MESH/BRIDGE NODES & OAS/EMS NODES

VERSION 1.0

Hardware Manual

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Mesh/Bridge Nodes & OAS/EMS Nodes

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Part # 1200 – Hardware Manual

FCC Statement

The H900 equipment complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference; and

(2) This device must accept any interference received, including interference that may cause undesired operation.

FCC Caution: Any changes or modifications not expressly approved by Sensicast could void the user's authority to operate this equipment.

FCC RF Radiation Exposure Statement
This device must operate with a separation distance of at least 20 cm from all persons and must not be co-located or operated in conjunction with any other antenna or transmitter.

Table of Contents

Chapter 1

Overview, Safety, and Storage Information

This chapter presents an overview of the SensiMesh hardware and provides important safety and storage information for using your SensiMesh system.

This chapter provides important safety information for using your SensiMesh system. The current document is a prerelease document and is subject to change.

Important Safety Information

Use only Sensicast battery packs. Inspect battery pack prior to use and do not use if there is any evidence of leakage or deformity.

Do not operate in an explosive environment.

Chapter 2

Mesh/Bridge Nodes

This chapter describes the hardware features of Mesh/Bridge nodes.

Sensicast Mesh nodes can function either as network coordinators or as sensing/actuating nodes. As a coordinator, the Mesh node automatically configures itself into a wireless mesh network with primary and secondary redundant connections. As a node, the Mesh node wirelessly transmits data from third-party sensors and receives control commands for device actuation. The Mesh node supports a completely wireless, self-configuring, self-healing, power managed sensor network.

Sensicast Bridge nodes are specialized Mesh nodes that route data between the wireless mesh network and a host computer.

Components and Functions

The primary components of a Mesh/Bridge node include the node itself, the battery pack, the power supply, and the serial cable, each of which is described below.

Node

The node is comprised of the node circuit board inside a two-piece plastic housing.

Battery Pack

The battery pack is a 3V pack of four AAA alkaline batteries. The battery pack is used as back-up power for the Mesh/Bridge node in case of an external power disruption.

Power Supply

The power supply is a 120VAC/60Hz in, 6V DC out adapter that is used as the primary power source for the Mesh/Bridge node.

Serial Cable

The serial cable includes a stereo jack on one end and a standard DB9 connector on the other end. The stereo jack can be plugged into the node, while the DB9 connector can be plugged into a PC serial port.

Note

The serial cable is an option on the Mesh node; it is standard on the Bridge node.

Physical Interface

The physical interface includes the housing, mounting options, switches, connectors, LEDs, and other features. A number of key features are described in the sections below.

Front- Cover Closed

Figure 2-1 shows the front of a Mesh node and a Bridge node with their covers closed.

FIGURE 2-1: FRONT OF MESH NODE (PURPLE)/BRIDGE NODE (ORANGE)- COVER CLOSED.

As shown in Figure 2-1, features on the outside of a Mesh/Bridge node include red, yellow, and green LEDs; cover hinges; a cover fastener; holes for mounting the node; and connectors.

Front- Cover Open

Figure 2-2 shows the front of a Mesh/Bridge node with its cover open.

