Subfloor EZ Node
Hardware Installation Guide

Version 1.0

SYNAPSENSE
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SynapSense Subfloor EZ Node Hardware Installation Guide

SynapSense Corporation

340 Palladio Parkway, Suite 530

Folsom, CA 95630

Tel: (916) 294-0110

Fax: (916) 294-0270

Web: www.SynapSense.com

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Notice to Users:

This equipment has been tested and found to comply with the limits for Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If the equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Plug the equipment into an outlet on a circuit different from that which the receiver is plugged.
- Consult the dealer or an experienced radio/TC technician for help. This product works using a radio frequency, so use on an airplane may be restricted due to interference.

FCC Statement:

This device 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. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

CE Statement:

This equipment has been tested and found to comply with the limits of the European Council Directive on the approximation of the law of the member states relating to electromagnetic compatibility (89/336/EEC) according to EN 55022 Class B.

Industry Canada Equipment Notice:

The Industry Canada certification identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements as prescribed in the appropriate Terminal Equipment Technical Document(s). The Department does not guarantee the equipment will operate to the user's satisfaction. Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations. Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Users should ensure, for their own protection, that the electrical ground connectors of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This presentation may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority or electrician, as appropriate.

Warranty Information

Limited One Year Warranty

Our company warrants that for one year from the date of purchase, it will replace this product if found to be defective in materials or workmanship. For a prompt, no charge replacement of equivalent product, contact technical support at **support@synapsense.com** or by phone.

This replacement is the company's sole obligation under this warranty. SynapSense Corporation will not be responsible for any incidental or consequential damages or for any loss arising in connection with the use or inability to use this product. Some states/provinces do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty excludes defects or damage due to misuse, abuse, or neglect. This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state/province to province.

Technical Support Center

Telephone: +1.916.294.0110 option 2
Email: **support@synapsense.com**
340 Palladio Parkway, Suite 530
Folsom, CA 95630
United States of America

RF Device Warning (Traditional Chinese)

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依據低功率電波輻射性電機管理辦法
第十二條經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。
第十四條低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前項合法通信，指依電信規定作業之無線電信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

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Table of Contents

CHAPTER 1.

Introduction

This chapter provides an overview of the Subfloor EZ Node hardware, introduces this installation guide, and lists general warnings and precautions.

In this chapter:

Overview

The Subfloor EZ Node is a wireless sensor that measures subfloor temperature and pressure differences between the data center room and its subfloor cavities. The Subfloor EZ Node contains:

- A high-pressure (positive) barb and a high-pressure air hose fitted with a diffuser, which is placed in the subfloor.
- Two low-pressure (negative) barbs connected to each other by a U-turn (a short hose bent in a "U" shape), which allows the node to sense low pressure internal to the unit. If necessary, you can remove the U-turn and attach a hose to the center barb to sense low pressure away from the node.
- A thermistor connected to the node via a harness. This allows the node to sense temperature away from the node.

Once installed and operational, the node transmits temperature and air pressure data to the Web Console. Combined with data collected from other Subfloor EZ Nodes located throughout the data center, operators use this information to adjust fan speeds and relocate perforated tiles to increase CRAC/CRAH efficiency.

About this Installation Guide

This document provides guidelines and instructions for installing SynapSense® Subfloor EZ Nodes to designated service companies or the customer. The intended audience for this document consists of customers or partners of SynapSense Corporation, SynapSense installers, and SynapSense installation teams. SynapSense "Tier 1" training is highly recommended for installation engineers and others who are installing SynapSense hardware or closely involved with the installation of data center optimization equipment.

Document Conventions

Table 1 defines the style conventions used throughout this document.

Table 1 – Installation Guide Style Conventions

Item	Description
Bold and Blue	Used for anything a user types, clicks, presses, or taps, for example, Click **OK**
Note:	Exceptions to the rule and other important information will be set off with this note style
	Denotes a warning

Item	Description
	Denotes a safety warning of a physical or electrical nature

Document References

The documents listed in this section affect the activities in this document. Refer to the appropriate document for user-specific information.

