

WAVEFORM

# DualPlus Duo

Ultra-Directional 8x8 MIMO Antenna Kit

## BEFORE YOU START!

Scan this QR code to watch the setup videos, and...

- ▶ Connect to **our team of dedicated Signal Specialists** - They are eager to help!
- ▶ **Get your free Virtual Site Survey** - including a map of cell towers and where to mount your antenna.
- ▶ Access installation **guides for a wide selection of cellular routers!**
- ▶ View a **digital copy** of this manual.



[setup.wf/DualPlusDuo](http://setup.wf/DualPlusDuo)

Designed by WAVEFORM in the USA





# 00 Before You Start

It's important that there's at least some 4G LTE or 5G signal where you're installing your DualPlus Duo. Ideally, the cell signal should be "usable."













## What Do We Mean by "Usable"?

When using your cellular router or hotspot, **you should be able to complete a data speed test** before connecting your DualPlus Duo. Connect to the Wi-Fi of your cellular device and visit [speedtest.net](https://www.speedtest.net) to run a quick data speed test.

MIMO antennas, like those in DualPlus Duo, will help condition your outdoor signal and get you better data speeds. **But if the signal outside your building isn't usable to begin with, an antenna might not help.** You can certainly still give DualPlus Duo a shot, you may not get the results you're expecting.

## Compatibility

Each DualPlus in your DualPlus Duo kit supports almost every 4G LTE and low/mid-band 5G service in use in North America, Europe, and across the world. Here are the bands that it covers\*:

USA	 <b>AT&amp;T</b>	B2/n2, B4, B5/n5, B12, B17, B29, B30, B66/n66, n77, n78
	 <b>verizon</b>	B2/n2, B4, B5/n5, B13, B48/n48, B66/n66, n77, n78
	 <b>T-Mobile</b>	B2, B4, B5, B12, B25, B26, B41/n41, B66, B71/n71, n77, n78
CANADA	 <b>Bell</b>	B2, B4, B5, B7, B12, B13, B17, B29, B66/n66, B71, n78
	 <b>ROGERS</b>	B2, B4, B5, B7, B12, B17, B25, n41, B66/n66, n71, n78
	 <b>TELUS</b>	B2, B4, B5, B7, B12, B13, B17, B25, B26, B29, B66/n66, B71/n71, n78
UK	 <b>EE</b>	B1/n1, B3/n3, B7, B20, n28, n78
	 <b>O<sub>2</sub></b>	B1, B3, B7, B20, n78
	 <b>3</b>	B1/n1, B3/n3, B7, B8, B20, n28, B32, B38, n78
EUROPE	 <b>O<sub>2</sub></b>	B1/n1, B3, B7, B8, B20, n28, n78
	 <b>T</b>	B1/n1, B3/n3, B7, B8, B20, B28, B32, n77, n78
	 <b>orange</b>	B1, B3, B7, B20, n78

**All supported 4G (LTE) Bands:** B1, B2, B3, B4, B5, B7, B8, B11, B12, B13, B14, B17, B18, B19, B20, B21, B22, B25, B26, B28, B29, B30, B32, B34, B37, B38, B39, B40, B41, B42, B43, B48, B50, B51, B53, B65, B66, B67, B69, B70, B71, B74, B75, B76, B85, B103, B106

**All supported 5G (NR) Bands:** n1, n2, n3, n5, n7, n8, n12, n13, n14, n18, n20, n25, n26, n28, n29, n30, n34, n38, n39, n40, n41, n48, n50, n51, n53, n65, n66, n67, n70, n71, n74, n75, n76, n77, n78, n80, n81, n82, n83, n84, n85, n86, n89, n90, n91, n92, n93, n94, n95, n96, n97, n98, n99, n100, n101, n105

*\*The bands your router actually uses may vary from this list. MVNOs and carrier subsidiaries, which use the same bands as those listed for the major carriers listed above are also supported.*

## How Much Improvement Should You Expect?

In short: It's hard to say. **Many people see an increase in data speeds of between 50% and 200%**, but some people may only see 10%. Despite all the science, wireless signals often work in strange and magical ways.

