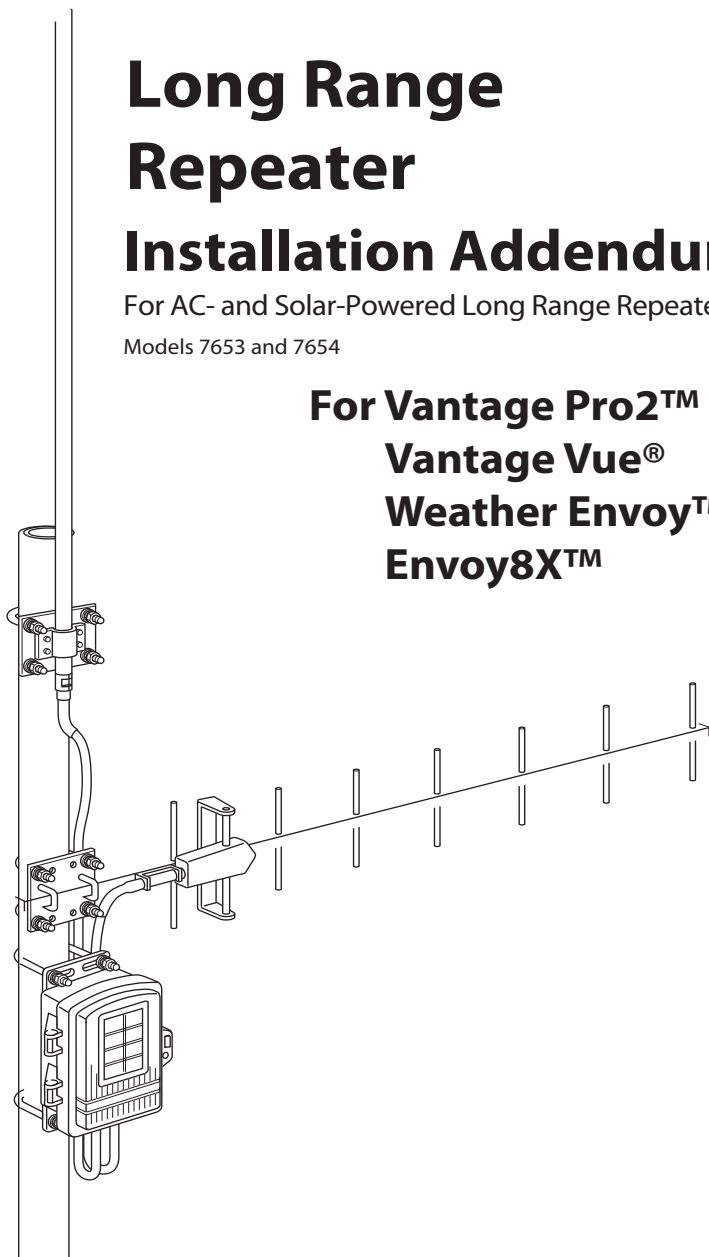


Long Range Repeater Installation Addendum

For AC- and Solar-Powered Long Range Repeaters
Models 7653 and 7654

For Vantage Pro2™
Vantage Vue®
Weather Envoy™
Envoy8X™



FCC Part 15 Class B Registration Warning

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modification not expressly approved in writing by Davis Instruments may void the warranty and void the user's authority to operate this equipment.

FCC ID: IRDWW765Y

IC: 3788A-765Y

EC EMC Compliance

This product complies with the essential protection requirements of the EC EMC Directive 2004/108/EC, as tested to the following directives:

- ETSI EN 300 220
- ETSI EN 301 489

This device has been designed to operate with an antenna having a maximum gain of 11 dBi. Antennas having a higher gain are strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms. To reduce potential radio interference to other users, the antenna type and its gain should be chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication.

Vantage Pro2™ Long Range Wireless Repeater Addendum

Rev. B, December 1, 2011

Document Part Number: 07395.258

For Vantage Pro2 Long Range Wireless Repeaters: 7653, 7654

Compatible with Vantage Pro2 Antennas: 7656, 7660

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Davis Instruments Quality Management System is ISO 9001 certified.

Information in this document subject to change without notice.



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Welcome!

