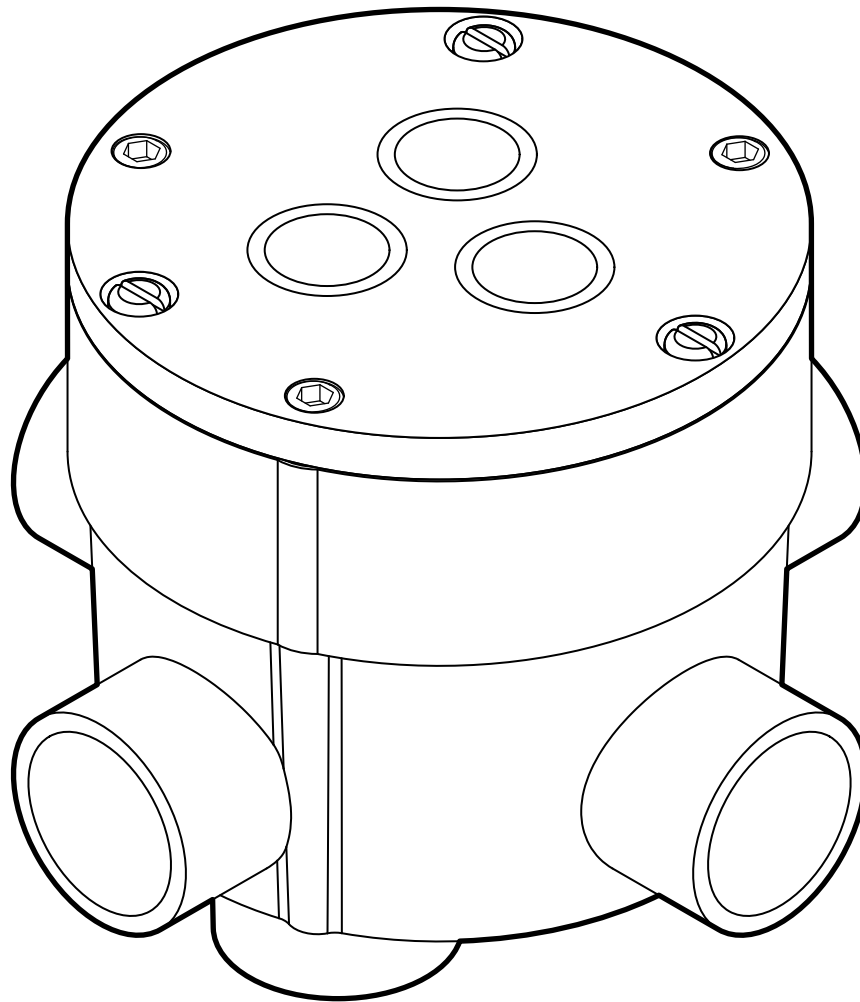




---

## Installation and Operation Manual



### **Environmental Technology, Inc.**

1850 N Sheridan Street  
South Bend, Indiana 46628  
(574) 233-1202 or (800) 234-4239  
FAX (574) 233-2152 or (888) 234-4238  
<http://www.networketi.com/>



## Description

The Snow Switch Model HSC-24, 24-volt Pavement-Mounted Snow and Ice Sensor reliably detects snow and ice conditions on pavement surfaces. The HSC-24 pavement sensor ensures that deicing heaters operate only while needed which minimizes energy costs without sacrificing snow melting effectiveness.

The HSC-24 is designed to be self-contained eliminating the need for an additional control panel, and it's independent relay-contact output is compatible with most heater control systems.

As part of a snow melting system, the HSC-24 sensor will signal for snow and ice melting at pavement temperatures below 38°F (3.3°C) while moisture in any form—including water, snow, sleet or ice—is present.

It's important for the sensor to be level with the pavement surrounding it. A Pavement Sensor Housing, ETI part number 23832 (sold separately), is needed for each pavement sensor. This housing supports the sensor within the pavement and includes adjustment screws that allow proper leveling with the pavement surface.

## What's in the Box

Immediately upon receipt, inspect the container and packing material for any noticeable damage or missing contents.

From the factory an HSC-24 sensor includes:

- One HSC-24 pavement sensor
- One package (1 lb.) duct seal
- Three 3/8"-16 × 0.25" hex socket set screws
- Three #8-32 × 0.375" machine screws
- One 3/16" hex key
- Installation and Operation Manual

Unpack the unit, taking care not to damage the packing materials. Save the shipping container and related materials until normal operation has been established. In the event of shipping damage, keep the packing materials for inspection by the carrier. If any of the contents are missing or damaged please contact your supplier or ETI Customer Service.

## Sensor Location

The HSC-24 pavement sensor should be installed in a location that best represents the typical snow and ice conditions on the pavement surfaces that are being deiced.

Position the sensor centered between the heater cables or tubing. This will allow the sensor to be exposed to a surface temperature that is typical of the deiced area without causing abnormal heating of the sensor.

**AVOID:** Building overhangs, trees, locations where vehicles park and any other obstructions that may prevent snow, freezing precipitation and/or solar gain from reaching the sensor.