One thing is for sure, **the more locations and directions you try the more likely you are to see a big increase in data speeds**. If you've gone through this manual and aimed your DualPlus Duo as we suggest, but you're still not seeing much improvement, **please reach out to us for help**.

## What Tools Do You Need?

Your DualPlus Duo kit includes all of the tools necessary for its assembly, but you may need **additional tools** to mount it against your building.

Please refer to your mount(s) included manual(s) or find them online at [waveform.com/flexmount-manual](http://waveform.com/flexmount-manual) and [waveform.com/ultrapole-manual](http://waveform.com/ultrapole-manual), respectively.

# 01 Install Process Overview

- 1 Read this manual**, ideally from start to finish, so that you understand the whole installation process before you begin.
- 2 Find the best antenna location and direction (Pages 6-7)**. This step is the most time-consuming, but it's worth the effort and has a huge impact on your system's performance. **Make notes of your readings in the table on page 15**.
- 3 Verify performance and connect everything (Pages 8-9)**. Before making any holes in your roof or walls you'll fully connect your system and run speed tests. If everything looks good, you'll finalize the cable runs and hard-wire everything.
- 4 Mount your DualPlus Duo (Page 10-11)**. You'll assemble each DualPlus with its FlexMount and mount them to your building.
- 5 Tell us how your system is doing**. Nothing makes our day like hearing from customers. And if for any reason you're not seeing the results you were hoping for, we can help.

Simply visit [setup.wf/DualPlusDuo](http://setup.wf/DualPlusDuo) to **get connected with our team** of dedicated Signal Specialists.

# 02 Positioning & Aiming DualPlus Duo

Finding the best position for your DualPlus Duo is the most important part of the installation process. In this section, we explain the best and simplest method for positioning & aiming your DualPlus Duo. Section 6 covers advanced tips for additional optimization.

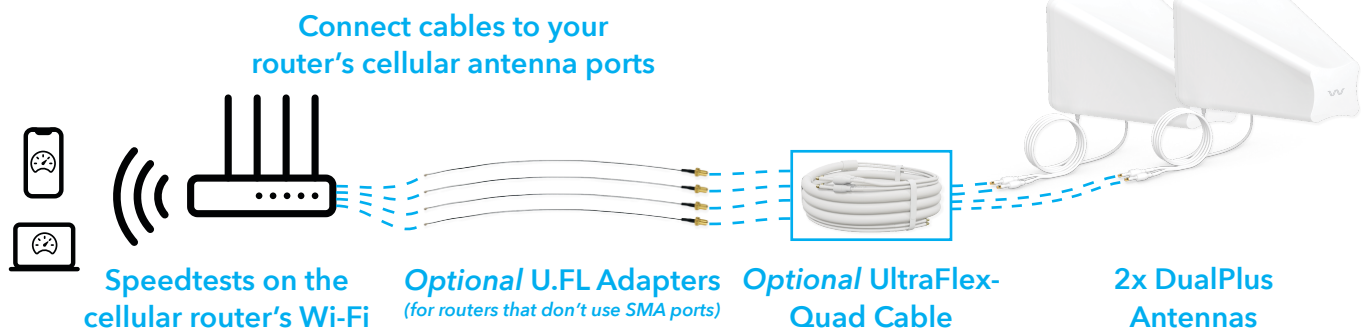
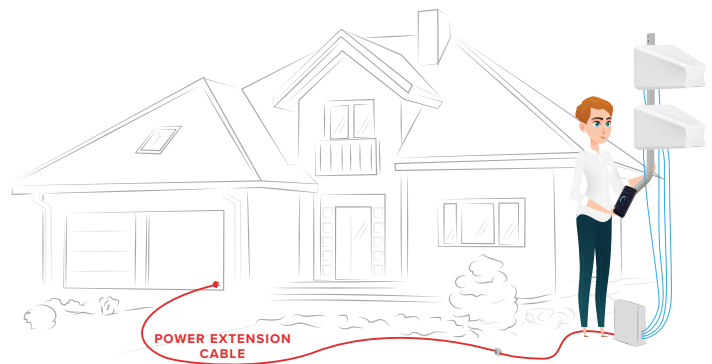
## The Goal