The Long Range Repeater can be used with any wireless Vantage Pro2™ or Vantage Vue transmitting station to re-transmit to a Vantage Pro2 compatible receiver (Vantage Pro2 or Vantage Vue console; Weather Envoy or Envoy8X, or another Vantage Pro2 wireless receiver or repeater). The Long Range Repeater works in much the same way as the Vantage Pro2 wireless repeater, but extends the distance between a repeater and a receiver by up to 10 times that of the Vantage Pro2 wireless repeater (#7626/ 7627).

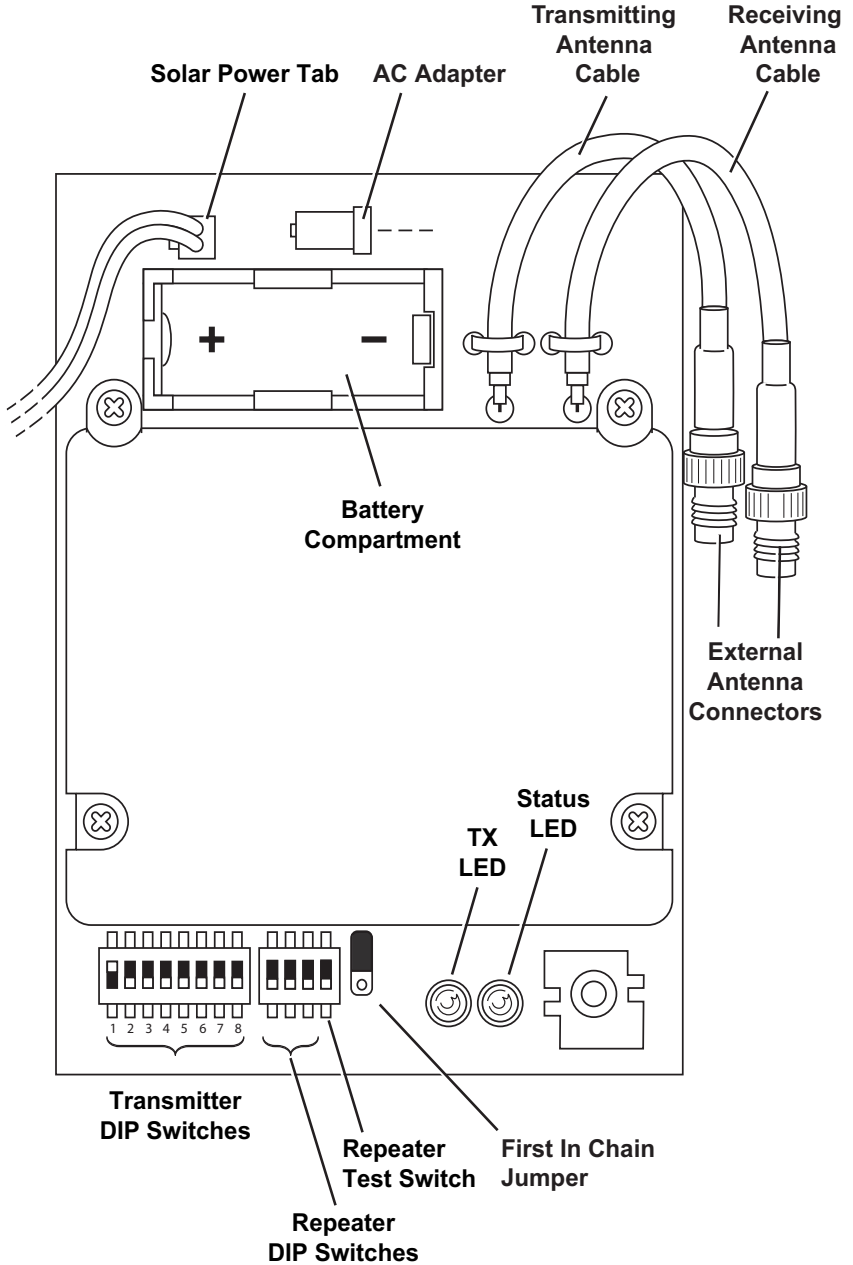
Long Repeater Addendum Overview

This addendum provides additional information specific to the installation and use of the Long Range Repeaters and is intended to be used in conjunction with the Wireless Repeater Installation Manual. The table below shows the location of the information required to install and maintain your Long Range Repeaters:

| Section/Procedure | This Addendum | Wireless Repeater Manual |
|--|----------------------|---------------------------------|
| Components and Hardware | | X |
| Repeater Board Contents | X | X |
| Additional Antenna Components and Hardware | X | |
| Tools for Setup | | X |
| Additional Tools for Setup | X | |
| Wireless Repeater Introduction | | X |
| Repeater Configurations/Architecture | | X |
| Long Range Repeater Antenna Configuration | X | |
| Applying Power | | X |
| Single Repeater Installation | | X |
| Advanced Repeater Installation | | X |
| Mounting Long Range Wireless Repeater and Antennas | X | |
| Connecting External Antennas to the Repeater | X | |
| Console and WeatherLink Configuration | | X |
| Repeater Communication Troubleshooting | | X |
| Long Range Repeater Specification | X | |