**AVOID:** Hot air exhaust ducts or other heat sources that may affect the sensor and cause it to be warmer and drier than the area being deiced.

**AVOID:** Animals. A sensor installed in an area housing animals (such as a kennel) or in an area with a high amount of animal traffic may run more often than desired.

**CONSIDER:** Site drainage is important. A sensor placed in a location where the drainage is better or worse than is typical of the pavement installation may cause the system to turn off too soon or to run too long.

**CONSIDER:** Vehicle and pedestrian traffic may track moisture and wet debris onto the pavement sensor and cause the system to run longer. Depending on the function of the area being deiced it may or may not be desirable to expose the sensor to typical traffic patterns.

**CONSIDER:** Installing additional sensor housings, It is less expensive than digging up a pavement installation later. Installing one or more extra housings will allow you to move a sensor later if needed. Also, depending on the control being used, you may be able to run additional sensors to the same control.

## Conduit

After positioning the sensor, install 3/4" conduit from the sensor housing to the snow melting control. Do not share the sensor cable's conduit with any high voltage wiring.

The HSC-24 pavement sensor includes 60' (18 m) of cable. Should any additional length of cable be required, ensure that the splice is made in a junction box appropriate for the location.

## Housing Installation

Follow the instructions in the Pavement Sensor Housing manual to ensure the housing is installed correctly and made level with the paving surface.

## Sensor Installation

Remove the sensor housing cap from the housing unit by removing the three screws securing it in place. Be sure to keep the cap for future use should the housing unit need to be recapped.

Feed your fish tape through the conduit from the control end. Attach the cable to the fish tape and pull it back through the conduit, using cable lubricant if necessary. Be sure there are no kinks in the cable. Leave a few inches of cable at the pavement sensor end for a service loop.

Inside the Pavement Sensor Housing apply duct sealant to protect the installation, leaving room for the sensor to be placed down inside the housing. Knead the supplied duct sealant until it is pliable. In addition to sealing the wiring conduit, the duct sealant should occupy space in the housing so that it will displace water that might enter. This will minimize the accumulation of water and ice in the housing and protect against possible ice damage.

Install the sensor into the housing with its top resting on the top of the Height Adjustment Ring. Check that all six holes are properly aligned, and fasten the sensor to the Height Adjustment Ring with the three Sensor Retaining Screws.

To promote correct assembly the screws that secure the housing cap and sensor attachment are positioned to form the points of an equilateral triangle. The positions of the height adjustment screws, which level the surface of the sensor to the surface of the pavement, form the points of an isosceles triangle.

Adjust sensor to be flush with the pavement around it. To do this remove the three protective hex screws (Figure 2), when removed you will see the Height Adjustment Screws. To level the sensor rotate the Height Adjustment Screws (Figure 3) clockwise to lower the sensor or counterclockwise to raise it. The housing flange can be raised up to 0.63"(16 mm) to allow the sensor surface to be aligned with the pavement surface. When the unit is level and flush with the pavement, reinstall the protective hex screws. Failing to level the sensor flush with its surrounding pavement can result in water pooling which will cause the sensor to not function properly.

