WAVEFORM

QuadPro

Directional 4x4 MIMO Antenna

PLEASE READ THIS FIRST:

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

We've helped thousands of customers improve signal to their cellular routers. 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 QuadPro.

Designed by WAVEFORM in California

Your QuadPro is designed, sold, and supported by Waveform and our team of Signal Specialists.

We've helped over 50,000 customers improve their signal since the company was founded in 2007.

If you have any issues at all, **please reach out**.

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

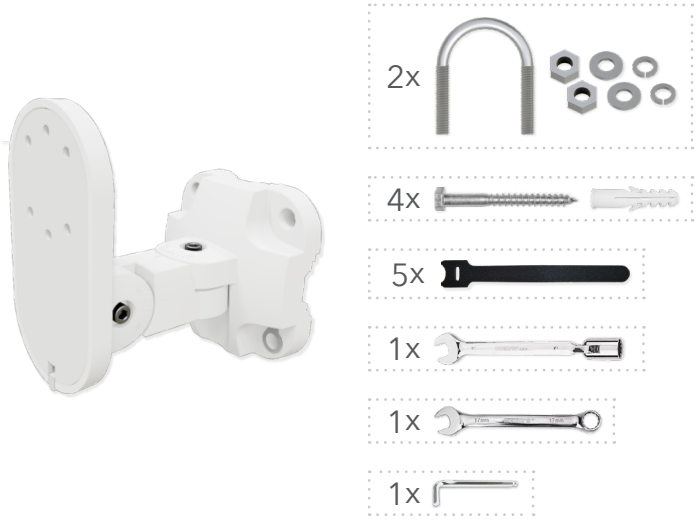
+1 (800) 761-3041

www.waveform.com
help@waveform.com

What's in the Box

QuadPro Antenna & FlexMount

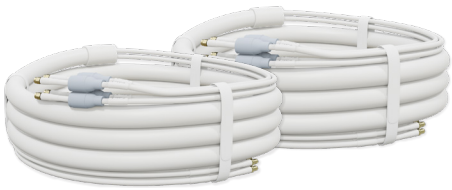
QuadPro Antenna



FlexMount w/
Assembly Hardware

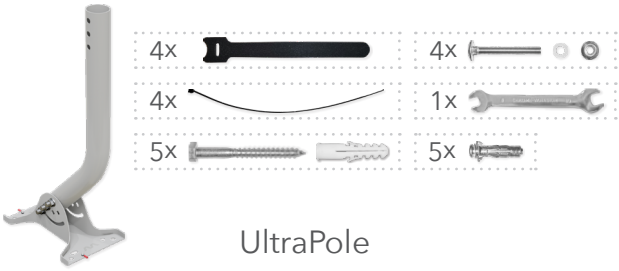
Cables, Adapters, UltraPole *(Only Included with Complete Kit)*

If you purchased the complete QuadPro Kit, you will also receive the following.



1x, 2x, or 3x UltraFlex-Quad Cables
(Kits include 10 ft and/or 20 ft lengths)

BROWN BAG

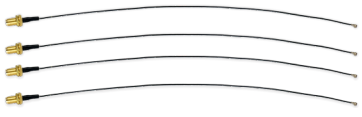


UltraPole

BROWN BOX

Quad Window Entry Cable

BROWN BAG



4x U.FL to SMA Pigtail Adapters

BLUE BAG

Install Manuals, Who Needs 'Em?

Heads up: Using MIMO antennas to improve your signal can take a bit of patience.

We'd be surprised if you saw better data rates immediately upon connecting your QuadPro. Be prepared to spend an hour or two to find the best location & direction to aim your antenna.

This manual is based on feedback from hundreds of customers like you. We've revised it dozens of times to make it as helpful as possible.

We promise **you'll be glad if you read it from start to finish before you get started**. It'll help you save time, avoid common pitfalls, and ensure your system works as well as possible.

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


Harry (Support)


Marcus (Product)


Sina (CEO)


Conold (Support)

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

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

If you're having issues, please reach out. Sometimes a small tweak can make all the difference.

