Cascade-500 Series Gateway User Manual

Contents

Introduction

Cascade-500 series Gateways are part of Rigado's Cascade Edge-as-a-Service solution that offer powerful and cost-effective edge network infrastructure for large-scale, low-power wireless deployments. Cascade gateways provide commercial and enterprise IoT project and product teams with flexible edge computing power, a robust containerized application environment, and a variety of wireless device connectivity options.

Models included in this document	
Cascade-500	Edge Gateway with Bluetooth, WiFi, and Ethernet connectivity
Cascade-500-W	Edge Gateway with Bluetooth, WiFi, Ethernet and LTE Cat1/3G/2G cellular connectivity

Revision History

Version	Description	Date
V1.0	Initial Release	2018-8-21
V1.1	Add regulatory statements; sections 6.4 and 6.5	2019-9-11
V1.2	Added interface drawing and descriptions for Cascade-500-W	2019-9-13
V1.3	Clarify cellular info in section 2.1	2019-9-18
V1.4	Updated regulatory information in sections 2 and 6	2020-6-17
V1.5	Updated regulatory statement; section 6.4	2020-9-22
V1.6	Updated operating temperature and mounting guide	2021-03-24
V1.7	Updated electrical specifications (section 2.2.2) and country list (section 6.1)	2021-05-25
V1.8	Update country list in regulatory section (section 6.1), added insert (section 6.7), updated power consumption in section 2.2.3. Minor formatting throughout.	2021-08-25

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 of about 4,000 sq. ft. per Gateway. However, the area of coverage for each Gateway is dependent on the layout and construction of the facility where it is installed. A Gateway in an open floor plan will have a larger coverage area 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 for a Gateway 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 Rigado Gateway.

1.2 Connections

The types of connections required should be taken into consideration when planning a new install. In order to function, the Gateway needs both a power and internet connection. For power, the options are Power over Ethernet (PoE) or AC wall power (adapters available upon request). For internet connection, the two options are Wi-Fi, Ethernet, or LTE (500-W only).

Rigado suggests using PoE-enabled Ethernet for Gateway connection. PoE connections allow for both data and power to be provided to the Gateway, requiring only one cable for installation. Special consideration needs to be given when choosing to use Wi-Fi, as the Gateway is an always-connected device without a physical user interface.

1.3 Placement

Correct placement of Gateways is important for getting the desired coverage. Generally, mounting Gateways 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 any metal near the mounting area, such as in support beams or HVAC ducts, as it is not recommended to mount the Gateway directly to any large metal surface.

Gateways do not need to be visible for operation. It is common to mount Gateways above drop ceilings, to either the wall or a drop from the ceiling. When mounting above drop ceilings or in open office style spaces, it is recommended to mount the Gateway below the level of any ceiling HVAC ducts to avoid dead spots.

2 Gateway Hardware

2.1 Specifications

Processor		
i.MX6ULL (Y2)	800MHz, 32bit ARM® Cortex™-A7	
Memory		
Memory (Volatile)	512 MB DDR3L SDRAM @ 400MHz, x16	
Memory (Bulk Storage)	8GB eMMC	
Wi-Fi (802.11a/b/g/n/ac)		
Frequency	2.412GHz - 2.472GHz; 5.180GHz – 5.700 GHz (region dependent)	
Modulations	DSSS, FHSS | OFDM	
Transmit Power	19dBm for 2.4GHz band, 18dBm for 5GHz band, depending on modulation	
Receiver Sensitivity	-98 to -72dBm for 2.4GHz band, -92 to -68dBm for 5GHz band, based on modulation	
Antenna	Integrated Dual-band Antenna	
Bluetooth	**BMD-345 Module**	
Bluetooth Version	5 (Bluetooth Low Energy)	
LE Connections	Up to 6 connections supported	
Frequency	2.402 to 2.480 GHz	
Modulations	GFSK at 1Mbps, 2Mbps data rates	
Transmit Power	12dBm	
Receiver Sensitivity	-108 to -98dBm, depending on modulation	
Cellular LTE Cat1 with 3G/2G fallback (Cascade-500-W only)		
LTE Frequencies	700, 800, 850, 900, 1700/2100 (AWS), 1800, 1900, 2100, 2600 MHz (bands 1, 2, 3, 4, 5, 7, 8, 12, 18, 19,20, 28) (region dependent)	
UMTS/HSPA+ Frequencies	800, 850, 900, 1700/2100 (AWS), 1800, 1900 and 2100 MHz (bands I, II, IV, V, VIII, IX, XIX) (region dependent)	
GSM/GPRS/EDGE Frequencies	GSM 850, 900, 1800, 1900 MHz	
Modulations	GMSK/QPSK/16QAM	
Power Class (per listed 3GPP release)	EGSM850/900: Class 4, GSM1800/1900: Class 1, according to release 99 GSM 850/900/1800/1900 8-PSK: Class E2, according to release 99 UMTS 800/850/900/AWS/1800/1900/2100: Class 3, according to release 99 LTE 700/800/850/900/AWS/1800/1900/2100/2600: Class 3 according to release 8	
Antenna	Dual external dipole antennas, 5.0dBi	
GPRS/EGPRS Multislot Class	12	
Ethernet		
10/100 Base-T RJ-45 connector with PoE Support		
USB		
USB 2.0, A-type Host connector		
Dimensions		
Cascade-500 Enclosure	Length Width Height	127 mm 127 mm 30 mm
Cascade-500-W Cell antennas	Length Width Height	196mm 38mm 13mm

