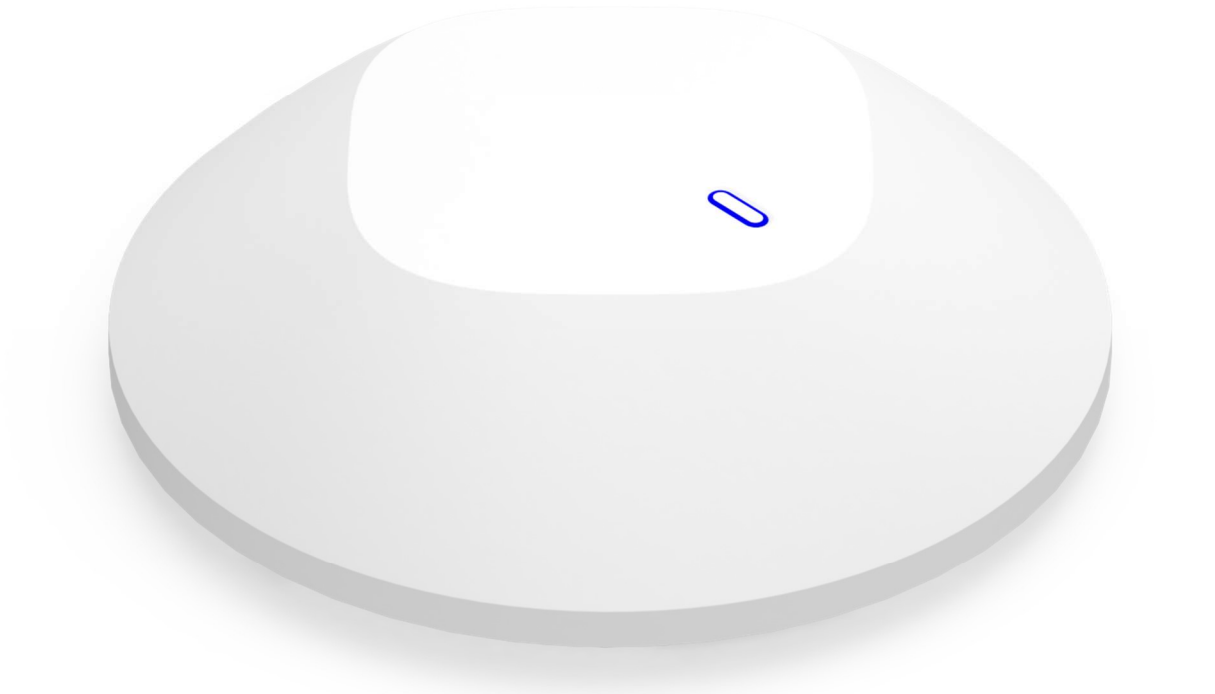
RIGADO

Cascade Antenna User Guide



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Introduction

The Cascade Antenna series is part of Rigado's Cascade Edge-as-a-Service solution that offers powerful and cost-effective edge network infrastructure for large-scale, low-power wireless deployments. Cascade Antennas provide commercial and enterprise IoT project and product teams with an effective means to scale Bluetooth® infrastructure through simple installation and superior coverage.

Revision History

Version	Description	Date	Initials
V0.1	Initial draft	2019-12-11	PJB
V0.2	Minor edits	2019-12-12	PJB
V0.3	Updated installation section (4)	2019-12-13	PJB
V0.4	Correct formatting in section (4.1) and update regulatory statements	2020-01-18	PJB
V0.5	Remove RF exposure and non-modification statements (6.4, 6.5)	2020-02-25	PJB

1 Planning

Planning is key to the success of any hardware installation. There are many things to consider when installing a wireless system into a space. Key elements for consideration are listed in the sections below.

1.1 Coverage

In a typical commercial space, expected coverage area is about 6,000 sq. ft. per Cascade Antenna. However, the area of coverage for each Cascade Antenna is dependent upon the application needs as well as the layout and construction of the facility where it is installed. An open floor plan will result in better coverage than a closed floor plan with many walls. Building construction materials also affect coverage – drywall and glass permit more coverage than brick and concrete. Note that brick or concrete walls should be planned around, as signals have poor penetration through these types of walls. If coverage is required on both sides of a brick or concrete wall, plan to install a Cascade Antenna on each side.