Your goal is to find the **best location & direction** for your DualPlus Duo. Its position should **maximize the data speeds** from your cellular router. It can take a little patience, but spending some extra time here can have a huge impact on performance - it's worth the extra effort.

### 1. Prepare your Test Setup

Is your cellular router battery-powered? Or, do you have a power extension cord?

If so, connect each DualPlus directly to your cellular router (as shown below), and restart your router. Treat the two DualPlus' as a single antenna moving forward.



**Can't take your router outdoors?** No problem. For your test setup, keep your router powered indoors and add the UltraFlex-Quad cable into the setup to bring your DualPlus Duo outside.

If you're leaving your router indoors, your speed tests may be limited by the router's Wi-Fi range rather than its cellular connection. Ask someone to stay near the router so they can run speed tests as you try different positions with your DualPlus Duo outside.

If you're running into issues, we'd love to help. Simply visit [setup.wf/DualPlusDuo](https://setup.wf/DualPlusDuo) to get connected with our team of dedicated Signal Specialists.

**Is holding both DualPlus antennas difficult?** Follow the FlexMount's **included or online manual** at [waveform.com/flexmount-manual](http://waveform.com/flexmount-manual) to attach them to each DualPlus and get a better grip.

- » *If your kit includes the UltraPole, you can also briefly skip ahead to section 6 of this manual to (partially) assemble your UltraPole and pole-mount your QuadMini Duo.*
- » *If not, have someone assist you with holding your QuadPros. If that isn't possible, try to locate a pole or plank to temporarily mount your QuadMini Duo.*

**Not sure which ports to connect to?** Some cellular routers have both Wi-Fi and cellular antenna ports. Make sure to attach both DualPlus' to your router's cellular ports, not Wi-Fi. Some devices only have internal antenna ports. **Refer to your router's manual, our device-specific guides** at [waveform.com/hotspot-guides](http://waveform.com/hotspot-guides), or reach out to us for help if you're unsure.

## 2. Get Ready to Perform Speed Tests

Since the goal is improved data speeds for your cellular router, it makes sense to **judge the best position for your antenna by measuring your data speeds**. We recommend using Speedtest by Ookla for this. Visit [waveform.com/speedtest](http://waveform.com/speedtest) to get there easily.

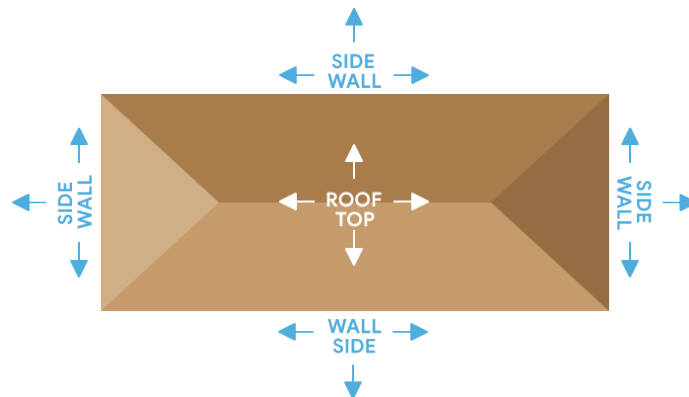
Once your test setup is ready and your testing phone or laptop is connected to your cellular router, **you'll have everything you need to start testing** at different positions outside.