Hardware		
Power supply	4.5 to 5.5VDC, 2A max via Barrel Jack (5.5mm x 2.1mm)	36-57V (IEEE 802.3af) via Ethernet connector (RJ-45)
Temperature Range	0 to +60°C	
Certifications		
Cascade-500	FCC / ISED / CE-RED / RCM / UL / MIC / WPC / SUTEL / MOC & SII / IMDA / NTC / TRA / UKCA / NCC (Nigeria) / CRA / ICASA	
Cascade-500-W	FCC / ISED / CE-RED / RCM / GCF / PTCRB / AT&T	

2.2 Electrical Specifications

2.2.1 Operating Conditions

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{AUX}	Operating supply voltage at barrel jack	4.5	5.0	5.5	V
V_{POE}	Operating supply voltage at Ethernet connector (PoE)	36	48	57	V
T_A	Operating ambient temperature	0	25	70	°C

2.2.2 USB Connector Power

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{USB}	Operating output voltage at USB connector for loads up to 500mA[1]	4.0	4.3	5.5	V

2.2.3 Power Consumption

Symbol	Parameter	Min.	Typ.	Max.	Unit
P_{POE}	Power consumption[2] referenced at PoE input	1.8	2.5	5.6	W

2.2.4 Absolute Maximum Ratings[3]

Symbol	Parameter	Min.	Max.	Unit
V_{AUX_MAX}	Voltage at barrel jack[4]	-5	12	V
V_{POE_MAX}	Voltage at Ethernet connector (for PoE)	-0.3	60	V
T_S	Storage temperature	-20	70	°C

1. USB is an output only – the unit will not run from power supplied to the USB port
2. Power consumption is very dependent upon the unit configuration (SKU) and the application. Numbers provided in this table are for a Cascade-500-W unit connected to a cellular network, powered over Ethernet, and without a USB load.
3. Do NOT operate the unit under these conditions.
4. The unit will NOT operate over this voltage range. Prolonged exposure to these conditions is also NOT recommended.

2.3 Interfaces

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

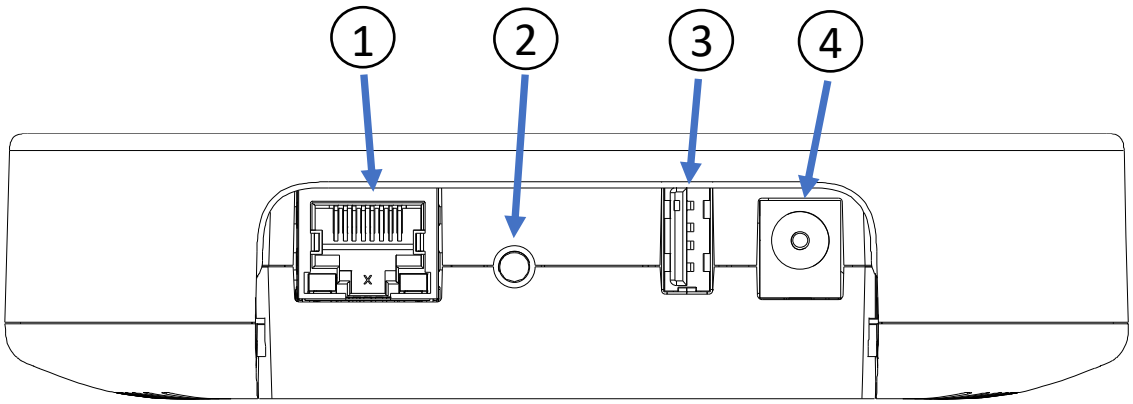


Figure 1 – Cascade Gateway – Back View

2.3.1 Ethernet with Power over Ethernet support

The Gateway is equipped with a single 10/100 Base-T Ethernet connector. For configurations supporting PoE (802.3af), the Gateway will operate when powered by either a PoE switch (end-span) or injector (mid-span).

2.3.2 Reset Button

The reset button provides both soft and hard reset capabilities, depending on the length of the press. The timing is described in the following table:

Reset Action	Time	Behavior
Quick Press	< 2 seconds	Soft Reboot
Short Press	2-4 seconds	Network Reset
Long Press	10-15 seconds	Hard Reset
Very Long Press	> 30 seconds	Factory Reset

2.3.3 USB

A USB 2.0 Type-A connector on the Gateway board provides access to a High Speed (up to 480Mbps) USB host.

2.3.4 Barrel Jack

The Gateway provides a 5.5mm x 2.1mm barrel jack for 5V DC input. Any AC/DC wall adapter used to power the gateway needs to be rated up to 2A. Please note that actual current consumption is dependent upon programmed snaps deployed on the Gateway.

