

MFJ-2990 43-Foot Self-Supporting Vertical Antenna

INTRODUCTION

The MFJ-2990 is a 43-foot self-supporting vertical antenna that covers 160-6 meters with the use of an wide range antenna tuner. Because the top 9-foot section of the antenna consists of a 1/8" diameter stainless steel whip, the MFJ-2990 has the lowest wind-loading and has the least visual impact of any 43-foot vertical antenna on the market.

The MFJ-2990 is built-to-last – using incredibly strong 6063 T-6 aircraft strength aluminum tubing for the radiator and all stainless steel hose clamps and hardware. And it assembles in about an hour.

WARNING: Improper installation and assembly can be hazardous! Read these instructions thoroughly before attempting to assemble, install or operate this product! High power transmitting devices produce voltages that can cause severe burns or other injuries.

SPECIFICATIONS

Electrical Specifications

Band Coverage: 160-6 Meters with external antenna tuner
Power Rating: 1500 watts CW/SSB

Mechanical Specifications

Antenna Diameter 2"OD bottom section, 1/8" stainless steel whip top section
Overall Length: 43 feet
Weight: 20 pounds
Wind Load: 2 square feet


CHOOSING A LOCATION FOR THE ANTENNA

For best performance, mount the antenna in a clear location away from buildings, towers, feedlines, utility wires, and other antennas.

- **Never** mount this antenna in a location that will permit unsuspecting people to come in contact with any part of the antenna.
- **Never** mount this antenna where a mechanical failure might allow the antenna to contact power lines or other utility wires.
- **Always** ground the feedline to a good earth ground at the point where it enters a building for lightning protection.

WARNING: Contact with the antenna during operation can result in severe RF burns.

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Permanent Installation

The ideal installation location is a rigid pole set in concrete.

Portable Operation

The MFJ-2990 may be disassembled as necessary for transporting to a temporary location. Even for temporary or portable operation, do not be casual about mounting integrity. If the antenna falls, it will be damaged and may cause serious injury. Whatever type of installation you choose, remember that the antenna should be installed where it cannot be contacted by people or animals or come in contact with power lines.

MFJ-2990 PARTS LIST

As you unpack your antenna, verify that the following parts are supplied:

<u>Item</u>	<u>Part Description</u>	<u>QTY</u>	<u>Part No.</u>
1	2" OD x 0.12" x 6' AL Slotted Tube	1	810-2000I-6S
2	1.75"ODx0.058"x6' AL Slotted Tube	1	810-1750G-6S
3	1.625"ODx0.058"x6' AL Slotted Tube	1	810-1625E-6S
4	1.50"ODx0.058"x6' AL Slotted Tube	1	810-1500E-6S
5	1.375"ODx0.058"x6' AL Slotted Tube	1	810-1375E-6S
6	1.25"ODx0.058"x6' AL Slotted Tube	1	810-1250E-6S
7	1.125"ODx0.058"x6' AL Slotted Tube	1	810-1125E-6S
8	1.00"ODx0.058"x6' AL Slotted Tube	1	810-1000E-6H

Parts Pack

10	Stainless Steel Clamp 2-1/4	6	745-3128S
11	Stainless Steel Clamp 1-1/2	6	745-3116S
12	Stainless Steel Clamp 1-1/6	2	745-3110S
15	Hy-gain Base Mount Assembly Kit	1	ATB-65
	Mast saddle	2	758-9198
	Insulator ABS	2	475500
	U-bolt	4	5136900
	Split washer	8	564792
	5/16 Nut	8	555747
	Base Plate	1	172734
	4-40X3/8 Screw	2	
	4-40 kep nut	2	
16	108-inch Stainless Steel Whip	1	MFJ-1966
17	Legal Limit 4:1 Balun	1	80-AV6160-1

Optional Items:

MFJ-915 RF Isolator

MFJ-272 Lightning Surge Protector

TOOLS AND TIME REQUIRED FOR ASSEMBLY

The estimated assembly time is about one hour. Antenna assembly requires the following hand tools:

