CEL-FI™ GO X MIMO

from WAVEFORM

PLEASE READ THIS FIRST:

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: it'll save you time and help you get the best performance out of your GO X MIMO Kit.

The GO X is set-up via the Cel-Fi Wave App, ***please skip the installation instructions provided within the app and follow this manual instead***.

Please note: Your two Cel-Fi GO Xs will come pre-programmed to boost Verizon signal.
You will need to change the carrier on both units using the Wave app if you are using a different provider.

About Waveform

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

We've helped over 50,000 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.

3411 W. Lake Center Dr.,
Santa Ana, CA 92704

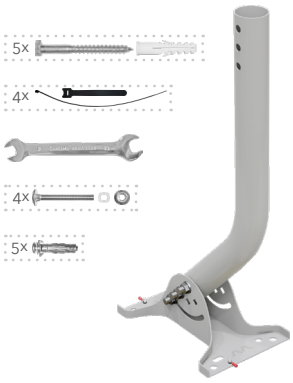
+1 (800) 761-3041

www.waveform.com
help@waveform.com

What's In The Box

2x Cel-Fi GO X Amplifiers and AC Power Supplies

Outdoor MIMO Panel Antenna



UltraPole (Base Kit) w/ Mounting Hardware

30 ft Twin-RS240 Cable

Indoor Antennas, Cables, and Splitters (Depends on Kit Selections)

Depending on which kit you purchased, your GO X kit will contain either 1x, 2x, 3x, or 4x **MIMO Dome** *or* **MIMO Panel indoor antennas.**

You'll also have **two 30 ft RS400 coax cables for each MIMO Dome** *or* **MIMO Panel indoor antenna**. If you picked a kit with multiple MIMO indoor antennas, you'll also get two 1 ft jumper cables and two signal splitters.

Indoor MIMO Dome or Panel Antenna(s)

2x, 4x, 6x, or 8x 30 ft RS400 Cables

Only included in kits with 2x, 3x, or 4x Indoor Antennas:

2x 2-Way, 3-Way, or 4-Way Signal Splitter

2x 1 ft RS200 Jumper

Other Parts

2x SMA to N-Type Pigtails
Blue bag

2x Lightning Surge Protector

2x 5 ft RS240 Jumper Cables
Clear bag

2x 10 AWG Grounding Cables

Install manuals, who needs 'em?

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 MIMO setup 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. This is the only MIMO signal booster kit on the market, and the GO X is the only amplifier that provides an industry-leading 100 dB of gain. Once you get 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.**

Who We Are

Hi! We're Waveform. We've been around since 2007, and while we've grown a bunch since then we're still a small team. There's just a handful of us answering texts, and picking up calls.

The four of us pictured below lead support and product development. Feel free to reach out to us at any time; our emails are all just our first names @waveform.com


Ian (Support)


Marcus (Product)


Sina (CEO)


Harry (Support)

Stuck? Have Questions? *Please:* Contact Us!

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

Talking to customers is what helps us improve our products. We can also help troubleshoot, and sometimes a small tweak we suggest can make all the difference.

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

Call us at (800) 761-3041 or email help@waveform.com. We're available from 9am-5pm PT, Monday to Friday.

00 Before you start

When installing the GO X MIMO kit, it's critical that you have **at least 1 bar of usable** signal outside or on the roof of the building. If you don't have 1 bar, or if you're not sure, please give us a call for assistance.

What do we mean by usable?

Well, you need to be able to place a call and use data reliably. For example, when running a speed test, you should have decent upload and download speeds.

Cell boosters bring signal inside from outdoors. If the signal outside your building isn't usable, the GO X MIMO isn't going to help.

If you don't have 1 bar of *usable* signal, we're sorry, but unfortunately the MIMO Cel-Fi GO X system is unlikely to work at your location. You can visit **waveform.com/returns** to set up a return. We're happy to take your MIMO Cel-Fi GO X back and try to help you find a booster that might work.

Compatibility

A quick note on compatibility. The Cel-Fi GO X is compatible with:

- AT&T 3G and 4G LTE signal on Bands 2, 4, 5, and 12
- T-Mobile 3G and 4G LTE signal on Bands 2, 4, 5, and 12
- Verizon 4G LTE signal on Bands 2, 4, 5, and 13

Worried about 5G? The Cel-Fi GO X is the only consumer grade signal booster capable of relaying 5G-DSS at 100 dB of gain.

Dynamic Spectrum Sharing (DSS) is used by some carriers to transmit 4G LTE and 5G in a single "hybrid" channel. 5G DSS Support on the GO X is enabled by default on the same bands listed above.

Please note that the GO X does not support boosting T-Mobile 5G at this time. T-Mobile's 5G bands are deployed on bands n71 and n41. FCC rules do not allow any consumer-grade signal booster sold in the US to amplify these bands.

01 Install Process Overview

This is the process that we suggest using for installing your MIMO Cel-Fi GO X:

1. **Read this manual.** Ideally from start to finish so that you understand the whole process before you begin.

2. **Download the Wave app** to your phone by visiting waveform.com/waveapp

3. **Select your carrier within the Wave App**. Your GO X's are preprogrammed to Verizon. If you're boosting a different carrier's signal you'll need to use the Wave app to **change the carrier on both amplifiers**.

4. **Find the best outdoor antenna location and direction**. This step is the most time-consuming, but it's worth the effort. Getting it right has a *huge* impact on your system's performance. **Make notes of your test results in the table at the back of this manual.**

5. **"Temporary install" and indoor antenna positioning** – Without making any holes in your roof or walls, temporarily run your cables indoors to your GO X's, and find the indoor antenna location(s) with enough separation from the outdoor antenna.

6. **Verify performance and hard-wire everything** – Run speed tests and check your bars – if everything's looking good, it's time to finalize all your cable runs and mount antennas.

