

# CEL-FI™ GO G41

from WAVEFORM

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## 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 G41 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 G41.

The GO G41 is set-up via the Cel-Fi Wave App, **please skip the installation instructions provided within the app and follow this manual instead.**

### About Waveform

The GO G41 is manufactured by Cel-Fi, but 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.



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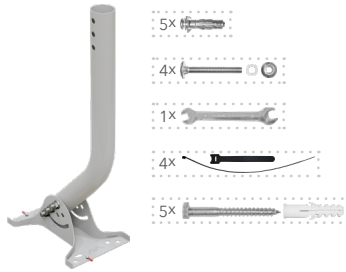


[www.waveform.com](http://www.waveform.com)  
[help@waveform.com](mailto:help@waveform.com)

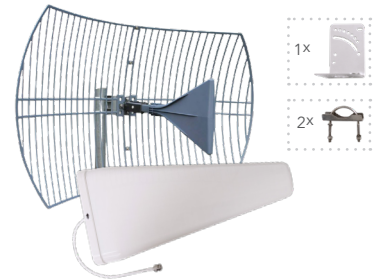
# What's In The Box



Cel-Fi GO G41 Amplifier and AC Power Supply



UltraPole (Base Kit) w/ Mounting Hardware



Outdoor Antenna(s) & Pole Mount Hardware

Your kit includes the GO G41 Amplifier, the UltraPole Base Kit, a Log Periodic outdoor antenna, a set of indoor antenna(s), and additional installation components. **Depending on which kit you purchased,** your kit may also include contain a **Grid Parabolic antenna**.

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

You will either have **1x, 2x, 3x or 4x dome and panel indoor antennas**.

**This bit is a little confusing:** We include both types of indoor antennas with each kit. 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 extra antennas you can discard.**



Dome & Panel Antenna(s)



2x, 3x, 4x or 5x 30 ft RS400 Cables

For example - if you purchased a 3 antenna kit, you'll receive a total of 3x dome antennas and 3x panel antennas, but you'll only install three antennas in total.

**You'll also have multiple 30 ft RS400 coax cables.** If you picked a kit with multiple indoor antennas you'll additionally get a 1 ft jumper and a signal splitter.

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



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



1 ft RS200 Jumper

## Other Parts



2x SMA to N-Type Pigtails  
Blue bag



Lightning Surge Protector



5 ft RS240 Jumper Cable  
Clear bag



10 AWG Grounding Cable





# 01 Install Process Overview

This is the process that we suggest using for installing your Cel-Fi GO G41, each of these steps is explained in greater detail within the following pages of this manual:

- 1 Read this manual** - Ideally from start to finish so that you understand the whole process before you begin.
- 2 Download the Wave app (Page 8)** - Visit [waveform.com/waveapp](http://waveform.com/waveapp) on your phone to download the Wave App, which lets you configure your GO G41.
- 3 Configure the settings of your GO G41 within the Wave App (Page 8)** - Run through the initial setup in the Wave App to configure your booster. Skip the install instructions suggested in the app; we're confident that following our manual will lead to a much smoother installation experience and better performance from your GO G41.
- 4 Find the best outdoor antenna location and direction (Pages 10-12)** - 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.
- 5 "Temporary install" and indoor antenna positioning (Pages 12-16)** - Without making any holes in your roof or walls, temporarily run the cable indoors to your GO G41, and find indoor antenna locations with enough separation from the outdoor antenna.
- 6 Verify performance and hard-wire everything (Page 17)** - 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 (Page 22)** - 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](mailto:help@waveform.com)**, or **book a meeting with our dedicated support team at [waveform.com/meet](http://waveform.com/meet)** 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**.

