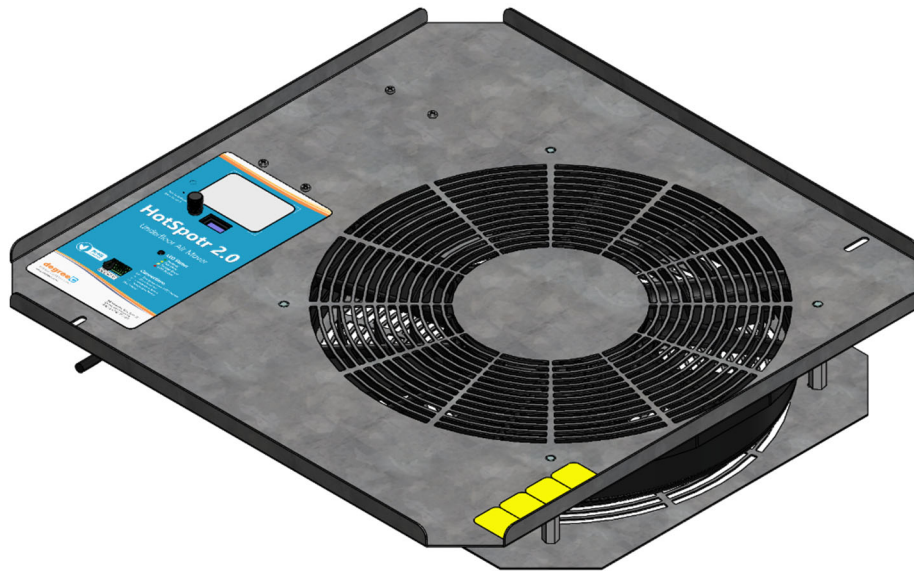


HotSpotr 2.0

User Manual



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1 Introduction

Thank you for your purchase of the HotSpotr 2.0 underfloor air mover. The intent of this manual is to introduce you to the engineered fan tray and guide you through setup and operation. Degree Controls is committed to your success.

1.1 Product Overview

The HT2-500 HotSpotr 2.0 underfloor air mover is designed to move increased volumes of cool air from existing air conditioning equipment to hard-to-reach locations within raised floor data centers and telecommunications equipment areas. It is intended to be attached to underfloor stanchions, independent of the floor tile used above it, to deliver air upward to the inlet side of server racks to eliminate hot spots. Because the HotSpotr 2.0 is active, i.e., it utilizes a fan to move air, it can overcome many obstacles and/or low-pressure areas of the underfloor region, effectively boosting airflow where more air is needed.

The HotSpotr's thermal management system consists of a DC fan, on-board controller, power supply, and stanchion mounting rails. It has two modes of operation, *Constant Speed* and *Temperature*. By default, the HotSpotr is configured to run the fan at a constant speed. Alternatively, the HotSpotr can be configured for temperature control, using inputs from up to two temperature sensors to adjust fan speed to maintain a user-defined temperature setpoint.

1.2 Features

The HotSpotr underfloor air mover will make a substantial difference in the cooling efficiency of your data center or other air-conditioned space. Key features include:

- Manually or thermostatically controlled underfloor air mover delivers cooling air upward, to the inlet side of data center server racks.
- Active cooling with high performance DC fan
- Immediate results
- Accepts up to 2 temperature sensors for temperature-based fan speed control.
- Seamless integration with larger solutions, HotSpotr becomes part of the floor.
- Easily fasten the HotSpotr to underfloor stanchions of a raised floor system with the included mounting rail kit
- EPO (emergency power off) input

2 Contents

You will find these items in your HotSpotr 2.0 underfloor air mover package:

- Qty (1) HotSpotr Fan Tray
- Qty (1) Mounting Kit
- *Optional* temperature sensors

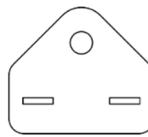
The mounting kit includes L-shaped rails with U-bolts and hardware to fasten the HotSpotr to underfloor stanchions:

- Qty (2) Mounting Rails, 1-1/2 x 1-1/2 x 27" (38 x 39 x 686mm)
- Qty (4) 1/4"-20 x 2-1/4 x 1-1/4 x 1-1/4" U-Bolts
- Qty (8) 1/4" Flat Washers
- Qty (8) 1/4" Lock Washers
- Qty (8) 1/4" Nuts

- Qty (4) Push-in Rivets

The HotSpotr accepts a 100 - 240VAC input, and the power cable is hardwired to the fan tray. The available power cables are:

Part Number	Air Mover Description	Power Cord Description
FL10161	HotSpotr 2.0 with 120V Power Cord	120V Version: 3m (10') Power Cord, NEMA 5-15P Plug
FL10162	HotSpotr 2.0 with 240V Power Cord	240V Version: 2.4m (8') Power Cord, NEMA 6-15P Plug



Options

- Temperature sensors for thermostatic control of the HotSpotr may be purchased separately.

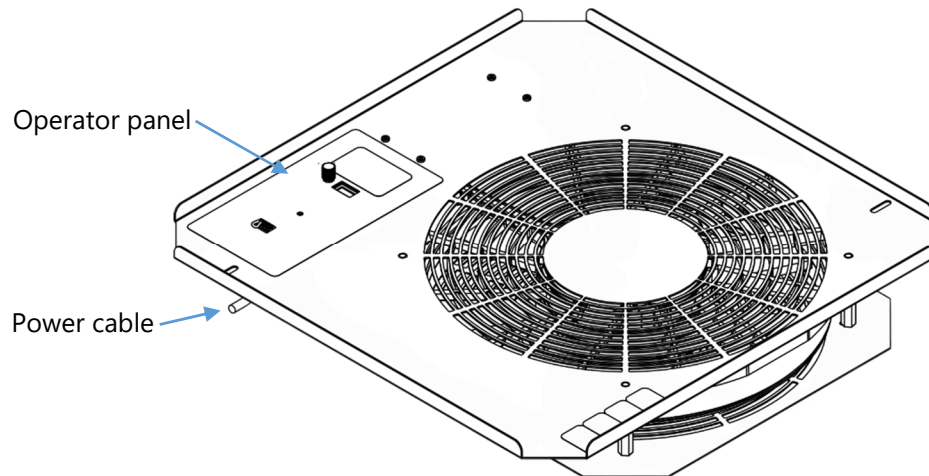
At least one temperature sensor is required to thermostatically control the underfloor air mover. A 5.8mm Ø x 34mm long (0.23in x 1.35in) temperature sensor probe is connected to 5m (16ft) of wiring. For easy installation, an adhesive-back mounting pad is attached to the sensor probe, and cable ties are included for cable routing. The sensor's inline connector allows you to quickly disconnect/reconnect the sensor head as needed.



The HotSpotr 2.0 User Manual is available for download at www.degreec.com.

3 Hardware Overview

The operator panel with connections is located on the topside of the HotSpotr, and the power cable exits from the bottom. When the underfloor air mover is powered up and functioning normally, the status LED is green. The internal fan is monitored, and if it should fail, the status LED will signal an alarm condition.



