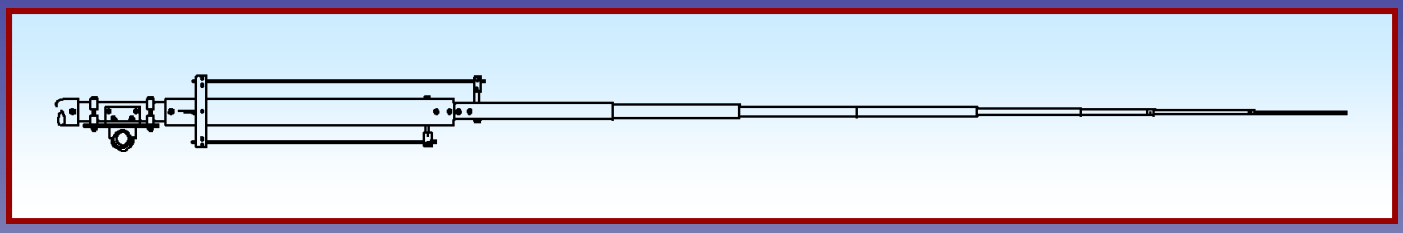
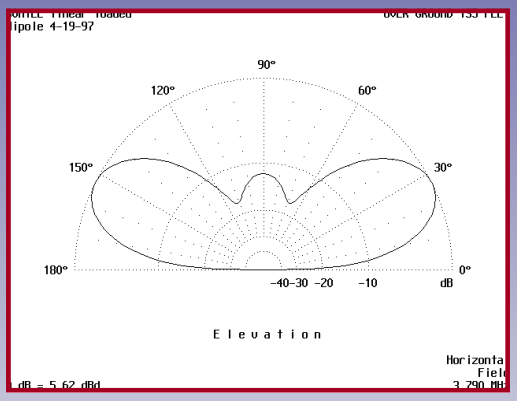
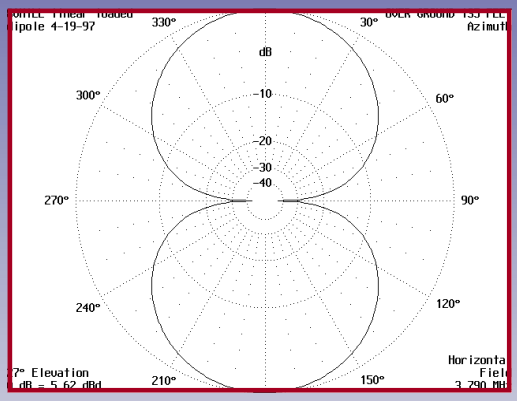
M2 Antenna Systems, Inc.
Model No: 80M1L







SPECIFICATIONS:

Model	80M1L
Frequency Range switch able	3.50-3.565 & 3.75-3.82
Gain	2.0 dBi Free space
Front to side	0 dB
Beamwidth	E=90°
Feed type	Direct feed
Feed Impedance	50 Ohms Unbalanced
Maximum VSWR	2.0:1
Input Connector	SO-239, Other avl.
Power Handling	3 kW, Higher avl.
Boom Length / Dia	N/A
Element Length / Dia.	105 Ft / 3” to 1/2”
Turning Radius:	52.5 Ft
Stacking Distance	100’ To 160’
Mast Size	2” to 3 ” Nom.
Wind area / Survival	8 Sq. Ft. / 100 MPH
Weight / Ship Wt.	75 Lbs. / 109 Lbs.

***Subtract 2.14 from dBi for dBd**

FEATURES:

The 80M1L is a reduced sized dipole with great versatility. It has been upgraded both mechanically and electrically. When used as a rotatable dipole, it will easily outperform all fixed wire dipoles. It can also be used as a building block for future expansion to a 2 or 3 element beam antenna. The dipole can also be separated in half and used as phased 1/4 wave verticals. Element halves start with 3” diameter tubing and taper through 2”, 1-3/4”, 1-1/2”, 1-1/4”, 1”, 3/4” & 1/2” sections to the 3/8 tips. The 3” and 2” sections are separated by a rugged fiberglass insulator to allow for the linear loading (3/8” aluminum tubing). A solid 2” O.D. x 36” fiberglass rod, sleeved to the 3” elements, serves as the center insulator. This is the same element used in our 80M2L and 80M3L Yagis. Let your imagination go wild. You may come up with something real different!

The linear loading terminates above the boom and out of the element plane to reduce inductive cancellation and provide element support. Tip droop is typically 3-4 feet and looks better than some 40 meter elements. The 3 kW, 1:1 balun and phone / CW power switching relay are housed in a water proof fiberglass Hoffman enclosure allowing access for maintenance and tuning at the center of the element. Relay switching requires 12 VDC @ .15a supply. The system defaults to phone when not energized.

