

Creative Connections, Inc.

HVAC Freeze Monitor P/N 236-801

Introduction

The HVAC Freeze Monitor prevents a liquid-to-air heat exchanger in a heat pump from freezing. It accomplishes this by accurately monitoring the Freon temperature and taking preemptive action. If a heat exchanger freeze is imminent, the HVAC Freeze Monitor will reverse cycle the heat exchanger, and if necessary turn off the compressor(s). There are many scenarios where a liquid-to-air heat exchanger can freeze and destroy the heat exchanger without the HVAC Freeze Monitor.

Specifications

General:

Accuracy	+/- 0.5 °C (0.9 °F) Max, +/- 0.25°C (0.45°F) Typical
Voltage	24 VAC 50/60 Hz
Current	50 mA Max

Inputs:

1	236-800-X Sensor Red Wire
2	236-800-X Sensor Black Wire
5	Temperature Select
6	Temperature Select
8	24 VAC Common
9	24 VAC Power

Outputs:

3	NC Freeze Limit Contact #1
4	NC Freeze Limit Contact #2
7	Reversing Valve 24VAC
LED	Green – Power Indicator
LED	Red – Reversing Valve Indicator
LED	Red – Fault Indicator

Fault Indicator has the following modes:

Off	OK
On	System currently in a fault timeout
1 Blink	Fault happened at some point
2 Blink	Extreme Freeze Fault, maintenance required
3 Blink	No sensor present
4 Blink	Noisy sensor, reroute hookup wires
5 Blink	Sensor temperature out of range (above 131 °F or below -4 °F)

Definitions:

Freeze Temperature	26 °F normally, 21 °F if 5 and 6 are connected together
Thaw Temperature	50 °F
Fault Delay	3 hours
Maximum Thaw Time	45 seconds
Reversing Delay	30 seconds after reaching Thaw Temperature
Hourly Max Reverses	10 reverses in one hour

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Operational Description:

Power up:

When power is first applied to the HVAC Freeze Monitor, all three LEDs will illuminate for 2 seconds.

Normal operation:

During normal operation, contact 7 is open. Contacts 3 & 4 are closed to provide power to the compressor contactor and the Fault Indicator LED & the Reverse LED are off.

Reversing:

Initially, when the temperature drops below the freeze temperature, contact 7 supplies 24 VAC to the reversing valve and the Reverse LED is illuminated.

Returning to normal:

Assuming the temperature reaches the thaw temperature in less than the maximum thaw time, the controller enters the reversing delay period where the reversing valve remains energized even though the exchanger has thawed out. Afterwards, contact 7 returns to an open state and the Reverse LED goes off.

Fault from not thawing out:

If the temperature does not reach the thaw temperature in less than the maximum thaw time, contact 7 is opened to return the reversing valve to its normal state and contact 3 & 4 are opened to break power to the compressor contactor. The Reverse LED goes off and the Fault Indicator LED goes on solid. The controller enters a fault delay and nothing is done during the fault delay.

Fault from too many reverses:

If the number of reverses in one hour equals the hourly max reverses, contact 7 is opened to return the reversing valve to its normal state and contact 3 & 4 are opened to break power to the compressor contactor. The Reversing LED goes off and the Fault Indicator LED goes on solid. The controller enters a fault delay and nothing is done during the fault delay.

Returning to normal operation:

Assuming the temperature is above the *freeze temperature* at the end of the fault delay, the controller will close contacts 3 & 4 to close the power circuit to the compressor contactor and the Fault Indicator LED will begin a 1 blink sequence.

Extreme freeze fault:

If the temperature is at or below the freeze temperature at the end of the fault delay, the relays will remain unchanged, the Fault Indicator LED will begin a 2 blink sequence, and the HVAC Freeze Monitor will “lock” in this condition until the unit’s power is cycled.

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Other fault indicator functions:

1. During normal, reversed, and 1 blink operation, if the sensor becomes disconnected, the signal becomes illegible, or the temperature reported is considered to be absurd, the Fault Indicator LED will blink 3, 4, or 5 times to indicate the condition respectively.
2. Two faults can be stacked. That is to say for example, if running in the 1 blink mode (a fault has previously occurred) and the sensor becomes disconnected, the Fault Indicator LED will blink once, pause, then blink three times, pause, and then repeat.

Test Operation

(for factory use only)

There is a test pin sticking straight out of the protective resin in the lower left corner of the unit. Connecting the test pin to contact 2 at any time during normal operation will put the HVAC freeze monitor into test mode.

In test mode, the reverse relay is deenergized (opened) and the fault relay is deenergized (closed). The fault indicator will flash the sensor temperature in degrees F unless there is a problem reading the sensor. The temperature's tens digit is flashed first, followed by the ones digit. Zeros are indicated by a short flash. For instance, a temperature of 72 degrees will flash 7 times, pause, flash 2 times, pause, wait 4 seconds and repeat.

During test mode, shorting pin 5 to pin 6 on the connector (the temp select inputs) will make both relays energize. This will open pins 3 and 4, and close pin 7 to the 24 VAC input. The relays will deenergize. Note that the state of pin 5 to 6 is only polled approximately every 5 seconds, so it may take several seconds to change the state of the relays.