



## **Troubleshooting and testing procedures for the following controls and snow sensors:**

Controllers:

APS-3B, APS-4, APS-3C, APS-4C, and EUR-5A

Snow Sensors:

CIT-1, GIT-1, and SIT-6E, these snow sensors work with all of the above controllers.

Combined controller and sensor:

GIT-3A

GIT-4

## **Warranty Info:**

ETI's warranty policy can be viewed at:

[http://www.networketi.com/pol\\_servicewarrantyreturns\\_23830.html](http://www.networketi.com/pol_servicewarrantyreturns_23830.html)

Items that are non repairable and out of the 2 year warranty period are disposable and should only be returned if you wish to have the factory verify that the part has failed. A fee of \$32.50 may be applied for this service and if you require the part back return shipping fees will be charged for their return.

Whenever possible contact your distributor for warranty repairs and replacements and be prepared to present proof of purchase within the 2 year warranty period.

## **Pilot Duty:**

The APS-3B, APS-3C, GIT-3A and EUR-5A controllers are used in pilot duty applications controlling external contactors that then control the higher current loads of the heaters. These units DO NOT have GFEP circuits so it is required that a Ground Fault Protection be installed to supply the heaters. The APS-3B, APS-3C and GIT-3A can also be used for switching duty applications within their maximum current ratings but still require Ground Fault Protection

## **Switching Duty:**

The APS-4, GIT-4 and APS-4C controllers are used for switching duty applications directly controlling heater loads up to 50 amps depending on model number. These units have GFEP circuits that will turn the unit off if a ground fault is detected in the heater circuit.

## **To trouble shoot a heating system you should consider the system in three parts:**

1. The Heaters, which consist of heat tapes, mats or hydronic tubing.
2. The Controller, one of the controllers listed above.
3. And the Snow Sensors, one or more of the three listed above in any combination.

**Troubleshooting each of the parts independently will quickly isolate the problem and affect the remedy.**

## **Heaters:**

ETI does not manufacture any of the heater components used with these controllers, so we recommend contacting the heater manufacturer for details on insulation resistance checks, current draw, desired meg-ohm values, output wattage, terminations and splice / repair kits.

If the controller is indicating a Ground Fault condition the quickest way to determine if it is a heater fault or a controller failure is to remove power from the controller, remove the heater load from the controller and restore power to the controller. If the GF indicator is no longer lit on the controller the problem resides in the heaters. Contact the heater manufacturer for help in troubleshooting the heater.

If more than one heater is connected to the controller then removing them all and reinstalling them one at a time after verifying the controller is good will allow you to isolate the bad heater and affect repairs.

On the APS-3C and APS-4C the ***Ground Fault indicators will flash*** if an attached SC-40C satellite controller is in a ground fault condition.

## **Controllers:**

With the exception of the GIT-3A, APS-3B and the APS-4, all of the above controllers REQUIRE that a high temp limit thermistor be installed. For the APS-3C and APS-4C these are installed on pins 10 and 11 of the class 2 wiring terminal block. On the EUR-5A it is installed on pins 1 and 2. This thermistor provides a feed back loop that turns the system off when it senses a temperature above the customer adjusted set point located on the front panel. ***Where thermistors are used the supply light will flash if they are not installed, installed improperly, damaged, or have failed.***

The Snow Sensors are attached to the controller on pins 1 (white [or blue in the future], Control signal), 2 (black, 24V-RTN) & 3 (red, 24V supply) on the APS-3C and APS-4C class 2 wiring terminal blocks. For the EUR-5A they are attached to pins 24 (white [or blue in the future], Control signal), 25 (black, 24V-RTN) & 26 (red, 24V supply). On the APS-3B and the APS-4 they are connected to the middle three pins of the class 2 terminal block, from bottom to top red, white, black.

**Note:** On some systems the 24V is AC, on others it is 24V full wave rectified. If you measure the 24V full wave rectified on the AC scale of your meter it will read 11VAC. These values are approximate and could be within +/- 10%

In all cases the controller can be checked using the following procedure:

1. Insure that the supply light is on solid
2. Cycle the start heat switch and to insure the system will engage the heaters in manual mode.

3. Cycle the stop heat switch to turn the heaters off
4. Using a short piece of wire (a paper clip will do) jumper (or short together) the terminal block positions that contain the snow sensors white [or blue in the future] and black wire together.
  - a. After a moment the snow indicator LED and the heater LED should come on and the heaters will engage.
  - b. When you remove the jumper the snow LED will go out and the heater LED will remain on for as long as the hold on timer knob is set for.
5. **If the unit turned on the snow indicator, heater indicator and the heaters then the controller will respond to a command from the sensor and you will now need to verify that the controller is powering the sensor.** The next test is to ensure that the controller is powering the sensor:
  - a. Using a voltmeter measure the sensor supply voltage between terminals that the red and black wires are on. If there is no voltage then:
  - b. For the APS-3C and APS-4C check the fuse that is located behind the 22 position terminal block (class 2 connections) to insure it is not blown. If it is blown out replace it with a 2-amp fuse. If it is not blown then the controller will need to be repaired. *Units with screw terminal blocks are susceptible to damage by over tightening the screws, breaking the connection if you are comfortable with soldering you can field replace the terminal block.* **Contact your distributor to have the unit returned to ETI for parts, repair or warranty work.**
  - c. For the remaining controllers, the controller will need to be repaired. **Contact your distributor to have the unit returned to ETI for repair or warranty work.**
6. **If the controller is providing power to the snow sensor and will respond to a call for heat, but the system is still not heating then the problem is in the sensors and you will need to trouble shoot the Snow Sensors. See below.**

