



NEXTIVITY.

CEL-FI QUATRA

Installation and User Guide



Nextivity, Inc.
16550 West Bernardo Ct
Building 5, Suite 550
San Diego, CA 92127
858-485-9442
support@cel-fi.com

Contents

Introduction3

 Cel-Fi QUATRA™3

 Unconditionally Network Safe.....5

 The Cel-Fi WAVE Platform5

 VIDEOS6

System Elements7

 Hardware Components7

 Cel-Fi QUATRA Network Unit (NU)7

 Cel-Fi QUATRA Coverage Unit (CU)7

 Software Components8

 QUATRA Planner Tool8

 QUATRA Management Tool Mobile Application (QMT)8

 Cel-Fi WAVE Portal8

 Peripheral Options.....9

 Cel-Fi QUATRA Small Cell Interface9

 Cel-Fi MIMO Panel Antenna powered by AntennaBoost9

 Cel-Fi Wideband Directional Antenna 10

 Cel-Fi Wideband Omni Antenna..... 10

 Cel-Fi QUATRA Range Extender (QRE)..... 10

 Available Models 11

Configuration Options (Modes)..... 12

 Off-Air 12

 Small Cell (Supercell) 12

 Determining the Proper Configuration..... 13

Deploying Cel-Fi QUATRA 14

 PLAN..... 14

 Planning Checklist:..... 14

 PLAN NU:..... 15

 PLAN CU 16

 PLAN CABLING 17

NU Power..... 18

NU LAN Management port..... 18

NU to CU cables..... 18

INSTALL 20

CABLE..... 21

POWER 22

Troubleshooting: Cel-Fi QUATRA 23

TERMINOLOGY 26

SPECIFICATIONS..... 27

INTRODUCTION

Cel-Fi QUATRA™

In-Building Enterprise Cellular System

Cel-Fi QUATRA is an active DAS hybrid solution for delivering high quality in-building cellular coverage in venues up to 200,000 sq. ft. As it combines the best of active DAS and Cel-Fi technology that has been widely adopted by carriers around the world, Cel-Fi QUATRA is a scalable solution that provides configurations for single or multi-carrier environments. Options are available for off-air mode or via integration with carrier small cell equipment and operated in distributed small cell mode, creating a Supercell.

Cel-Fi QUATRA is self-configuring and self-optimizing, distributes RF over Ethernet (RfE), and leverages Power over Ethernet (PoE) for ease and accuracy of installation by Cel-Fi Certified professionals. The system is monitored and managed using the Cel-Fi WAVE Platform.

Two QUATRA variants are available:

	QUATRA 1000	QUATRA 2000
Smart Signal Booster	✓	✓
Unconditionally Network Safe	✓	✓
100dB System Gain	✓	✓
Distributed over Cat 5e cable	✓	✓
Power over Ethernet (POE)	✓	✓
12.5K ft² per Coverage Unit	✓	✓
MIMO	✓	
Dual-Carrier		✓

Configurations are available for use on global carrier networks.

- Improves cellular reception for venues from 15,000 to 50,000 sq. ft. per system; scalable to four systems for up to 200,000 sq. ft.
- Built for streamlined installation and maintenance by Cel-Fi Certified professional
- Carrier approved and unconditionally network safe for voice and data
- Intelligently self-configures and continually self-optimizes to adapt to environmental changes
- AntennaBoost intelligent antenna aiming optimizes signal quality
- Remote monitoring and management using the Cel-Fi WAVE Platform
- Designed for off-air or small cell applications
- Best quality signal at 100 dB max gain in off-air mode
- Systems include Internal Antennas (MIMO) and External Antenna connections (MIMO)
- IntelliBoost 6 Core Processor delivers high speeds with low power consumption
- Advanced digital echo-cancellation and channel select filtering algorithms
- Automatic Gain Control (AGC) maximizes system power
- Adaptive signal equalization
- Seamless integration with the macro network; improves network efficiency without causing interference
- Only one power outlet needed for the entire system (at the NU)
- External Multi-Band Panel MIMO Antenna and Small Cell Interface device available (Optional)

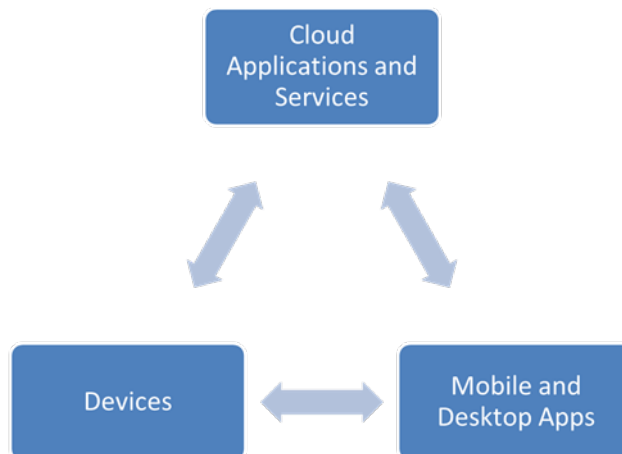
Unconditionally Network Safe

Cel-Fi QUATRA provides a sophisticated network-safe design that has been engineered to deliver multiple levels of network protection:

- Uplink power control to prevent desensitizing the network
- Echo cancellation and feedback control
- Uplink gating
- Signal qualification (channels are individually qualified, so noise or very poor signals won't be amplified and degrade the network)