7. **Tell us how your system is doing** – We really love hearing how our customer's systems are performing. Send us an email and let us know how things look.

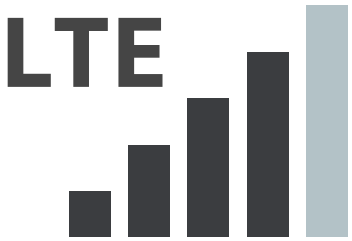
If anything's unclear, or you're unsure about something, just **call us at (800) 761-3041, email us at help@waveform.com, or book a meeting with our dedicated support team at** waveform.com/meet We're generally available from 9am-5pm PT, Monday to Friday.

02 A Quick Introduction to Cellular Signal

One of the most common questions we get asked is: *how do I get better data rates?*

To understand how to get the highest data rates we need to dig into the details a little. In this section we'll give you a quick primer on how cell signal works.

a. Signal Bars



Your phone's signal bars attempt to give you an idea of how "good" your signal is.

How does your phone decide how many bars to show? Well, it measures both the *signal strength* and *signal quality*, and converts those measurements into a simple indicator.

Having either low signal strength *or* low signal quality can limit the number of bars your phone displays.

For example, you can have a strong signal, but if the signal quality is low, you won't have many bars. Or your signal quality might be perfect, but if it's very weak, you still won't see many bars.

However, the real secret is this: **signal bars aren't all that important.**

You can have full bars and very slow data rates. Or you can have 1 bar and super high data rates. We regularly see both!

That's why we don't recommend judging your signal by the number of bars your device is showing. Instead, **use a speed test app** to measure your data rates indoors before and after you install your GO X MIMO.

You can download our favorite speed test app ("Speedtest by Ookla") by visiting this URL: waveform.com/speedtest

Go ahead and download that speed test app now, and run a couple of speed tests indoors. You'll notice that your results will fluctuate a little between tests – that's normal.

If your phone's connected to Wi-Fi, the speed test will measure the speed of your Wi-Fi instead of your cellular connection. **Disable your phone's Wi-Fi** and run the test again.

b. Signal Quality (SINR)

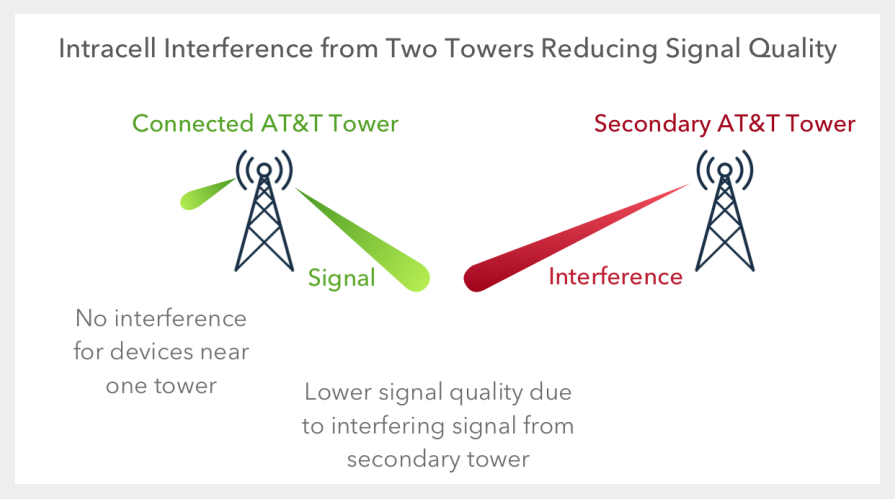
Signal quality is probably **the most important measure of your cell signal**. In 4G LTE networks, signal quality is called "SINR," which stands for "Signal to Interference Plus Noise Ratio."

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's will amplify that signal and rebroadcast it indoors.

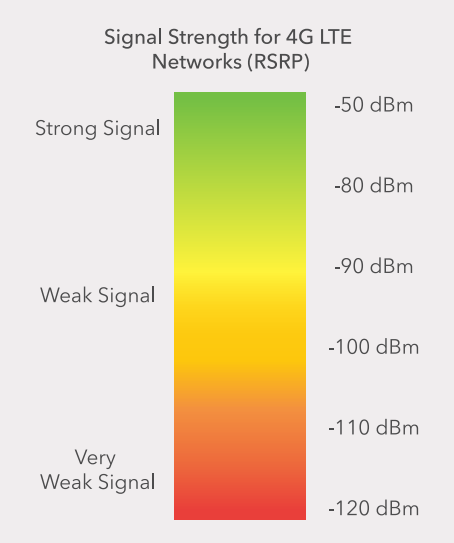
We'll explain exactly how to position and aim your outdoor antenna later in this manual.

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.



d. Bands

Your cell phone connects to towers on certain 'frequency bands." These bands are licensed to each carrier by the Federal Communications Commission (FCC) in the US.

Each frequency band has a certain "bandwidth" which determines it's total data capacity. That capacity is split amongst the users who are connected to it.

In general, higher frequency bands (like 1900 MHz and 2100 MHz) travel less far and penetrate building materials less well than lower frequency bands (like 700 MHz and 800 MHz). As a result, higher frequency bands tend to be less "congested" - they have fewer users connected to them, and data rates are often faster. This isn't *always* the case though, sometimes a lower frequency band may have better data rates, depending on your location.

Low Frequency Bands More congested, lower data rates Travel further, penetrate buildings	700 MHz (Bands 12, 13, 17) 850 MHz (Band 5)
High Frequency Bands Less congested, faster data rates Travel less far, don't penetrate buildings	1900 MHz (Band 2) 2100 MHz (Band 4, 66)

Newer phones have a feature called "carrier aggregation," which means that they can connect on multiple bands simultaneously to increase data rates.

