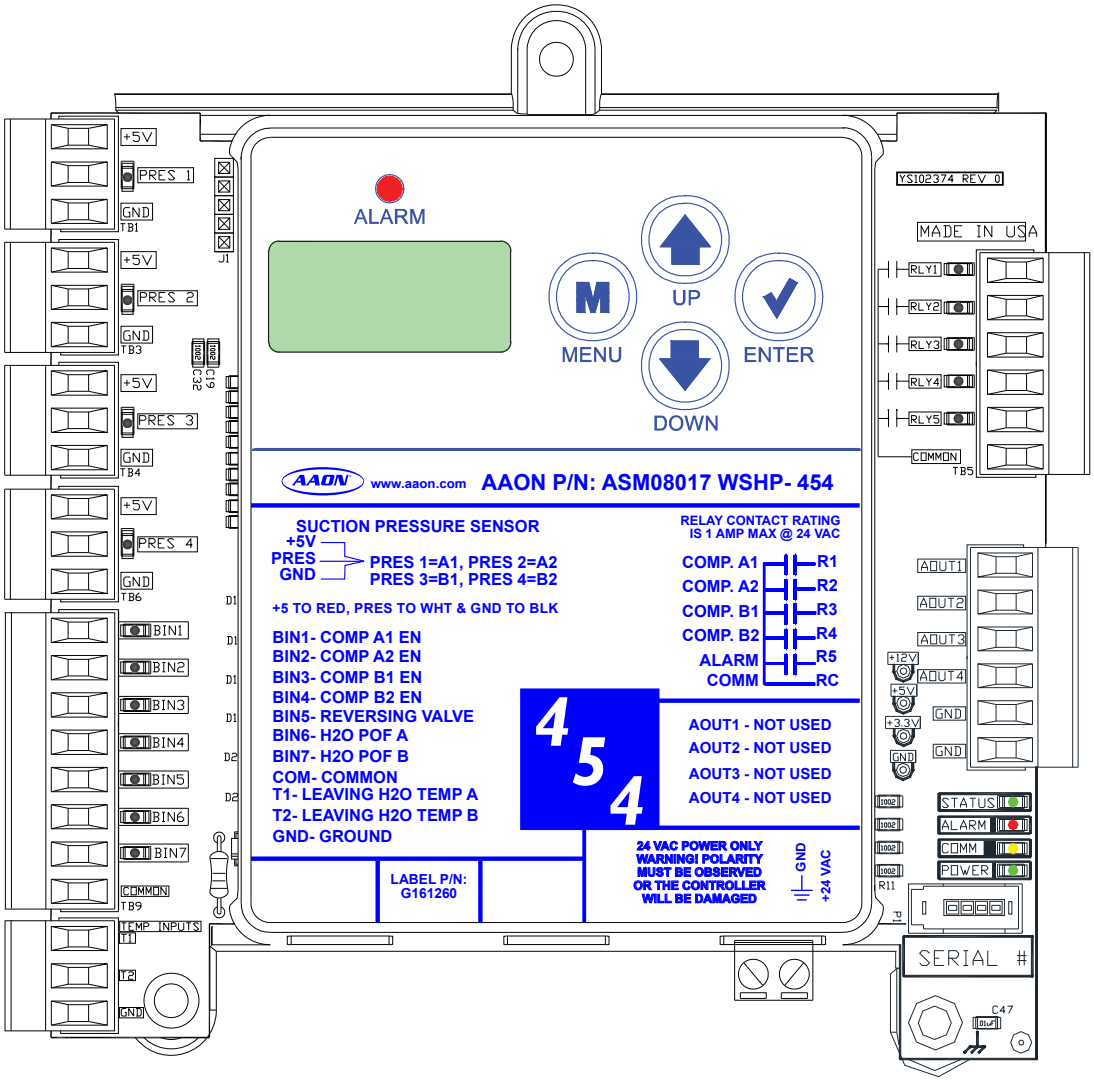
WSHP-454 Module Technical Guide

ASM08017
SS1211



VAV/ZONE BACNET® CONTROLLER TECHNICAL GUIDE	
REVISION AND DATE	**CHANGE**
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This manual is available for download from www.aaon.com

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Features

The WSHP-454 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-454 Module's water circuit configuration can be either single or dual. There are nine glycol configurations for the WSHP-454 Module—0%-40% in increments of 5%. The glycol will automatically default to 0%.

The WSHP-454 Module can be used stand-alone. The WSHP-454 Module requires a 24 VAC power connection with an appropriate VA rating.

Features of the WSHP-454 include:

- Monitoring 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-454 Module contains no user-serviceable parts. Contact qualified technical personnel if your module is not operating correctly.

Mounting and Installation

Environmental Requirements

The WSHP-454 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).

