CEL-FI QUATRA RED®

Installation and User Guide

Draft

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Revision History

Version	Author	Description	Date
0.1	Nextivity	Initial Release	Oct 10th, 2019

Change List

Version	Change List	Contents

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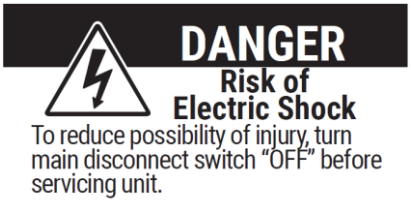
GENERAL INFORMATION

Safety Notices

Electric Shock

Opening any of the QUATRA RED components may result in electric shock and may cause severe injury



Exposure to RF

Working with the equipment while in operation may expose the technician to RF electromagnetic fields that exceed FCC rules for human exposure. Visit the FCC website at www.fcc.gov/oet/rfsafety to learn more about the effects of exposure to RF electromagnetic fields.

Please maintain a minimum safe distance of at least 400 cm while operating near the donor and the server antennas. The safe distance can be reduced if a lower antenna gain is used. Also, donor antenna should be mounted outdoors on a permanent structure.

Hot Surface

In certain conditions, the equipment may become hot and may cause minor injuries if handled without any protection.

Warranty

Opening or tampering with any of the QUATRA RED components voids all warranties.

Lithium battery

The battery may explode if it's replaced by an incorrect type. Dispose of used batteries according to instructions.

Ethernet instructions

This equipment is for indoor use only. All cabling should be installed indoors.

INTRODUCTION

During an emergency incident, every minute is critical; first responders need to be able to communicate with each other inside and outside of any structure at any time. Nextivity's Cel-Fi QUATRA RED for Public Safety solutions are designed to provide coverage in the most challenging and complicated buildings and structures to ensure complete-code compliant coverage throughout the facility.

This guide refers to additional tools and resources, such as the Cel-Fi WAVE PRO Mobile app, and the COMPASS device. This guide does not cover the complete usage of outside tools, but only instructs usage as it pertains to the QUATRA RED system.

System Overview

Cel-Fi QUATRA RED solution consists of a Network Unit (NU) and up to six (6) Coverage Units (per NU). The Network Unit takes off-air signals from two available donor antenna ports (LMR and LTE) and digitizes the RF signals for distribution to up to six Coverage Units (CU) over dedicated Category (Cat5e or better) cables. CUs convert the digital signals back to RF, boosts them, and transmits from its RF port to provide public-safety coverage at the location.

NU and CUs must be the same model and band configuration. Multiple QUATRA RED systems can be installed together to form a more extensive solution. Systems can be attached to a specific site in the WAVE platform and remotely managed.

Cel-Fi QUATRA RED provides a sophisticated network-safe design that has been engineered to minimize the embedded effects of signal amplification.

Note: There is no technical limitation to the number of systems or solutions that can be installed together at a site.

QUATRA RED Architecture

Cel-Fi QUATRA RED is a modular solution with five (5) foundational components:

- **Network Unit (NU)**
- **Coverage Units (CU)**
- **Monitoring and Battery Backup Unit (MBBU)**
- **Remote Annunciator Panel (RA)**
- **Emergency Power-Off Switch (EPO)**

Cel-Fi by Nextivity recommends the use of Category cable (CAT5e or superior) for data transmission and to provide electrical power supply (Power-over-Ethernet) to all the components in the system except were is indicated in this user manual.

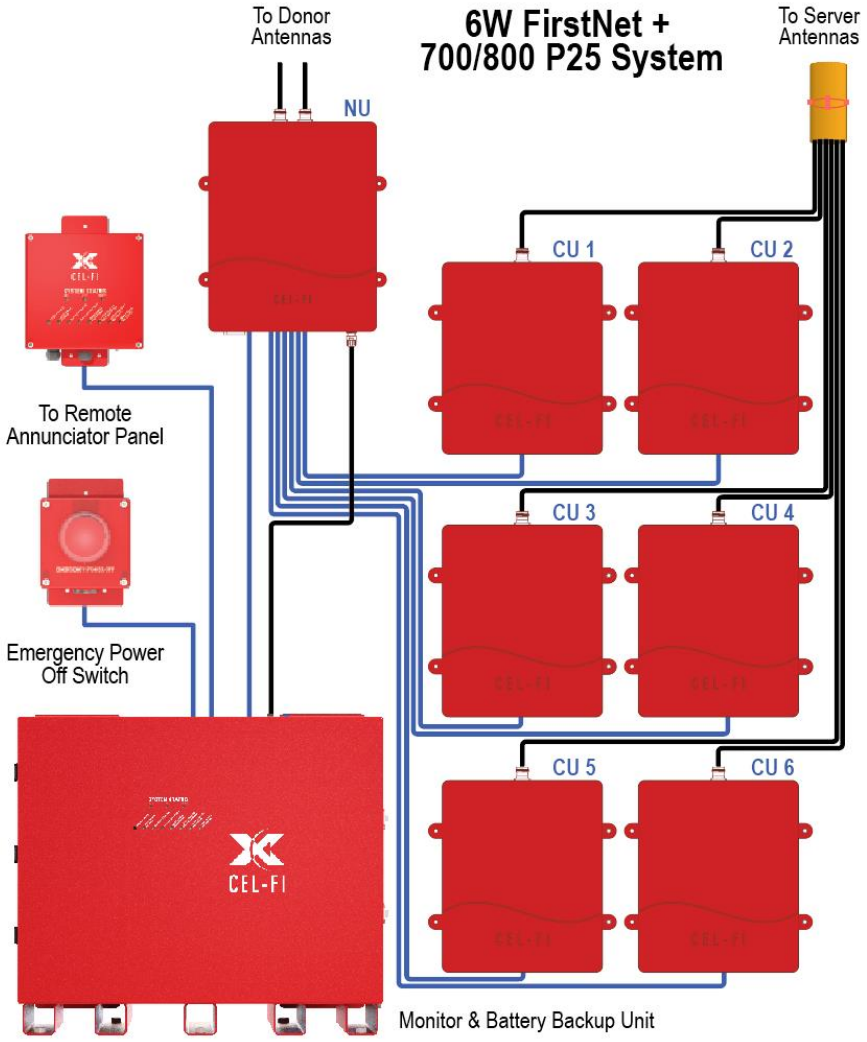


Figure 1. QUATRA RED System Architecture

Main Features

- **Antenna pointing algorithm to optimize FirstNet donor signals**
- **Uplink gain automatically calculated and set based on donor site location**
- **Near real-time uplink (UL) automatic gain control (AGC).**
- **Coverage footprint provided via Power over Ethernet (PoE) up to 325 ft (100m) range from NU to CU.**
- **A single NU and up to six (6) CU's may be attached.**
- **Remote Management through Cel-Fi WAVE portal**
- **Real-time, slot-to-slot gain control**
- **Automatic setting of uplink (UL) and downlink (DL) gain during the commissioning phase**
- **Downlink gain automatically set to 20dB isolation per NFPA 1221**
- **Maximum uplink gain automatically calculated based on donor site location**
- **Uplink AGC and gating can respond in <1.2ms to changing inputs levels, making the QUATRA RED system very robust against the near-far effect.**

DAQ test can be done using the WAVE PRO app without support from the dispatch center.

Ordering Info

Cel-Fi QUATRA RED is available in four different configurations

- **FirstNet + LMR (700 MHz & 800 MHz)**
- **LMR (700 MHz & 800 MHz)**
- **700 MHz only**
- **800 MHz only**

Note: NU & CU model configurations are not interchangeable.