- Web Console™ User Guide
- MapSense™ User Guide
- Active Control™ User Guide
- SynapSense Software Installation Guide

Warnings and Precautions

The following warnings and precautions pertain to Subfloor EZ Node installations. Failure to adhere to warnings and precautions could result in physical injury or damage to equipment, which may void the warranty.

Warning: Data centers may pose a risk of hearing loss. Use appropriate ear protection prior to entry into high-noise areas.

Warning: When performing subfloor work in a data center, be careful not to stress, crush, pull, or disconnect wiring and hoses running underneath electrical and data cables, leak detectors, etc. (including fire alarm/suppression systems).

Warning: Subfloor work poses significant trip/fall hazards and eye hazards from airflow-borne debris. Eye protection must be worn at all times when removing or replacing floor tiles and when working in or around areas with removed tiles.

Safety Warning: Installation of this equipment must be in accordance with local and national electrical codes.

Safety Warning: This product contains Lithium metal primary cell batteries, which are NOT rechargeable. Recharging can cause battery leakage or cause the safety release vent to open. Inadvertent charging can occur if battery installation is backwards. Dispose of batteries appropriately after use.

Safety Warning: Lithium metal batteries may pose a fire, explosion, or burn hazard if misused. Do not open batteries, dispose of in fire, heat above 100° C (212° F), expose contents to water, recharge, put in backwards, or mix with used or other battery types as this may cause the batteries to explode or leak and cause personal injury.

Safety Warning: Lithium metal batteries must be properly packed and shipped in accordance with transportation standards.

Safety Warning: Do not touch any electrical or computer/server equipment in the data center without approval from data center operators (including loose cables, pushcarts, and terminals).

CHAPTER 2.

Getting Started

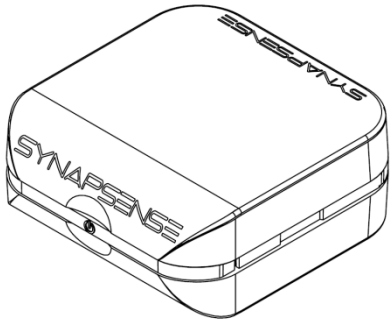
This chapter lists the hardware, software, tools, and additional material requirements for installing Subfloor EZ Nodes.

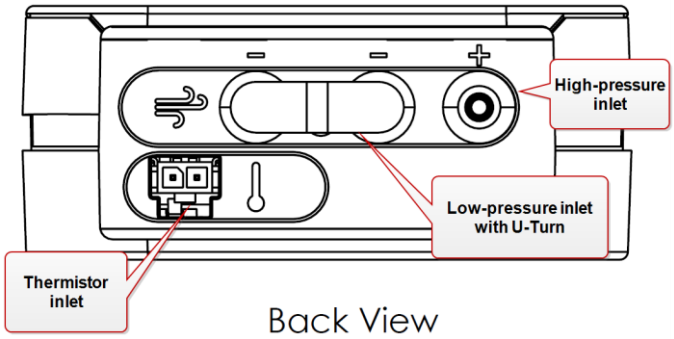
In this chapter:

Required Hardware

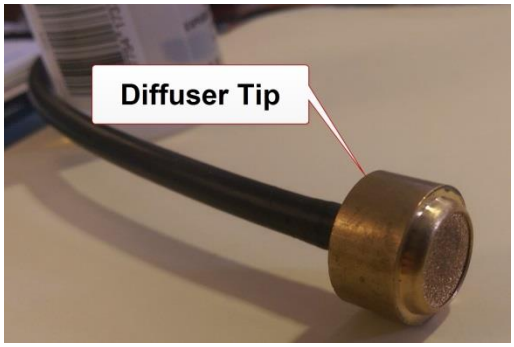
The required hardware is included in the Subfloor EZ Node and the Accessory Kit, which contain these components:

- One wireless Subfloor EZ Node module with two installed batteries

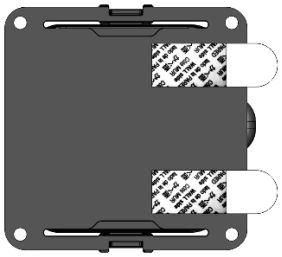




- One 3-foot long air hose fitted with one diffuser tip on one end.