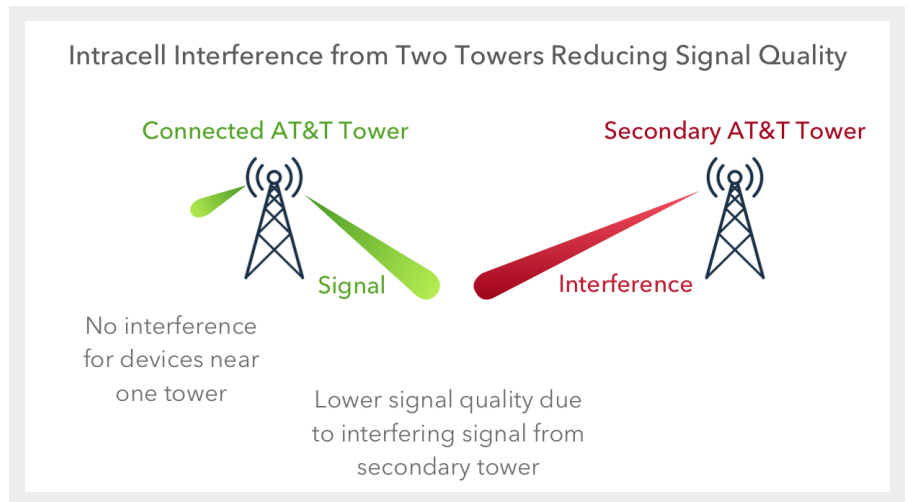
Every cell tower transmits signal on the same set of bands.

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 G41 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 G41 will amplify that signal and rebroadcast it indoors.

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

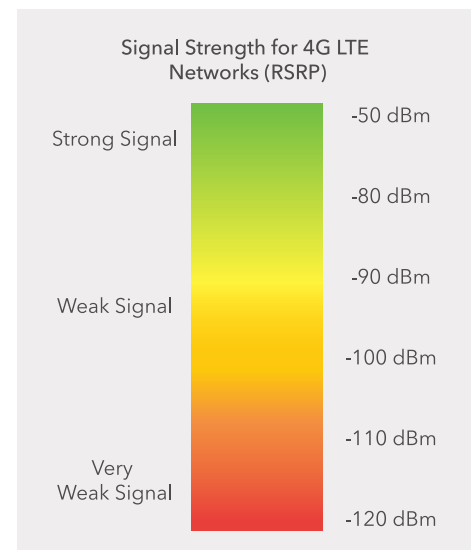


## c. Signal Strength (RSRP)

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 G41 amplify your signal so you have higher signal strength. The GO G41 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 its 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)

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### 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 G41 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, connect your GO G41 to power, and download the Wave app to configure and monitor your GO G41. You won't need any antennas during this step.

**1** Plug your GO G41 into a power outlet to power it on, don't connect any antennas just yet.

**2** Download the Wave app at [waveform.com/waveapp](http://waveform.com/waveapp)

**3** Ensure bluetooth is enabled for your phone (or tablet). The Wave App requires a bluetooth connection to your GO G41 for it's configuration and monitoring.

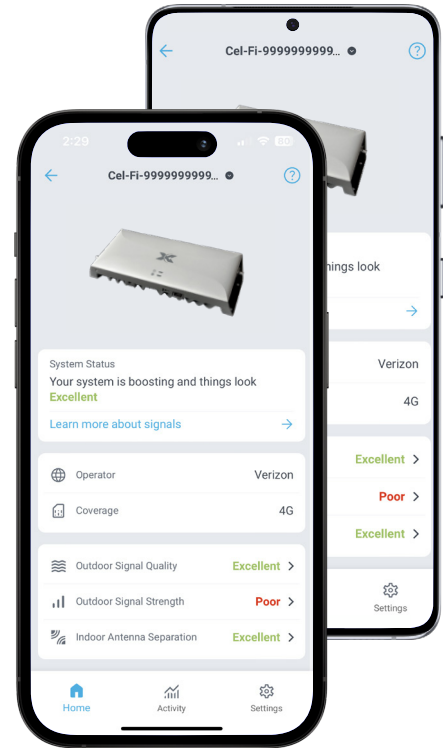
**4** Open the app with your phone near the GO G41 and select "I don't need help" to start pairing. Don't worry! We'll walk you through every step of the installation in this manual.

It may take a few minutes for the GO G41 to connect.

**5** Once connected, select your operator (i.e. carrier) and press continue. You can leave all other options unchanged.

For AT&T customers, choose "AT&T LTE Preferred" to ensure that your GO G41 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.