Even if everything goes smoothly, let us know how your system is performing! And we love getting feedback: if you think of a way we could make our antenna, accessories, the install process, or this manual better - let us know!

Call **(800) 761-3041**, email **help@waveform.com**, or book a meeting at **waveform.com/meet** to **chat with a Waveform Signal Specialist**. We're available from 6am-5pm PT, Mon to Fri.

00 Before You Start

Whether it be inside, outside, or on the roof, it's important that there's at least some 4G LTE or 5G signal where you're installing your QuadPro. 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 QuadPro. Connect to the Wi-Fi of your cellular device and visit speedtest.net to run a quick data speed test.

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

Compatibility

Your QuadPro supports almost every 4G LTE and low/mid-band 5G service in use in the US, Canada, and across the world. Here are the bands that it covers*:

USA	AT&T	B2/n2, B4, B5/n5, B12, B17, B29, B30, B46, B66/n66, n77
	verizon	B2/n2, B4, B5/n5, B13, B46, B48/n48, B66/n66, n77
	T-Mobile	B2, B4, B5, B12, B25, B26, B41/n41, B46, B66, B71/n71, n77
CANADA	Bell	B2, B4, B5, B7, B12, B13, B17, B29, B46, B66/n66, B71, n78
	ROGERS	B2, B4, B5, B7, B12, B17, B25, n41, B66/n66, n71, n78
	TELUS	B2, B4, B5, B7, B12, B13, B17, B25, B26, B29, B46, B66/n66, B71/n71, 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, B46, B47, 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, n46, n47, n48, n50, n51, n53, n65, n66, n67, n70, n71, n74, n75, n76, n77, n78, n79, n80, n81, n82, n83, n84, n85, n86, n89, n90, n91, n92, n93, n94, n95, n96, n97, n98, n99, n100, n101, n102, n105

**The bands your router actually uses may vary from this list.*

How Much Improvement Should You Expect?

In short: It's hard to say. **Many people see an increase in data rates 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 rates**. If you've gone through this manual and aimed the QuadPro as we suggest, but you're still not seeing much improvement, **please reach out to us for help**.

What Tools Do You Need?

Your QuadPro 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 and 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 QuadPro *(Page 10-11).*** You'll assemble your QuadPro with its FlexMount and mount it 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.

   Call **(800) 761-3041**, email **help@waveform.com**, or book a meeting at **waveform.com/meet**. We're available from 6am-5pm PT, Monday to Friday.

02 Positioning and Aiming the QuadPro

Finding the best position for your QuadPro is the most important part of the installation process. In this section, we explain the best and simplest method for positioning and aiming your QuadPro. Section 06 covers some more advanced tips for additional optimization.