3.1 Electrical Power

The HotSpotr draws a maximum of 400 Watts of power (at full fan speed) from an electrical wall outlet through an internal power supply. The electrical socket that will provide power to the underfloor air mover should be close to the device and easily accessible.

The socket should participate in the same backup power arrangements as your CRAC units to ensure that the HotSpotr underfloor air mover continues to operate in similar periods as the cooling units during a facility power loss. Be sure your power meets HotSpotr specifications.

3.2 Operating Modes

The HotSpotr fan tray functions as a stand-alone unit with two modes of operation, *Constant Speed* or *Temperature*. PWM (pulse width modulation) is used to adjust the speed of the fan.

By default, the HotSpotr is configured for *Constant Speed*, running the fan at a fixed speed. The fan speed setpoint can be set with the rotary encoder knob accessible from the operator panel.

In *Temperature* mode, PI temperature control (proportional and integral temperature control), with feedback from up to two temperature sensors, is used to adjust fan speed to maintain a temperature setpoint. Like the fan speed setpoint, the temperature setpoint is user-adjustable via the encoder. Fan speed is controlled by the hottest of the two sensors, and two temperature sensor inputs are provided for redundancy.

3.3 Operator Panel

The HotSpotr 2.0 features an operator panel with user interface, status LED, and input connections, everything a user needs to monitor status and control operation.

3.3.1 User Interface

The user interface consists of a color display and rotary encoder with knob. The display allows for viewing HotSpotr status and settings, and the rotary encoder permits users to navigate through menus and change settings.

The very first time the HotSpotr is plugged in, the fan is energized, and the fan speed is set to 30%.

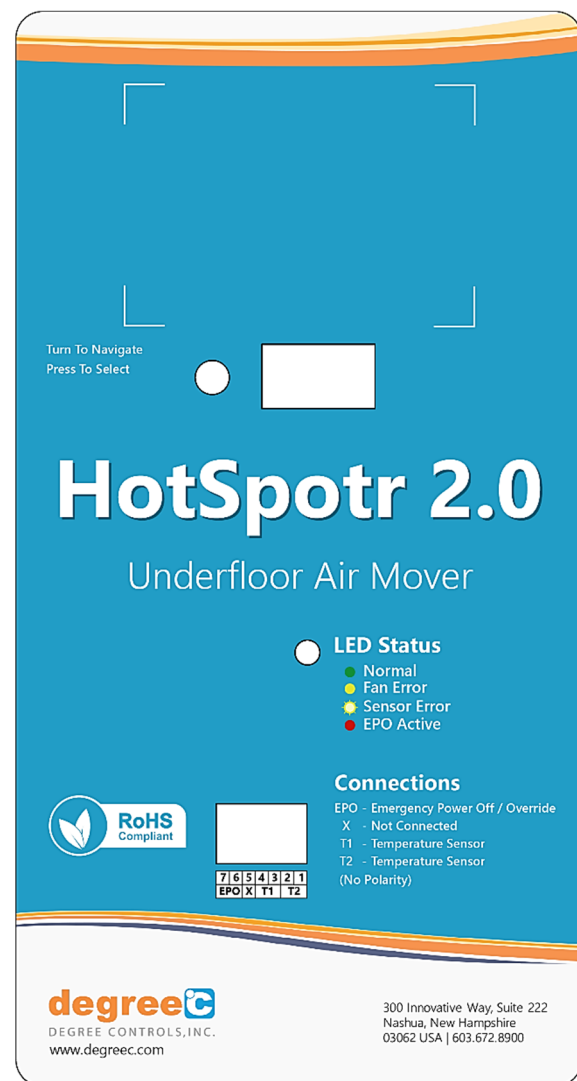


Figure 1 Operator Panel

3.3.2 Status LED

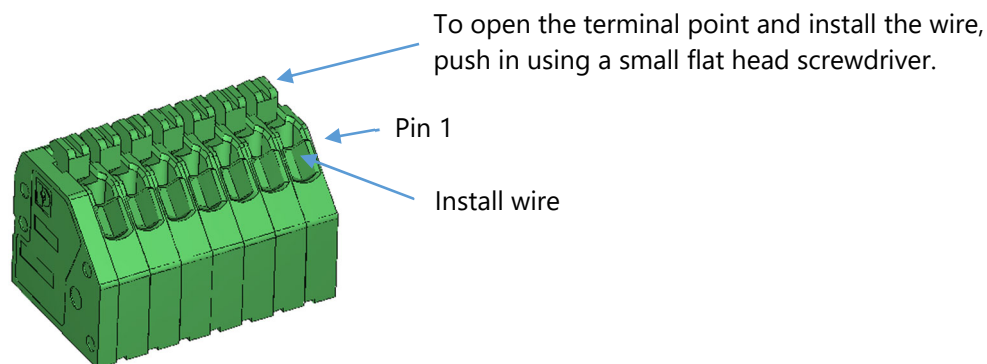
LED Behavior		HotSpotr 2.0 State	Fan State
	Green	Normal operation	Fan runs according to established settings.
	Yellow	Fan alarm Fan current exceeds tolerance. This may be the result of increased friction and forces due to a bearing going bad.	Fan runs at 100% speed If the fan shows signs of failure, the HotSpotr defaults to the safest mode for the datacenter, delivering the maximum cooling airflow.
	Blinking Yellow	Temperature alarm or sensor failure If temperature continually deviates from the setpoint by +/- 2°C (+/- 1°F), or there is a sensor failure, the status LED shows the temperature alarm condition.	Fan runs at 100% speed In the event of a temperature alarm or sensor error, the HotSpotr defaults to the safest mode for a datacenter, delivering the maximum cooling airflow.
	Red	EPO alarm	Fan off Once the external EPO alarm is cleared, normal operation resumes after a 5 sec delay.

3.3.3 Connections

The HotSpotr employs push-in spring connections for fast, convenient installation. Use 20AWG to 24AWG wire with a strip length of 9mm [0.35in].

Connector Pinout

Connections	Pins	Description
EPO	6, 7	Emergency power off / override
X	5	Not connected
T1	3, 4	Temperature sensor 1
T2	1, 2	Temperature sensor 2 (for redundancy)



Emergency Power Off Input

EPO / OVERRIDE		
EPO Configuration	EPO Connector Contacts	HotSpotr Status
NC, Normally Closed (factory default condition)	Closed	Operating
	Open	Fan Stopped
NO, Normally Open	Open	Operating
	Closed	Fan Stopped

The underfloor air mover is supplied with an EPO (Emergency Power Off) safety feature and may be integrated into your data center's EPO system or building fire safety system. The HotSpotr arrives from the factory with a jumper installed in the EPO terminal and the logic configuration set to NC, Normally Closed. This is the default configuration, and it allows power to pass from the power supply to the fan.