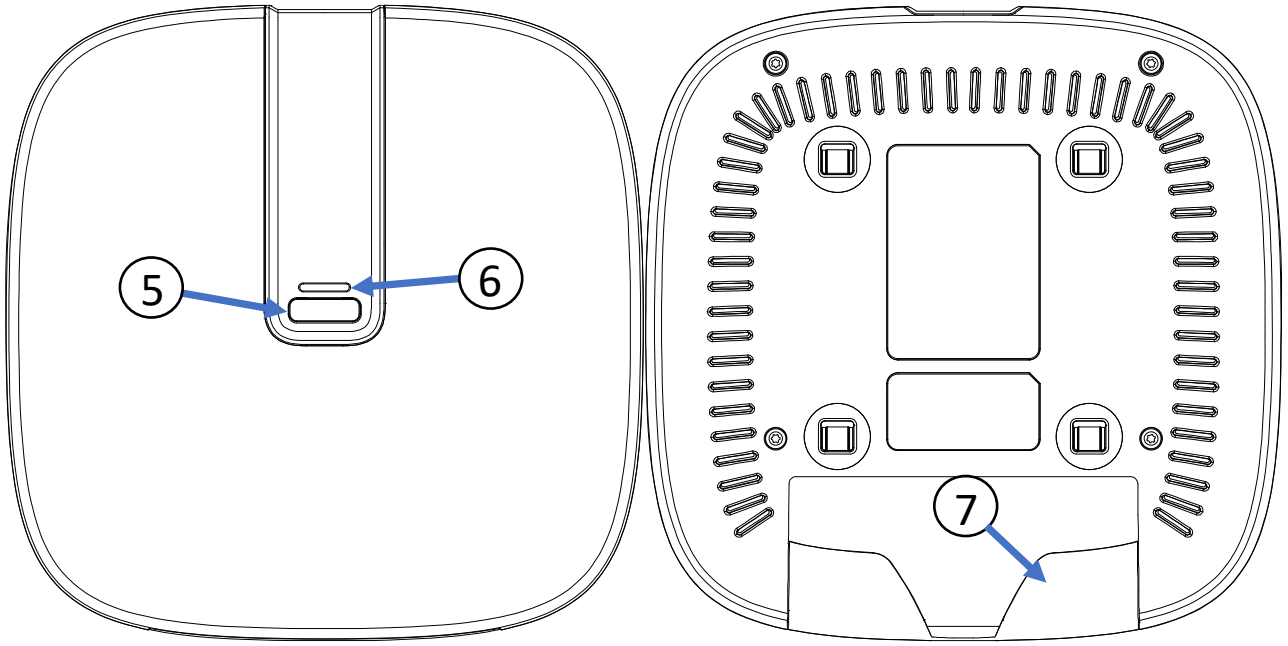


Figure 2 – Cascade Gateway – Top and Bottom View

2.3.5 Front Button

A front facing button is located on the face of the Gateway. This button is not enabled on the default Gateway configuration.

2.3.6 Multi-color LED

A multi-color (red/green/blue) LED located near the user button provides a means of visual indication for the user. For additional information regarding LED behavior, please refer to docs.rigado.com.

2.3.7 Cable Cover

The back of the unit has a snap-in cover for improved cable management. This allows for hidden cable routing when the unit is installed on a wall or ceiling. The cable cover is removable.