Repeater Board Contents

The board contained within the repeater enclosure has the following contents:



The components unique to the Long Range Repeater board are:

- **Transmitting Antenna Cable** — Connects the repeater to the external transmitting antenna.
- **Receiving Antenna Cable** — Connects the repeater to the external antenna receiving a station or repeater signal.

Additional Tools for Setup

In addition to the tools required for standard wireless repeater installation, the following additional tool is required to set up and install the long range repeater:

- 1/2" socket

Long Range Repeater Hardware

Each long range repeater requires two antennas, one for receiving a station or wireless repeater, and one for transmitting the data to another repeater or receiver. The two external antenna choices are:

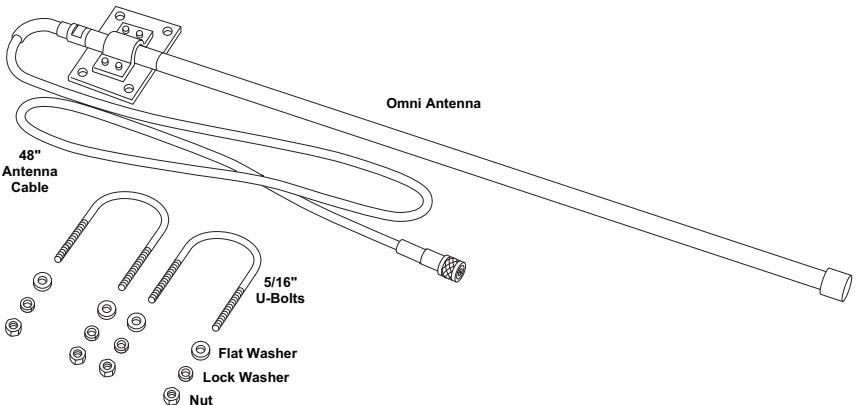
- Omni-direction
- Yagi (directional) antenna

You must purchase external antennas appropriate to your network architecture requirements

Note: Davis Instruments sells FCC Type approved antennas for the long range repeater. These antennas are available for US customers only. US customer must use these antennas. Overseas customers are responsible for procuring their own long range antennas for use with the long range wireless repeater that comply with local regulations. See "Specifications" on page 13 for more information.

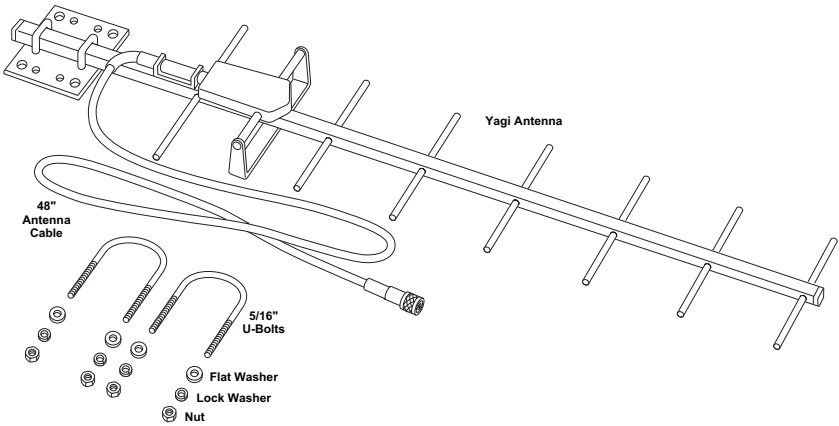
Omni-direction Antenna (#7656)

The omni-direction antenna includes the omni-directional antenna and mounting hardware:



Yagi (Directional) Antenna (#7660)

The Yagi antenna includes the directional antenna and mounting hardware:



Antenna Uses

The Omni and Yagi antennas transmit and receive with two different radiation patterns.

