

# **User' s Manual**

**Home Signal Booster Product**

**Link50**

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## 1. Introduction

Booster is a kind of repeater which can improve the mobile signal. The user's Manual describes how to install our repeater products and how to use the monitor software. Please do read this manual carefully before installing repeater products.

### 1.1. What's the repeater

We use mobile phone every day, but it might be not work in some areas because mobile signal from BTS(Base Transceiver Station) is shielded or too weak. Repeater is communication equipment that can be used to enhance wireless signal, it receives signal from BTS then enhances the signal and transfer to blind and weak areas, repeaters is often used in the following cases.

- Blind or weak signal areas are formed if the buildings are too far away from CELL TOWER, or the buildings themselves shield or absorb signals.
- There are too many complicated signals in the higher part of the buildings, therefore ping-pong switching effect has been formed and the signals fluctuate a lot, there are annoying noises during phone calls and call drops accordingly.
- Elevators and basements are well-known for blind areas.
- Downtown areas of the cities, which congested with many high-rise buildings, are usually the weak or blind areas.
- The remote villages, mountains, hills, valleys, etc. are mostly populated areas with quite few mobile users, so the main target is to send coverage to these areas, and it will not be worthy installing a CELLTOWER, therefore a booster is a quite good option.

### 1.2. Warning



- Do not open the repeater and touch the module or IC, the repeater may be damaged due to electrostatic.



- Do not touch the shell of repeater or be careful during working a long time, and do not cover repeater with anything, the repeater dissipate heat and may be too hot.



- The power supply voltage of repeater should meet the standards of security requirement.

## 2. Features of the products

### 2.1. Appearance of the Home Booster



### 2.2. Specification

3.

| ITEM                         |        | SPEC               |                    | Remark |
|------------------------------|--------|--------------------|--------------------|--------|
|                              |        | DOWNLINK           | UPLINK             |        |
| FREQ (MHz)                   | Band13 | 746~756            | 777~787            |        |
|                              | Band12 | 729~746            | 699~716            |        |
|                              | Band5  | 869~894            | 824~849            |        |
|                              | Band25 | 1930~1990          | 1850~1910          |        |
|                              | Band4  | 2110~2155          | 1710~1755          |        |
| Output Power (dBm)           |        | 18dBm±2.0          | 12dBm±2.0          |        |
| Automatic level control (dB) |        | ≥25                |                    |        |
| Gain (dB)                    |        | 58±2dB @746~757MHz | 53±2dB @776~787MHz |        |

|                                 |                   |                                     |                      |  |
|---------------------------------|-------------------|-------------------------------------|----------------------|--|
|                                 |                   | 58±2dB @728～746MHz                  | 53±2dB @698～716MHz   |  |
|                                 |                   | 62±2dB @869～894MHz                  | 55±2dB @824～849MHz   |  |
|                                 |                   | 68±2dB @1930～1990MHz                | 62±2dB @1850～1910MHz |  |
|                                 |                   | 68±2dB @2110～2155MHz                | 62±2dB @1710～1755MHz |  |
| Manual Gain Control（dB）         |                   | ≥25                                 |                      |  |
| Gain adjustment<br>error（dB）    | 0～20              | ≤ ±1.0                              |                      |  |
|                                 | >20               | ≤ ±2                                |                      |  |
| Gain Flatness（dB）               |                   | ≤±5.0                               |                      |  |
| Frequency stability（ppm）        |                   | ≤±0.01                              |                      |  |
| Group Delay（μs）                 |                   | ≤1.0                                |                      |  |
| VSWR                            |                   | ≤3.0                                |                      |  |
| Noise Figure (at max. gain)（dB） |                   | ≤13.0                               | ≤13.0                |  |
| Error Vector Magnitude (EVM)    |                   | LTE: ≤8%                            |                      |  |
| ACPR（dBc）<br>（5M LTE）           | ±5MHz             | ≤-35                                |                      |  |
|                                 | ±10MHz            | ≤-40                                |                      |  |
| Spurious<br>emissions           | 9kHz – 150kHz     | -36dBm Measurement Bandwidth 1KHz   |                      |  |
|                                 | 150kHz – 30MHz    | -36dBm Measurement Bandwidth 10KHz  |                      |  |
|                                 | 30MHz – 1GHz      | -36dBm Measurement Bandwidth 100KHz |                      |  |
|                                 | 1GHz – 12,75 GHz  | -30dBm Measurement Bandwidth 1MHz   |                      |  |
|                                 | 12,75GHz – 19 GHz | -30dBm Measurement Bandwidth 1MHz   |                      |  |
| RF Connector Type               |                   | SMA-type Female/50Ω                 |                      |  |
| Power supply                    |                   | AC 110V/220V ±20%, 50 ~ 60Hz        |                      |  |
| Dimensions                      |                   | 260x 210 x 50 MM                    |                      |  |
| Weight                          |                   | <2 KG                               |                      |  |

