Installation Guide

Celona Indoor Access Point AP 24

AP24 is a plug-and-play indoor 5G NR access point delivering deterministic, enterprise-grade wireless performance for business-critical applications across 3.44.2, 4.5-4.9 GHz spectrum, supporting bands n48, n77, n78, and n79. Powered by CelonaOS, AP24 enables AerFlex™ AP-only, controller-less deployments with external antenna support on select models.

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Introduction

This document provides the necessary guidance to help the user enable services on the Celona Indoor Access Point AP 24 capable of private 5G connectivity.

About the AP

AP24 is a plug-and-play indoor 5G NR access point delivering deterministic, enterprise-grade wireless performance for business-critical applications across 3.44.2, 4.5-4.9 GHz spectrum, supporting bands n48, n77, n78, and n79. Powered by CelonaOS, AP24 enables AerFlex™ AP-only, controller-less deployments with external antenna support on select models.

AP24 is available in two SKUs

- AP24-48|77|78H: n48/n77/n78 (3.5–4.2 GHz), AerFlex support and external antenna support
- AP24-79: n79 (4.5–4.9 GHz), no AerFlex support and no external antenna support

AP 24

What's in the box?

The Celona AP24-79 box contains:

1.		Indoor Access Point
2.		PoE++ Power Injector
3.		AC Power Cord
4.		Ceiling Mount Kit
5.		Wall Mount Screws and Strap

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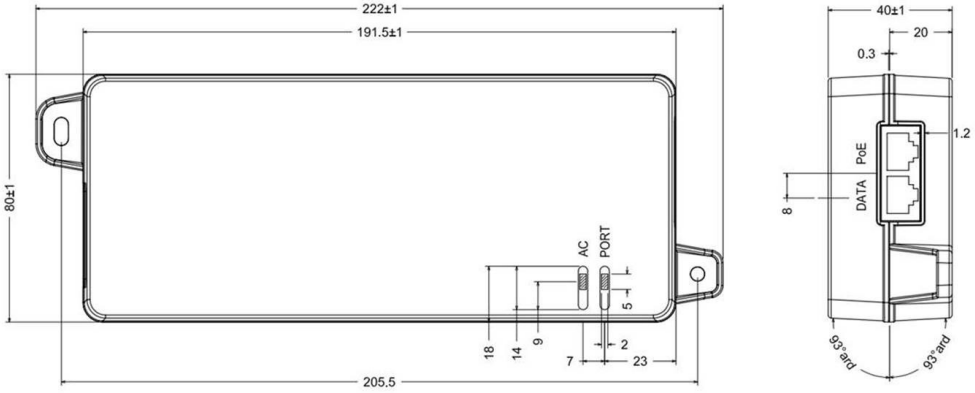
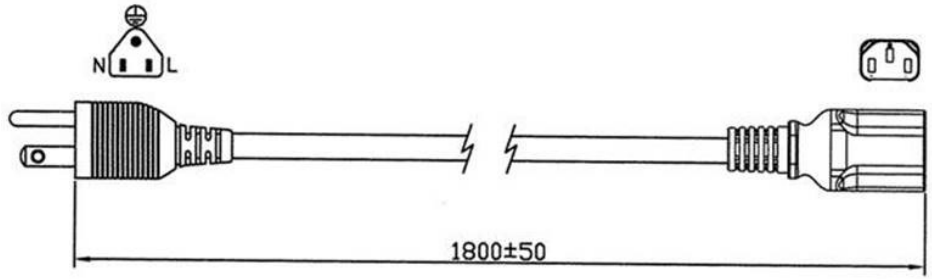
PoE Power Injector Specifications

Power Rating:

1. Input: 100-240V~50/60Hz, 1.8A
2. Output: 56V, 1.61A
3. Dimensions: 222*80*40mm
4. Power cable: 1800mm





Interfaces

Port	Description
DBG	N/A
WAN	Connects an Ethernet cable to establish communication between AP24-79 and a switch/router.
DC IN	N/A. Powered by PoE injector. Use the injector's PoE port for WAN connection. Data port connects to the internet.
ANT1	External antenna option.
ANT2	External antenna option.
SFP+	Not used.
GPS	Not used. Use PTP GM for time synchronization.
PPS	Not used.

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Mounting and Installation

There are mainly 3 ways for AP24-79 installation - wall mount, ceiling mount and pole mount.