The Cel-Fi WAVE Platform

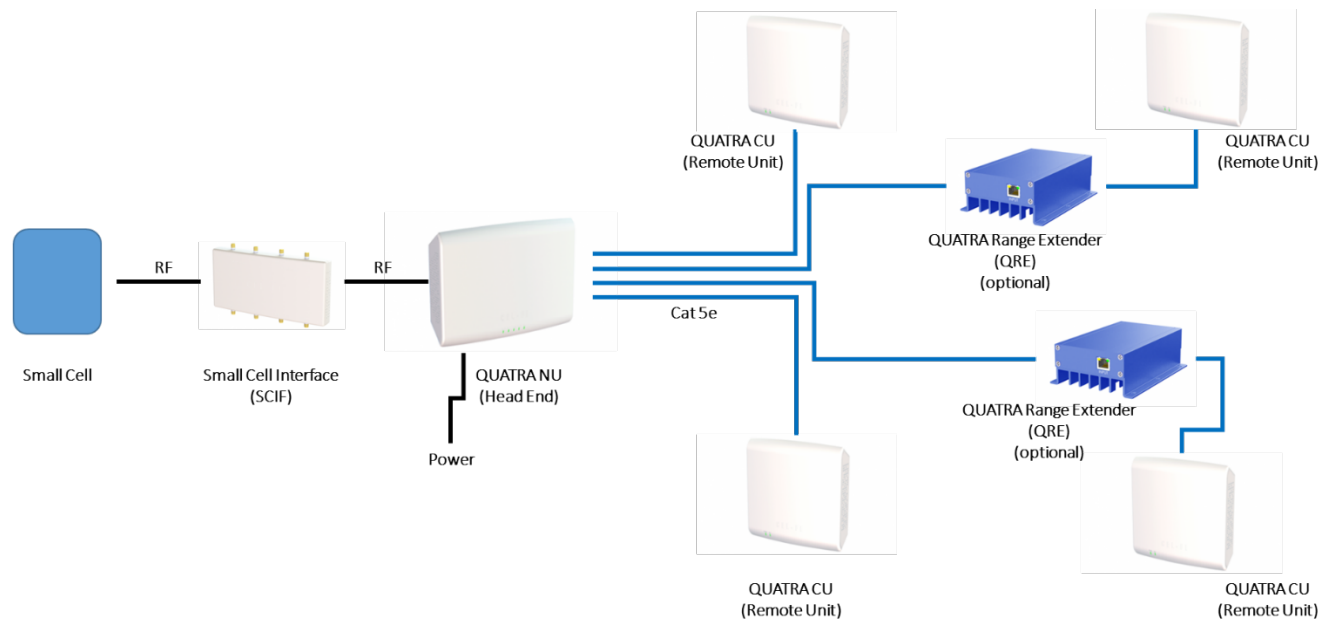
The Cel-Fi WAVE Platform enables device management and maintenance of Cel-Fi QUATRA systems. Alerts and alarms can be used as configured out of the box or they can be customized however the owner or admin chooses.



VIDEOS

- Cel-Fi Intro Video
<https://youtu.be/Jy6PFhip3SM>
- Small Cell Planning
https://youtu.be/SURNn6vk-_E
- Off-Air Planning
<https://youtu.be/QoMk4XNu47E>
- Small Cell Install
<https://youtu.be/ZP8LeQ8YQMc>
- Off-Air Install
<https://youtu.be/-Esb0DhkgG4>
- Small Cell Commissioning
<https://youtu.be/tpZe1c2KdMw>
- Off-Air Commissioning
https://youtu.be/gFhWN_6wqwl

SYSTEM ELEMENTS

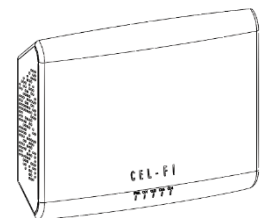


Hardware Components

Cel-Fi QUATRA Network Unit (NU)

Cel-Fi QUATRA Network Unit (NU) is the hub of the system. The scalable design works with one to four Coverage Units to provide up to 50,000 sq. ft. of coverage.

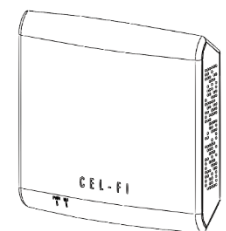
- Provides donor signal to the Cel-Fi QUATRA system
- Provides power to Coverage Units and QREs
- Connects to the Cel-Fi WAVE Platform for remote monitoring and management
- QUATRA 1000 and QUATRA 2000 variants available



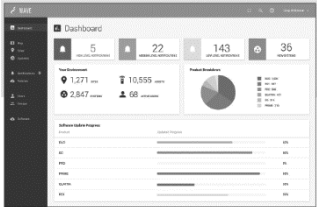
Cel-Fi QUATRA Coverage Unit (CU)

Cel-Fi QUATRA Coverage Unit (CU) is the remote unit of the system that rebroadcasts the donor signal. The cost efficient and easy-to-deploy system leverages Power over Ethernet (PoE) for up to four CUs.

- Provides coverage in the Cel-Fi QUATRA system (up to four per Network Unit)
- Power delivered by Power-Over-Ethernet from the Network Unit
- Self-configuring and self-optimizing
- QUATRA 1000 and QUATRA 2000 variants available



Software Components

QUATRA Planner Tool This simple on-line tool estimates hardware needs based upon building size, floor plan utilization, and donor mode. • Define building and Name the project • Select Donor mode • Email results https://wave.cel-fi.com/#/QuatraPlanner	
QUATRA Management Tool Mobile Application (QMT) Smartphone app to manage systems locally without a wired internet connection. • Communicates to QUATRA using Bluetooth • Syncs the system's data/metrics to the WAVE Portal in the cloud over the mobile network • May be used to commission systems	
Cel-Fi WAVE Portal For channel partners and installers, the WAVE portal is a cloud based management solution to keep track of systems in the field. • Commissioning • Alerts & Alarms • Status & Email/Text Notifications • Troubleshooting	

Peripheral Options

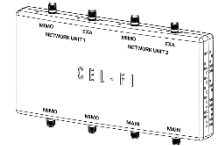
Cel-Fi QUATRA Small Cell Interface

The Cel-Fi QUATRA Small Cell Interface (SCIF) simplifies RF connections between a small cell and NUs. It includes a main unit and all cables for a single NU.

- Simplifies connections to a small cell
- Provides proper signal attenuation and isolation
- Required for small cell Installation

Works best with:

- QUATRA 1000



Cel-Fi MIMO Panel Antenna powered by AntennaBoost

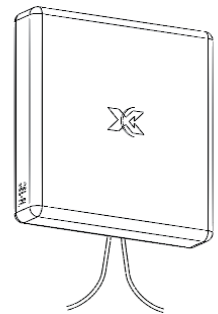
The Cel-Fi MIMO Panel Antenna is the only authorized indoor/outdoor MIMO antenna for Cel-Fi QUATRA.