## Troubleshooting Wave App Pairing:

- Only **one** device (e.g. your phone or tablet) can connect to the GO G41 via Bluetooth at a time to configure and monitor your GO G41.
- 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 G41 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**. 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. **If you've got the upgraded Grid Parabolic Antenna**, refer to section 13 for how to aim it.

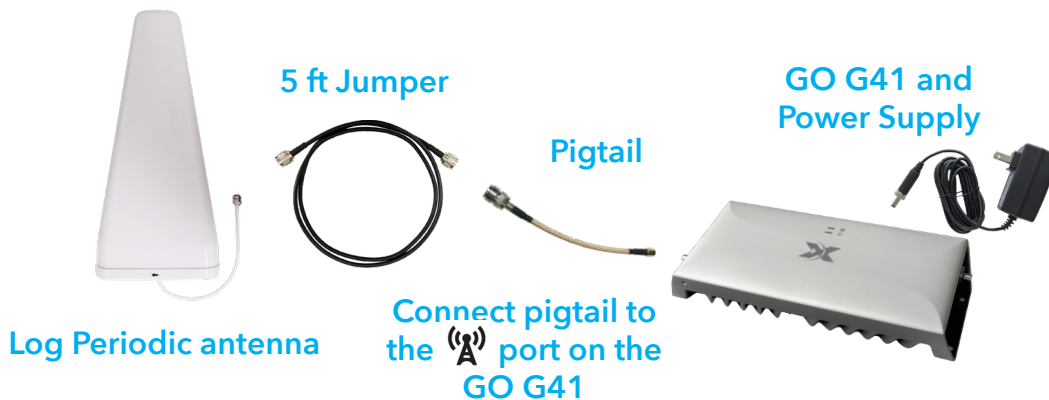
## The Goal

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 G41 as a Signal Meter

If you have a long power extension cable, we recommend taking the GO G41 outside with you and using the 5 ft cable and Log Periodic Antenna in the kit to set up the GO G41 as "signal meter."

Here are all the parts you'll be using:



**Don't have a long power extension cable?** Keep the GO G41 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 G41 via Bluetooth, so you may need a second person near the booster watching the Wave app as you take signal readings.

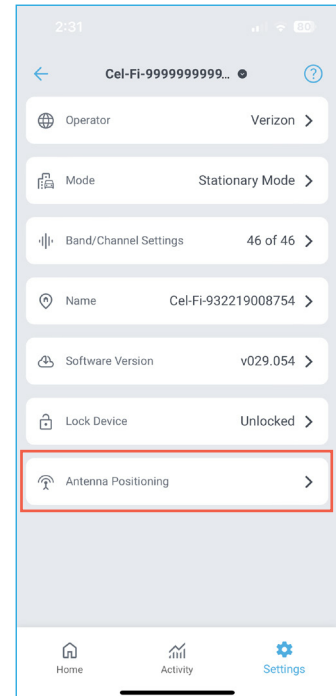
## Using the Antenna Position Test

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

Wait for the booster to display a solid green LED before proceeding with the antenna position test. 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**.

The scores are completely relative to one another 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.

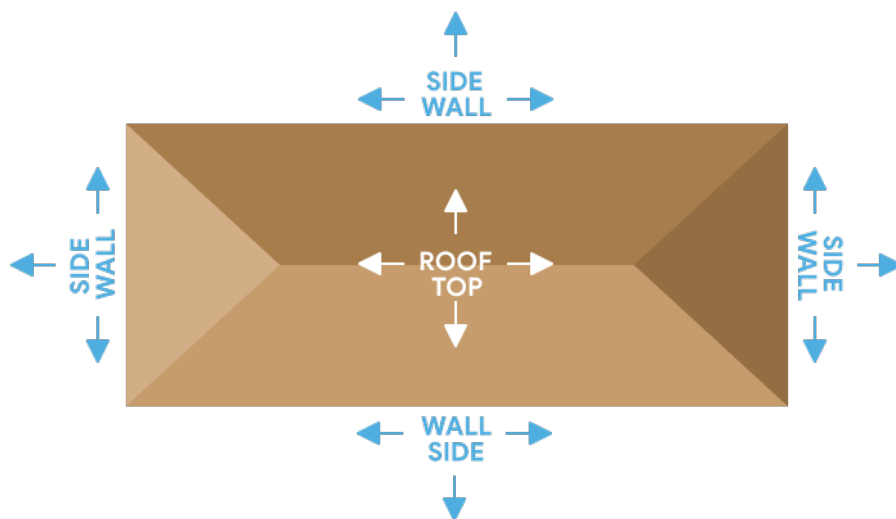
Don't be surprised if your antenna position score goes down later on when you connect your indoor antenna(s). That's normal!



