

# CEL-FI™ GO X

1 Antenna Kit

with support by WAVEFORM

## BEFORE YOU START:

### 1 Text **GO X** to (949) 449-2290

We'll respond with a link to the **Cel-Fi Wave app** for iOS and **Android**, and **connect you to a dedicated Waveform Signal Specialist** who can help if you have any issues.

### 2 Read this manual

We know, reading manuals isn't fun. But we promise it's worth it.

We've helped hundreds of customers install the Cel-Fi GO X and boost their signal. We've compiled everything we've learned in this manual. Give it a read before you start!

**Please note: Your Cel-Fi GO X comes pre-programmed to boost Verizon signal.**

You will need to change the carrier using the Wave app if you are using a different provider.

## About Waveform

The GO X is manufactured by Cel-Fi, but supported by Waveform and our team of Signal Specialists.

We've helped over 20,000 customers boost their signal since our company was founded in 2007. We've installed and configured thousands of devices in buildings across the country, and **we're here to help**. If you have any issues at all, please don't hesitate to reach out.



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# What's In The Box

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Cel-Fi GO X Amplifier



Outdoor Antenna & Pole Mount Hardware



Universal Antenna Mount



2x 30 ft RS400 Cables

## 2 Indoor Antennas (but this is a 1 Antenna Kit)

**This bit is a little confusing:** We include *both* a dome and a panel antenna with the 1 Antenna Kit you purchased. This is so you can use whichever type of antenna works best in your space. **Once you're done with your install, you'll have an extra antenna you can discard.**

If you'd like to use both antennas, or you want to add an additional antenna to your install later, you can purchase a splitter and the additional cables you'll need. Just send us a text message and we'll be happy to get you set up.



Dome Antenna



Panel Antenna

## Other Parts



2x SMA to N-Type Pigtails



AC Power Supply



Lightning Surge Protector



5 ft RS200 Jumper Cable



10 AWG Grounding Cable

# Install manuals, who needs 'em?

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**Signal boosters can be finicky to set up.** The Cel-Fi GO X is no exception. It will take a bit of work to get your GO X unit installed optimally.

But there's a reason that most people are willing to take the time to perform an installation, even if it takes 4 to 5 hours. The GO X is the only device on the market that provides an industry-leading 100 dB of gain. Once you get it set up and running properly, you should see a **significant** improvement in signal, right away.

We've written this guide based on our own experiences and those of hundreds of customers who we've helped. **We promise you'll be glad if you read this manual through thoroughly before you get started.** It'll help you save time, avoid the most common pitfalls, and ensure your system works as well as possible.

## Stuck? Have Questions? Text us!

We're a small team of four, but we *really* care about helping you get the best results.

We're happy to discuss any issues you're having or walk you through any of the steps in this manual. Helping people improve their signal is what gets us out of bed in the mornings.

Even if everything goes smoothly, reach out and let us know how your system is performing. We particularly appreciate feedback: let us know if there's any way we could have made the install process or this manual better.

Text us at (949) 449-2290. We're generally available from 9am-5pm PT, Monday to Friday.







## b. Signal Quality (SINR)

Signal quality is probably **the most important measure of your cell signal**. In 4G LTE networks, signal quality is called “SINR,” which stands for “Signal to Interference Plus Noise Ratio.”

In general, the better the signal quality, the faster your download speeds will be. Improving this measure can have a big impact on your system’s performance.