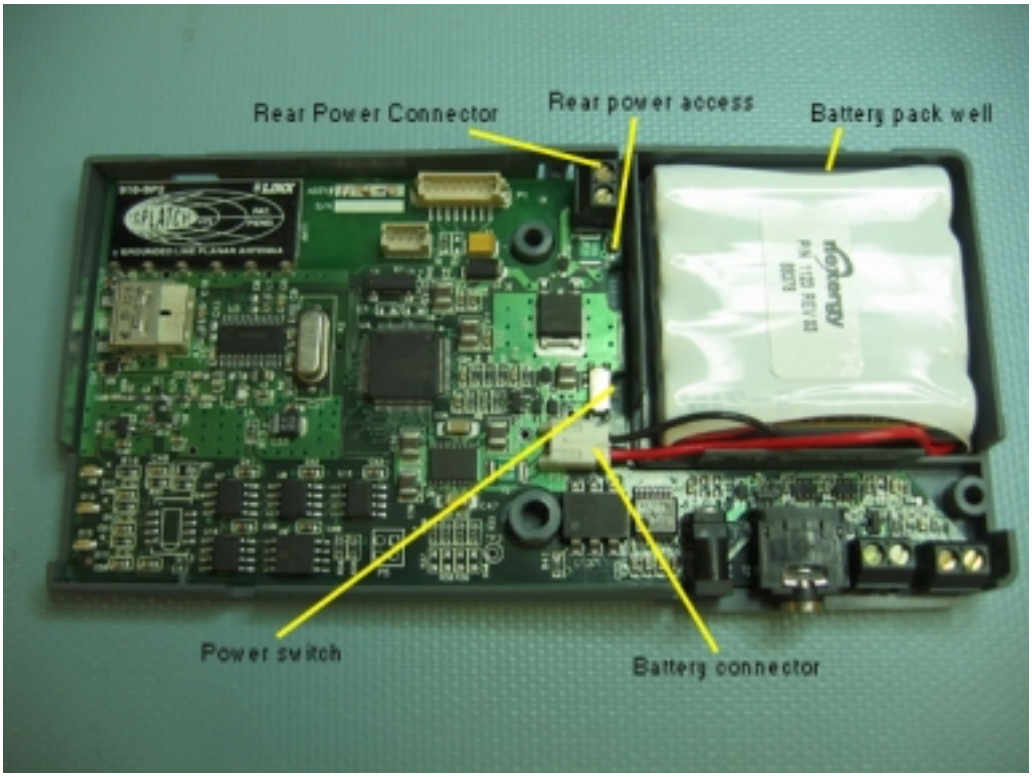

FIGURE 2-2: FRONT OF MESH/BRIDGE NODE- COVER OPEN.

As shown in Figure 2-2, features on the inside of a Mesh/Bridge node include the battery well, the battery connector, and the power switch.

Back

Figure 2-3 shows the back of a Mesh/Bridge node.

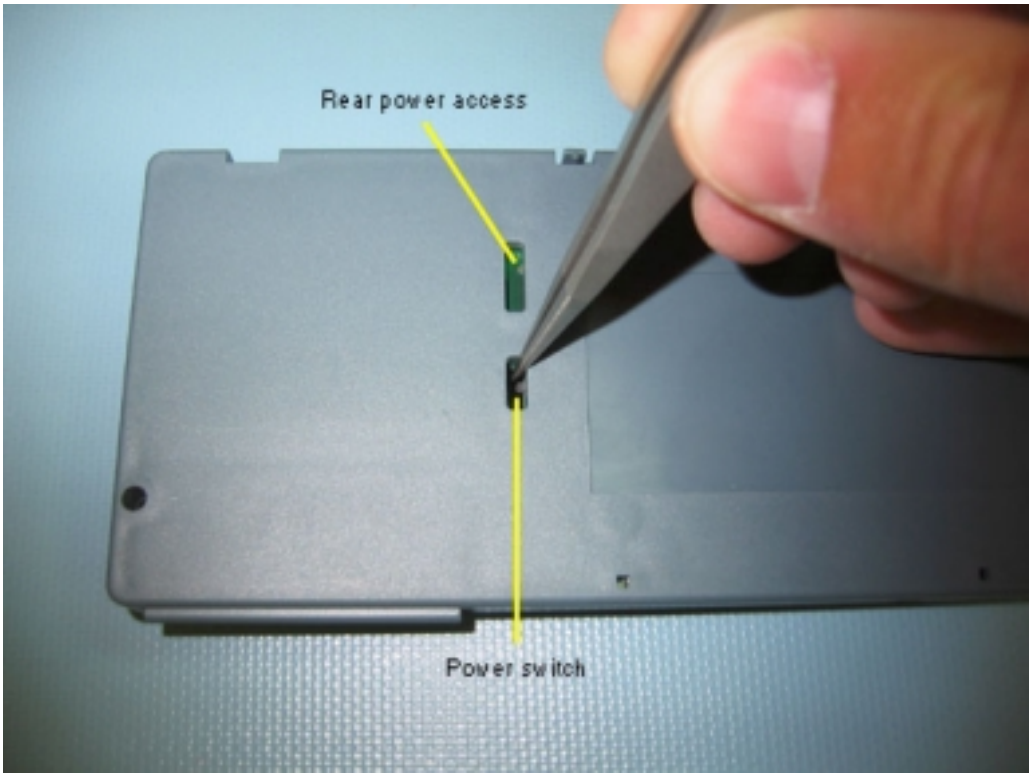

FIGURE 2-3: BACK OF MESH/BRIDGE NODE.