Preparation: Fix the mount base to AP24-79

No matter which mount installation method you choose, the first step is to fix the mount base to AP24-79 with M4 screw*4, as shown in the figure. Dimensions for the mount kit: Diameter 18cm, thickness 1cm

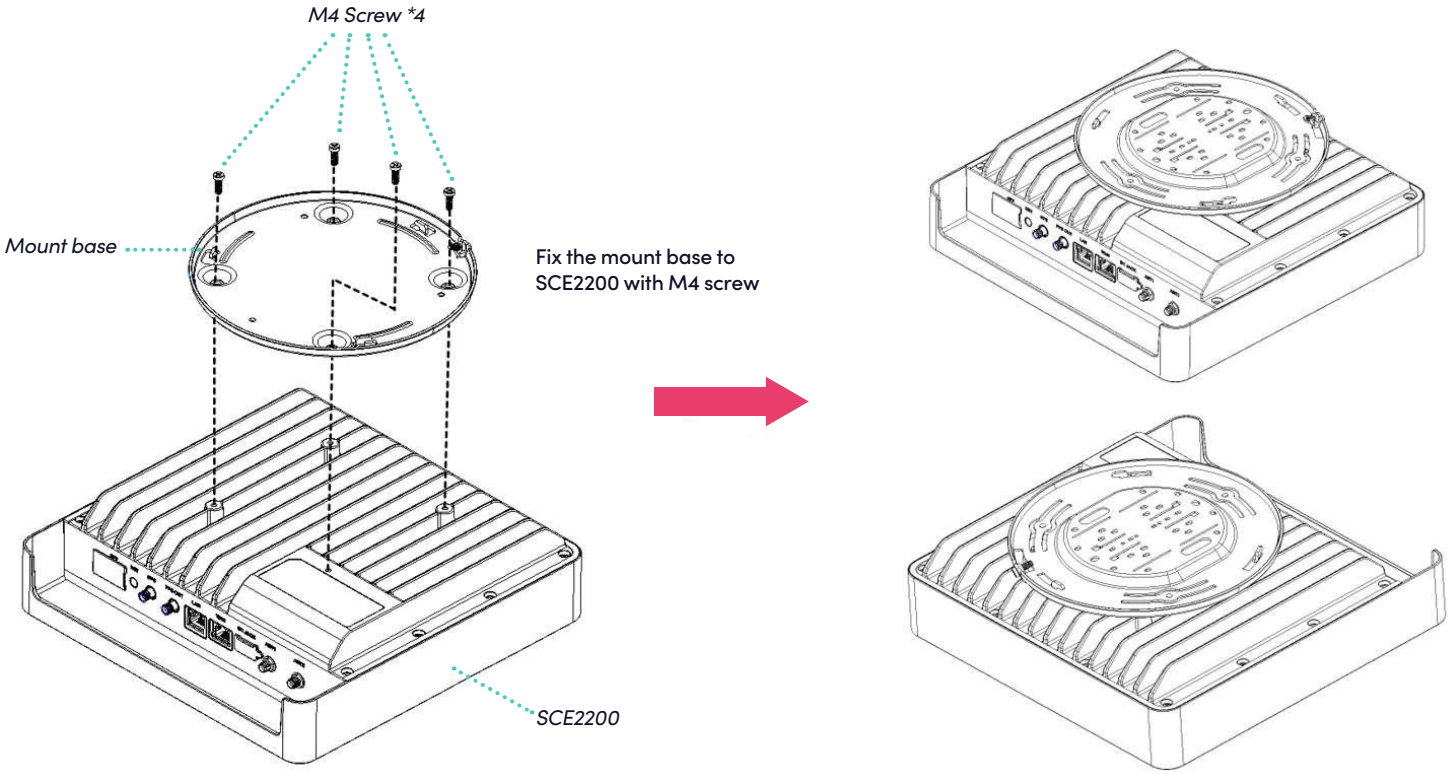

Figure 2. Fix the Mount Base to AP24-79

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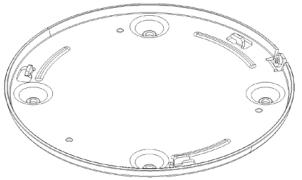
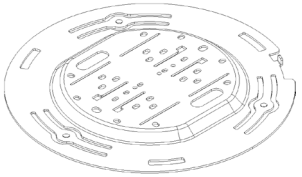
Mounting and Installation

Wall Mount

List of Items for Wall Mount

Items	Qty	Description	Picture
1. Mount base	1	Fix the mount base to AP24-79 with M4 screw*4	
2. Mount bracket	1	Fixed to the wall, used with the mount base to fix the AP24-79	
3. Screw anchor	2	To fix the screws (STP3.5-20)	
4. M4 Screw	4	To fix the mount base to AP24-79	
5. Screw (STP3.5-20)	2	To fix the mount bracket to the wall	