## 4. Installation of Home Booster

### 4.1. Installation proposal

- For indoor repeater, it is installed in a cool, dry and ventilated room as recommend

and the installation place should be easy for heat dissipation and maintainable.

- Generally the installation place should have AC power supply, and the requirement of AC is 90~264VAC / 50±5Hz.
- For enhancing mobile signal of the area, the output power of repeater is very important, output power = input power + Gain, and the output power cannot exceed the rated power because repeater have ALC function, so it is important to test the signal strength received from donor antenna by mobile phone.

For example:

input power = -55dBm

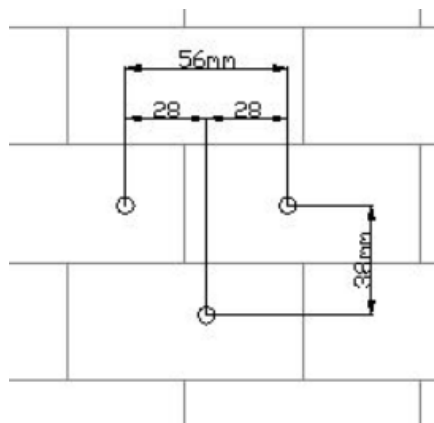
gain = 60dB

so output power = -55dBm + 60dB = 5dBm

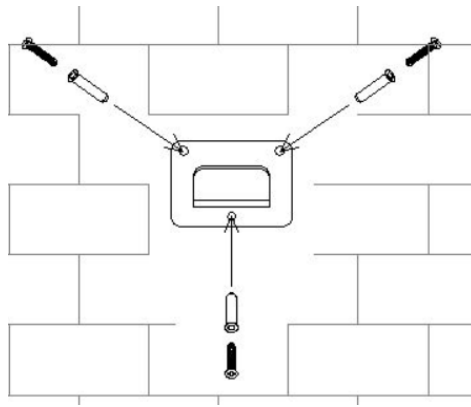
- For repeater of 60dB gain, the minimum horizontal distance between donor antenna and server antenna shall be more than 10meters, the direction of donor and server antennas shall be opposite, and it is recommend to increase the vertical distance between donor antenna and server antenna, if gain of repeater is large than 70dB and the distance between donor antenna and server antenna shall be more far away. You must make attention to the distance between donor antenna and server antenna, if the distance is too small, the repeater may be self-oscillation and may lead to more serious conditions.

## 4.2. Install on wall

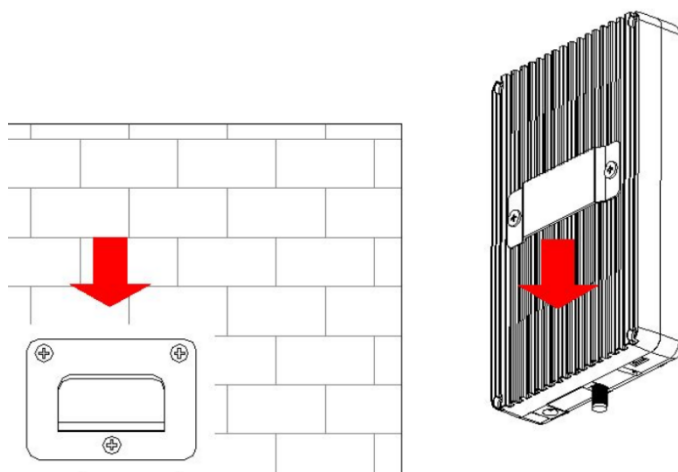
- 1) Drill fixing screw holes(Φ6\*35) on the wall using percussion drill.