If a higher level of coverage planning precision is required, Rigado suggests using a Wi-Fi site planning tool to simulate coverage. There are multiple planning tools available online, both free and professional. For use in this application it should allow for changing the Access Points transmit power and characteristics for the Cascade Antenna.

1.2 Connections

The types of connections required should be taken into consideration when planning a new install. In order to function, the Cascade Antenna requires both power and network connectivity through the RJ-45 (Ethernet) connector. Rigado suggests using PoE-enabled Ethernet that supports 100Mbit throughput and is IEEE 802.3af compliant.

1.3 Placement

Correct placement of the Cascade Antenna is important for getting the desired coverage. Generally, mounting up high and out of reach is recommended, as this improves line of sight while making the units more difficult to tamper with. Special consideration should be given to the orientation as the internal antennas are directional and will perform best when the unit is horizontal. For some applications, wall mounting is also acceptable. Mounting on or near metal objects will also affect performance and should be taken into consideration during installation.

2 Cascade Antenna Hardware

2.1 Specifications

Processor		
STM32H750	480MHz, 32bit ARM® Cortex™-M7	
Memory		
Memory (MCU Internal)	1 MByte RAM, 128 Kbytes Flash	
Memory (Flash)	8 MByte QSPI NOR Flash, 8 Mbyte NOR Flash	
Bluetooth®		
Radio 1, 2, 3, 4	Bluetooth® Version	5 (Bluetooth® Low Energy)
	LE Connections	N/A: Disabled in software
	Frequency	2.402 to 2.480 GHz
	Modulations	GFSK at 1Mbps, 2Mbps data rates
	Transmit Power	N/A: Disabled in software
	Receiver Sensitivity	-96dBm, depending on modulation
Radio 5	Bluetooth® Version	5 (Bluetooth® Low Energy)
	LE Connections	Up to 20 connections
	Frequency	2.402 to 2.480 GHz
	Modulations	GFSK at 1Mbps, 2Mbps data rates
	Transmit Power	4dBm
	Receiver Sensitivity	-96dBm, depending on modulation
Ethernet		
10/100 Base-T RJ-45 connector with PoE Support		
Sensors		
3-axis Accelerometer, Temperature Sensor		
Battery		
CR2032 Primary Cell (Optional)		
Interface		
Multi-color Status LED, “User” Button, Reset Button		
Dimensions		
Cascade 500 Enclosure	Length Width Height	225.8 mm 225.8 mm 61.5 mm
Hardware		
Power supply	36-57 VDC (IEEE 802.3af) via Ethernet connector (RJ-45)	
Temperature Range	0 to +60°C Operating, -20 to +70°C Storage	
Certifications		
CA-55 - **PENDING**	FCC / ISED / CE-RED / ENACOM / ANATEL / WPC / IFT / PTA / EAC / SABER / ICASA+NRCS / UkrSEPRO / Bluetooth® SIG	

2.2 Electrical Specifications

2.2.1 Operating Conditions

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{POE}	Operating supply voltage at Ethernet connector (PoE)	36	48	57	V
T_A	Operating ambient temperature	0	25	60	°C

2.2.2 Typical Power Consumption

Symbol	Parameter	Min.	Typ.	Max.	Unit
P_{5V}	Power consumption, referenced at PoE input	1.3	1.8	2.2	W

2.2.3 Absolute Maximum Ratings [1]

Symbol	Parameter	Min.	Max.	Unit
V_{POE_MAX}	Voltage at Ethernet connector (for PoE)	-0.3	60	V
T_S	Storage temperature	-20	70	°C

1. The unit is not intended to operate under these conditions.

2.3 Interfaces

Interface features are described throughout this section, including power and data connectivity, and button and LED location and behavior.

2.3.1 Ethernet: Power and Data

The Cascade Antenna is equipped with a single 10/100 Base-T Ethernet connector. It is IEEE 802.3af compliant and will operate with a PoE switch (end-span) or injector (mid-span).