If you are installing your HotSpotr as a stand-alone unit, leave the EPO circuit at its factory default. If you are installing your HotSpotr as part of a general EPO system in your facility, remove the jumper from the EPO terminal, and connect a dedicated dry contact signal pair from the fire safety panel to the EPO terminals. In normal operation the dry contact relay should be closed, allowing the HotSpotr fan to operate. During a fire safety event, the dry contact relay should open, causing the fan to stop. If desired, relay logic can be reversed in the Factory Settings menu.

For example, in the default HotSpotr *EPO logic configuration of NC*, a normally energized relay with NO contacts could be used to drive the EPO input as follows:

- Normal Operation – If the facility is operating normally, the relay will be energized and relay contacts closed, allowing the HotSpotr fan to run.
- Alarm or Override Condition – If the facility is in a state of emergency, or needs to initiate an override, the relay will be de-energized and relay contacts will open, preventing the HotSpotr fan from running.

Temperature Sensor Inputs T1 and T2

Temperature sensor connections allow for temperature-controlled operation of the HotSpotr. Two temperature sensor inputs are provided for redundancy, and fan speed is controlled by the hottest of the two sensors, or by a single sensor if one has failed. At least one sensor must be connected for thermal fan speed control.

3.3.4 Part Number and Serial Number

The HotSpotr is labeled with its part number and serial number. This information is also presented on the display during startup.

4 Installation

4.1 Guidelines

Before removing or installing a fan tray ensure that you read and follow the guidelines and safety warnings listed.

	Only a skilled person should be allowed to install, replace, or service this equipment.
	A skilled person or qualified personnel is someone who has training or experience in the equipment technology and understands potential hazards when working with equipment.
	To reduce risk of electric shock, unplug the power cable to de-energize the unit.
	No user-serviceable parts inside. Do not open.
	The underfloor HotSpotr with mounting hardware will not support any external weight. A standard perforated tile with at least 25% open area must be installed.
	Never operate the HotSpotr in and around water.

4.2 Des lignes directrices

Avant de retirer ou d'installer un plateau de ventilation, assurez-vous de lire et de suivre les directives et les avertissements de sécurité répertoriés.

	Seule une personne qualifiée doit être autorisée à installer, remplacer ou entretenir cet équipement.
	Une personne qualifiée ou un personnel qualifié est une personne qui a une formation ou une expérience dans la technologie de l'équipement et qui comprend les dangers potentiels liés au travail avec l'équipement.
	Pour réduire le risque de choc électrique, débranchez le câble d'alimentation pour mettre l'appareil hors tension.
	Aucune pièce réparable par l'utilisateur à l'intérieur. Ne pas ouvrir.
	Le HotSpotr sous plancher avec matériel de montage ne supportera aucun poids externe. Une tuile perforée standard avec au moins 25 % de surface ouverte doit être installée.
	N'utilisez jamais le HotSpotr dans et autour de l'eau.

The HotSpotr 2.0 underfloor air mover is to be installed by a skilled person in a secure place such as a datacenter. Installation consists of:

1. Determine where HotSpotr will be installed, verify that there is sufficient clearance, and close off any unused "U" space. (A U is a unit of measurement applied to server racks. 1U or rack unit is 1.75" tall.)
2. Install the fan tray within the floor system.
3. Make connections, as needed.

Tools needed:

- 7/16" or 11mm torque wrench with deep-well socket
- Measuring tool

4.3 Steps

Evaluate HotSpotr Location

We suggest locating the HotSpotr such that fan airflow is as close as possible to the front face of the most critical rack to be cooled, or in areas where hot spots are common, however final orientation is up to the user. The HotSpotr will add airflow to adjacent racks, but the central rack will receive the most benefit.

1. Determine the location and orientation in which you are mounting the fan tray.
2. Remove the existing tile from the raised floor grid where you plan to install the HotSpotr and check to ensure that there is sufficient clearance without obstructions.
 - For a typical 2" thick floor tile, you should have at least 165mm (6.5") from top of the floor tile/walking surface to first obstruction. HotSpotr 2.0 will only fit if clearance is > than 165mm (6.5").

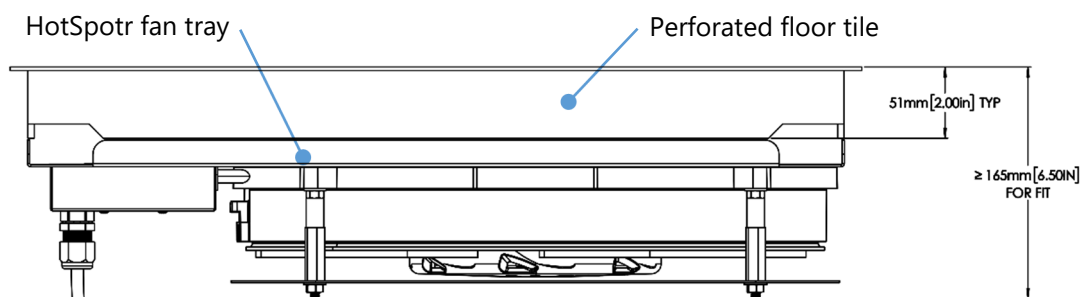


Figure 2 For a 51mm [2"] thick tile, HotSpotr fits the floor if there is **at least 165mm [6.5"]** to the first obstruction.

- The recommended clearance between the top of the HotSpotr and the bottom of the floor tile is 38mm (1.5"). If the HotSpotr is much closer than this, the floor tile may hit and damage the rotary knob. If the HotSpotr is significantly farther away, some volume of air delivery will be lost.

Note: For a 51mm (2") thick floor tile, position the mounting rail to be 57.2mm (2.25") below the bottom of the tile to achieve the recommended clearance of 38mm (1.5").

- A minimum of 51mm (2") of clearance between the bottom of the HotSpotr and any underfloor obstructions is suggested to permit air to be drawn freely to the intake side of the fan.