- One mounting bracket with preinstalled command strips.



- Cable ties, 24" thermistor harness, mounting bracket (not shown)

PLACE LOW-PRESSURE DIFFUSER IN STILL AIR.

Warning: The Subfloor EZ Node contains a low-pressure sensor internal to the unit, but if a client needs to have the U-turn hose replaced by an external hose, make sure to position the low-pressure diffuser (-) in an area of still air. Rapidly moving air provides incorrect pressure readings. Keep diffuser at least one foot away from server fan airflow, holes in the subfloor, or perforated floor tiles.

PLACE HIGH-PRESSURE DIFFUSER AWAY FROM OBSTRUCTIONS.

Warning: Position the high-pressure (+) diffuser away from air turbulence in the subfloor cavity (for example, large cable bundles, electrical boxes, wall outside corners, bends or edges, and concrete support columns).

BE CAREFUL WHEN REMOVING HOSES FROM A PRESSURE NODE.

Warning: Hose connections on the Subfloor EZ Node are brittle, particularly in subfloor cavities or cold aisles where chilled air is present. See *Replacing a Subfloor EZ Node Diffuser Hose* on page 18 for more information.

Required Software

The Subfloor EZ Node installation requires the installation of the following SynapSense software:

- Web Console™
- MapSense™ (including optional Active Control™ software with MapSense project *.dlz file exported to the Web Console)

Installation of SynapSense software generally takes place prior to hardware installation. This prevents redundancy of hardware verification activities. Refer to the SynapSense Software, Web Console, and MapSense Installation and User Guides for more information.

Required Tools and Materials

Table 2 lists the minimum tool and material requirements installers need to bring to the job site.

Table 2 – Required Tools and Materials

Item	Description/Comments
Attire	Proper dress and shoes for performing work in a data center (including areas inside the sub-floor and above ceiling tiles)
Additional Parts	Spare Subfloor EZ Nodes and batteries
Laptop	To configure settings (such as gateway settings)
Fasteners	Cable ties, 3M™ Command Strips (preinstalled). Adhesive cable clips are necessary only when an external low-pressure hose is requested.
Tools	Flashlight, diagonal cutters for cable ties, utility knife, scissors, tile pullers, screwdrivers, and alcohol wipes
Label Maker	To create identification labels
Barcode scanner	To scan Subfloor EZ Node MAC IDs
Digital Camera	To document wiring before sealing enclosure (for troubleshooting and customer documentation purposes)
Documentation	• A printed copy of this installation document • Web Console and MapSense User Guides • Printed MapSense layout of the data center (with installation locations)
Identification	Photo ID to present to data center security personnel

CHAPTER 3.

Installing Subfloor EZ Nodes

This chapter describes general guidelines and specific procedures for installing Subfloor EZ Nodes.

In this chapter:

General Installation Guidelines

Ensure software installation and required file exports are complete before installing hardware.

Be consistent and neat.

- Match all node installations in appearance to ensure optimum data collection
- Ensure there are no hard turns or kinks in hoses during routing and installation
- Ensure each node provides a representative pressure measurement of the surrounding area
- Clean installation surfaces thoroughly with alcohol wipes and allow area to dry
- Ensure no tripping or other data center wiring hazards result from Subfloor EZ Node installation
- Adhere to safety regulations
- Inform customer when relocating nodes to ensure compliance with site safety protocols

Use cable ties and adhesive cable clips as needed.

- Attach cable ties such that the locking mechanism is always on the inside
- Use diagonal cutters to clip cable tie ends close to its locking mechanism
- When external low-pressure hoses are requested, use adhesive cable clips to ensure appropriate air pressure measurements

Installation Process Flow

Figure 1 shows the installation process flow for installing Subfloor EZ Node.