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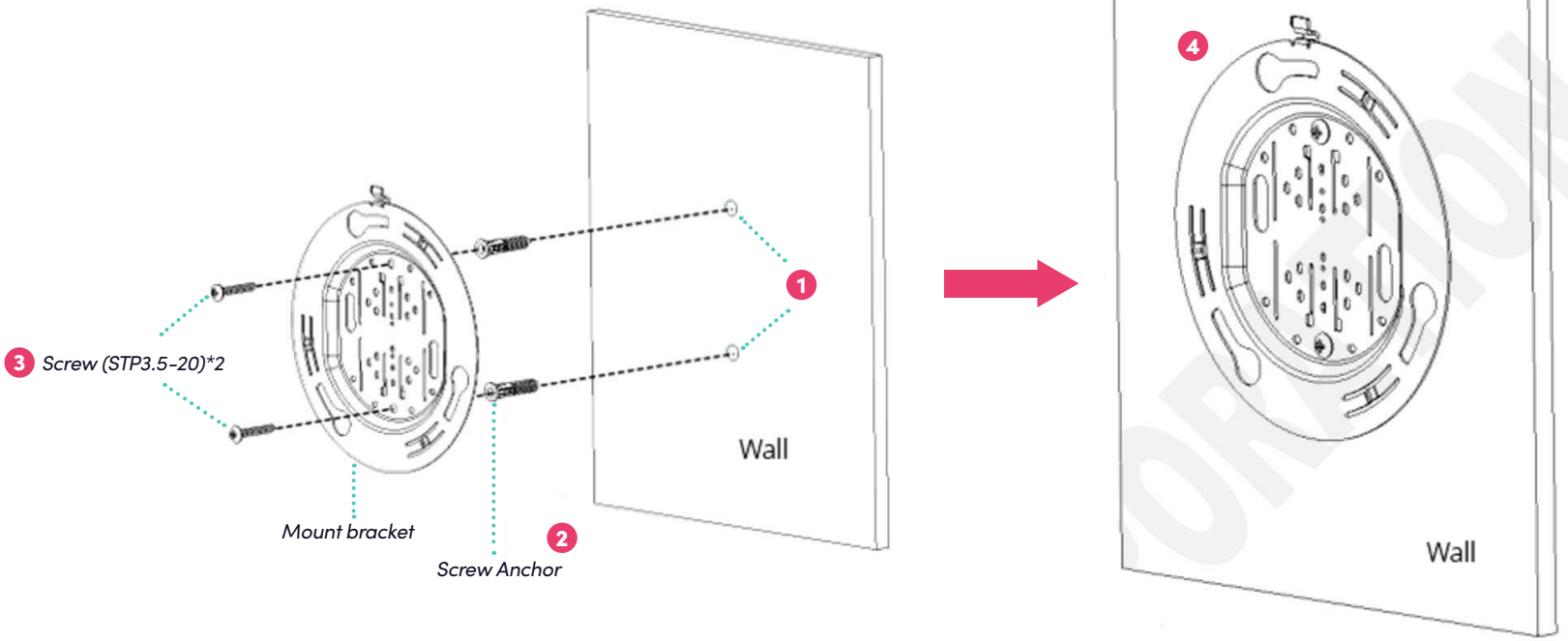
Mounting and Installation

Wall Mount installation steps

1. Place the mount bracket on the wall. Mark and drill 2 screw holes on the wall.
2. Use a tool to insert 2 screw anchors into the drilled holes on the wall.
3. Align the inserted screw anchors and the screw holes of the bracket.
   Fix the bracket to the wall by fastening 2 screws.



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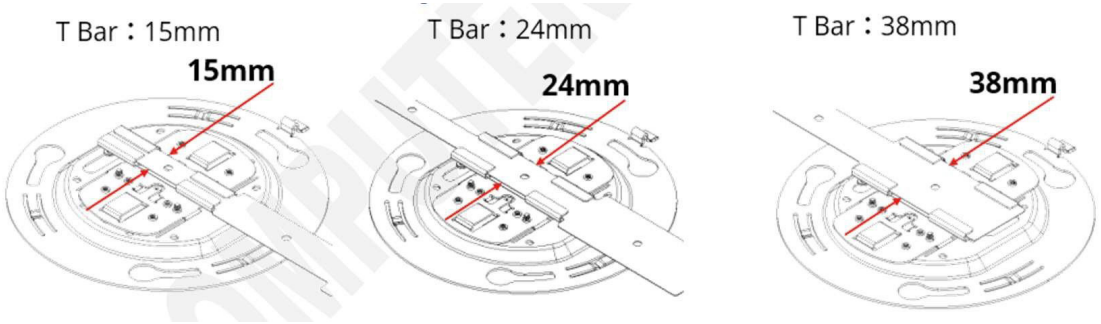
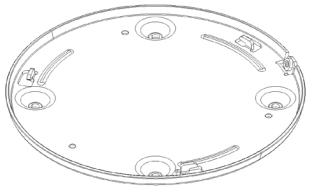
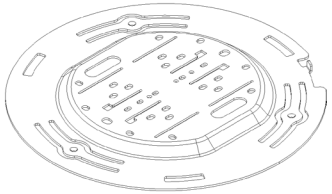
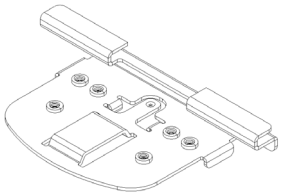
Mounting and Installation

Ceiling Mount

Only 3 widths of T bar are supported, 15mm, 24mm & 38mm.