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Rev.01

80M1L ASSEMBLY MANUAL

OVERVIEW: Feel free to change order of assembly to fit your space needs.
Once fully assembled or even in pieces, this antenna is LONG. Assemble the center section to the 2" diameter point. Then assemble the element tip sections from the 1-3/4 inch diameter section out. Use the length and hardware sizes called out on the DIMENSION AND ASSEMBLY DRAWING. Penetrox (zinc paste) has been supplied to be used on the threads of bolts and screws, as well as every aluminum joint.

1. Locate the large, 36" long 2 inch diameter fiberglass rod used as center insulator. The rod has 4 bushings or coupling rings and the rod may be labeled to match two 3 " x 180"' inner element sections. Using four machined 2 inch saddles, attach the center insulator to a 8" x 8" x 1/4" element to boom plate. Use the 3/8-16 x 3-1/2" stainless bolts and locknuts. Rotate the 2" rod so the holes through the coupling rings are up or parallel with the plate. Center the insulator on the plate and tighten the 3/8" hardware.

2. Assemble the center section of each element. Slip on the butt sections and NOTE THE LARGE 1/2" HOLES AT THE OPPOSITE END OF THE SECTIONS ARE FACING THE SAME DIRECTION. Insert a 1/4-20 x 3-3/4" inch bolt UP through the inner hole and add a plain nut. Use 1/4-20 x 3-1/2 inch bolts and LOCKNUTS through the outer set of holes. NOTE: The longer inner bolts now form studs where the CW LOADING/SWITCHING assembly is attached later in the assembly. Tighten all hardware.

3. Locate the 1/2" x 4-1/2 " aluminum rods and attach the 3/4" square rod tips and secure each with an 8-32 x 1-1/4" screw and locknut and tighten. Assemble all 4 at this time.

4. Insert the completed rod assembly near the outer end of the 3" sections . Attach with 1/4-20 x 3/4" bolts and lock washers. BUT DO NOT TIGHTEN YET. Now orient the rod assembly so the 3/8" holes at the ends are parallel with the element and tighten the bolts. Add the 1/4-20 x 1-1/4" bolts and locknuts finger tight at this time.

5. Next, install the completed rod assemblies into the 1/2" hole at the butt of the 2" x 48" element section. Again attach with 1/4-20 x 3/4" bolts and lock washers. Now orient the rod assembly so the 3/8" holes at the ends are parallel with the element and tighten the bolts. Add the 1/4-20 x 1-1/4" bolts and locknuts finger tight at this time.
6. Insert the hybrid sleeve insulator into the outer end of the 3" element butts and add the 1-4-20 x 3-1/2" bolts and locknuts finger tight. Now insert the 2" x .125 x 48" section into the insulator and align the holes. Make sure the 1/2" post assembly installed in step #4, points opposite from the post assembly in the 3" element section. Add the 1/4-20 x 2-1/2 bolts and locknuts and NOW TIGHTEN all 4 bolts. Repeat for the other element half.

7. Add a 3/8" x 185" tube to the inner post and the outer 2" section post, by inserting the 3/8" tube through the hole about 1 inch, and tighten the 1/4-20 x 1-1/4" bolt and locknut. Continue until you have all 4 tubes attached and secured.

8. Loosely install five (5) 1/4-20 x 1" bolts and locknuts in pairs of "linear loading shorting bars". Refer to the DIMENSION SHEET for the shorting bar positions for the linear loading tubes. Use a permanent marking pen or a ring of masking tape to mark the shorting bar position on the 3/8" tubes. Prepare the 5/16" turnbuckles by removing the "hook" end of each turnbuckle and add a 5/16-18 nut on the threads all the way to the hook. Now replace the hook end into the turnbuckle body and adjust the threaded ends so that just one thread "shows" inside the body of the turnbuckle. Add a 1/4" cable eye to each "eye" of the turnbuckles. Now hook the turnbuckles into the turnbuckle plate.

