



*We make your luggage light, and your signal strong!*

# Aerial-51 Model 807-xx

## Asymmetrically-Fed, Inverted-V/Dipole

### *Current-Sum-Antenna*

80/40/30\*/20/17/15/12/10/6m

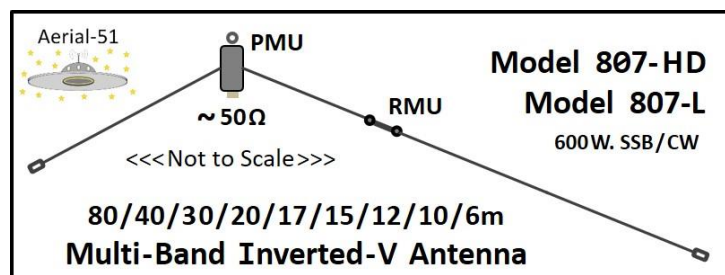
600 Watts SSB/CW

\*150 Watts on 30m

### User Manual (Ver. 1.0p)

- **807-HD** (Heavy Duty)
- **807-L** (Lightweight Portable)

(preliminary manual)



*Simple, Effective, & Reliable*

## A Multi-Band Current-Sum Antenna

*An intelligent choice for traveling and portable radio operators demanding high performance from a simple, lightweight antenna.*

This user manual describes Spiderbeam's Aerial-51 Model 807-L and 807-HD OCFD antennas. More information will be posted on the Aerial-51 web site as it becomes available. See: [www.aerial-51.com](http://www.aerial-51.com)

**HISTORY:** In his book entitled *Windom- und Stromsummen-Antennen*, Karl H. Hille, DL1VU (SK) described a different approach to designing Windom antennas. He called it "Stromsummen-Antennen", which literally translated into English means "Current Summation Antenna" or simply *Current-Sum-Antenna*.

Whereas the original concept of the Windom antenna was focused on eliminating standing waves on the single-wire feedline and had no focus (at all) on its multi-band ability, the modern definition of the Windom, better referred to as **Off-Center-Fed Dipole (OCFD)** is a *coaxial-fed antenna, fed at a point where the impedances of all of the bands intended to be covered are equal*.

The **Current-Sum Antenna** differs from this concept. Rather than focusing on equal impedances on all bands, it examines the magnitude of the current flowing at the feedpoint of the antenna for all of the bands that it is intended to cover and finds the point at which *the sum of all currents is maximum*.

This results in a feedpoint impedance on *all* of the desired bands which is *within the range* required by modern transmitters. Even if a band happens to be slightly outside of this range, as long as the SWR is not too high (i.e. less than 4:1) the antenna will still be an efficient radiator on that band and just need matching on with a simple antenna matchbox (i.e. the transceiver's own built-in ATU).

This concept maximizes the number of bands that can be covered by a single wire radiator, without using multiple wires or heavy, lossy traps. The result is a low profile (i.e. *stealthy*) antennas with minimum impact on the neighbors' critical eyes.

More important, by making intelligent decisions on the choices of material, it is possible to build a super-lightweight antenna that covers many bands.

### **Super-Lightweight enables Super Performance.**

By keeping our wire antennas as light as possible, we are able to erect them much higher on lightweight portable telescoping fiberglass poles, resulting in a lower angle of radiation, which is good for DX, and lower ground losses.

### **With horizontal wire antennas, HEIGHT = MIGHT!**

The Aerial-51 Model 807-HD and 807-L combine the Current-Sum-Antenna concept with today's modern lightweight material to produce a unique multiband antenna capable of excellent performance when mounted high in the air (i.e. on a tall, lightweight Spiderbeam fiberglass pole). If you follow the instructions in this manual for erecting the antenna, it will give you many years of excellent and reliable service.

**Model Differences:**

Electrically, both antennas are identical.

**Model 807-HD:** This **Heavy Duty version** is considered the standard version of the 807 and is better suited for permanent installations, especially in areas that are prone to snow, ice, or heavy winds. The 807-HD uses a heavier wire (CQ-532) than the 807-L. In addition, its RMU is potted with 2-component Epoxy. This prohibits the buildup of condense water inside. It also adds weight. Its thicker wire (18-AWG) has a slightly higher velocity factor (vf), thus this version is 20cm (8in.) longer than the portable version.

Spiderbeam's 18m telescoping fiberglass pole is the ideal companion for this antenna, albeit you should only use the lower 9 sections of the pole, leaving the top 3 pole sections off. This places the feedpoint at about 13m (43ft.) height

**Model 807-L:** This **Lightweight** version is also known as the **Portable version** of the 807. Keeping in mind that *height = might*, and that travelers, especially those traveling by air are conscience of size and weight, this model was designed to be usable with Spiderbeam's popular 12m telescoping fiberglass pole. Again, the top two segments should not be used.

To save on weight, thinner wire (CQ-532/26-AWG) was used. In addition, the RMU was not potted with Epoxy. Instead, two small drainage holes were drilled in its bottom and covered with a fiberglass mesh to keep bugs (i.e., Spiders) out.