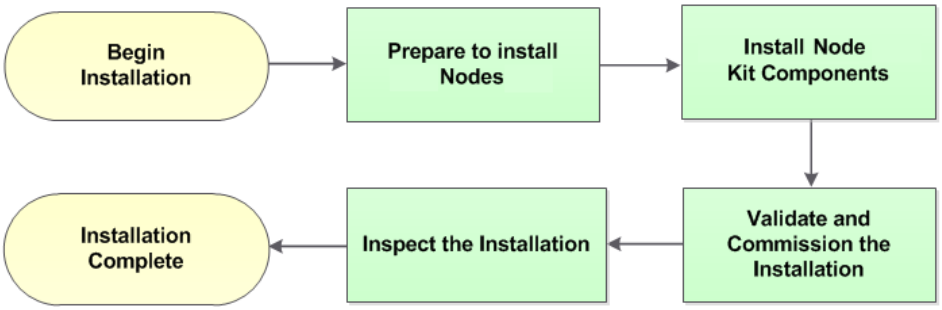


Figure 1 – Subfloor EZ Node Installation Process Flow

Preparing to Install the Subfloor EZ Node Hardware

The SynapSense Field Engineer is responsible for confirming installation readiness and completing these steps:

1. Assure the following steps are complete:
    a. Required software is installed and configured.
    b. Gateways are installed and powered on.
    c. All products and tools necessary for installation are on site.
2. Verify the receipt of quantities and contents listed on packing/shipping list found in Box 1.
    a. Place kits in front of each cabinet number on the kit bag (or as numbered on the printed MapSense layout).
    b. Verify install team has all necessary tools and additional materials to complete installation and site is ready for installation.
3. For Subfloor EZ Nodes with MAC IDs not yet recorded or scanned, follow these steps:
    a. Record the Subfloor EZ Node MAC IDs manually, or capture them using a barcode scanner and upload them into MapSense.
    b. Access the site layout from the MapSense application. Refer to the MapSense User Guide.
    c. Add and configure Subfloor EZ Node objects and associated IDs in the data center floor plan.
4. Export the MapSense project *.dlz file from MapSense for viewing in Web Console.
5. Determine where the subfloor sensor routing will be located.

Subfloor EZ Node Placement

- The Subfloor EZ Node is to be mounted under the back of the cabinet or adjacent to the floor penetration inside the cabinet.
- The high-pressure diffuser is to be located under the floor.
- The temperature sensor is to be located under the floor.

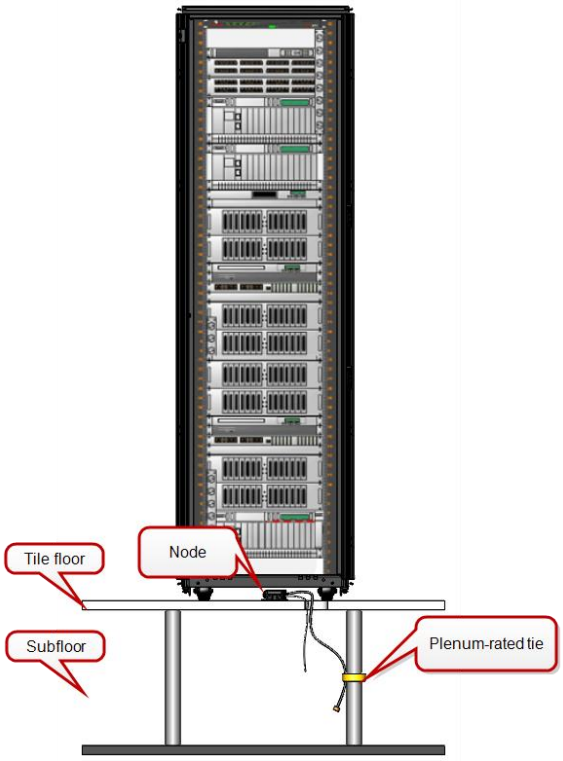
Installing the Subfloor EZ Node

This section provides the steps for installing Subfloor EZ Nodes. After installing the Subfloor EZ Nodes, see **Validating and Commissioning the Subfloor EZ Node Installation** to validate the installation and commission pressure nodes. See **Inspecting the Installation** to complete the installation.