The Cel-Fi GO X can boost up to 2 bands simultaneously. Depending on the signal conditions in your area, there may be just 1 cellular band available, or up to 5. After you've completed a provisional install, you can experiment with enabling specific frequency bands to see if a particular combination gets you the best speed test results.

Unfortunately, FCC regulations don't yet allow consumer signal boosters in the US to amplify LTE band 30 (2300 MHz), band 41 (2500 MHz), or band 71 (600 MHz).

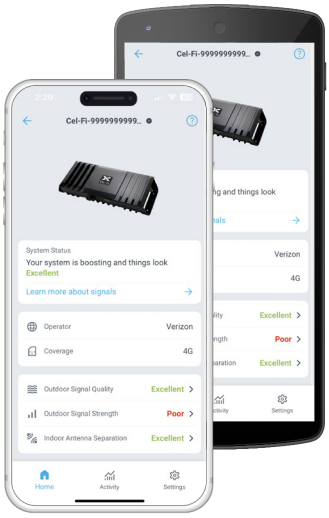
Okay, thanks for reading that!

We know that's a lot of information, but we promise it'll be helpful as you start your install. Our goal is to get you strong, amplified signal and the best possible signal quality on the bands that get you the best data rates. Let's get started!

03 Wave App and Carrier Selection

First, prior to installing any of the antennas or running any of the cables, each GO X needs to be set up in the Wave App.

It's important that both GO X's share the same settings. Any time you make a change to one GO X, make sure to mirror them onto the other.



1 **Plug each GO X into a power outlet** to power them on, don't connect any antennas just yet.

2 **Download the Wave app** at waveform.com/waveapp

3 **Open the app** with your phone at most 4 feet from both GO Xs and **select "I don't need help"** to start pairing. Don't worry! We'll walk you through every step of the installation in this manual.

This may take a few minutes. The app will say “searching” and then allow you to select a system to connect to. **Select either of the two devices.**

4 Once connected, **rename this device** to "GO X A", **select your operator** (i.e. carrier), and **press continue**, leave all other options unchanged. **For AT&T customers,** choose “AT&T LTE Preferred” to ensure that each GO X boosts as many LTE bands as possible.

If you need to boost a different carrier at a later date, go to “Settings” then “Operator”. Changing carriers takes a few minutes - don’t turn off your booster or move your phone away during the process.

5 **Connect to your second GO X** by tapping the top left arrow, and selecting the other available GO X. **Repeat step 4** to rename this device to "GO X B" and select your carrier.

Please note: Only **one device** (e.g. your phone or tablet) can connect to **one Cel-Fi GO X** via Bluetooth at a time. But don’t worry – every device in the building will see better cellular signal, the Wave app is only used to change settings and monitor the GO X's.

Troubleshooting Wave App Pairing:

- If the Wave app is unable to connect to one of your devices, try force-closing the app.
- If force-closing the app doesn’t help, restart your phone and power cycle the GO X by unplugging the power adapter.

04 Understand How The GO X Works

The GO X "Searches" For Signal

Unlike other boosters, the GO X doesn't blindly amplify every frequency. Instead, it ***searches*** for, and then amplifies, the best signal available for your carrier.

At any given time, the GO X can amplify up to two frequency bands.

In the Wave mobile app, you can watch in the "Activity" tab as it scans the frequencies on different bands to find the best signal to amplify.

Anytime you power-cycle one of your GO X's, connect or disconnect the outdoor antenna, change the band settings, or change the operator, it will restart scanning to find the best signal. To make sure it scans all frequencies, **restart both GO X units anytime you disconnect and then reconnect the outdoor antenna**.

Activity Lights

A small light on each GO X flashes to indicate the booster's current status.

Solid Green:
The GO X has found the best band and is amplifying your signal.

Blinking Green:
The GO X is scanning for networks to boost.

Blinking Red:
The unit is in an error condition. Check the app for more information.

Solid Red:
If the status light remains red, the device has a hardware issue. Call us for a replacement.

Boot-up Sequence

On being plugged in, the GO X activity light will start solid red, then flash red, then move on to blinking green as it starts scanning the cellular frequency bands. Make sure the outdoor antenna is connected to the port before powering on so the GO X can find signal.

Finally, once the GO X has found signal to boost, the activity light will switch to solid green.

05 Positioning & Aiming the Outdoor Antenna

Finding the best location for the MIMO outdoor antenna is the **most important part of the install**. In this section, we explain the simplest method for positioning and aiming. Section 12 covers some more advanced information you can use to optimize your signal further.

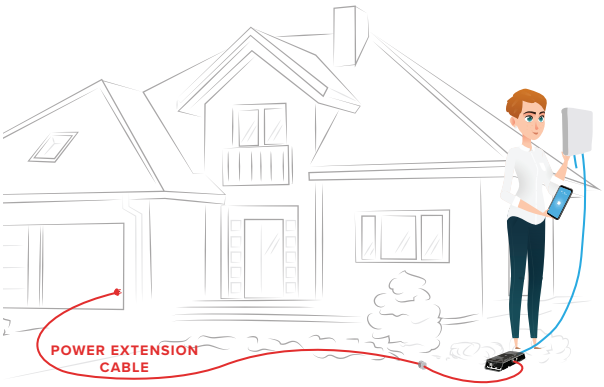
The Goal

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.