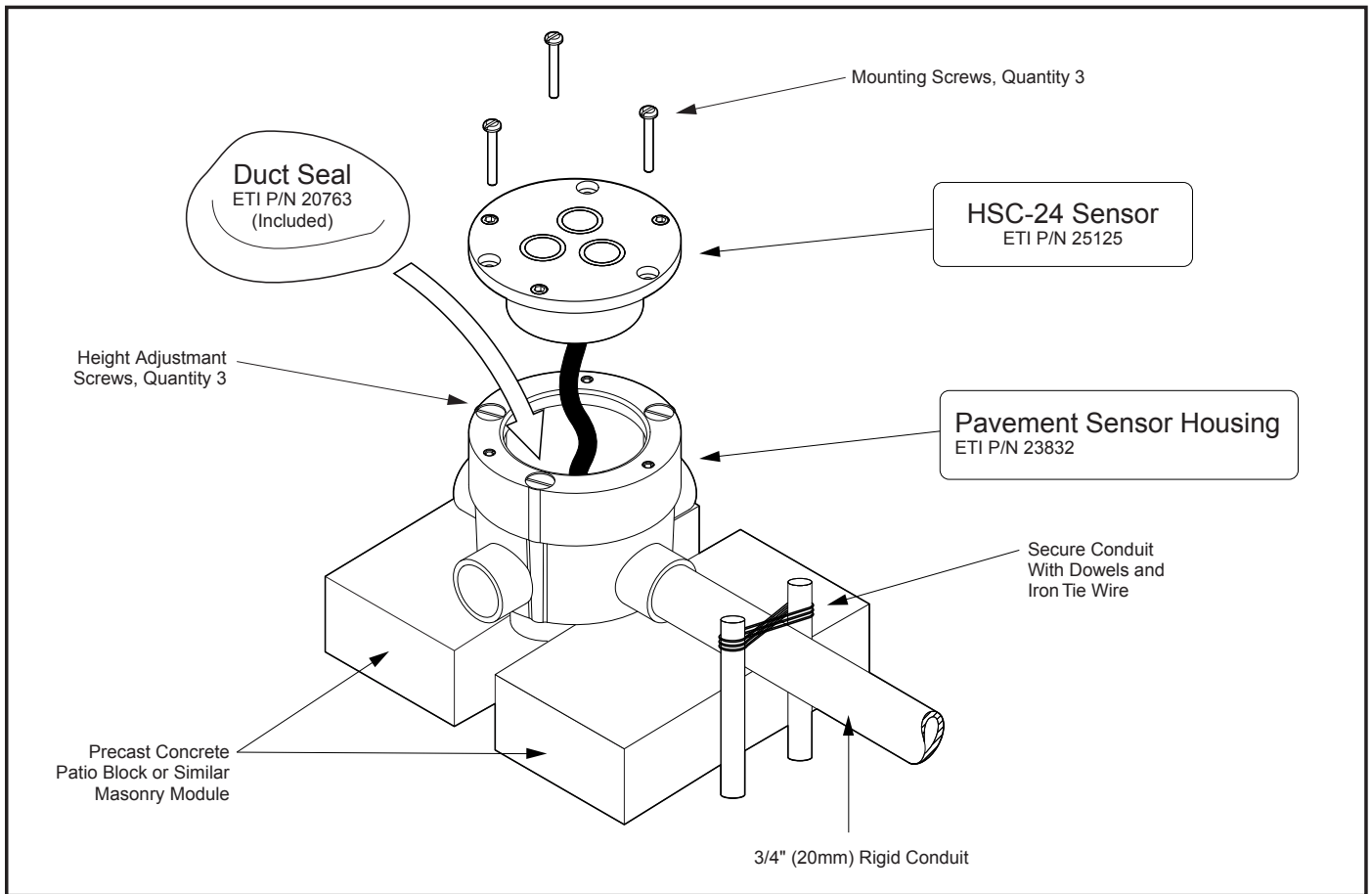


Figure 1. HSC-24 Pavement Sensor Installation.

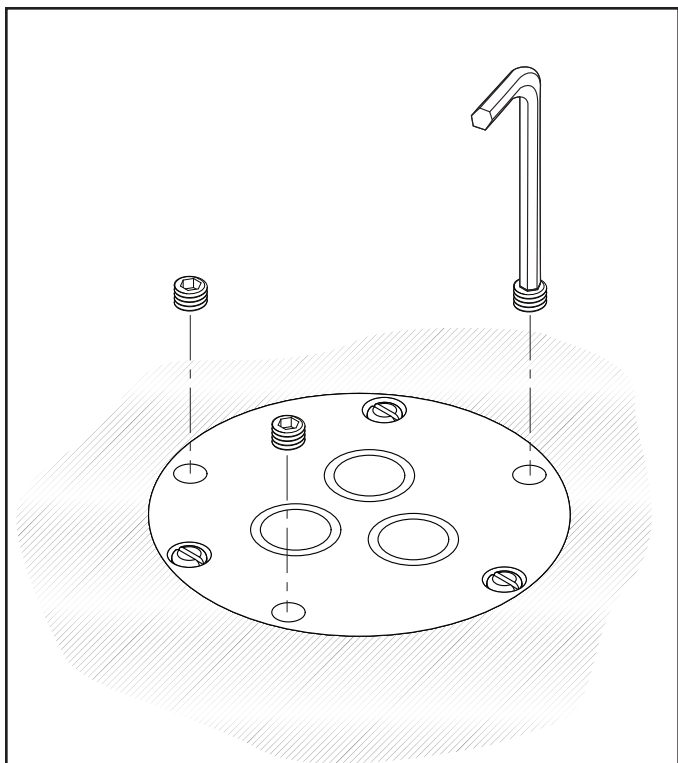


Figure 2. Remove protective hex screw to reveal Height Adjustment Screw.