In all configurations, hose lengths should not be excessive (short or long) and routing should be smooth. Avoid hard turns and kinks.

Cabinet to Subfloor

Subfloor EZ Nodes located on the floor behind the cabinet have a high-pressure hose/diffuser routed through a hole in the tile floor and secured to the stanchion with a cable tie.



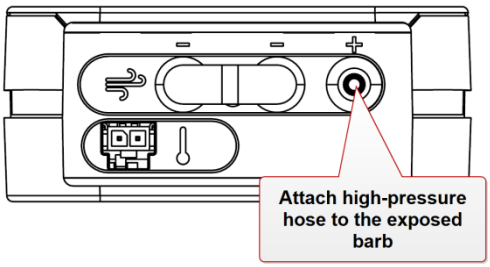
Warning: Position the diffusers in areas of still air.
Hose connections may be brittle, particularly in chilled subfloor or cold aisles areas.

Cabinet and Subfloor Installation

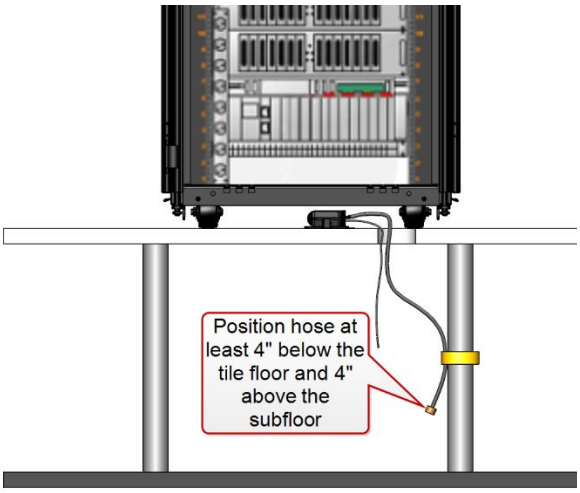
Perform the following steps for a standard installation of a Subfloor EZ Node behind a cabinet.

Note: If an external low-pressure hose is requested, you will need to remove the U-turn and install the low-pressure hose on the center barb.

1. Prepare and route the diffuser hose.
    a. Determine Subfloor EZ Node location (behind cabinet).
    b. Determine necessary length for the high-pressure hose. The maximum length is 3 feet. If needed, trim the hose to the appropriate length using scissors or a utility knife.
    c. Attach the hose to the exposed barb using gentle but firm pressure.



    d. Attach the external temperature sensor to the connector
    e. Remove the tile above the subfloor cavity near the cabinet with a tile puller.
    f. Secure the diffuser hose to the stanchion with a plenum-rated cable tie, with the diffuser pointed down.
    g. Place the temperature sensor in the subfloor.

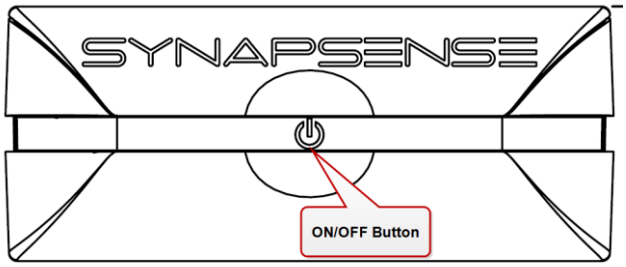


Warning: Do not allow diffusers to lay on the subfloor. Position the diffuser on stanchion a minimum of four inches from the subfloor and four inches from the underside of the tile floor.

2. Activate, position, and secure the Subfloor EZ Node.
    a. Once the hoses are connected, activate the Subfloor EZ Node by

pressing the ON/OFF button on the light pipe once.

b. Ensure the Subfloor EZ Node is active. The light pipe will display as **green** when the node is activated.



c. Make sure the area where the Subfloor EZ Node will reside is clean and free of debris.