As shown in Figure 2-3, the main features on the back of a Mesh/Bridge node are the power switch and rear power access.

There is a barcode label on the back of a Mesh/Bridge node. This label contains the node ID and the association key for the node. The association key is entered into the database when the node is added to the network. When a node asks permission to join the network, it sends its node ID to the host. When the host gives permission, it replies with an association key specific to that node. This association key is listed in the SensiMesh database with the node ID. When the node receives this message, it confirms that the association key is correct. This provides a two-way safeguard against spoofing the node or network. If the association key in the database does not match the node's association key, the node will refuse to join the network and will not be shown in the network tree.

There is also a label on the side of the node. This label contains the node ID in human readable format. The node ID is slightly different from the association key and is used as a node identifier in the SensorNet Administration Software and other applications.

Electrical Interface

The electrical interface includes internal and external connectors, as described below.

Internal Connector

Figure 2-4 shows the internal electrical interface for the Mesh/Bridge node.

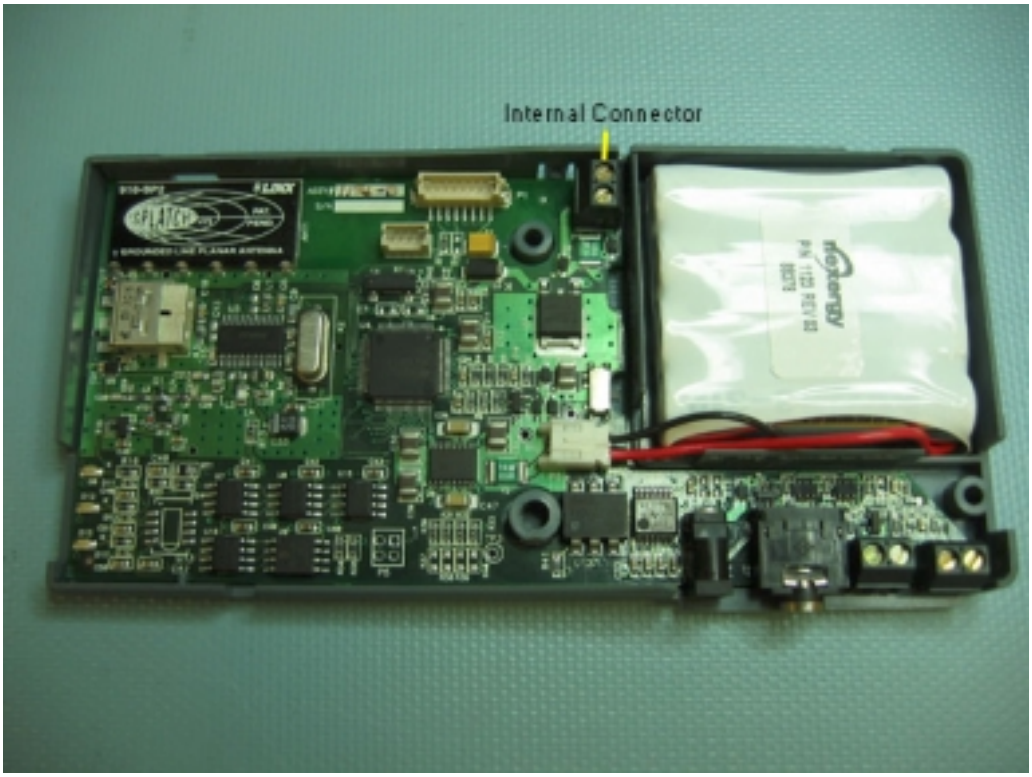

FIGURE 2-4: INSIDE OF MESH/BRIDGE NODE SHOWING INTERNAL ELECTRICAL INTERFACE.