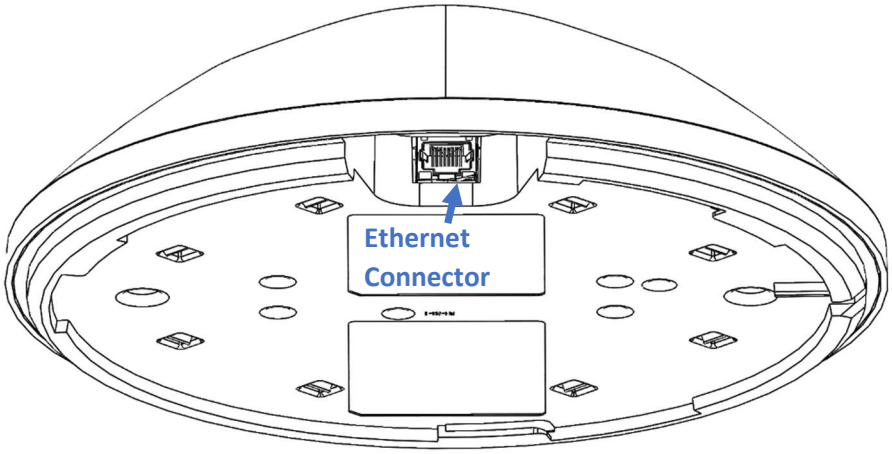


Figure 1 – Cascade Antenna – Connector View

2.3.2 Reset Button

The reset button is recessed into the back enclosure. Pressing this momentarily will force a hardware reset of the Cascade Antenna.

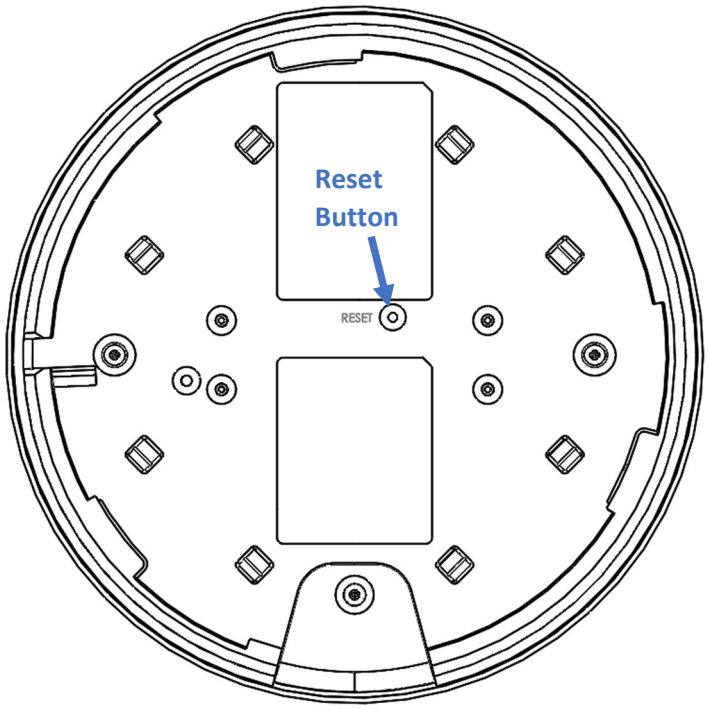


Figure 2 Remote Antenna - Back View

2.3.3 Front Button

The front face of the Cascade Antenna contains a tactile button. Button functionality is software defined and is presently not used.

2.3.4 Status LED

An LED ring circumscribes the front button. It provides a means of visual status indication.