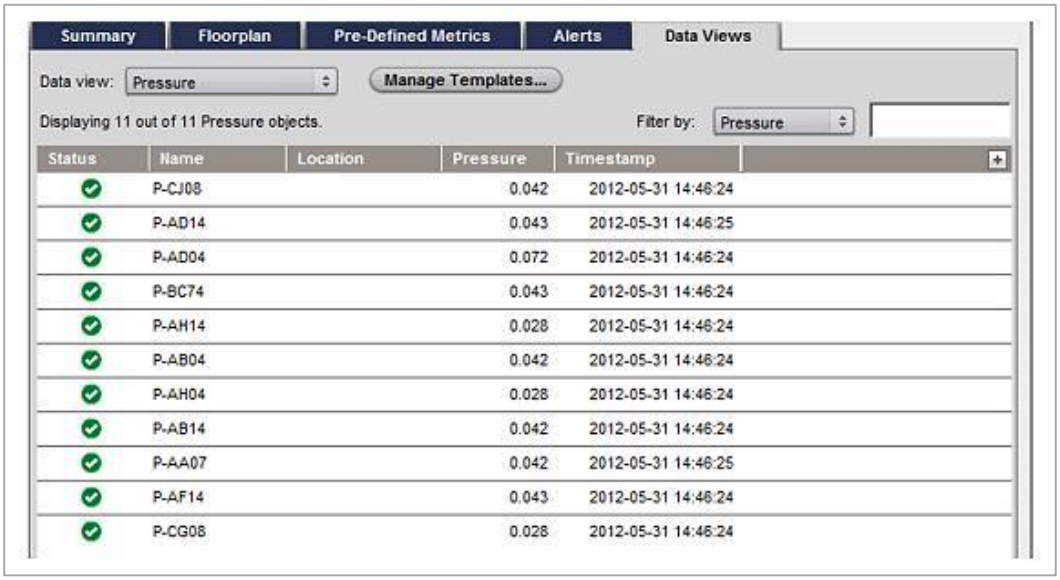
3. Finalize hose routing, replace tiling, and clean area.
   a. Remove tools and debris from cabinet and subfloor areas.
   b. Replace tile over subfloor cavity.

Validating and Commissioning the Subfloor EZ Node Installation

Validate and commission the Subfloor EZ Node installation by activating the Subfloor EZ Node and confirming node communication with the SynapSense Web Console software application. Refer to the Web Console User Guide for detailed information.

Before beginning the following steps, first verify (with lead supervisor or installer) all necessary installation activities, including software installation and file exports, are completed. Assure all peripheral hardware and software is powered on and functional (gateway, server, etc.).

1. Confirm sensor node operations and communications. Refer to the Web Console User Guide for detailed information.
   a. Open Web Console and select the data center from the **Sites** list.
   b. Click the **Data View** tab.
   c. Select **Pressure** from the **Data View** drop-down menu. A tabular view of the Cabinet Node data displays.
2. Verify green checkmarks display for each installed object in the **Status** column.
3. If a red **X** displays for an object in the **Pressure** column, check for loose connections, obstructed diffusers, and reversed hose connections. Correct the errors and repeat the previous steps for software communication validation.
4. If there are no loose connections, obstructions, or reversed hose connections, reset the node by turning it off (press the light pipe dimple once) and on (press the light pipe dimple once again). Allow time for the module to connect to the network and repeat the previous steps for software communication validation.



Subfloor EZ Node LED Status Lights

A light pipe located on the front of the Subfloor EZ Node provides a means to turn the unit on and off and to provide status.

To power the unit on, push and hold the button for more than 1 second. The light pipe toggles between white and magenta.

As the unit is connecting to the network, the light pipe will display as follows:

- When the unit is looking for the network, it blinks **red** every 2 seconds.
- When the unit is time synchronizing, it blinks **green** every 2 seconds.
- When the unit is joining the network and performing a security handshake, it blinks **yellow** every 2 seconds.

When the unit is in the on state, press the button quickly to display the status on the LED lights.

- When **green** displays for 3 seconds, the unit is connected to the network and is reporting.
- When **cyan** displays for 3 seconds, the unit is in sleep mode.

Push and hold of the button for more than 1 second (but less than 3 seconds) to reset the unit. The light pipe will display as **blue** while you press the button.