The internal connector is a two-position screw terminal used to connect DC power from the rear of the device. The terminal marked with a "+" sign is the positive lead; the other terminal is ground.

Note

Acceptable input voltages for the internal connector range from 5V to 13V DC.

External Connectors

Figure 2-5 shows the external electrical interface for the Mesh node and the Bridge node.

FIGURE 2-5: FRONT OF MESH NODE AND BRIDGE NODE SHOWING EXTERNAL ELECTRICAL INTERFACE.

External connectors include a DC IN, a stereo jack, and two different screw terminals.

DC IN

The DC IN is a barrel connector designed to accept the connector on the Sensicast 6V DC power supply. The center conductor is positive; the outer conductor is ground.

Note

Be careful not to insert the power connector into the serial jack.

Stereo Jack 10101

The 10101 stereo jack is designed to accept the stereo plug on Sensicast serial cable.

Note

The serial cable is an option on the Mesh node; it is standard on the Bridge node.

Screw Terminal A

Screw Terminal A is a two-position screw terminal that is used to provide power out. The voltage is the node's supply voltage (nominally 3V). The terminal marked with a "+" sign is the positive voltage out; the other is ground.

The node's microprocessor can instead use Screw Terminal A as the output of a normally open (Form A) solid-state relay. When used as a relay, the maximum voltage that can be applied to the terminal is 18V. The maximum load the relay can conduct is 100mA. The maximum resistance when closed is 35ohms.

Screw Terminal B

Screw Terminal B is a two-position screw terminal that is used to read in analog voltages, digital signals or dry contact switches. The maximum voltage that can be applied to the positive terminal (indicated by a "+" sign) is the supply voltage of the node (nominally 3V). The other terminal is ground.

Note

When used for dry contacts, the maximum voltage that will be applied to either contact is +3.3V; the maximum resistance for a closed switch is 100ohms; and the minimum resistance for an open switch is 10Kohms.

Hardware Operation: What to Do/What to Avoid

The following sections describe some tips for hardware operation, including information about what not to do when using the Mesh/Bridge node.

Opening/Closing Node Cover

To open the node, loosen the screw in the center of the unit and tilt the cover up. The cover is hinged along the top. To close the lid, first fit the top of the cover over the top edge of the base to form a hinge, then swing the lid down into place. Secure the lid to the base using the screw in the center of the unit.

Removing and Installing Battery Packs

The SensiMesh system will indicate when a battery pack is low and should be replaced.

Before handling the batteries, be sure to turn off the node. To remove the battery pack, first open the node cover. Remove the battery pack just enough to gain access to the battery connector. Pull the connector out, holding on to the white plastic connector housing as much as possible to prevent the wires from breaking.

To install a new battery pack, plug the connector of the new battery pack into its connector on the circuit board inside the node. Remove the protective cover from the tape on the back of the battery pack and place the battery pack into its well. Arranging the red and black wires in the well with the battery will better secure the battery pack.

Once the new battery pack has been installed, close and secure the node cover. Dispose of the old battery pack properly.

Note

Use only Sensicast battery packs. Inspect battery pack prior to use and do not use if there is any evidence of leakage or deformity.

Power On/Off

When the node is open, slide the power switch down to turn the node on; slide it up to turn the node off. This is indicated on the printed circuit board.

When the node is closed, the power switch can still be accessed. From the back, insert an unfolded paperclip or similar tool (with a diameter of 1/16" or smaller) into the power switch slot. Slide the power switch down to turn the node on; slide it up to turn it off.

Resetting the Mesh/Bridge Node

To reset the circuitry, turn the node off, wait for 3 seconds, and turn the node on again.

Mounting the Mesh/Bridge Node

Use the enclosed #4 wood screws to mount the node using one or both of the mounting holes. The unit may also be attached using adhesives or double sided tape, allowing for the fact that the device weighs 4.5 ounces.

For the best radio antenna performance, mount the unit on a vertical surface, oriented so the label on the front of the node is readable.

Note

Avoid mounting the node near large pieces of metal.

Powering the Mesh/Bridge Node from the Barrel Connector

To power the node from the barrel connector, first turn off the node. Insert the Sensicast 6V wall adapter into a 120VAC/60Hz outlet. Take the barrel connector that is attached to the wall adapter and insert it into the "DC IN" connector on the node. Finally, turn the node on again.