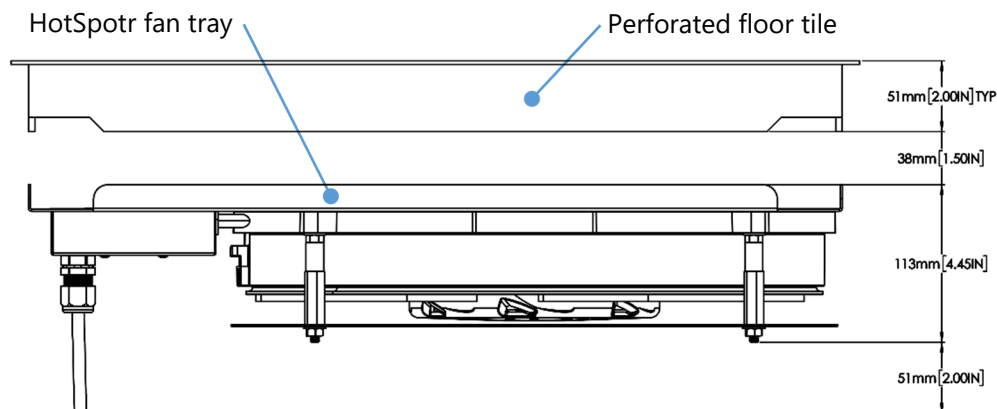
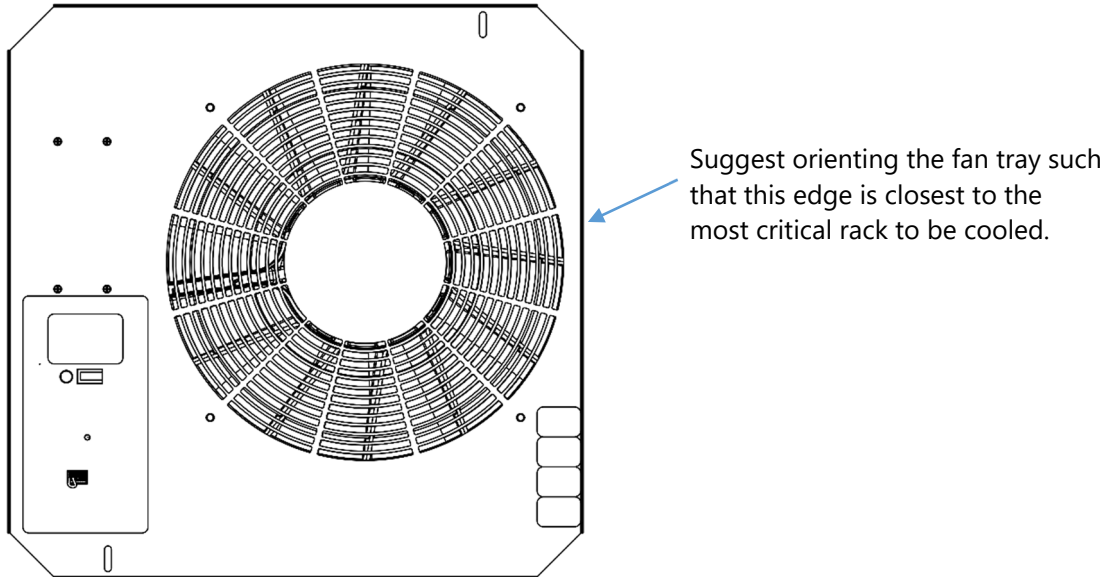


Figure 3 Suggested HotSpotr installation.

Obstructions can potentially reduce airflow and determine which direction air is pulled from. Typically, small pipes and conduits are of little consequence and air is drawn around these. Large, chilled water pipes and electrical junction boxes can affect where air is drawn from and from which CRAC air is delivered.



3. Close off any unused rack spaces in front of, or adjacent to, the HotSpotr with blanking panels (see Appendix).

Mount HotSpotr Within Floor System

Mount the HotSpotr at the proper height with respect to the top of the raised floor to achieve optimal air supply volume.

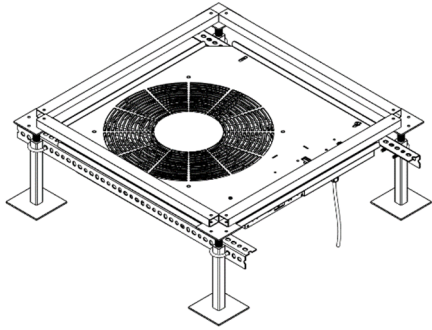


Figure 4 HotSpotr Installed in Floor System,
Floor Tile Not Shown

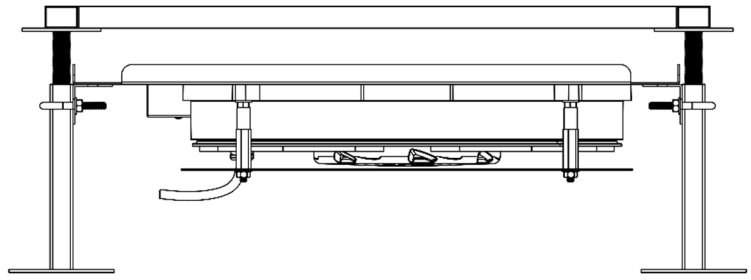


Figure 5 Side View of HotSpotr in Floor System, Floor Tile Not Shown

4. Install mounting rails.

- 4.1. Place the flat side of one mounting rail against two raised floor support stanchions.
 - 4.2. Place a U-bolt around the floor stanchion and then through the holes near the end of the mounting rail. The included U-bolts can be used with 25mm (1") floor stanchions.
 - 4.3. Attach (1) flat washer, (1) lock washer, and (1) nut to each threaded post of the U-bolt.
 - 4.4. Tighten the two nuts until hand tight. You should be able to move the rail up and down on the stanchion with minimal force.
 - 4.5. Install another U-bolt to the opposite end of the mounting rail using the same process.
 - 4.6. Position the mounting rail at the desired height and use a wrench to tighten up the nuts on both sets of U-bolts.
 - 4.7. Install the second mounting rail on the opposite side of the floor opening so that the two mounting rails are secure and provide a level platform for the HotSpotr.
5. Fasten the HotSpotr to the mounting rails using the included push-in rivets in four places.
 6. Ensure the perforated tile rests firmly on the stringers and not on the HotSpotr.

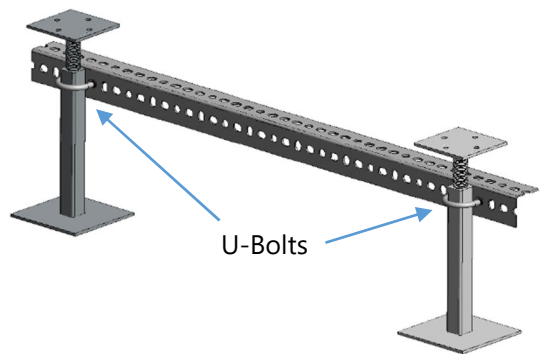


Figure 6 Install first mounting rail.



Figure 7 Install second mounting rail.



Figure 8 Fasten HotSpotr to rails.

Make Connections

7. At the discretion of the user, connect the building EPO system to the EPO terminals.
8. If the HotSpotr is to operate under temperature control, mount temperature sensor(s) near the top and front of the rack to be monitored (see Appendix), and connect them to the T1 and/or T2 terminals.

9. Plug the HotSpotr's power cord into a nearby outlet of appropriate voltage under the raised floor. Due to the critical function that the HotSpotr is performing, take care to decide whether you will supply power from a UPS (uninterruptible power source) or emergency generator circuit.

Once powered, the screen displays startup information followed by HotSpotr status. Upon initial startup only, the HotSpotr defaults to Constant Speed mode with fan speed set to 30%.

Pressing the encoder knob activates the settings menu. From this point, you can travel through settings, and raise or lower values, by turning the knob and then pressing the knob to accept a selection.

