td>Low Leaving Water Temp</td>
</tr>
</tbody>
</table>

Table 9: ALARM LED Blink Codes

Figure 10: Operation Status LED Locations
2 Suction Pressure Transducer LEDs

“PRES 1-4” - There are LEDs for each of the Suction Pressure Transducers. Since each compressor has a sensor, these LEDs which are located on the top left of the WSHP-X Module will give a better indication of which compressor is causing an alarm. See Table 10 for PRES LED status descriptions. See Figure 11 for locations.

<table>
<thead>
<tr>
<th>No. of Blinks</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid On</td>
<td>Sensor is Detected and is OK</td>
</tr>
<tr>
<td>Solid Off</td>
<td>Sensor is Not Detected</td>
</tr>
<tr>
<td>1</td>
<td>Low Suction Pressure on this Compressor</td>
</tr>
<tr>
<td>2</td>
<td>Compressor is Locked Out</td>
</tr>
</tbody>
</table>

Table 10: PRES 1-4 LED Blink Codes

Figure 11: PRES 1-4 LED Locations

LED Diagnostics

“POWER” LED: When the WSHP-X Module is powered up, the POWER LED (located above 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 WSHP Series Controller or SA Series Controller is powered (if connected). If after making all these checks, the POWER LED does not light up, the module is probably defective.

“COMM” LED: When the WSHP-X Module is powered up while in Stand Alone Mode, the COMM LED does not light up. When the module is connected to the VCM-X WSHP Series Controller 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 WSHP Series Controller or SA Series Controller is powered. If after making all these checks, the COMM LED does not light up, the board is probably defective.

“STATUS” LED: As previously described, when the WSHP Module is first powered up, the STATUS LED will blink out the Mode of Operation.

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

NOTE: The WSHP-X Module contains no user-serviceable parts. Contact qualified technical personnel if your Module is not operating correctly.