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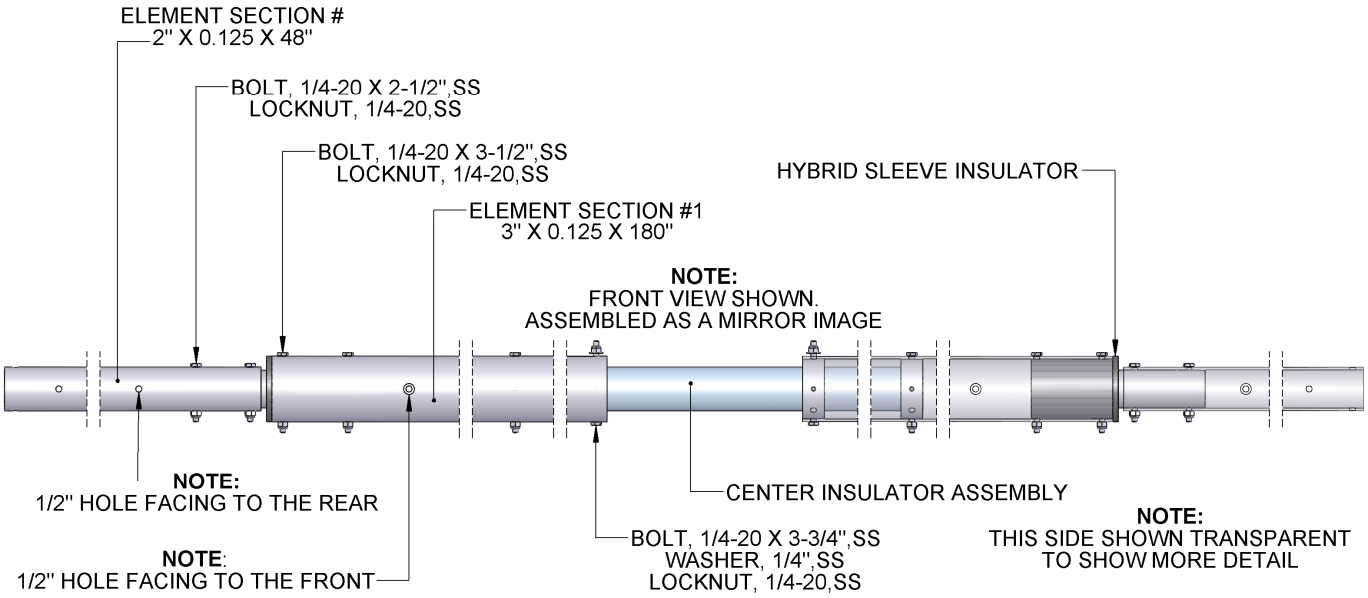

