Complete Installation Guide

Sensor Version s5b (lid with ceiling mount threads)

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In the Box

Product
- Density Sensor
- Legal Information Booklet
- Quick Start Guide

Wall Mount Kit
- Wall Bracket (temporarily installed on sensor)
- Hex Key (2mm)
- 2pcs #8 x 1.25in Rounded Head Screws
- 2pcs Toggler Multi-Surface Anchors
- Rubber Plug

Hardware

Alternative Mounting *(Available For Order)*
- Low Profile Wall Mount Kit (section 6)
- Ceiling Mount Kit (section 7,8)
- Door Frame Mount Kit (section 9,10)
- Glass/Metal Adhesive Mount Kit (section 11)

Sensors
Depth Sensor utilizing Class 1 Eye Safe Infrared Lasers

Operating Temperature & Humidity
- Temperature: 32°- 95°F (0°- 35°C) with minimum 3in (7.6cm) clearance above the sensor
- Relative humidity: 20% to 80% non condensing

Unit Weight
1.4lbs (0.59kg)

Certifications
Certified Class 1 Eye Safe Laser Device
- EN/IEC 60825-1 2014 (2007 USA)
- FCC Part 15 Subpart B Class A
  - Conducted Emissions (15.107)
  - Radiated Emissions (15.109)
- CE Certification
- RCM Mark (Australia & New Zealand)
- RoHS2 Compliant

Indicators
Multi-color status LED
Dimensions and Features

- Enclosure Material: Anodized Aluminum
- Window Material: IR PMMA Plastic
- Removable Mount Arm
- 1/4in-20 threads for ceiling mounting

Interface

- 1x 10/100/1000 BaseT RJ45 interface
- 1x USB 2.0 Port for WiFi/Bluetooth dongle
- Reset Button

Labels

Serial Label: Appears on the DPU as shown.

MAC address: Can be found on the side of the box that the sensor came in.
Resetting the Sensor

To power reset the sensor to default factory settings, use the provided hex key or similar thin object to press and hold the reset button until the LED stops blinking (approx 10 seconds). The sensor must be plugged in and connected to power in order to reset.

Sensor LED Status Indicator

The sensor has an indicator LED located on the front of the sensor. The color chart to the right explains the meaning of each color, defines any issues, and lists what actions to take if necessary.

If the recommended action does not resolve the LED light error status, factory reset the sensor. To reset, press and hold the reset button on the back of the sensor until the LED light starts flashing white. If the issue persists, please reach out to support@density.io

<table>
<thead>
<tr>
<th>Color</th>
<th>Pattern</th>
<th>Meaning</th>
<th>Description/Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>No Light</td>
<td>Sensor is not receiving power</td>
<td>Check sensor is plugged in and is receiving power from source</td>
</tr>
<tr>
<td>White</td>
<td>Solid</td>
<td>Operating Normally</td>
<td>No action needed</td>
</tr>
<tr>
<td>White</td>
<td>Flashing</td>
<td>Indicates where sensor is when selecting Locate on Unit Setup App</td>
<td>Triggered via Unit Setup App</td>
</tr>
<tr>
<td>Blue</td>
<td>Flashing</td>
<td>Sensor is provisioning</td>
<td>Triggered via Unit Setup App. This process may take 5-10 minutes.</td>
</tr>
<tr>
<td>Orange</td>
<td>Flashing</td>
<td>Low Power Mode</td>
<td>Confirm switch is PoE+ with at least 30W per port or test ethernet cable</td>
</tr>
<tr>
<td>Purple</td>
<td>Solid</td>
<td>Sensor cannot connect to Density Server</td>
<td>Provision sensor via Unit Setup app and if not resolved, run Validation in same app</td>
</tr>
<tr>
<td>Purple</td>
<td>Flashing</td>
<td>Server cannot connect to DNS</td>
<td>Verify DNS is available on VLAN. If no Internal DNS server, review corporate firewalls to verify device can reach default DNS servers.</td>
</tr>
<tr>
<td>Red</td>
<td>Solid</td>
<td>Sensor does not have a Network Configuration</td>
<td>If using WiFi, use the Unit Setup app to create a Network Template. If using ethernet, verify DHCP server is available on VLAN.</td>
</tr>
</tbody>
</table>
Power Requirements

Density sensors require 802.3at PoE+ (Power over Ethernet) and need a constant 30W power budget.

Cabling Requirements

The sensor requires a Cat 5e or later ethernet cable (not included).

Option 1 - PoE+ Switch

Connect one end of a Cat 5e or later ethernet cable to a 802.3at (PoE+ Type 2) compliant network switch capable of providing 30W per port. Plug the other end of the ethernet cable into the sensor.

Each sensor requires 30W at the PSE (Power Supply Equipment / Switch) per 802.3at PoE+ Type 2 spec. Please ensure your switch is not overloaded or the sensor will fail to operate. (For example, if you have a 24-port 500W switch you can support up to 16 sensors at a time assuming no other load on the remaining ports).
**Option 2 - PoE+ Injector Using WiFi**

Plug the 30W PoE+ Injector into any standard 120v wall outlet. Plug one end of a Cat 5e or later ethernet cable into the Data & Power Out port located on the bottom of the injector. Plug the other end of the ethernet cable into the sensor. Use the Unit Setup App to connect the sensor to a WiFi network.

**Option 3 - PoE+ Injector Using Ethernet**

Plug the 30W PoE+ Injector into any standard 120v wall outlet. Plug one end of a Cat 5e or later ethernet cable into a cradlepoint / router or non PoE+ switch. Plug the other end of the cable into the Data In port located on the bottom of the injector. Plug an additional ethernet cable into the Data & Power Out port also located on the bottom of the injector. Plug the other end of the ethernet cable into the sensor.
Networking Basics

Density devices require internet connectivity to pass data to the web application.