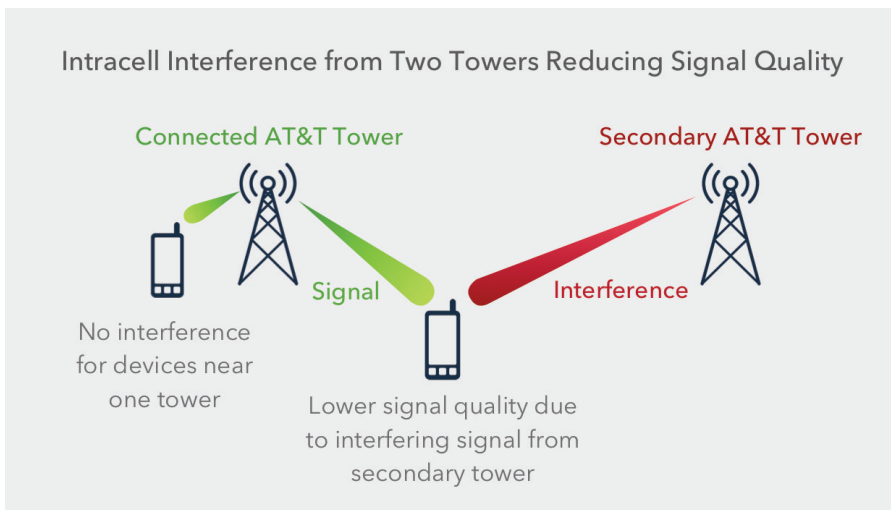
Why does signal quality drop? It's actually because **cell towers interfere with each other**.

Every cell tower transmits signal on the same set of bands.

If you’re located between multiple cell towers, your phone has a hard time clearly “hearing” the cell signal from the tower you’re connected to. This is called “**intracell interference**.”

A signal booster like the GO X won’t increase your signal quality directly. However, by shielding and aiming the directional outdoor antenna that’s included in your kit you can find higher quality signal, and the GO X will amplify that signal and rebroadcast it indoors.

We’ll explain exactly how to position and aim your outdoor antenna later in this manual.

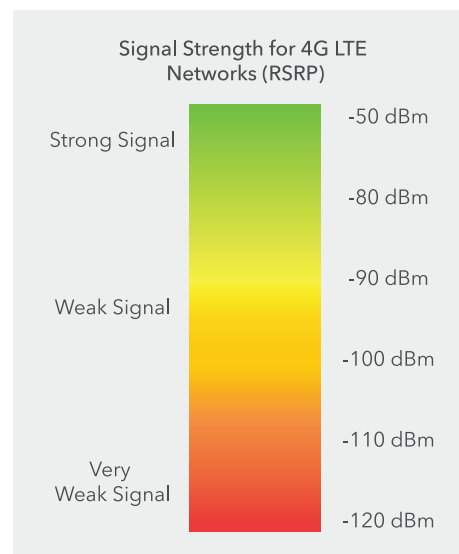


## c. Signal Strength (RSRP)

The main measure of signal strength for LTE networks is called “RSRP.” Signal strength is measured in dBm and is always a negative number.

Signal boosters like the GO X amplify your signal so you have higher signal strength. The GO X has 100 decibels of gain (a measure of amplification). That means that it’ll cover **a larger area with stronger signal than most boosters**.

Stronger signal can help you get better data rates and a more reliable connection. But signal quality is critical as well.

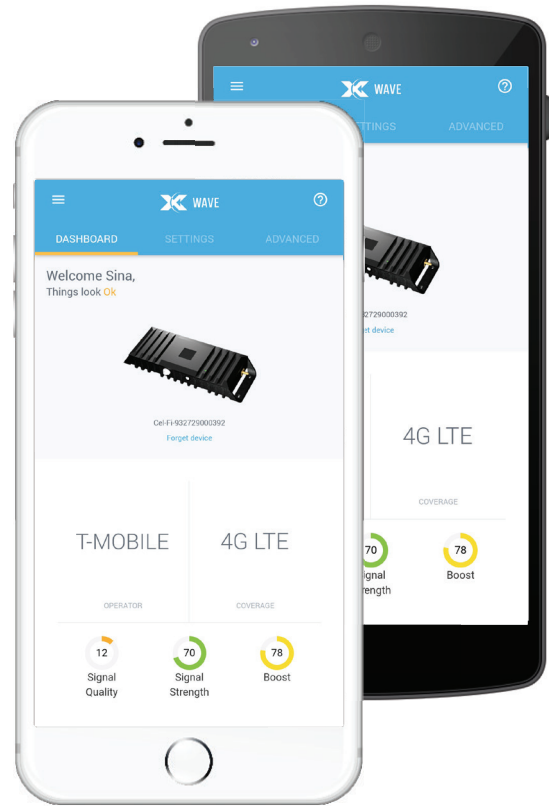




# 03 Wave App and Carrier Selection

First, download the Wave app and make sure the GO X is set up to boost your carrier:

- 1** Download the Wave app by texting "GO X" to (949) 449-2290.
- 2** Open the app while keeping your phone within 4 feet of the GO X to start pairing. This may take a few minutes. The app will say "searching," "syncing data," and finally "gathering data."
- 3** Your GO X is preprogrammed to boost Verizon. If you're with a different carrier, go to "Settings" and then the "Operator" section and change it. Changing carriers takes a few minutes - don't turn off your booster or move your phone away during the process.



**Note for AT&T customers:** if there is 4G LTE signal outdoors, choose "AT&T LTE Preferred" instead of the other AT&T options available. This will ensure that the GO X boosts as many LTE bands as possible, instead of also boosting 3G.

## Troubleshooting Wave App Pairing:

- Note: only **one** device (your phone or tablet) can connect to the Cel-Fi GO X via Bluetooth at a time. But don't worry - every device in the building will see better cellular signal after you're done installing.
- If the Wave app is unable to connect to your device, first try force-closing the app.
  - In Android, this is done by going to your phone's Settings, choosing the "Apps" option, finding the Wave app, and then choosing the "Force Stop" option.
  - For iOS, you can read here about how to force-close apps: [waveform.com/fcios](http://waveform.com/fcios)
- If force-closing the app doesn't help, restart your phone and power cycle the GO X by unplugging the power adapter.



# 05

## Positioning & Aiming the Outdoor Antenna

Finding the best location for the outdoor antenna is the **most important part of the install.**

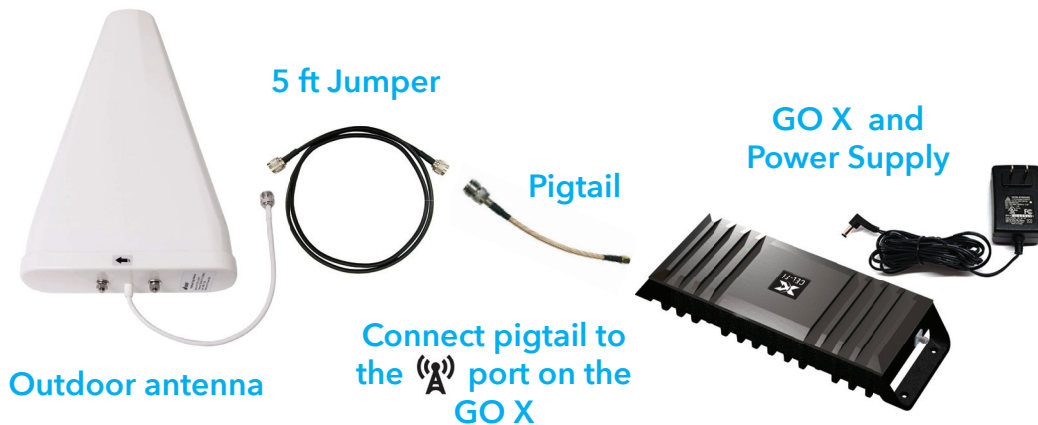
### The Goal

Your aim is to find the best **location** and **direction** for the outdoor antenna that maximizes signal strength and in particular, signal quality, for the frequency bands available in your area.

### Set up the GO X as a Signal Meter

If you have a long power extension cable, we recommend taking the GO X outside with you and using the 5 ft cable included in the kit to set up the GO X as “signal meter.”

Here are all the parts you’ll be using:



**Don't have a long power extension cable?** Keep the GO X indoors near a power socket, and use the 30 ft coax cable included in the kit to take the outdoor antenna outside. Everything will be the same as the diagram above, except you'll use the 30 ft coax cable instead of the 5 ft jumper.