Cel-Fi AntennaBoost integrates the Cel-Fi MIMO Panel Antenna with the Cel-Fi WAVE Platform to provide the best donor signal in the industry. The antenna connects to any MIMO-enabled NU or CU with QMA (quick connect) cables. Nextivity's proprietary 8-position dial base enables the antenna to be rotated in 45-degree increments for best performance, managed with real-time data from the Cel-Fi Platform Antenna Position Test.

- High gain directional MIMO panel antenna
- Donor managed with AntennaBoost's 8-position aiming mount
- Includes options for ceiling, wall, and pole mounting
- Required for off-air installation of multiple CUs

Works best with:

- QUATRA 1000



Cel-Fi Wideband Directional Antenna

Cel-Fi Wideband Directional Antenna is an outdoor-rated cellular antenna, perfect for use as a donor antenna for Cel-Fi QUATRA.

- 698 MHz - 2700 MHz
- SISO
- SMA connector

Works best with:

- QUATRA 1000
- QUATRA 2000



Cel-Fi Wideband Omni Antenna

Cel-Fi Wideband Directional Antenna is an outdoor-rated cellular antenna, perfect for use as a donor antenna for Cel-Fi QUATRA.

- 698 MHz - 2700 MHz
- MIMO
- QMA connectors

Works best with:

- QUATRA 1000
- QUATRA 2000



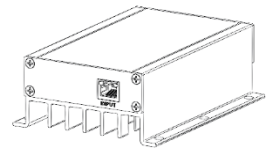
Cel-Fi QUATRA Range Extender (QRE)

Cel-Fi QUATRA Range Extender is a Power over Ethernet (PoE) device that extends the maximum distance between the NU and the CU.

- Allows NU-to-CU cable lengths of up to 200 meters (650 ft.)
- Power over Ethernet (no separate power supply or PoE injector needed)

Works best with:

- QUATRA 1000
- QUATRA 2000



Available Models

Model	Bands	Approval
Q34-2/4/5/12	2,4,5,12	FCC
Q34-2/4/5/13	2,4,5,13	FCC
Q34-1/3/7/8	1,3,7,8	CE
Q34-1/3/8/20	1,3,8,20	CE
Q34-1/7/8/20	1,7,8,20	CE
Q34-3/5/7/28	3,5,7,28* *Telstra-only	CE, RCM
Q34-4/5/12/13/25	4,5,12,13,25	FCC. IC

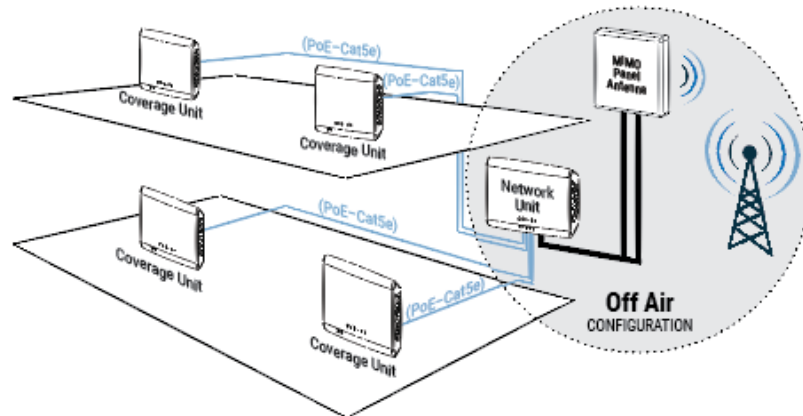
BAND / FREQUENCY DETAIL

Cel-Fi QUATRA BAND SUPPORT		Downlink (MHz)		Uplink (MHz)	
Band	Name	Low	High	Low	High
1	2100	2110	2170	1920	1980
2	1900 PCS	1930	1990	1850	1910
3	1800+	1805	1880	1710	1785
4	AWS-1	2110	2155	1710	1755
5	850	869	894	824	849
7	2600	2620	2690	2500	2570
8	900 GSM	925	960	880	915
12	700a	729	746	699	716
13	700c	746	756	777	787
20	800 DD	791	821	832	862
25	1900+	1930	1995	1850	1915
28*	700 APT	758	788	703	733

* This doesn't cover the full band; the product covers the lower part of the band. This is because components are not available to support the entire band within the product constraints.

CONFIGURATION OPTIONS (MODES)

Off-Air

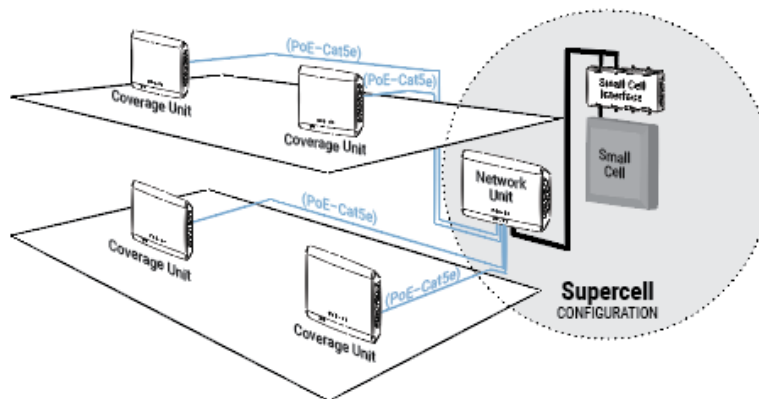


Cel-Fi QUATRA can be installed off-air to provide high-quality in-building wireless connectivity by using the existing cellular network. Off-air installations comprised of an NU and up to four (4) distributed CUs dynamically networked into a single system to provide high-quality in-building wireless connectivity covering up to 50,000 sq. ft.

External Antenna is required when using more than one CU in off-air mode.

Be sure to choose the System Mode "External Antenna" or "Internal Antenna" in the Cel-Fi WAVE Portal when using the internal Cel-Fi QUATRA in Off-Air.

Small Cell (Supercell)



A Supercell is comprised of a Cel-Fi QUATRA system connected to a small cell. Multiple Cel-Fi QUATRA systems can be connected to a single small cell, or multiple small cells, to form a coordinated Supercell that extends coverage for large venues. A Supercell with multiple Cel-Fi QUATRA coverage units (CUs) is more efficient than multiple small cells, and the CUs of a Cel-Fi QUATRA system connected to a Supercell do not interfere with one another.