**CONTENTS: WHAT'S IN THE BAG?**

- 1x Primary Matching Unit (PMU) with the short leg (~12m long wire) of the antenna attached to one side, and the first ~8 meters of wire of the long leg attached to the other side.
- 1x Outer ~20m of wire of the long leg.
- 1x Remote Matching Unit (RMU) with stainless steel hardware consisting of a screw, washer, and crown nut attached to each of its ends.
- 1x Tiny plastic bag with a spare set of stainless steel hardware.
- 1x User Manual

**ASSEMBLY:** The antenna comes partially assembled and final assembly is very simple: Using a plain screwdriver and an 8mm wrench or a pair of pliers, simply fasten one end of the RMU to the short segment of the long leg, and the other end of the RMU to the long segment of the long leg.

**CAUTION:** **be sure all pieces are aligned in a straight line.**

**INSTALLATION: Height is Might.** Always strive to mount the antenna with its feedpoint as high in the air as possible. It goes without saying that antennas work much better when mounted free and in the clear of buildings or obstacles than they do when mounted in between houses, cars, etc.

**CAUTION:** The PMU (balun box) should always be supported by a pole or tree limb.

The two legs of the antenna can then be spanned to any elevated object with a little bit of slack (or droop), which eliminates the stress applied to the wires when strung as a flat-top between two poles or trees. This is especially true for the Portable version (807-L). It also helps assure long life for the antenna.

**COAX:** The 807-L does not come with any coax. It has a standard SO-239 UHF coax connector at its PMU. If the antenna is supported by a steel tower or mast, use any coax you want. If it is to be supported by a lightweight fiberglass pole, care should be taken in the choice of coax. RG-58 will suffice for the power rating of this antenna. Better yet (though only slightly) is any of the modern coax cables such as AIRCAIL5, LMR-240, RG8x, etc.

**LENGTH OF COAX:** The 807-L/-HD is not dependent on any particular length of coax to operate on all bands. However keep in mind the concept of this antenna, specifically that it is designed to have a good match on all bands it covers, *but not a perfect match* – that is impossible!

Any time the match between the coax and the feedpoint is not perfect, transmission line transformation will occur, so the impedance (and SWR) in the shack can vary slightly with coax length, especially on the higher bands.

Though the length is normally not critical, occasionally you may happen to use a specific length that cause slightly higher SWR than you like on one of the higher bands. In that case, insert another 2 or 3 meters of coax and the problem should go away.

**RUNNING THE COAX:** When installing the antenna on a lightweight fiberglass pole, do not attempt to run the coax horizontally or even diagonally away from the feedpoint. This may damage or even break the upper section of the pole. Instead, run the coax down the pole, spiraling it about one turn per meter around the pole as it descends. This keeps the load on the pole balanced and reduces coax flapping in the wind. Once you reach a lower point where the pole diameter is sufficient and has enough strength, you may then run the coax horizontally away from the pole. Near a guy point is a good place to do this.

### **HOW HIGH SHOULD THE ENDS BE OFF THE GROUND?**

Even if we had an answer to that question, it is not always possible to install it like we suggest. Changing the height of the feedpoint or the ends of the antenna also changes the radiation pattern slightly but you have to change it quite a lot to make any significant change in pattern (or SWR).

Keep in mind that the radiation pattern of this antenna only resembles that of a dipole when the antenna is used on its fundamental frequency. The higher bands radiate multiple lobes and these all move slightly when varying the height of the ends. Describing this change is beyond the scope of this manual.

For operation in remote locations, such as sandy or rocky beaches where there are no trees, simply connect a long and very thin rope or string to the wire ends and run them to ground stakes as far away as you can. For this you may use 1mm Kevlar or PVDF Monofil (from Spiderbeam), or even a heavy kite string.

**Do not use kite string for permanent installations.** However, you may do so for temporary, portable installations.

**CAUTION: DANGEROUS HIGH VOLTAGE ON THE WIRES!**

**Always assure that the wire portion of the antenna is at least 2.5m (8 ft.) above the ground . . . to prevent humans or animals from coming into contact with the wire.**

**MAINTENANCE:** If the recent portable operation was on a beach near salt water, it is a good idea to rinse the entire antenna once you get it home. For the 807-HD, you can easily do this in a bath tub or a shower. The 807-L has two drainage holes in its bottom, so it should not be submerged in the bathtub. Use the shower and keep the bottom (with the SO-239 coax jack) facing down.

Pay particular attention to the stainless-steel hardware that fastens the RMU to the supporting mast. Although the eye-bolt is of stainless steel, it is V2A stainless, not V4A. V4A is resistant to salt water, V2A is not – thus it can rust if exposed to saltwater for longer periods of time.

**TYPICAL SWR CURVES:** are available on the Aerial-51 web site and will become available on the Spiderbeam web site. They are also shown in the 807-xx brochure (download here: <https://www.aerial-51.com/model-807-xx/807-l-brochure/>).

**However, keep in mind that these are only “typical” examples.** The exact SWR will vary slightly from one location to another and also as a function of height of the PMU and ends of the antenna.