Model Number	Product Description
F42-67ENU	Cel-Fi QUATRA RED NU, FirstNet + 700/800MHz LMR
F41-8XCU	Cel-Fi QUATRA RED CU, FirstNet + 700/800MHz LMR
F42-10L-100	Cel-Fi QUATRA RED MBBU Large (for systems w/ 3 to 6 CUs; 12 Hrs)
F42-10S-100	Cel-Fi QUATRA RED MBBU Small (for systems w/ 1 to 2 CUs)
F42-10X-100	Cel-Fi QUATRA RED MBBU Large (for systems w/ 3 to 6 CUs; 24 Hrs)
F42-10R-100	Cel-Fi QUATRA RED Remote Anunciator Panel
F42-10E-100	Cel-Fi QUATRA RED Emergency Power-Off Switch

Table 1. Model Numbers

INSTALLATION

Installation Area

All the components of the QUATRA RED solution are NEMA 4 rated; however, temporary protection should be taken when the equipment packaging is opened for installation or maintenance in an outdoor environment.

The installation location for the product must be well ventilated. The equipment has been designed to operate at the temperature range and humidity level, as stated in the product specifications.

The mounting surface must be able to support the weight of the equipment.

Direct sunlight exposure to the equipment should be avoided. Provide additional shelter if necessary.

Required Tools

The following are the recommended list of tools for new installation and routine maintenance.

- Slotted Screwdriver
- Philips Screwdriver
- Ring Spanner (Assorted size: 12~20mm)
- Electrically operated drill and masonry drill bits (Assorted size: 5~10mm)
- Anti-static Wrist Strap
- Side Cutter
- Voltmeter (e.g., Fluke)
- RF Power Meter (e.g., Anritsu)
- RF assessment tool (e.g., Cel-Fi Compass)

Waterproof RJ45 Inline connectors assembly

This section applies to all the components in the Cel-Fi QUATRA RED solution using RJ45 connectors. Use a CAT 5e cable or higher category to interconnect the units. Each QUATRA RED component includes a set of waterproof RJ45 inline connectors to be installed on each side of the Ethernet cable.

1. **Pass the cable thru the screw-on cap**
2. **Insert the cable into the split sleeve and washers**
3. **Push the screw-on cap and washers in the receptacle**
4. **Apply on the screw-on cap a maximum mating torque of 4.1 - 6.1 in-lbs**

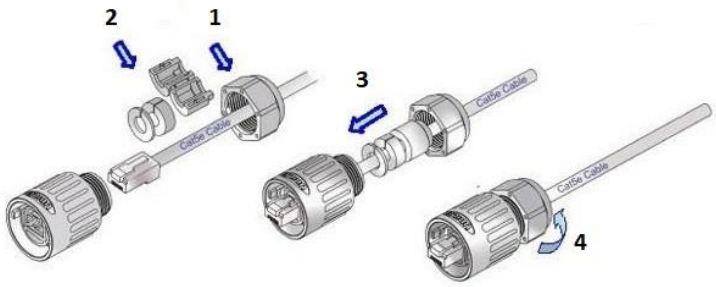


Figure 2. Waterproof RJ45 Inline connector assembly

Installing the Monitor and Battery Backup Unit (MBBU)

The Monitor and Battery Backup Unit (MBBU) is the centerpiece of the QUATRA RED system. The MBBU processes all alarming, DC power, service configuration, and system control. The installation procedure described in this manual is identical for both models F42-10S-100 and F42-10L-100.

Note: Even though this manual explains how to install and wire the batteries inside the MBBU, the unit doesn't include the batteries. Please contact your distributor to select and purchase the batteries that support the requirements in your area.

MBBU Unpacking and Package Content

When receiving the MBBU, perform the following checks:

- **Inspect the shipping container for damage before unpacking the unit.**
- **Look for any physical damage to the equipment.**
- **Check that all the items listed in the packing list are included.**

MBBU Wall Mounting

The Cel-Fi QUATRA MBBU is designed to be wall-mounted. Mounting accessories, including screws and anchors, for common material types (drywall, plywood, etc) are included in the standard kit.

The QUATRA RED MBBU has nine (9) secure mounting tabs, six on the top and three on the bottom side.

Caution. Make sure the area behind any surface is free of electrical wires or other dangerous elements before drilling.

1. **To mount the MBBU, first determine the approximate location on the wall for the unit.**
2. **Hold the unit against the wall and use a pencil or similar marker to mark the top and bottom anchor points.**
3. **Using a drill, drill holes for the wall anchors.**
4. **Hammer in the wall anchors.**
5. **Place the MBBU against the wall anchors and affix all anchor screws.**

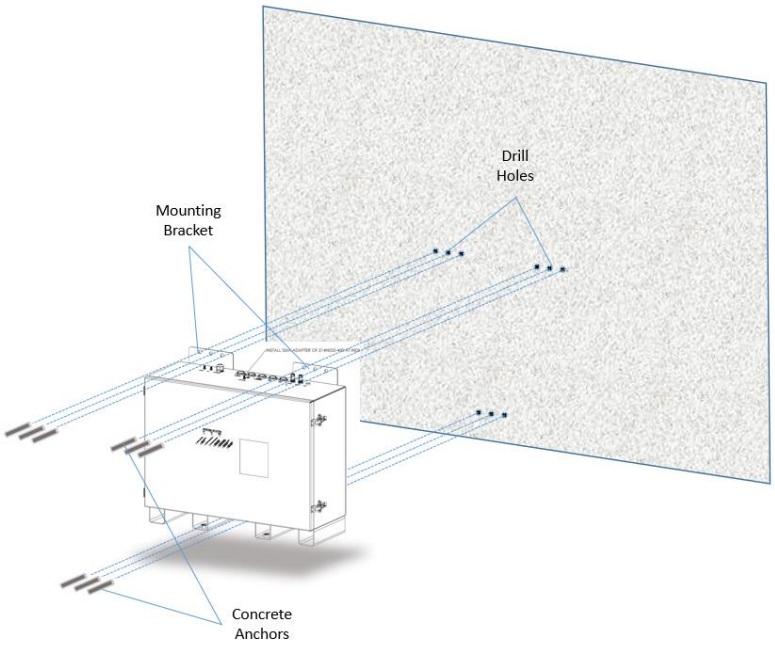


Figure 3. MBBU Wall Mounting

Notes:

- **The unit mounting procedure is for concrete walls only.**
- **The weight of the unit may require two people to manipulate the unit.**
- **The unit must be installed horizontally with the connectors on the top side.**

MBBU Battery connections

1. **Ensure both circuits breakers A & B (AC and Batteries) are in the OFF position.**
2. **Install batteries into enclosure per Figure 5.**
3. **Connect the battery series jumpers, as indicated in Figure 6.**
4. **Connect battery cables from circuit breaker B (Battery Breaker) and DC ground terminal block to 48-volt battery string terminals, as shown in Figure 7.**

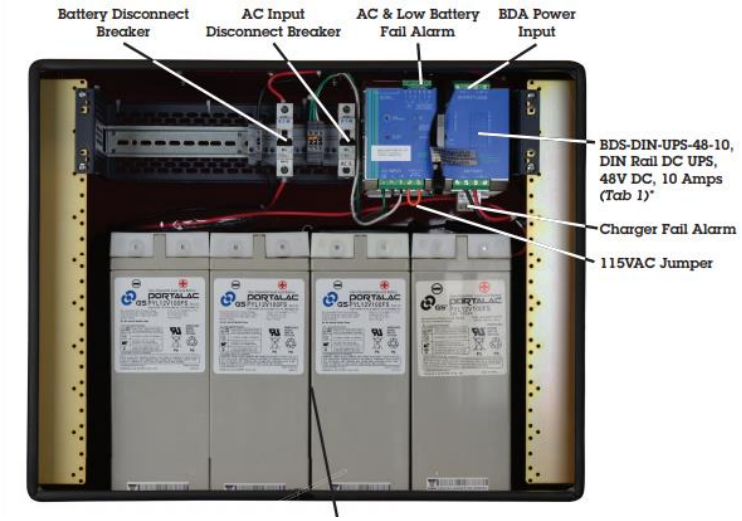


Figure 4. Batteries inside MBBU (Place holder)