Items	Qty	Description	Picture
1. Mount base	1	Fix the mount base to AP24-79 with M4 screw*4	
2. Mount bracket	1	Fixed to the T bar, used with the mount base to fix the AP24-79	
3. Ceiling bracket	2	To fix T bar & mount bracket	
4. M3 Screw	6	To fix the ceiling bracket	
5. M4 Screw	4	To fix the mount base to AP24-79	

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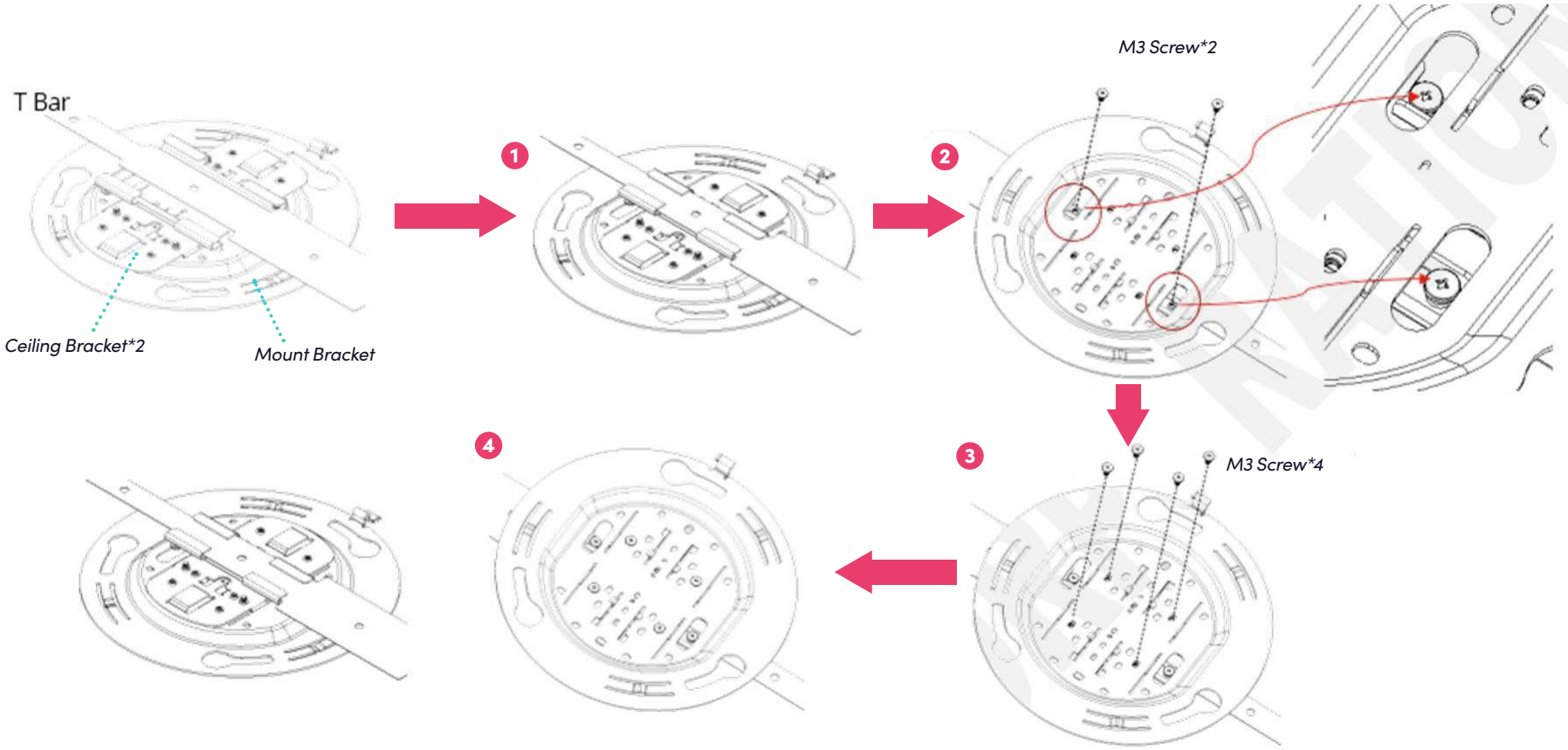
Ceiling Mount installation steps

1. Adjust the Ceiling Bracket*2 to fit the width of the T Bar.
2. Fastening M3 screws*2 to fix the Ceiling Bracket on the T Bar.
3. Fastening M3 screws*4 to fix the Ceiling Bracket to the Mount Bracket.



Ceiling Mount Overview

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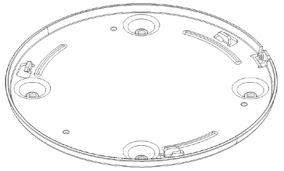
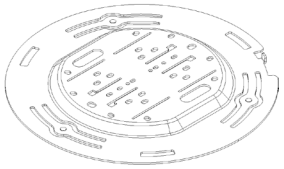
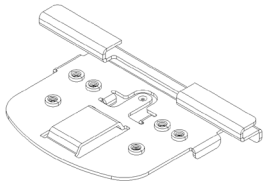
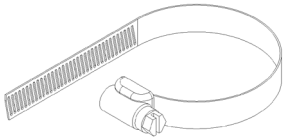
Pole Mount

List of Items for Pole Mount

Items	Qty	Description	Picture
1. Mount base	1	Fix the mount base to AP24-79 with M4 screw*4	
2. Mount bracket	1	Used with the mount base to fix the AP24-79	
3. Ceiling bracket	2	To fix mount bracket & lashing ring	
4. lashing ring	2	Wrapped to a pole	
5. M3 Screw	4	To fix the ceiling bracket to the mount bracket	
6. M4 Screw	4	To fix the mount base to AP24-79	