Options to connect your Density devices to the internet:

• Option 1 - Wired internet via switch
• Option 2 - Wi-Fi (requires the Density Unit Setup App to locally set up the device)
• Option 3 - Wired internet via cradle-point

Networks that are not supported:

• Captive portal
• Proxy
• 5GHz Wifi networks
• WPA2 Enterprise
• Hidden Networks*

* Hidden networks can be used if temporarily made transparent while we configure the devices.

Network Configuration Options

Both DHCP and Static IP configurations are supported. (Static IP configurations require the Density Unit Setup App to locally set up the device).

DHCP Supported Configuration Options

Option 53 - DHCP Message Type
• Discover
Option 57 - Maximum DHCP Message Size
• 576
Option 55 - Parameter List
• Parameter request Line Items
  • Subnet Mask (1)
  • Router (3)
  • Interface MTU (26)
  • Private/Proxy Auto Discovery (252)
  • Network Time Protocol Servers (42)
  • Domain Name (15)
  • Domain Name Server (6)
  • Hostname (12)
Option 60 - Vendor Class Identifier*
• "Density S5 DPU"
Option 61 - Client Identifier
• MAC Address
Option 12 - Hostname
• Density-<Serial>

Static Configuration Requirements

You will need an IPv4 Address and Name Servers from your IT team to use in the setup process. (Requires the Density Unit Setup App to locally set up the device).

If You Have a Corporate Firewall

You will need to whitelist the device MAC addresses (the MAC addresses can be found on the outside of the packaging box for the device). You may also have to whitelist the following addresses to ensure the device is able to communicate to your corporate network:

*.density.io
*.s3.amazonaws.com
*.pool.ntp.org (if applicable)
connman.net
connectivitycheck.gstatic.com
8.8.8.8 (if applicable)
8.8.4.4 (if applicable)

Density does not currently support IP address whitelisting. A list of exact API subdomains is available by request.

Notes:

• The DPUs communicate via https, therefore port 443 must be open
• ntp port (port 123) must be open
• If internal DNS is not available then external dns servers 8.8.8.8 and 8.8.4.4 will be used and port 53 must be open

Unit Setup App

Used to configure units. iOS and Android application available - Go to mobile.density.io to download.
Temperature

The aluminum enclosure of the sensor is expected to be hot during operation. Density sensors are in compliance with certification temperature requirements and do not pose any risk of burning the skin or causing fires. If the sensor has been powered on for an extended period of time, it is recommended to remove the power cable and allow the sensor to cool for at least 5 minutes before handling.

Window Cleanliness

Smudges, fingerprints, and excessive dust can affect sensor’s ability to detect people. The sensor comes with a protective film that is designed to keep the window clean during the installation process. Remove the protective film after the installation is complete. Check the window for smudges or dust after the installation and wipe clean with a microfiber cloth if necessary. Make sure to check the sensor window every few months for excessive dust build up and wipe clean if necessary.
Entryway Guidelines

**Number of Sensors**

To maintain an accurate count of a space, you need to install a sensor above every entryway to that space.

*The sensor is designed for indoor use only.*

**Field of View / Placement**

The total detection area beneath the sensor is called the FOV (Field of View). To count people, the entryway needs adequate FOV coverage. Refer to the Install Height Chart (pg.14) to determine the minimum sensor height for your entryway.

The sensor should be centered horizontally above the entryway or hallway to ensure people are detected within the Field of View. The exception to this rule is if the sensor height is at 96in (244cm) or below and the sensor is being mounted over a single swinging door. In this case, a sensor offset of 10in (25.4cm) will be needed. See Single Door Specifics Section on pg.12.

The sensor cannot be mounted inside of the ceiling, on a side wall facing the entryway, or in the corner of a room.

**Trigger Line**

People are counted as they cross an invisible barrier known as the Trigger Line. The sensor needs to be installed as close to the entryway as possible to ensure people cross this line.
Install Height

The higher the sensor height, the greater the entryway FOV (Field of View) coverage. Install the sensor at its maximum height of 10ft (305cm) for optimal entryway coverage. The minimum install height for the sensor is 7ft 6in (228cm). Refer to the Install Height Chart on pg. 7.

Sensor Height

Adequate sensor height is very important to ensure proper FOV coverage of the entryway. The Sensor Height is determined by measuring the distance between the front edge of the sensor or black window and the ground. The Wall Bracket Height is the distance between the bottom of the Wall Bracket and the ground. For wall mounted installations, Sensor Height can be determined by measuring the Wall Bracket Height and adding 2.5in (6.3cm) to that measurement.

Threshold Width

To determine the Threshold Width of the entryway, measure the open space that a person can physically walk through. Doors with handles can restrict the walkable pathway and reduce the FOV coverage requirements. For entryways with doors, open the door fully and measure the width of the unobstructed path through the doorway. For hallways or entryways with no doors, measure the distance from wall to wall.
Sensor Orientation

The sensor must be positioned parallel to the flow of traffic. If mounted near an entryway, the sensor should be pointing away from the wall.

Sensor Positioning

When mounting the sensor to the ceiling, make sure that the sensor is not mounted too close or too far away from the entryway/threshold. The optimal position for the threaded rod is 3.5in (8.9cm) away from the threshold/entryway.

*In some cases obstructions or other environmental issues may call for the sensor to be installed outside of these guidelines. Any deviation from the guidelines should be under direct consultation of an account representative.*
Exit Signs

Exit signs should be level with the front edge of the sensor or higher to avoid any light or FOV interference. If the exit sign is level with the front edge of the sensor, make sure that there is at least 7.5in (19cm) of space between the exit sign and the wall.