Cel-Fi QUATRA partners with carrier-approved small cell(s) to deliver better RF distribution through CUs, utilizing the full capacity of the small cell(s), minimizing interference significantly, and requiring much less network management. This achieves the major goal of in-building network densification.

Be sure to choose the System Mode “Small Cell” in the Cel-Fi WAVE Portal when connecting a Cel-Fi QUATRA Network Unit to a Small Cell.

Determining the Proper Configuration

Coverage Need	Existing Service using your phone (bars of signal)	
	Weak Cellular service (0-2 bars), reliable calls where signal exists.	Signal exists but calls unreliable, or available small cell does not cover all required areas.
≤ 13,000 sq. ft. open area	NU Internal Antenna (single CU)	NU External Antenna (single CU)
20,000 sq. ft. many walled rooms	NU External Antenna (multiple CUs)	NU Small Cell input (multiple CUs)
≤ 50,000 sq. ft. open area	NU External Antenna (multiple CUs)	NU Small Cell input (multiple CUs)
≥ 50,000 to 200,000 sq. ft.	Multiple NUs with External Antennas (multiple CUs)	Small Cell input to multiple Cel-Fi QUATRAs

Use Table 1 to determine the recommended system configuration for the installation site.

DEPLOYING CEL-FI QUATRA



PLAN

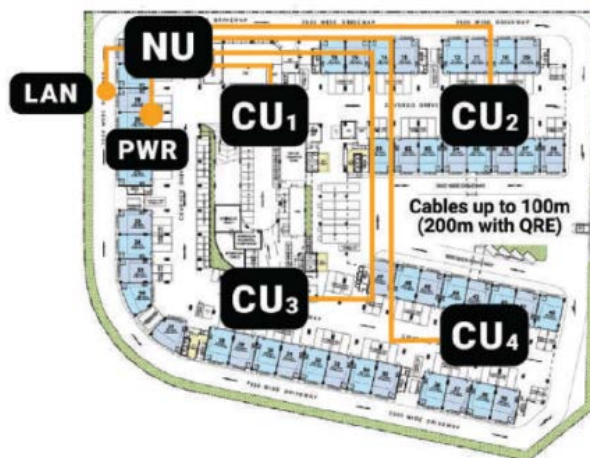
To facilitate the easiest installation process and the best performance at the site, it's important to plan the system design prior to any permanent installations.

Planning Checklist:

- ☐ Carriers to be Boosted
- ☐ Donor Signal Source

Equipment Ready

- ☐ NU
- ☐ CU(s)
- ☐ Antenna
- ☐ SCIF
- ☐ Coax Cable (if using external antenna)
- ☐ Adapters for Coax Cable
- ☐ Cat 5e cable for each CU



PLAN NU:

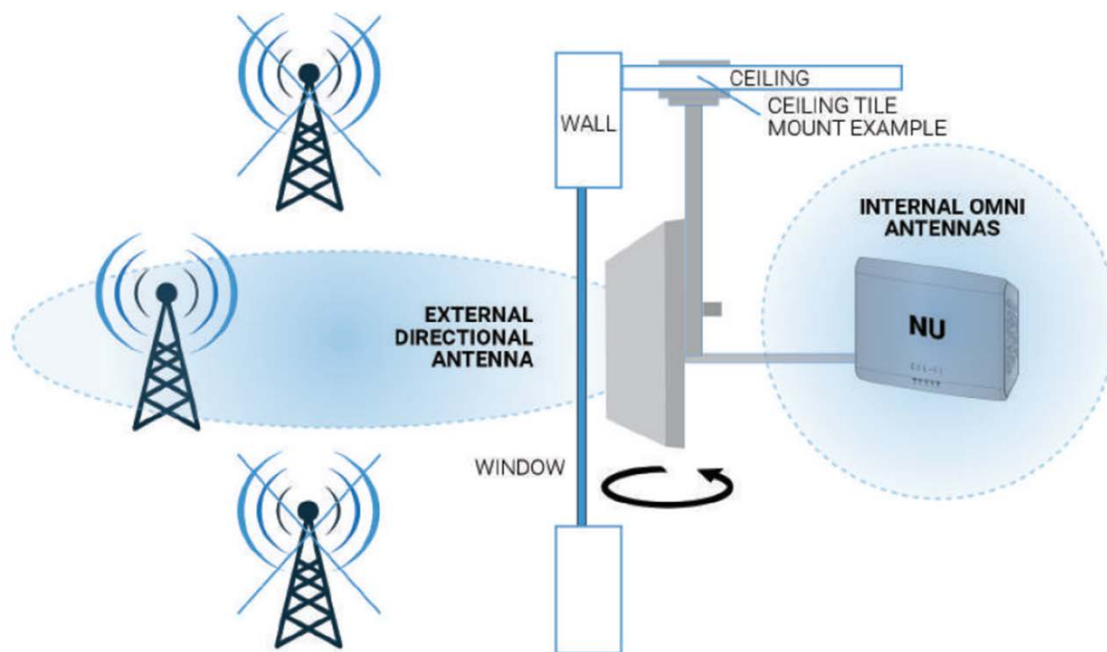
- Based on the system selected and donor signal method, where will the NU be placed?
 - o Using an Off-Air Donor

The input signal quality is a critical factor in the overall performance of the system. It is important to optimize the input signal through antenna placement and aiming.

For small footprint applications where an excellent indoor donor signal is available, the NU Mode may be set to Internal Antenna and a single CU system may be deployed.

For all other Off-Air applications, Mode must be set to External Antenna and up to four CUs may be used. To meet regulatory compliance and to assure optimum performance, an approved Cel-Fi External Antenna is required.

Donor Antenna Aiming (through the WAVE app) is a simple guided process when commissioning the system.



- o Ensure power is available at the NU location.
 - o If planning for an external donor antenna, where will the coax cable run be and where will the donor antenna be mounted?
- For best results, test donor signal locations during normal peak usage hours.