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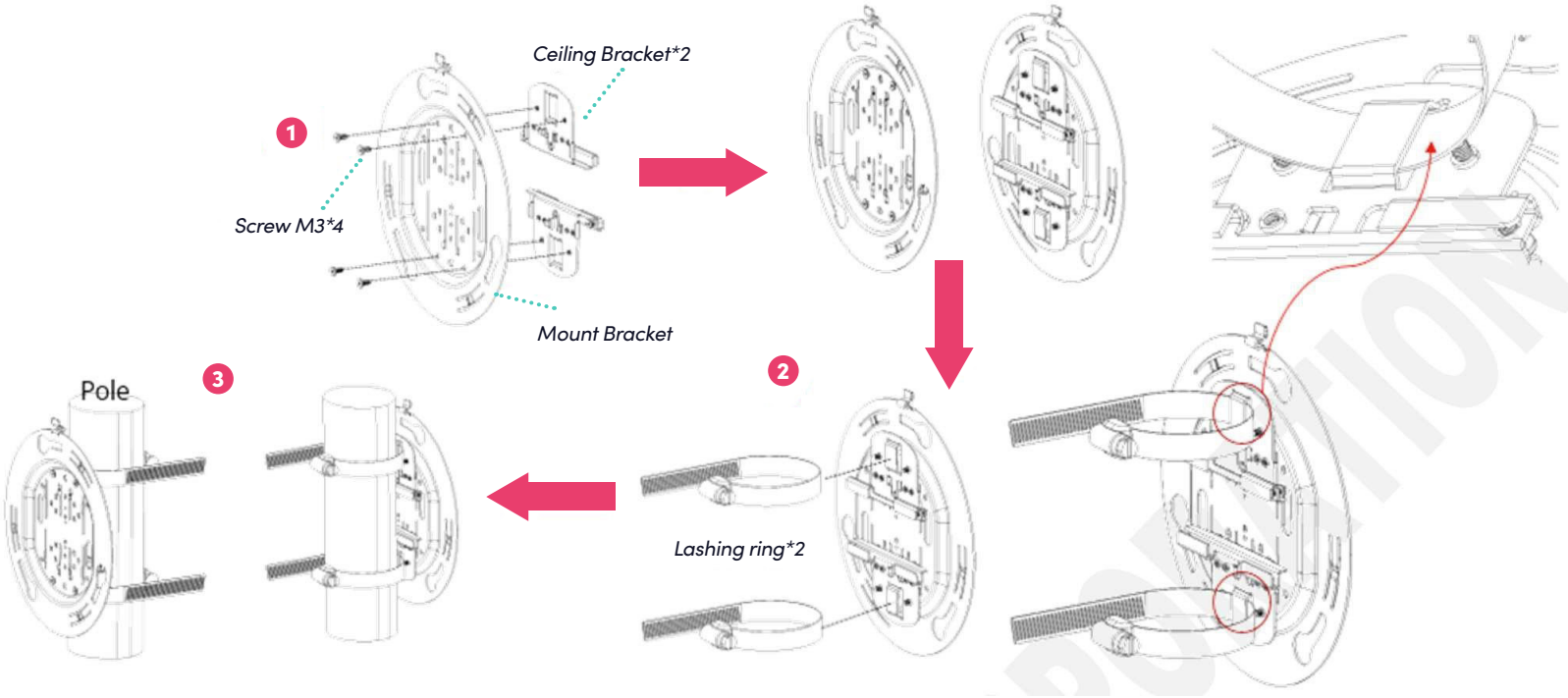
Mounting and Installation

Pole Mount installation steps

1. Fastening M3 screws*4 to fix the Ceiling Bracket on the Mount Bracket.
2. Pass the lashing ring *2 through the Ceiling Bracket.
3. The lashing ring wraps around the pole and please lock the lashing ring.



Align the mount base with the 3 holes on the mount bracket and then turn clockwise to fix it in place. Please note to fasten the screw to prevent AP24-79 from falling.