External Antenna Radiation Patterns

(Top View)

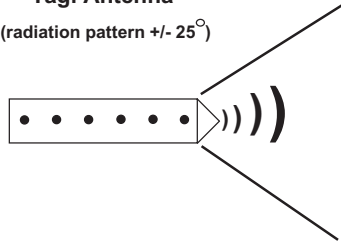
Omni-Direction Antenna

(radiation pattern 360°)



Yagi Antenna

(radiation pattern $\pm 25^{\circ}$)



The long range omni antenna transmits and receives data using the same radiation pattern as a standard Vantage Pro2 dipole antenna. The Yagi antenna transmits and receives data packets in a 50° beam of the front of the Yagi antenna. The antenna is limited in the angle and direction it can transmit and receive packets, but it increases the distance between station, repeater, and receiver proportionally.

All wireless Davis Instruments stations and standard wireless repeaters come equipped with standard dipole antennas that have an omni-directional radiation pattern.

To determine which antenna or antenna combination is needed for your network:

- Use an omni antenna if receiving or transmitting in multiple directions.
- Use a Yagi antenna if receiving from or transmitting to stations within a 50° angle of the antenna.

Note: The best Yagi antenna performance is always achieved by pointing the antenna directly at the antenna at the other end of the link

Antenna Ranges

Each antenna type in a repeater network varies in the distances it can receive and transmit data. For instance, the dipole antenna on an ISS station transmitting to a dipole antenna on a console is limited to 1000'. A dipole transmitting to an external omni antenna lengthens the distance to 1580', because the distance can now be 1.58 times greater between an omni antenna and a standard dipole than it could with two standard dipole antennas. The range multiplier table below displays the exact multiplier distance you should use to determine the antenna distances and which antennas would best suit the needs and distances in your network:

| Antenna Type | Multiplier |
|--------------|------------|
| Dipole | 1 |
| Omni | 1.58 |
| Yagi | 3.16 |

Use the following multiplier matrix to determine the antenna relationship(s) that will best suit the needs of your weather station network:

| | Dipole | Omni | Yagi | Total Multiplier | Total Distance |
|---------------|--------|------|------|------------------|-----------------|
| Dipole | X | | | 1 | 1000' (300 m) |
| Dipole | | X | | 1.58 | 1580' (480 m) |
| Dipole | | | X | 3.16 | 3160' (960 m) |
| Omni | | X | | 2.5 | 2500' (762 m) |
| Omni | | | X | 5 | 5000' (1542 m) |
| Yagi | | | X | 10 | 10000' (3048 m) |

Antenna Configurations

Given the various antenna types and their various distance and range reputations, it important to explore the types of antenna configurations and how they could impact a weather network.

The legend below describes the antenna types and how they will be represented in a sample antenna configuration:

Antenna Topology Legend

Antenna Symbol

Antenna Type



**Vantage Pro2 or
Vantage Vue
Console**



**Weather
Envoy or
Envoy8X**



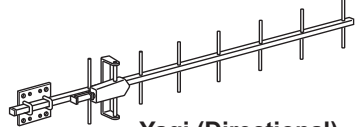
**Vantage Pro2
Wireless
Repeater**



**Any
Vantage Pro2
or Vantage Vue
Transmitter**



**Omni-directional
Long Range
Repeater Antenna**



**Yagi (Directional)
Long Range
Repeater Antenna**

The first symbol represents any station/receiver/repeater with a normal dipole or long range omni antenna. The second symbol represents the long range Yagi antenna.

The diagram on the next page contains all the long range external antenna configurations available for a network. In this example, there are four repeaters, each with a unique station-to-repeater or repeater-to-repeater antenna relationship.