Figure 5. Battery connection scheme (Place holder)

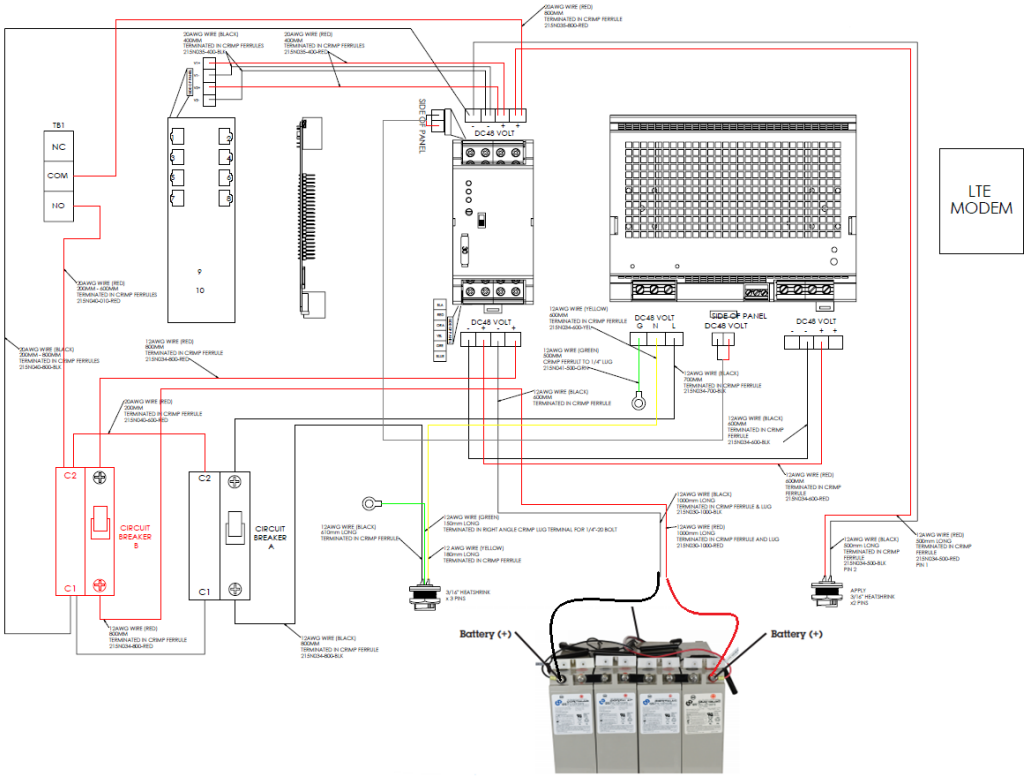


Figure 6. Battery connection diagram

MBBU Power Supply Connection

1. **Connect the AC power cord to standard 115 VAC outlet**
2. **Turn ON circuit breaker A (AC Power) and verify the battery controller AC-OK LED turns on solid green (Figure 8).**
3. **Confirm battery polarity is correct and turn ON circuit breaker B.**
4. **Verify battery voltage is approximately 55 VDC.**
5. **Turn OFF circuit breakers A & B and continue with the installation as indicated in this manual.**

Figure 7. AC OK LED

Network Unit (NU)

The Network Unit is referred to as the NU and itis the signal processing head end for the QUATRA RED system. The signal sources (LMR & LTE) are connected to the NU, digitized, and distributed over Category cable to the Coverage Units.

Figure 8. Network Unit (NU)

NU unpacking and package content

When receiving the NU, perform the following checks:

- Examine the box for damage before unpacking the unit.
- Perform a visual inspection to reveal any physical damage to the equipment.
- Verify that all the items listed in the packing list are included.

NU port layout

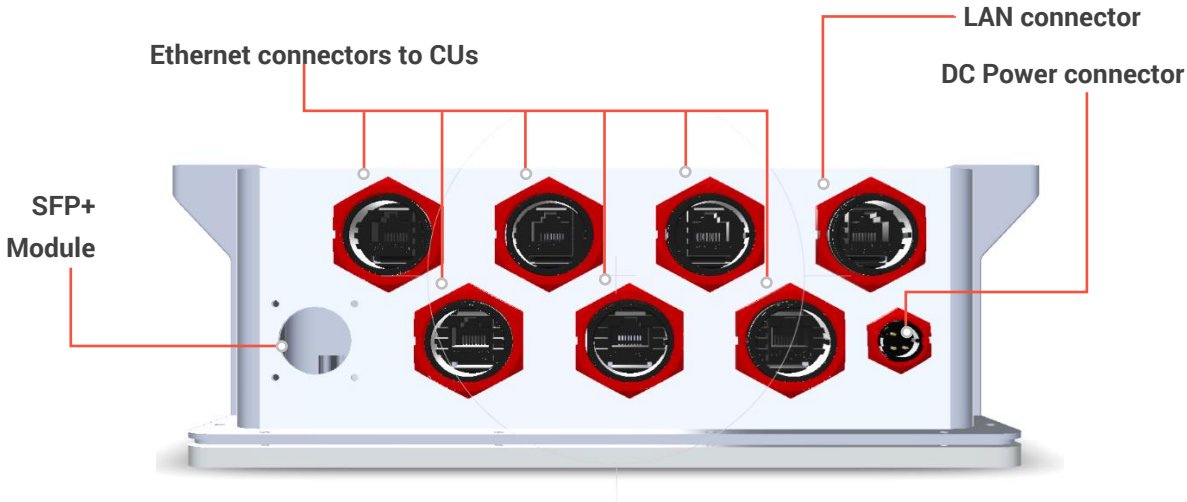


Figure 9. NU bottom panel connections

NU Mounting

The Cel-Fi QUATRA NU is designed to be wall-mounted. Mounting accessories, including screws and anchors for common material types (drywall, plywood, etc), are included in the standard kit.

The QUATRA RED NU has four (4) secure mounting tabs, two on each side. The two topmost tabs have been keyholed to allow the unit to hang from preinstalled wall anchors.

Caution. Make sure the area behind any surface is free of electrical wires or other dangerous elements before drilling.

6. To mount the NU, first determine the approximate location on the wall for the unit.
7. Hold the unit level against the wall. Using a pencil or similar marker, mark both top (left and right) anchor points.
8. Using a drill, drill drill holes for the top wall anchors.
9. Hammer in the wall anchors.
10. IScrew both top screws into the wall anchors, leaving enough screw head space to hang the NU on the screws.
11. Hang the NU on the top anchor screw heads.
12. With the NU in place, mark the lower tab wall anchors.
13. Remove the NU from the wall and drill/install the lower wall anchors.
14. Hang the NU on the top screws and install/tighten all four anchor screws.

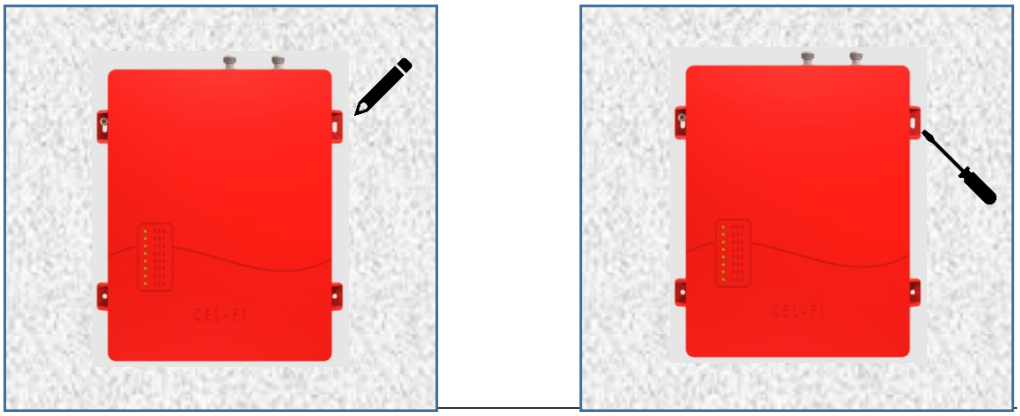


Figure 10. Wall mounting the NU

NU Grounding

1. Connect one side of the grounding cable to the grounding terminal on the equipment with a ¼" – 20 Bolt.
2. Connect the other end to the main grounding bar installed inside the fire room. The recommended cable gauge is AWG #10 or AWG #12 and color code green/yellow.