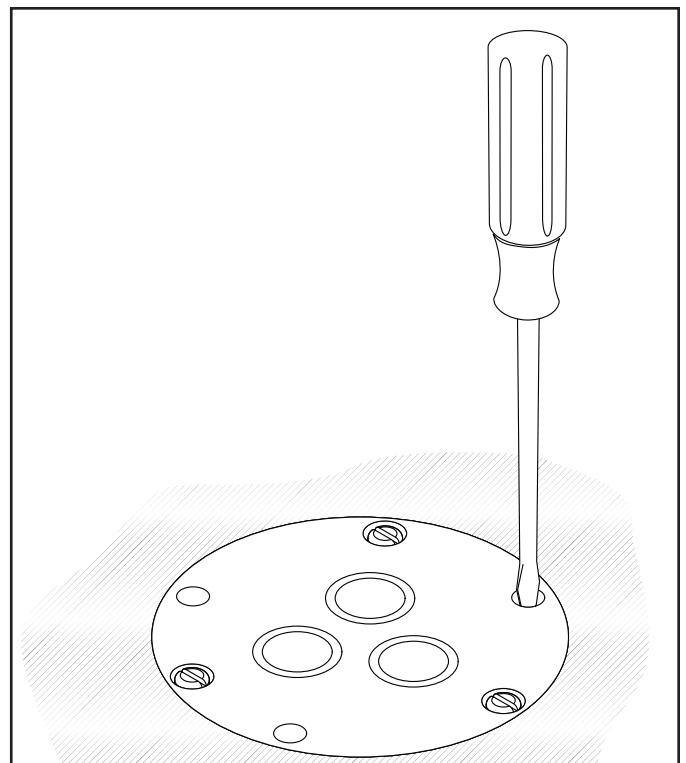
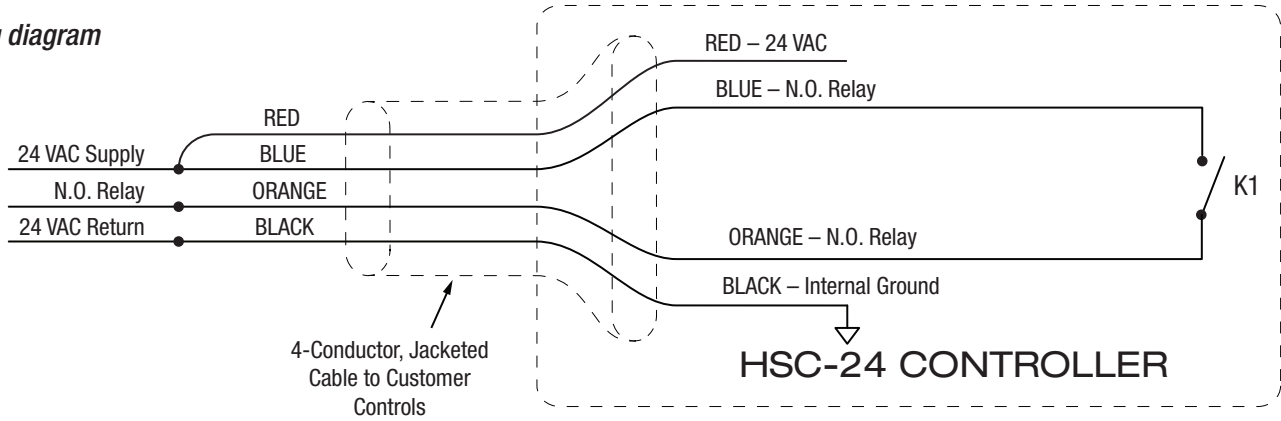


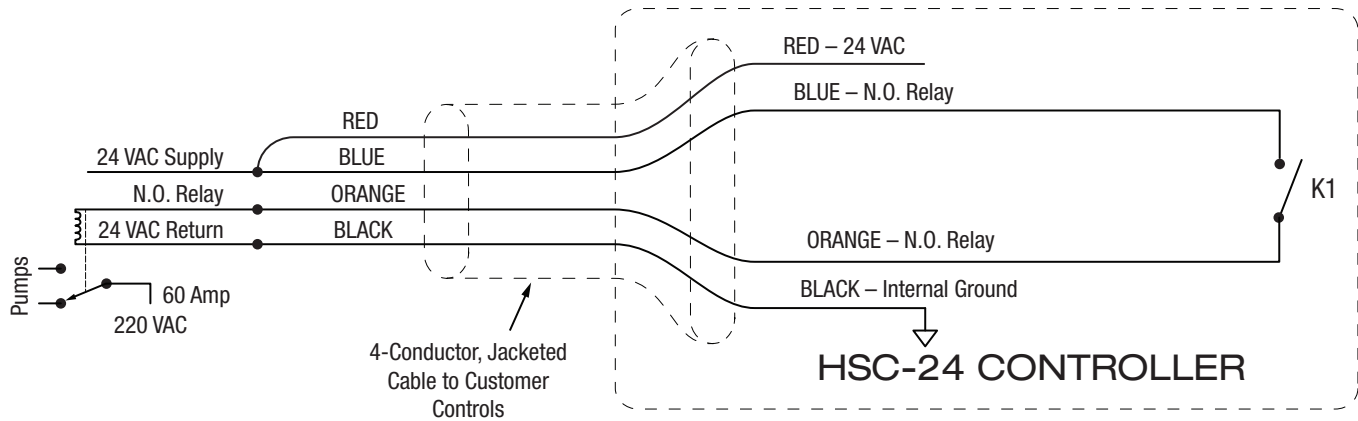
Figure 3. Rotate Height Adjustment Screw clockwise to lower or counterclockwise to raise sensor.