Go ahead and **run a couple of speed tests to get a baseline**. You'll notice your results fluctuate a between tests - that's completely normal.

## 3. Take Outdoor Measurements

**With each new location, restart your cellular router by disconnecting and reconnecting the power. This forces the device to connect to the best bands available at that location.**

We recommend **running 2-3 speed tests at each of the following outdoor positions** with your DualPlus Duo, and writing each of your results in the table on page 15.



**Don't just go to the highest point of the roof!** While signal is generally stronger the higher you go, there's also often more interference. We've found it's often better to mount DualPlus Duo on the side of the building where antennas are better shielded from interference.

# 03 Connecting Your System

Once you've identified the best position for your DualPlus Duo, it's time to hook everything up.

**Don't drill any holes in your walls yet!** Start with a temporary install and test performance first.

Keep DualPlus Duo at the position you've identified, but move your router indoors and perform a final round of tests to make sure everything is performing optimally.

**If you purchased your DualPlus Duo as a complete kit, follow the steps below to assemble and install your kit.** If you only purchased the antennas, your assembly may look a little different.

## Getting the Complete Kit Set Up

Refer to the diagram to the right as needed.

- 1 Place both DualPlus'** near the best position you found in section 2.
- 2 Connect each DualPlus to your UltraFlex-Quad cable** and run the cable into your building.

*If you don't want to drill holes into your walls or roof to route your cables, **install your Coax Window Entry cable** in a window, and **connect it to each DualPlus and/or your UltraFlex-Quad cable(s).***

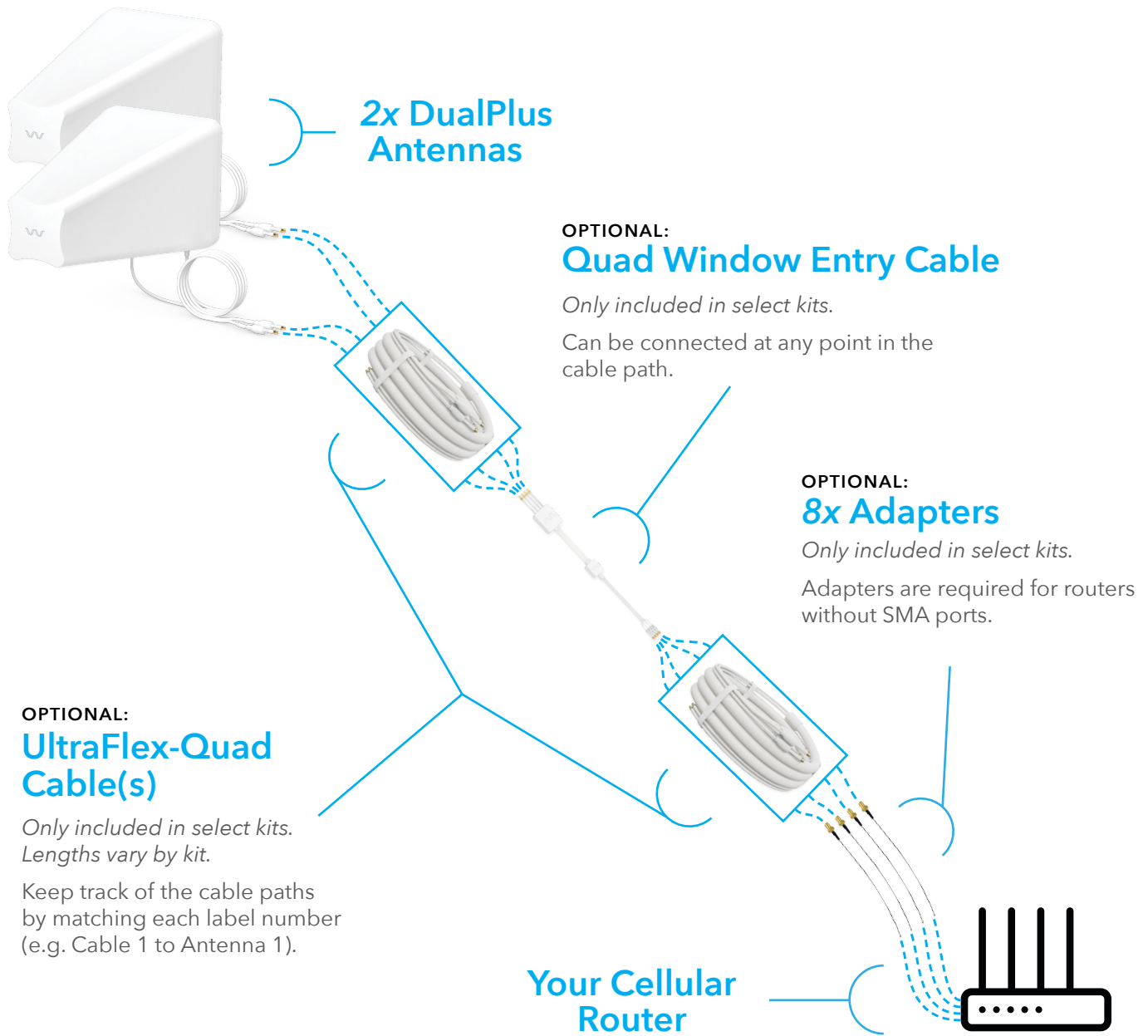
- 3 Connect your cables** to your router's cellular antenna ports and hand-tighten the connections.