*If an exit sign position falls outside these guidelines, reach out to your account representative or support@density.io to verify that there is no FOV or light interference.*

Door Frames

Installing the sensor near a door frame can cause potential FOV interference. If your installation requires a door frame mount (section 9,10), make sure to position the sensor towards the front edge of the door frame.

Door Swing

The sensor performs best when mounted on the non-door swing side of the entryway.
Single Door Specifics

For some single doors, the optimal sensor placement is closer to the handle side of the door. Mount the sensor approximately 10in (25.4cm) away from the handle side of the door if your single door meets any of the below criteria:

- The sensor height is 96in (244cm) or less
- A closer swings under the sensor

Black Tape

If the sensor is mounted too close to a swinging door, the IR light emitting from the sensor will bounce off of the top surface of the door and cause interference with the sensor. If the door swings underneath the sensor, and the distance between the sensor and the top of the door is 6in (15.2cm) or less, apply a strip of black painters or gaffers tape to the entire top surface of the door. Make sure to trim off any excess tape. The tape will help absorb the emitted sensor light, and mitigate any interference.

* Metal doors cause extreme light reflection at any sensor height. If your door is made of metal, apply a strip of black tape to the entire top surface of the door regardless of sensor height.
Door Swing Offset

Doors that swing both directions, and that are flush with the ceiling require the sensor to be ceiling mounted and offset away from the swinging door to avoid any collision. The maximum offset distance for the sensor is 19.5in (49.5cm), measured from the wall to the center of the sensor.

Overhang

Some doorways have a structural overhang which would prevent the sensor from being installed above the door at the optimal mounting height. The sensor can be offset from the door and mounted above the opening of the overhang. The opening will act as an extension of the door entryway. In order for the overhang mount to work, there needs to be structural side walls to confine human movement to the area beneath the sensor.
Mounting Zone

The Mounting Zone is the area between the minimum sensor height (as dictated by the install height chart below), and the maximum sensor height, which is 120in (305cm). The optimal sensor placement is as close to the center of the mounting zone as possible. This ensures that the device is not too high or too low for a particular threshold width.

Install Height Chart - Single Sensor

To determine the necessary sensor height for a given threshold, first measure the threshold width (the physical opening that a person can walk through), then refer to the Install height Chart for the minimum sensor height. Use the minimum sensor height as the starting measurement for the Mounting Zone. The upper measurement of the mounting zone will be the overall maximum sensor install height of 120in (305cm). Mount the sensor near the center of the Mounting Zone.

* If the sensor height is at 96in (244cm) or below and the sensor is being mounted over a single swinging door, a sensor offset of 10in (25.4cm) will be needed. The sensor is offset to be positioned over the handle side of the door so coverage is emphasized on the side that people walk through the door. See Single Door Specifics Section on pg.12.

If your entryway falls outside of these guidelines, additional sensors may be needed. Please reach out to your account representative or support@density.io
Multiple Sensors

If entryway width is too wide, and the sensor cannot be mounted high enough for ample FOV coverage, additional sensors can be added (see pg. 16-19).

When installing multiple sensors, they should be mounted in line and parallel to each other as shown.

Hallways

In certain scenarios the sensor can be suspended over hallways using a threaded rod and a Ceiling Mount Kit (section 7,8).

Make sure to follow the Install Height Chart for hallway installs.

Clearance

For standard wall mount installations (section 5), a minimum of 4.5in (11.4cm) of unobstructed vertical wall space is required above the entryway. This allows enough clearance for the unit to slide onto the wall bracket.

If available vertical mount space above the entryway is less than 4.5in (11.4cm), a Low Profile Wall Mount Kit (section 8) or Ceiling Mount Kit (section 9,10) can be ordered.

For ceiling mount installations, the sensor cannot hang below the entryway if the door swings toward the sensor as the door will make contact. If the door swings toward the sensor, the sensor must be offset away from the door (see Door Swing Offset section on pg. 13)
Multi Unit Spacing - 2 Sensors

For 2 sensor installs, the distance between the centerpoint of the entryway and the center point of the left and right sensors should be equal (a = b). The distance from the ground to the sensors should also be equal (x = y).

Make sure to record distance between sensor centerpoints, sensor height, as well as both sensor serial numbers.

Install Height / Spacing Chart - 2 Sensors

The Install Height / Spacing Chart lists the minimum sensor height requirements for various threshold widths as well as the required distance between sensors.

To use the chart, measure the threshold width (the physical opening that a person can walk through), then look at the chart for the minimum required install height. If possible, mount the sensors as close to the center of the Mounting Zone (see pg. 14) as possible. Space the sensors over the threshold according to the Distance Between Sensors section of the chart. The minimum allowable distance between sensors is 22in (56cm), and the maximum allowable distance between sensors is 67in.

If needed, please reach out to your account representative or support@density.io for a walk through of the Install Height / Spacing Chart.
Multi Sensor Spacing - 3 Sensors

For 3 sensor installs, the distance between the centerpoint of centrally mounted sensor and the center point of the left and right sensors should be equal (a = b). The distance from the ground to the sensors should also be equal (x = y).

Make sure to record distance between sensor centerpoints, sensor height, as well as both sensor serial numbers.

Install Height / Spacing Chart - 3 Sensors

The Install Height / Spacing Chart lists the minimum sensor height requirements for various threshold widths as well as the required distance between sensors.