wiring diagram



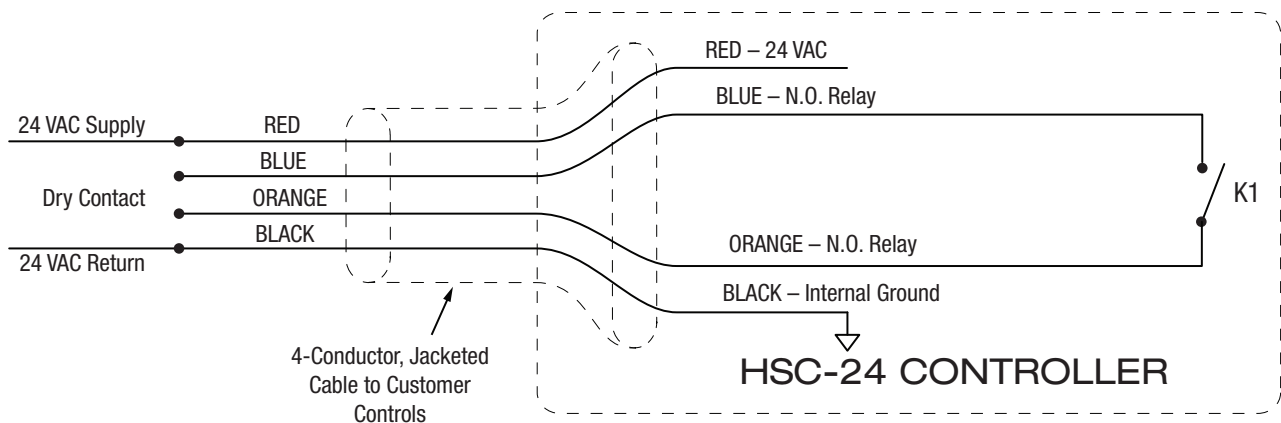
### HSC-24 Solenoids 24 VAC Wiring, Pumps < 1 Amp

Figure 4. Wire connections for 24 ac loads.



### HSC-24 “Ice Cube” Relay Wiring for Loads over 1 Amp

Figure 5. Wire connections for external relay with 24 ac coil.



### HSC-24 Wiring for Boiler Controllers

Figure 6. Wire connections for dry contact control.

## Wiring

Be sure to follow NEC and local code for all electrical connections.

A four-conductor direct-burial wet-environment cable is required to connect the HSC-24 sensor to the control panel. The 60-foot cable supplied with the HSC-24 meets these requirements. This may be extended up to 500 feet (152m) using 18 AWG 4-wire jacketed cable, or up to 2,000 feet (609m) using 12 AWG 4-wire jacketed cable.

Install all cables through conduit as indicated in the Conduit section.

Make sure that any cable runs greater than 60 feet are spliced together either in a suitable water-tight junction box or in some other water-tight or dry location.

Cable Connections for HSC-24 Snow Switch Pavement Sensor:

Wire Color	Function
Black	Ground
Red	24 V Power (AC or full-wave rectified)
Blue	Sensor Output Signal
Orange	Sensor Output Signal

Note: To call for heat, the blue and orange wires are connected together by the sensor's internal relay. These wires are interchangeable.

The HSC-24 can directly operate solenoids, pumps, or other loads up to a maximum of 60 W or 62 VA.

For applications of this type that operate at 24 V ac, see Figure 4.

For larger loads, the HSC-24 can operate a separate relay or contactor. Figure 5 shows the connections for an external relay with a 24 V ac coil.

Boiler controllers often need a dry contact closure to control their operation. The wiring for this type of connection is shown in Figure 6.

## Testing

The sensor installation should be tested before being placed in service. The HSC-24 has an internal self-test mode which can be used to help verify correct operation. A Digital Volt Meter (DVM) is used to test its operation.

1. Verify the supply voltage to the sensor. With the system turned on, measure the voltage from the sensor's black lead to the red lead. By measuring with an AC range setting and then with a DC range setting, each type of voltage will be shown on the DVM. Depending on the controller used, the DVM readings should be 11-12 VAC and 24-28 VDC (with rectified source), 22-28 VAC and 0 VDC (with pure ac source), or 0 VAC and 22-26 VDC (with pulsed DC source).
2. Meter Connections for Self Test

During self test, the sensor's internal heater can be tested using the DVM as a current meter. The sensor current is measured with the DVM connected in series with the sensor power lead (the red wire). The meter can be set to DC amps when the sensor is being powered by a functioning ETI control panel. It can be set to AC amps when

the unit is powered with a separate 24 VAC power supply. When the heater is off, the current will be about 5 mA. When the heater is on, the current will be about 250 mA.

During self test, the sensor's output signal can be tested with a voltmeter while the output lead is connected to a functioning control panel. The voltage is measured from the Blue lead to the Orange lead.

When the temperature is above 38°F or the sensor is dry, the output will be OFF. In this case there will be a voltage present from Blue to Orange (the voltage will depend on the system controller).

When the output is turned ON, the voltage from Blue to Orange will be zero volts.

The sensor can also be tested with at least one of the Blue and Orange leads disconnected, using the continuity-test mode on the DVM. When the output is OFF, Blue and Orange will be open; when the output is ON, they will have continuity.

3. After the meter connection is made, initiate the self-test mode as follows. A system power switch or temporary connection for the red power lead is needed to allow briefly interrupting the supply voltage to the sensor. See Figure 5.
  - a. Power is applied to the sensor.
  - b. Then between 0.1 second and 4 seconds later, the power is very briefly interrupted – for 50 to 100 milliseconds – and then reapplied. This can be done with a power switch, using a clip cable, or by temporarily wiring a normally-closed pushbutton so that it can be very briefly pressed.
  - c. The power is maintained after that power-up pulse, and the self-test then begins.