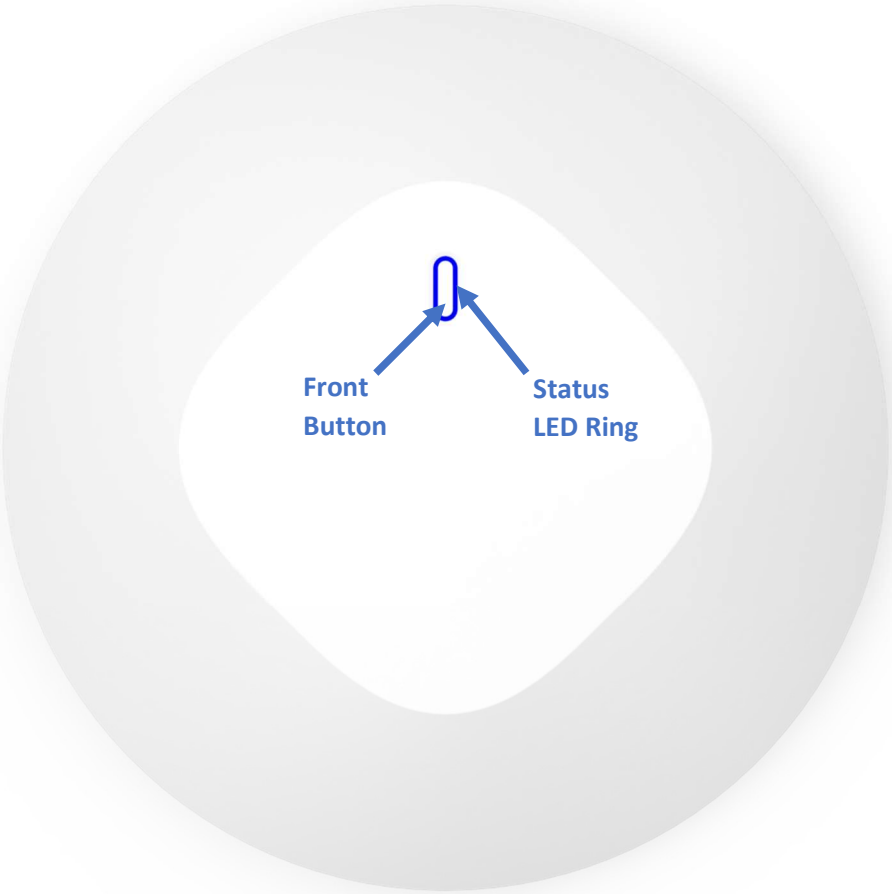


Figure 3 – Cascade Antenna – Front View

3 Mechanical Information

3.1 CA-55 Dimensions

Dimensions of the unit enclosure are shown below in millimeters.

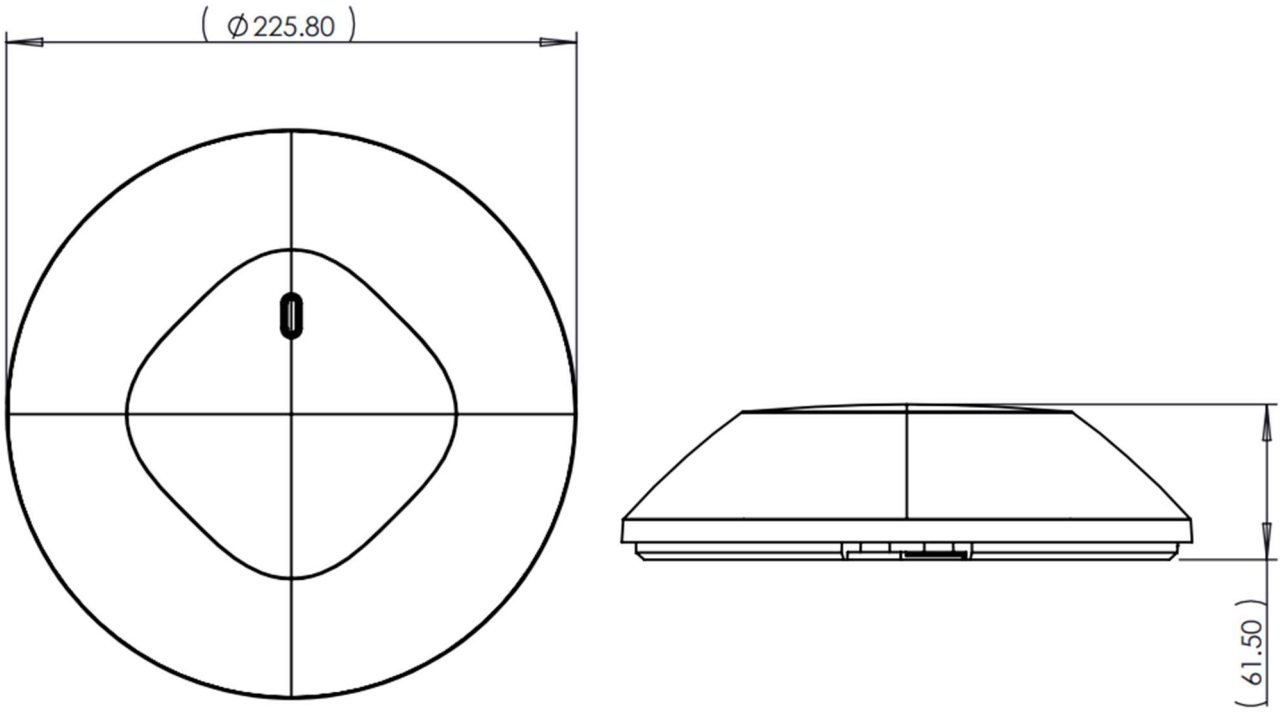


Figure 4 – Cascade Antenna – Dimensions (in mm)