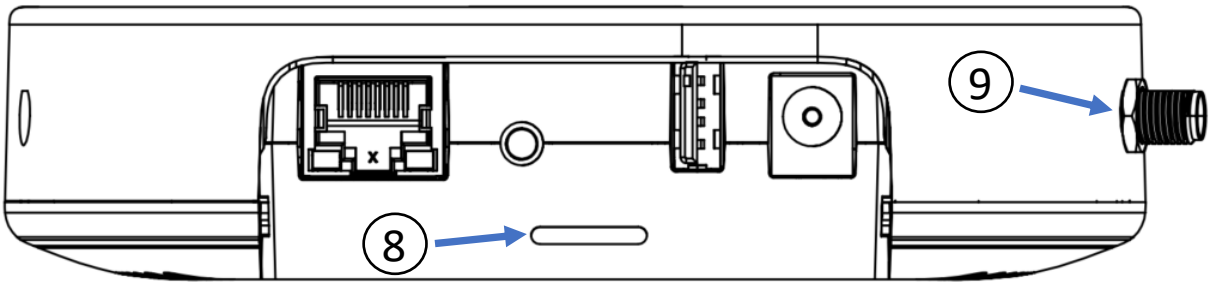


Figure 3 – Cascade-500-W Gateway – Back View

2.3.8 SIM Card Slot

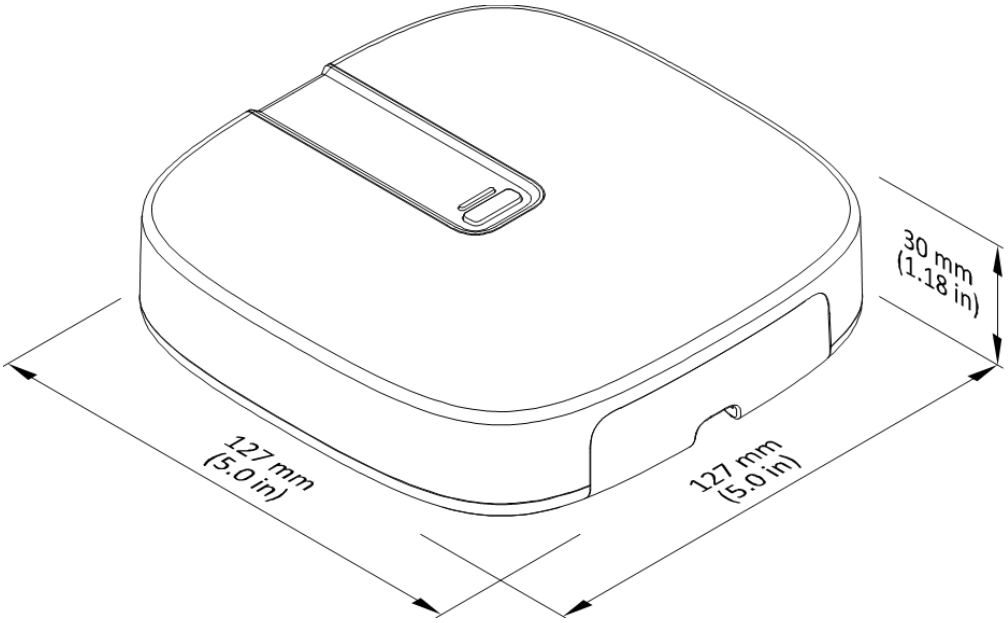
Cascade-500-W units also have a small slot on the back of the enclosure near the USB connector and reset button. This is a push-push type slot that fits a micro SIM (3FF).

2.3.9 Antenna Connector

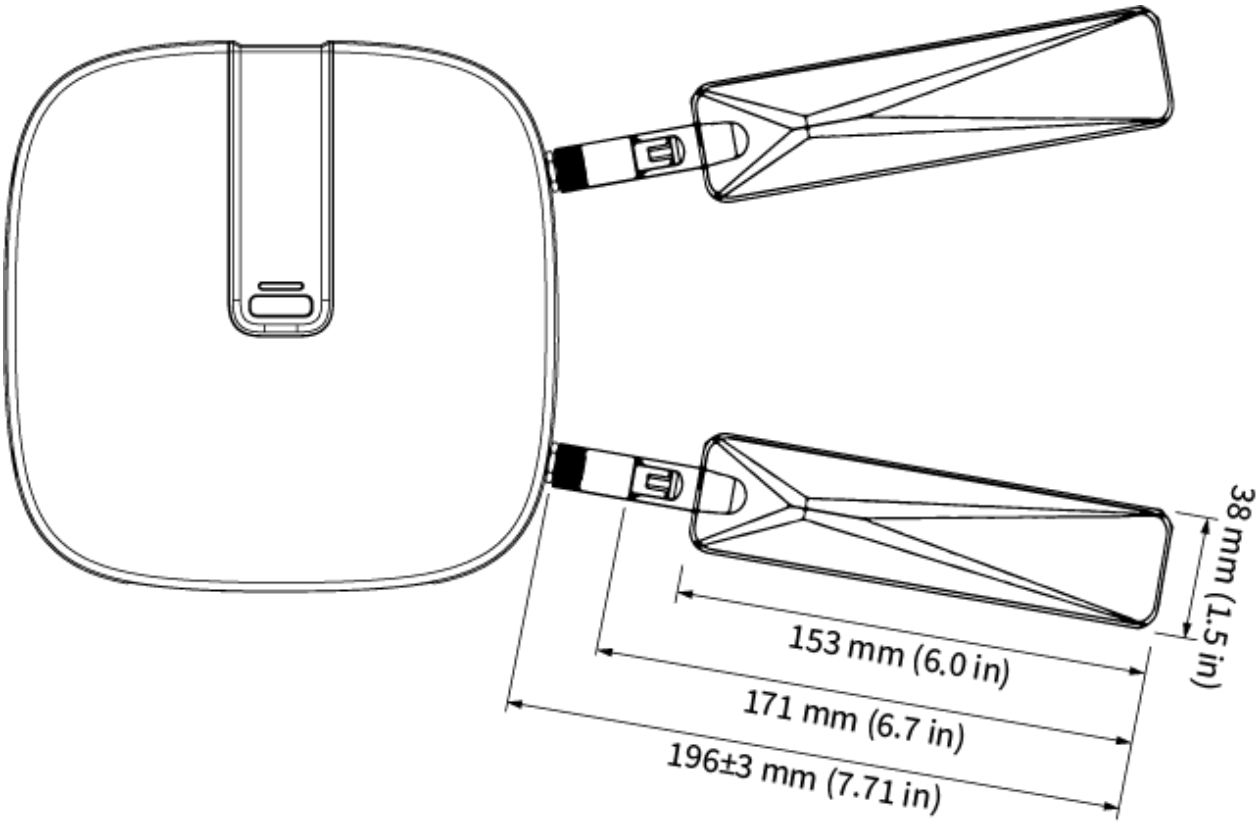
Two SMA type connectors are visible on one side of the unit where the provided cellular antennas attach. Only the antennas provided with the Cascade-500-W unit are certified for use on cellular networks.