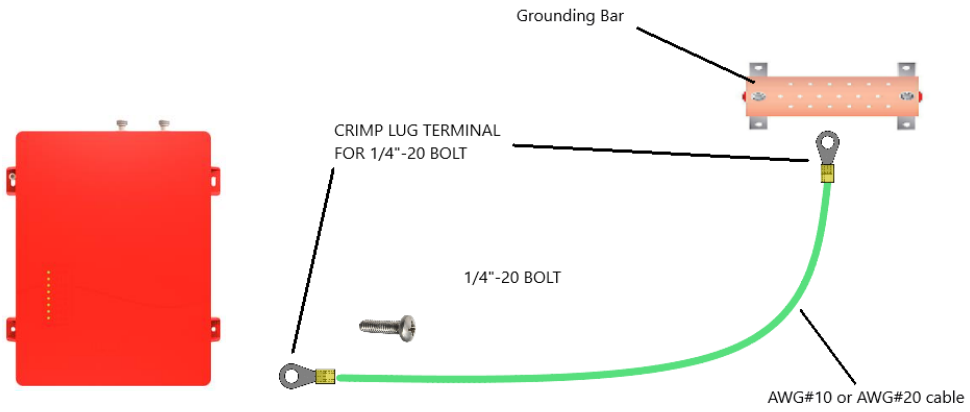


Figure 11. Grounding the NU

Donor antenna connection

Connection to the donor antennas is made via two Type-N female connectors. The RF connector labeled "LMR" must be connected to the antenna pointing towards the LMR base station. The LMR port can receive both 700 and 800MHz public safety signals. The RF connection labeled "Cellular" must be connected to the antenna pointing towards the "LTE/Cellular" base station. The RF connections must be made using cables with an impedance of 50 ohms.

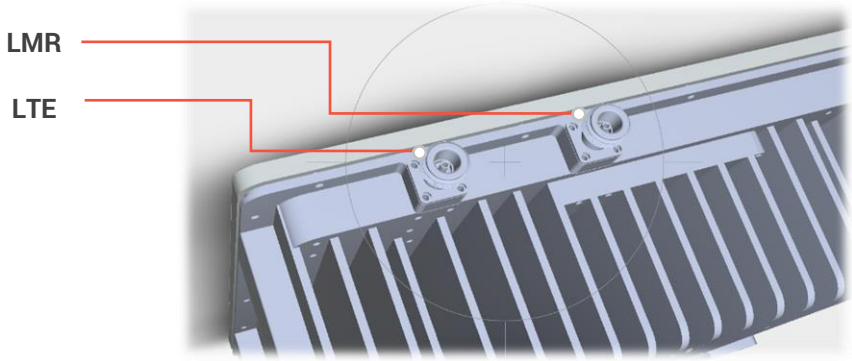


Figure 12. NU antenna ports

User Interface

The table below shows the LED interface (front) to indicate system status.

State	Power	CU1	CU2	CU3	CU4	CU5	CU6	LAN	SFP
NORMAL OP	G-S	G-S	G-S	G-S	G-S	G-S	G-S		
HARDWARE ERROR	R-S	OFF	OFF	OFF	OFF	OFF	OFF		OFF
CONNECTED BUT NOT RELAYING	G-S	G-F	G-F	G-F	G-F	G-F	G-F		
NETWORK SCANNING	G-F								
LAN CONNECTED								G-S	
LAN ERROR								G-F	
SFP HARDWARE INSTALLED/READY									G-F
SFP CONNECTED									G-S
SOFTWARE ERROR	R-F	G-F	G-F	G-F	G-F	G-F	G-F		

G-F = Green Flashing
G-S = Green Solid
B-F = Blue Flashing
B-S = Blue Solid

Coverage Unit (CU)

The Coverage Unit (CU) receives the digitized signal from the NU, converts back to RF, boosts, and distributes the service from its RF port. Service can be deployed through a single connected antenna or a DAS field. The CU is powered over Ethernet (PoE).

Figure 13. QUATRA RED Coverage Unit

CU unpacking and package content

- Examine the box for damage before unpacking the unit.
- Perform a visual inspection to reveal any physical damage to the equipment.

- **Check that all the items listed in the packing list are included.**

CU ports layout

The Coverage Unit (CU) has one N-type female connector for RF signals; one PoE port for communication with the Network Unit (NU) and a LAN port for local connection to the unit.

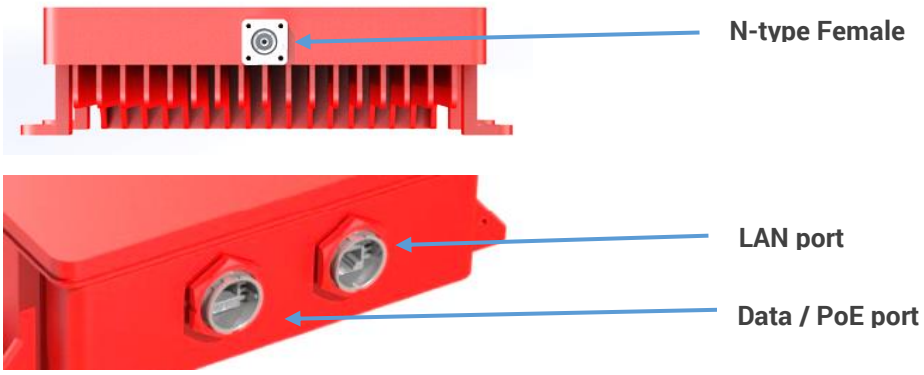


Figure 14. CU port layout

Coverage Unit (CU) Mounting

The Cel-Fi QUATRA CU is designed to be wall-mounted. Mounting accessories, including screws and anchors, for common material types (drywall, plywood, concrete) are included in the standard kit.

The QUATRA RED CU has four (4) secure mounting tabs, two on each side. The two uppermost tabs have been keyholed.

Caution. Make sure the area behind any surface is free of electrical wires or other dangerous elements before drilling.

1. **To mount the CU, first determine the approximate location on the wall for the unit.**
2. **Hold the unit up on the wall and, using a pencil or similar marker, mark one of the tops (right or left) points.**
3. **Using a drill, drill the location for the wall anchor.**
4. **Hammer in the wall anchor.**
5. **Place the CU in the right location and screw it on the mount.**
6. **Make the unit as level as possible, and mark the spot for the other top mounting hole on the wall.**
7. **Using the drill, drill the appropriate hole where marked.**
8. **Hammer in the anchor, appropriately.**
9. **Screw in the second CU tab.**

Note: The keyhole style allows for fine-tuning of the horizontal level.

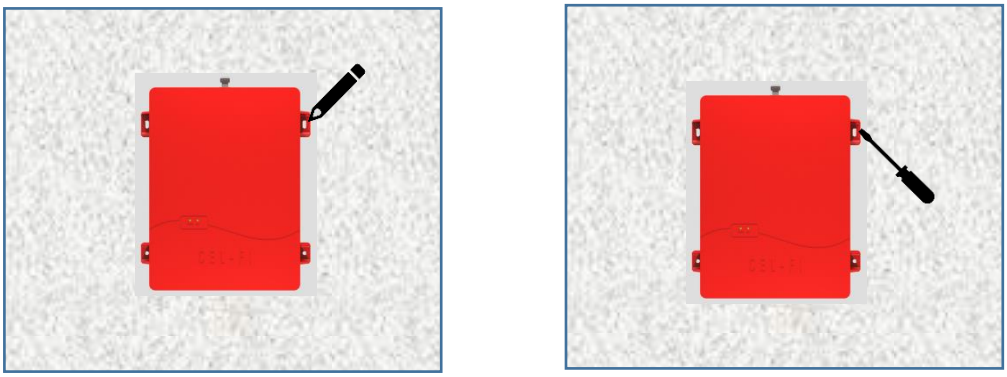


Figure 15. CU Mounted on a wall

CU Grounding

1. Connect one side of the grounding cable to the grounding terminal on the equipment with a ¼" – 20 Bolt.
2. Connect the other end to the main grounding bar installed inside the fire room. The recommended cable gauge is AWG #10 or AWG #12 and color code green/yellow.