- 2) Fix the bracket on the wall.

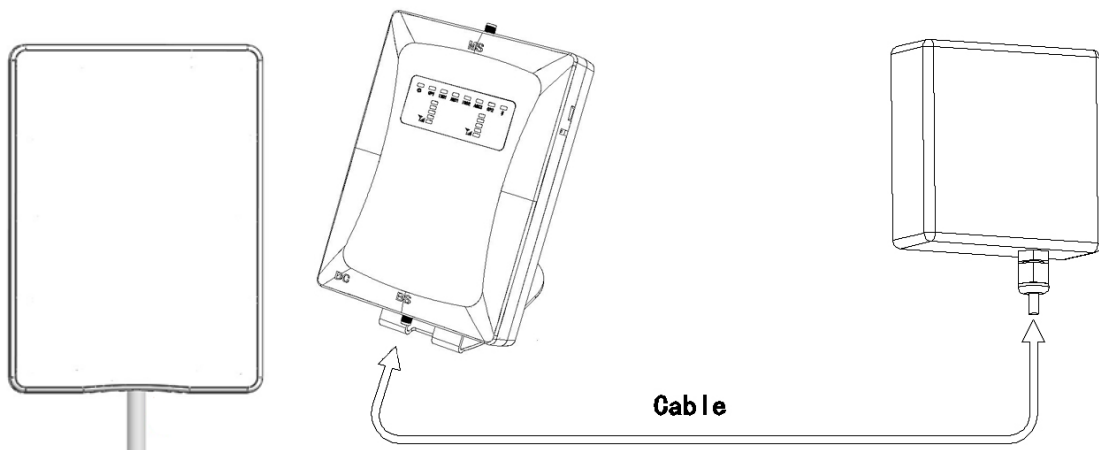


3) Install the equipment on the wall.



#### 4.3. Donor Antenna Installation

The Donor/Indoor Antenna can be installed using 3M glue or hanging on the wall, the antenna must be installed back to the Indoor Antenna , and we suggest to install antenna vertically like the below picture.



## 5. Software Connect and Setting

### 5.1. Bluetooth Connect



Step1: Open Bluetooth and connect HC-02 ,  
click logo to open the APP

下午4:46

user

.....

Login

Step2: Click to Login



Expired Date:2021-12-31

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Step3: Click on the red arrow