To use the chart, measure the threshold width (the physical opening that a person can walk through), then look at the chart for the minimum required install height. If possible, mount the sensors as close to the center of the Mounting Zone (see pg. 14) as possible. Space the sensors over the threshold according to the Distance Between Sensors section of the chart. The minimum allowable distance between sensors is 22in (56cm), and the maximum allowable distance between sensors is 67in.

If needed, please reach out to your account representative or support@density.io for a walk through of the Install Height / Spacing Chart.

<table>
<thead>
<tr>
<th>3 Sensors - Standard (in)</th>
<th>Sensor Heights</th>
<th>Distance Between Sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Threshold Width</strong></td>
<td><strong>Min Sensor Height</strong></td>
<td></td>
</tr>
<tr>
<td>≤ 84in</td>
<td>93in</td>
<td></td>
</tr>
<tr>
<td>≤ 93in</td>
<td>92in</td>
<td></td>
</tr>
<tr>
<td>≤ 102in</td>
<td>91in</td>
<td></td>
</tr>
<tr>
<td>≤ 111in</td>
<td>90in</td>
<td></td>
</tr>
<tr>
<td>≤ 120in</td>
<td>89in</td>
<td></td>
</tr>
<tr>
<td>≤ 129in</td>
<td>88in</td>
<td></td>
</tr>
<tr>
<td>≤ 138in</td>
<td>87in</td>
<td></td>
</tr>
<tr>
<td>≤ 147in</td>
<td>86in</td>
<td></td>
</tr>
<tr>
<td>≤ 156in</td>
<td>85in</td>
<td></td>
</tr>
<tr>
<td>≤ 165in</td>
<td>84in</td>
<td></td>
</tr>
<tr>
<td>≤ 174in</td>
<td>83in</td>
<td></td>
</tr>
<tr>
<td>≤ 183in</td>
<td>82in</td>
<td></td>
</tr>
<tr>
<td>≤ 192in</td>
<td>81in</td>
<td></td>
</tr>
<tr>
<td>≤ 201in</td>
<td>80in</td>
<td></td>
</tr>
<tr>
<td>≤ 210in</td>
<td>79in</td>
<td></td>
</tr>
<tr>
<td>≤ 219in</td>
<td>78in</td>
<td></td>
</tr>
</tbody>
</table>

*Minimum Sensor Height - 90in (7ft 6in)  Maximum Sensor Height - 120in (10ft)

<table>
<thead>
<tr>
<th>3 Sensors - Metric (cm)</th>
<th>Sensor Heights</th>
<th>Distance Between Sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Threshold Width</strong></td>
<td><strong>Min Sensor Height</strong></td>
<td></td>
</tr>
<tr>
<td>≤ 213cm</td>
<td>228cm</td>
<td></td>
</tr>
<tr>
<td>≤ 235cm</td>
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<td>≤ 256cm</td>
<td>249cm</td>
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<td>≤ 275cm</td>
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<td>≤ 292cm</td>
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<td>≤ 304cm</td>
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<td>≤ 325cm</td>
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<td>≤ 338cm</td>
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<td>≤ 350cm</td>
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<td>≤ 533cm</td>
<td>264cm</td>
<td></td>
</tr>
<tr>
<td>≤ 590cm</td>
<td>264cm</td>
<td></td>
</tr>
</tbody>
</table>

*Minimum Sensor Height - 228cm (2.28m) Maximum Sensor Height - 305cm (10.05m)
Multi Sensor Spacing - 4 Sensors

For 4 sensor installs, the distance between the centerpoint of each sensor should be equal (a = b = c). The distance from the ground to the sensors should also be equal (x = y). Center the group of 4 sensors over the entryway.

Make sure to record distance between sensor centerpoints, sensor height, as well as both sensor serial numbers.

Install Height / Spacing Chart - 4 Sensors

The Install Height / Spacing Chart lists the minimum sensor height requirements for various threshold widths as well as the required distance between sensors.

To use the chart, measure the threshold width (the physical opening that a person can walk through), then look at the chart for the minimum required install height. If possible, mount the sensors as close to the center of the Mounting Zone (see pg. 14) as possible. Space the sensors over the threshold according to the Distance Between Sensors section of the chart. The minimum allowable distance between sensors is 22in (56cm), and the maximum allowable distance between sensors is 67in.

If needed, please reach out to your account representative or support@density.io for a walk through of the Install Height / Spacing Chart.
Multi Sensor Spacing - 5 Sensors

For 5 sensor installs, the distance between the centerpoint of each sensor should be equal \( (a = b = c = d) \). The distance from the ground to the sensors should also be equal \( (x = y) \).

Center the group of 5 sensors over the entryway.

Make sure to record distance between sensor centerpoints, sensor height, as well as both sensor serial numbers.

### Install Height / Spacing Chart - 5 Sensors

The Install Height / Spacing Chart lists the minimum sensor height requirements for various threshold widths as well as the required distance between sensors.

To use the chart, measure the threshold width (the physical opening that a person can walk through), then look at the chart for the minimum required install height. If possible, mount the sensors as close to the center of the Mounting Zone (see pg. 14) as possible. Space the sensors over the threshold according to the Distance Between Sensors section of the chart. The minimum allowable distance between sensors is 22in (56cm), and the maximum allowable distance between sensors is 67in.

If needed, please reach out to your account representative or support@density.io for a walk through of the Install Height / Spacing Chart.