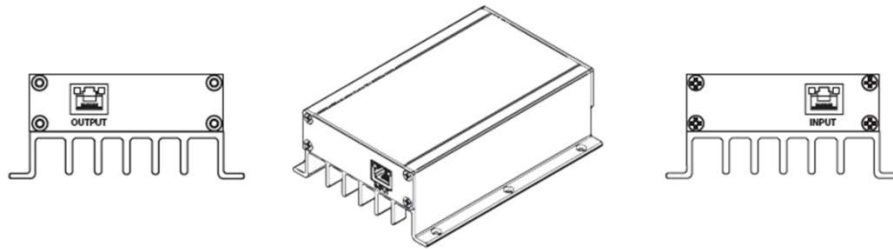
- Determine best existing Off-Air signal location at the site (using phone signal bars), usually near windows.
 - o Test results for LTE are preferred over 3G results.
 - o OPTION: Run a few speed tests on a phone at each location. Higher data rates indicate better signal quality.
 - o ADVANCED: Evaluate signal quality parameters (Smartphone apps such as Network Cell Info Lite show this information).

PLAN CU

- Where will the CU(s) be placed?
- Site survey Suggestions (how do we survey the location?)
- Where is coverage needed?
- How will the CU(s) be mounted?

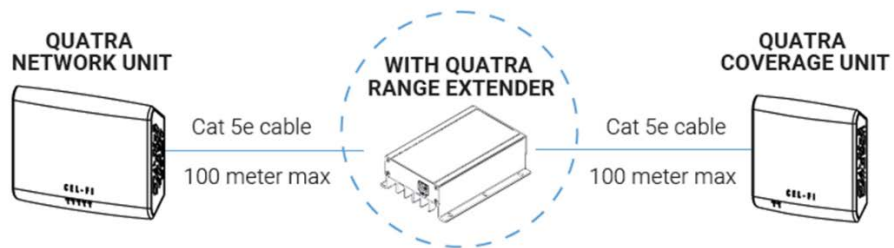
- Given CU placement, what sorts of cable runs will be required?
 - o Are the CU(s) sufficiently isolated from one another?
 - From the NU?
 - o Any distance over 200 m from the NU will require a QRE to be included in-line.

OPTIONAL: QUATRA Range Extender (QRE)



For NU to CU cable lengths up to 200m, use a QRE.

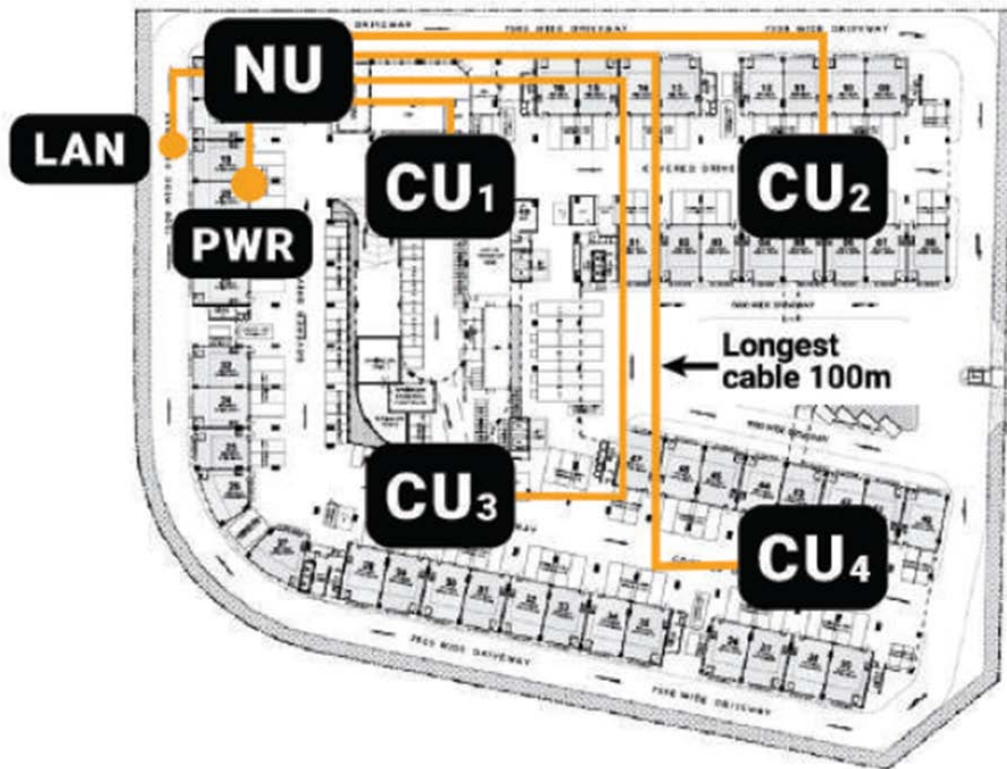
- Only one QRE may be used per CU.
- The QRE is powered by the cable from the NU (no local power source is needed).
- Install the QRE in accordance with the QRE User Manual.



- Coverage Areas

PLAN CABLING

- Distance requirements
- QRE needs



Once NU and CU locations are determined, have your IT professional or cable installer recommend cable routes and lengths (use a QRE for any CU cable length over 100m). Rather than running new cable, sometimes existing LAN cables may be re-purposed.

NU Power

- The NU should be located within reach of an AC power output.

NU LAN Management port

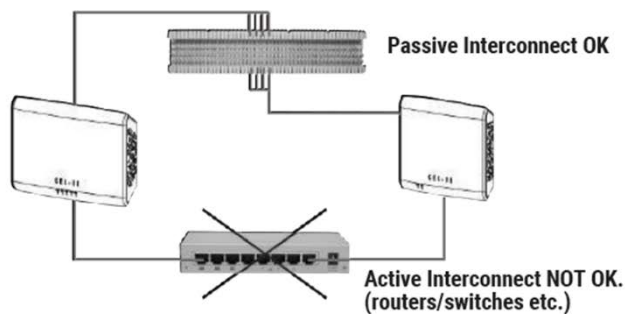
- The NU LAN port connects QUATRA to the WAVE Portal through your LAN/ISP
- The LAN OUTPUT port is for daisy chaining additional NUs.