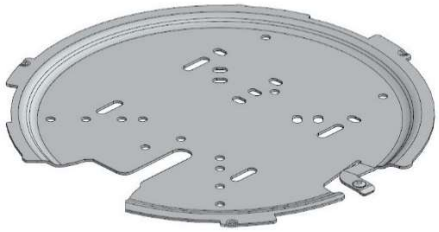
4 Installation

4.1 Equipment

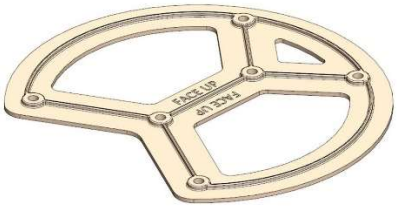
Each Cascade Antenna comes with following equipment in the box:

- 1 x Cascade Antenna
- 1 x Mounting Plate
- 1 x Quick Start Guide (Optional)
- 1 x Wall/Ceiling Mount Kit (Optional):
  - 1 x Backer Plate
  - 4 x Machine Screw, M3 x 50 mm Length, Pan Head, Phillips #1
  - 4 x Wood Screw, 1-1/4" Length, Round Head, Phillips #6
  - 4 x Drywall Anchor, 1-1/4" Length, #6-#8 Screw

Cascade Antenna



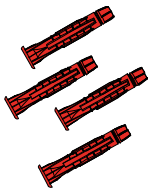
Mounting Plate



Backer Plate

Ceiling Mount Screws
M3 x 50 mm Phillips (x4)

Wall Mount Screws
#6 x 1-1/4” Phillips (x4)



Drywall Anchors (x4)

4.2 Mounting Tools

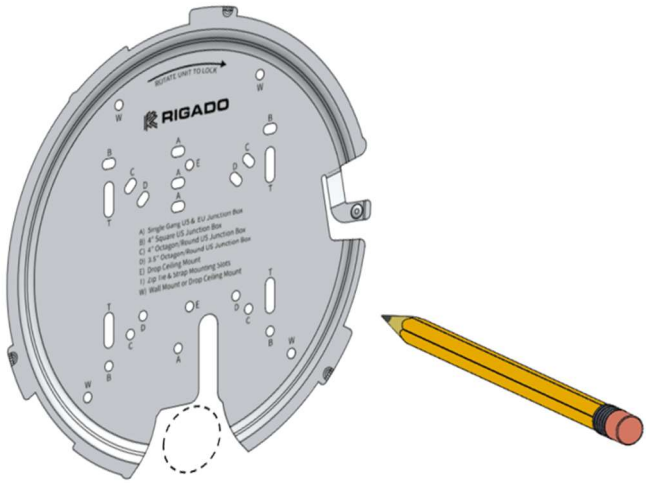
To use the Wall/Ceiling Mount kit provided, the following tools are required (*not included*):

- Phillips screwdriver
- Drill and drill bit - 3/16” for wall, or 1/8” (3-4 mm) for ceiling mounting
- Drywall saw or keyhole saw for 1" cable pass-through hole

4.3 Mounting Instructions

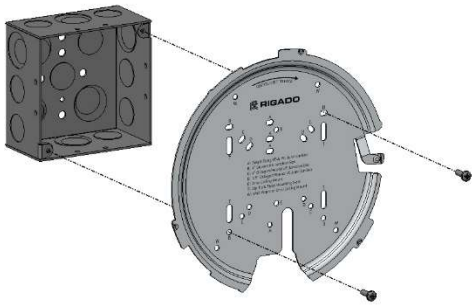
Rigado recommends mounting the Cascade Antenna horizontally (front of the unit, i.e., LED Ring, faces down). This correctly orients the antennas and maximizes coverage.

1. If mounting on a wall or ceiling, use the mounting plate as a template to mark the hole locations on the mounting surface. If mounting to the wall, use a 3/16” (5 mm) drill bit. If mounting to a ceiling tile, use a 1/8” (3-4 mm) drill bit.
   If a hole is needed for any cables, also mark this in the appropriate cable opening space in the mounting plate.