## 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:

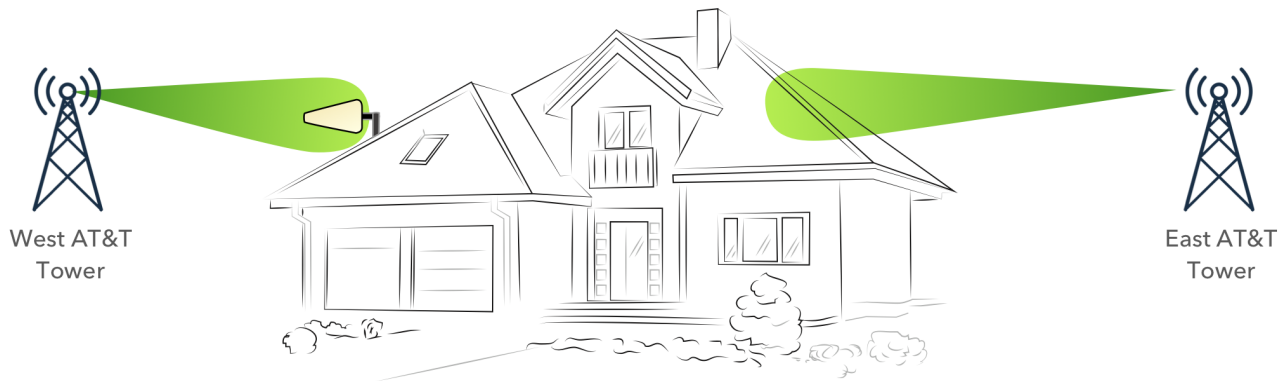


How come we don't recommend just using the highest point on the roof? It's simple: while signal strength is generally higher on the roof, signal quality is often better on the side of the building.

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 G41**. 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 **call us at (800) 761-3041, email [help@waveform.com](mailto:help@waveform.com), or book a meeting with our dedicated support team at [waveform.com/meet](https://waveform.com/meet)**

We're available from 9am-5pm PT, Monday to Friday. We'll be happy to help assist - we can often suggest an easy solution to most 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. You'll have both dome and panel antennas included in the box, so that you can install whichever will work best for your space.

## 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.

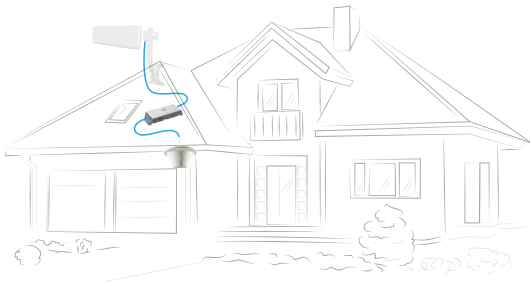


# 08 Indoor Antennas: Separation

Antenna separation is critical to installing your indoor antennas.

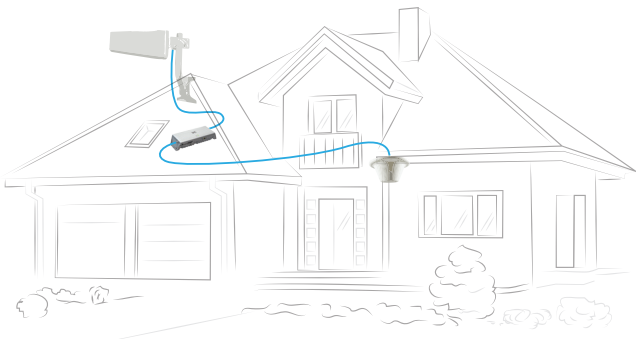
If you don't have enough separation, the Cel-Fi GO G41 will throttle its gain (amplification) to avoid "oscillation." Oscillation is a type of feedback that occurs if the gain of the system is higher than the "RF separation" between the indoor and outdoor antennas.