The self-test mode can be identified by the initial increase in current draw (part 5a, below). If that does not happen, it may be that self-test mode was not entered; this happens if the power-off pulse time is too long. In that case, remove power for at least two seconds, then repeat the off-pulse sequence (a-c) described above (Figure 7).

4. After self-test mode is initiated, the following will happen:
  - a. The heater turns on for three seconds. During this time, the current draw will increase to 0.25 amps. This can be monitored with the current meter as described in part 2.
  - b. As shown in Figure 7, the output and heater pulse some number of times to indicate the current temperature, measured to the nearest degree F. One pulse means below 38, 2 means at 38, 3 means above 38, 4 means there is a problem.
  - c. After that, the unit will go into moisture-sense mode. At this point, when moisture is sensed, the output will turn on. When moisture is not sensed, the output will turn off. This is monitored with the DVM as described in part 2.



- d. Moisture can be simulated with water on the sensor (at any temperature) or with a metallic object placed on the sensor to short one of the electrode disks to the outside rim of the sensor.

When moisture is sensed, in addition to the output turning on, the heater will begin pulsing with one second on and two seconds off. You can see that happening with the current meter.

- e. After one minute, the self-test will end, and the sensor will begin normal operation.
5. As an alternative to the self-test mode, the sensor can be tested with ice. To do this, place ten pounds (4.54 kg) of crushed ice over the sensor and wait about 20 minutes before observing that a low output voltage (2 volts or less) is indicated by the DVM. When the sensor temperature goes below 38° F (3.3° C) the sensor's output will turn ON and change to a lower voltage. If the sensor surface temperature is initially very warm then this procedure may take longer, perhaps 40 minutes or more.
6. With satisfactory results, disconnect the DVM and restore all sensor wiring connections.

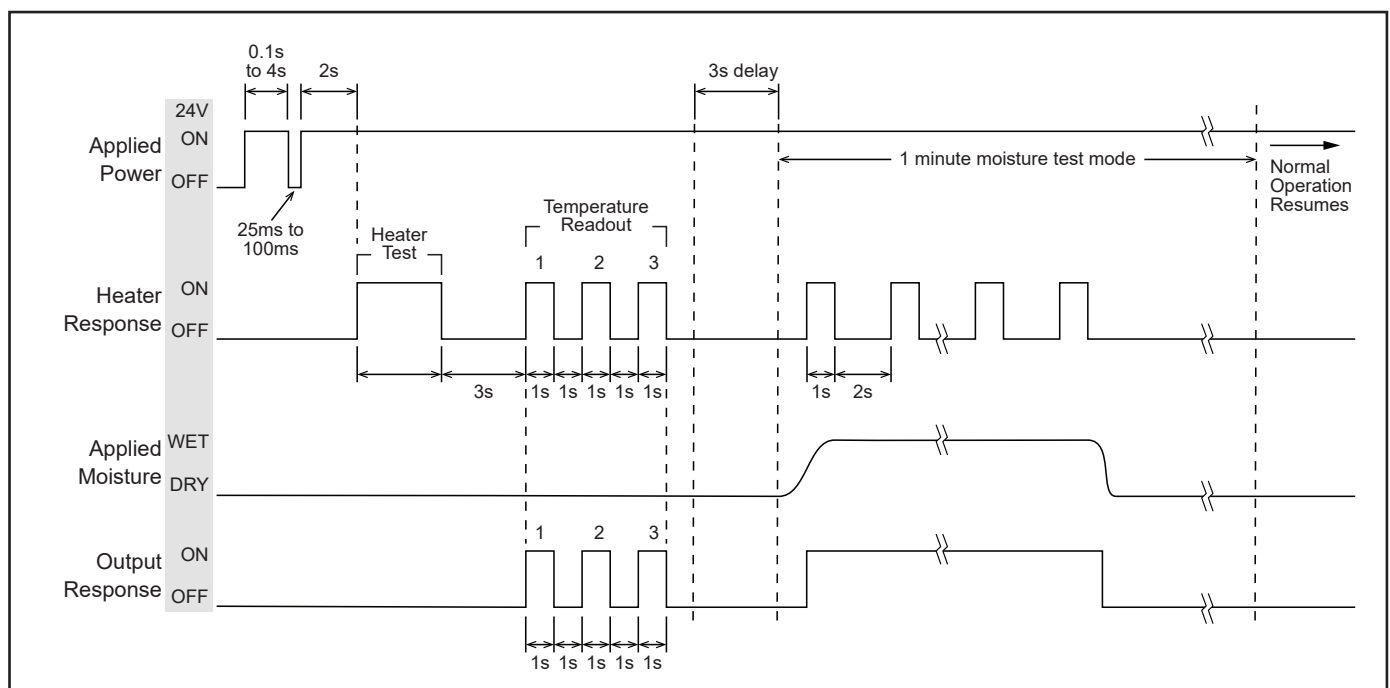


Figure 7. Sensor Self-Test Mode.