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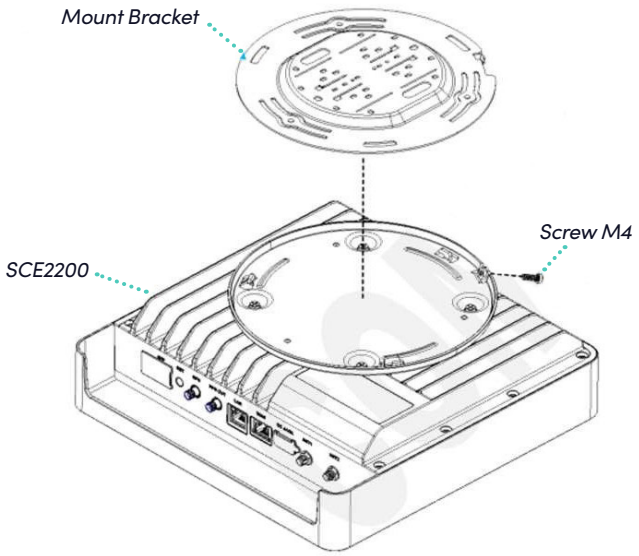
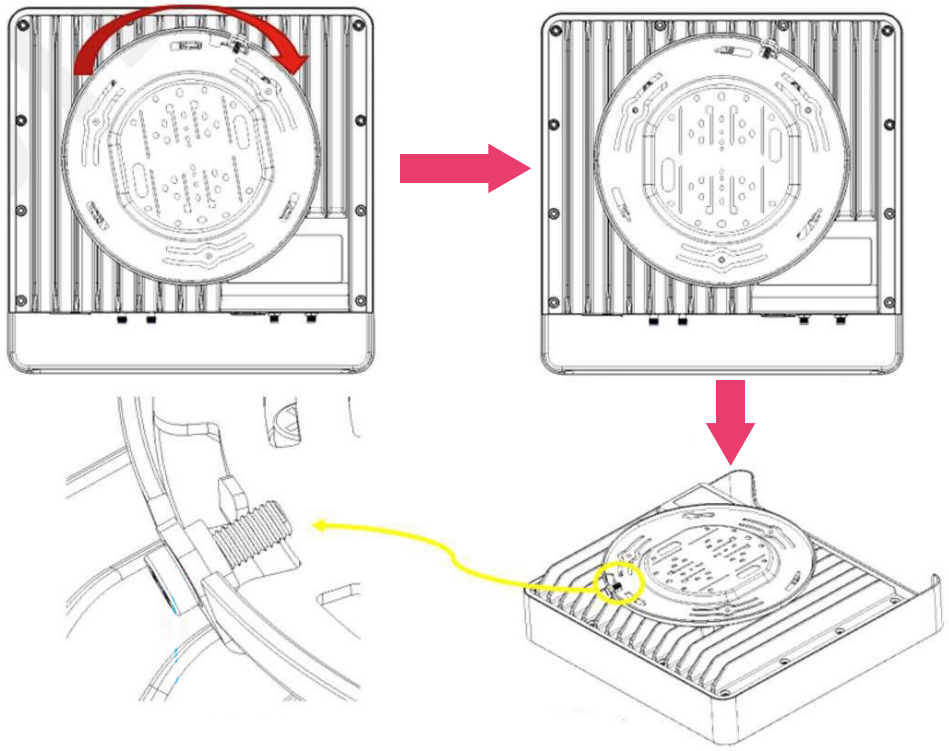
Mounting and Installation

Align the mount base and the mount bracket

1. Align the mount base with the 3 holes on the mount bracket and then turn clockwise to fix it in place





2. Fastening the screw to prevent SCE2200 from falling

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Powering the Access Point

The Celona AP 24 can be powered by IEEE 802.11bt (POE++) on the WAN Ethernet port or connected to an AC electrical outlet using the optional AC power injector/adapter.

Access Point Discovery and Provisioning

The AP will connect to the Celona Orchestrator for provisioning and discover the Celona Edge within the network on-premises or in the private/public cloud based on the site assignment. The AP will then connect directly to the Celona Edge and establish control and data plane connections. Once this is completed, the 5G LED on the AP will turn blue, signifying the private 5G network is operational. This will take approximately 2-3 minutes.

Configuring the Access Point

The Celona AP 24 supports zero-touch provisioning. The AP is preconfigured with details necessary to discover the Celona Orchestrator and the Celona Edge automatically. After the AP discovers the Celona Orchestrator and the Celona Edge, the AP gets provisioned with operational parameters and is authorized to transmit. The Celona Edge alone controls the radio frequency transmission of the Celona AP 24. Once the AP has gone operational, it is able to provide services to mobile stations. The mobile stations can interact with the enterprise network via the Celona Edge. The user data and control signals are encrypted. The Celona AP 24 performance is periodically monitored by the Celona Edge and operational parameters are continually optimized if necessary. Refer to the Celona Orchestrator configuration guide for detailed instructions on configuring Celona access points.