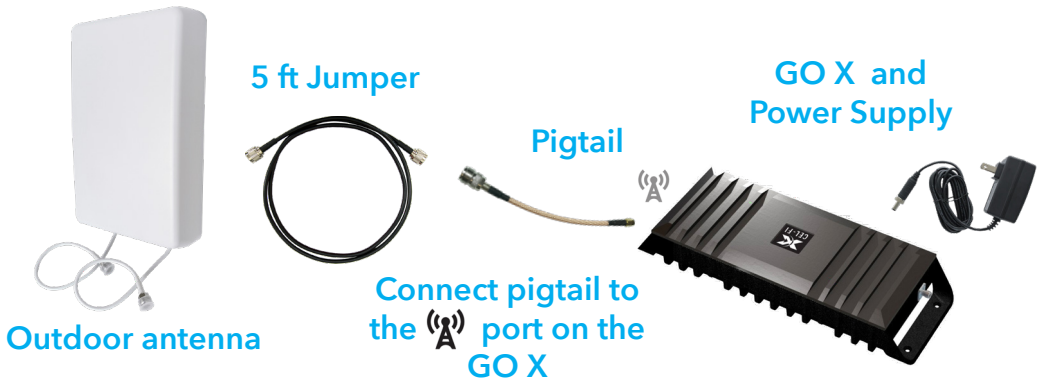
Set up one GO X as a Signal Meter

To keep things simple, you'll only use one of your GO X's for this step. Keep the other unit turned off.

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.”

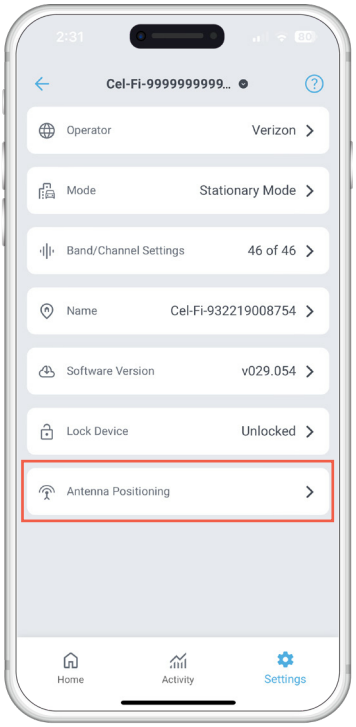


Here are all the parts you’ll be using. It doesn't matter which port you use on the antenna:



Don’t have a long power extension cable? Keep the GO X indoors near a power socket, and use the 30 ft twin coax cable included in the kit (in place of the 5 ft jumper) to take the outdoor antenna outside. The downside of this approach is that you won’t easily be able to stay connected to the GO X via Bluetooth, so you may need a second person near the booster watching the Wave app as you test antenna positions.

Using the Antenna Position Test



The Wave app has a special "Antenna Position Test" that you can find in "Antenna Positioning" under the "Settings" tab.

Connect to the GO X you're testing with, and start the antenna position test. You'll want to test a few positions around your building.

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 that is as high as possible**.

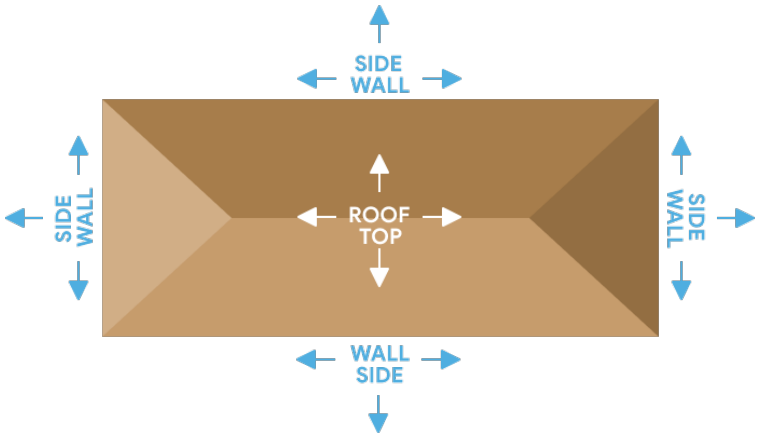
Feel free to **make additional notes of your test results in the table at the back of this manual.**

The scores are completely relative to eachother so there isn't a specific value to aim for, just find the best score you can. It will take some work, but it's always worth it to test as many locations as possible, to optimize for the very best signal.

Please note: Don't be surprised if your antenna position score goes down when you connect your internal antenna(s) later on. That is totally normal!

How to Position & Aim

Finding the right outdoor antenna location and direction takes some patience, but it's absolutely worth it and will have a big impact on your system's performance. Here are all the locations and directions we recommend testing your outdoor antenna:

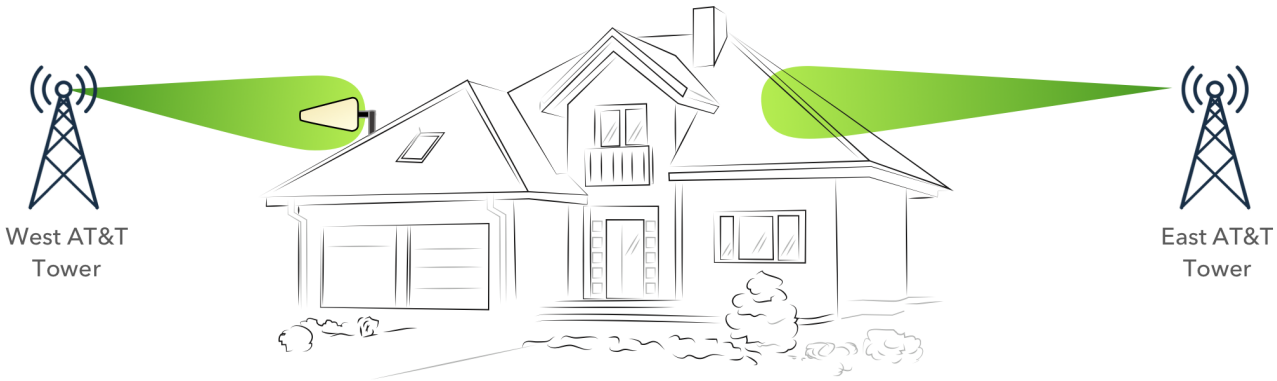


Why **don't we recommend using the highest point on the roof**? It's simple: Signal strength is generally higher on the roof, signal quality is often better on the side of the building.