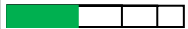
FAN STOPPED
PUSH TO START

After initial startup, the HotSpotr resumes settings previously established by the user.

5 Operation

Once the HotSpotr's power cord is plugged in, operation is automatic. Within the first few seconds of power up, the status LED lights, and the unit controls fan speed and CFM to the equipment rack according to established settings for operating mode and setpoint.

In Constant Speed mode, the fan runs at a constant speed. In Temperature mode, the HotSpotr uses inputs from up to two temperature sensors (T1 and T2 input connections) to adjust fan speed to maintain a user-defined temperature setpoint. At least one sensor must be connected for thermal fan speed control, and two inputs are provided for redundancy. The hottest sensor controls fan speed. In temperature mode, if no sensor is connected, or there is a sensor failure, the unit will operate at full fan speed and the status LED will indicate an alarm condition.

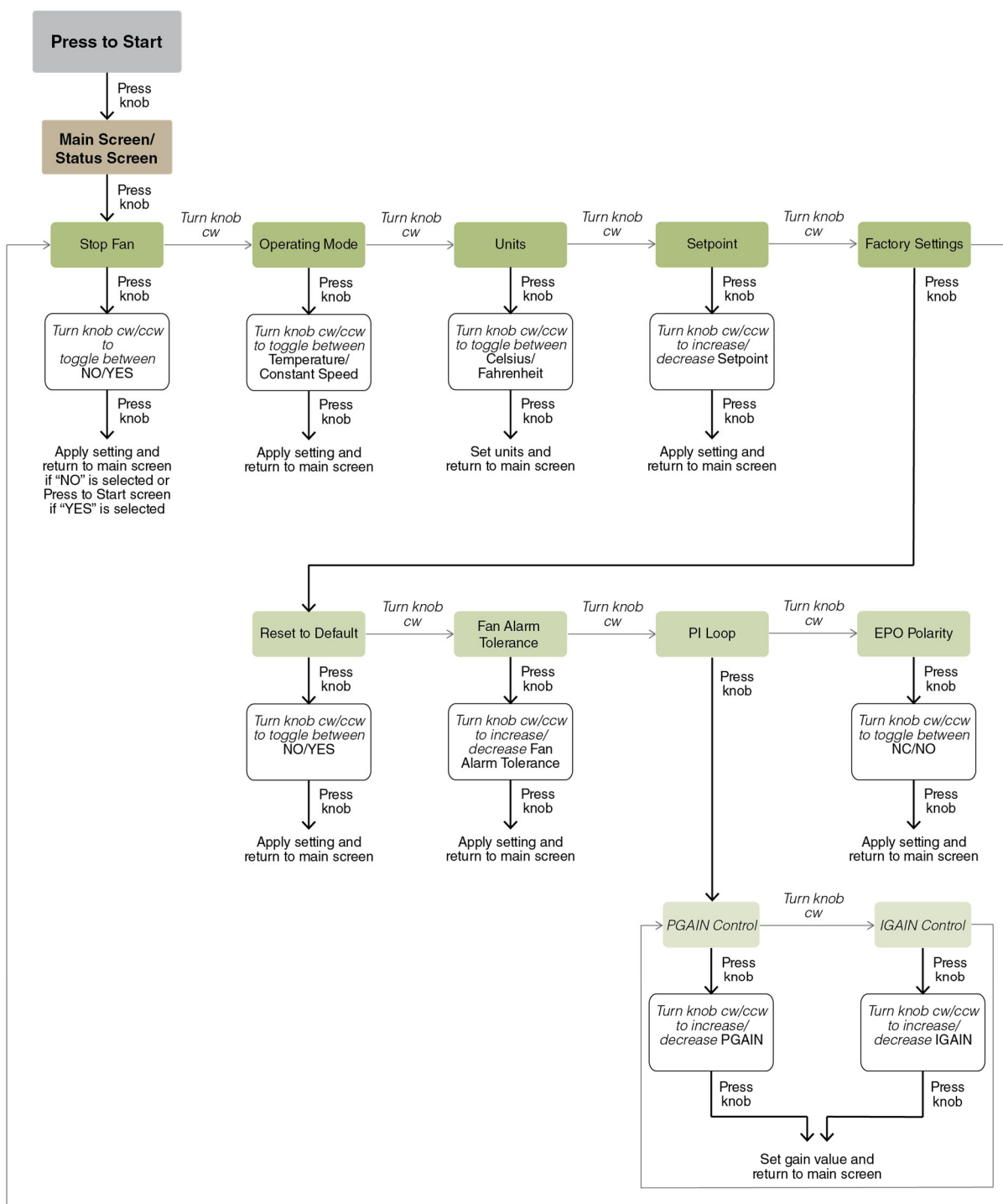
Status Screen Examples	Description
Mode: Constant Speed Setpoint: 40% Fan Current: 	In constant speed mode, the bar graph is colored green when fan current is between 0% and 64% of maximum current.
Mode: Constant Speed Setpoint: 82% Fan Current: 	The bar graph is colored yellow when fan current is between 65% and 84% of maximum current.
Mode: Constant Speed Setpoint: 97% Fan Current: 	The bar graph is colored red when fan current is between 85% and 100% of maximum current.
Mode: Temperature Setpoint: 23°C Temperature: 22.4°C Mode: Temperature Setpoint: 77°F Temperature: 77.2°F	Temperature values can be displayed in Celsius or Fahrenheit.

5.1 Settings

With HotSpotr status displayed on the main screen, press the encoder knob to enter the settings menu. Turn the knob to cycle through menu options and then press the knob to make a selection. The knob is also used to change settings and increase/decrease values.

After 20 seconds of user inactivity, the HotSpotr will return to the main status screen.

5.1.1 Graphical User Interface



5.1.2 Parameters and Default Values

PARAMETER	
Name/Description	Default
Stop Fan NO YES	NO
Operating Mode Temperature – Fan is thermostatically controlled using input from temperature sensor(s). Constant Speed – Fan runs at a constant speed.	Temperature
Units Celsius Fahrenheit	Celsius
Setpoint – Temperature Temperature setpoint in Temperature mode. The range is TBD F to TBD F.	25 C
Setpoint – Fan Speed Fan speed setpoint, expressed as a percentage, in Constant Speed mode. The range is 20% to 100%.	30%
Fan Alarm Tolerance A fan alarm will be triggered when the fan speed exceeds the limits established by the +/- fan alarm tolerance. The range is 20% to 70%. Example: Fan speed is based on fan current. If fan speed is set to 70% and the fan tolerance is set to +/- 20%, a fan alarm will be triggered for fan speed > 90%. This may be an indication of increased bearing friction or blade resistance.	20%
PGAIN – Proportional Gain Proportional gain is a ratio of a change in the output to a change in the input. The range is 0 to 300.	100
IGAIN – Integral Gain Integral gain addresses the output error based on past cumulative error values. The range is 10 to 150.	50
EPO Polarity NC – Normally Closed NO – Normally Open	NC

6 Troubleshooting

Symptom	Possible Corrective Action
The fan stopped unexpectedly.	Interference from a foreign object may prevent the fan from spinning. In this case, the status screen will display "WARNING Fan Blocked". Disconnect power from the HotSpotr. With power disconnected, inspect the fan tray and carefully remove any obstructions. Note: If the primary temperature sensor experiences a rapid change in temperature ($>5^{\circ}\text{F}/60\text{sec}$) a fan block error will occur, however extreme, short-duration temperature changes are not the norm for datacenter facilities so this should never happen.