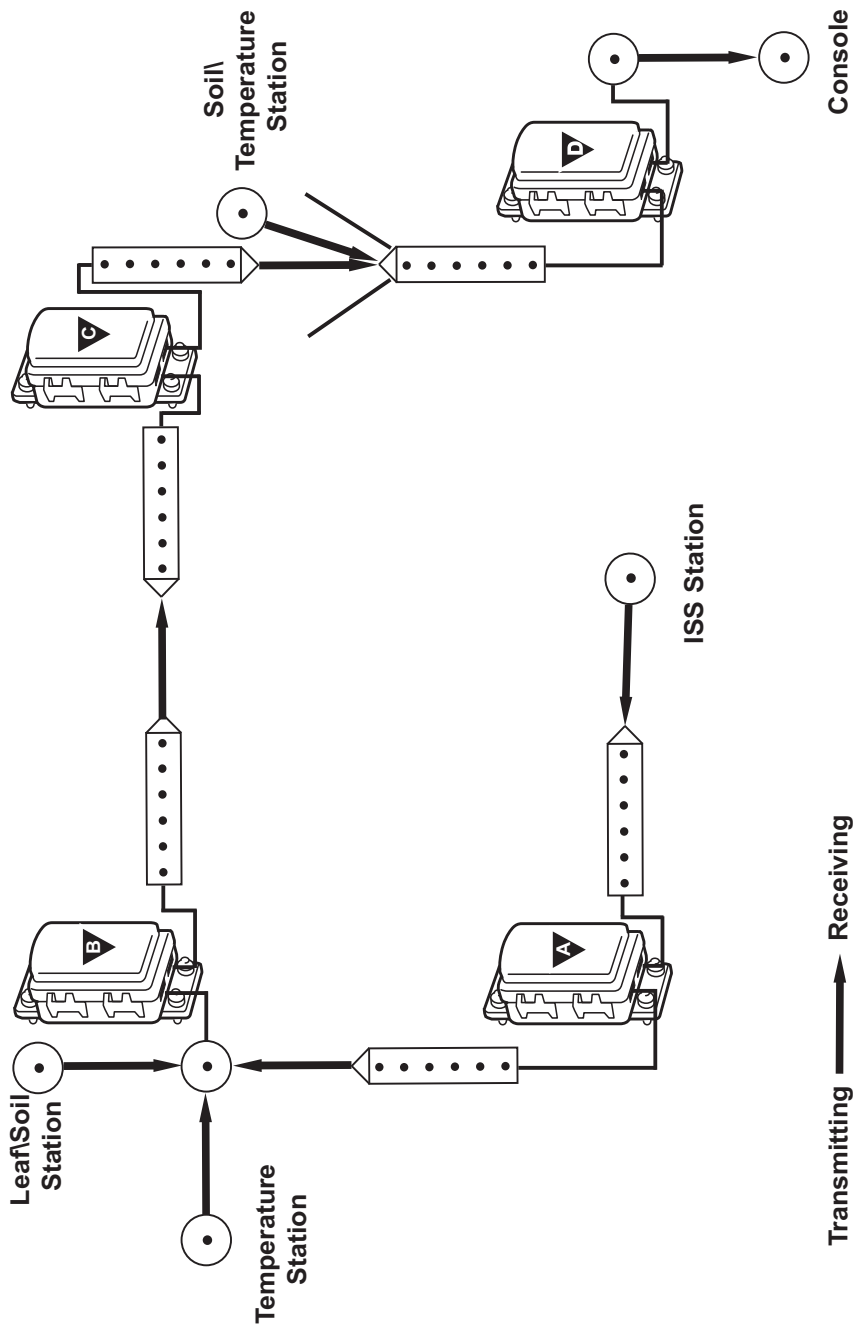
Repeater A has two Yagi antennas, the first antenna receiving data packets from an ISS station with the standard dipole omni antenna. The transmitting Yagi antenna is sending the data packets to Repeater B.

The receiving antenna on Repeater B is an omni antenna, that is collecting data from not only repeater A, but also from two other stations in different directions. The transmitting Yagi antenna is in direct line to the Yagi antenna on Repeater C.

The transmitting antenna on Repeater C is also a Yagi antenna. Repeater C is also sharing a line of sight to Repeater D's receiving Yagi antenna with another station. The omni transmitting antenna on Repeater D is in range of the console.

Decide which configuration or multiple antenna configurations works best for your network before mounting and installing your long range wireless repeaters.