## Hold-on Time Display

The programmed hold time can be determined with this test. Using the sensor and meters connected as in the self-test mode (“Testing” section 2), apply power to the sensor and within four seconds quickly interrupt and restore the power twice. After a two second delay, the unit will pulse both the heater and output (one second on, one second off)  $n+1$  times to indicate the currently configured hold-on time. This will be repeated 5 times with 3 seconds between each set of pulses. See Figure 8.

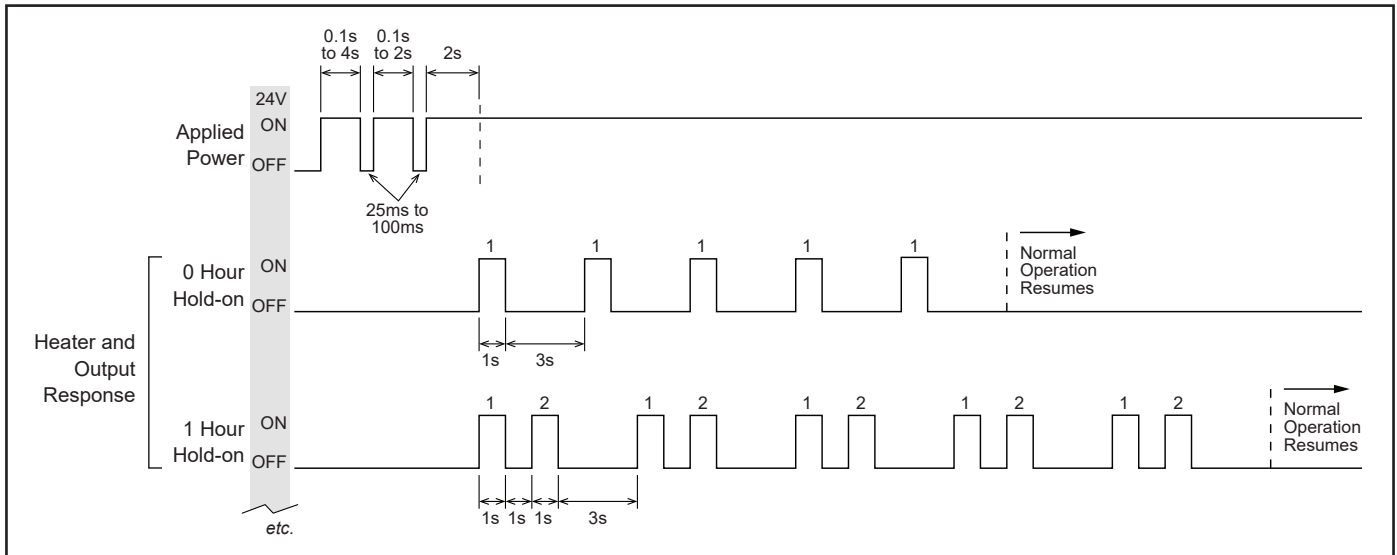


Figure 8. Hold-On Time Display Mode.

## Hold-on Time Configuration

The programmed hold time can be changed with this procedure. Apply power to the sensor and within four seconds quickly interrupt and restore the power three times. After a two second delay, the sensor will send three quick pulses to indicate it is in hold-on configuration mode. Interrupt and reapply power to create  $n+1$  quick pulses to zero volts, where  $n$  is the number of hours (from 0 to 6 hours, 1 to 7 pulses). See Figure 9. The first pulse must be within 6 seconds or the process aborts. There can be up to two seconds between pulses. After configuring the hold-on time, wait two seconds to initiate a save of the hold-on time. Once the hold-on time has been saved the sensor will display the new hold-on time with the same pattern used during the hold-on time display mode (Figure 8).

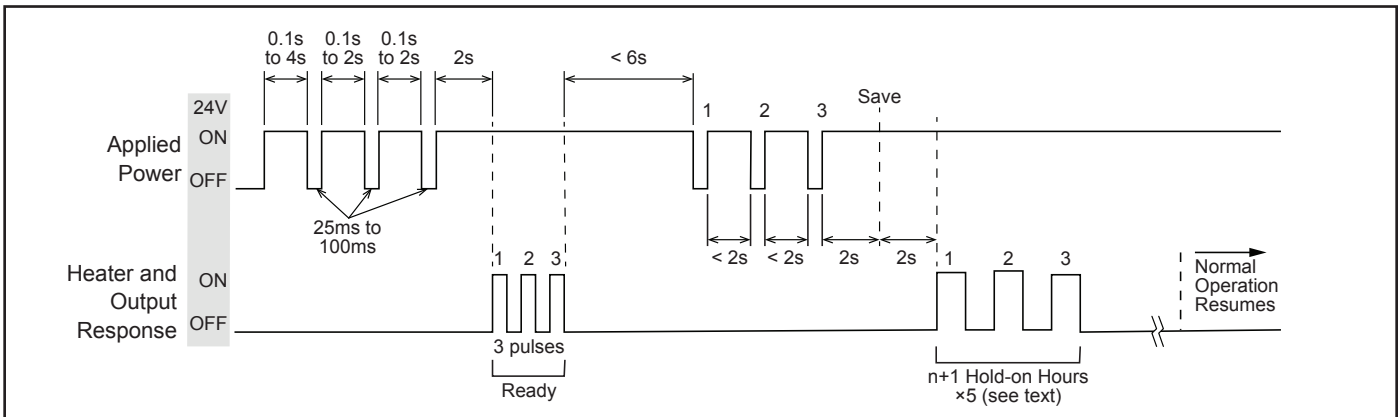


Figure 9. Hold-On Time Configuration Mode.