3 Mechanical Information

3.1 Cascade-500 Dimensions



3.2 Cascade-500-W dimensions

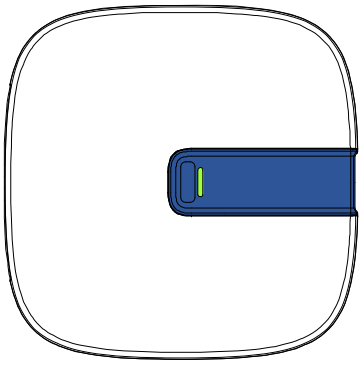


4 Installation

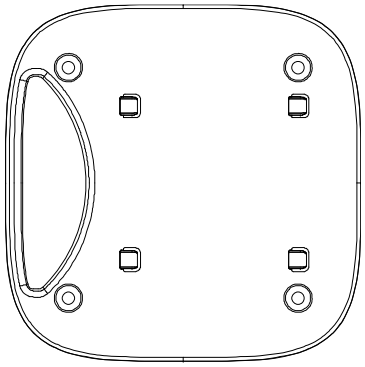
4.1 Equipment

Each Cascade Gateway comes with following equipment in the box:

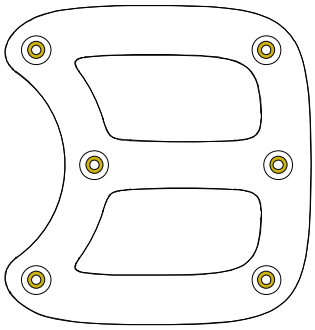
- 1 x Cascade Gateway
- 2 x Cellular Antennas (C-500-W only)
- 1 x Power supply with international adapters (optional)
- 1 x Wall/Ceiling Mount Kit:
  - 1 x Cascade mounting bracket
  - 1 x Cascade ceiling backer plate
  - 4 x M3 x 50 mm Length, Pan Head, Phillips #1, Machine Screw
  - 4 x Screw, Pan Head Phillips Sheet Metal #6/18x1.25"
  - 4 x Drywall Anchor, #6 Screw, 1-1/4" Length



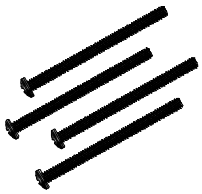
Cascade Gateway



Mounting Bracket

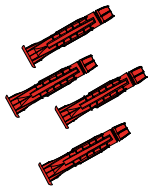


Ceiling Backer Plate



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*):

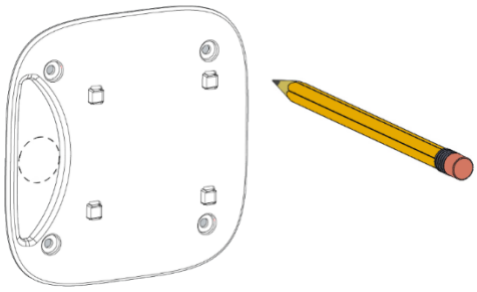
- Phillips screwdriver
- Drill and drill bit - 3/16” for wall, or 1/8” (3-4 mm) for ceiling mounting
- Drywall saw or keyhole saw for 1" cable pass-through hole

4.3 Mounting Instructions

Rigado recommends mounting the Gateway on a wall or ceiling, at least 6ft (2m) off the ground. If mounting on a wall, position the unit so that the connectors (USB, Ethernet, etc.) are facing down. This will ensure the mounting bracket attachment mechanism is secure against incidental removal.

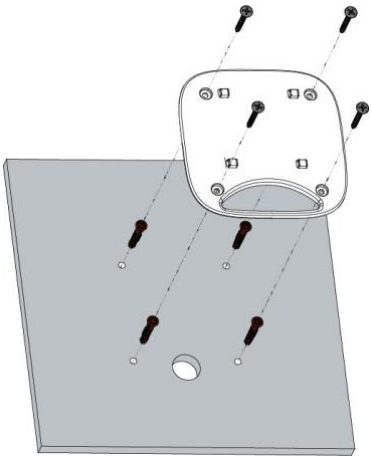
1. Use the mounting bracket as a template to mark the hole locations on the wall or ceiling.
    a. If mounting to the wall, use a 3/16” (5 mm) drill bit.
    b. If mounting to a ceiling tile, use a 1/8” (3-4 mm) drill bit.

    If a hole is needed for cable routing, also mark this in the appropriate cable opening space in the mounting bracket.