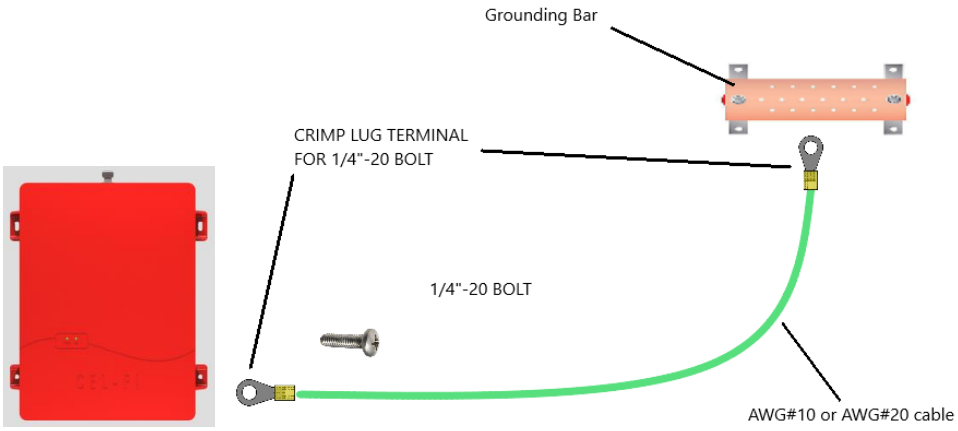


Figure 16. CU Grounding

CU user interface

The table below shows the LED interface (front) to indicate system status.

Label	NU	PWR
NORMAL OPERATION	G-S	G-S
ERROR CONDITION AT THE NU	G-F	G-S
ERROR CONDITION AT THE CU	G-S	G-F

G-F = Green Flashing
G-S = Green Solid
B-F = Blue Flashing
B-S = Blue Solid

REMOTE ANNUNCIATOR PANEL (RA)

Cel-Fi QUATRA RED Remote Annunciator Panel provides automatic supervisory signals for malfunctions of the ERRCS. It includes FORM-C dry relay contacts compatible with any fire alarm control unit (open or short circuits).

Figure 17. Remote Annunciator Panel

RA unpacking and package content

- **Examine the box for damage before unpacking the unit.**
- **Perform a visual inspection to reveal any physical damage to the equipment.**
- **Check that all the items listed in the packing list are included.**

RA ports layout

Figure 19 shows the RJ45 port to connect the Remote Annunciator (RA) with the Monitor and Battery Backup Unit (MBBU) and the 24-Pin connector to connect the Form-C cable with the fire alarm control unit.

Figure 18. Remote Annunciator port layout

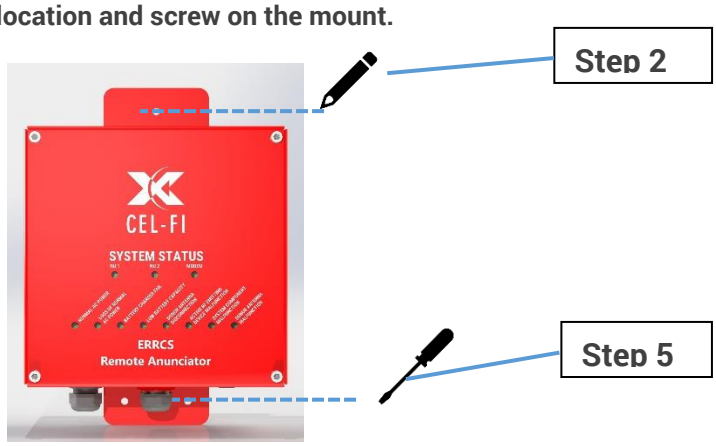
RA Mounting

The Remote Annunciator is designed to be wall-mounted. Mounting accessories, including screws and anchors, for common material types (drywall, plywood, concrete) are included in the standard kit.

The QUATRA RED RA has two (2) secure mounting tabs, one on each top/bottom side.

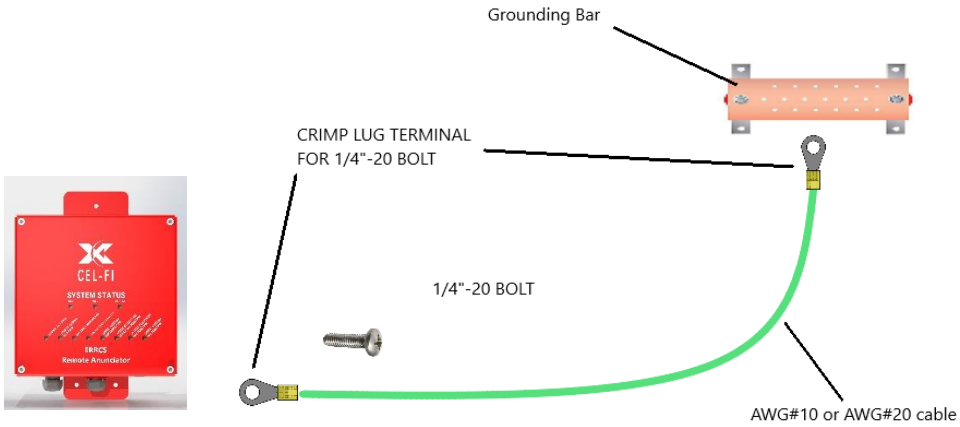
Caution. Make sure the area behind any surface is free of electrical wires or other dangerous elements before drilling.

1. **To mount the RA, first determine the approximate location on the wall for the unit.**
2. **Hold the unit up on the wall and, using a pencil or similar marker, mark the mounting tabs points.**
3. **Using a drill, drill the location for the wall anchors.**
4. **Hammer in the wall anchors.**
5. **Place the RA in the right location and screw on the mount.**



RA Grounding

1. **Connect one side of the grounding cable to the grounding terminal on the equipment with a ¼" – 20 Bolt.**
2. **Connect the other end to the main grounding bar installed inside the fire room. The recommended cable gauge is AWG #10 or AWG #12 and color code green/yellow.**



RA Ethernet connection

Remote annunciator connection to the MBBU is thru a PoE (Power Over Ethernet) cable. You can find assembly instructions on page 12 of this manual.

Form-C cable connection to Fire Alarm Control Panel

Included in the box is a Form-C cable with three pins per alarm. The first one is a normal-close signal, the second one is a common signal, and the third is a normal-open signal. Choose the appropriate signal according to the type of fire alarm control panel in the building.