*If your cellular router only has internal U.FL ports, **install the included U.FL pigtail adapters**, and connect them to your UltraFlex-Quad cable(s).*

- 4 Restart your cellular router**, wait for it to reconnect, then perform 1-2 speed tests to verify that you are happy with your system's performance.

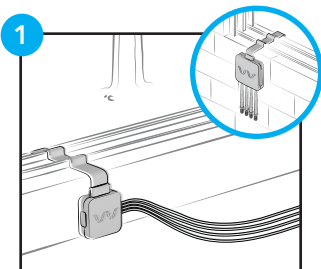
### Install Tips

- **Before attempting to route the cables through your building**, lay the UltraFlex-Quad cable(s) out flat to straighten it. This will make it easier to work with.
- **A finger-tight connection is sufficient** to secure the connectors. Tools are not required to tighten them and may cause damage.
- **Unsure how your cables connect to your router?** Refer to your router's manual, our device-specific guides at [waveform.com/hotspot-guides](http://waveform.com/hotspot-guides), or reach out to us for assistance.

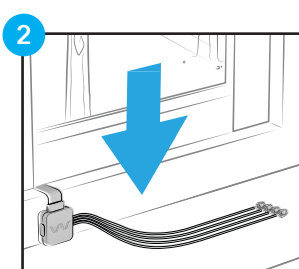


## • How to Install the Quad Window Entry Cable •••••

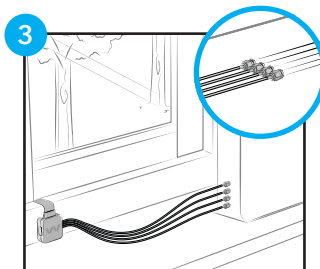
• Your Quad Window Entry Cable can be connected at any point in your system as needed. Follow **the manual included or find it online at [waveform.com/window-entry-manual](http://waveform.com/window-entry-manual)**



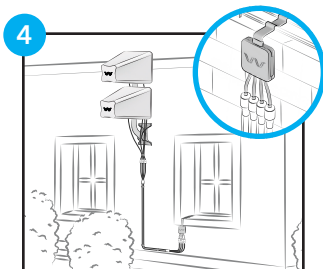
**1** Loosely position the window entry cable in your window frame, with its larger case outside.