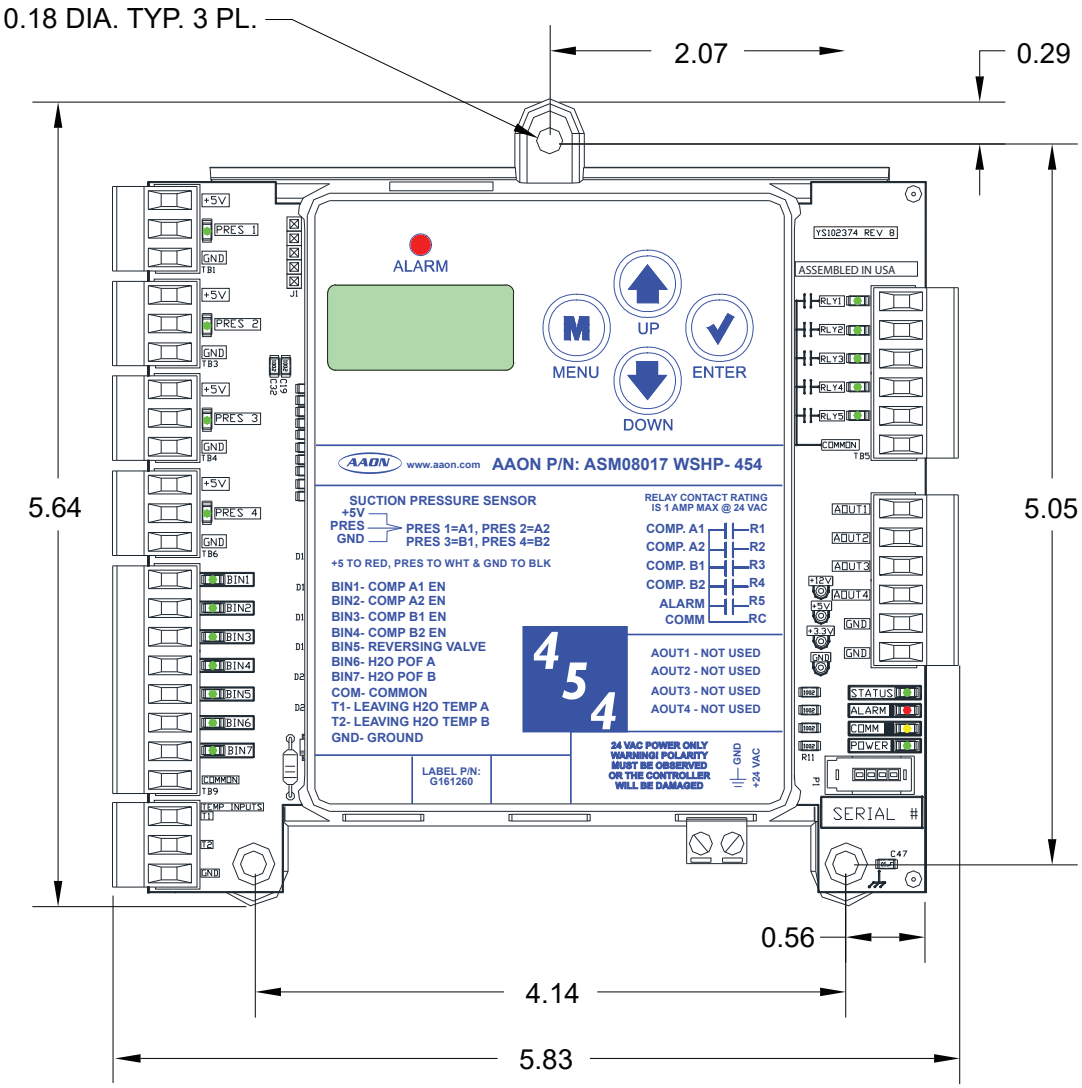
Mounting

The WSHP-454 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 1 for Module dimensions (in inches).

Power Supply

The WSHP-454 Module requires a 24 VAC power connection with an appropriate VA rating.

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



Note: Height is 1.49 inches.

Figure 1: WSHP-454 Dimensions

Installation & Wiring

Important Wiring Considerations

Please read carefully and apply the following information when wiring the WSHP-454 Module:

1. To operate the WSHP-454 Module in Stand-Alone mode, you must connect power to the 24 VAC input terminal block. Do not allow wire strands to stick out and touch adjoining terminals. This could potentially cause a short circuit.
2. All 24 VAC wiring must be connected so that all ground wires remain common. Failure to follow this procedure can result in damage to the module and connected devices.
3. All wiring is to be in accordance with local and national electrical codes and specifications.
4. 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-454 Module as Stand Alone, connect the Module to a 24 VAC power connection with an appropriate VA rating. See Figure 2 for wiring.