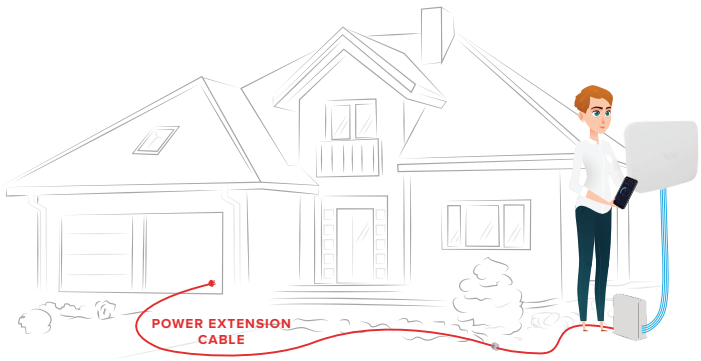
The Goal

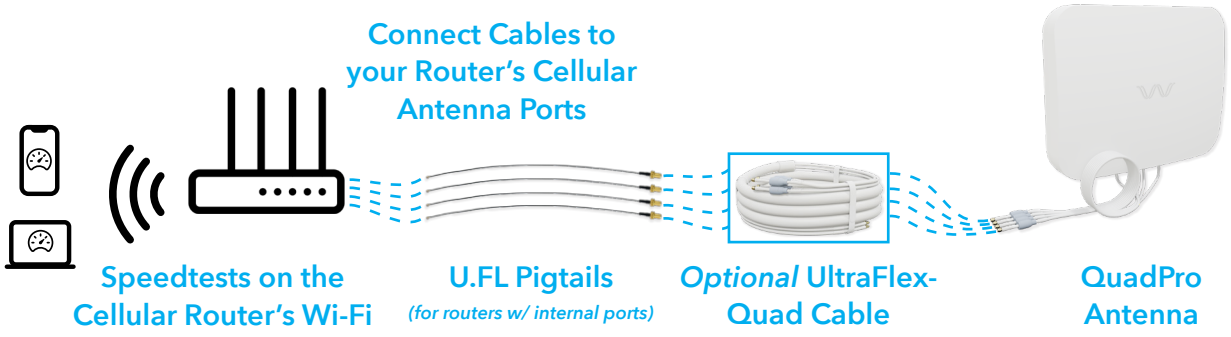
Your goal is to find the **best location and direction** for the QuadPro. Its position should **maximize the data rates** from your cellular router. It can take a little patience, but spending some extra time here can have a huge impact on performance - it's worth the extra effort.

1. Prepare your Test Setup

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

If so, **connect your QuadPro directly to your cellular router** (as shown below), restart your router, and take them both outside to start testing.





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 the QuadPro 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 the QuadPro outside.

Is holding your QuadPro difficult? Follow the FlexMount's **included or online manual at** waveform.com/flexmount-manual to attach it to your QuadPro and get a better grip.

Not sure which ports to connect to? Some cellular routers have both Wi-Fi and cellular antenna ports. Make sure to attach your QuadPro 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, or reach out to us for help if you're unsure.**

2. Get Ready to Perform Speed Tests

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

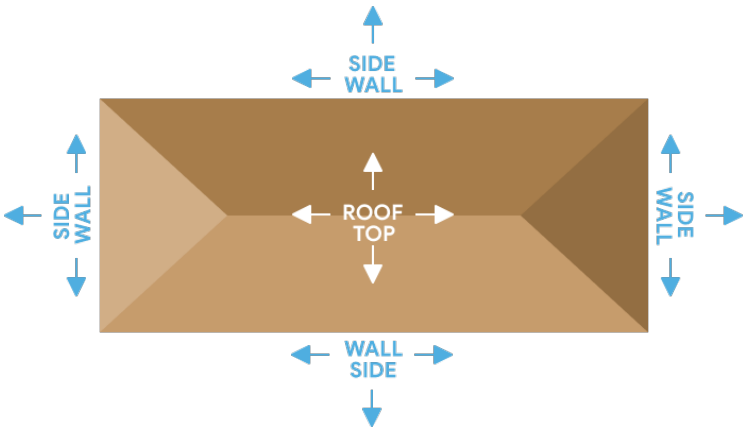
Once your test setup is ready and your testing phone or laptop is connected to your cellular router, **you'll have everything you need to start testing** at different positions outside.

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 QuadPro, 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 the QuadPro on the side of the building where antennas are better shielded from interference.

If you're running into issues, we'd love to help. Call **(800) 761-3041**, email **help@waveform.com**, or book a meeting at **waveform.com/meet** to **chat with a Waveform Signal Specialist**. We're available from 6am-5pm PT, Monday to Friday.

03 Connecting Your System

Once you've identified the best position for your QuadPro, 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 your QuadPro 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 QuadPro as a complete kit, follow the steps below to assemble and install your kit. If you only purchased the QuadPro, your assembly may look a little different.

Getting the Complete Kit Set Up

Refer to the diagram to the right as needed.