Note

 Be careful not to insert the power connector into the serial jack.

Serial Connection

To use a serial connection with the Mesh/Bridge node, insert the stereo plug end of the Sensicast serial cable into the connector on the front of the node marked "10101". Connect the DB9 connector to your DTE serial device (e.g., a personal computer). The signals are RS-232 levels.

> **Note**
>
> The serial cable is an option on the Mesh node; it is standard on the Bridge node.

Connecting to the Screw Terminals

The screw terminals can accept wires from 28AWG to 22AWG. (Solid wire or stranded wire that has been tinned works best.) Strip approximately 0.125" inches of insulation from the wire before inserting them and tightening the screw.

Chapter 3

OAS/EMS Nodes

This chapter describes the hardware features of OAS/EMS nodes.

Sensicast Object Alarm System (OAS)/Environmental Monitoring System (EMS) nodes report accurate, real-time data on touch, temperature, and humidity to a central management application. OAS/EMS nodes are user-configurable, allowing the user to adjust remotely the desired data transmission interval for specific applications. EMS nodes also support the remote setting of different temperature and humidity thresholds.

Components and Functions

The primary components of an OAS/EMS node include the node itself, the battery pack, and the touch sensors, each of which is described below.

Node

The node is comprised of the node circuit board inside a two-piece plastic housing.

Battery Pack

The battery pack is a 3V pack of four AAA alkaline batteries. The battery pack is used to power the OAS/EMS node.

Touch Sensors

One or two touch sensors can be attached to the node. Figure 3-1 shows a Sensicast touch sensor.

FIGURE 3-1: SENSICAST TOUCH SENSOR.

Note

Touch sensors are an option for OAS nodes only.

Physical Interface

The physical interface includes the housing, mounting options, switches, connectors, LEDs, and other features. A number of key features are described in the sections below.

Front- Cover Closed

Figure 3-2 shows the front of an OAS node and an EMS node with their covers closed.

FIGURE 3-2: FRONT OF OAS NODE (RED)/EMS NODE (BROWN)- COVER CLOSED.

As shown in Figure 3-2, features on the outside of an OAS/EMS node include red, yellow, and green LEDs; a sounder output; a temperature/humidity sensor port (EMS nodes only); cover hinges; a cover fastener; holes for mounting the node; and connectors.

Front- Cover Open

Figure 3-3 shows the front of an OAS/EMS node with its cover open.