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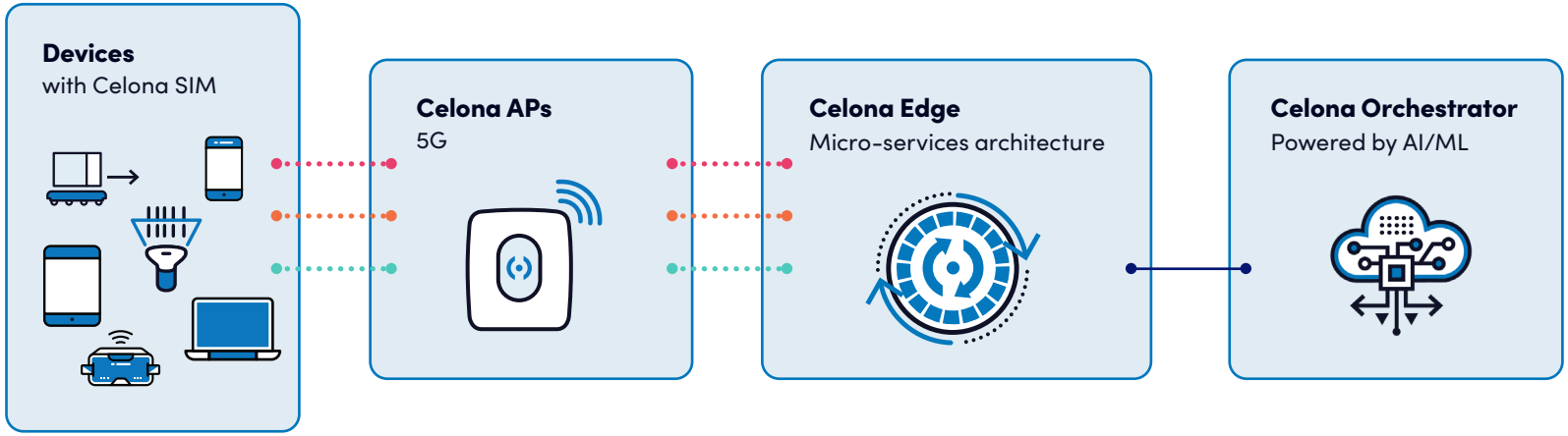
Solution Architecture

The high-level architecture that enables the Celona AP 24 is shown below.



The system consists of the essential functions detailed in Figure 1: System Architecture. The Celona Orchestrator performs AP authentication, validates the AP's serial number, determines the network the AP needs to connect to and finally directs the Celona AP 24 to the serving Celona Edge.

Each Celona AP 24 obtains service via its serving Celona Edge. The Celona Edge registers the Celona AP 24, arbitrates spectrum with a FCC approved Spectrum Access Service (SAS) system in the United States and algorithmically determines the most optimal radio parameters for the AP.

The Celona Edge becomes automatically aware of the Celona AP 24's location and its existing surrounding radio environment. Once the AP is admitted by the Celona Edge, the AP can commence radio transmissions and service the mobile stations.

Celona AP 24 capabilities

The following sections give the reader the capabilities of the Celona Indoor Access Point (AP), which is based on the Qualcomm platform. The AP hosts functions to provide the following services:

- Resource management with admission and flow control
- Encryption of user data and control streams
- Registering mobile stations with Celona Edge for connectivity services
- Paging the mobile stations that are in power save mode
- Fairness in allocation of resources across multiple stations in uplink & downlink directions
- Measurement configurations and handling of mobility of mobile stations

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Operations and Maintenance

The Celona AP 24 is operationally maintained by the Celona Orchestrator and Celona Edge using NETCONF. Celona AP 24's radio parameter provisioning, performance monitoring and fault monitoring occur over the NETCONF interface.

Celona AP 24's performance is monitored between every 5 minutes and 15 minutes based on the periodicity determined by the Celona Edge. If a fault surfaces on the AP, the fault is automatically propagated by the AP to the Celona Edge and the Celona Orchestrator.

Security

The certificates that are required to establish HTTPS connections with the Celona Orchestrator and the IPSEC channel with the Celona Edge are installed to the Indoor AP at the factory. If the certificates need to be updated or replaced, the process is automatically triggered and managed by the Celona Edge. The certificates conform to the industry compliant X.509 standard. The IPSEC gateway is provisioned at the Celona AP 24 through the Celona Orchestrator. IKEv2 is used to establish the IPSEC tunnel between the Celona AP 24 and the Celona Edge.

Phase and time synchronization

Celona AP 24 supports Time Division Duplex (TDD) which has strict requirements for maintaining time and phase synchronization so that it does not interfere with neighbouring APs. The Celona AP 24s have a built-in, high-fidelity GPS chip that can establish location as well as maintain clock synchronization.

The AP's carrier frequency accuracy, time and phase drifts are disciplined by the onboard GPS clock. If the AP cannot obtain a GPS lock for any reason, Celona AP 24 synchronizes with a Precision Time Protocol (PTP) server to maintain time, phase, and frequency synchronization.

Data and voice connectivity

Mobile stations can access data, video, and voice applications over the enterprise IP network via the Celona Edge after the Celona AP 24 has its radio enabled. Note that the Celona AP 24 can provide voice, video, and data sessions simultaneously to mobile stations. Celona AP 24 automatically determines the capability of mobile stations before determining whether requested services can be accommodated.

Celona AP 24 and Celona Edge perform admission control for mobile stations and Celona Edge enforces authentication of the mobile station before accepting service requests and keep all control signals and user data encrypted.

Celona AP 24 employs sophisticated adaptive modulation and code rate control for adapting mobile station link according to the dynamic channel conditions seen on the air interface. It also employs effective power control to keep transmit powers from the mobile stations as low as practicable.

Power save mode

Celona AP 24 enables, and controls power save options on the mobile stations. When a mobile station has encountered a long lull in data volume, Celona AP 24 monitors traffic volume on each flow enabled at the mobile station.