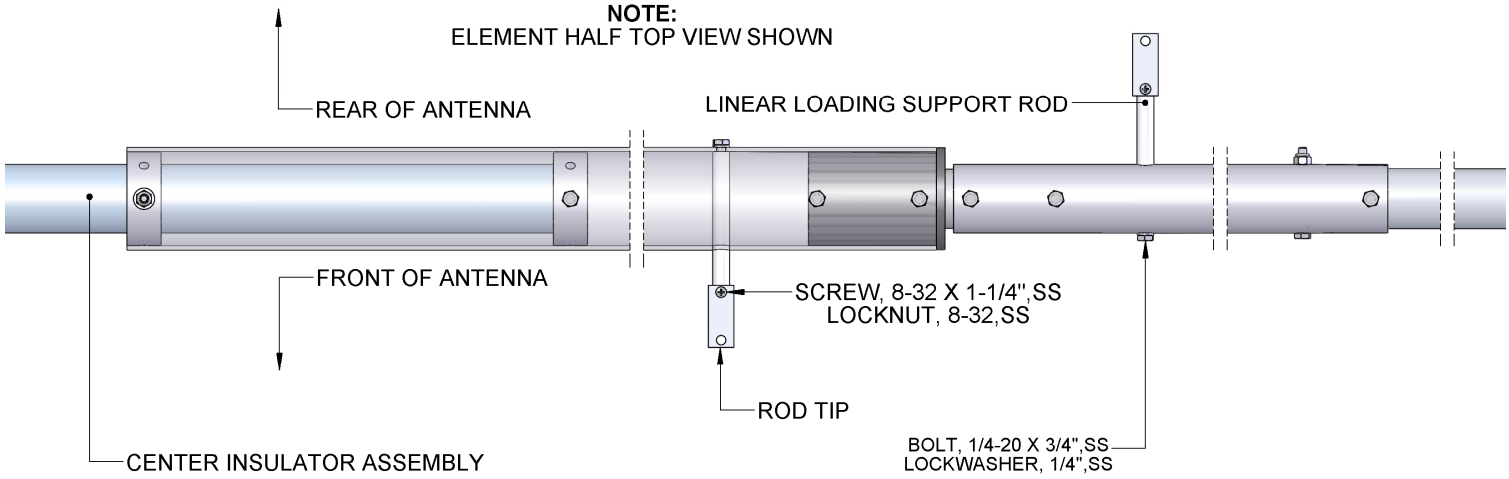

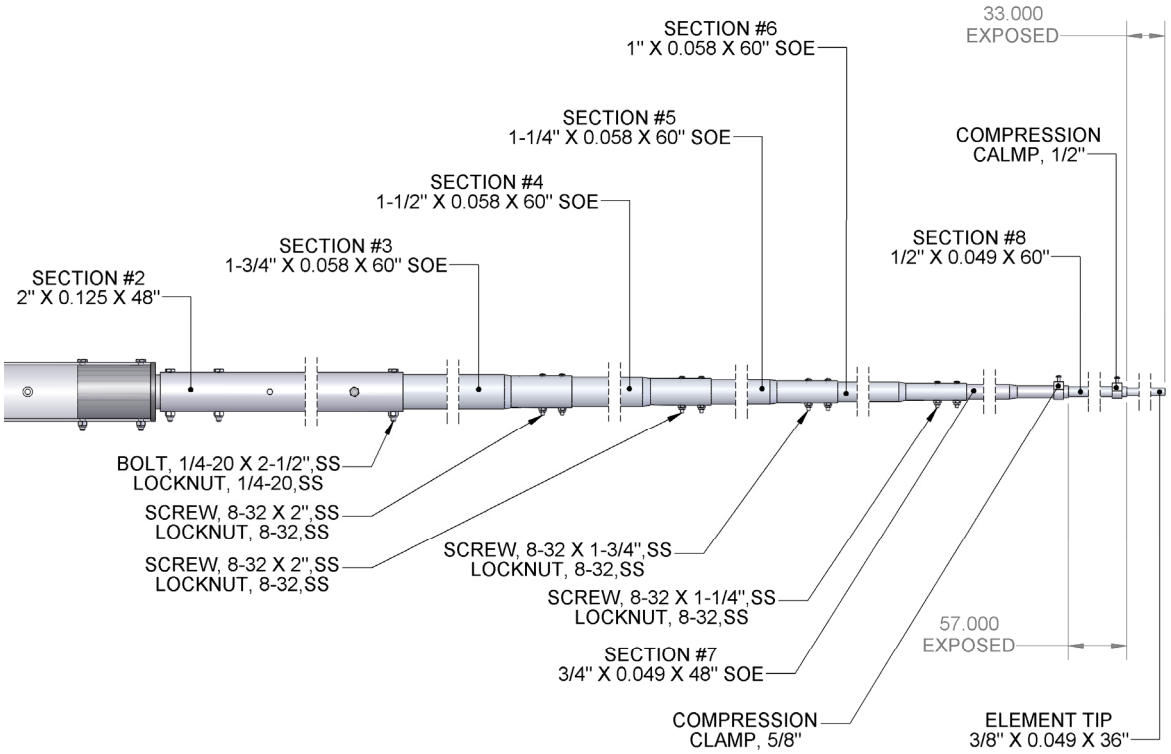