#### 5 Sensors - Standard (in)

<table>
<thead>
<tr>
<th>Threshold Width</th>
<th>Min Sensor Height</th>
<th>Sensor Heights</th>
<th>Distance Between Sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td>56cm</td>
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<td>759cm</td>
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<td>683cm</td>
<td>683cm</td>
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<tr>
<td>553cm</td>
<td>553cm</td>
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<tr>
<td>516cm</td>
<td>516cm</td>
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<td>359in</td>
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<td>143in</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

*Minimum Sensor Height - 90in (7ft 6in) *Maximum Sensor Height - 120in (10ft)

#### 5 Sensors - Metric (cm)

<table>
<thead>
<tr>
<th>Threshold Width</th>
<th>Min Sensor Height</th>
<th>Sensor Heights</th>
<th>Distance Between Sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td>140cm</td>
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<td>170cm</td>
<td>228cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>203cm</td>
<td>228cm</td>
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<td>143cm</td>
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*Minimum Sensor Height - 228cm (2.28m) *Maximum Sensor Height - 305cm (3.05m)
Mounting Options

**Standard Wall Mount**

For mounting the sensor to a variety of wall types using the provided multi-surface wall anchors and screws.

*Refer to section 5 for more details and mounting instructions.*

**Low Profile Wall Mount**

For mounting the sensor in areas with limited space above the entryway. Requires minimum 3.75” (9.5cm).

*Refer to section 6 for more details and mounting instructions.*

**Ceiling Mount**

For mounting the sensor to the ceiling in front of the entryway. Kit includes two options: A Toggle Anchor for hollow ceiling types like drywall or ceiling tiles as well as Threaded Rod and Expansion Anchors for a variety of solid surface materials like wood, metal, tile, stone & plaster.

*Refer to section 7 and 8 for more details and mounting instructions.*
Door Frame Mount (Top and Bottom)

For mounting the sensor to the top or bottom surface of a wood or metal door frame.

Refer to section 9 and 10 for more details and mounting instructions.

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Glass/Metal Wall Mount

For mounting the sensor to a smooth glass or metal surface with semi-permanent adhesive.

Refer to section 11 for more details and mounting instructions.
Wall Mounting

Wall Mount Kit *(Included, available for order)*

a. Wall Bracket
b. 2pcs #8 x 1.25in Rounded Head Screws
c. 2pcs Multi-Surface Anchors
d. Hex Key

Materials Not Included

- Drill
- Mallet or Hammer
- Level
- Measuring tape
- Pencil
- 3/16in drill bit
- Ethernet Cable (Cat 5e or later)

Power & Connectivity

All sensors require power over ethernet and internet connectivity.
Mounting with Screws and Anchors

The Wall Mount Kit and Low Profile Wall Mount Kit (section 6) come with 2pcs #8 x 1.25” Phillips Rounded Head Screws and 2pcs Multi-Surface Toggler Anchors designed for a wide range of materials (concrete, brick, stone, drywall, etc.). The anchor expands and elongates within a solid substrate to distribute force evenly. For hollow substrates, the anchor jaws pop open to lock into position.

Anchors should be used for all wall materials except for wood. For wood, use the screws and drill directly into the surface.

Cable Management - Hidden

For hollow wall installs, the cable can be hidden by drilling a hole into the wall material and threading the ethernet cable through the drilled hole.
Step 2: Mark Placement

Before installing, refer to and follow the supported mounting height and clearance requirements in section 3.

Center the Wall Bracket horizontally above the doorway. Use the level to ensure the Wall Bracket is parallel to the ground. Use a pencil to mark the center of the two holes in the Wall Bracket.

If there are any objects obstructing the sensor, you may install the sensor slightly off-center, or consider moving the obstruction. Please consult your Density Account Manager before offsetting the sensor.

Cable Management - Exposed

For solid and hollow wall installs, the cable can be secured directly to the wall surface using cable clip fasteners or channeling.

Step 1: Prepare The Sensor

Remove the protective film on the back of the sensor. Use the provided Hex Key to release the Wall Bracket from the Mount Arm.
Step 3: Drill Holes
Drill a hole through each pencil mark using a 3/16in drill bit. For hollow substrates, drill completely through. For solid wall materials, drill holes with a depth of at least 1 1/4in (3.2cm).

Step 4: Insert Anchors
Use a mallet or hammer to tap the anchors into each hole. Anchors should be flush with the wall.

Step 5: Install Wall Bracket
Align the holes in the Wall Bracket with the installed anchors. Use a drill with #2 Phillips Screwdriver Bit or manually with a standard Phillips head screwdriver to drive each screw into the drywall anchors.
Step 6: Power Up The Sensor

Plug in the ethernet cable. The sensor will automatically power up and the LED indicator on the front of the sensor will turn white.

Step 7: Wall Mount

Slide the sensor downward onto the installed Wall Bracket.

Step 8: Lock Sensor and Peel Film

Lock the sensor to the Wall Bracket with the provided Hex Key by twisting the set screw all the way in. Remove the protective film on the black window.

Make sure the black sensor window remains free of dust and smudges during operation.
Low Profile Wall Mounting

Low Profile Wall Mount Kit
(available for order)

- e. Low Profile Wall Bracket
- b. 2pcs #8 x 1.25in Rounded Head Screws
- c. 2pcs Multi-Surface Anchors
- d. Hex Key

Materials Not Included

- Drill
- Mallet or Hammer
- Level
- Measuring tape
- Pencil
- 3/16in drill bit
- Ethernet Cable (Cat 5e or later)

Power & Connectivity

All sensors require power over ethernet and internet connectivity.

www.density.io
**Low Profile Wall Mount Kit**

The Low Profile Wall Mount Kit (available for order) is designed for installations with less than 4.5in (12.7cm) of clearance above the entryway, however, you will need a minimum of 3.75in (9.5cm) of clearance above the entryway.