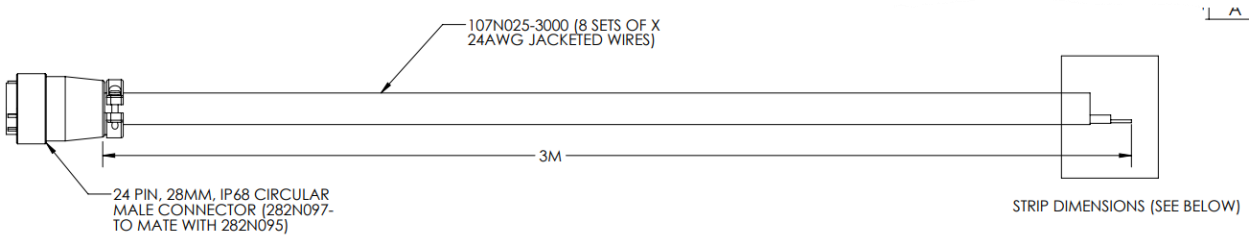


Figure 19. Relay Output Cable

1. **Locate the port labeled "Remote Annunciator" on top of the MBBU and connect an Ethernet cable with a waterproof RJ45 inline connector.**
2. **Connect the other end to the Remote annunciator Panel port labeled "Master."**
3. **On the Remote Annunciator Panel, plug-in the 24-PIN connector.**
4. **Choose the appropriate pins (normal-open / common / normal-close) to set up the alarms in the main fire alarm control panel.**

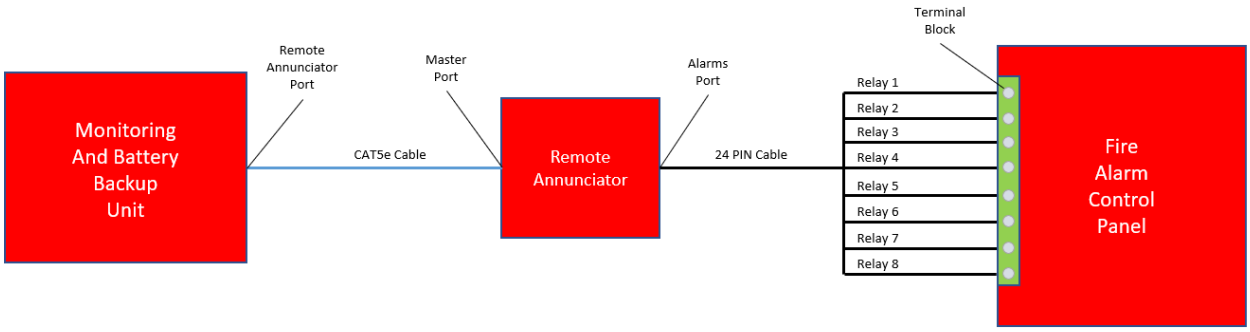


Figure 20. Remote Annunciator Interconnection

WIRE CHART			
CONDUCTOR SET	WIRE NO.	COLOR	PIN # - 24 PIN CONN (282N097)
#1- RED	1	BLACK	1
	1	WHITE	2
	1	RED	3
#2- BLUE	2	BLACK	4
	2	WHITE	5
	2	RED	6
#3 - YELLOW	3	BLACK	7
	3	WHITE	8
	3	RED	9
#4 - GRAY	4	BLACK	10
	4	WHITE	11
	4	RED	12
#5 - GREEN	5	BLACK	13
	5	WHITE	14
	5	RED	15
#6 - WHITE	6	BLACK	16
	6	WHITE	17
	6	RED	18
#7 - BLACK	7	BLACK	19
	7	WHITE	20
	7	RED	21
#8 - ORANGE	8	BLACK	22
	8	WHITE	23
	8	RED	24

Figure 21. Alarm Cable Configuration

RA user interface

The table below shows the color coding for any alarm condition in the Remote Annunciator. LEDs will be OFF if there is no alarm. If an alarm is present LEDs will be RED.

If there is a communications fault (open, shorted to ground or disconnected cable) between the Fire Alarm Control Unit and the Remote Annunciator Panel, the LEDs will flash.

	Normal OK Status	Alarm	Communications Fault
Normal AC Power	**Off**	**Red**	**Red - Flashing**
Loss of normal AC power	**Off**	**Red**	**Red - Flashing**
Battery Charger Fail	**Off**	**Red**	**Red - Flashing**
Low Battery Capacity	**Off**	**Red**	**Red - Flashing**
Donor Antenna Disconnection	**Off**	**Red**	**Red - Flashing**
Active RF Emitting Device Malfunction	**Off**	**Red**	**Red - Flashing**
System Component Malfunction	**Off**	**Red**	**Red - Flashing**
Donor Antenna Malfunction	**Off**	**Red**	**Red - Flashing**

Figure 22. LED panel configuration

EMERGENCY POWER-OFF SWITCH (EPO)

Cel-Fi's QUATRA RED Emergency Power Off Switch (EPO) can instantaneously shut down the ERRCS from a single point to eliminate the risk of combustion caused by electricity or static. Designed to prevent inadvertent operation and can be installed in any location acceptable to the authority having jurisdiction.

Figure 23. Emergency Power-off Switch (EPO)

EPO unpacking and package content

- **Examine the box for damage before unpacking the unit.**
- **Perform a visual inspection to reveal any physical damage to the equipment.**
- **Check that all the items listed in the packing list are included.**

EPO ports layout

Figure 19 shows the RJ45 port to connect the Emergency Power-off Switch to the Monitor and Battery Backup Unit (MBBU).

Figure 24. Emergency Power-off Switch

EPO Mounting

The Emergency Power-off Switch (EPO) is designed to be wall-mounted. Mounting accessories, including screws and anchors, for common material types (drywall, plywood, concrete) are included in the standard kit.

The QUATRA RED EPO has two (2) secure mounting tabs, one on each top/bottom side.

Caution. Make sure the area behind any surface is free of electrical wires or other dangerous elements before drilling.

1. To mount the EPO, first determine the approximate location on the wall for the unit.
2. Hold the unit up on the wall and, using a pencil or similar marker, mark the mounting tabs points.
3. Using a drill, drill the location for the wall anchors.
4. Hammer in the wall anchors.
5. Place the EPO in the right location and screw on the mount.

EPO Grounding

1. Connect one side of the grounding cable to the grounding terminal on the equipment with a ¼" – 20 Bolt.
2. Connect the other end to the main grounding bar installed inside the fire room. The recommended cable gauge is AWG #10 or AWG #12 and color code green/yellow.

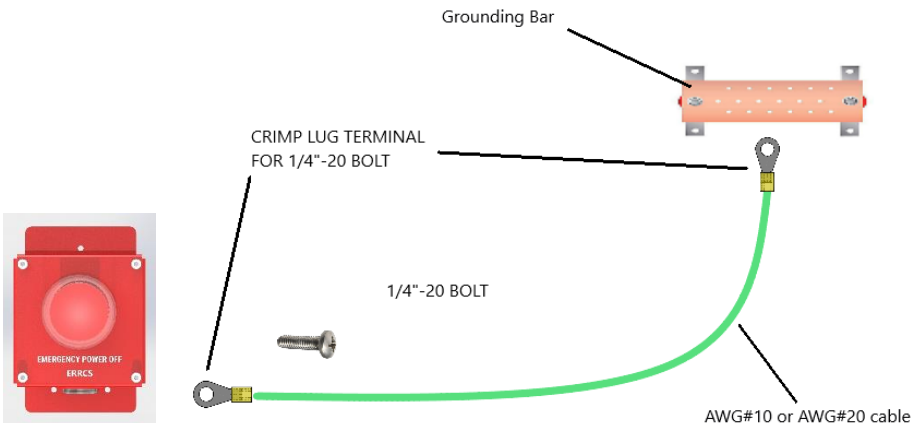


Figure 25. EPO Grounding

EPO Ethernet connection

On the bottom of the EPO is an RJ45 port to connect the device to the MBBU using a CAT5e cable with a waterproof RJ45 inline connector on both ends. Find assembly instructions on page 12 of this user manual.

EPO Operation

In the scenario of an emergency, it might be necessary to shut down all the radio communication systems.