Representative Antenna Configurations



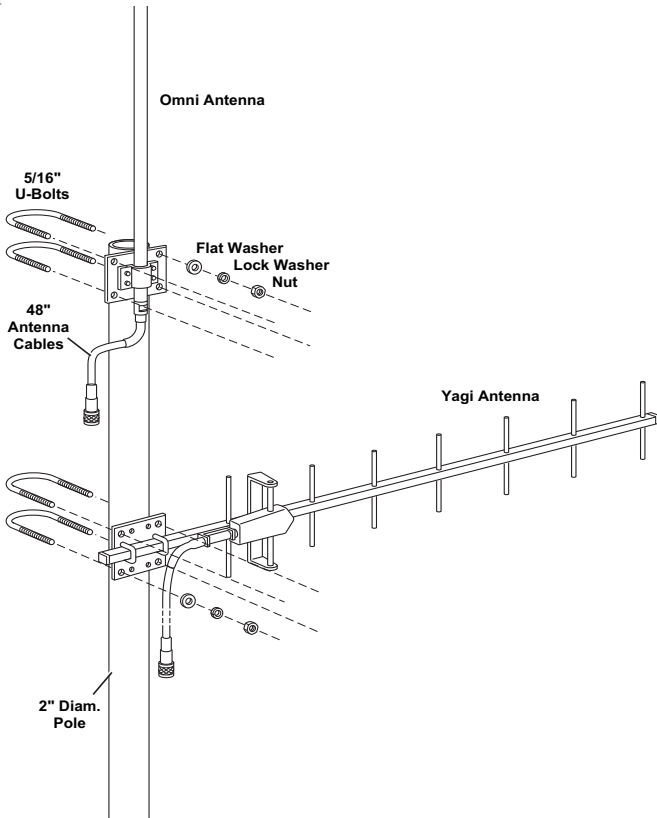
Mounting the Repeater and External Antennas

The antenna configuration and wireless repeater can be mounted on a pole at a designated location. Use the provided U-bolts for the wireless repeater and the U-bolts provided for each antenna type to install them all to a pole.

Note: To accommodate your antenna configuration (omni and Yagi or Yagi and Yagi), mount the antennas first before mounting the wireless repeater enclosure.

Omni and Yagi Antenna Combination Assembly

The omni and Yagi combination assembly should be performed from the bottom antenna (Yagi) up to the top antenna (Omni) so that the omni antenna can be installed flush to the top of the pole.



1. Place the Yagi on the pole in the general vicinity of the desired station/repeater/receiver.
2. Place a U-bolt around the pole and through the two holes at the top and of the antenna plate.
3. Place a flat washer, a lock washer and a hex nut on each of the bolt ends.

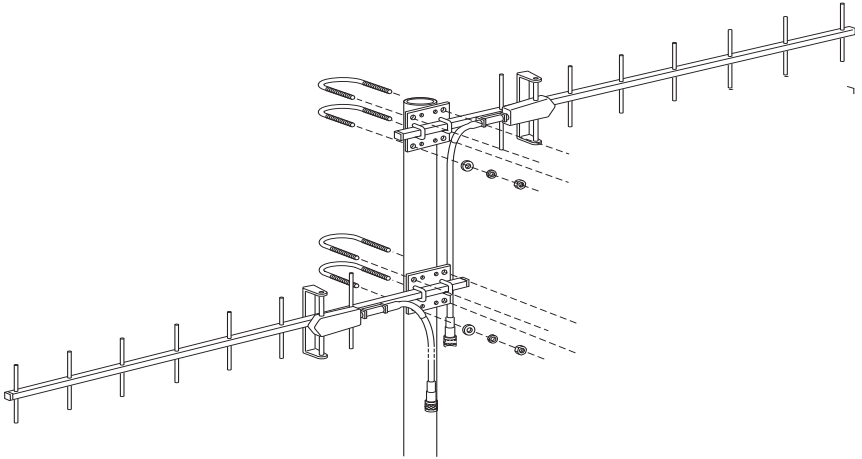
-
- Using an adjustable wrench or 1/2" wrench, tighten the nuts.
 - Place the second U-bolt around the pole and through the two holes at the bottom of the shelter.
 - Put a flat washer, a lock washer, and a hex nut on each bolt end, and tighten the hex nuts so that the Yagi remains in place, but can still be adjusted.
 - Rotate the Yagi so that it points to the desired station/repeater/receiver.
 - Tighten the hex nuts so that the Yagi is firmly attached.
 - Place the omni antenna a distance above the Yagi antenna, providing space between the mounted antennas.

Ideally, omni antenna should be mounted flush with the very top of the pole, so that the pole does not interfere with the antenna's communication.

- While holding the omni antenna against the pole, place a U-bolt around the pole and through the two holes at the top and of the antenna plate.
- Place a flat washer, a lock washer and a hex nut on each of the bolt ends.
- Using an adjustable wrench or 1/2" wrench, tighten the nuts.
- Place the second U-bolt around the pole and through the two holes at the bottom of the shelter.