**2** Check that your window **fully closes**. If not, please reach out to us for assistance.



**3** Connect its **indoor connectors** to your router or UltraFlex cable.



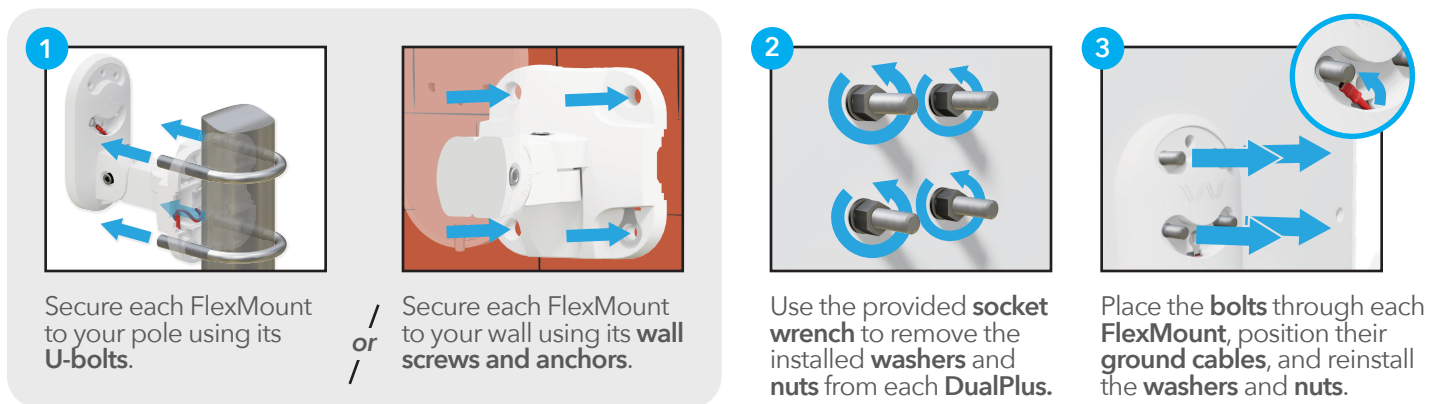
**4** Connect its **outdoor connectors** to your UltraFlex cable or each DualPlus.

# 04 Mounting Your DualPlus Duo

Now that you have all the components in your system connected and **you've verified that you are happy with your data speeds**, it's time to permanently mount your DualPlus Duo!

Each DualPlus, equipped with a FlexMount, should be **installed against a pole or directly onto the exterior of your building**.

## Mounting each DualPlus with its FlexMount



**1** Secure each FlexMount to your pole using its **U-bolts**.

**or**

Secure each FlexMount to your wall using its **wall screws and anchors**.

**2** Use the provided **socket wrench** to remove the installed **washers** and **nuts** from each **DualPlus**.

**3** Place the **bolts** through each **FlexMount**, position their **ground cables**, and reinstall the **washers** and **nuts**.

For the full instructions, follow the FlexMount's **included manual**, or find it online at [waveform.com/flexmount-manual](http://waveform.com/flexmount-manual), then **resume this manual** to complete your installation.

If your kit includes the **UltraPole**, refer to its included manual, or find it online at [waveform.com/ultrapole-manual](http://waveform.com/ultrapole-manual) for additional instructions on its assembly for your system.

### Install Tips

- Mount each DualPlus with its cables facing downward **to ensure proper weatherproofing**.
- **Create a small "drip-loop" in your cables** before they enter your building to help prevent water from entering your building.
- **When wall mounting**, position your FlexMount against the wall and mark the locations of its holes with a pencil or marker before drilling any holes.

## We're Here to Help!

We know that every use case is different and the steps for mounting your DualPlus Duo kit may differ for your unique location. **Don't worry!** If you're running into issues, or have any questions, just reach out.

# 05 Protecting Your System

There are a couple of final steps before your installation is complete.