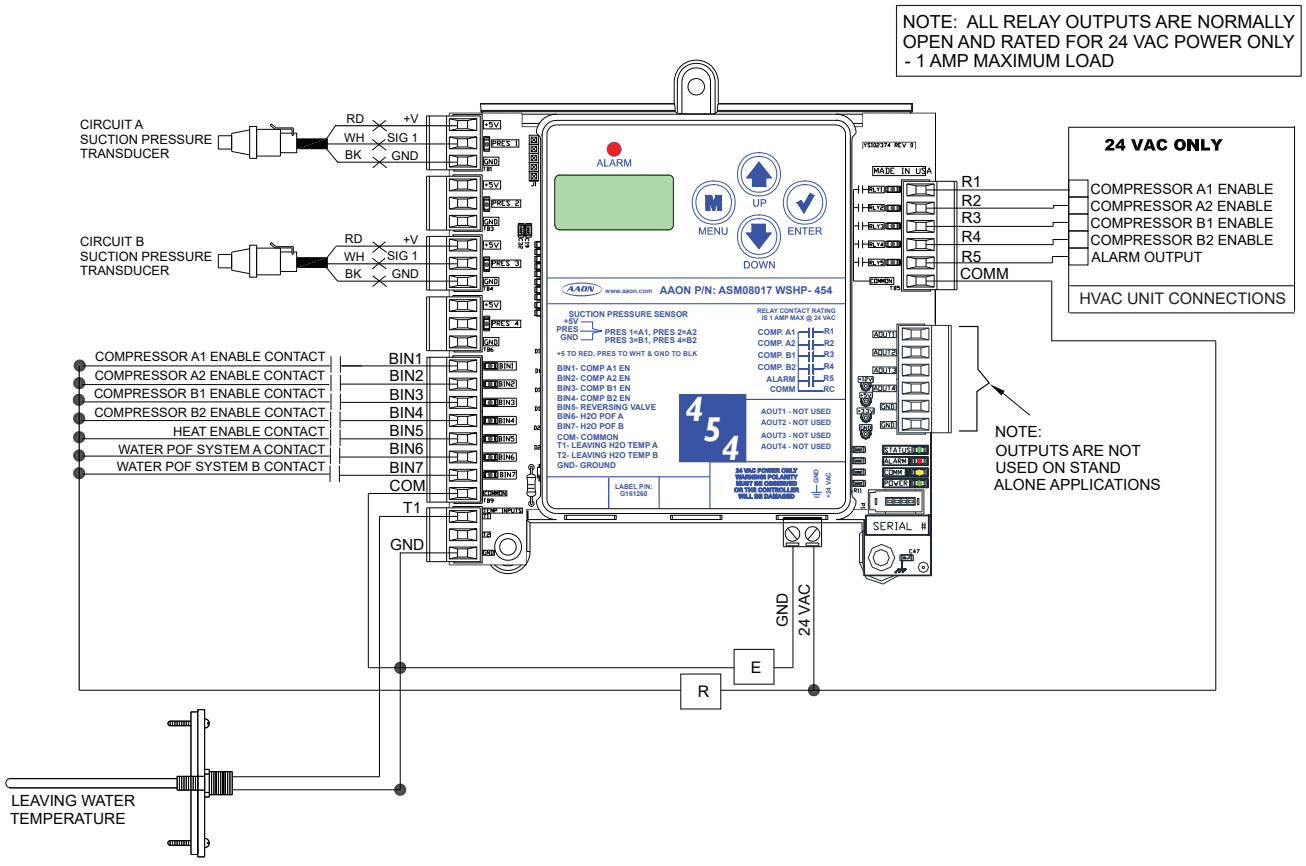


Figure 2: WSHP-454 as Stand-Alone for Single Water Circuit

Stand-Alone Wiring Dual Water Circuit

To operate the WSHP-454 Module as Stand Alone, connect the Module to a 24 VAC power connection with an appropriate VA rating. See Figure 3 for wiring.

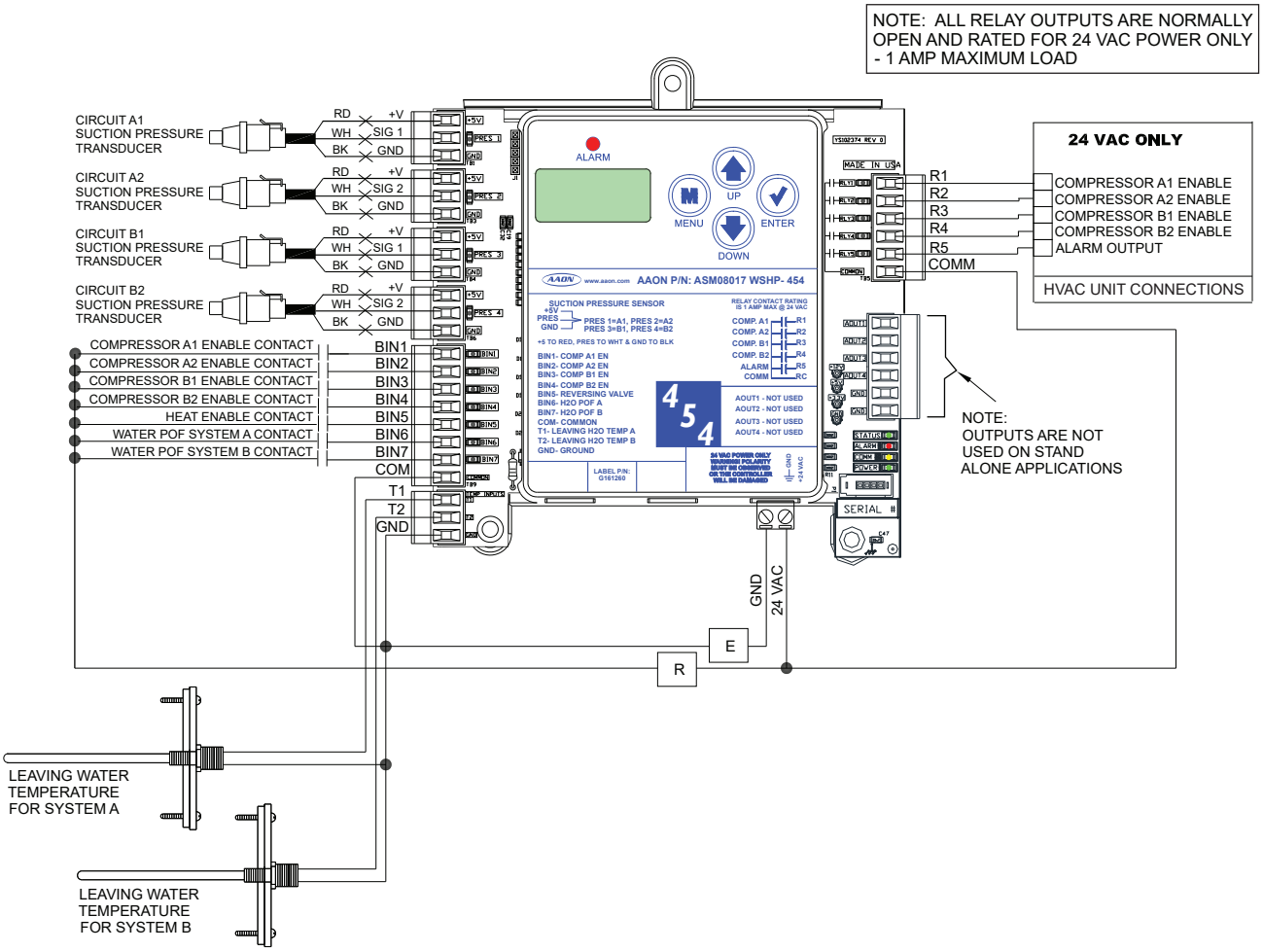


Figure 3: WSHP-454 as Stand-Alone for Dual Water Circuit

Sequence of Operation

General

The following inputs and outputs are available on the WSHP-454 Module. See Table 1 below to reference the Input/Output Map.