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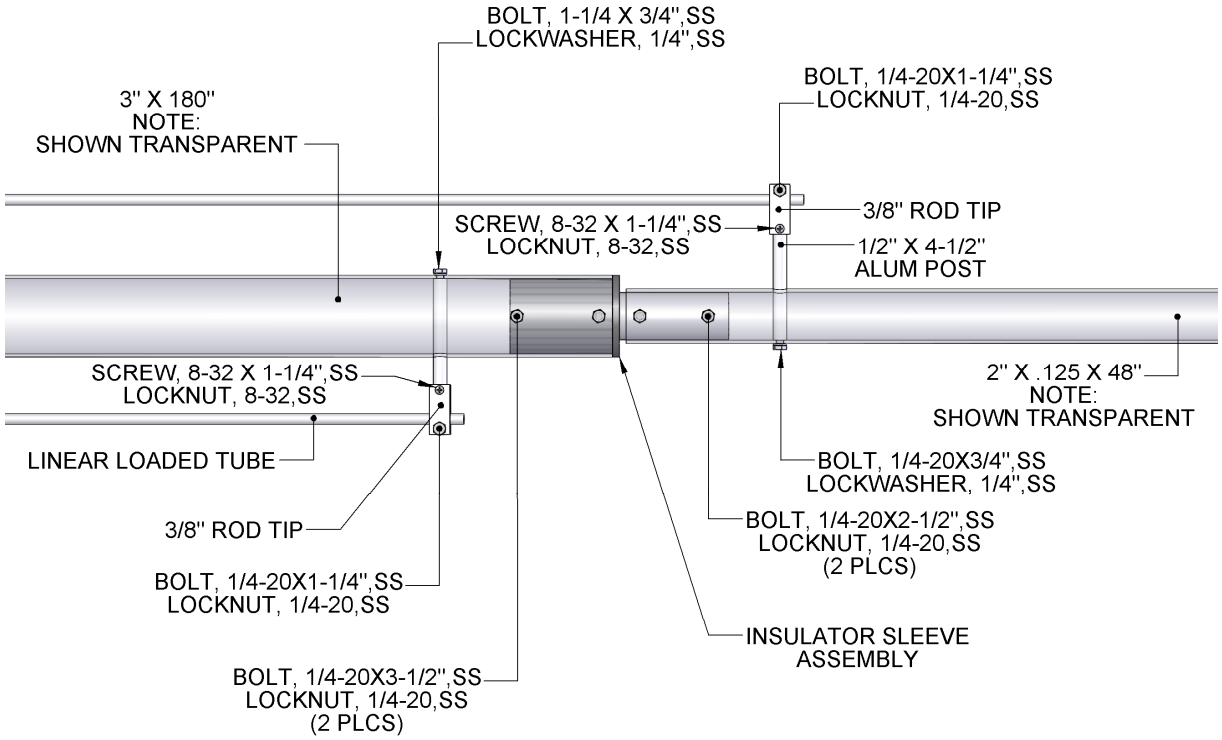