- ½" wrench, #2 Phillips screwdriver
- 5/16" nut driver for hose clamps.
- Safety glasses.
- Felt-tip permanent marker
- 4-6 foot step ladder

Additional Materials Needed

- 1) Mounting pipe: 4-foot long steel pipe 2.0" OD/0.125" wall thickness.
- 2) Quick-setting concrete – For installing the mounting pipe
- 3) High quality low-loss 50-Ohm coax terminated with PL-259 connectors from antenna to transmitter. LMR-400 coax cable is recommended.
- 4) 3/8" lugs for attaching radials to the ATB-65 mounting plate.
- 5) 18-gauge or larger copper wire for radials, insulated or uninsulated.

SAFETY PRECAUTIONS:

WARNING! You can be killed if the antenna, feedline, or the equipment used to install the antenna accidentally contacts any utility lines. Never install an antenna near power lines!

1. Be careful when carrying and installing the antenna. It is heavy enough to cause you to lose your balance if it is handled too casually or if the antenna is snagged on anything.
2. Mount the antenna to minimize accessibility. The antenna can cause serious RF burns.

ASSEMBLY and INSTALLATION PROCEDURE

Refer to the figures in this manual during assembly. Assembly consists of installing a ground mount, installing the base mount assembly to the ground mount, assembling the telescoped antenna, installing the antenna to the base mount, installing the balun, radials and feedline, and finally telescoping the antenna to its full height. .

WARNING: Wear safety glasses whenever working with any antenna.

Step-By-Step Procedure

Note: Select a mounting location clear of power lines, structures and other antennas. **Consider the proximity of overhead power lines, utility cables and wires.** The vertical should be

mounted away from local noise sources or metallic objects which can re-radiate noise and affect the radiation pattern.

Note: The use of radials is required with any vertical antenna for optimum performance. If possible, a minimum of 16 radials should be used and the radials should be at least 43 feet long (the length of the antenna). However, more short radials are better than fewer longer radials. Increasing the number and length of the radials will improve performance. Radials should be connected as close to the base of the antenna as possible. A good location for connecting radials is the U-bolt mounting nuts on the ATB-65 base mounting assembly.

Mounting Pipe Installation:

The mounting pipe should consist of a 4-foot length of thick-walled (1/8" minimum) galvanized steel pipe with an outside diameter of 2". Do **NOT** use aluminum, as aluminum will corrode in short order. Dig a 1-foot diameter hole deep enough to accommodate 2.5-feet of pipe and a few inches of gravel at the bottom for drainage. 18" of pipe should extend above ground level. These are minimum requirements in that a longer pipe, deeper mounting hole, and larger diameter hole is better – especially if your ground soil is somewhat unstable (moves due to freezing/thawing or moisture content). Set the pipe on the gravel and pour concrete around the pipe until the concrete is level with the ground. Use a level to ensure that the pipe is straight. Allow 8-10 hours for the concrete to set.

Alternative Mounting Pipe Installation

You may elect to support the antenna by bracketing it to your house, wood fence or other structure. If you elect to do this, it is not necessary to pour concrete for the mounting pipe.

To bracket the antenna to a house, wood fence or other structure, place a piece of 2" PVC pipe around the antenna and use a 2" galvanized fence post support bracket to affix the antenna to the support structure. The fence post support bracket should go around the 2" PVC pipe as shown in Figure 1 below. Add one or more 2x4" treated wood spacers as desired to space the antenna away from the supporting structure as shown in Figure 1.