NU to CU cables

- Cat 5e (or better) must be used.
- Maximum NU to CU cable length is 100m for Cat5e.

Longer CU cables may be used for Cat6 if cable performance meets qualification testing for 1000Base-T.

- If longer cabling is needed (Cat5e or Cat6), a Cel-Fi QUATRA Range Extender (QRE) may be used for up to 200m total cable length.
- These cables must be dedicated to each CU.
- Passive cable interconnects may be used when routing the cables (such as a punch-down block or patch panel).
- Active Ethernet LAN hardware may not be used because Cel-Fi QUATRA uses proprietary signaling.



IMPORTANT



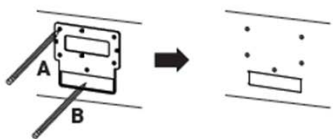
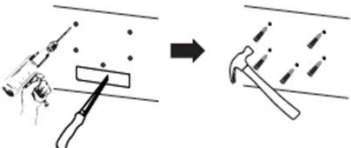
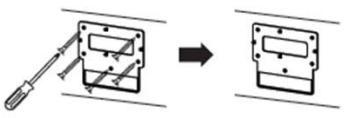
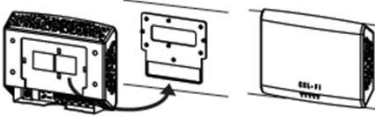
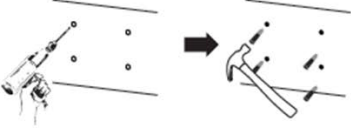
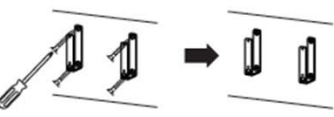
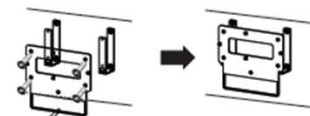
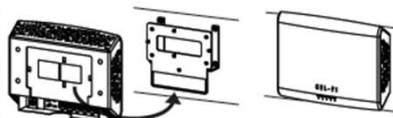
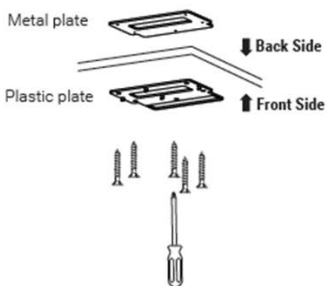
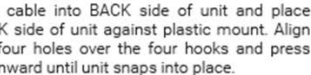
NU to CU Ethernet cables must be dedicated (proprietary data link)! The system will not function if common shared LAN resources are used (routers, switches etc).

INSTALL

1. Record serial numbers by location

The QUATRA Management tools will reference the NUs and CUs by serial number during commissioning, and allow the assignment of personalized names to each unit.

2. Mount the hardware

WALL MOUNT		CEILING MOUNT
Network Unit or Coverage Unit Mark screw holes using plastic mount (A) onto wall. OPTIONAL: Trace rectangular area (B) if you are planning to run the cables through the wall.  Drill holes into wall. Use a hammer to insert dry wall anchors. OPTIONAL: Cut rectangular area for cables with a dry wall saw.  Attach the plastic mount to the wall with drywall screws. OPTIONAL: Route cables through wall cutout.  Plug cables into BACK side of unit and place BACK side of unit against plastic mount. Align the four holes over the four hooks and press downward until unit snaps into place. 	Network Unit Metal Stand-off Brackets Temporarily attach metal brackets to plastic mount with machine screws. Mark screw holes on metal brackets onto wall.  Drill holes into wall. Use a hammer to insert dry wall anchors.  Attach the metal brackets to the wall with drywall screws.  Attach the plastic mount to the metal brackets with machine screws.  Plug cables into BACK side of unit and place BACK side of unit against plastic mount. Align the four holes over the four hooks and press downward until unit snaps into place. 	Coverage Unit Ceiling Tile Mount Attach plastic mount on to the FRONT side of the ceiling tile with screws. The screw ends will be exposed on BACK side of ceiling tile. Attach metal plate on to the BACK side of the ceiling tile using the exposed screws.  IMPORTANT  Do not overtighten the plastic mount screws. Create a hole in the ceiling tile in the cutout area of the plastic mount to run the CU cable through.  Plug cable into BACK side of unit and place BACK side of unit against plastic mount. Align the four holes over the four hooks and press downward until unit snaps into place. 
		Accessories To install accessories, please refer to the installation instructions included with the accessory.

CABLE

STEP 3: Route and connect all Cat 5e (or better) cables

NU to CU Cabling

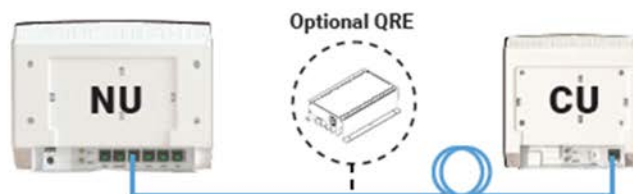
Connect CUs in order CU1, CU2... (recommended)

If unsure of CU placement, leave extra cable to allow for CU relocating.

IMPORTANT



Do not power up the Network Unit at this time.



LAN Cables are not provided with unit. End-use installer must choose correct LAN / PoE cables. The LAN cable must be as per requirements of CEC / NEC.

NU Management Connections

If multiple NUs are used at a Site, all LAN management ports should be connected to the same Subnet, or daisy chained using the LAN and LAN OUTPUT ports as shown.



IMPORTANT



Remember to set Mode when commissioning the system. Choices are: Internal Antenna, External Antenna, or Small Cell.