Finding the best outdoor antenna location without a power extension cable is a little bit harder. You won't easily be able to stay connected to the GO X via Bluetooth as you try different locations. You may need a second person standing near the booster, watching the Wave app to help you as you take signal readings.

## Using the Antenna Position Test

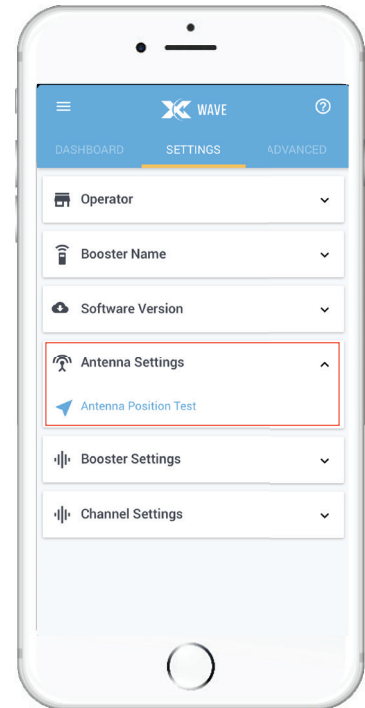
The Wave app has a special “Antenna Position Test” that you can find under the “Settings” tab in the “Antenna Settings” dropdown.

With each location and direction you try, you can “Capture” results. Tests take about a minute each.

Ideally, we want to find a location with a score of **115 or higher**.

If you have very weak or low-quality signal outdoors, then it may be hard to get over 100 or even 90. It’s okay if that’s the case, just find the best score you can.

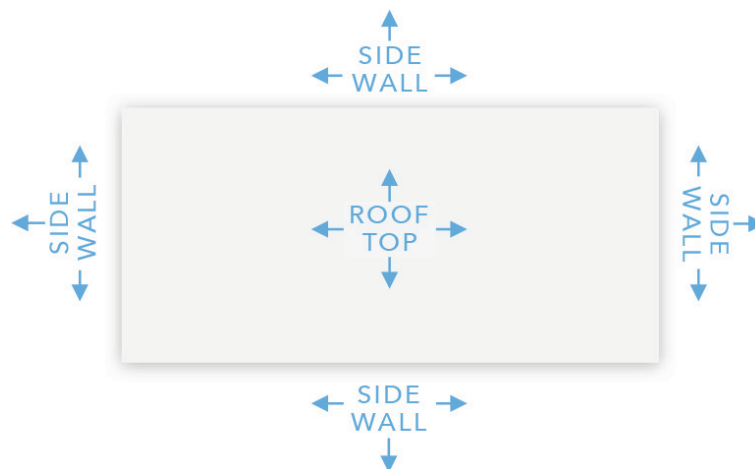
Alternatively, you might find that the first location you try is over 115. That’s great! It’s still worth trying more locations to optimize for the very best signal.



## How to Position & Aim

Finding the right outdoor antenna location and direction takes some patience, but it’s absolutely worth it. Spending time to get it right will have a big impact on your system’s performance.

Here are all the locations and directions we recommend testing your outdoor antenna:

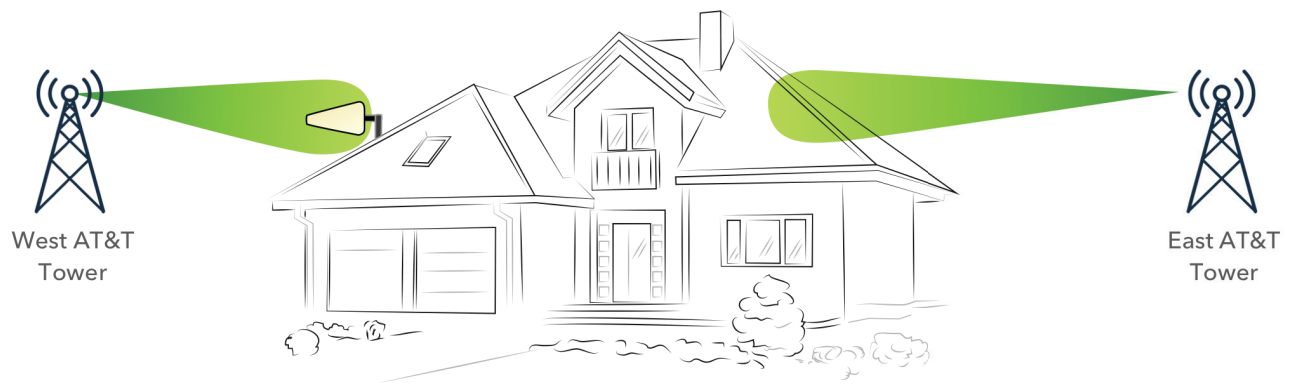


How come we don’t recommend just using the highest point on the roof? It’s simple: while signal strength is generally higher on the roof, signal quality is often better on the side of the building.

In Section 2 of the manual (go back and read it if you haven't!) we explained that low signal quality happens because of "intra-cell interference."

The best way to improve signal quality is to "shield" the outdoor antenna from any other towers in the area, by putting it on the side of the building.

When the signal quality outdoors is low, the goal is to shield the outdoor antenna to reduce the signal from other nearby towers:



For some people, the top of their roof (where signal is the strongest) provides the best signal. For others, it's the side of the house. The only way to find which is best is to test.

## 06 Set up a Temporary Install

Once you've found the best outdoor antenna location according to the Antenna Position Test, it's time to temporarily secure the outdoor antenna and set up a "temporary install."

The following 4 pages explain **choosing the right indoor antennas, antenna separation, and how to assemble your GO X**. Read them before you start.

We recommend securing the outdoor antenna temporarily, and running coax indoors through a window or a door without drilling any holes. Once you've done that, you can test your coverage and data rates. If everything is looking good, you can drill holes, install your antennas, and switch to a permanent install.

If you're having signal issues with your temporary setup, or aren't happy with the performance, simply send us a text at 949-449-2290. We'll be happy to help assist - we can often suggest an easy solution to the most common problems.

# 07 Indoor Antennas: Types & Placement

Before choosing a location for your indoor antenna, you'll need to determine which antenna type is the right fit. We include both panel and dome antennas - you can choose which to use and discard the other.

## Panel Antenna

A panel antenna has a narrower "spray" (technically called a "beamwidth"). This means that it directs signal in one direction, and *not* in a circle, like a dome antenna. Panel antennas should be installed on a wall near the perimeter of the coverage area for best results. For example, you might use a panel at the end of the hallway or at one end of your house.



## Dome Antenna

Dome antennas should be installed in the ceiling, centrally to the area you are looking to cover. Some (but less) signal will also radiate upwards to cover the floor above. You'll need to have access to an attic or crawl space to run the cable.



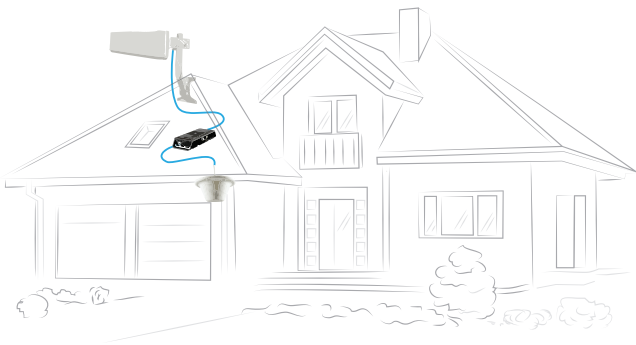
# 08

## Indoor Antennas: Separation

Antenna separation is critical to installing your indoor antenna(s).