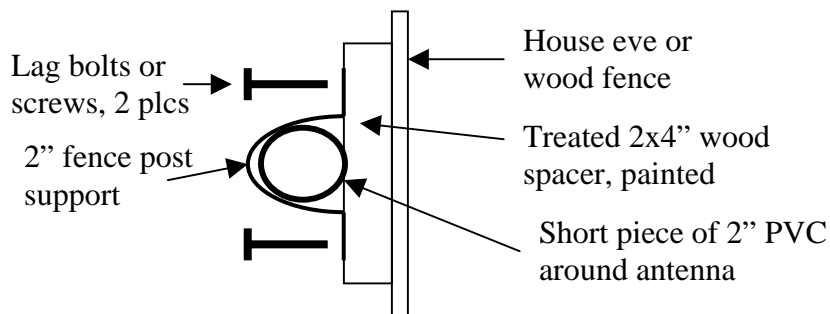


Figure 1: Alternative House or Fence Support

Use a plumb to determine the proper location for the ATB-65 Base Mounting assembly and the mounting pipe. Now simply bury 2-1/2 feet of the mounting pipe in the ground with drainage gravel at the base, and tamp the fill soil snugly around the pipe. Use a level to ensure that the mounting pipe is vertical.

ATB-65 Base Mounting Installation

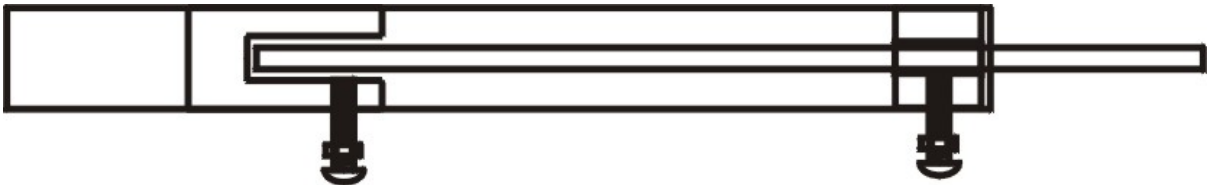
Attach the ATB-65 Base Mounting assembly to the mounting pipe using two of the U-bolts, pipe clamps and associated hardware supplied in the ATB-65 kit. The U-bolts should be placed in the outer mounting holes and the mounting plate. Tighten the U-bolt nuts securely.

Alternative Construction Method

The MFJ-2990 can be assembled without the whip on top if desired. The whip on top of the antenna reduces wind loading and visual impact of the antenna. If these are not a concern, the bottom sections of the antenna can be overlapped 5 inches per section. This will create a more uniform tapered look to the antenna and reduce some of the sway in the top section. After the overlap is reduced, the very top section, which would normally contain the whip, should be extended enough to make the overall length of the antenna 43 feet. The aluminum inserts that hold the whip can be removed by unscrewing the Phillips head screws all the way out. Retain the parts in case you want to change the assembly in the future.

MFJ-2990 Tubing Preparation:

- 1) Slide the stainless steel whip into the top 1" section of tubing by loosening the setscrews on the top and bottom adapter. Insert the whip until it seats into the bottom adapter completely. Adjust the nut until it is all the way back to the head of the screw. Tighten the top and bottom screw until the whip is secure in the adapters. Tighten the nut against the tube until it is snug.



- 2) Except for the 2"OD 6-foot aluminum tube and the 1"OD tube, measure four-feet from the slotted end of each tube and clearly mark this position with a permanent felt marker. You will use these marks when telescoping the antenna to its full length. Mark the 1"OD 6-foot tube one foot from the end without the set screws.
- 3) Slide two tubing clamps over the 1.75", 1.625", 1.500", 1.325", 1.250", and 1.125" OD aluminum tubes. Use the appropriately-sized tubing clamps for the particular aluminum tubes. Securely tighten one clamp just below the slot cut in the tubes, but leave the second clamp loosely fitted over the tube slot. The tightened clamp will keep the tubes from falling into each other when the antenna is vertically placed prior to telescoping the individual sections. See Figure 3.