**POWER RATING:** Because of the goal of keeping all components of the antenna as lightweight as possible, individual components were chosen (with a small safety factor) to meet the specific power ratings of the antenna.

**RUNNING EXCESSIVE POWER WILL DAMAGE THE PMU AND RMU.**

**CAUTION: On bands for which the antenna was not designed to work (i.e. 30m and 60m), even 150 Watts can be near the safety limit of the antenna’s components.**

**DO NOT IGNORE THE CAUTION FOR THESE TWO BANDS.**

**SPECIAL FEATURES**

**REMOTE MATCHING UNIT:** Although Windom, OCFD, and Current Sum antennas are touted to be “harmonic-antennas”, meaning besides working on their fundamental band, they also work on their harmonic bands, keep in mind that they are not *exactly* harmonically related. This is primarily due to end-effect that affects each band differently.

**Common Mode Current (CMC)** is a nasty by-product of antennas fed off center and a significant amount of choking is necessary to tame them. If not tamed properly, the result is a distortion of the apparent resonant frequency on the fundamental band. Indeed, most other commercial OCFD antennas suffer from this problem. As a result, when their SWR is good on the harmonic bands, it also “appears” to be good on the fundamental band – but it’s not. It only appears to be good. With a good enough

balun, the antenna will be resonant just below the lower portion of the fundamental band. Otherwise it would be resonant above the band on higher harmonic bands. Shortening of the wires to bring it in-band on 80m results in resonance on the higher bands being too high or even out of band. **DO NOT ATTEMPT TO ADJUST THE WIRES.**

**The Solution: RMU.** The RMU is a passive device strategically placed in the longer leg of the antenna to achieve resonance where you want it. Eventually we will provide different RMUs with different resonant frequencies and these are field replaceable.

**HALF-SIZE ANTENNA:** By carefully selecting the position of the RMU, slightly off-center, we were able to find a length such that removal of the RMU and extension wire results in a half size antenna that works great on 4 bands and good on another 3 bands.

**To configure the antenna for half-size operation,** simply remove the RMU and outer 20m of wire, insert a medium-size wire-tie in the screw hole of the remaining short wire, and use it as an insulator.

On day trips you might not need 80m; just leave off half of the wire. If your holiday destination does not have enough space for a full size 80m antenna, ***remove half of the wire and still run it on 7 bands!***

**This flexible “2-in-ONE” feature is unique in the industry!**

**The Windom is DEAD (and rightly so).**

**The OCFD had its day; now: *LONG LIVE THE CURRENT SUM ANTENNA.***

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## **TRANSCEIVER CONSIDERATIONS:**

Transceivers come in many different varieties. Some can cope with much higher SWR than others. Some begin folding back power when the SWR is 1.7:1 or higher. Others can deliver full power with 3:1 SWR.

Some transceivers have built in antenna match boxes (antenna tuners / ATU). Others do not. Some ATU's match up to 10:1 SWR, most match up to 5:1 SWR, a few match only up to 3:1 SWR.

It is **impossible** to say whether “your” transceiver will run full power on all bands or not. This depends on the make and model of your transceiver, and the capability of its built-in ATU.

Most transceivers with a built-in tuner can easily lower the 807-xx's SWR to nearly 1:1 on all bands, except maybe 30m. Many will even match it on 30m. If your transceiver fails to match the antenna on 30m, you will need to use an external tuner with a wider tuning range.

**INSTALLATION TIPS:**

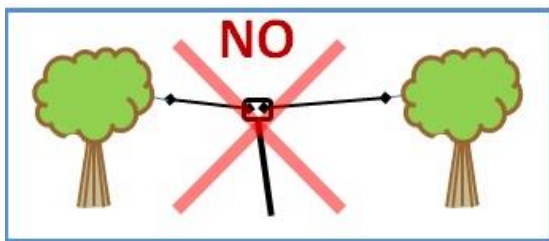
The 807-xx was designed to have its Feedpoint (RMU) and coax supported by a mast or tree below.

*Especially the “-L” (portable) version must NOT be strung between two trees.*

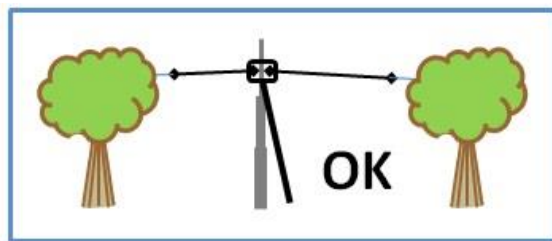
**Installation Alternatives:**

Most people install these antennas as a “Lazy Inverted-V”, with the feedpoint supported by a mast or tree and the ends drooping slightly to remote supports.

The antenna may also be installed as a flat top dipole, but the feedpoint and coax should still be supported by a pole or tree; the wires should be hung slightly drooping. Otherwise the tension on the wire might break it.



Too much tension on the wires.



Wires loosely supported by trees.

**MORE INFORMATION:** <https://www.aerial-51.com/model-807-xx/>

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