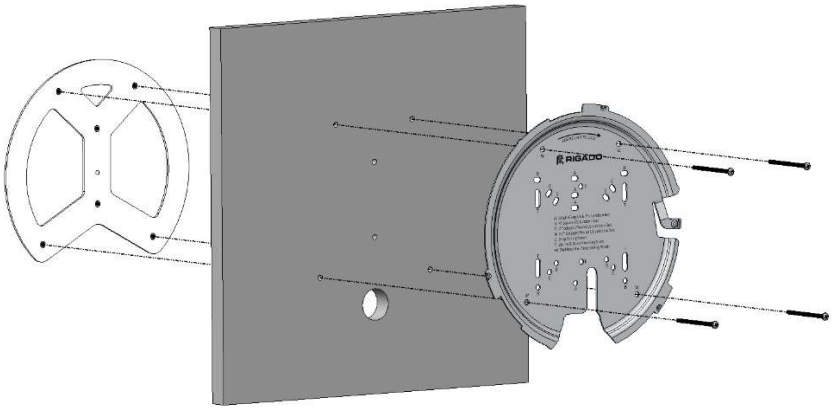
2. Attach the mounting plate to the surface using the appropriate method:

Junction Box Mounting



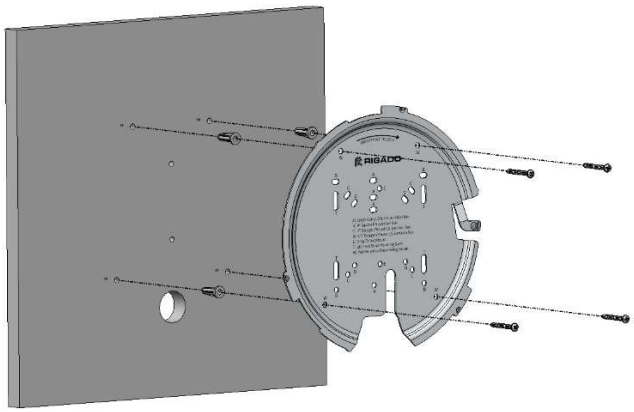
Using the guide printed on the mounting plate, align the holes in the plate with the corresponding holes in the junction box. Use the screws provided with the junction box to attach the plate.

Ceiling Mounting



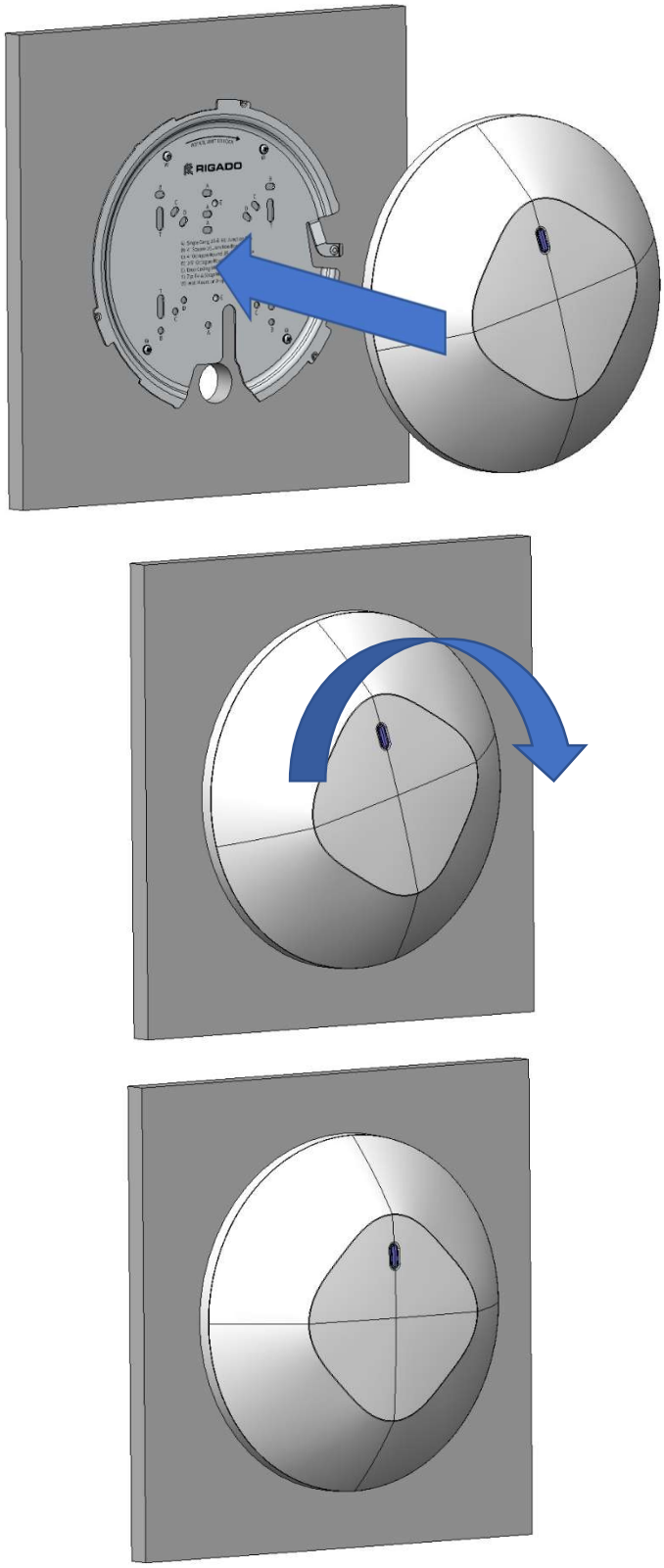
Push a ceiling mount screw through one of the mounting plate screw holes, and then through the corresponding drilled ceiling hole. Use this screw to guide placement of the backer plate on the opposite side. Use the screwdriver to attach this screw followed by the remaining ceiling mount screws.