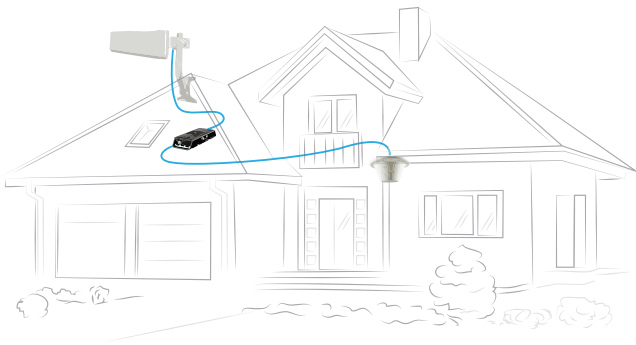
If you don't have enough separation, the Cel-Fi GO X will throttle its gain (amplification) to avoid "oscillation." Oscillation is a type of feedback that occurs if the gain of the system is higher than the "RF separation" between the indoor and outdoor antennas.

You can improve your separation by moving your indoor antenna within the building. Keep your outdoor antenna in the location you've identified with the best signal.



### Example of Poor Separation

- ✗ Not enough vertical and/or horizontal separation between outdoor and indoor antenna.
- ✗ Not enough building materials between indoor and outdoor antenna.



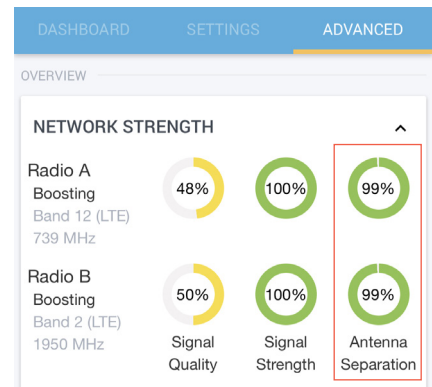
### Example of Good Separation

- ✓ Plenty of vertical and/or horizontal separation.
- ✓ Outdoor antenna pointing away from indoor antenna.
- ✓ Multiple layers of building materials between antennas.

### How to Tell If You Have Enough Separation

The Wave app shows a percentage score for separation on both the Dashboard and Advanced tabs.

Ideally, we want a score of 80% or higher for each "boosting" band, but in small buildings that might not be possible - just do the best you can.



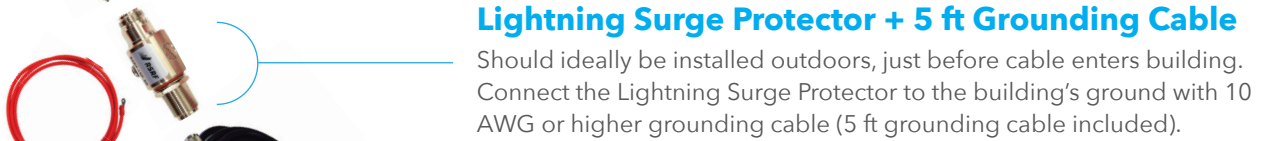




**Antenna Mount & Outdoor Directional Antenna**

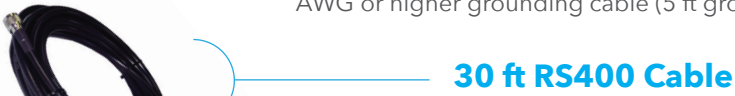


**5 ft RS200 Cable**



**Lightning Surge Protector + 5 ft Grounding Cable**

Should ideally be installed outdoors, just before cable enters building. Connect the Lightning Surge Protector to the building's ground with 10 AWG or higher grounding cable (5 ft grounding cable included).



**30 ft RS400 Cable**



**SMA to N-type Pigtail Adapter**



**Cel-Fi GO X**

**AC Power Adapter**

**SMA to N-type Pigtail Adapter**

**Dome or Panel Antenna**

Choose which antenna type works best for you and discard the other.



**30 ft RS400 Cable**



# 11

## Optional: Test Band Combinations

In many areas, the GO X will only find a single band to boost. You can see this under the Advanced tab: one of the GO X's radios will say *Boosting* and the other will remain *Scanning*. If that's the case, there's only a single band available for the GO X to amplify.