**Low Profile Wall Bracket**

The Low Profile Wall Bracket is similar to the standard Wall Bracket, but has slight physical modifications to the design to allow the sensor to attach to the bracket with minimal vertical movement.

*Warning: When using the Low Profile Wall Bracket, the set screw MUST be tightened all the way to ensure the sensor does not fall off the wall.*

**Cable Management - Hidden**

For hollow wall installs, the cable can be hidden by drilling a hole into the wall material and threading the ethernet cable through the drilled hole.
Step 2: Mark Placement

Before installing, refer to and follow the supported mounting height and clearance requirements in section 3.

Center the Low Profile Wall Bracket horizontally above the doorway. Align the bottom edge of the Low Profile Wall Bracket with the edge of the entryway as shown. Use the level to ensure the Low Profile Wall Bracket is parallel to the ground. Use a pencil to mark the center of the two holes in the Low Profile Wall Bracket.

If there are any objects obstructing the sensor, you may install the sensor slightly off-center, or consider moving the obstruction. Please consult your Density Account Manager before offsetting the sensor.

Step 1: Prepare The Sensor

Remove the protective film on the back of the sensor. Use the provided Hex Key to release the Wall Bracket from the Mount Arm.

Cable Management - Exposed

For solid and hollow wall installs, the cable can be secured directly to the wall surface using cable clip fasteners or channeling.
Step 3: Drill Holes

Drill a hole through each pencil mark using a 3/16in drill bit. For hollow substrates, drill completely through. For solid wall materials, drill holes with a depth of at least 1 1/4in (3.2cm).

Step 4: Insert Anchors

Use a mallet or hammer to tap the anchors into each hole. Anchors should be flush with the wall.

Step 5: Install Low Profile Wall Bracket

Align the holes in the Low Profile Wall Bracket with the installed anchors. Use a drill with #2 Phillips Screwdriver Bit or manually with a standard Phillips head screwdriver to drive each screw into the drywall anchors.
Step 6: Power Up The Sensor

Plug in the ethernet cable. The sensor will automatically power up and the LED indicator on the front of the sensor will turn white.

Step 7: Low Profile Wall Mount

To mount, align the bottom of the sensor approximately 1/8in (0.3cm) above the bottom edge of the Low Profile Wall Bracket. Move the sensor directly towards the wall so that the Mount Arm and Low Profile Wall Bracket are overlapping. Slide the sensor downward, then all the way over to the right.

Step 8: Lock Sensor and Peel Film

Lock the sensor to the Low Profile Wall Bracket with the provided Hex Key by twisting the set screw all the way in. Remove the protective film on the black window.

Make sure the black sensor window remains free of dust and smudges during operation.

Warning: When using the Low Profile Wall Bracket, the set MUST be tightened all the way to ensure the sensor does not fall off the wall.
Ceiling Mounting - Toggle Anchor

For Hollow Ceiling Types

**Materials Not Included**

- Mallet
- Measuring tape
- Drill
- Wrench or Pliers
- 5/8in Drill Bit
- 1/4in-20 Threaded rod
- Ethernet Cable (Cat 5e or later)

**Ceiling Mount Kit (available for order)**

- r. 1/4in-20 Toggle Anchor
- h. Steel Washer
- i. Hex Nut
- d. Hex Key

**Power & Connectivity**

All sensors require power over ethernet and internet connectivity.
**Step 1: Prepare The Sensor**

Remove the protective film on the back of the sensor. Use the provided Hex Key to unscrew the two flat head screws and release the Mount Arm.

**Step 2: Insert Rubber Plug**

The sensor comes with a Rubber Plug (located in the Wall Mount Kit Box) designed to cosmetically cover the cavity where the Mount Arm was. Insert the plug by pressing the two pegs firmly into the two holes in the Mount Cavity. A small arrow on the inner surface of the Rubber Plug indicates which direction should face upward.

**Toggle Anchor**

Designed for hollow ceiling types (Drywall, Plaster, Ceiling Tile, Wood Paneling, etc.), the Toggle Anchor has spring loaded wings that fold flush, and then re-open once they have passed through the ceiling material.
Step 3: Drill Mounting Hole

Before installing, refer to and follow the supported mounting height and clearance requirements in section 3.

Mark a spot 3.5in (8.9cm) away from the wall that is centered horizontally above the entryway. Drill a hole all the way through the hollow ceiling material using the 5/8in drill bit.

Step 4: Assemble

Screw the sensor onto the bottom end of the threaded rod. Make sure that the threaded rod is screwed completely into the threads on the sensor. Screw the nut and washer onto the top end of the threaded rod. Screw the Toggle Anchor onto the top end of the threaded rod. Make sure that the threaded rod is fully threaded into the Toggle Anchor.

The 1/4”-20 threads on the sensor have an internal nylon washer which is designed to prevent the sensor from coming off the threaded rod. The nylon washer requires firm initial pressure to engage the threads of the rod. If needed, use a pair of pliers to clamp onto the threaded rod for a firm grip while threading on the sensor.
Step 5: Insert Toggle Anchor Into Ceiling

Fold the Toggle Anchor flaps down, then insert the Toggle Anchor and end of the threaded rod through the drilled hole. Once through the ceiling, the Toggle Anchor flaps will spring open again.

To adjust the install height, twist the threaded rod counter clockwise to raise or clockwise to lower. Make sure the threaded rod has enough thread engagement with the Toggle Anchor.

Step 6: Tighten the Anchor Assembly

Once desired install height is determined, twist the nut and washer until they are tight against the ceiling. Tighten the nut with a wrench or pliers so that the washer provides strong clamping pressure against the ceiling.
**Step 7: Power Up The Sensor**

Plug in the ethernet cable. The sensor will automatically power up and the LED indicator on the front of the sensor will turn white.