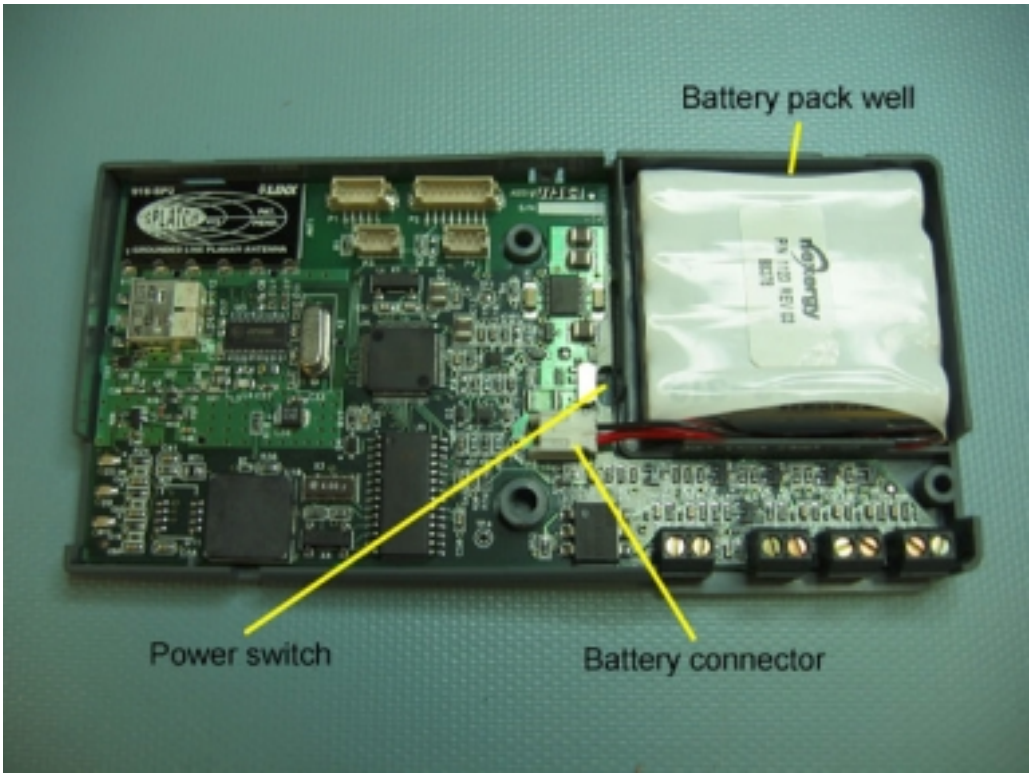

FIGURE 3-3: FRONT OF OAS/EMS NODE- COVER OPEN.

As shown in Figure 3-3, features on the inside of an OAS/EMS node include the battery well, the battery connector, and the power switch.

Back

Figure 3-4 shows the back of an OAS/EMS node.

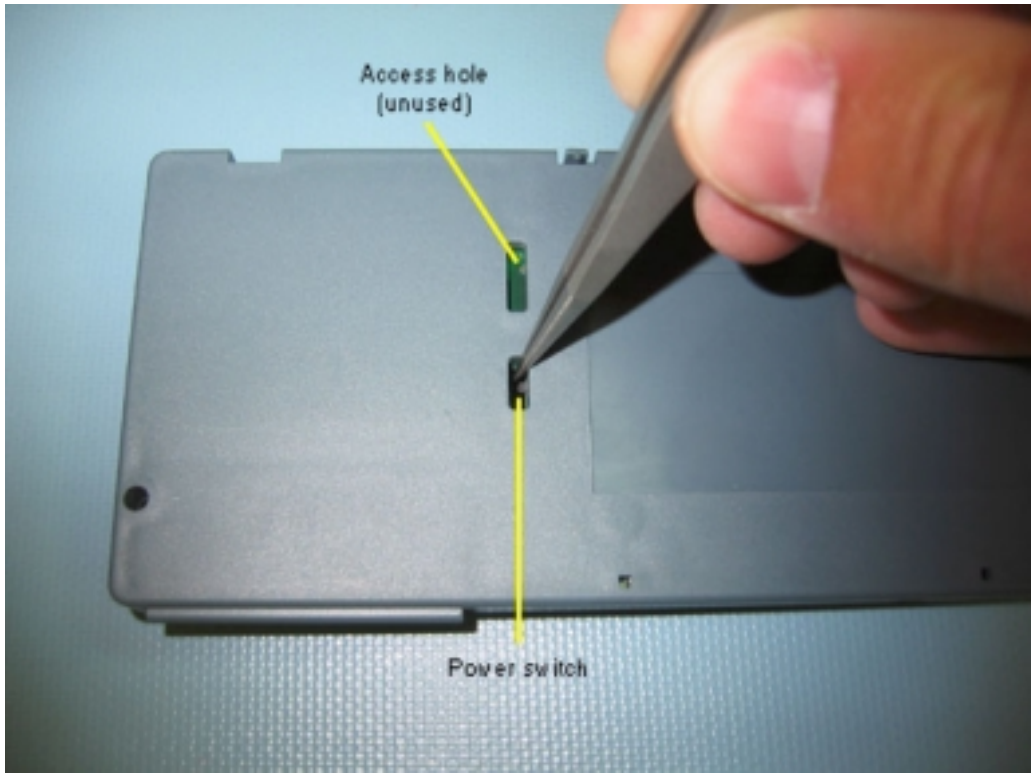

FIGURE 3-4: BACK OF OAS/EMS NODE.

As shown in Figure 3-4, the main feature on the back of an OAS/EMS node is the power switch.