You can improve your separation by moving your indoor antennas. 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

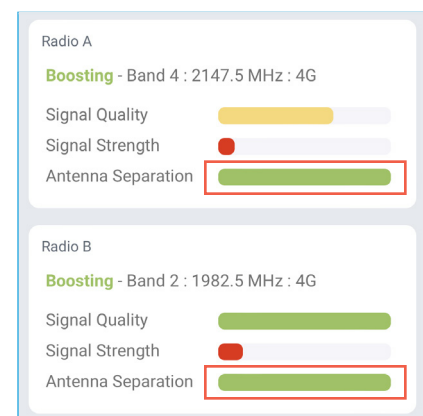
- ✓ Plenty of vertical and/or horizontal separation.
- ✓ Outdoor antenna pointing away from indoor antenna.
- ✓ Multiple layers of building materials between antennas.

## 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.

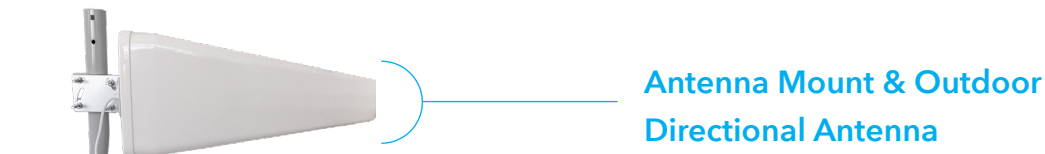
Ideally, you'll want "Excellent" separation with a fully green gauge for each "Boosting" band. In small buildings this might not be possible - just do the best you can.

If you need to improve your antenna separation, refer to section 12 for more information.





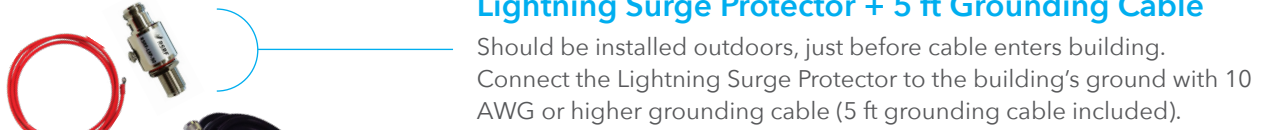




**Antenna Mount & Outdoor Directional Antenna**

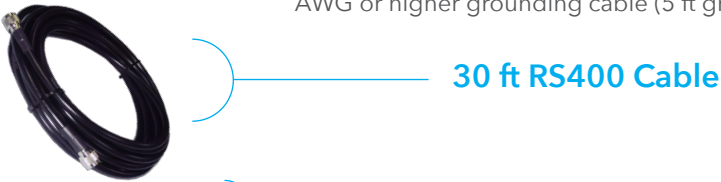


**5 ft RS200 Cable**



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

Should 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 G41**

**AC Power Adapter**



**SMA to N-type Pigtail Adapter**



**1 ft RS200 Jumper**

Only included in kits with 2x, 3x, or 4x indoor antennas.



**Dome or Panel Antennas**

How many you have depends on the kit you purchased.



**30 ft RS400 Cable**

Quantity depends on number of antennas in the kit you purchased.



**Splitter**

Only included in kits with 2x, 3x, or 4x indoor antennas.



# 10 Test & Install Permanently

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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 our favorite speed test app ("Speedtest by Ookla") which you can download from [waveform.com/speedtest](https://www.waveform.com/speedtest).

If you're using a hotspot, simply connect to it before performing your tests.

**If everything is working well, you can start drilling holes for your permanent install.**

If you're not happy with the results, don't panic! We can help you figure it out. **Call (800) 761-3041**, email [help@waveform.com](mailto:help@waveform.com), or **book a meeting with our dedicated support team at [waveform.com/meet](https://www.waveform.com/meet)**. 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

**It's critical to ground your outdoor antenna and UltraPole kit along with your surge protector**, since their metal components make them prime targets for lightning strikes. Also, grounding a mounting pole, such as your UltraPole, is required by the National Electric Code (NEC).