Wall Mounting



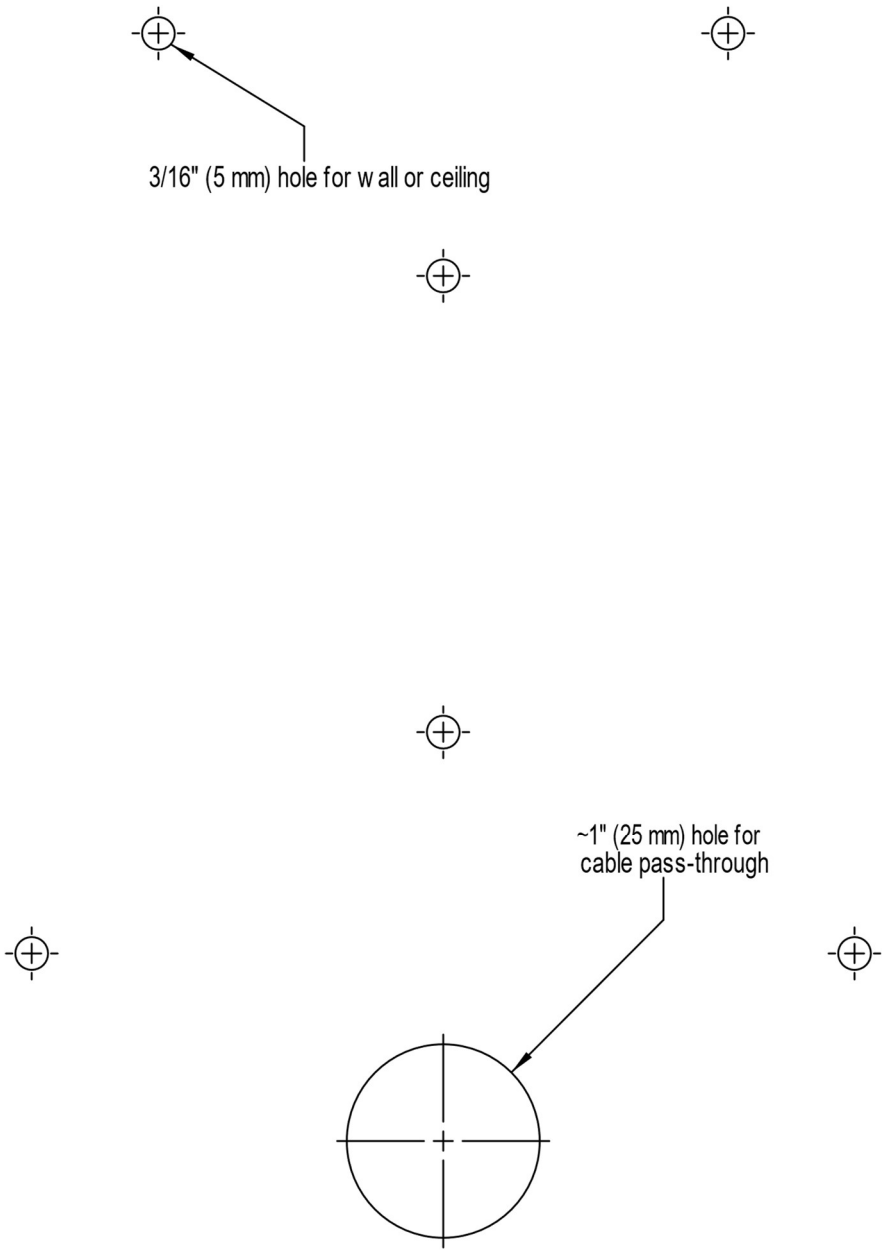
Push the provided drywall anchors into the drilled holes, then place the mounting plate snugly against the wall. Using a screwdriver, screw the wall mount screws into the drywall anchors.