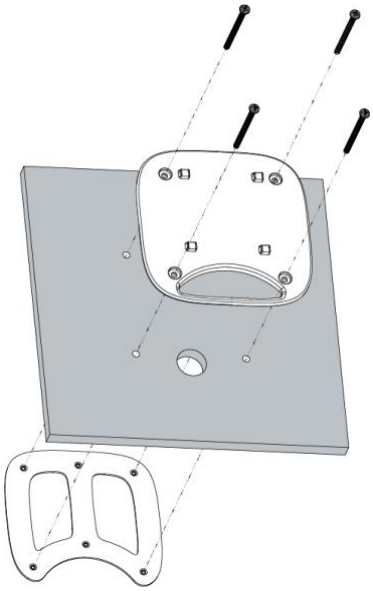
2. Attach the mounting bracket to the surface using the appropriate method:

Wall Mounting



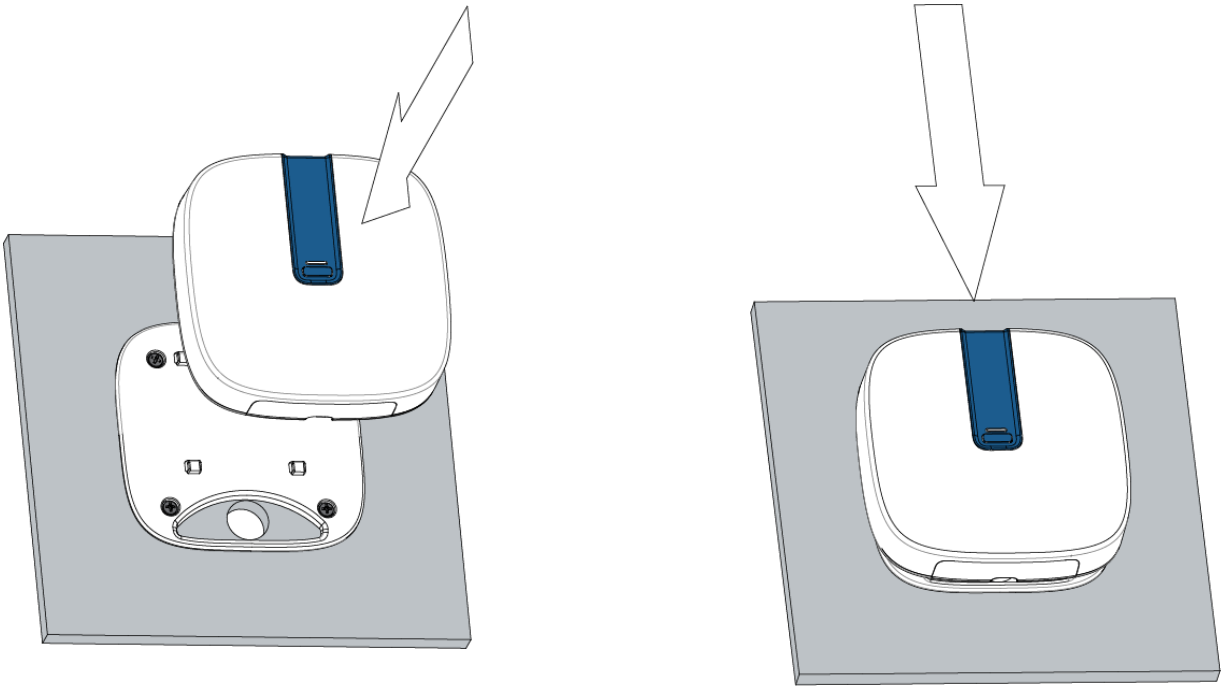
Push the provided drywall anchors into the drilled holes, then place the mounting bracket snugly against the wall. Using a screwdriver, screw the wall mount screws into the drywall anchors.

Ceiling Mounting



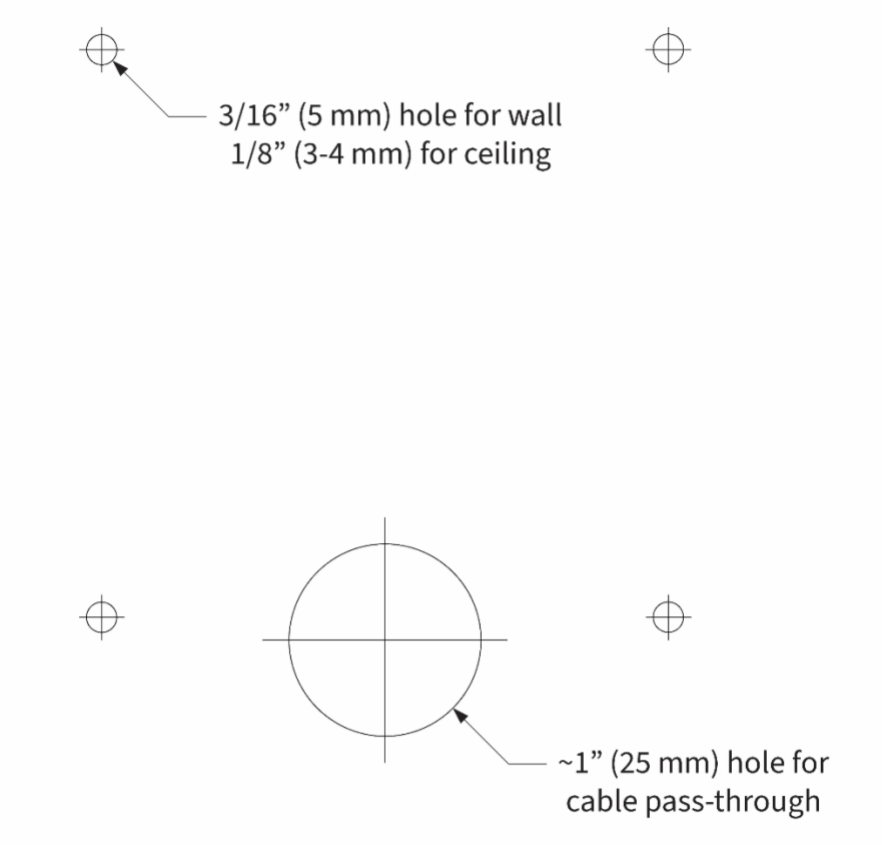
Place one ceiling mount screw through a mounting bracket screw hole, and push through the corresponding drilled ceiling hole. Use this screw to guide placement of the ceiling backer plate to the opposite side, then use the screwdriver to screw in this and the remaining ceiling mount screws.