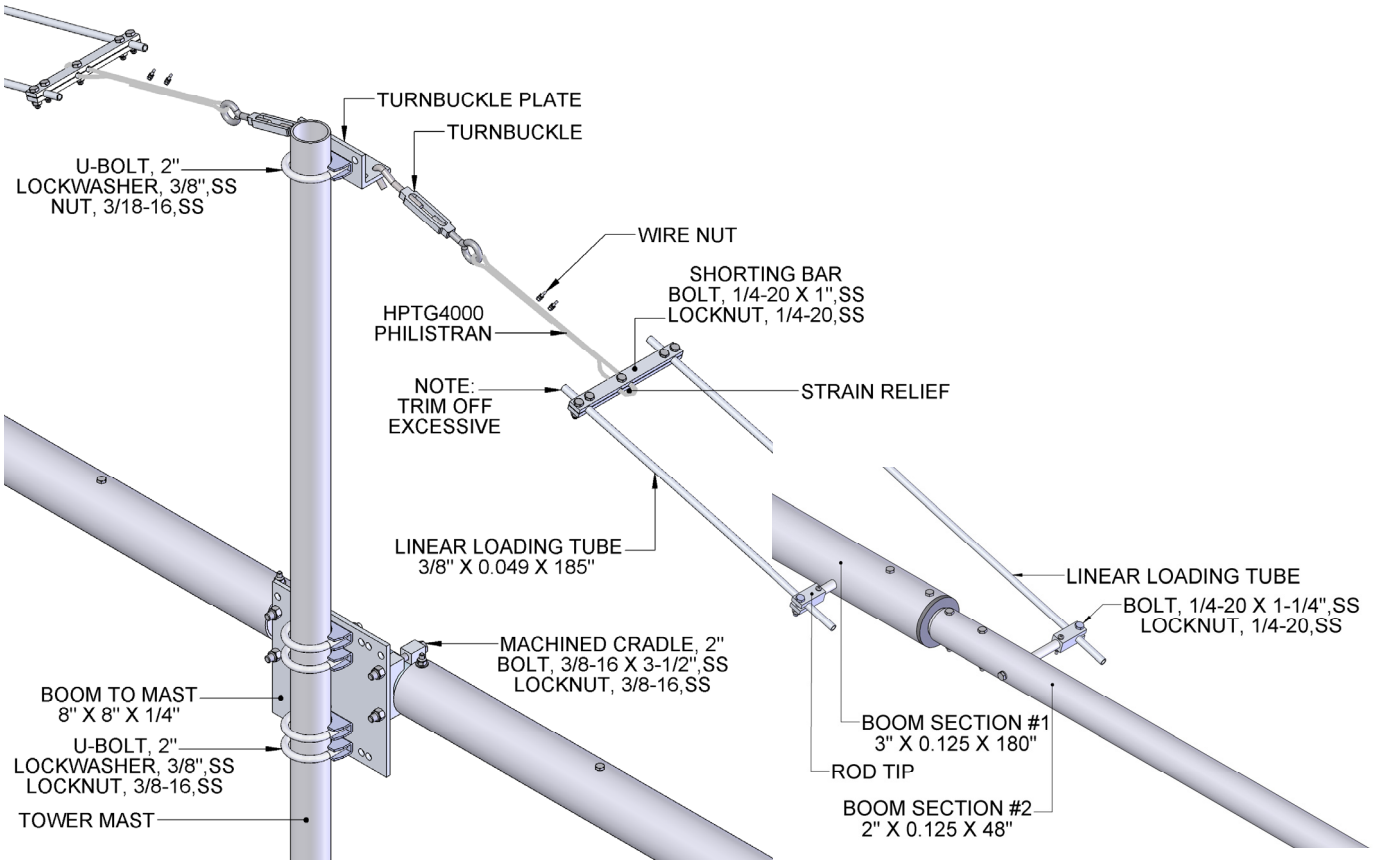
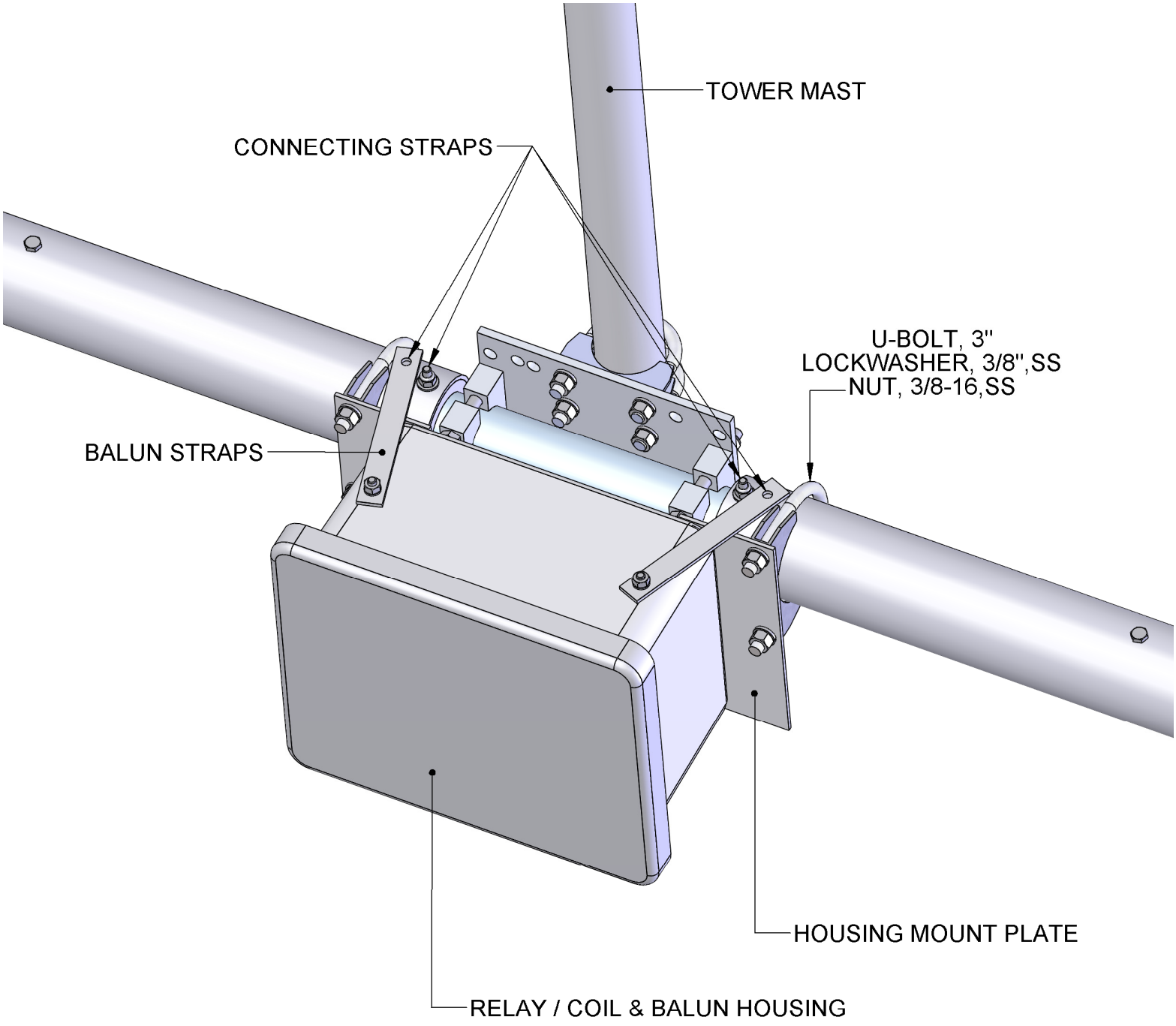