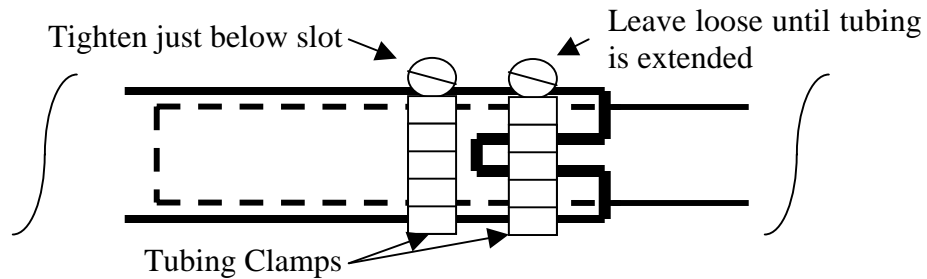


Figure 3: Tubing Clamp Positioning

- 4) Place a #28 (largest) tubing clamp over the bottom 2"OD tube, and tighten over the slot just enough to keep the tubing clamp from falling.
- 5) Install the MFJ-1966 108" stainless steel whip into the 3/8x24 insert in the top section of the antenna. Make sure to use a 3/8 stainless steel split lockwasher, and tighten securely in place.
- 6) Progressively telescope each of the aluminum tubing sections into each other, starting with the top section with the 108" whip.
- 7) Install the antenna mount U-bolts and insulators on the ARB-65 Base Mount. Raise the telescoped antenna into a vertical position and insert the lower end into the ARB-65 insulators and U-bolts. Tighten the U-bolt hardware securely.

Balun and Radial Installation

- 1) Unscrew the balun pipe clamp mounting screws such that the clamps can be fully opened. Place the balun alongside the antenna mast with the balun pipe clamps located between the antenna insulating tubing and the UHF connector oriented down. Close the pipe clamps around the antenna and tighten the clamps securely. The balun pipe clamps provide the antenna feed. Attach the balun ground wire with the 3/8" lug to a bottom 3/8" U-bolt. See Figure 4 below.

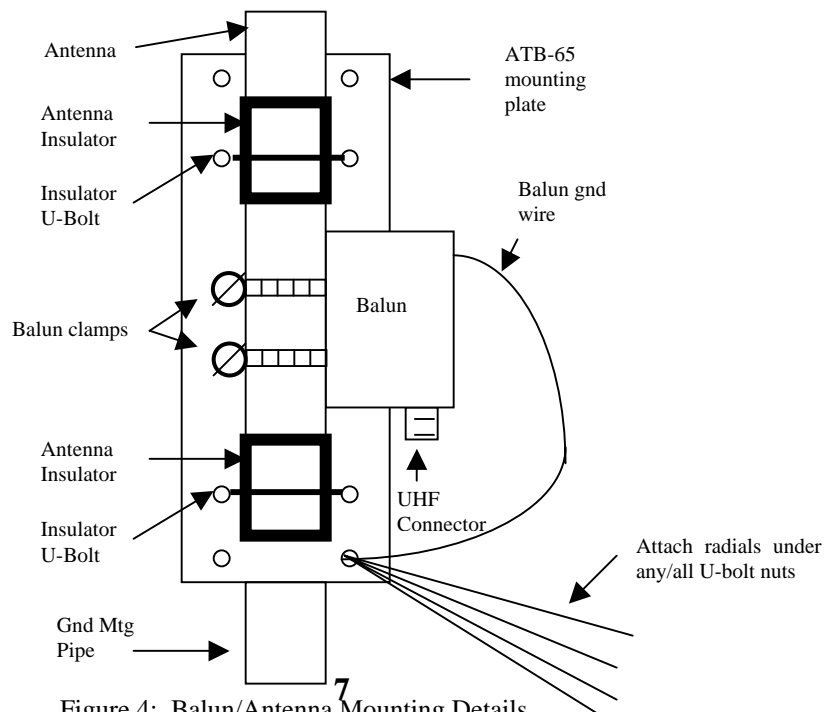


Figure 4: Balun/Antenna Mounting Details

- 2) Attach radials to the ATB-65 using the 3/8" lugs under the U-bolt mounting hardware. Multiple radials can be attached to each 3/8" lug. Use as many radials as possible – preferably 16 or more - and make the radials as long as possible.