Binary Inputs	
1	Compressor A1 Enable (BIN 1)
2	Compressor A2 Enable (BIN 2)
3	Compressor B1 Enable (BIN 3)
4	Compressor B2 Enable (BIN 4)
5	Heat Enable (BIN 5)
6	Water Proof of Flow System A (BIN 6)
7	Water Proof of Flow System B (BIN 7)
Analog Inputs	
1	Suction Pressure A1 (Pres 1)
2	Suction Pressure A2 (Pres 2)
3	Suction Pressure B1 (Pres 3)
4	Suction Pressure B2 (Pres 4)
5	Leaving Water Temperature System A (T1)
6	Leaving Water Temperature System B (T2)
Analog Outputs	
1	AOUT1*
2	AOUT2*
3	AOUT3*
4	AOUT4*
Note: Analog outputs are not usd on Stand Alone Applications	
Analog Inputs	
1	Compressor A1 Enable Output (RLY1)
2	Compressor A2 Enable Output (RLY2)
3	Compressor B1 Enable Output (RLY3)
4	Compressor B2 Enable Output (RLY4)
5	Alarm Output (RLY5)

Table 1: WSHP-454 Module Inputs & Outputs

WSHP-454 Module Setpoints

The WSHP-454 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 Table 2, below & Table 3, page 11 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	
Description	R454B
UNSAFE SUCTION	39 PSIG
LOW SUCTION HEAT MODE	96 PSIG
LOW SUCTION COOL MODE	81 PSIG
LOW LEAVING WATER TEMP	37ºF

Table 2: Factory-Set Default Setpoints - Water Only

Sequence of Operation

Glycol Default Setpoints									
Description	R454B 0% Glycol	R454B 5% Glycol	R454B 10% Glycol	R454B 15% Glycol	R454B 20% Glycol	R454B 25% Glycol	R454B 30% Glycol	R454B 35% Glycol	R454B 40% Glycol
UNSAFE SUCTION	39 PSIG	39 PSIG	39 PSIG	39 PSIG	39 PSIG	39 PSIG	39 PSIG	39 PSIG	39 PSIG
LOW SUCTION HEAT MODE	96 PSIG	89 PSIG	83 PSIG	78 PSIG	71 PSIG	62 PSIG	55 PSIG	47 PSIG	43 PSIG
LOW SUCTION COOL MODE	81 PSIG	81 PSIG	81 PSIG	81 PSIG	81 PSIG	81 PSIG	81 PSIG	81 PSIG	81 PSIG
LOW LEAVING WATER TEMP	37ºF	34ºF	30ºF	27ºF	20ºF	15ºF	9ºF	2ºF	0ºF

Table 3: Factory-Set Default Setpoints - Glycol

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).

Stand-Alone Input Commands

NOTE: When the term "ON" is used, it means there is 24 VAC on the appropriate Binary Input. When the term "OFF" is used, it means there is 0 VAC on the appropriate Binary Input.

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 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.

Compressor Operation (Heat/Cool)

A compressor can energize if the following is true:

1. There is 24 VAC 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 the compressors.

Note: If the WSHP-454 Module receives a signal on the Heat Enable input, it will operate using the Heating Mode Setpoints.

Navigation Keys & Main Screens Map

LCD Display Screen & Navigation Keys

The WSHP-454 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 4 and refer to Figure 5 for descriptions.

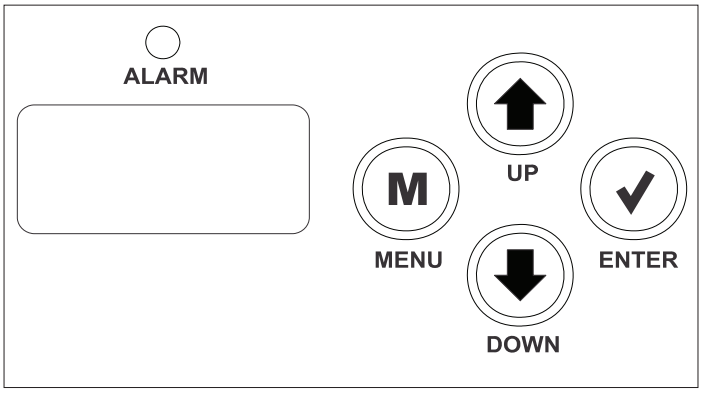


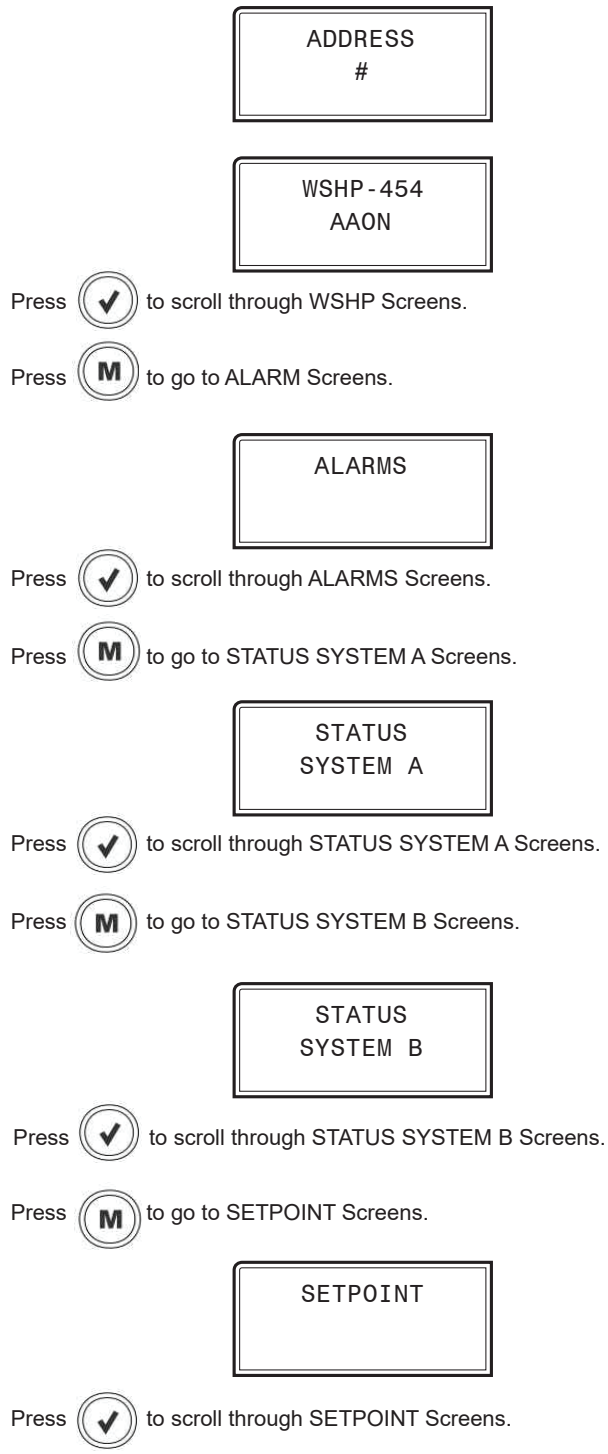
Figure 4: LCD Display and Navigation Keys