However, in some areas, your GO X may find two bands. If that's the case, you may be able to optimize your data rates by manually testing different bands.

Here are the steps we recommend following:

### 1. Discover all available bands

There may actually be more than 2 bands available outdoors. The GO X will attempt to boost the best two available, but sometimes data rates may be better on other bands. If you manually disable the first two bands that the GO X has selected, you can force the GO X to scan and show you what other bands are available.

### 2. Test each band individually, then together

When your phone detects multiple bands, it will attempt to "carrier aggregate" and connect on multiple bands simultaneously. Unfortunately, carrier aggregation isn't perfect - sometimes it works well, but in other cases, it can actually decrease your data rates.

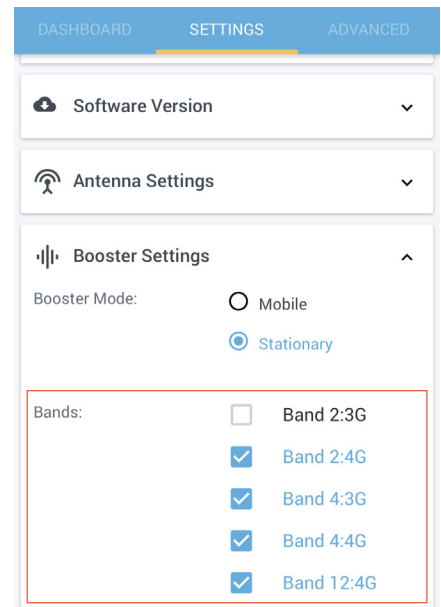
To get the absolutely best data rates, you can try running speed tests with the GO X amplifying each band individually, and then testing different combinations of bands.

## How to disable and enable bands

You can disable and enable bands under the "Booster Settings" dropdown in the settings tab of the Wave app.

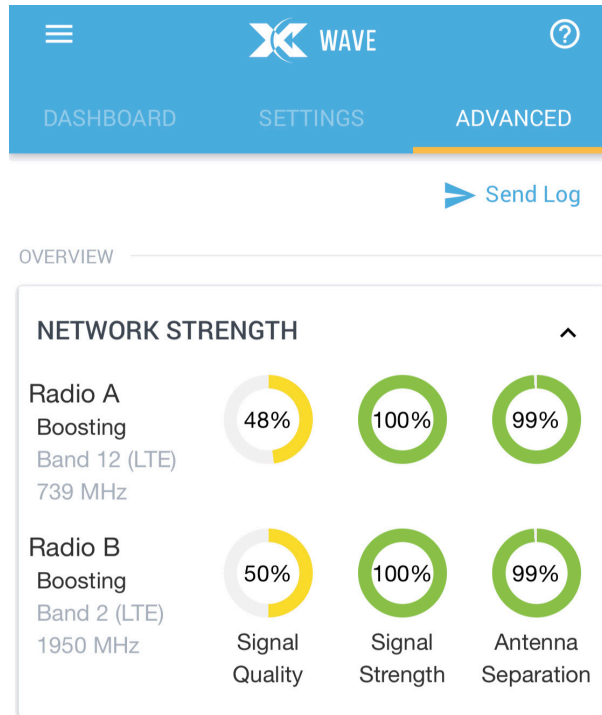
Each time you enable or disable a band, **the GO X will rescan to find signal**. It can take a minute or two until the GO X finds and starts boosting signal again.

After the GO X starts amplifying a new band, **toggle on airplane mode on your phone for a few moments, then turn it off again**. This will force your phone to connect to the newly boosted band before you run a speed test.



# 12 The "Advanced" Tab

One of the best features of the GO X is that it actively listens and decodes the cellular signals before amplifying. You can find out more about the system's status at any given moment in the "Advanced" tab.



The most important information is summarized at the top of the screen, under the "Overview" section. The information here is divided into two "radios" - the GO X's two radios are what allow it to amplify up to two bands simultaneously.