Final Assembly

- 1) Place a 4-6" high step ladder alongside the antenna and begin telescoping each section. Begin with the top section, and telescope this section until you get to the 4-foot marker. Securely tighten the tubing clamp over the slot in the lower tubing section.
- 2) Continue telescoping each additional tubing section to its 4-foot mark and securely tighten each hosing clamp over the slots as you progress. When all sections have been extended, the antenna has been lengthened to its final 43-foot height.
- 3) Attach a high quality coax feedline to the SO-239 connector on the UHF connector on the 4:1 balun.

GUYING

The MFJ-2990 is normally considered to be self-supporting when installed as described in this manual. And when bracketed to a house, this antenna is even more stable in adverse conditions. However, if your antenna is located in a part of the country characterized by ice loading or sustained high winds greater than about 40 mph, you should consider guying to ensure maximum antenna life. If guying is employed, a 3-point guying system will provide the necessary stability. The guys should be attached at the top of the 1.25" OD aluminum tube just above the hose clamp. MFJ-19C100 polyester rope is an appropriate guy rope. Finally, the MFJ-2990 can be easily telescoped down should very strong storms be forecasted for your area.

ANTENNA OPERATION

Like all 43-foot verticals, this is an MFJ-2990 untuned antenna that provides a compromise SWR across the 160-6 Meter frequency range. While the untuned SWR may vary depending on your ground system and mounting location, typically you can expect an untuned SWR of less than 4:1 at your transceiver from 60-6 meters when the antenna is fed with good quality, low loss coaxial cable (the SWR will actually be lower when higher-loss cables are used). This is easily handled by any external antenna tuner, and even by most transceiver internal antenna tuners (check your transceiver's owner manual to see what your transceiver's antenna tuner matching range is). Operation on 160- and 80-meters does require the use of an external wide-range antenna tuner due to the much higher SWR of the 43-foot vertical on these bands.

For best low angle radiation (good DX performance), an antenna should be no more than 5/8-wavelength long on your highest frequency. So the MFJ-2990 43-foot antenna length provides an excellent low-angle radiation pattern from 160-20 meters. From 17-6 meters the angle of radiation becomes higher, which reduces the antenna's DX effectiveness on these higher frequency bands. However, for optimum performance on the higher frequency bands, the MFJ-2990 is easily telescoped down to a shorter length.

GROUNDING CONSIDERATIONS

Safety grounding should always be provided to protect equipment, property and persons from the hazards of lightning strikes and other weather related electrical discharges. Adequate protection can be accomplished by grounding the shield of the coax to a good earth ground where it enters the building, or directly burying the cable in the earth for several feet before it enters the building. A better solution is to use a MFJ-272 Lightning Surge Protector at the entrance of your home with a heavy duty ground wire to a suitable earth ground, as well as tying into your main home electrical ground as required by NEC. For maximum lightning protection, the coaxial cable should be disconnected from the station during threatening weather conditions.

MAINTENANCE

Your antenna is constructed of heavy duty non corrosive materials and should withstand normal climates for many years. The use of some type of coaxial connector moisture protection is recommended at the balun/coax connection, especially in coastal areas where salty mist is commonplace. GE makes a pure, silicone grease called "SILICONE DIALECTRIC COMPOUND" that can be applied SPARINGLY to the threaded area of the female connector. This compound, or even a clear silicone heatsink compound, will prevent moisture from entering the connector through the threads and protect the connectors from corrosion. This is the same type of sealer that commercial antenna installers and CATV companies use with great success. Plast-Dip™ and Liquid Electrical Tape™, available at your local hardware store, also do an excellent job of insulating/waterproofing connectors, and can be easily peeled off when desired. A less desirable, but still adequate sealer is the automobile seam sealer commonly sold as "coax seal". This is a semi-pliable black or white sealing compound. When installing any "coax seal", NEVER completely cover the barrel of the coax connector. The sealer should ONLY be placed near the junction of the threaded part of the chassis connector and the knurled area of the male connector. This will leave the bottom of the male outer sleeve open and permit the connector to "breathe" so it does NOT collect moisture!

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