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, connect the second GO X, and set up a "temporary install."

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

We recommend securing the outdoor antenna temporarily, and running the twin coax cable indoors through a window or a door without drilling any holes. Now connect both of your GO X's and in turn connect them to the indoor antenna.

Once you've done that, you can test your coverage and data rates. If everything is looking good, you can move to a permanent install. More on this in section 10.

If you're having issues with your temporary setup, or aren't happy with the performance, **call (800) 761-3041, email help@waveform.com, or book a meeting with our support team at** waveform.com/meet We can often suggest an easy solution to the most common problems.

07 Indoor Antennas: Types & Placement

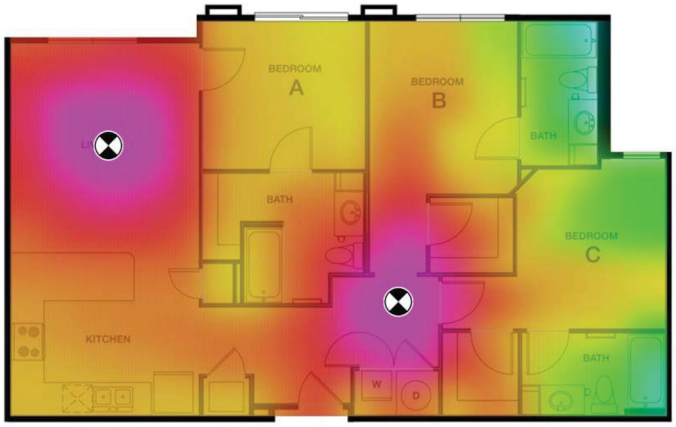
Before choosing a location for your indoor antennas, you'll need to understand how your indoor antennas broadcast signal. Depending on which kit you purchased, you'll have either dome or panel antennas included in the box.

Panel Antennas

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 Antennas

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

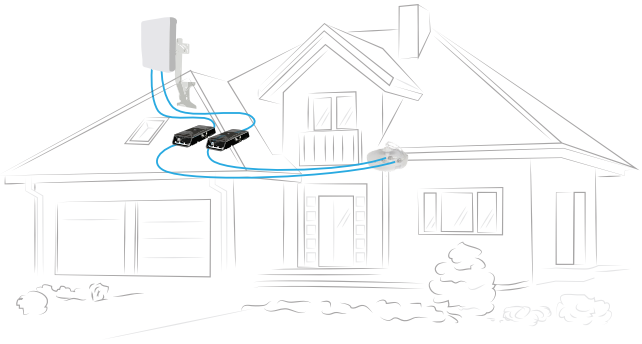
Antenna separation is critical to installing your indoor antennas.

If you don't have enough separation, the Cel-Fi GO X boosters will throttle their 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. Keep your outdoor antenna in the location with the best signal. **If you have more than one indoor antenna, the total separation is determined by whichever antenna is closest the outdoor antenna.**

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.



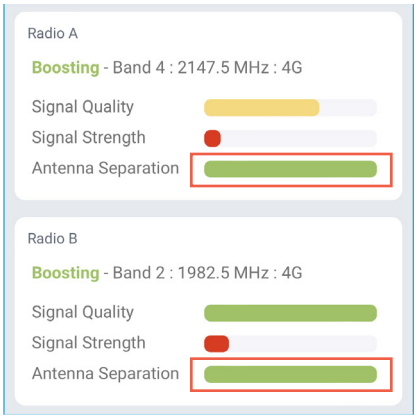
Example of Good Separation

- 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 your status on the Home tab and a gauge on the Activity tab for antenna separation.

Ideally, you'll want "Excellent" separation with a fully green gauge for each "Boosting" band, but in small buildings that might not be possible - just do the best you can.



09 Assembling the "Outdoor" Side of Your Kit

Assembling the J-Mount and Outdoor Antenna

The photo to the right shows how the Outdoor Antenna should be secured to the included Antenna Mount.

If you'd like more detailed instructions on how to install the L-bracket to the antenna mount, you can find that online here:

waveform.com/polemount-instructions

Assembling the "Outdoor" Components

Refer to the diagram to the right as needed →

1. Secure your outdoor MIMO panel antenna to your mount if you haven't already, and install it outdoors in the antenna position which you found using the method described in section 3 of this manual.
2. Connect each port of the outdoor MIMO panel antenna to the included 5 ft jumper cables and lightning surge protectors. Instructions on grounding are in section 11 of this manual.
3. Connect the large N-type ends of one of your twin RS240 coax cables to each of the lightning surge protectors and hand tighten it.
4. Connect the smaller SMA-type ends of your twin RS240 cable to the outdoor antenna ports on each of your GO X boosters and hand-tighten them. Note the two icons by the Cel-Fi GO X's two SMA antenna ports:

   This port should be connected to the outdoor antenna.

   This port should be connected to the indoor antenna.

Next up: *Proceed with Step 5 on page 17 when you are ready to start installing the indoor components.*

Outdoor MIMO Panel Antenna & Mount

2x Lightning Surge Protector Kits

Includes 5 ft jumper cable and 5 ft red grounding cable.

Should ideally be installed outdoors, just before cable enters the building.

Connect Lightning Surge Protectors to the building's ground with 10 AWG or higher grounding cable.

30 ft Twin RS240 Cable

2x Cel-Fi GO X

Can be installed indoors or outdoors, provided a power outlet is available.