Two Yagi Antenna Combination Assembly

The Yagi and Yagi assembly should be performed from the bottom antenna (Yagi) up to the top antenna (Yagi) so that the Yagi antenna can be installed flush to the top of the pole.



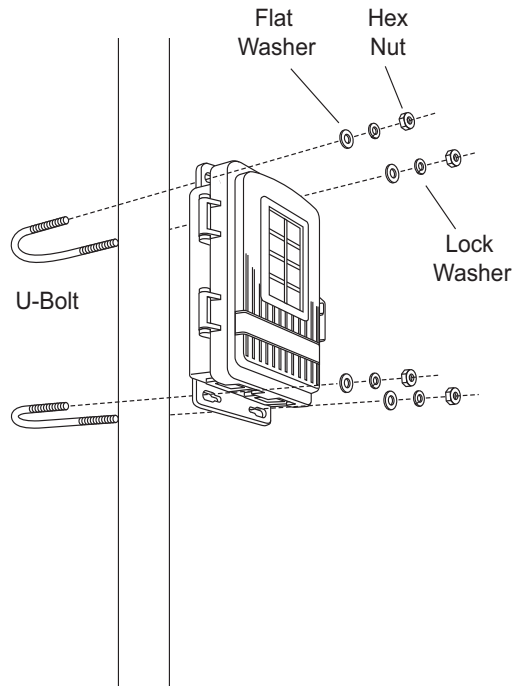
- Place the Yagi on the pole in the general vicinity of the desired station/repeater/receiver.
- Place a U-bolt around the pole and through the two holes at the top and of the antenna plate.
- Place a flat washer, a lock washer and a hex nut on each of the bolt ends.

4. Using an adjustable wrench or 1/2" wrench, tighten the nuts.
5. Place the second U-bolt around the pole and through the two holes at the bottom of the shelter.
6. Put a flat washer, a lock washer, and a hex nut on each bolt end, and tighten the hex nuts so that the Yagi remains in place, but can still be adjusted.
7. Rotate the Yagi so that it points to the desired station/repeater/receiver.
8. Tighten the hex nuts so that the Yagi is firmly attached.
9. Rotate the second Yagi so that it points to the desired station/repeater/receiver.
10. While holding the Yagi antenna in the correct alignment against the pole, place a U-bolt around the pole and through the two holes at the top and of the antenna plate.
11. Place a flat washer, a lock washer and a hex nut on each of the bolt ends.
12. Using an adjustable wrench or 1/2" wrench, tighten the nuts.
13. Place the second U-bolt around the pole and through the two holes at the bottom of the shelter.

Installing a Repeater on a Pole

Refer to the following illustrations to install the repeater and antennas on a pole:

1. Place the repeater enclosure on the pole somewhere below the antennas that makes it easy for the antenna cables to be routed around. It should be below the second antenna.
2. Mount a repeater enclosure so that the solar panel receives the maximum amount of sunshine available at that location.
3. While holding the shelter against the pole close to the bottom, place a U-bolt around the pole and through the two holes on at the top of the shelter.
4. Place a flat washer, a lock washer and a hex nut on each of the bolt ends.
5. Using an adjustable wrench or 7/16" wrench, tighten the nuts.
6. Place the second U-bolt around the pole and through the two holes at the bottom of the shelter.
7. Put a flat washer, a lock washer, and a hex nut on each bolt end, and tighten the hex nuts.