1. **Locate the EPO and press the bottom to automatically turn-off all the QUATRA RED units, including the MBBU.**
2. **To turn the system back on, twist the EPO button clockwise, then follow the instructions on the WAVE PRO APP.**

QUATRA RED SYSTEM CONFIGURATION

Once you have all the QUATRA RED components installed and energized, the next step is to configure and commission the system. The general process to commission QUATRA RED is explained in the next figure

1. Request Access to the WAVE Portal
2. Register your equipment
3. Create a config file

1. Install the WAVE PRO App on your mobile phone
2. Download config file

1. Install Config File
2. Optimize system

Figure 26. QUATRA RED System Configuration Workflow

To get access to the portal, click on the link below and follow the instructions in the webpage

- **Request portal access: www.cel-fi.com/account-request**

The WAVE PRO app is available for Android and IOS devices. Scan the QRE codes below to download and install the app in your mobile phone

- **WAVE PRO App**

Google Play

App Store

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.

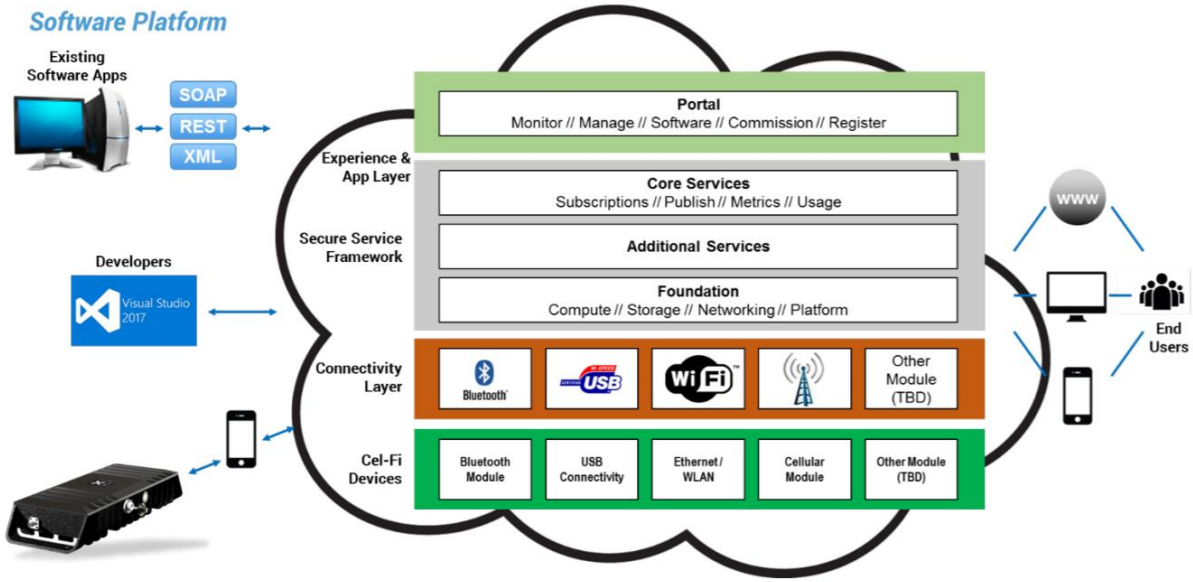
• Commissioning

• Alerts & Alarms

• Status & Email/Text Notifications

• Troubleshooting

WAVE Architecture



MBBU Internet Connection & WAVE Portal Account

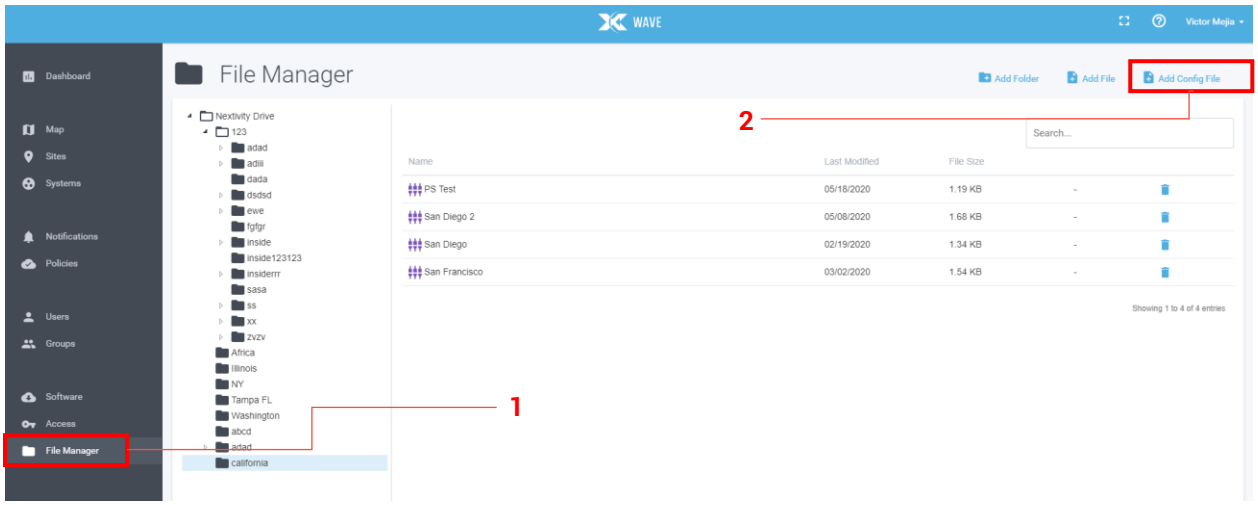
- **Monitor and Battery Backup requirements**
  - **Power**
  - **Internet Access via LAN port**
  - **Note MBBU Serial number located on the side of the unit**

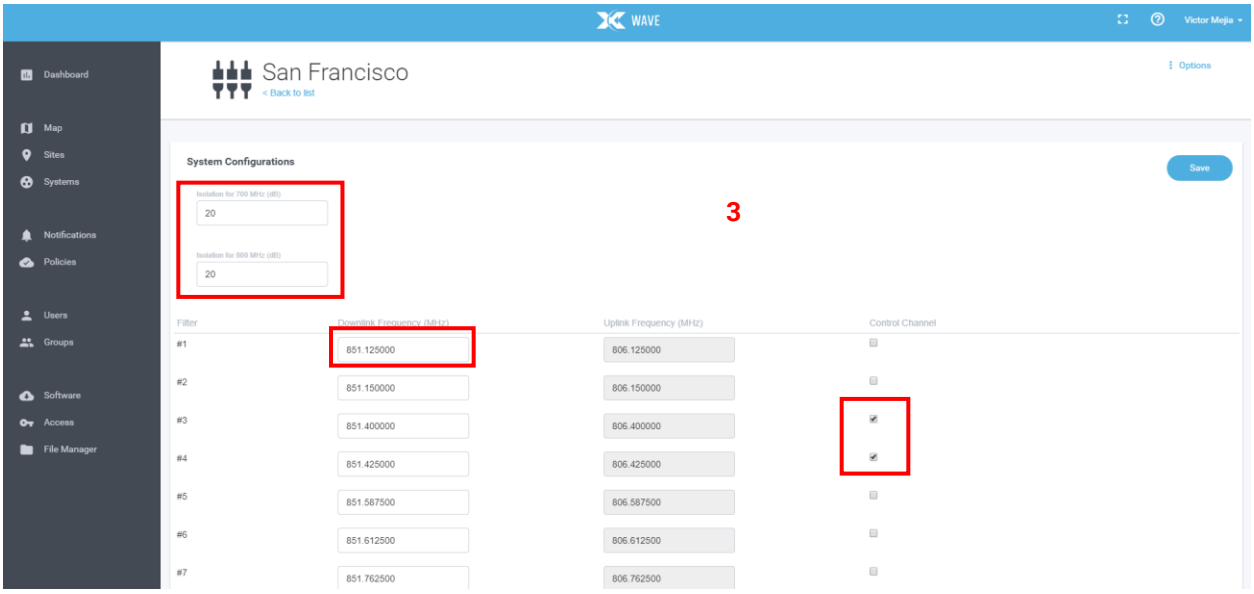
File Manager

From the file manager in the WAVE portal, you will have access to existing configuration files and will give you options to add folders, files, and creating new config files. A config file contains information such as operating frequencies and isolation values.