**Step 8: Secure Cable**

A zip tie can be used to secure the ethernet cable to the threaded rod for tidy cable management.

**Step 9: Peel Film**

Remove the protective film on the black window.

*Make sure the black sensor window remains free of dust and smudges during operation.*
Cable Management

A 1/2in PVC pipe can be used to run the cable and rod through. Before assembly, cut the PVC pipe to the proper length and drill or cut a notch or hole at the top of the pipe to allow for cable relief. For optimal cable aesthetics, we recommend using a flat white Cat 5e or greater ethernet cable as shown. Make sure to use a pipe size with a minimum inner diameter of 0.62in (1.6cm).

Sensor Height

The illustration on the right indicates the distance from the ceiling to the internal sensor for each anchor type when the device is mounted as flush to the ceiling as possible. Note the minimum threaded rod length required.
Ceiling Mounting - Threaded Anchor

For Solid Ceiling Types

Ceiling Mount Kit *(available for order)*

- d. Hex Key
- s. Threaded Rod Anchor - Wood
- u. Threaded Rod Anchor - Steel
- t. Expansions Anchor - Concrete
- v. Installation Tool - Concrete

Materials Not Included in Kit

- Measuring tape
- Drill
- 5/8in Drive Socket - Wood only
- 1/2in Drive Socket - Steel only
- ANSI 3/8" masonry bit - Concrete only
- 1/4in - 20 Threaded rod
- Ethernet Cable (Cat 5e or later)

Power & Connectivity

All sensors require power over ethernet and internet connectivity.
Threaded Rod Anchor

Install directly into a mounting surface to suspend a threaded rod. The Ceiling Mount Kit ships with three different mounting anchors designed for wood, steel, and concrete surfaces. The wood and steel anchors require a drill along with the appropriate sized drive socket (not included) for installation. The concrete anchor requires a hole drilled by an ANSI 3/8” masonry bit, as well as a hammer (not included) and an installation tool (included).

Step 1: Prepare The Sensor

Remove the protective film on the back of the sensor. Use the provided Hex Key to unscrew the two flat head screws and release the Mount Arm.

Step 2: Insert Rubber Plug

The sensor comes with a Rubber Plug (located in the Wall Mount Kit Box) designed to cosmetically cover the cavity where the Mount Arm was. Insert the plug by pressing the two pegs firmly into the two holes in the Mount Cavity. A small arrow on the inner surface of the Rubber Plug indicates which direction should face upward.
Step 3: Install Ceiling Anchor

Before installing, refer to and follow the supported mounting height and clearance requirements in section 3.

Mark a spot 3.5in (8.9cm) away from the wall that is centered horizontally above the entryway.

**Wood and Steel installation:** Use a drill and a drive socket (5/8in for wood, 1/2in for steel) to drive the anchor into the ceiling until the bottom side of the anchor head is flush with the ceiling.

**Concrete installation:** Anchors for concrete require a hole drilled by an ANSI 3/8in masonry bit. To install, place the anchor into the drilled hole, insert the required installation tool into the anchor, and drive with a hammer until the thicker portion of the tool makes contact with the anchor. When installed, anchors sit flush with the surface.

Step 4: Assemble

Screw the sensor onto the bottom end of the threaded rod. Twist the threaded rod completely into the threads of the Anchor. Make sure that the threaded rod is threaded completely into both the sensor and the Anchor.

*The 1/4"-20 threads on the sensor have an internal nylon washer which is designed to prevent the sensor from coming off the threaded rod. The nylon washer requires firm initial pressure to engage the threads of the rod.*
Step 5: Power Up The Sensor

Plug in the ethernet cable. The sensor will automatically power up and the LED indicator on the front of the sensor will turn white.

Step 6: Secure Cable

A zip tie can be used to secure the ethernet cable to the threaded rod for tidy cable management.

Step 7: Peel Film

Remove the protective film on the black window.

Make sure the black sensor window remains free of dust and smudges during operation.
Cable Management

A 1/2in PVC pipe can be used to run the cable and rod through. Before assembly, cut the PVC pipe to the proper length and drill or cut a notch or hole at the top of the pipe to allow for cable relief. For optimal cable aesthetics, we recommend using a flat white Cat 5e or greater ethernet cable as shown. Make sure to use a pipe size with a minimum inner diameter of 0.62in (1.6cm).

Flush Mount

The illustrations on the right indicate the distance from the ceiling to the internal sensor for each anchor type when the device is mounted as flush to the ceiling as possible. Note the minimum threaded rod length required.
Top of Frame Mounting

Door Frame Mount Kit *(available for order)*

- f. Utility Mount
- d. Hex Key
- k. 2pcs Self-Drilling Screws, #6 x 1.5in

Materials Not Included in Kit

- Drill
- #2 Phillips Screwdriver Bit
- Ethernet Cable (Cat 5e or later)

Power & Connectivity

All sensors require power over ethernet and internet connectivity.
Step 1: Screw In Utility Mount

Before installing, refer to and follow the supported mounting height and clearance requirements in section 3.

Center the Utility Mount horizontally above the entryway, and 1/4in (0.6 cm) away from the front edge of the frame as shown. Use a drill to drive both self-tapping screws through the Utility Mount and into the top of the door frame.

Step 2: Prepare The Sensor

Remove the protective film on the back of the sensor. Use the provided Hex Key to release the Wall Bracket from the Mount Arm.

Cable Management

For tidier cable management, the ethernet cable can be run within the hollow frame.
Step 3: Power Up The Sensor

Plug in the ethernet cable. The sensor will automatically power up and the LED indicator on the front of the sensor will turn white.