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

Figure 5: Navigation Key Functions

Main Screens Map

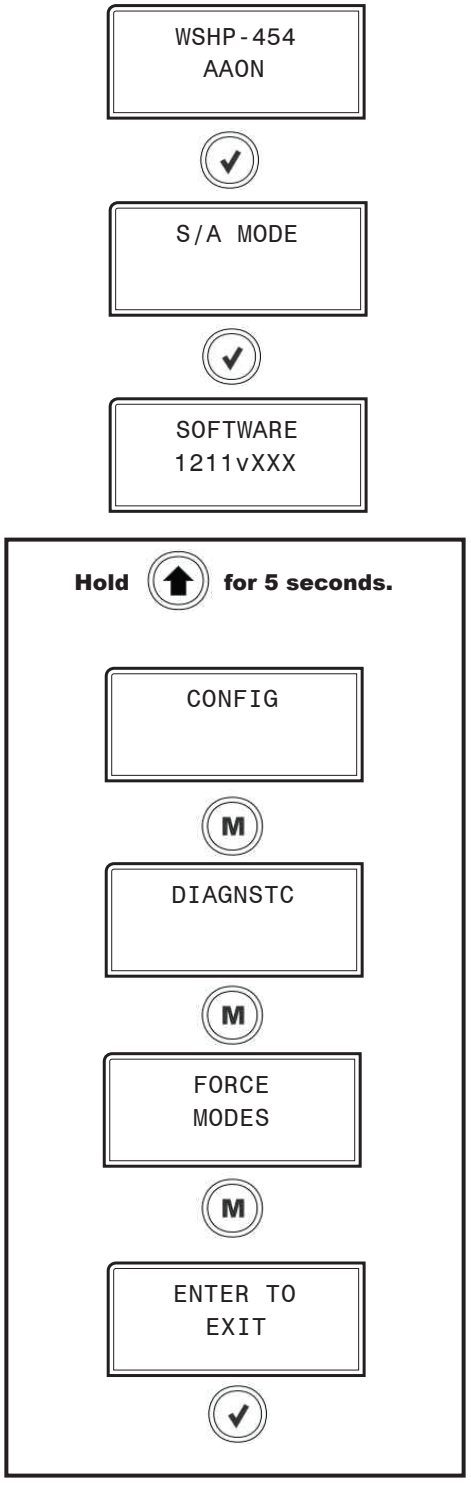
Refer to the following map when navigating through the LCD Main Screens. The first screen is the address screen. To scroll through the rest of the screens, press the **<MENU>** button.



Protected Screens Map and WSHP Screens

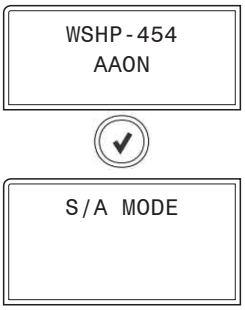
Protected Screens Map

Refer to the following map when navigating through the LCD Protected Screens. From the WSHP Screen, press the **<ENTER>** twice until you get to the SOFTWARE Screen. Then hold the **<UP>** button for 5 seconds. To scroll through the rest of the screens, press the **<MENU>** button.



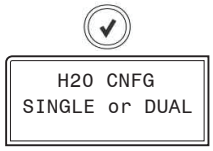
Main Screens Map

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

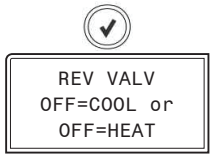


S/A Mode means the controller is in Stand Alone Mode

CURRENT SOFTWARE VERSION



WATER CIRCUIT CONFIGURATION
SINGLE (Typical for AAON Coil) or DUAL (Typical for AAON Tulsa)

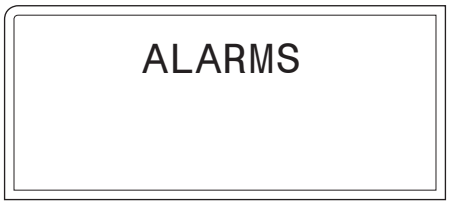


REVERSING VALVE CONFIGURATION
OFF=COOL (No signal on reversing valve input equals cool mode)
OFF=HEAT (No signal on reversing valve input equals heat mode)

WSHP-454 ADDRESS
Default is 1.

Alarm Screens

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



The alarms as is 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.

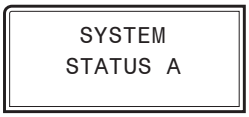
LOW H2O: The Leaving Water Temperature has dropped below setpoint. This alarm will disable when the leaving water temperature rises 6 degrees above the setpoint.

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.