The lightning surge protection kit included with your GO G41 kit contains a short length of grounding cable, but an additional grounding cable may need to be purchased to reach a suitable electrical ground for your system. Grounding cables are available at most hardware stores, and **we recommend using 10 AWG or lower gauge (thicker) grounding cables**.

To properly ground your lightning surge protector kit and UltraPole mount, please refer to their included manuals, or view the manuals online at [waveform.com/surge-protector](https://www.waveform.com/surge-protector) and [waveform.com/ultrapole](https://www.waveform.com/ultrapole). The surge protector should ideally be installed just before the coaxial cable enters your home.

You can find more detailed instructions on how to properly ground your system and examples of suitable electrical grounds at [waveform.com/grounding](https://www.waveform.com/grounding)

## 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.

# 11 Optional: Test Band Combinations

In many areas, the GO G41 will only find a single band to boost. You can see this under the Activity tab: one of the GO G41'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 G41 to amplify.

However, in some areas, your GO G41 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 G41 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 G41 has selected, you can force the GO G41 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.

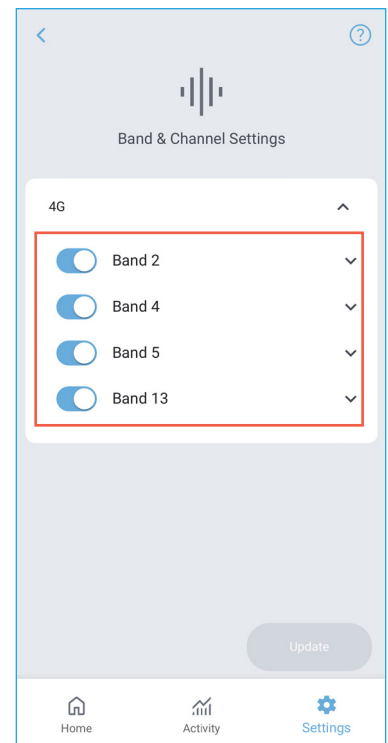
To get the absolutely best data rates, you can try running speed tests with the GO G41 amplifying each band individually, and then testing different combinations of bands.

## How to disable and enable bands

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

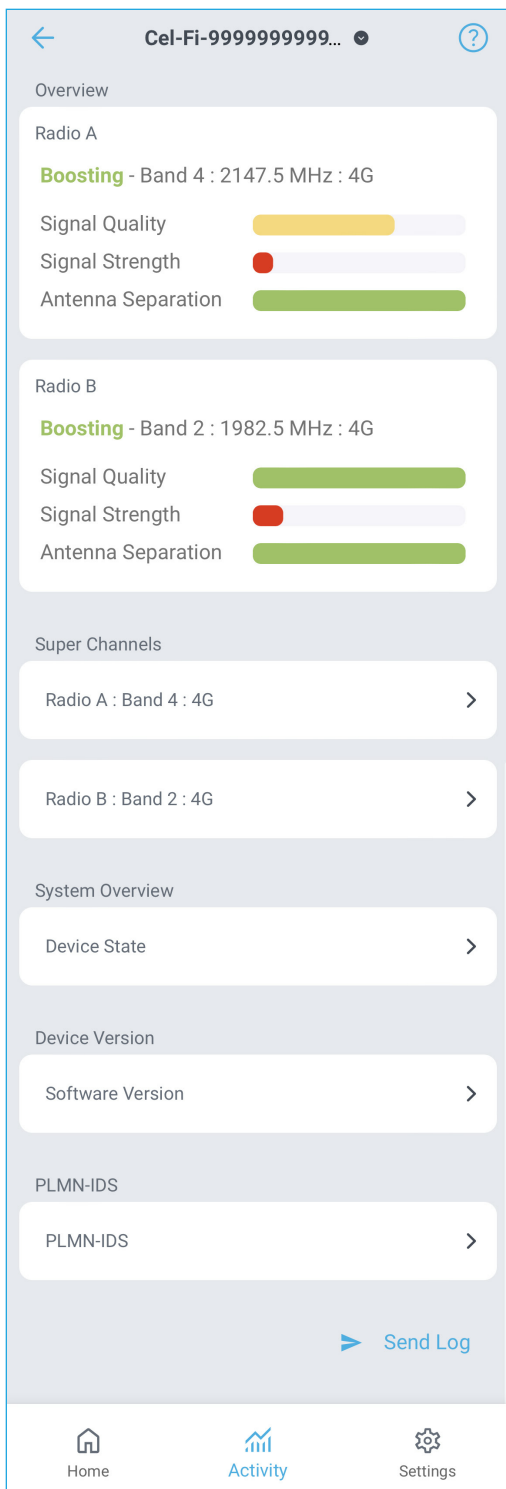
Each time you enable or disable a band, **the GO G41 will rescan to find signal**. It can take a minute or two until the GO G41 finds and starts boosting signal again.