Frequently Asked Questions

Why is the HotSpotr running at full speed?

The HotSpotr will run at full speed if it cannot get to the temperature setpoint. Make sure that the temperature setpoint is not lower than the supply air setpoint.

In temperature mode, the HotSpotr will run at full speed if there are no sensors connected. Inspect temperature sensors and their connections.

Do you offer temperature sensors for thermostatic control of the HotSpotr?

Yes. Purchases can be made by visiting www.degreeec.com. Temperature sensors are included in the Accessory section of the HotSpotr product page.

How can I get support?

Email inquiries to sales@degreeec.com and one of our experts will respond to you promptly.

7 Maintenance

Clean the sheet metal tray with a soft cloth moistened with a mild detergent solution. Do not use any type of abrasive pad, scouring powder, or solvent, such as alcohol or benzene. Do not, under any circumstances, allow water or liquid of any type to enter the HotSpotr fan or electronics.

Annually, disconnect power and check the HotSpotr fan tray for dust build-up. Carefully clean the fan tray using compressed air or a vacuum. Reconnect the unit to power and check to ensure that the fan ramps to the correct speed. Note: The fan motor is completely sealed and does not need cleaning.

For HotSpotr installations using temperature sensors, sensor heads may be carefully wiped to remove dust. Use a soft cloth moistened with a mild detergent solution.

8 Safety Guidelines

Below are important notices and safety instructions. Please read carefully, and follow all warnings and instructions marked on the HotSpotr and in this manual.

	There are no customer-serviceable parts inside the HotSpotr. Removing the cover results in risk of electric shock and voids warranty.
	Always unplug the HotSpotr and follow proper lockout/tagout procedures before cleaning the underfloor air mover.
	Never install or operate the HotSpotr and sensors in or around water.
	The HotSpotr and sensors should be used and stored in the ranges specified.
	If smoke is present, or liquid has spilled, or the HotSpotr is physically damaged, turn the unit off immediately.

9 Consignes de Sécurité

Vous trouverez ci-dessous des avis importants et des instructions de sécurité. Veuillez lire attentivement et suivre tous les avertissements et instructions marqués sur le HotSpotr et dans ce manuel.

	Il n'y a aucune pièce réparable par le client à l'intérieur du HotSpotr. Le retrait du couvercle entraîne un risque de choc électrique et annule la garantie.
	Débranchez toujours le HotSpotr et suivez les procédures de verrouillage/étiquetage appropriées avant de nettoyer le système de ventilation sous le sol.
	N'installez ni n'utilisez jamais le HotSpotr et les capteurs dans ou à proximité de l'eau.
	Le HotSpotr et les capteurs doivent être utilisés et stockés dans les plages spécifiées.
	Si de la fumée est présente, si du liquide s'est répandu ou si le HotSpotr est physiquement endommagé, éteignez immédiatement l'appareil.

10 Specifications

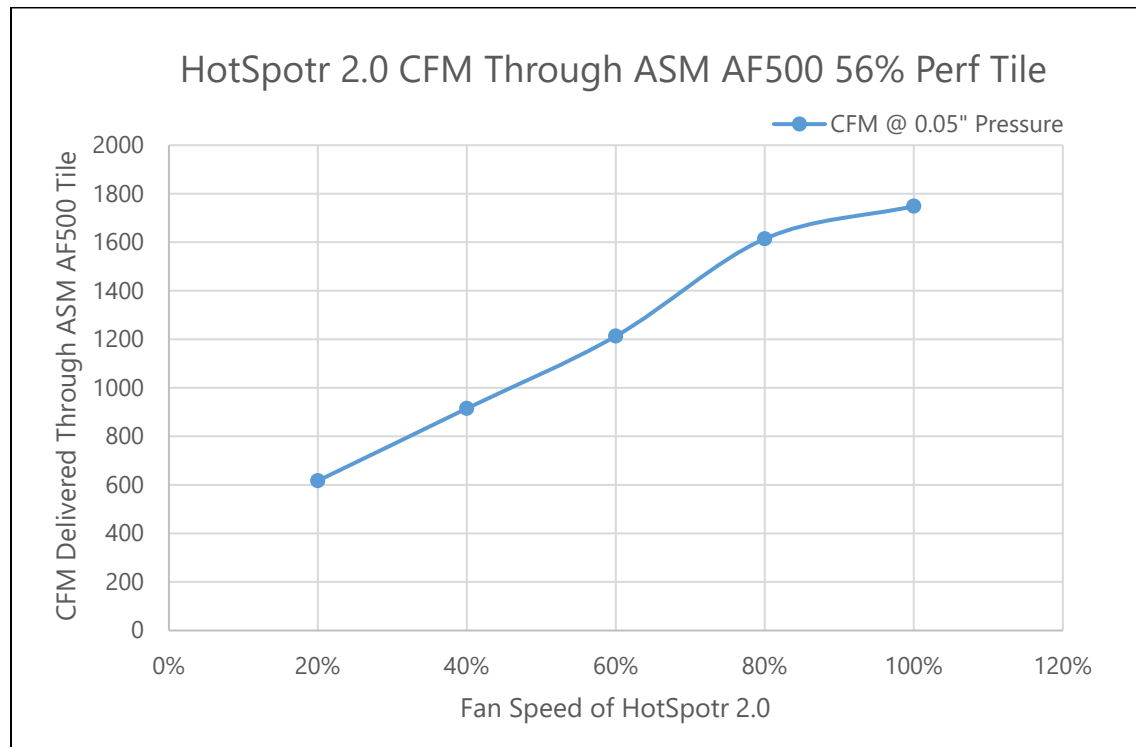
Model	HT2-500
Description	HotSpotr 2.0 Underfloor Air Mover
Physical Specifications	
<i>Airflow (without floor tile in place)</i>	1700 CFM at 0 Static Pressure
<i>Dimensions</i>	585mm x 585mm x 113mm (23.02" x 23.02" x 4.45")
<i>Packaged Dimensions</i>	737mm x 686mm x 193mm (29.0" x 27.0" x 7.6")
<i>Weight</i>	8.73kg (19.3lbs)
<i>Packaged Weight</i>	12.52kg (27.6lbs)
<i>Housing Construction</i>	Galvanized steel
<i>Mounting</i>	Direct attachment to underfloor stanchions with included mounting kit containing rails, U-bolts, and fasteners.
Electrical Specifications	
<i>Operating Voltage</i>	100 - 240VAC 50/60Hz
<i>Operating Current</i>	< 4A
Power Cord	
<i>Description</i>	120V Version: 3m (10') 16 AWG Black, NEMA 5-15P Plug 240V Version: 2.4m (8') 14 AWG Black, NEMA 6-15P Plug
Environmental	
<i>Operating Temperature</i>	0 to 50°C (32 to 122°F)
<i>Storage Temperature</i>	-20 to 70°C (-4 to 158°F)
<i>Operating Humidity</i>	20 to 85% non-condensing continuous 20 to 90% non-condensing 96 hours
<i>Storage Humidity</i>	10 to 95% non-condensing
Part Number	10161AS012
Description	Temperature Sensor, HotSpotr 2.0
Sensor Head	
<i>Measurement Range</i>	-55 to 80°C (-67 to 176°F)
<i>Dimensions (Ø x L)</i>	5.8mm x 34mm (0.23in x 1.35in)
<i>Housing Material</i>	Vinyl
Sensor Cable	
<i>Cable Dimensions (Ø x L)</i>	2.4mm x 5m (0.096in x 16ft) nominal
<i>Cable Type</i>	24 AWG 2 conductor FEP jacketed cable, plenum rated, OD 2.6mm (0.103in) Max
<i>Termination</i>	Stripped and tinned leads
<i>Mounting</i>	An adhesive-back mounting pad is attached to the sensor probe for mounting. The sensor ships with cable ties for cable routing.