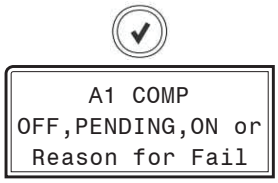
LOW SUCTION PRESSURE: The Circuit's Suction Pressure has dropped below the Low Suction Pressure for longer than one minute. This alarm will disable ten minutes after Suction Pressure rises above the setpoint.

System A Status Screens

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



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



SYSTEM A, COMPRESSOR 1

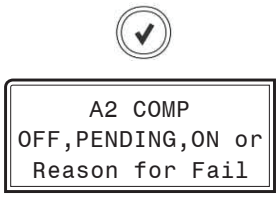
This screen displays the current status of the A1 Compressor.

OFF

PENDING: Compressor is off, but a request is made to be on, but the 1 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

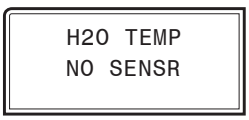
This screen displays the current status of the A2 Compressor.

OFF

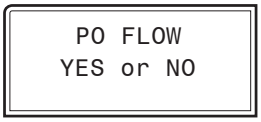
PENDING: Compressor is off, but a request is made to be on, but the 1 minimum off time has not been met.

ON: HEAT or Cool

REASON FOR FAILURE: Low Pres, Lockout, Low H2O, No Flow

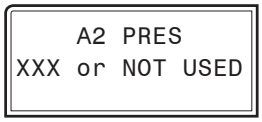


LEAVING WATER TEMPERATURE READING OR "NO SENSOR"



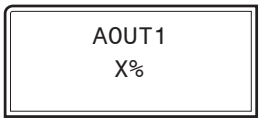
PROOF OF WATER FLOW

SYSTEM A, COMPRESSOR 1 PRESSURE READING



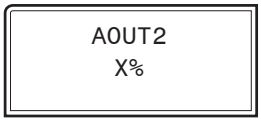
SYSTEM A, COMPRESSOR 2 PRESSURE READING

If Single Water Configuration, this screen will display "NOT USED."



ANALOG OUTPUT 1 PERCENT

0 - 100%



ANALOG OUTPUT 2 PERCENT

0 - 100%

System B Status Screens

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

```
SYSTEM B
DISABLED
```

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

```
SYSTEM
STATUS B
```

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

```
B1 COMP
OFF,PENDING,ON or
Reason for Fail
```

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

```
B2 COMP
OFF,PENDING,ON or
Reason for Fail
```

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
```

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."