3. Once the mounting bracket is installed, line up the four hooks of the mounting bracket with the corresponding holes on the back of the Gateway and press the two together. To lock in place, slide the Gateway over towards the cabling hole until it clicks into place.



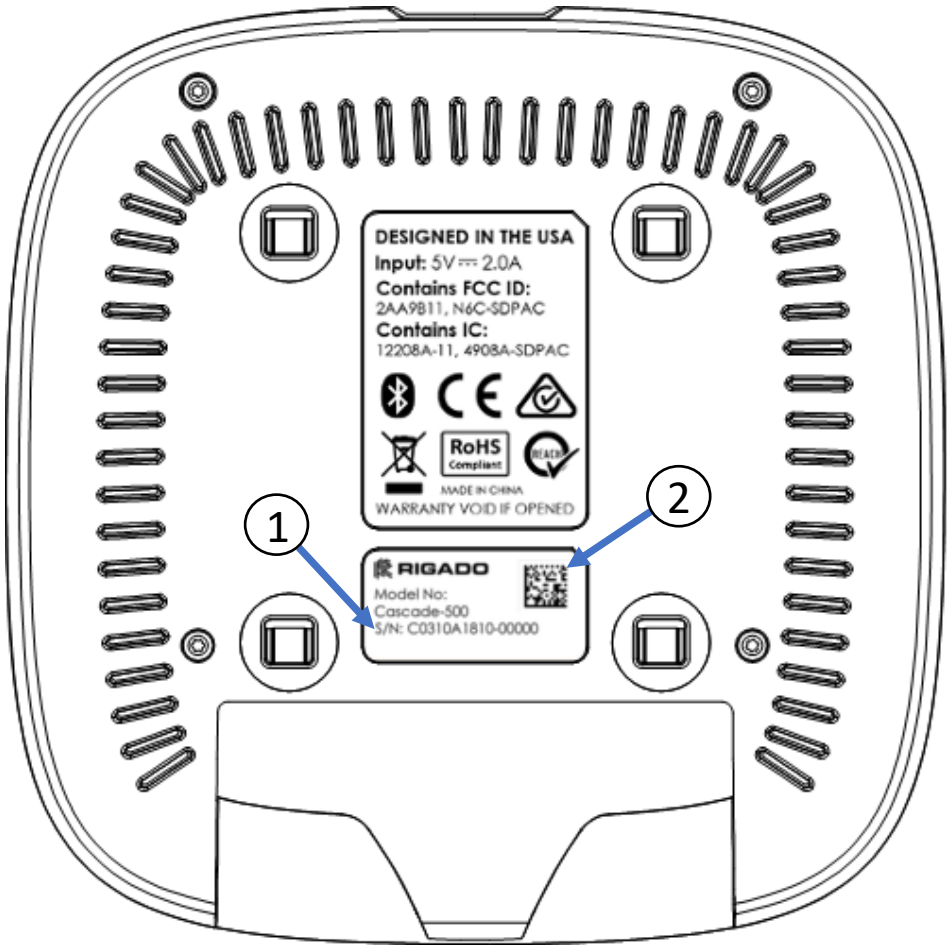
4.4 Hole Drilling Template

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



5 Gateway Setup

Before the Gateway is permanently installed, look at the bottom (mount side) and record the unit Serial Number (1) or scan the 2D barcode (2), as shown below.



5.1 Initial Boot

At first power on, the Gateway's LED indicator will display the boot status. The status of the Gateway can be determined using the following table:

LED color	LED activity	Status
Yellow/Amber	Solid	Appliance is booting
Yellow/Amber	Slow-blink (1 blink every 2 seconds)	Appliance is in provisioning sequence
Yellow/Amber	Fast-blink (2 blinks per second)	Provisioning is complete, appliance is authenticating
Green	Solid	Appliance is provisioned and authenticated with Rigado Edge Direct

5.2 Edge Direct Connection

Once the Gateway is successfully booted, it should show up on your Edge Direct homepage. To find the Gateway, navigate to 'Gateways' and look for the matching serial number. Select that unit and a live status page will appear, showing current status and utilization. This is your primary user interface for configuring the Gateway's applications and updates. For further details on Gateway configuration reference our Edge Direct documentation at docs.rigado.com.