11 Degree Controls Warranty

For a period of one (1) year following the date of delivery, and subject to the other provisions of this Warranty Section, DegreeC warrants that all new products that are both (a) manufactured by DegreeC and (b) purchased directly from DegreeC (or an authorized distributor of DegreeC) shall be free of material defects in materials and workmanship. Buyer's sole and exclusive remedy, and DegreeC's sole and exclusive obligation, in the event of any product defect shall be for DegreeC to, at its option, repair or replace such products free of charge. In no event shall DegreeC be liable for ordinary wear and tear. In order to get the benefit of the foregoing warranty, Buyer must examine the delivered products immediately upon receipt thereof and report to DegreeC, in writing, any visible defects within ten (10) working days of such receipt. Buyer's failure to report defects within the foregoing time period will be deemed an unqualified waiver of any and all of Buyer's rights to warranty claims. DegreeC does not provide any warranty for third party parts, components, or products that are not manufactured by DegreeC. Such parts, components, or products may be warranted by third parties on a "pass through" basis. The foregoing remedies shall not apply to any product failure caused in whole or in part by (i) Buyer's failure to operate, maintain, or service the products in accordance with DegreeC's documentation, (ii) any alteration, modification, or repair made to the products other than by DegreeC, or (iii) use of the products for a purpose other than that for which it is intended. THE FOREGOING EXPRESS WARRANTY extends only to the original customer of DegreeC or DegreeC's authorized distributor, as the case may be. THE CORRECTION OF ANY DEFECT IN, OR FAILURE OF, PRODUCTS BY REPAIR OR REPLACEMENT IN ACCORDANCE WITH DEGREEC'S POLICIES DESCRIBED HEREIN SHALL BE DEGREEC'S SOLE AND EXCLUSIVE OBLIGATION AND THE SOLE AND EXCLUSIVE REMEDY OF BUYER FOR ANY AND ALL LOSSES, DELAYS OR DAMAGES RESULTING FROM THE PURCHASE OR USE OF DEGREEC'S PRODUCTS. OTHER THAN THE LIMITED WARRANTY SPECIFICALLY STATED HEREIN, DEGREEC SPECIFICALLY DISCLAIMS ANY AND ALL OTHER WARRANTIES WITH RESPECT TO DEGREEC'S PRODUCTS, INCLUDING THE PERFORMANCE THEREOF AND ANY SERVICES PROVIDED TO BUYER, EITHER EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY ARISING FROM A COURSE OF DEALING OR USAGE OF TRADE, NON-INFRINGEMENT AND ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE OR USE.

12 Appendix

12.1 Airflow vs % Fan Speed



12.2 Use of Blanking Panels

The use of blanking panels to fill unused "U" space in racks directly in front of or to either side of the HotSpotr is recommended:

- Blanking panels keep cool air at the front of racks and enclosures where servers intake air.
- Blanking panels help to maintain the separation of hot and cool air.

Failure to blank off unused U space in the bottom half of the rack can cause the large amount of air moved by the HotSpotr to draw warm air from the back side of the rack to the front of the rack. The warm air and cool air will mix, decreasing cooling effectiveness and impeding the HotSpotr's ability to eliminate a hot spot.

12.3 Temperature Sensors

A temperature sensor must be connected to operate the HotSpotr in Temperature mode and thermostatically control fan speed.

	The temperature sensor head is small to minimize the disruption of airflow. It is important not to obstruct it.
	Air always takes the path of least resistance. Do not mount the sensor in an out of the way corner within a rack, or on top of the rack outside of the air stream that affects the servers.
	The top of the rack usually contains the highest inlet air temperature for the entire rack. Place sensors lower than the top of the rack only if you have a known hot spot below.
	Temperature sensors are sensitive devices, but they are not unreasonably fragile. Always handle sensors with care during installation.
	La tête du capteur de température est petite pour minimiser la perturbation du flux d'air. Il est important de ne pas l'obstruer.
	L'air emprunte toujours le chemin de moindre résistance. Ne montez pas le capteur dans un coin à l'écart d'un rack, ou au-dessus du rack, à l'extérieur du flux d'air qui affecte les serveurs.
	Le haut du rack contient généralement la température d'air d'entrée la plus élevée pour l'ensemble du rack. Placez les capteurs plus bas que le haut du rack uniquement si vous avez un point chaud connu en dessous.
	Les capteurs de température sont des appareils sensibles, mais ils ne sont pas excessivement fragiles. Manipulez toujours les capteurs avec précaution pendant l'installation.

Starting with the probe end of the sensor assembly, mount the sensor near the top and front of the rack to be monitored. Choose a spot so that the tip of the probe is in the air stream to be controlled, such as near the inlet of the top server within the rack. Remove the backing on the adhesive-back mounting pad, and adhere sensor securely to a flat surface.

Route and secure the sensor cable as appropriate for your application. Sensor mounting and cable routing depend on rack type and internal accessibility. Please refer to the Sensor Mounting Guidelines below for general guidelines.

Once the sensor cable is under the floor, route it to the HotSpotr, and connect it to the first temperature input T1. If a second temperature sensor is used, connect it to temperature input T2.

Note: The HotSpotr will bring additional cool air directly to one rack, and will indirectly assist cooling in the two adjacent racks. If you wish to directly assist cooling in the adjacent racks, determine which rack generates more heat, and mount the second sensor in this rack.