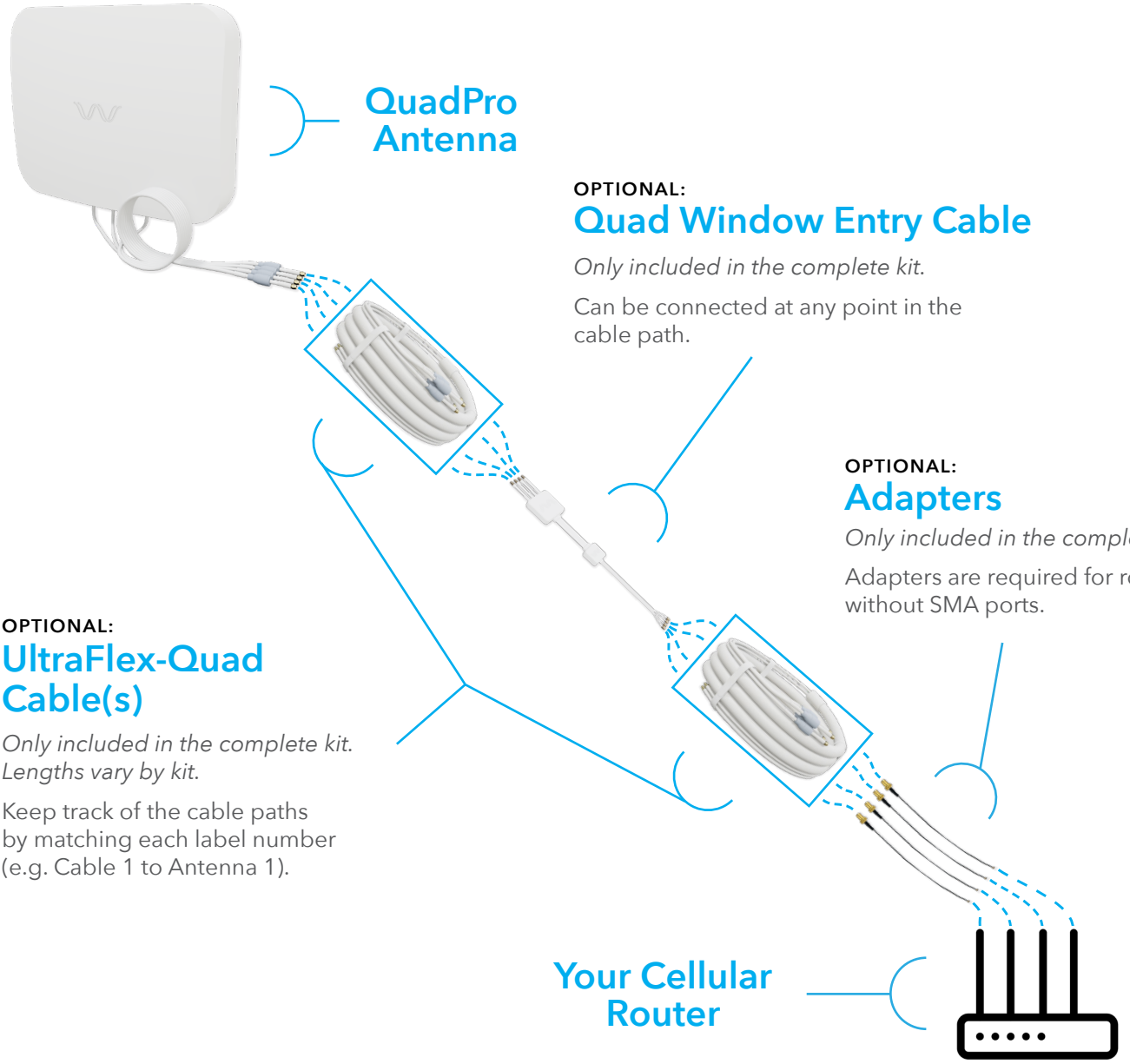
1. **Place your QuadPro** near the best position you found in section 2.
2. **Connect your QuadPro to your UltraFlex-Quad cable** and run the cable into your building.

   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 your QuadPro and/or UltraFlex-Quad cables**.
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.
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 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, or reach out to us for assistance.



QuadPro Antenna

OPTIONAL:

Quad Window Entry Cable

Only included in the complete kit.

Can be connected at any point in the cable path.

OPTIONAL:

Adapters

Only included in the complete kit.

Adapters are required for routers without SMA ports.