Push and a hold for more than 3 seconds to turn the unit off. The light pipe will toggle between **magenta** and **blue** five times as the unit powers off.

Inspecting the Installation

Inspect the installation to ensure appropriate sensor placement and a clean installation area.

1. Verify sensor placement.
   - All node and diffuser installations are positioned consistently
   - Diffuser placement in the subfloor
   - Cable ties and clips do not interfere with fans or bind or rub against surfaces
2. Clear the installation area.
   - Remove all debris and tools from the data center floor
   - Replace all floor tiles and close all cabinet doors
   - Properly discard all packaging, snipped cable tie ends, etc.

Appendix A – Maintenance

In this appendix:

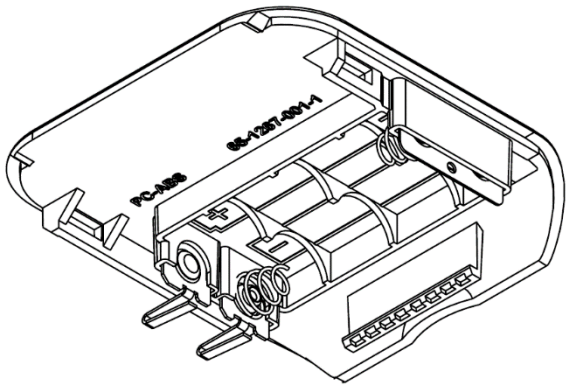
This appendix describes maintenance activities necessary for optimum operation of Subfloor EZ Nodes.

Battery Replacement

The Subfloor EZ Node module comes from the factory with two pre-installed AA-size Lithium/Iron batteries under a removable plastic cover plate.

Follow these steps to change module batteries:

1. Turn the Subfloor EZ Node off by pressing the light pipe button once for more than 3 seconds.
2. Pull up on the edge of the battery cartridge closest to the SynapSense logo. The battery cartridge slides out.
3. Replace both batteries with Energizer L91 Lithium/Iron batteries.



Warning: Only use Energizer L91 batteries. Using incorrect battery types may damage the product and/or compromise performance.

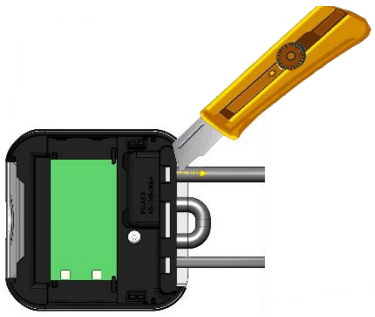
4. Replace the plastic cover positioning the SynapSense label text right side up (readable) after installing the Subfloor EZ Node.
5. Turn the Subfloor EZ Node on by pressing the light pipe once for more than 1 second.

Replacing a Subfloor EZ Node Diffuser Hose

Warning: Hose connections may be brittle, particularly in chilled subfloor or cold aisles area.

Remove and replace a diffuser hose by following these steps.

1. Remove the battery cartridge.
2. Carefully slice the hose lengthwise from the inlet connection using a utility knife.



3. Peel and remove the hose from the inlet connection.
4. Clean any debris from the inlet.
5. Attach new diffuser hose.

Appendix B – Technical Support and Return Material Authorization

This appendix describes how to contact Technical Support, open a Technical Support Case, and receive a Return Material Authorization (RMA) to return a SynapSense product for replacement. Not all problems will result in a RMA.

Technical Support

For all technical support issues, contact **SynapSense Technical Support**:
Tel: (916) 294-0110, option 2
Email: support@SynapSense.com
Web: http://www.SynapSense.com

Opening a Technical Support Case

Follow these steps to open a Technical Support Case

1. Search the SynapSense Knowledge Base at http://www.synapsense.com/ (click **Support Login** at the top of the page).
   a. Login using your email and password.
   b. Search the knowledgebase for the symptom. If the knowledgebase solution does not resolve the issue, enter a Technical Support Case.
2. Describe the following information:
   a. Symptoms or how to reproduce the problem.
   b. Damage to the product, such as dropping or exposure to condensing humidity.
   c. Attempted measures to resolve the problem.
   d. How long has it been in service? Include all information regarding the device history: "Dead" on arrival? Failed upon initial installation? Failed after initial install, but nothing changed with the unit. Failed upon some subsequent action (moved, redeployed, SMOTA, etc.).
   e. Part number (underside of most nodes).
   f. Serial number (underside of most nodes), typically beginning with PR or AM.
   g. MAC ID (on the exposed barcode label).
   h. Quantity.