POWER

STEP 4: Power the Network Unit and Commission the System

IMPORTANT

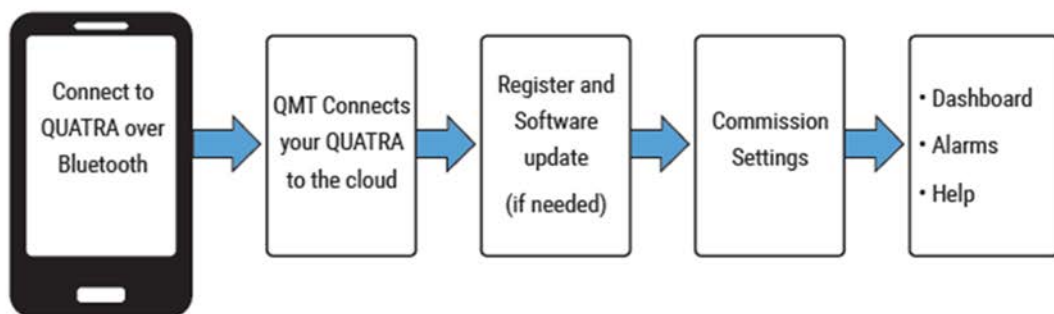


- 1) Cel-Fi QUATRA commissioning using QMT or the Cel-Fi WAVE portal is required for operation.
- 2) Make sure that NU Mode is properly set to Internal Antenna, External Antenna, or Small Cell using QMT or the Cel-Fi WAVE Portal (you can access your system record using the NU serial number).
- 3) If using a small cell, verify that the small cell is commissioned and transmitting before commissioning QUATRA.

- A. Once a donor signal is available to the NU and the CUs are connected, plug in the NU power supply.
- B. Download and launch the Cel-Fi QUATRA Management Tool (QMT) app from Google Play or the Apple App Store (you can also find and commission your system using the Cel-Fi WAVE portal).



- C. Follow the on-screen prompts to connect to the Cel-Fi QUATRA system over Bluetooth and complete the guided Commissioning steps (you must be within Bluetooth range of an NU or CU).
- D. If an NU External Antenna is used, you will be guided through Antenna Positioning (aiming) steps at this time.
- E. Once Commissioning is completed, your Cel-Fi QUATRA system should be providing service (the NU and CU front panel LEDs should be solid Green). If an LED is blinking green, wait for setup to complete. If any red LED indications persist, see Troubleshooting.



TROUBLESHOOTING: CEL-FI QUATRA

LED	ISSUE	TRY
 SOLID RED	Network Unit (NU) error.	Reset the Network Unit by unplugging the power supply, wait 5 seconds, then plug it back in.
		Verify Network Unit software is up to date (using QMT or cloud portal).
		If the problem persists, return Network Unit for service.
	Network Unit overheating.	Make sure that the vents (the small openings in the plastic housing) on the units are not blocked. Move the unit to a cooler area. The system will start working normally when it cools down.
	Coverage Unit (CU) error.	Reset the Coverage Unit by unplugging it and then plugging it back in.
		Verify Coverage Unit software is up to date (using QMT or cloud portal).
		Make sure that the LAN cabling to each Coverage Unit is dedicated (not combined with other active LAN hardware such as routers and switches). Passive connectors may be used (i.e. punch-down blocks) but the maximum cable distance may be reduced.
		If a Cel-Fi QUATRA Range Extender is used to lengthen the 100 meter maximum Network Unit to Coverage Unit Ethernet distance, make sure only a single Cel-Fi QUATRA Range Extender (QRE) is used per Coverage Unit. QRE is proprietary and other extenders will not work. See QRE Troubleshooting.
		Uninstall Coverage Unit and plug it into back of Network Unit with a short Ethernet cable that is known to work. If the Coverage Unit works properly, troubleshoot the original Ethernet cable (or QRE if used).
		If the problem persists, return Coverage Unit for service.
	Coverage Unit overheating.	Make sure that the vents (the small openings in the plastic housing) on the units are not blocked. Move the unit to a cooler area. The system will start working normally when it cools down.
 BLINKING RED	Problem with donor signal or Mode setting.	Insufficient Donor Signal. If internal antennas used for Network Unit, relocate Network Unit where signals exist or add and Enable external antennas in Settings.
		If external antennas or a small cell donor signal are used, check Mode setting, donor source, and cable connections to the NU RF ports.
	Registration required.	Product Registration is required for your system to operate (system is new or has been moved to a new address). Please follow the registration instructions using QMT or the Cel-Fi WAVE portal.
	Check Mode and number of CUs.	If NU Mode is set to Internal Antenna, only one CU may be used. More connected CUs will result in system Disable. Disconnect additional CUs, or set NU Mode to External Antenna and connect an External Antenna.
	No CU connected.	Connect at least one CU to the NU.
	CU too close to NU.	A CU is too close to the NU. Move the closest CU further away from the NU.
	CU Disabled.	Use QMT or the Cel-Fi WAVE portal to Enable the CU if it is Disabled.
	Input signal too strong.	The Network Unit is receiving too strong a donor signal and may operate with reduced gain (the signal source could be any Operator's cell tower if close enough, or it could be another indoor cellular solution in close proximity to the Network Unit donor antennas).
		If internal antennas used, move the Network Unit to another location. You might need to move your system to the other side of your building.
		If external antennas used, move or re-aim the external antennas away from the strong cellular signal source.

		If a Small Cell donor is used, make sure the coaxial connections to the Small Cell have the supplied attenuators installed.
	Location Lock – Registration Required	Your system has been moved from its previous Registration location. Please reregister your system at its new location using QMT or the Cel-Fi WAVE portal, or move the system back to its original location.
	System Disabled.	The system has been remotely disabled. Please check for a notification message and contact your Operator or Vendor.
	Port keeps resetting	A Coverage Unit LAN cable may be shorted. Unplug all Coverage Units, power cycle the system, and plug Coverage Unit cables back in one at a time to check where fault occurs (fault could be in cabling, a Cel-Fi QUATRA Range Extender, or a Coverage Unit).
		If Cel-Fi QUATRA Range Extenders are used, verify that LAN cable length on either side of the Extenders does not exceed 100 meters.
		If none of the above works, try another power supply.
		If none of the above works, try another Network Unit.
QMT/WAVE	Management Connection Error	Verify that a live LAN Ethernet cable is connected to the Network Unit LAN port (not the LAN OUT port which is used to daisy-chain to another Network Unit LAN port).
		Check LAN firewall settings to the cloud (contact your IT Administrator). The NU uses port 443 for management traffic.
		Verify system performance and Cel-Fi WAVE cloud portal connectivity using QMT (QMT must have an active internet connection).
 BLINKING GREEN	Setup in progress	Wait. System is in a setup state. If a red error indication occurs on the NU, CU LEDs may stay in the setup state until the NU error is cleared.
 SOLID GREEN	Phones have signal but can't make calls	If using a Small Cell donor, make sure the small cell is commissioned and transmitting.
		Make test calls using just the Small Cell signal to verify its operation (temporarily connect small cell antennas).
		Verify handset settings and compatibility against boosted channel bands and 3G/4G technologies.
	Phone not seeing boosted signal	Due to network resource balancing, a handset may be directed by the network to use an unrelayed channel if that channel is adequate. This is normal and should not cause a service interruption.
	Slow software update.	Software updates using QMT may take an hour or more due to Bluetooth limitations. Connect your NU LAN (Management) port to the Internet for faster updates.