When the traffic volume is zero for a duration of time, duration determined by the Celona AP 24 based on mobile capability as well as current loading in the system, Celona AP 24 enables Power Save mode on the mobile station. While in power save mode, the mobile station can turn off its receiver and transmitter functions for the most part except for essential functions. This increases the battery standby time on the mobile stations.

When the mobile station is in power save mode and if there is user data destined towards the mobile station, Celona Edge pages the mobile station indicating data arrival via the Celona AP 24 in order to awaken the station.

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Radio access technology

Celona AP 24 implements an extensive set of 3GPP worldwide standards to provide advanced, 5th-generation packet radio service to mobile stations.

Supported frequency band

The Celona AP 24 is a 3GPP Release 15 compliant integrated 5G NR with external antenna support, operating within the 4500-4900 MHz spectrum band. AP 24 supports 2x2 MIMO (multiple-input, multiple-output), up to 256-QAM modulation and can be ceiling or wall mounted. Any Celona AP 24 within a Celona private 5G network is automatically assigned frequency and power levels by Celona's unique Self Organizing Network (SON) software function, after the Celona Edge retrieves available frequency channels per AP from SAS, given each AP's geo-location.

Frequency Band Support (SKUs)
AP24-79 4.5-4.9 GHz
AP24-48|77|78H 3.5-4.2 GHz

Seamless session mobility

If there are multiple Celona AP 24s in the system all connecting to the same Celona Edge, the Celona AP 24 s can enable seamless mobility for mobile stations. The source and target Celona AP 24s handle the transfer of contextual information corresponding to existing flows setup for the mobile station automatically.

Coverage area

The coverage area of each Celona AP 24 depends on several factors:

- Transmit power authorized by the Spectrum Manager
- Transmit power set on the Celona AP 24 by Celona Edge
- Number of other APs operating on the same frequency in the geographic area
- Proximity of other APs operating on a different frequency but in the same band
- Building type and material types used within the building
- Expected minimum for data rate at the edge of coverage

As a rule of thumb, at maximum transmit power, the Celona AP 24 should provide coverage between 10,000 and 25,000 square feet.

Transmit power

The Celona AP 24 can transmit at a maximum power of 24 dBm max per port, plus a built-in omni with max 6 dBi antenna gain

Supported system bandwidth

The Celona AP 24 supports one sector, and the system bandwidths are supported are 60/100 MHz

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AP24 with External Antennas

Option 1 – External Antenna Connectivity via Splitter Connectivity

AP24 RF Port

- SMA-Male to N-Male Cable (LMR400)
  (Customer/Partner to procure from Pasternack or other reliable vendors)
- RF Splitter
  (Celona orderable part)
- N-Male to N-Male Cable (LMR195/400 – long cable)
  (Provided as part of the Celona Antenna Kit)
- Antenna #1, Antenna #2

Notes

RF splitter **is required**
Antenna coupler is **NOT used** in this configuration

- Used when deploying **two external antennas from a single RF port**

Option 2 – Direct Antenna Connection (No Splitter) Connectivity

AP24 RF Port

- SMA-Male to N-Male Cable (LMR400)
  (Customer/Partner to procure from Pasternack or other reliable vendors)
- Antenna Coupler
  (Provided as part of the Celona Antenna Kit)
- N-Male to N-Male Cable (LMR195/400 – long cable)
  (Provided as part of the Celona Antenna Kit)
- Antenna #1, Antenna #2

Notes

RF splitter is **NOT used**
Antenna coupler **is required**

- Default configuration when using the **Celona Antenna Kit** for a single antenna

Antenna Cable Strain Relief Requirement

The LMR cable with SMA connector must have sufficient slack and must not pull on or strain the AP antenna ports. Extreme care must be taken to ensure that no mechanical load or antenna strain is applied to the AP antenna leads or connectors. Failure to provide adequate strain relief can damage the AP antenna port and degrade or impede RF performance.

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AP24 with External Antennas

AP24 External Antenna Cable Requirement

For AP24 deployments with external antennas, use SKU **C-ANT-CBL-3-SMA-NM** as the short RF cable connection between the AP24 RF port and the external antenna or RF component (such as a splitter).

SKU: C-ANT-CBL-3-SMA-NM

Description: 3 ft RF Cable, SMA Male to N Male

This 3 ft RF coaxial cable is designed for indoor access point deployments and provides reliable short-distance RF signal transmission with minimal cable loss. The standard antenna kit includes both short and long RF cables. For AP24 deployments, replace the existing short cable with **C-ANT-CBL-3-SMA-NM.**

Installation Note:

When connecting external antenna cables to the AP24 SMA connectors, carefully align the cable connector before tightening. Hand-tighten the connector gently and ensure proper thread alignment before fully securing the connection. Improper insertion, cross-threading, or excessive force may damage the AP SMA connector pin.

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Troubleshooting

System LED is not blue:

- Ensure the AP 24 has a POE++ (802.11bt) connection. POE (802.11 at) is not sufficient.
- Please check for loose connections between the POE++ injector / POE++ switch and the Celona AP 24.

Contacting Support

Celona support is available via support@celona.io.

Warranty

As part of an active Celona subscription, Celona AP 24 comes with a limited warranty that includes advanced replacement for RMA.

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