2x AC Power Adapter

Towards the Indoor SMA to N-type Pigtail Adapters

10 Assembling the "Indoor" Side of Your Kit

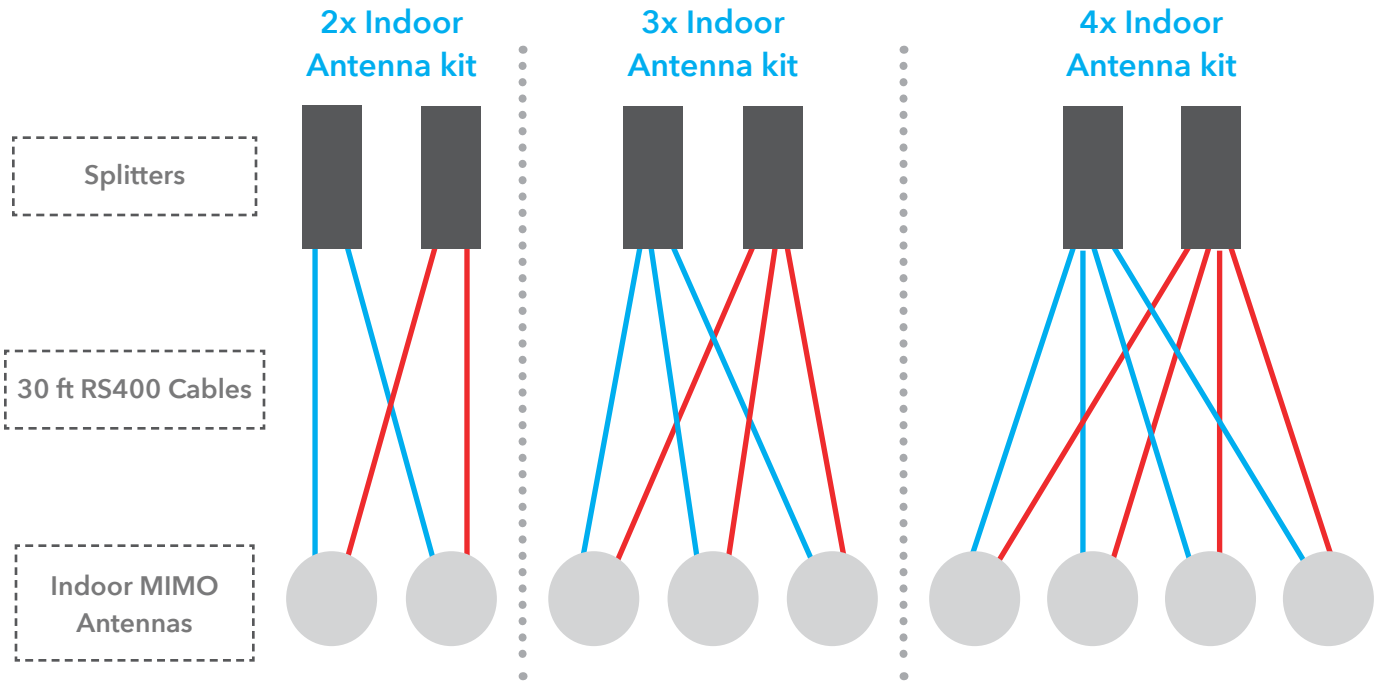
Assembling the "Indoor" Components

Refer to the diagram to the right as needed

5 Connect a SMA to N-Type Male Pigtail Adapter to the port of each of GO X booster and hand-tighten the connection.

6 **For kits with 1x indoor antenna**, connect the 30 ft RS400 cables to each pigtail adapter. **For kits with 2x, 3x, or 4x indoor antennas**, use the 1 ft jumpers to connect a splitter to each pigtail adapter, then connect the 30 ft RS400 cables to these splitters.

7 **For kit with 1x indoor antenna**, connect the two 30 ft RS400 cables directly into the indoor antenna and hand-tighten the connectors. **For kits with 2x, 3x, or 4x indoor antennas**, connect the 30 ft RS400 cables for each splitter into a different indoor antenna and hand-tighten the connectors**, as shown in the diagram below:**



Tip: Use painter's/masking tape to label the RS400 cables as "GO X #1" and "GO X #2" to keep track of which RS400 cables go to each Cel-Fi GO X.

Tip: Make sure that the two cable paths for each indoor antenna connects to a different Cel-Fi GO X amplifier. **If an indoor antenna has both cables paths connected to same Cel-Fi GO X, it will not broadcast a MIMO cell signal**.

11 Test & Install Permanently

Once you're done setting up your temporary install, it's time to test the performance.

If you mostly care about voice calls, simply place a call and walk around your home. If data rates are your primary concern, we recommend testing with the Speedtest app you downloaded from **waveform.com/speedtest**

If you're using a hotspot, simply connect to it and visit speedtest.net in a browser.

If everything is working well, you can start drilling holes, securing the antennas, and switch to a permanent install.

If you're not happy with the results, don't panic! We can help you figure it out. Call us at (800) 761-3041 or email help@waveform.com. We're generally available from 9am-5pm PT, Monday to Friday, and we can help you optimize your setup.

A Quick Note on Surge Protection & Grounding

We include two lightning surge protection kits in your GO X MIMO kit to help protect from lightning. The surge protectors should ideally be installed outside, just before the coaxial cable enters your home.

Both the surge protectors and the outdoor antenna mast itself should ideally be grounded. We include two short lengths of grounding cable, but you'll likely need to purchase more. Grounding cable is available at most hardware stores, and we recommend using at least 10 AWG cable. Cable gauges are a little confusing, the numbers increase as the cable gets thinner. So 6 AWG and 8 AWG are both okay, but 12 AWG and 14 AWG are too thin.

If you have a satellite or HDTV antenna on your roof already, it's likely grounded. You should be able to simply ground the mast and the lightning surge protectors to the satellite dish's grounding cable. Alternatively, **you can ground your outdoor antenna directly to a grounding rod.** Most homes should have a grounding rod, but if yours doesn't you can purchase one easily at a hardware store.

Weatherproofing Outdoor Connections

We strongly recommend wrapping all outdoor N-type connections with stretch-and-seal self-fusing silicone rubber tape (available from most hardware stores). N-type connectors are outdoor-rated, but water can still sometimes get in and causes a lot of issues.