The following steps will guide you to the process of creating a config file:

1. Click on the "File Manager" button on the left side menu
2. Click on the "Add Config File" button, enter a name for the new config file, and click "Add" to save your file.
3. A new window will open for you to enter isolation values and frequencies according to the requirements in your area. Notice that only the "Downlink Frequency" box needs to be filled in and mark those channels serving as control channels. Click "Save" to





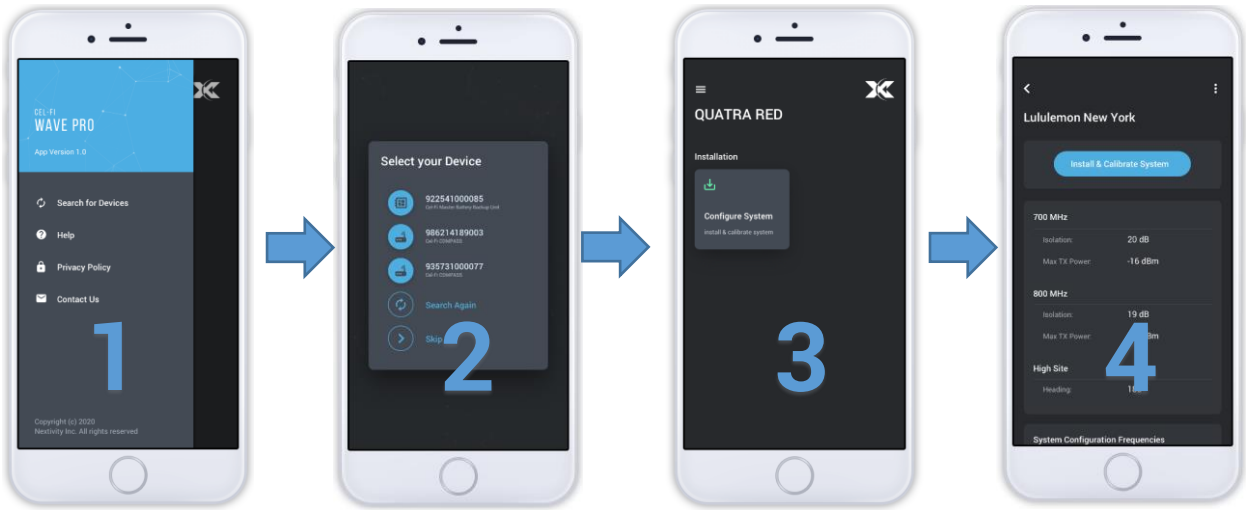
Once you have had created a config file, you can export it to the Monitor and Battery Back-up Unit (MBBU) to configure your system by using the WAVE PRO app

WAVE PRO APP

The Cel-Fi WAVE App is designed for end-users, installers, and channel partners to activate and manage the Cel-Fi product line. The app connects to the device via Bluetooth and is available on smartphones and tablets.

By following the next steps, you will be able to configure your QUATRA RED System:

1. Open the WAVE PRO app and search for Cel-Fi devices
2. Select the device labeled "Master Battery Backup Unit."
3. Click on "Configure System" to install the config file previously created in the WAVE Portal
4. Select the desired installation package from the list and click on "Install and Calibrate System."



You are allowed to make changes in the configuration file and update the system via the WAVE App

WAVE PRO and COMPASS

Introduction

COMPASS is Nextivity's site survey and installation tool. The UI for COMPASS is WAVE PRO (iOS and Android). It is a complete solution to allow integrators to install and optimize a QUATRA RED installation without the need for local Internet connectivity.

Note: COMPASS has a User Manual. Included here are only those items that relate specifically to the QUATRA RED.

COMPASS Features and Functions

Updating QUATRA RED Software

From time to time, the QUATRA RED firmware is updated for feature improvements and bug fixes. Updating QUATRA RED firmware can be accomplished in either of two ways:

1. **Connect the LAN port on the QUATRA RED NU to an active Ethernet LAN. The unit updates its firmware automatically, communicating with Nextivity's cloud.**
    a. **Make sure the NU's Internet connection can get through the firewall.**

2. **Update the COMPASS software by connecting it to an active Internet connection. Connect the COMPASS to the QUATRA NU and follow the instructions on the WAVE PRO app.**

Donor Antenna Setup

- **With the help of COMPASS, select a location on the roof with a dominant signal level at least 6dB higher than other signals.**
- **Install the donor antenna at the designated location and height.**
- **Verify that the antenna is pointing towards the donor site and it has a clear line-of-sight.**

Connecting Donor Source

The QUATRA RED system can accept up to two individual donor signals (LMR and FirstNet), each technology has a dedicated donor port. These ports cannot be reassigned or reconfigured. Each donor can be established to the system via off-air. A directional antenna is recommended to provide the best signal quality. (Nextivity offers many directional antennas that can be used. See www.cel-fi.com/products for details).

Isolation calculation and setting

QUATRA RED automatically calculates and sets isolation according to any value given. The default isolation value is 20 dB. To enter a new value for isolation:

1. **Click on the current isolation value**
2. **Type-in the new value**
3. **Click on calculate and set**

A message will appear on the screen once the system has been adjusted to the new value.

If you can't achieve enough isolation, you can try one of the options below:

1. **Increase the spatial separation between the donor and the closer server antenna.**
2. **Try a larger value for the coupler feeding the antenna causing the issue**
3. **Look for a donor antenna location with some physical obstructions such as walls or columns.**
4. **If you're using a wide-angle donor antenna, consider replacing it by a high-isolation antenna.**

Uplink output power configuration

In this section, you will learn how to set a value for the output transmit power to reach the high-site without blocking the receiver. Two pieces of information are required to determinate the most optimal value. Decimal coordinates from both the high-site and QUATRA RED and the desired signal level reaching the remote site (the default value is -95dBm).

1. **Open the WAVE PRO app and select "Uplink output power configuration."**
2. **Enter the coordinates of the remote site**
3. **Enter the coordinates of the building**
4. **Enter the desired value in dB to reach the high-site**
5. **Press the "Calibrate" button and wait until you see the message "System has been calibrated."**

Band configuration (FirstNet)

This section applies only to QUATRA RED units that support FirstNet bands (Model number F42-10C-78F and F42-10N-78F).

There are two ways to select the LTE/FirstNet band to be repeated; you can either relay on the system to choose the band with the best signal strength and quality or manually select the desired band to boost.

Selecting the band via the WAVE PRO app

1. **Open the WAVE PRO app and select "Network Settings."**
2. **Click on "Band configuration" and select "Auto" The system will automatically choose the band to be repeated.**
3. **Click on "accept" and continue with the commissioning process.**

Selecting the band manually

1. **Open the WAVE PRO app and select "Network Settings"**
2. **Click on "Band configuration" and select "Manual"**

Channel configuration (LMR)

Alarms configuration and test

LEDs

NU

CU

QRE

Antennas and QUATRA RED

Donor Antennas

The donor antenna is a crucial element when designing a public safety DAS. Typically this component is mounted on the roof of the building and is exposed to signal interference caused by reflections or direct signals hitting the antenna from every direction. To avoid excessive interference going into the repeater is vital to pick an antenna according to the RF environment.

In low dense populated areas or rural areas, a wide-angle panel antenna may be an okay option since the RF noise in those areas it's generally below the average. The Cel-Fi Wideband Directional Antenna (A32-V32-101) it's a perfect option in these scenarios.

On the other hand, a high-isolation donor antenna as the Cel-Fi LPDA Antenna (A62-V44-100) is highly recommended in urban areas with an RF polluted environment that will cause more noise.

Donor Signals

A minimum donor signal

Antenna Selection

Mounting

Grounding and Lightning Protection

Server Antennas

Antenna Selection

Mounting

Drop Ceiling

Hard Cap

CEL-FI™

www.cel-fi.com

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