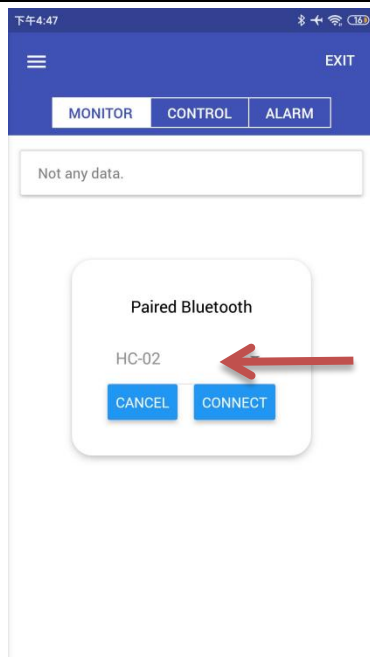
Connect By Bluetooth

Connect By OTG

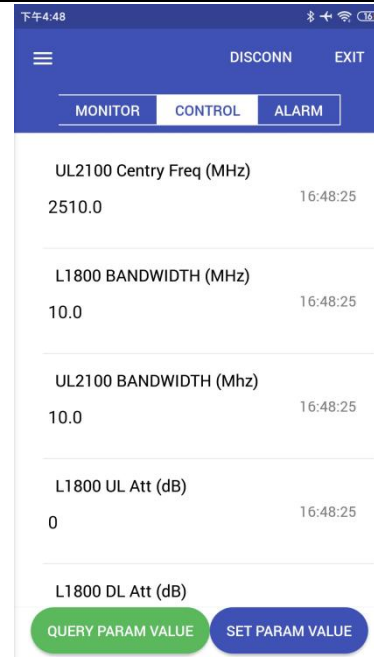
App Apply

About

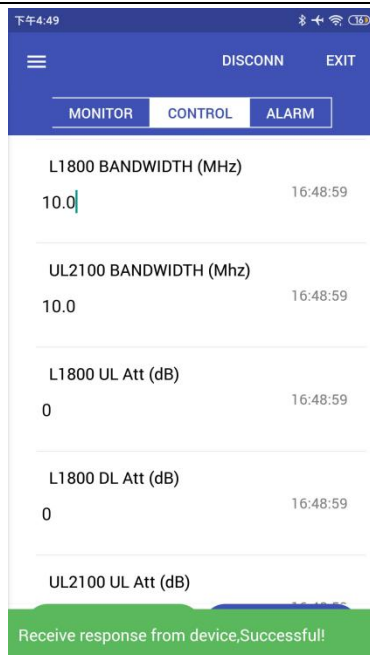
Step4: Connect By Bluetooth



Step5:Click on the blank, Select HC-02,  
Connect By Bluetooth

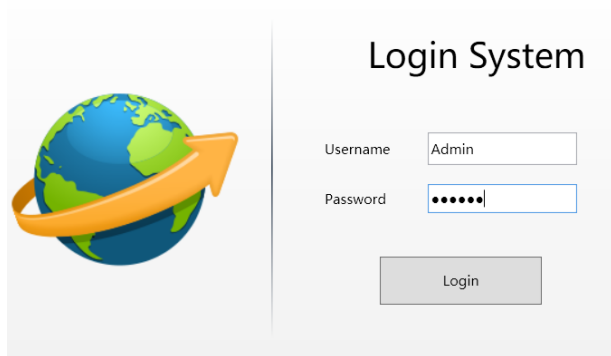


Step6:Query param value

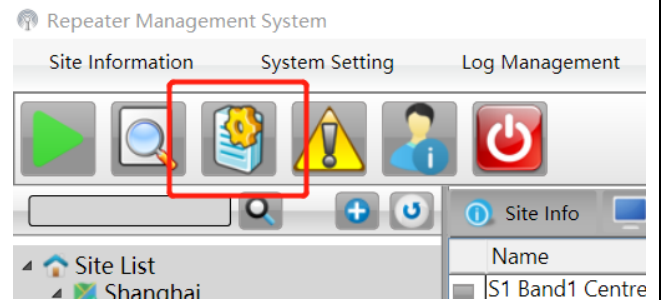


Step7:Query param successful

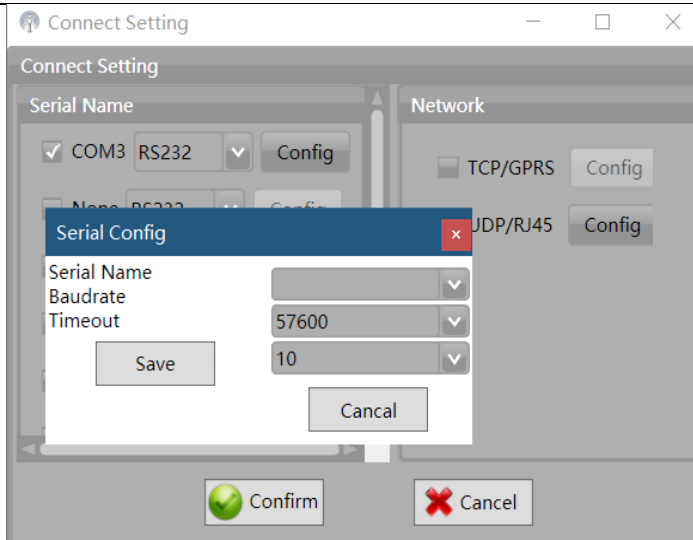
## 5.2.USB Connect



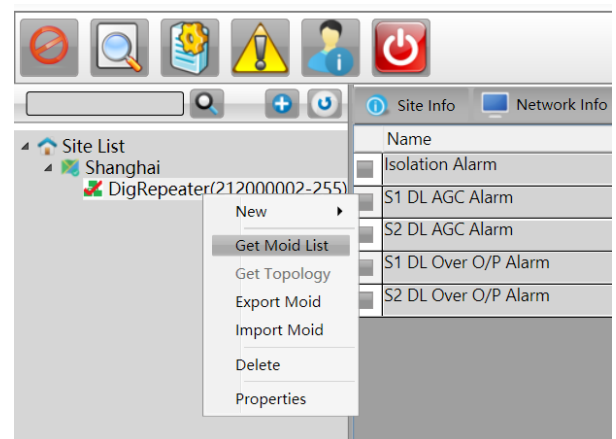
Step1 Logo system with password:123456



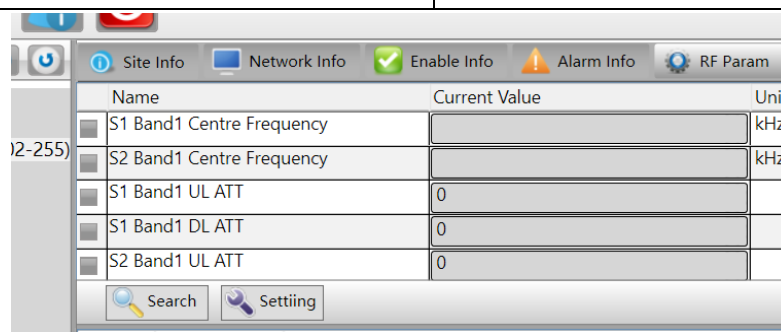
Step2 Click Connect Setting to config USB-COM



Setp3 config USB-COM



Setp4 Get Moid List



Setp5 Search and Setting Item

## 6. FCC STATEMENT

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/ TV technician for help.

### FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, Human proximity to the antenna shall not be less than 20cm(8 inches)during normal operation.

**935210 D02 Signal Boosters  
Certification v04r02 Installation and  
User Guide**

# Table of Contents

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# 01.Introduction to 935210 D02 Signal Boosters Certification v04r02

## Overview

This product is a multi band RF gain modulation module, Can automatically control gain and detect power, The MCU computes the voltage detected by the RF Detector, Control the AGC of each circuit, And can report link gain. Simultaneously, MCU communication interface enables transparent communication between WiFi or BLE; Control light board flashing indicator; Control the display of LCD;

## A Solution Anyone Can Confidently Deploy

Cel-Fi QUATRA is designed to improve indoor signal coverage without any risk of interference on the mobile network, Cel-Fi QUATRA provides a sophisticated network-safe solution that has been rigorously tested globally, through multiple generations, engineered to deliver multiple levels of network protection:

- Uplink power control to prevent desensitizing the network
- Echo-cancellation and feedback control to prevent oscillation of the system
- Uplink muting, when handsets (UE) are not detected
- Signal qualification (channels are individually qualified, so noise or very poor signals won't be amplified and degrade the network)

## 02.System Overview

### How Does It Work?

935210 D02 Signal Boosters Certification v04r02 is a radio frequency controlled amplification device that supports 5 frequencies. It receives external base station signals and uses indoor antennas to cover the indoor area. The device is equipped with WiFi and Bluetooth communication, and can be configured through mobile phones or mini USB. It has signal lights to visually observe the quality and intensity of the signal.

### Equipment available for frequency band selection

certified for the following bands: BAND4, BAND2, BAND13, BAND5, BAND12.