In this section we'll describe how to weatherproof and properly ground your system. **These steps are crucial** to ensuring the longevity of your system by protecting it from the elements.

## Weatherproofing Your Outdoor Connections

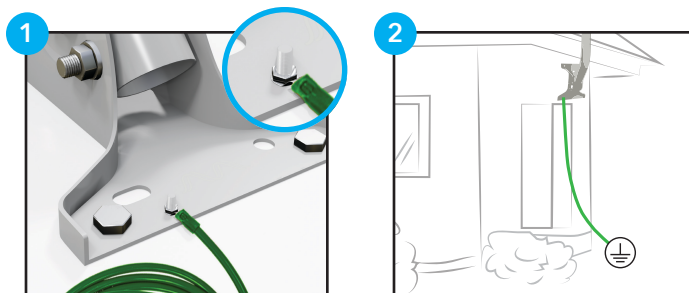
Each DualPlus and UltraFlex-Quad cable come with weatherproofing boots to help waterproof each outdoor cable connection. Once your connectors are tightened, **slide the weatherproofing boots over all of the outdoor cable connections**. Sliding these boots takes a bit of strength so don't be scared to put some elbow-grease into it!



## Grounding Your System

It's important to ground your FlexMounts and UltraPole (optional in the complete kit) to a suitable electrical ground in order to help protect your equipment. Equipment mounted outdoors can be prime targets for lightning strikes. Grounding a mounting pole with a **10 AWG or lower gauge (thicker) grounding cable** (not included) is required by the National Electric Code (NEC).

Follow the instructions within the manuals included with your FlexMount and UltraPole to properly ground them for your system. The general steps are described below:



Attach a **ground wire** to your **pole**. e.g. Some mounting poles use a **grounding bolt & nut**.

Attach the **Ground Wire** to a suitable **Electrical Ground**.

### Grounding Tips

- If you're unsure about your grounding setup, **reach out to an electrical contractor**.
- **Expanded instructions** on grounding and **examples of suitable electrical grounds** can be found at [waveform.com/grounding](http://waveform.com/grounding)



## 07 Need Help with Adapters?

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- > **Having difficulties connecting your U.FL pigtails to internal antenna connectors?** U.FL connectors are small and can be difficult to install on the first try. We suggest that you **use a tweezer to hold the cable in place** and a **pencil eraser to push the U.FL connector down**.
- > **Does your cellular router need different adapters for its cellular antenna ports?** If so, please reach out to our team so we can help you obtain the parts you need.

## 08 Live in a Hilly or Heavily Wooded Area?

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If so, you may achieve even better results with our **QuadPro kit!**

QuadPro is a directional, high-gain antenna, ideal for locations where cell signals might be **bouncing off of hills or forests**.

Fully optimizing your system for your local environment may help you obtain **superior performance over DualPlus Duo!**



## 09 Some Final Tips

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- > **Don't judge your signal by signal strength or quality alone.**  
You may find that your RSRP signal strength and SINR/RSRQ haven't improved much, but that your data speeds are meaningfully better. There's much more to an antenna than just gain: our antennas are optimized for MIMO isolation to get you the best 5G data speeds possible.
- > **If data speeds decrease over time, consider re-optimizing your system.**  
Occasionally carriers will update their towers to broadcast different bands, light up new towers, or simply turn off existing towers altogether. If your data speeds get worse, try repositioning and re-aiming your DualPlus Duo to get the best results.







# WAVEFORM

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

MIMO Antennas, like those in DualPlus Duo, aren't always easy to install. 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 can walk you through troubleshooting and fine-tuning your installation for best results.

Simply **scan this QR code** to visit [setup.wf/DualPlusDuo](https://setup.wf/DualPlusDuo) to **connect with our team** of dedicated Signal Specialists, get your **free Virtual Site Survey**, access **installation guides**, watch our **setup videos**, and more!



We love helping solve tricky install problems.



v2.0.1



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