12 Optional: Test Band Combinations

In many areas, the GO X will only find a single band to boost. You can see this under the Activity 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's to amplify.

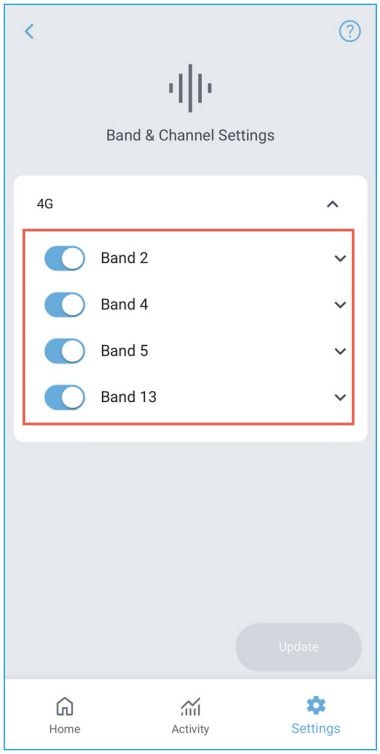
However, in some areas, your GO X amps may find two bands. If that's the case, you may be able to optimize your data rates by manually testing different bands. Just **make sure you set both GO X's to the exact same band combinations,** or else you won't get a MIMO signal.

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's 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 both GO X's 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 both GO X's amplifying each band individually, and then testing different combinations of bands. **Refer back to section 2d for more guidance on different bands. Make notes of your test results in the table at the back of this manual.**



How to disable and enable bands

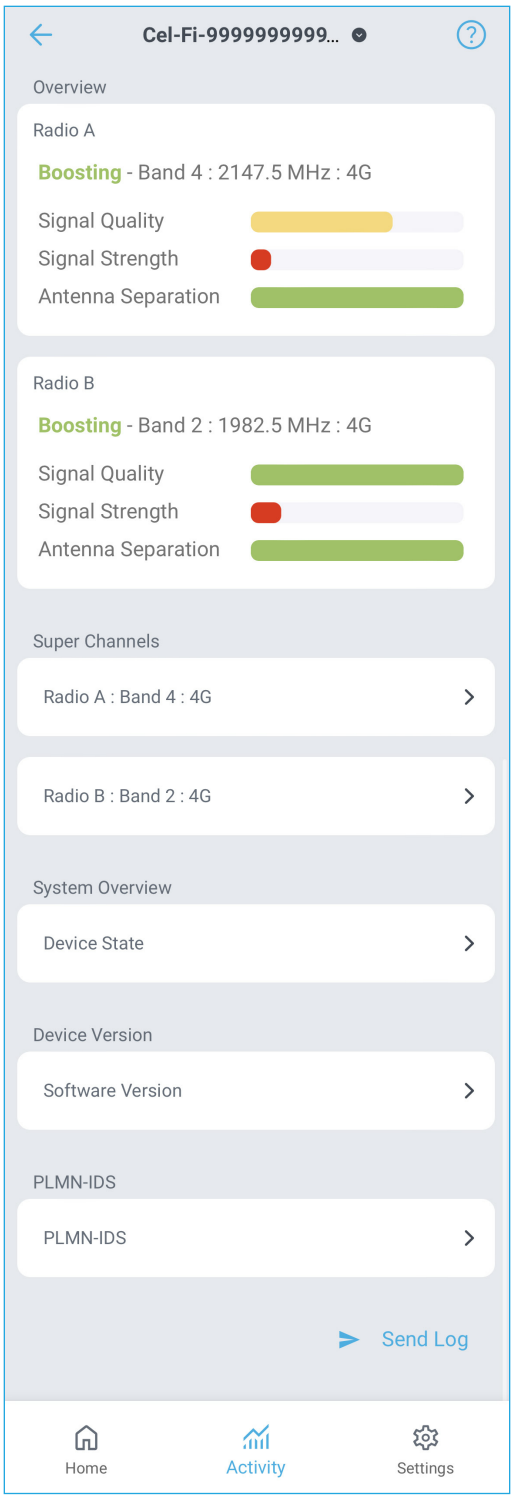
You can disable and enable bands under the "Booster Settings" dropdown in the settings tab of the Wave app.

Each time you enable or disable a band, **the GO X's will rescan to find signal**. It can take a few moments until the GO X finds and starts boosting signal. Always set both GO X's to the same bands.

After the GO X's start 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.

13 The “Activity” 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 “Activity” 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" – each GO X's two radios are what allow it to amplify up to two bands simultaneously.

For each radio, the activity 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 a GO X is boosting on one of the radios, the Wave app will show a gauge for signal quality, signal strength, and antenna separation.