12.3.1 Sensor Mounting Guidelines

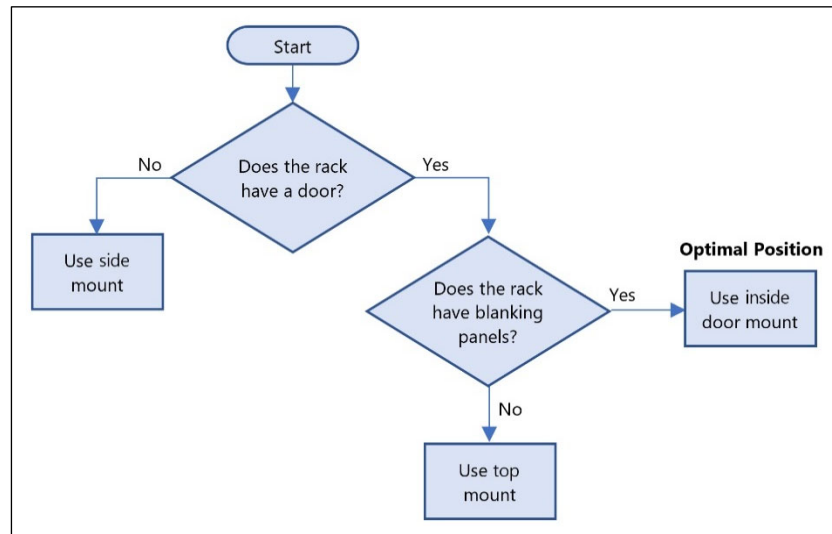


Figure 9 Sensor Mounting Guidelines

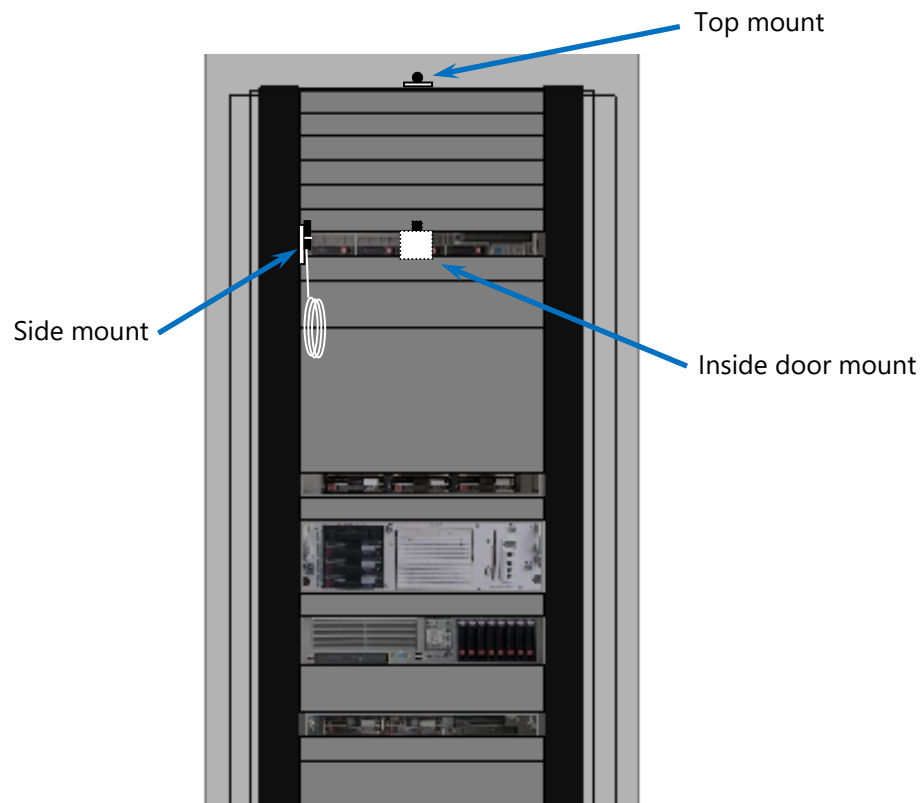


Figure 10 Sensor Mounting Configuration Examples

12.3.1.1 Inside Door Mount

The sensor should be located on the inside of the door so that it is facing the servers. Steps are:

1. Align the sensor with the top edge of the top server or 1.5m (5 feet) above the floor, whichever is higher. It must be in the cool air stream.

2. Mount the sensor securely to reduce the possibility of control errors. For mesh doors, mount the pad to the mesh and then use a tie wrap to attach the assembly to the door.
3. Plan sensor cable routing so that it will not interfere with, or become entangled in, any rack equipment or server cabling runs.
4. Route the sensor wire to the hinge side of the door. Leave a large enough loop of extra wire at the hinge to fully open the door without straining the wire.
5. Attach the wire to the door, and secure the loop with tie wrap mounts and tie wraps.
6. Thread the wire to the rear of the rack securing it with tie wrap mounts, tie wraps, or cable channels when possible, ensuring there is no server or server cable interference.
7. Once the wire is at the rear of the rack, run it down the side of the rack using existing cable channels when possible. Run the wire through the floor cut out in the bottom of the rack.

12.3.1.2 Side Mount

If there is no door, regardless of whether blanking panels are installed, use side mount sensor mounting on either side of the rack. Steps are:

1. Align the sensor with the top edge of the top server or 1.5m (5 feet) above the floor, whichever is higher. It must be in the cool air stream.
2. Mount the sensor securely to reduce the possibility of control errors.
3. Plan sensor cable routing so that it will not interfere with, or become entangled in, any rack equipment or server cabling runs.
4. Thread the wire to the rear of the rack securing it with tie wrap mounts, tie wraps, or cable channels when possible, ensuring there is no server or server cable interference.
5. Once the wire is at the rear of the rack, run it down the side of the rack using existing cable channels when possible. Run the wire through the floor cut out in the bottom of the rack.

12.3.1.3 Top Mount

In a case where there is a door, but blanking panels are not in use in the rack and exhaust air can therefore freely circulate, mount the sensor on the outside top of the cabinet. External mounting at the top of the cabinet is also used for sealed racks where internal access is not allowed. Steps are:

1. Center the sensor on the rack. It must be in the cool air stream.
2. Mount the sensor securely to reduce the possibility of control errors.
3. Plan sensor cable routing so that it will not interfere with, or become entangled in, any rack equipment or server cabling runs.
4. Route the sensor wire to the hinge side of the door and around the hinge. Leave a large enough loop of extra wire at the hinge to fully open the door without straining the wire.
5. Attach the wire to the rack with tie wrap mounts and tie wraps.
6. Thread the wire to the rear of the rack securing it with tie wrap mounts and tie wraps.
7. Once the wire is at the rear of the rack, run it down the rear of the rack again securing it using tie wrap mounts and tie wraps. Run the wire into the floor.

Note: Do not place temperature sensors on the back side of servers or racks, or within the hot aisle of a row of racks. The underfloor HotSpotr is designed to bring additional cool air to the inlet side of servers, based upon the temperature of air entering the rack. Placing temperature sensors in an excessively hot area will defeat the adaptable control feature of your HotSpotr.