3. Once the mounting plate is installed, align the Cascade Antenna as sown below and place it onto the mounting plate. Rotate the unit clockwise until it locks into place.



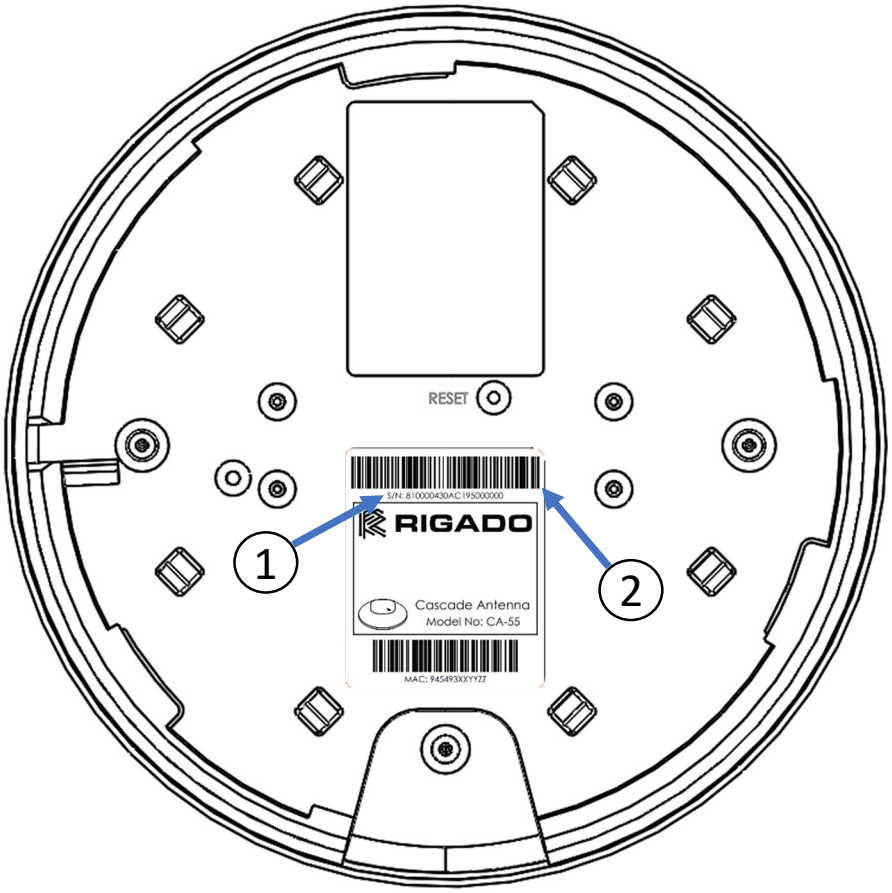
4.4 Hole Drilling Template

This template is at scale and can be printed for use.



5 Cascade Antenna Setup

Before the Cascade Antenna is permanently installed, look at the back (mount side) to find the unit Serial Number (1) or scan the Serial Number barcode (2), as shown below.



5.1 Troubleshooting

Should you experience issues with any of the above steps, or with the Cascade Antenna in general, please visit our technical documentation portal at docs.rigado.com. If you have an issue that is not resolved in our documentation, or if you have a more application-specific question, please reach out to us at support@rigado.com.

6 Regulatory Information

6.1 FCC Statement

This equipment has been tested and found to comply with the limits for a 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 this 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
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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.

6.2 IC Statement

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada’s licence-exempt RSS(s). Operation is subject to the following two conditions: (1) This device may not cause interference. (2) This device must accept any interference, including interference that may cause undesired operation of the device.

L’émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d’Innovation, Sciences et Développement économique 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; (2) L' appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d' en compromettre le fonctionnement.

6.3 CE Statement

Rigado, Inc. declares that the CA-55 comply with the essential requirements and other relevant provisions of Radio Equipment Directive 2014/53/EU. A copy of the Declaration of Conformity is available on request.

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