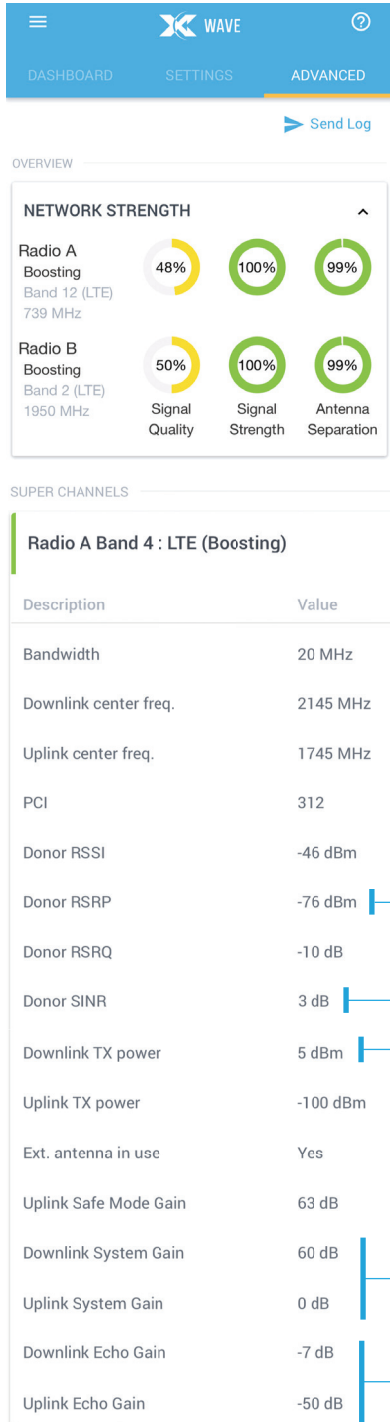
For each radio, the advanced tab tells you if it is "scanning," or if it has found a signal and started "boosting." When the radio is scanning, you'll notice that the frequency changes often. Once it's boosting, the frequency will no longer change.

Once the GO X is boosting on one of the radios, the Wave app will show a percentage for signal quality, signal strength, and antenna separation. Signal quality and signal strength are determined by your outdoor antenna's location and direction. Antenna separation is determined by the separation between the indoor antennas from to the outdoor antenna.

**The goal during the install is to get the highest numbers possible for each of percentages. But sometimes, despite your best efforts, these numbers may remain low. That's okay - they're just a guide to help you during the install.**

The GO X also gives a lot more diagnostic information under the "Super Channels" dropdowns for each boosted band.

You typically won't need to use this information in most cases, but we've documented some of the most important numbers below.



The "Send Log" button allows you send a diagnostic log from your device if our support team needs one.

### "Super Channel" Diagnostics Information

This section lists diagnostic information on the two bands being amplified. Select a Radio to expand the details (as shown).

The "Donor RSRP" value shows the signal strength being received from the outdoor antenna.

The "Donor SINR" is a measure of signal quality. Ideally, you want a number higher than 3 dB here. The higher the SINR, the more bars, and the better your data rates.

The "Downlink TX Power" shows the strength of the signal being rebroadcast. The higher this number, the greater the coverage area. Ideally you want 0 dBm or higher.

The Uplink and Downlink System Gain show the current uplink and downlink amplification of the system. Uplink may sometimes show 0 dB when phones aren't in use. That's normal.

The "Echo Gain" reflect how much separation you have between the outdoor antenna and the and indoor antennas. If either number is at or near 10 dB, you'd benefit from more separation.







# WAVEFORM

## Need help? We're ready and waiting.

Signal boosters aren't always easy to install. In fact, getting everything up and running can sometimes be a pain. But the end result is worth it.

One of the benefits of buying from Waveform is our **lifetime technical support** on every system we sell. We've installed hundreds of these devices ourselves, and can walk you through troubleshooting and fine-tuning your installation for best results.

Simply send us a text at (949) 449-2290. It's our dedicated hotline for the Cel-Fi GO X products. We're generally available from 9 am to 5 pm PT, Monday to Friday.

We **love** helping solve tricky install problems.



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