80M1L ASSEMBLY DETAIL



80M1L ASSEMBLY MANUAL

9. Refer to the TYPICAL HARDWARE ARRANGEMENT drawing. Slide one loosely assembled shorting bar pair onto the two tubes to the marks. Tighten one outside screw just enough to hold the shorting bar in position. Insert the 18" section of HPTG-4000 Phillistran cord into the two center grooves in the shorting bar pair and around strain relief. Note one groove is dead center and the other is offset. The long end of the cord should come out the "centered" groove. The short end should loop around the strain relief and come back out about 2". Now tighten the rest of the screws in the shorting bars.

NOTE: IT MAY BE HELPFUL TO INSTALL A TEMPORY MAST OF 1-1/2 TO 2" DIA. TUBE TO ADJUST THE LINEAR LOADING TENSIONING SYSTEM PRIOR TO ASSEMBLY ON YOUR MAST.
SET THE FLAT PART OF THE TURNBUCKLE PLATE ABOUT 33" ABOVE THE ELEMENT.

10. Route the black cord around the thimble in the turnbuckle eye and back on itself. Keep this length between the eye and the shorting bar pair no more than 3" in length. Now lift the linear loading tubes and pull the cord until the tubes are under tension. Install the cable clips around all three cords and tighten the clips.

11. Now, begin tensioning the linear loading tubes using the turnbuckles. If you run out of adjustment, relax the turnbuckle again and pull more slack with the cord. Then re-tighten the clips and tension again with the turnbuckles. Adjust tension until each element is flat and not bowed up.
Final adjustment of the wire tensioning is done after the element is complete and even on the mast. NOTE: THESE TUBES FORM THE ELEMENT LINEAR LOADING AND ALSO HELP TO SUPPORT THE ELEMENT HALVES AND MINIMIZE DROOP.

12. Now assemble the outer element sections together (1-3/4" through 1/2") using the supplied 8-32 hardware. See the 80M1 Dimensions and Assembly Sheet as a guide. Next, install both assemblies (1-3/4" through 3/4") to the free ends of the 2" elements using 1/4-20 x 2-1/2" bolts and locknuts.

REFER AGAIN TO THE "TYPICAL HARDWARE ARRANGEMENT DRAWING.
13. Mount the CW loading COIL, RELAY AND 1:1 BALUN HOUSING by attaching the two mounting plates to the "bottom" of the housing using 10-32 x 3/8" screws . Then attach the housing assembly to the two element halves using two 3" U-bolts, saddles, 3/8-16 stainless nuts and lockwashers. Center it and tighten the U-bolts slightly. Now add the connecting straps between the inner bolts at the butt of each element half over to the studs on the housing. Note: Some forming / bending of straps may be necessary. Secure using flat washers and 1/4-20 locknuts. (IF THE PHONE CW RELAY IS NOT USED, ATTACH A 1:1 BALUN ON THE STUDS AT THE BUTTS OF THE ELEMENTHALVES.

14. Attach the 12 VDC leads to the two inner terminals on the down side of the housing. (no polarity requirement). Use RG-58 coax putting +12 VDC on the center conductor. The shield goes to the negative terminal of your power supply. Or use #22 AWG (minimum) twisted, SHIELDED pair to carry the 12 VDC and ground shield at supply. Ground shield at shack end. Apply voltage only when you want to operate in the low CW part of the band. When the relay is not activated the coil loading is bypassed.

15. Connect good quality 50 Ohm coax to the connector on the housing. NOTE THE TWO BLOCK CONNECTIONS ON EITHER SIDE OF THE RF CONNECTOR. These are used for the hairpin match adjustment on the 80M2LLA and the 80M3LLA Yagis and are not used for the 80M1LL. The dipole match should be close to 50 Ohms (depending on height above ground, but 3/8" tubes and an appropriate shorting bar could be added here if your match is disturbed by surrounding objects on the tower / mast or height over ground. Caution: these block connectors are **HOT with RF** when you transmit.

THIS COMPLETES THE ASSEMBLY.

80M1L TUNE-UP DETAILS

TUNEUP: If possible raise the dipole to its normal height and take a measurement to determine the resonant frequency. Alternately get the dipole at least 30 feet high and in the clear and remember it will probably go a little higher in frequency once it is raised to its final height. If the resonant frequency is below 3.750, reduce the "TUNING DIMENSION" or slide the 3/8" tip sections in 1 inch at a time. If it is resonant too high, increase the tip dimension. The resonant frequency moves at a rate of about 8.5 to 9 KHz per inch of adjustment.

This Antenna will have the most effect on 20 meter antennas. If possible locate it on a separate tower or at least orient it in parallel with the boom of the 20 meter antenna. It can be mounted just a few feet from other antenna boom and elements. These objects can affect the minimum VSWR and the resonant frequency. It is best to do the final tuning in its permanent location.

DO NOT SWITCH FROM PHONE TO CW WHILE TRANSMITTING AS DAMAGE TO THE RELAY IS POSSIBLE. The 1:1 balun is constructed of Teflon coax and uses NO ferrite. It is rated at 5000 Watts, continuous. Contact the factory for higher power options.

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ADJUSTING / CUSTOMIZING YOUR 80M YAGI

WE RECENTLY RE-DESIGNED THE PHONE –CW RELAY AND COIL HOUSING AND GENERAL ASSEMBLY. This was done to make manufacture easier and to allow customer modification and maintenance. We now use a fiberglass enclosure that can be opened for inspection, repair or modification.