There is a barcode label on the back of an OAS/EMS node. This label contains the node ID and the association key for the node. The association key is entered into the database when the node is added to the network. When a node asks permission to join the network, it sends its node ID to the host. When the host gives permission, it replies with an association key specific to that node. This association key is listed in the SensiMesh database with the node ID. When the node receives this message, it confirms that the association key is correct. This provides a two-way safeguard against spoofing the node or network. If the association key in the database does not match the node's association key, the node will refuse to join the network and will not be shown in the network tree.

There is also a label on the side of the node. This label contains the node ID in human readable format. The node ID is slightly different from the association key and is used as a node identifier in the SensorNet Administration Software and other applications.

Electrical Interface

Figure 3-5 shows the electrical interface for the OAS node and the EMS node.

FIGURE 3-5: FRONT OF OAS NODE AND EMS NODE SHOWING ELECTRICAL INTERFACE.

Each of the electrical interface connectors is a two-position screw terminal.

OUT

The terminals labeled "OUT" are the two terminals of a normally open (Form A) solid-state relay under the control of the node's microprocessor. The maximum voltage that can be applied to either of the terminals is 18V. The maximum load the relay can conduct is 100mA. The maximum resistance when closed is 35 ohms.

IN AUX

The terminals labeled "AUX" are designed to connect to either normally open (Form A) or normally closed (Form B) dry contact sensors. The maximum voltage that can be applied to either of the terminals is +3.3V. The maximum resistance for a closed switch is 100 ohms; the minimum resistance for an open switch is 10 Kohms.

IN A and IN B

Either or both of the terminals labeled "A" and "B" can be attached to a Sensicast touch sensor. These terminals can also act as inputs for dry contact sensors in a similar manner to the AUX connector.

Note

Touch sensors are an option for OAS nodes only.

Hardware Operation: What to Do/What to Avoid

The following sections describe some tips for hardware operation, including information about what not to do when using the Mesh/Bridge node.

Opening/Closing Node Cover

To open the node, loosen the screw in the center of the unit and tilt the cover up. The cover is hinged along the top. To close the lid, first fit the top of the cover over the top edge of the base to form a hinge, then swing the lid down into place. Secure the lid to the base using the screw in the center of the unit.

Removing and Installing Battery Packs

The SensiMesh system will indicate when a battery pack is low and should be replaced.

Before handling the batteries, be sure to turn off the node. To remove the battery pack, first open the node cover. Remove the battery pack just enough to gain access to the battery connector. Pull the connector out, holding on to the white plastic connector housing as much as possible to prevent the wires from breaking.

To install a new battery pack, plug the connector of the new battery pack into its connector on the circuit board inside the node. Remove the protective cover from the tape on the back of the battery pack and place the battery pack into its well. Arranging the red and black wires in the well with the battery will better secure the battery pack.

Once the new battery pack has been installed, close and secure the node cover. Dispose of the old battery pack properly.

Note

Use only Sensicast battery packs. Inspect battery pack prior to use and do not use if there is any evidence of leakage or deformity.

Power On/Off

When the node is open, slide the power switch down to turn the node on; slide it up to turn the node off. This is indicated on the printed circuit board.

When the node is closed, the power switch can still be accessed. From the back, insert an unfolded paperclip or similar tool (with a diameter of 1/16" or smaller) into the power switch slot. Slide the power switch down to turn the node on; slide it up to turn it off.

Resetting the OAS/EMS Node

To reset the circuitry, turn the node off, wait for 3 seconds, and turn the node on again.

Mounting the OAS/EMS Node

Use the enclosed #4 wood screws to mount the node using one or both of the mounting holes. The unit may also be attached using adhesives or double sided tape, allowing for the fact that the device weighs 4.5 ounces.

For the best radio antenna performance, mount the unit on a vertical surface, oriented so the label on the front of the node is readable.

> **Note**
>
> Avoid mounting the node near large pieces of metal.

Connecting to the Screw Terminals

The screw terminals can accept wires from 28AWG to 22AWG. (Solid wire or stranded wire that has been tinned works best.) Strip approximately 0.125” inches of insulation from the wire before inserting them and tightening the screw.

Temperature/Humidity Sensor

The temperature and humidity sensor is located under the temperature/humidity port indicated in the drawing.

> **Note**
>
> Temperature/humidity sensors are an option for EMS nodes only.

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