OPTIONAL:

UltraFlex-Quad Cable(s)

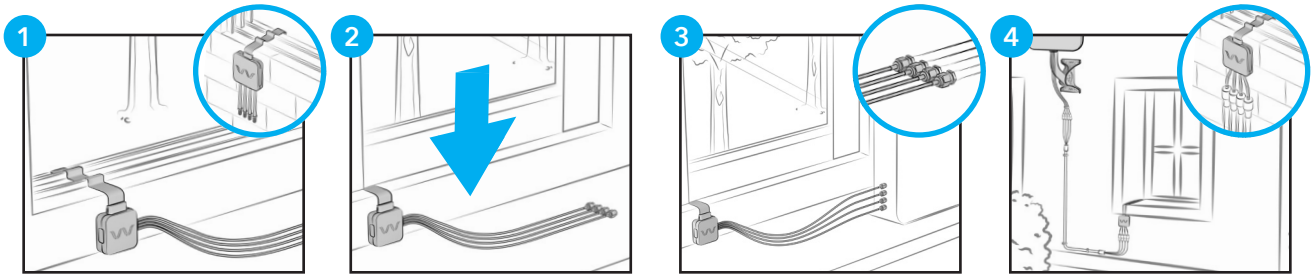
Only included in the complete kit. Lengths vary by kit.

Keep track of the cable paths by matching each label number (e.g. Cable 1 to Antenna 1).

Your Cellular Router

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



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 QuadPro or UltraFlex cable.

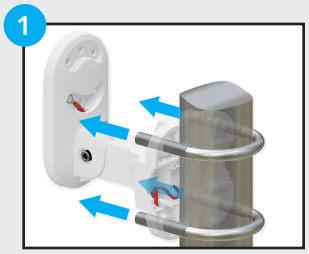
04 Mounting Your QuadPro

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

Your QuadPro, equipped with the FlexMount, can be **installed against a pole or directly onto the exterior of your building**.

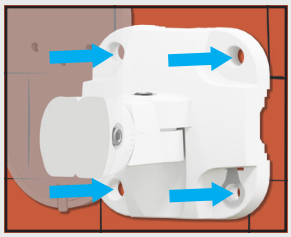
Mounting your QuadPro with the FlexMount

1



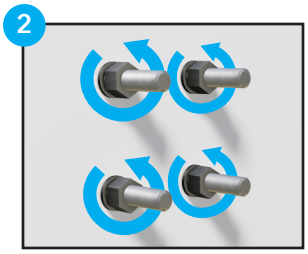
Secure the FlexMount to your pole using its **U-bolts**.

or



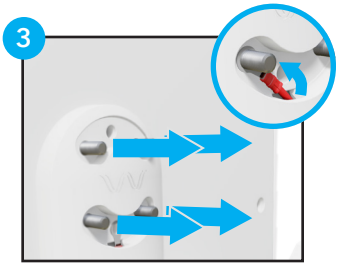
Secure the FlexMount to your wall using its **wall screws and anchors**.

2



Use the provided **socket wrench** to remove the installed **washers** and **nuts** from your **QuadPro.**

3



Place the **bolts** through your **FlexMount** , position the **ground cable**, 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, 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 for additional instructions on its assembly for your system.

Install Tips

- Mount the QuadPro 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 antenna 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.

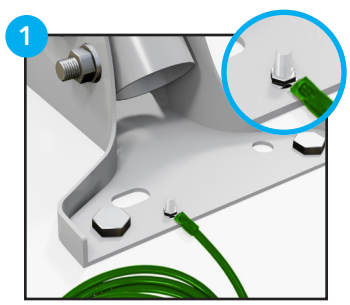
Weatherproofing Your Outdoor Connections

The QuadPro and UltraFlex-Quad cables 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!

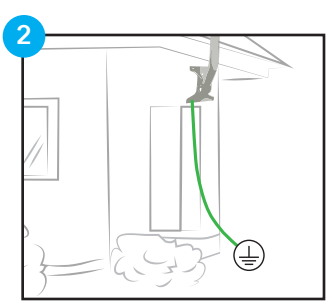
Grounding Your System

It's important to ground your FlexMount 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 10 AWG or lower gauge (thicker) grounding cable 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

06 Advanced Optimization

By this point, you should have a really solid understanding of how to position and aim your QuadPro and get great performance. In fact, **we're convinced that for 95% of people, the instructions provided in this manual so far are more than enough**.