After the GO G41 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 "Activity" Tab

One of the best features of the GO G41 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" - the GO G41'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 the GO G41 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. But 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.

The GO G41 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.**

Description	Value
Bandwidth	15 MHz
Downlink center freq.	2147.5 MHz
Uplink center freq.	1747.5 MHz
PCI	91
Donor RSSI	-72 dBm
Donor RSRP	-99 dBm
Donor RSRQ	-10 dB
Donor SINR	10 dB
Downlink TX power	13 dBm
Uplink TX power	-100 dBm
Ext. antenna in use	true
Uplink Safe Mode Gain	93 dB
Downlink System Gain	82 dB
Uplink System Gain	0 dB
Downlink Echo Gain	-2 dB
Uplink Echo Gain	-50 dB
Guard-band NB-IoT enabled	true
ENBID	48595980

### "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" is a measure of the signal strength received by the outdoor antenna. **This should be -115 dBm or better** (i.e. closer to zero).

The "Donor SINR" is a measure of the signal quality received by the outdoor antenna. **This should be 3 dB or better** (i.e. more positive). The higher the SINR, the more bars, and the better your data rates.

The "Downlink TX Power" is a measure of the signal strength sent by the amplifier to the indoor antenna(s). **This should be 0 dBm or better** (i.e. more positive). The higher this number, the greater the coverage area.

The "Downlink and Uplink System Gain" are a measure of how much your system is amplifying the signal from your outdoor antenna (Downlink) and to your outdoor antenna (Uplink). **Uplink may sometimes show 0 dB when phones aren't in use.** That's normal.

The "Downlink and Uplink Echo Gain" reflect how much separation you have between your outdoor and indoor antenna(s). **If either number is at or near 10 dB**, you'd benefit from increasing the distance between your outdoor antenna and it's closest indoor antenna(s).

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](mailto:help@waveform.com), or book a meeting with our dedicated support team at [waveform.com/meet](https://waveform.com/meet).** We're available from 9am-5pm PT, Monday to Friday.

# 13 Upgrading with Griddy

If you got the GO G41 kit that includes a Grid Parabolic outdoor antenna, you'll need to spend a little more time aiming it, to get it dialled in just right.

We included a short guide on assembling and aiming the Grid Parabolic antenna, in your kit. Read that before trying to aim the antenna, to make sure you understand how precise you'll need to be. You can also find that online at [waveform.com/griddy](http://waveform.com/griddy).

When you're ready to start aiming, **follow the steps in section 5 above, using the included Log Periodic antenna** to find the best general direction to aim your antenna.

**Once you've found the general direction** using the Log Periodic antenna, **switch to the Grid Parabolic and move it in very small increments to aim it precisely.**

If you don't already have a Grid Parabolic Antenna, and you have direct line of sight to the nearest tower (no obstructions, including trees), you may be able to **increase your signal quality and strength even further by upgrading your outdoor antenna.**



# 14 Some Final Tips

**- If you unplug the cable from the outdoor antenna, make sure to reset the GO G41.**

The GO G41 will start scanning as soon as you unplug the cable to the outdoor antenna. To make sure it scans all frequencies, restart the unit after you reconnect the cable.

**- If you have extra cable, don't coil it tightly.**

If you have extra cable, make sure to keep any cable loops as large as possible to minimize negative side-effects (4 ft or wider loops are best).

**- 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 eyes on what the GO G41 is doing, and potentially to further optimize your signal.





# 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.

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