## Troubleshooting

Most issues are due to wiring error or moisture in the housing. Check for these issues first. If problem persists please contact your supplier or ETI Customer Service.

## Maintenance

The top of the sensor should be kept reasonably clean and free of gravel, leaves, mud, or other debris. If paving material, salt or another residue becomes adhered to the sensing elements, clean the surface with a Scotch™ Brite Pad. Do not use metallic or coarse abrasives or detergents.

We recommend that the HSC-24 sensor's power supply operate continuously even though you may elect to de-energize the snow/ice melting system main heaters at the season's end. The sensor will consume very little energy (a small fraction of a watt) and this will enhance the long-term reliability of the HSC-24 sensor.

## Returns and Replacements

Equipment cannot be returned for credit once it has been installed. Environmental Technology will repair or replace faulty equipment under warranty. Prior to removal of equipment for warranty return, please contact ETI Technical Support at (800) 234-4239 for troubleshooting assistance.

Before returning a unit to Environmental Technology, Inc., obtain a Return Merchandise Authorization from our Customer Service Department, available between 8:00 a.m. and 5:00 p.m. Eastern Time at (574) 233-1202 or (800) 234-4239. If possible, use the original container and packing materials when packing the unit for shipment. It is important to mark the Return Merchandise Authorization clearly on the outside of the shipping container so that it may be correctly processed upon receipt at Environmental Technology.

## SPECIFICATIONS

### General

Area of Use	Pavement
Activation Temperature	38° F (3.3° C)
Hold-on Time	User configurable to 0 h, 1 h, 2 h, 3 h, 4 h, 5 h, or 6 h
Default Hold-On Time	0 h up to 3 minutes after snow/ice/water no longer detected or 5 minutes after temperature rises above sense range
Materials	Brass with Epoxy and Polyurethane Fill
Weight	0.5 kg (1.1 lb)
Dimensions	Top Diameter: 9.84 cm (3.875 in) Top Thickness: 6.35 mm (0.25 in) Mounting Depth: 5 cm (2 in)

### Electrical

Circuit type	NEC Class 2
Supply voltage	24 Vac +/- 15%
Supply Current	5 mA idle, 0.25 A max.
Operating Power	6 W max.
Snow/Ice Sense Response Time	10 to 20 seconds
Output Signal	Voltage drop
Output Off	Relay Open
Output On (snow/ice present)	Relay Closed
Contact Rating	220 Vdc / 250 Vac / 2 A / 60 W / 62 VA max.
Cable Type	Direct Burial 4-Conductor 18 AWG
Cable Length	60 ft (18.3 m) included; may be extended: <ul style="list-style-type: none"> <li>• Up to 500' (152m) using 18 AWG 3-wire jacketed cable</li> <li>• Up to 2,000' (609m) using 12 AWG 3-wire jacketed cable</li> </ul>
Self Test Mode	Checks temperature, heater, and sensor grid. Indicates results with output and current pulses (see manual).
Compatible Controllers	APS , EUR, PD Pro, and GF Pro controllers, and other systems which can utilize contact-closure signaling and provide 24 Vac power.

### Environmental

Operating Temperature Range	-40 °C to 70 °C (-40 °F to 158 °F)
Snow/Ice Sense Temperature Range	-30 °C to 3 °C (-22 °F to 38 °F)
Storage temperature	-50°F to 180°F (-45°C to 82°C)

## ORDERING INFORMATION

Order Number	Description
25125	HSC-24 Pavement-Mounted Sensor (requires 23832 Pavement Sensor Housing)
23832	Pavement Sensor Housing

## LIMITED WARRANTY

Environmental Technology provides a two-year limited warranty that covers any defects in workmanship or materials. Contact Customer Service for complete warranty information.

## DISCLAIMER

Environmental Technology, Inc. makes no representations or warranties, either expressed or implied, with respect to the contents of this publication or the products that it describes, and specifically disclaims any implied warranties of merchantability or fitness for any particular purpose. Environmental Technology, Inc. reserves the right to revise this publication, and to make changes and improvements to the products described in this publication, without the obligation of Environmental Technology, Inc. to notify any person or organization of such revisions, changes or improvements.





**Environmental Technology, Inc.**

1850 N Sheridan Street, South Bend, Indiana 46628

(574) 233-1202 | (800) 234-4239

FAX (574) 233-2152 | (888) 234-4238

<http://www.networketi.com>