- Frequency1; Uplink: 1710MHz~1755MHz ; Downlink: 2110MHz~2155MHz
- Frequency2; Uplink: 1850MHz~1910MHz ; Downlink: 1930MHz~1990MHz
- Frequency3; Uplink: 729MHz~756MHz ; Downlink: 777MHz~787MHz
- Frequency4; Uplink: 824MHz~849MHz ; Downlink: 869MHz~894MHz
- Frequency5; Uplink: 698MHz~716MHz ;

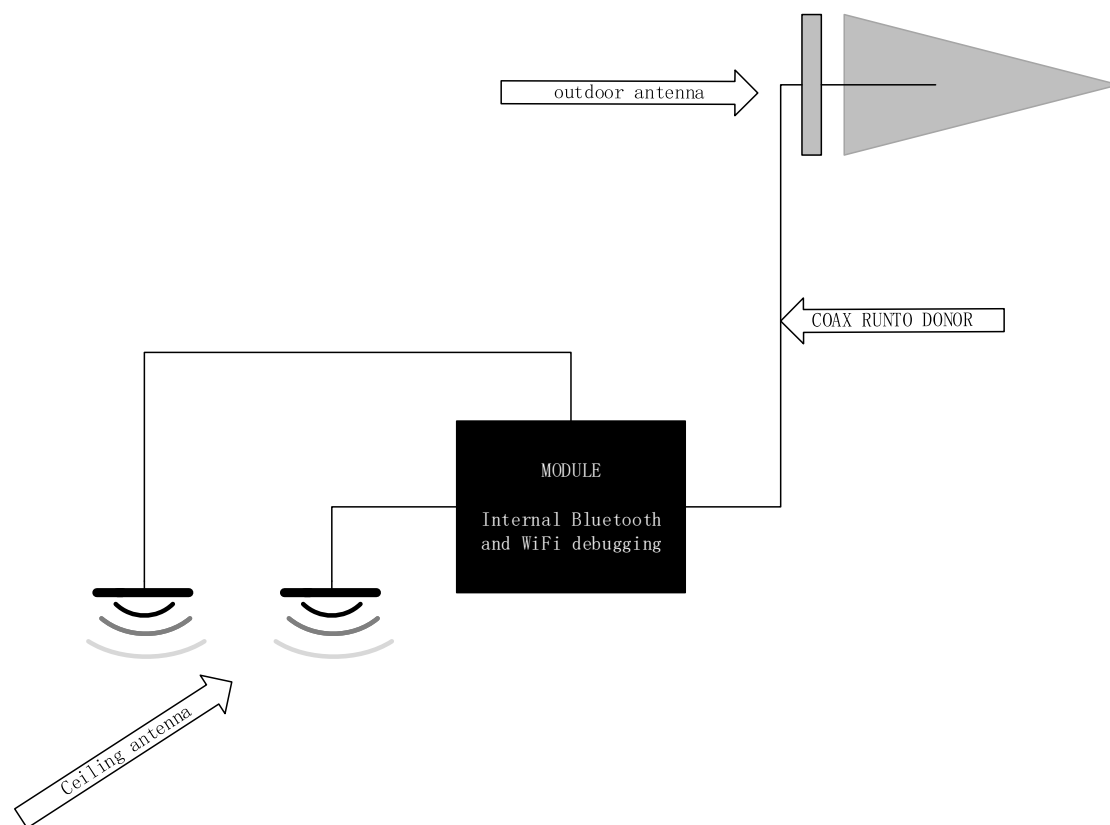
## Device Function Description

- Each frequency band has an RF detector that can read the gain of power. Through MCU processing, it can be fed back to the indicator light or display screen. It can also be directly read by connecting to Bluetooth through an app program.
- When the MCU reads the detection power, when the power is abnormal, it controls the CNC attenuator in the link to smooth out fluctuations and adjust the AGC function.

## Equipment power supply

- The device uses an adapter power supply, and the adapter inputs AC power of 100-240V, Frequency 50/60Hz, output voltage 5V, current limiting 4A.