Return Material Authorization

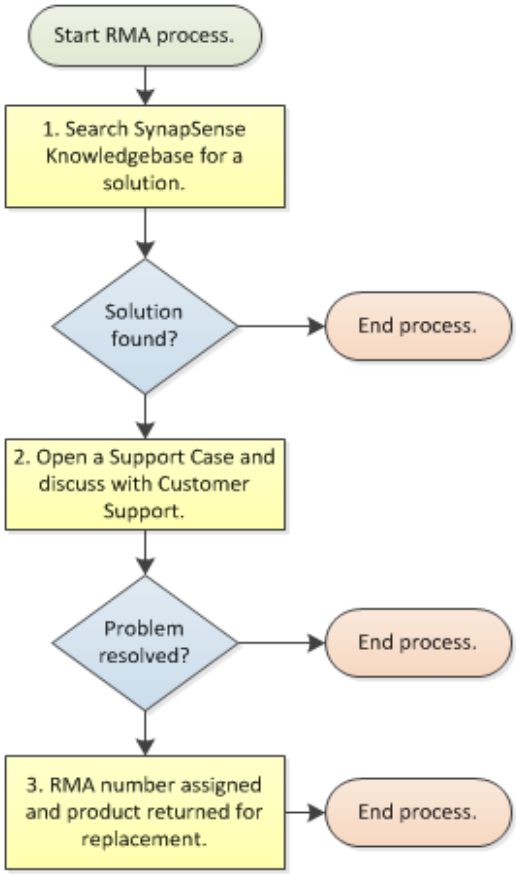
SynapSense products carry a one year warranty from date of purchase and have a low failure rate and most customer inquiries result in a solution without returning the product. It is important to SynapSense to provide a high quality product; therefore, all failures are taken seriously and we ask that all damaged or non-functional products be returned for root cause analysis.

When it is necessary to return a damaged or defective product, a Return Material Authorization (RMA) is required. Returns are only accepted with an accompanying RMA number issued by SynapSense Technical Support.

Returning SynapSense Products

If a product supplied by SynapSense is suspected to be damaged or non-functional in any way, follow these steps to resolve the problem and, if necessary, return the product for replacement.

The procedure for returning damaged or non-functioning products is described below.



1. Search the SynapSense Knowledge Base at **http://www.synapsense.com/** (click **Support Login** at the top of the page).
   a. Login using your email and password.
   b. Search the knowledgebase for the symptom. If the knowledgebase solution does not resolve the issue, enter a Support Case.
2. Describe the following information:
   a. Symptoms or how to reproduce the problem.
   b. Damage to the product, such as dropping or exposure to condensing humidity.
   c. Attempted measures to resolve the problem.
   d. How long has it been in service? Include all information regarding the device history: "Dead" on arrival? Failed upon initial installation? Failed after initial install, but nothing changed with the unit. Failed upon some subsequent action (moved, redeployed, SMOTA, etc.).
   e. Part number (underside of most nodes).
   f. Serial number (underside of most nodes), typically beginning with PR or AM.
   g. MAC ID (on the exposed barcode label).
   h. Quantity.

What Happens Next?

A Customer Support Engineer will contact you within one business day. The Engineer may ask additional questions or have you perform activities to attempt to resolve the issue. If the Engineer is unable to resolve the problem, you will be asked to return the product. A replacement product will be shipped to you at no charge.

Include the Support Case Number (RMA number) on the mailing/shipping label when returning the product. Products received without a valid RMA number are returned to the sender. Send returns to:
SynapSense Corporation
Customer Support RMA – RMA # _____
340 Palladio Parkway, Suite 530
Folsom, CA 95630