5.3 Troubleshooting

Should you experience issues with any of the above steps, or with the Cascade-500 / Cascade-500-W Gateway 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 Authorized Countries and Territories

The Cascade-500 and Cascade-500-W are authorized for use in the following countries:

Afghanistan, Anguilla, Australia, Austria, Belgium, Bulgaria, Canada, Comoros, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Guadeloupe, Hong Kong, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Martinique, Myanmar, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Saint Barthelemy, Saint Martin, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turks and Caicos, United Kingdom, USA.

The Cascade-500 is also certified for use in Costa Rica, India, Israel, Japan, Nigeria, The Philippines, Qatar, Singapore, and United Arab Emirates.

6.2 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

6.3 IC Statement

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

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

Under Industry Canada regulations, these radio transmitters may only operate using provided antennas approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec des antenne fournies approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

6.4 CE Statement

Rigado, Inc. declares that The Cascade-500 and Cascade-500-W 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.
Rigado, Inc.
101 SW Main St., Suite 2000
Portland, OR 97204 USA

6.5 RF Exposure Statement

This equipment complies with the radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 35cm between the radiator and any part of the human body.

6.6 Non-modification Warning Statement

Changes or modifications to this equipment that are not expressly approved by Rigado could void the user's authority to operate the equipment.

6.7 Product Insert – Compliance Information

The following images show the regulatory insert provided within the product packaging.

FCC Statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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 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.

FCC Caution

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

RF Exposure Statement

This equipment complies with the radiation exposure limits set forth for an uncontrolled environment. THis equipment should be installed and operated with a minimum distance of 35cm between the radiator and any part of the human body.

Canada (ISED) Statement

This device complies with Industry Canada license exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device. Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be chosen so that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement. Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radio électrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Taiwan (NCC) Statement

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

RIGADO

Cascade-500 Series
IoT Gateway

Important Safety Information

Before installing or operating this product, please review this insert and the information available online at: rigado.com/certifications

Unless otherwise indicated, this product is designed for indoor use. Use in dry locations only. Do not install near heat sources such as radiators, heat registers, stoves, or any other apparatus that produce heat.

Only use attachments and accessories specified by the Manufacturer.

Optimal Product Placement

This product uses wireless communications to operate. Do not install the product inside or near any large metal objects, or near sources of radio interference.

For more installation guidance, please visit **docs.rigado.com** or contact **support@rigado.com**

Disposal Guidelines

For professional users in the European Union
If you wish to discard electrical and electronic equipment (EEE), please contact your dealer or supplier for further information.

For disposal in countries outside of the European Union
This symbol is only valid in the European Union (EU). If you wish to discard this product please contact your local authorities or dealer and ask for the correct method of disposal.

Product Regulatory Information

See inside this pamphlet for regulatory information unique to each model.

Rigado, Inc. declares that the Cascade-500 and Cascade-500-W 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.

RoHS Compliant

The Cascade-500 and Cascade-500-W are RoHS compliant per RoHS Recast Directive 2011/65/EU, and Directive (EU) 2015/863. For additional details, including any exemption information, please contact Rigado.

Rigado, Inc.
101 SW Main St.
Suite 2000
Portland, OR
97204, USA

rigado.com/certifications

745-00003 v0B

C-500-R

Regulatory Model/型号: Cascade-500
Product Type/产品名称: Gateway/网关
Input/输入: DC 5V/2A or PoE (DC 48V/0.5A)
Manufacturer/制造商: Rigado, Inc.
Country of Origin/原产地: See Product Label/请查看铭牌

Contains FCC ID:
2AA9B11
N6C-SDPAC

Contains IC:
12208A-11
4908A-SDPAC

R 204-920365
5.2G band: この製品は屋内においてのみ使用可能です

Complies with IMDA Standards DA105282

sutel
03699-2021

NTC
Type Approved
No: ESD-RCE-2126036

ICASA
TA-2021/1187
APPROVED

Connection and use of this communications equipment is permitted by the Nigerian Communications Commission

TRA

TRA - United Arab Emirates
Dealer ID: DA00655/21
TA RTTE: ER97858/21
Model: Cascade-500
Type: Gateway

מספר אישור התאמה מטעם משרד התקשורת: 55-08460
חל איסור לבצע פעולות במכשיר אשר יש בהן כדי לשנות את תכונותיו האלחוטיות של המכשיר, ובכלל זה החלפת אנטנה מקורית או הוספת אפשרות לחיבור לאנטנה חיצונית ללא קבלת אישור משרד התקשורת, בשל החשש להפרעות אלחוטיות.
[Indoor]-חל איסור על הפעלת המכשיר מחוץ למבנה, בשל חשש להפרעות אלחוטיות.

C-500-W

Regulatory Model/型号: Cascade-500-W
Product Type/产品名称: Gateway/网关
Input/输入: DC 5V/2A or PoE (DC 48V/0.5A)
Manufacturer/制造商: Rigado, Inc.
Country of Origin/原产地: See Product Label/请查看铭牌

Contains FCC ID:
2AA9B11
N6C-SDPAC
QIPPLS-62W

Contains IC:
12208A-11
4908A-SDPAC
7830A-PLS62W