## Architecture Overview



## Cel-Fi 935210 D02 Signal Boosters Certification v04r02 Key Features

- Carrier Grade.FCC-certified Smart Signal Booster
- Support for AT&T,Verizon,T-Mobile and CBRS
- Relays two (2) bands per operator, and one (1) CBRS channel
- Independent donor ports for each operator allows for independent antenna optimization

- Single combined (CU) server port enables driving either a serving antenna or passive DAS field
- 100 dB max system gain
- 140MHz total relay bandwidth
- 
- N-type RF connectors (donor and server)
- Internal modem for remote management (SIM slot access) industrial aluminum powder-coated housing
- Up to 100m cable distance between NU and CU (using Cat5e), or 150m using 22/23AWG CAT6/7
- OUATRA Range Extender (ORE) doubles CU cable length (up to 300m)
- 20-22 dBm uplink power per operator per band
- 16 dBm downlink power per cellular channel, and 20 dBm for CBRS

### 03. Hardware Components

#### Wall mounted installation

Install expansion screws at appropriate positions on the wall according to the installation holes of the chassis, hang the equipment, and lock it with screws.

#### Principles for selecting installation locations

- Installed in a location that is easy to supply power and arrange feeders, with feeder openings for easy feeder connection
- The installation location should avoid heat sources and humid environments, and the indoor environment should be well ventilated with a temperature of 0-40 °C.
- The distance between the back and side of the equipment and the wall or other equipment shall not be less than 80-100mm.

### 04. Installation specifications

- The installation position must ensure that there is no influence from strong electricity, strong magnetism, or corrosive equipment.
- The installation site should be dry, dust-free, and well ventilated.
- The installation position facilitates the wiring of feeder lines, power lines, and ground wires.
- Equipment installation must comply with engineering design requirements.
- If the equipment is wall mounted outdoors, moisture-proof measures must be taken, and

waterproof tape should be wrapped around the equipment interface.

- The installation location is convenient for engineering construction and operation maintenance.
- If there are special items around the equipment, such as microwaves, it is recommended to stay at least 2-3 meters away from such interference sources.

## 05. Antenna Kitting

The 935210 D02 Signal Boosters Certification v04r02 is designed to be used with the following antennas.

### Donor Antennas

#### 1. Cel-Fi Wideband Directional Antenna

Model Number: A32-V32-201



The Cel-Fi Wideband Directional Antenna is an outdoor vertically polarized highly directional antenna for Cellular Boosters: with 10 dB gain in the low bands and 11 dB gain in the high bands, The weather resistant housing is built with UV stabilized ABS plastic casing. Optimized for Cel-Fi products, the Cel-Fi Wideband Directional Antenna works great with the Cel-Fi WAVE Antenna positioning app. The unit includes standard brackets for mounting, and can also be used with the Cel-Fi Pole Mount.

- Outdoor/Indoor use
- Boosts Cell Signal by up to 11 dBi
- 5G-ready
- 700-2700 MHz Frequency
- Vertical Polarization
- Directional

### Server Antennas

## 1. Indoor Omni Dome Antenna

Model Number:A11-V43-121



The Indoor Omni Antenna receives and transmits signal in a 360° pattern and are compatible with the 698 -2700 MHz frequency ranges that include 3G and 4G signals, They come with an SMA Male Connector.

- Indoor use
- 5G ready
- 50 ohm
- 698-2700 MHz
- N\_Female connector
- Omni-directional

Note:-101 part number includes an N-type connector

## 2. (Low-Profile) LP SISO Indoor Omni Antenna

Model Number: A11-H43-201



Nextivity's Cel-Fi LP SISO Indoor Omni Antenna provides a 360-degree horizontal coverage pattern in an ultra-modern, low-profile, high performance industrial design.

- Indoor use
- 5G-ready
- 50 ohm
- 617-4000 MHz
- N-type connector (other options available)
- Ultra low-profile

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## **06. Advanced Information-Antennas and 935210 D02 Signal Boosters**

### **Certification v04r02**

#### **Donor Antennas**

##### **Antenna Kitting Section**

In order to comply with FCC/SED RF Exposure requirements:

1. The donor antenna must be installed to provide at least 65 cm separation from the human body at all times
2. The server antenna must be installed to provide at least 20 cm separation from the human body at all times