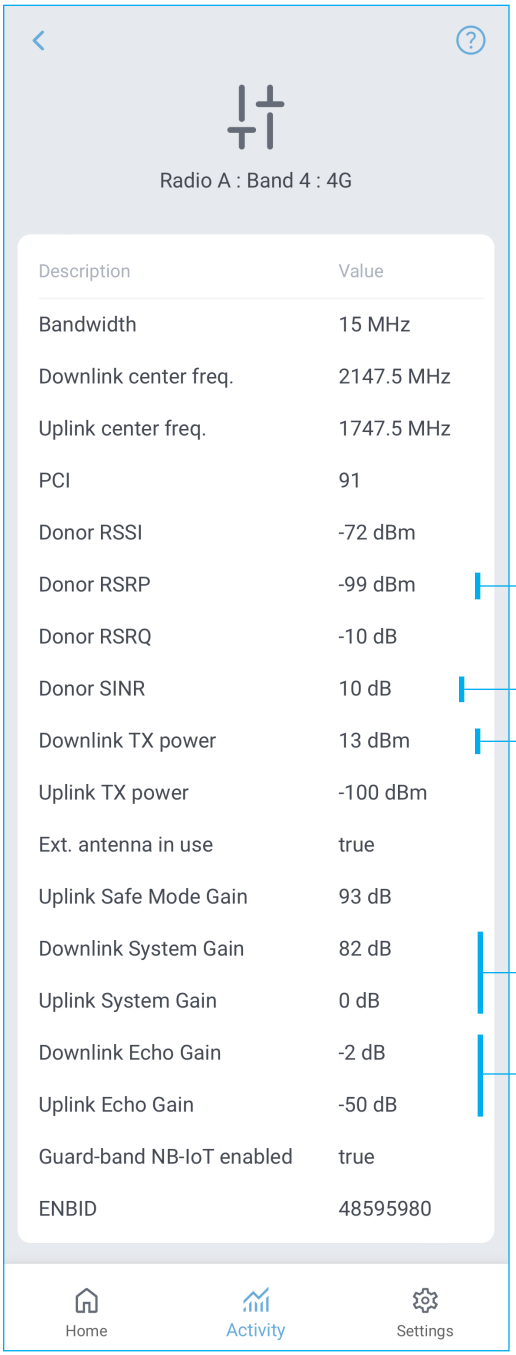
Signal quality and signal strength are determined by your outdoor antenna’s location and direction. Antenna separation is determined by the separation between the indoor antennas from to the outdoor antenna.

The goal during installation is to get all gauges fully green. Sometimes, despite your best efforts, these gauges may remain red or yellow. That's okay, just try to fill the gauges as much as possible.

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

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

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



"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, this should be -115 dBm or better (i.e. closer to zero).

The “Donor SINR” is a measure of signal quality. Ideally, you'll want a number 3 dB or higher (i.e. more positive). 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.

If you’re running into issues, or have any questions, we’d love to help. **Call us at (800) 761-3041, email help@waveform.com, or book a meeting with our dedicated support team at** waveform.com/meet. We’re available from 9am-5pm PT, Monday to Friday.

14 Some Final Tips

If you unplug any of the cables on the outdoor antenna side, make sure to reset both GO X's

A GO X will start scanning as soon as you unplug the cable to its outdoor antenna. To make sure both units rescan across all available frequencies, **restart both units after you reconnect any of their outdoor cables**.

If you have extra cable, don’t coil it tightly.

To minimize the negative side-effects (4 ft or wider loops are best) of coiling coaxial cables, **make sure to keep any cable loops as large as possible**.

Use the gauges shown at the top of the Activity tab.

After you’ve optimized the outdoor antenna location using the Antenna Position Test, use the gauges at the top of the Activity tab to **keep an eye on what the GO X's are doing**, and potentially to further optimize your signal.

Create a "drip-loop" in the RS240 cable right before it enters the building.

When feeding the cable coming from the outdoor antenna into the building, have the cable dip below it's entry hole into the building to help ensure water doesn't flow from the cable directly into the building.

15 Upgrading Antennas

If you have direct line of sight to the nearest tower (no obstructions, including trees) and you'd like to increase your signal quality and strength even further, you may want to consider upgrading your outdoor antenna.

We particularly recommend our **Log Periodic Antenna** *or* **Grid Parabolic Antenna**.

Waveform Log Periodic Antenna

waveform.com/log-periodic

- Up to 10 dBi gain with 56 - 82 degree beamwidth
- Easy to set up and aim
- Provides a small improvement over your MIMO Panel Antenna

Waveform Griddy, The Grid Parabolic Antenna

waveform.com/grid-parabolic

- Up to 23 dBi gain with 9 - 23 degree beamwidth
- Adjustable feedhorn for frequency-specific gain improvements.
- Provide a large improvement over your MIMO Panel Antenna

If you choose to upgrade, you'll need replace your single outdoor MIMO Panel Antenna with two of either of these antennas and then cross-polarize them to ensure a proper MIMO connection.

If you're unsure whether the Log Periodic or Grid Parabolic antennas would help in your situation, please feel free to **call us at (800) 761-3041, email help@waveform.com, or book a meeting with our dedicated support team at waveform.com/meet**. We're available from 9am-5pm PT, Monday to Friday.

16 Tell Us How It Works

Did your installation go great? Are you having trouble aiming your outdoor antenna? Do you think our manual could be improved? Are your data rates not quite what you were hoping?

We'd love to hear from you: send us an email at help@waveform.com or call us at (800) 761-3041.

We're not a huge, nameless corporation with lots of bureaucracy. **There is a small team of us** who wrote this manual and provide support for the GO X, and we love nerding out over how to get the absolute best cell signal in any given situation.

So please, reach out!

Two ways to get some money back!

Send us a video of your install and get $50

We want to feature videos of our customers who've had success with our MIMO GO X kit.

Take a video that's at least 30 seconds long showing how you installed your outdoor MIMO antenna as well as the speed test results you're getting. Send it to us via email at **videos@waveform.com** and we'll send you $50 via PayPal!

Recommend us to friends, family, or neighbors

Hopefully by the time you've finished installing and tuning your ourdoor MIMO antenna, you're as excited about this product as we are.

One of our biggest challenges is spreading the word. Most people don't know that products like our MIMO GO X kit exist.

Help us get the word out: everyone you refer gets 5% off their kit, and we'll also give you 5% of whatever they spend in cash (via Paypal).

Simply visit **waveform.com/referrals** to get started.

Your Measurements

Use the table below to make notes of your measurements while positioning and aiming the outdoor antenna of your MIMO Cel-Fi GO X kit.

Position & Direction	Band(s)	Position Test Score	Download Speed	Upload Speed

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 **call us** at (800) 761-3041, **email us** at help@waveform.com or **book a meeting with our fantastic support team** at waveform.com/meet. We're available from 9am-5pm PT, Monday to Friday.

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

v3.1

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