```
AOUT3
X%
```

ANALOG OUTPUT 3 PERCENT

0 - 100%

```
AOUT4
X%
```

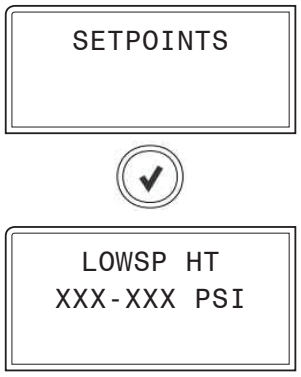
ANALOG OUTPUT 4 PERCENT

0 - 100%

Setpoint Screens

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

Note: The following screens are Status Screens. The Setpoints can't be changed from these screens



LOW SUCTION PRESSURE HEAT MODE SETPOINT

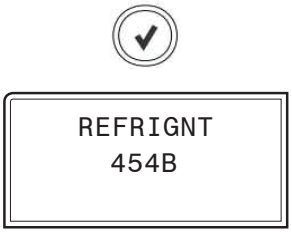
Glycol %	Low Suction Heat Setpoint	Glycol %	Low Suction Heat Setpoint
0%	96 PSI	25%	62 PSI
5%	89 PSI	30%	55 PSI
10%	83 PSI	35%	47 PSI
15%	78 PSI	40%	43 PSI
20%	71 PSI		

LOW SUCTION PRESSURE COOL MODE SETPOINT

UNSAFE SUCTION PRESSURE SETPOINT

GLYCOL SETPOINT

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



REFRIGERANT

454B

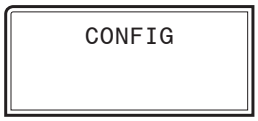
LOW LEAVING WATER TEMPERATURE SETPOINT

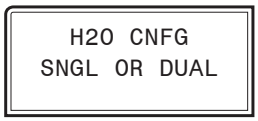
See Table Below

Glycol %	Low Leaving Water Temperature Setpoint	Glycol %	Low Leaving Water Temperature Setpoint
0%	37ºF	25%	15ºF
5%	34ºF	30%	9ºF
10%	30ºF	35%	2ºF
15%	27ºF	40%	0ºF
20%	20ºF		

Configuration Screens

Refer to the following map when navigating through the Confi guration Screens. From the CONFIG Screen, press **<ENTER>** to scroll through the screens and change setpoints. Use the **<UP>** and **<DOWN>** arrow keys to change your selections. Press **<ENTER>** to save any changes.

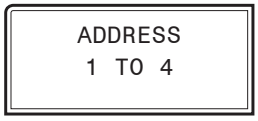




WATER CIRCUIT CONFIGURATION

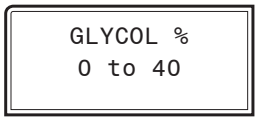
SINGLE: One cooling tower for all compressors on this module

DUAL: Two cooling towers for compressors on this module



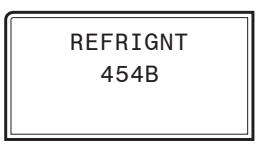
CURRENT ADDRESS OF THE BOARD

Default = 1



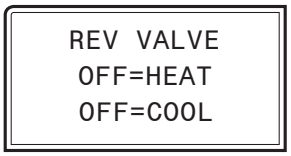
GLYCOL CONFIGURATION
One cooling tower for all compressors on this module

Choose between 0,5,10,15,20,25,30,35,40 percent glycol.



REFRIGERANT CONFIGURATION

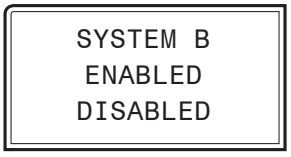
454B



REVERSING VALVE CONFIGURATION

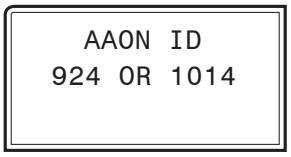
OFF=HEAT: When Reversing valve input is off, valve will be in heat mode

OFF=COOL: When Reversing valve input is off, valve will be in cool mode

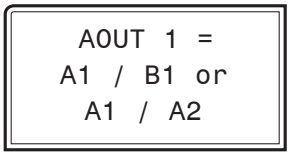


SYSTEM B ENABLE

When disabled, alarms and screens will be removed.



This screen does not apply to R454-B units.



AOUT 1 CONFIGURATION

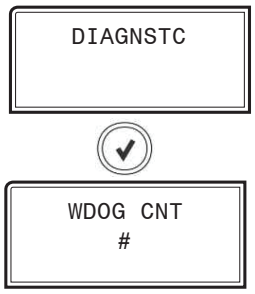
A1 / B1 (default): Select this for new current configurations.

A1 / A2: Select this for “specific” older configurations.

Diagnostic & Force Outputs Screens

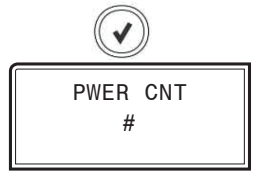
Diagnostic Screens

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



WATCH DOG TIMER

Displays the number of times the board has been reset due to watchdog timer overflow.

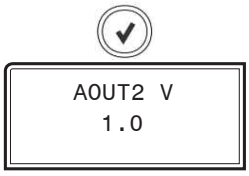


POWER LOSS COUNT

Displays the number of times the board has been reset due to power loss. **NOTE:** If you hold the **<UP>** button for 5 seconds, all configurations and setpoints will return back to their default settings. The Power Up counter will go to "1" when this occurs.

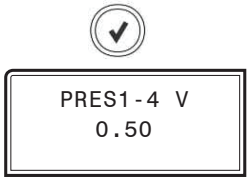
COMPRESSOR 1 VOLTAGE

Displays the current voltage of the 1st analog output.



COMPRESSOR 2 VOLTAGE

Displays the current voltage of the 2nd analog output.

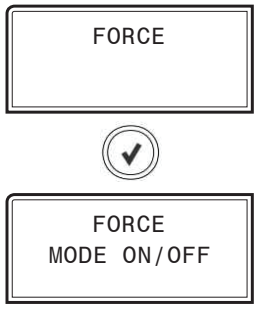


SUCTION PRESSURE SENSORS VOLTAGE

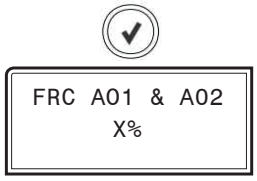
Displays the current voltage of the suction pressure sensor.

Force Outputs Screens

Refer to the following map when navigating through the Force Screens. From the FORCE OUPTUS Screen, press **<ENTER>**. At the FORCE MODE ON/OFF screen, press the **<UP>** arrow key to turn the FORCE MODE on and press the **<DOWN>** arrow key to turn the FORCE MODE off. Use the **<UP>** and **<DOWN>** arrow keys to increase and decrease the percentage.



Press the **<UP>** button to turn the Force Mode on. Press the **<DOWN>** button to turn the Force Mode off.



FORCE VALVE 1 & 2 PERCENTAGE

These screens only appears when Force Mode is on.

Press the **<UP>** button to increase the percentage. Press the **<DOWN>** button to decrease the percentage.

NOTE: When you turn the Force Mode back off or after 1 hour has elapsed, the valve will reinitialize to zero.