Antenna systems to be used with 935210 D02 Signal Boosters Certification v04r02 are limited per table below:

| Port      | Max System (Antenna & Cable) Gain                                                                                                        |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------|
| CU        | 0.01 dBi for WCDMA Band 5<br>1.16 dBi for LTE Band 4<br>1.44 dBi for LTE Band 12<br>1.16 dBi for LTE Band 13<br>0.14 dBi for LTE Band 25 |
| NU Port 1 | 8.32 dBi for WCDMA Band 5<br>6.63 dBi for LTE Band 4<br>8.08 dBi for LTE Band 12<br>6.52 dBi for LTE Band 25                             |
| NU Port 2 | 6.63 dBi for LTE Band 4<br>8.08 dBi for LTE Band 12<br>6.52 dBi for LTE Band 25                                                          |
| NU Port 3 | 6.63 dBi for LTE Band 4<br>7.99 dBi for LTE Band 13<br>6.52 dBi for LTE Band 25                                                          |

## Donor Signals

A good donor signal, arriving as cleanly as possible, to the NU, is perhaps the most important consideration in driving the best experiences and outcomes with 935210 D02 Signal Boosters Certification v04r02.

With regard to 4G or 5G, there are two metrics of particular importance to monitor and optimize:

1. RSRP. Reference Signal Receive Power. It is the power of the LTE Reference Signals spread over the fullbandwidth and narrowband. A minimum of -20 dB SINR (of the S-Synch channel) is needed to detect RSRP/RSRO.

In the context of Cel-Fi 935210 D02 Signal Boosters Certification v04r02, the following stratification of quality is recognized:

| RSRP                 | Signal Strength |
|----------------------|-----------------|
| > -90 dBm            | Excellent       |
| -90 dBm to -105 dBm  | Good            |
| -106 dBm to -120 dBm | Fair            |
| < -120 dBm           | Poor            |

1. SINR. Signal to Noise Ratio. The SINR is the ratio of the usable (desired) signal over the noise. The following metrics should be used when assessing SINR in the context of Cel-Fi 935210 D02 Signal Boosters Certification v04r022.

| SINR Value | Throughput |
|------------|------------|
| > 10       | Excellent  |
| 6 to 10    | Good       |
| 0 to 5     | Fair       |
| < 0        | Poor       |

## Antenna Selection

There are a few considerations to make when determining the donor antenna.

1. How many serving sites? If there are multiple serving sites, and the design goal is to select a specific site, for loading, or any other reason, then directional antenna would be required. If there is a single donor site, and not much RF contention, then an omni-directional antenna could be considered, which would save a little time and energy in the install process, as it would not need to be aimed.
2. How much noise? If the site location is very noisy, then a strong directional antenna would be a good choice, as it will filter out some of the unwanted noise and improve SINR.
3. How strong is the serving signal? Although Cel-Fi 935210 D02 Signal Boosters Certification v04r02 has the highest gain of any system in its class, if the serving signal is extremely weak, then a high-gain antenna may be required to connect the uplink calls and to get the optimal DL power on the serving side.

## Grounding and Lightning Protection

Installers of Cel-Fi 935210 D02 Signal Boosters Certification v04r02 are encouraged to follow the lightning protection guidelines documented in the National Electrical Code (NEC) and NFPA 780,

and/or local codes.

## Server Antennas

The 935210 D02 Signal Boosters Certification v04r02 Coverage Unit has a single RF output port in the form of an N-type female connector on the top of the unit. A single whip or blade-style antenna can be attached directly, or a distributed antenna system can be deployed.

## Antenna Selection

There are two types of indoor antenna to choose from:

**Omni-directional** dome antennas broadcast and receive signals from all sides. They are designed for central locations with 360° coverage requirement. Like outdoor antennas, their power is measured by their “gain”. They are typically mounted to a ceiling for best results.

Nextivity has standard dome antennas and also offers “low-profile” server antennas that are thin and occupy less visual space.

**Panel** antennas are directional antennas. Panel antennas allow optimum reception to targeted areas. Like with outdoor antennas, a directional antenna is stronger than an omnidirectional antenna which means the signals it broadcasts are stronger in a particular direction. It can be mounted to either the wall or ceiling. We usually recommend placing it on the ceiling for maximum coverage but in some spaces (like a long narrow hallway) the panel antenna can be placed on a wall.

Nextivity has a few different panel antenna options, with different levels of gain and directivity.