## **Snow Sensors:**

The CIT-1, GIT-1, and SIT-6E all basically work the same way although they come in different shapes for different applications. They all require the same environmental conditions to turn on the attached controller. **The Snow Sensors are not repairable.**

The CIT-1 aerial snow sensor is round and about 2 inches thick (like a big hockey puck). It has a moisture sensor grid on the top and a temp sensor on the bottom (about the diameter of a pencil and about an inch long)

The GIT-1 gutter snow sensor is a cylinder about 1-1/2 inches in diameter and about 6 inches long. The moisture grid is on one end and the temp sensor is on the end that the cable comes out of and is about the same shape as mentioned above.

The SIT-6E pavement snow sensor is a circular brass plate with five small circular rings arranged in a pentagram on the top. The plate is attached to a brass tube that is approximately 2 inches long and filled with an epoxy. The brass rings on the top contain

both the temp sensor and moisture sensor. When connecting this sensor to the wires in the pavement box use waterproofing wire nuts to ensure that water cannot attack the wiring.

In all three cases the moisture sensors are heated with internal heaters to melt the ice or snow and enable the sensor to detect moisture.

***To turn on, the snow sensors have to sense both moisture and a temperature below 38 degrees Fahrenheit.***

The snow sensors will work on either 24VAC or 24V Full Wave Rectified applied to the red wire with the 24V return applied to the black wire.

To test the snow sensors:

1. Make sure they are properly attached to the controller and voltage is applied.
2. Ensure that the ambient temp is below the 38 degrees; use a freeze mist or a cup of salted Ice to chill the temp sensor if required
3. Apply moisture to the moisture grid
4. If possible apply snow to the moisture grid and determine that the heaters are on by observing that the snow melts.

You can also voltage test the sensors at the controller by monitoring the voltage between the white and black wire. When the sensor is warm and dry you should see 24V. When the sensor is wet and cold you will see less than 2 V.

**Tunneling, caving, ice crown or snow caves:**

All of the above terms can be used to describe the same condition, which keeps the snow sensor from calling for heat. This occurs when excessive snow accumulates around the moisture sensor. The moisture sensor heater melts the snow and forms a cavity around the moisture grid. Since the heater eventually dries out the grid, and the cavity prevents more snow from making contact with the grid, the snow sensor is now dry and cold and will not call for heat.

**A final comment about snow sensor location and function:**

A number of sensors in differing locations will generally give better performance than a single sensor, but several sensors in bad locations will not out perform one sensor in a good location. It boils down to location, location, location....

**The GIT-3A Gutter Ice control**

The GIT-3A uses its own unique sensor that in appearance is identical to the GIT-1, however its voltage requirement is 12 to 16 volt DC but otherwise functions in the exact same manner as the sensors described above. **Both the sensor and control are sealed in potting and so are non repairable.**

**Before testing the unit, be sure that power is applied to the control box!**

Upon opening the control box of the GIT-3A you will note a high voltage area separated by a divider from the low voltage area. The sensor cable comes into the low voltage area and its wires are terminated with wire nuts to matching color wires coming from the controller.

To test the controller you can remove the wire nuts from the white and black wires and short these wires together (the ones coming from the controller). The controller should turn on the heaters. If it does not then the controller is bad and will need to be replaced. If the controller does turn on the heaters then the problem lies in either the sensor or the related cable.

To test the sensor:

1. Make sure it is properly attached to the controller and voltage is applied.
2. Ensure that the ambient temp is below the 38 degrees; use a freeze mist or a cup of salted Ice to chill the temp sensor
3. Apply moisture to the moisture grid
4. If possible apply snow to the moisture grid and determine that the heaters are on by observing that the snow melts.

### **The GIT-4 Gutter Ice control**

The GIT-4 uses its own unique sensor that in appearance is identical to the GIT-1, however its voltage requirement is 16 VDC and **cannot be tested by shorting wires together**. The white wire is a communication wire and passes data between the sensor and the controller. Because of this the sensor and control need to be tested together.

**Both the sensor and control are sealed in potting and so are non repairable.**

To test the controller and sensor:

1. Make sure the proper voltage is applied to the controller.
2. You can check the voltage between the red and black wires going to the sensor. (16 VDC)
3. Ensure that the ambient temp is below the 38 degrees; use a freeze mist or a cup of salted Ice to chill the temp sensor
4. Apply moisture to the moisture grid
5. If possible apply snow to the moisture grid and determine that the heaters are on by observing that the snow melts.