FORCE COMPRESSORS 1-4

These screens allow you to force the compressor relays on or off.

FORCE MODE TIME OUT

This screen will appear when the Force Mode times out after 1 hour.

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. 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.

Troubleshooting

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.

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

Table 4: Temperature/Resistance for Type III 10K Ohm Thermistor Sensors

Temperature - Resistance - Voltage for Type III 10 K Ohm Thermistor Sensors		
Temp (ºF)	Resistance (Ohms)	Voltage @ Input (VDC)
74	10625	2.635
75	10398	2.607
76	10158	2.577
78	9711	2.520
80	9302	2.465
82	8893	2.407
84	8514	2.352
86	8153	2.297
88	7805	2.242
90	7472	2.187
95	6716	2.055
100	6047	1.927
105	5453	1.805
110	4923	1.687
115	4449	1.575
120	4030	1.469
125	3656	1.369
130	3317	1.274
135	3015	1.185
140	2743	1.101
145	2502	1.024
150	2288	0.952

Table 5: Temperature/Resistance for Type III 10K Ohm Thermistor Sensors, continued

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.

Suction Pressure Transducer Testing for R454-B 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 WSHP-454 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.

Using LEDs to Verify Operation

The WSHP-454 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 6, page 24 & Figure 7, page 25 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 6 below for Status Blink Code descriptions. The blink code descriptions are also located on the Module's front cover. See Figure 6 for location.

"ALARM" - This is the diagnostic blink code LED. It will light up and blink out diagnostic codes. See Table 7 below for Diagnostic Blink Code descriptions. The blink code descriptions are also located on the Module's front cover. See Figure 6 for location

No of Blinks	Status
1	Off Mode
2	Cool Mode
3	Heat Mode

Table 6: Status LED Blink Codes

No of Blinks	Alarms
1	Low Suction Pressure
2	Compressor Lockout
3	Water Flow Failure
4	Low Leaving Water Temperature

Table 7: Alarm LED Blink Codes

SUCTION PRESSURE TRANSDUCER COIL PRESSURE TEMPERATURE AND VOLTAGE CHART FOR R454 REFRIGERANT			
Temperature (°F)	Temperature (°C)	Pressure (psi)	Signal DC Volts
25.88	-3.4	80.94	1.8
29.42	-1.4	87.16	1.9
32.81	0.5	93.39	2.0
36.05	2.6	99.62	2.1
39.16	4.0	105.84	2.2
42.15	5.6	112.07	2.3
45.02	7.2	118.29	2.4
47.79	8.8	124.52	2.5
50.47	10.3	130.75	2.6
53.06	11.7	136.97	2.7
55.57	13.1	143.20	2.8
57.99	14.4	149.42	2.9
60.36	15.8	155.65	3.0
62.65	17.0	161.88	3.1
64.88	18.3	168.10	3.2
67.05	19.5	174.32	3.3
69.16	20.6	180.55	3.4
71.23	21.8	186.78	3.5
73.24	22.9	193.00	3.6
75.20	24.0	199.23	3.7
77.12	25.1	205.46	3.8
79.00	26.1	211.68	3.9
80.83	27.1	217.91	4.0
82.63	28.1	224.14	4.1
84.39	29.1	230.36	4.2
86.11	30.1	236.59	4.3

Table 8: Coil Pressure/Voltage/Temp for Suction Pressure Transducers - R454 Refrigerant

Troubleshooting

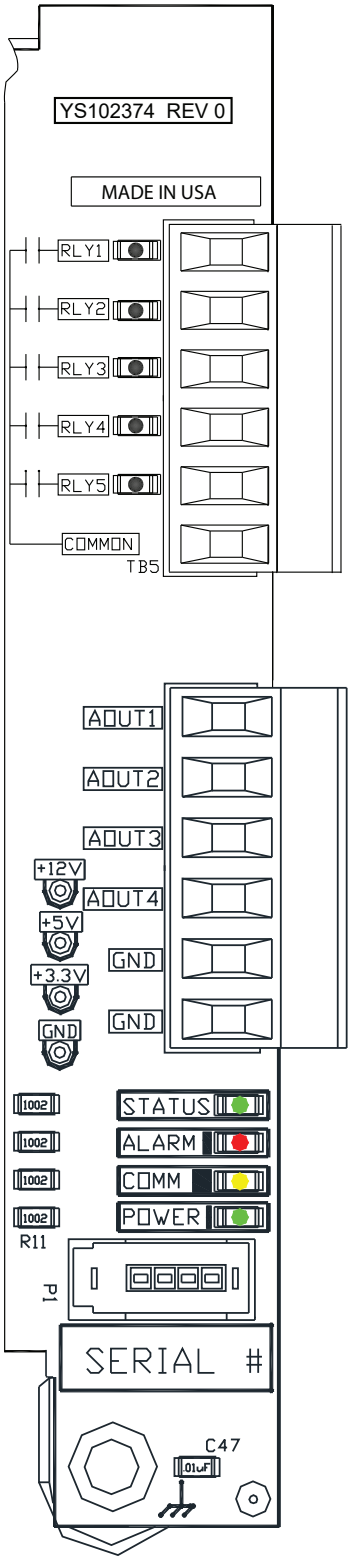


Figure 6: Operation Status LED Locations

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-454 Module will give a better indication of which compressor is causing an alarm. See Table 9 for PRES LED status descriptions. See Figure 7 for locations.

No of Blinks	Status
Solid On	Sensor is Detected and is OK
Solid Off	Sensor is Not Detected
1	Low Suction Pressure on this Compressor
2	Compressor is Locked Out

Table 9: PRES 1-4 LED Blink Codes

LED Diagnostics

"POWER" LED: When the WSHP-454 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 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-454 Module is powered up while in Stand Alone Mode, the COMM LED does not light up.

"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-454 Module contains no user-serviceable parts. Contact qualified technical personnel if your Module is not operating correctly.

Troubleshooting

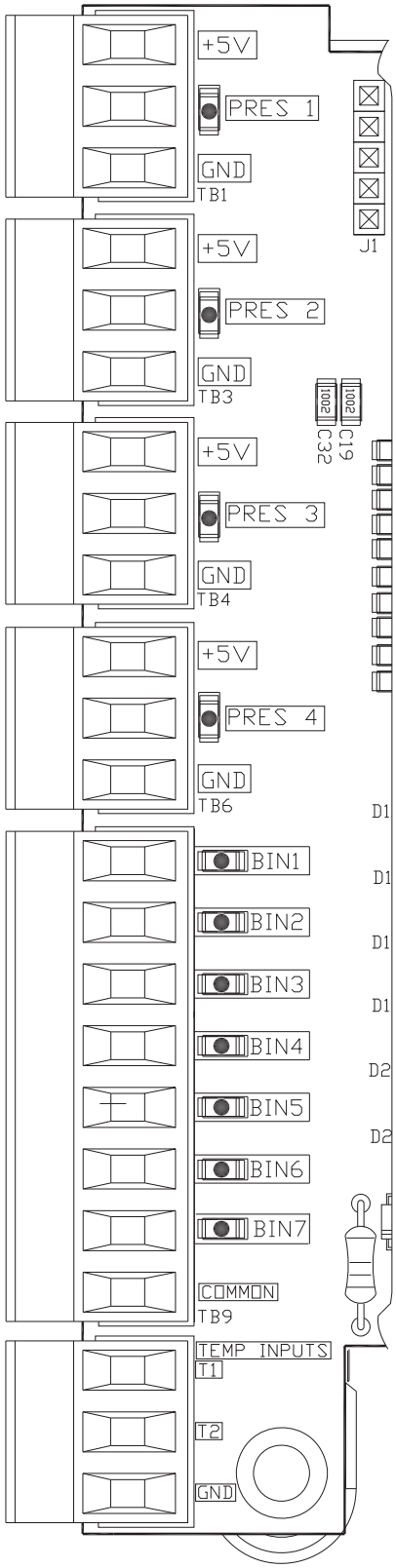


Figure 7: PRES 1-4 LED Locations

WSHP-454 Module Technical Guide

Rev. A · 250317

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

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.

2425 So. Yukon Ave • Tulsa, OK • 74107-2728
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