Step 4: Mount the Sensor

Slide the sensor downward onto the Utility Mount.

Step 5: Lock Sensor and Peel Film

Lock the sensor to the Utility Mount with the provided hex key by twisting the set screw all the way in. Remove the protective film on the black window.

*Make sure the black sensor window remains free of dust and smudges during operation.*
Step 1: Screw In Utility Mount

Before installing, refer to and follow the supported mounting height and clearance requirements in section 3.

Center the Utility Mount horizontally above the entryway, and 1/4in (0.6 cm) away from the front edge of the frame as shown. Use a drill to drive both self-tapping screws through the Utility Mount and into the top of the door frame.

Step 2: Prepare The Sensor

Remove the protective film on the back of the sensor. Use the provided Hex Key to release the Wall Bracket from the Mount Arm.

Step 3: Power Up The Sensor

Plug in the ethernet cable. The sensor will automatically power up and the LED indicator on the front of the unit will turn white.
## Bottom of Frame Mounting

### Door Frame Mount Kit (available for order)
- f. Utility Mount
- d. Hex Key
- k. 2pcs Self-Drilling Screws, #6 x 1.5in

### Materials Not Included in Kit
- Drill
- #2 Phillips Screwdriver Bit
- Ethernet Cable (Cat 5e or later)

### Power & Connectivity
All sensors require power over ethernet and internet connectivity.
Step 1: Screw In the Door Frame Mount

Before installing, refer to and follow the supported mounting height and clearance requirements in section 3.

Center the Utility Mount horizontally above the entryway, and 0.27in (0.68cm) away from the front edge of the frame as shown. Use a drill to drive both self-tapping screws through the Utility Mount and into the bottom of the door frame.

Note the orientation of the Door Frame Mount.

Step 2: Prepare The Sensor

Remove the protective film on the back of the sensor. Use the provided Hex Key to release the Wall Bracket from the Mount Arm.

Cable Management

For tidier cable management, the ethernet cable can be run within the hollow frame.
**Step 3: Power Up The Sensor**

Plug in the ethernet cable. The sensor will automatically power up and the LED indicator on the front of the sensor will turn white.

**Step 4: Mount the Sensor**

Slide the sensor downward onto the Utility Mount.

**Step 5: Lock Sensor and Peel Film**

Lock the sensor to the Utility Mount with the provided Hex Key by twisting the set screw all the way in. Remove the protective film on the black window.

*Make sure the black sensor window remains free of dust and smudges during operation.*
Glass/Metal Adhesive Mounting

Glass/Metal Mount Kit *(available for order)*

1. Glass/Metal Adhesive Mount
   d. Hex Key

**Materials Not Included in Kit**

Hand Roller (optional)
Lint-Free Towel
70:30 Isopropyl Alcohol (IPA)
Ethernet Cable (Cat 5e or later)

**Power & Connectivity**

All sensors require power over ethernet and internet connectivity.
**Glass/Metal Adhesive Mount Specs**

The Glass/Metal Adhesive Mount utilizes a 3M VHB adhesive specifically designed for glass and metal surfaces. The entire surface area of the adhesive must be in contact with the glass or metal surface it is adhered to.

*Warning: The Glass/Metal Adhesive Mount utilizes a Low Profile Bracket design and requires the set screw in the Mount Arm of the sensor to be tightened all the way to ensure the sensor does not fall off the wall.*
Step 1: Clean The Surface

To obtain optimal adhesion, the bonding surfaces must be clean and dry. Wipe the surfaces with a mixture of approximately 70:30 isopropyl alcohol (IPA)/water solution.

Warning: The Glass/Metal Adhesive Mount is designed for use on glass and metal surfaces only. DO NOT USE ON ANY OTHER SURFACE TYPES.

Step 2: Dry The Surface

Wipe the surface dry with a clean lint free microfiber towel or cloth.
Step 3: Attach to Wall Surface

Before installing, refer to and follow the supported mounting height and clearance requirements in section 3.

Use a hand roller to apply very firm pressure across all front surfaces (indicated with grey shading in illustration) of the Glass/Metal Adhesive Mount for at least 15 seconds.

Use of roller is recommended to ensure proper adhesive bonding and to prevent the unit of device falling.

Roller Source:
McMaster-Carr
Part Number - 62395T69
www.mcmaster.com

Step 4: Wait For The Adhesive To Set

Before mounting the sensor, the adhesive on the Glass/Metal Adhesive Mount must cure at room temperature for at least 24 hours to achieve 90% strength. We recommend waiting 72hrs to achieve 100% strength.

Step 5: Prepare The Sensor

Remove the protective film on the back of the sensor. Use the provided Hex Key to release the Wall Bracket from the Mount Arm.
Step 6: Power Up The Sensor

Plug in the ethernet cable. The sensor will automatically power up and the LED indicator on the front of the sensor will turn white.

Step 7: Mount The Sensor

To mount, align the bottom of the sensor approximately 1/8in (0.3cm) above the bottom edge of the Glass/Metal Adhesive Mount. Move the sensor directly towards the glass/metal wall so that the Mount Arm and bracket on the Glass/Metal Adhesive Mount are overlapping. Slide the sensor downward, then all the way over to the right.

Step 8: Lock Sensor and Peel Film

Lock the sensor to the Glass/Metal Adhesive Mount with the provided Hex Key by twisting the set screw all the way in. Remove the protective film on the black window.

*Warning: When using the Glass/Metal Adhesive Mount, the set screw MUST be tightened all the way to ensure the sensor does not fall off the wall.*

Make sure the black sensor window remains free of dust and smudges during operation.