Troubleshooting: Accessories

LED	ISSUE	TRY
QRE – All LEDs Flashing		Unplug the INPUT cable, wait 5 seconds, and plug it back in. If the condition persists the unit needs to be replaced.

Any RJ45
Green LED is off
between
NU/QRE/CU

Link is down

CU is not connected or cannot be seen. Check QRE to CU cable and/or CU. CU may be checked by plugging directly to back of NU or QRE Output with LAN test cable. Check NU – QRE – CU cables lengths (must not exceed 100 meters each, and use of patch panels may reduce maximum length).

TERMINOLOGY

Active DAS. A powered DAS (Distributed Antenna System) Network.

Attenuator. An electronic device that reduces the amplitude of a signal.

Cel-Fi WAVE. A cloud portal system for managing Cel-Fi systems

Coverage Unit (CU). The Cel-Fi unit that broadcasts cellular service where coverage is needed (Service signal).

Donor Antenna. Receives and transmits signals with the existing cellular network.

External Antenna. Antennas external to a device and connected with RF cables.

Gain, or System Gain. The amount of amplification that may be applied to the source signal.

iBwave. A solutions planner that allows you to perform complete RF distribution designs with hardware such as Cel-Fi products.

Interference. Locations usually between multiple cell sites that may be interfering with each other and reducing network capacity.

Isolation. Separating donor-service antennas to limit feedback potential.

MIMO. Multiple-Input Multiple-Output antenna scheme that improves capacity. Cel-Fi QUATRA is a 2x2 MIMO system, using two antennas per NU or CU.

Network Unit (NU). The Cel-Fi unit that connects to the existing cellular network (Donor signal).

Pilot Pollution. See Interference.

PoE (Power over Ethernet). To pass electrical power along with data on Ethernet cabling.

QMA connector. A spring loaded quick connect small-size RF connector used to join coaxial cables.

QMT (Cel-Fi QUATRA Management Tool). A Smartphone App and cloud-based management system that allows local and remote management of Cel-Fi QUATRA systems.

QRE (Cel-Fi QUATRA Range Extender). Allows Cel-Fi QUATRA NU to CU interconnect cable lengths to 200m.

RFoE. The transport of RF signals over Ethernet cable.

Service Antenna. Receives and transmits signals amongst local user devices (phones/tablets etc).

SMA Connector. A common small (Sub-Miniature A) 50 ohm RF cable connector.

Small Cell. Low-powered cellular radio access node.

Splitter (Divider/Combiner). Splits a single coaxial cable to/from multiple cables.

SPECIFICATIONS

Item	Description
Supported Bands	1, 2, 3, 4, 5, 7, 8, 12, 13, 20, 28
WCDMA Bandwidth per Band	3.84, 5, 10, 15, 20MHz contiguous UMTS/HSPA channels
LTE Bandwidth per Band	5, 10, 15, 20MHz contiguous (up to band max)
Channel Selection	Full Auto with self-learn Scan
Downlink TX Power max (conducted)	10dBm per 5MHz (max 16dBm per band per antenna)
Uplink TX Power max (conducted)	Max 24dBm per band per antenna
Max boost bandwidth (all channel)	75MHz
Maximum System Gain	100dB
System Gain dynamic range	0-100dB (real time echo controlled)
Internal MIMO antenna gains	0-2dBi (band dependent) V-H polarization
External RF connections	50 ohm QMA female Quick-Connect
Ethernet ports	Shielded Fast Ethernet ports (RJ45)
Maximum NU-CU cable length	100 meter (200 meter with Cel-Fi QUATRA Range Extender accessory)
NU and CU LAN cabling	Cat 5e or better
Bluetooth (NU and CU)	Bluetooth Low Energy (BLE) v4.1.2
Bluetooth (Frequency)	2402-2480 MHz
Bluetooth Power	10dBm
User Interface	Red/Green LEDs, QMT Smartphone App, WAVE Cloud Portal
Input Power (NU only)	54 VDC @ 2.22 Amp via external supply (51.3 to 56.7 VDC tolerance)
External Power Supply (NU only)	100 to 240 VAC, 47 – 63Hz
Cooling	Natural convection
Network Unit dimensions	264mm (W) x 185mm (H) x 62mm (D)
Coverage Unit dimensions	225mm (W) x 185mm (H) x 36.5mm (D)
Network Unit weight	1.2kg (40.8 oz.)
Coverage Unit weight	0.83kg (29.2 oz.)
Operating temperature	0° to 40°C
Storage temperature	-25° to 60°C
Relative humidity	0% to 95%, noncondensing
IP Rating	IP20
Compliance	RoHS II 2011/65/EU
Compliance	3GPP TS 25.143 Rel.10

Compliance	3GPP TS 36.143 Rel.10
Compliance	EN 301 489-1
Compliance	EN 301 489-17
Compliance	EN 301 489-50
Compliance	EN 301 908-1
Compliance	EN 301 908-11
Compliance	EN 301 908-15
Compliance	EN 300 328
Compliance	EN 62311
Compliance	FCC Part 15, 20, 22, 24, 27
Compliance	UL STD 62368-1
Compliance	CSA STD C22.2 No. 62368-1
Compliance	Bluetooth BQB



www.cel-fi.com

Visit our website or contact your local Nextivity representative for more information.

© 2017 Nextivity Inc. All rights reserved.

All trademarks identified by ® or ™ are registered trademarks or trademarks, respectively, of Nextivity, Inc.

This document is for planning purposes only and is not intended to modify or supplement any specifications or warranties relating to Nextivity products or services.