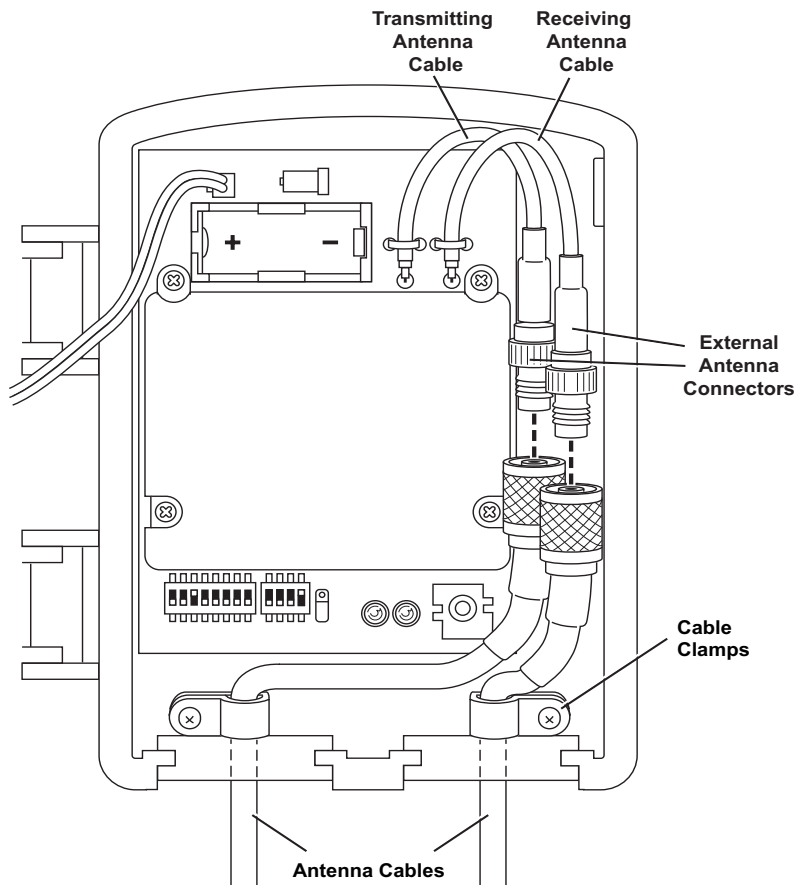
Connecting External Antennas to the Repeater

Once the repeater, and both external antennas have been attached to a pole and positioned, the antennas should be attached to the respective antenna cables in the wireless repeater enclosure. To do this:

1. Thread each antenna cable into the individual black cable grommets at the bottom of the shelter to provide weather-resistant entrances for cables. Make sure that there is one antenna cable per grommet.

For identification purposes, the transmitting antenna cable should be threaded through the grommet on the left side and the receiving cable on the right side to align with the antenna cable connectors on the repeater board.

2. Unscrew the cable clamps and thread each antenna cable through.



3. Connect the transmitting antenna cable to the transmitting repeater connector.
4. Connect the receiving antenna cable to the receiving repeater connector.
5. Once all the antennas are mounted and connected to the repeater, test communication.

Specifications

Complete specifications for all of the Vantage Pro2 weather products as well as the wireless repeater are available in the Weather Support section of our website:

<http://www.davisnet.com/support/weather/>

General

Operating Temperature -40 to 150° Fahrenheit (-40 to 65° Celsius)

Non-Operating Temperature -40 to 150° Fahrenheit (-40 to 65° Celsius)

Current Draw 1.5 mA at 4-6 VDC (average draw when not in Test Mode)

Batteries CR 123A 3-volt lithium battery

Battery Life Estimates (with no solar or AC power input):

| # of IDs* | Estimated Life Expectancy (Months) |
|-----------|------------------------------------|
| 1 | 4 |
| 4 | 1.5 |
| 8 | <1 |

**Both received directly by the repeater and those IDs repeated from the previous repeater in a chain.*

Note: Battery life in excess of two years is expected with normal solar input.

Solar Panel 0.5 Watts

Alternate Power AC power adapter

Housing Material UV-resistant PVC plastic

Dimensions 6.25" x 2.25" x 7.88" (159 mm x 57 mm x 200 mm)

Weight 1.188 lb. (.539 kg)

Transmit Interval

Repeater Transmit Interval 2.5625 - 3.0000 per ID

Wireless Communication (US models)

Transmit/Receive Frequency 902-928 MHz FHSS

ID Codes Available 8

Output Power 902-928 MHz FHSS: FCC-certified low power,
less than 8 mW, no license required

| Type | Gain |
|---------------------------------|--------|
| Omnidirectional Antenna (#7656) | 5 dBi |
| Yagi Antenna (#7660) | 11 dBi |

Range

Line of Sight up to 2 miles (3 km)

Wireless Communication (OV, EU, UK models)Transmit/Receive Frequency 868.0 - 868.6 MHz FHSS (Frequency Hopping
Spread Spectrum)

ID Codes Available 8

Output Power 868.0 - 868.6 MHz FHSS. CE-certified, less than
8 mW, no license required. Antenna gain can not
exceed 8 dBi maximum and no more than four
transmitter IDs to comply with the EN 300 220
regulation.

Range

Line of Sight up to 1.5 km (5000')