If, however, you'd like to go a little deeper and get technical to optimize your system even further, here are some general guidelines.

1. **Look up your nearby towers** on cellmapper.net by performing a "Tower search" with the "eNB-ID" that your cellular router is connecting to. An eNB-ID is a unique cell tower identifier that can often be found in your cellular router's admin interface.

2. **Aim your QuadPro at each nearby tower.** Run speed tests for each tower to find the fastest bands, and compare speed tests. **If your cellular router also supports bandlocking**, band lock it to every band that the tower transmits, and run speed tests for each tower on each band to find your fastest band(s) and tower.

3. **Try enabling multiple bands** and using carrier aggregation to find the fastest band combination. Carrier aggregation is supported by most cellular routers and allows them to connect to two or more bands simultaneously. However, it doesn't always result in faster data speeds so stick to a single band if that gets you the best results.

Unfortunately, **many cellular routers don't support band locking or carrier aggregation**, and some don't list eNB-IDs or any other tower identifiers, making these steps impossible. Every cellular router is so different that we could never cover them all with just one set of instructions.

However, **we've written up guides for some of the most common devices**, you can find them online at waveform.com/hotspot-guides. We suggest reading our guide for your router, or referring to your user manual.

We're Here to Help!

We know, there's a lot of information out there and this can get very technical. If you're running into issues, aren't happy with the performance of your system, or you'd just like a hand, we'd love to help!

Call **(800) 761-3041**, email **help@waveform.com**, or book a meeting at waveform.com/meet to **chat with a Waveform Signal Specialist**. We're available from 6am-5pm PT, Mon to Fri.

07 Need Help with Adapters?

> **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 Have Line of Sight with Your Cell Tower?

If you have direct line of sight to your nearest cell tower, the four individual log periodic antennas in our 4x4 MIMO Log Periodic Antenna Kit may provide you with **superior performance over the QuadPro**:

» **For large buildings/hills/mountains/etc.**, you'd mount its four antennas horizontally side-by-side.

» **For large fields/plains/etc.**, you'd mount its four antennas vertically top-to-bottom.

4x4 MIMO Log Periodic Kit
waveform.com/4x4-LP-kit

09 Some Final Tips

> **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 rates 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 rates possible.

> **If data rates 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 rates get worse, try repositioning and reaiming your QuadPro to get the best results.

10 Tell Us How It Works

Did your installation go well? Are you having trouble positioning your QuadPro? Do you think our manual could be improved? Are your data rates not quite what you were hoping?

Please tell us: Call **(800) 761-3041**, email **help@waveform.com**, or book a meeting at waveform.com/meet to **chat with a Waveform Signal Specialist**. We're available 6am-5pm PT, Monday to Friday.

We're a small team who loves hearing how our products perform and helping folks get the absolute best data rates in any given situation. **So please, reach out!**

Two ways to get some money back!

Send us a video of your install and get $30

We want to feature videos of our customers who've had success with our QuadPro antenna.

Take a video that's at least 30 seconds long showing how you installed your 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 $30 via PayPal!

Get 5% back for each friend or neighbor you refer!

Hopefully by the time you've finished installing and tuning your QuadPro, 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 your QuadPro 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.

11 Your Data Rate Measurements

Use this table to make notes of your data rate measurements while you're positioning and aiming your QuadPro at the various positions described in section 2.

Important: each time you move to a new location, power cycle your cellular router so that it connects to the very best bands available.

Position	Download Speed	Upload Speed

WAVEFORM

Need help? We're ready and waiting.

MIMO Antennas, like the QuadPro, 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've installed hundreds of these devices ourselves, and can walk you through troubleshooting and fine-tuning your installation for best results.

Simply give us a call at **+1 (800) 761-3041**, email us at **help@waveform.com**, or book a meeting with our fanatical support team at **waveform.com/meet**. **We're available from 6am-5pm PT, Monday to Friday.**

We love helping solve tricky install problems.

v1.0.3

Designed by Waveform in California

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Santa Ana, CA 92704

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www.waveform.com
help@waveform.com