Looking inside the housing you will see that we have provided two holes in the coil leg that attaches to the relay. Generally the easiest way to move the frequency of the element when the coil is engaged, is to change the inductance of the coil by spreading it. Quite a wide range of inductance can be achieved by lengthening or shortening the coils. They are set to be just under 2.5 uHy from the factory. By shifting to the other holes in the coil legs, the inductance can be dropped to about 2.3 uHy. This will shift operation up the band about 50 kHz. You may also have to physically open the coil since it is springy and make sure all the turns are evenly spaced. Larger movement in frequency can be achieved by removing turns, however you should do some calculations first or contact the factory to avoid seriously degrading the bandwidth, or performance of the antenna. The antenna has been modeled in Brian Beezley's AO "PRO" ,version 6.5. Linear loading will not necessarily model correctly in NEC based programs. AO is *Mininec* based and does much better at modeling parallel wires than NEC.

What about coils in the place of the linear loading? Several hams have had another group modify our Yagi to eliminate the linear loading and convert to coils. The boom is also lengthened by about UP TO 18 feet. This results in a gain improvement of .8-.9 dB and this is not due to the coils, but to the added boom length AND NARROW BANDING.. We have modeled both coils and linear loading and when all other parameters are equal, the performance is virtually the same. One big But remains however. The "Q" of the coils used must be over 600. This is very difficult and expensive to do. For those of you who have structural or local weather concerns, you should know we are planning on producing a coil version of the 80M3. We are doing this carefully and slowly. We are also planning on offering a longer boom version of the 80M3. As always, we like to make changes in such a way that past owners can upgrade. We will continue to review customers desires and at some point, if some want or need coils or a longer boom, or both, we will make what our customers request.

We just don't want you to be misled by a few random, uncontrolled on the air tests that show one antenna to be better than the other. So many parameters are at play that it is easy to come to the wrong conclusion. Height above ground, local terrain, location in the world or in the United States, feedline loss and of course, the RF power delivered to the antenna all can have massive effects on test comparisons.
Enjoy your 80M1L and call me if you have questions or concerns.

73, Mike Staal, K6MYC

80M1L PARTS & HARDWARE

DESCRIPTION	QTY.
3 x .125 x 180" alum. tube	2
Center Insulator assembly, 2" fiberglass w. rings	1
Hybrid Sleeve Insulator, 2.75 x 8”	2
2 x .125 x 48" alum. tube	2
1-3/4 x .058 x 60" alum tube SOE	2
1-1/2 x .058 x 60" alum. tube SOE	2
1-1/4 x .058 x 60" alum. tube SOE	2
1 x .058 x 60" alum. tube SOE	2
3/4 x .049 x 48" alum. tube SOE	2
1/2 x .049 x 60” alum. tube, STR	2
3/8 x .049 x 36”	2
3/8 X .049 X 185” linear loading tube	4
Element mounting plate 8 x 8 x 1/4 alum.	1
U-bolt, 2" heavy duty	5
Assembly instructions	1

SMALL PARTS BOX / BAG

Linear Loading Support Rod, alum. 1/2 x 4-1/2"	4
Rod tip, 3/4 sq. x 2”	4
Shorting bar halves, 1/4 x 3/4 x 7.25” machined	4
Strain relief, 1/2” x 1/2” (Black Delrin)	2
Saddle, 2’ heavy duty, machined, aluminum	4
Turnbuckle angle plate, HD 1/4”	1
Turnbuckle, 5/16” hook and eye	2
Penetrox, (zinc paste)	1
Cable, Phillistran HPTG 4000 x 18”	2
Compression Clamp, 5/8”	2
Compression Clamp, 1/2”	2

80M1L PARTS & HARDWARE

IN HARDWARE BAGS	QTY
Bolt, 3/8-16 x 3-1/2	4
Locknut, 3/8-16, ss	4
Nut 3/8-16 ss	14
Lock washer, 3/8 split ring, ss	14
Nut 5/16-18 ss	6
Lock washer, 5/16" split ring ss	2
Bolt 1/4-20 x 3-3/4" hex cap ss	2
Bolt 1/4-20 x 3-1/2" hex cap ss	10
Bolt 1/4-20 x 2-1/2" hex cap ss	4
Bolt, 1/4-20 x 1-1/4", ss	4
Bolt 1/4-20 x 1" hex cap ss	10
Bolt 1/4-20 x 3/4" hex cap ss	4
Nut 1/4-20 locking ss	32
Nut, 1/4-20, ss, plain	2
Washer, 1/4", flat ss	4
Lock Washer, 1/4", split ring, ss	4
Screw 8-32 x 2" pan hd ss	4
Screw 8-32 x 1-3/4" pan hd ss	4
Screw 8-32 x 1-1/2" pan hd ss	4
Screw 8-32 x 1-1/4" pan hd ss	8
Screw 8-32 x 1/2" pan hd.	4
Locknut 8-32 ss	38
Nut 8-32, ss	4
Wire clip, 1/4"	4
Thimble, (cable eyes) 1/4"	2

PHONE-CW RELAY ASSEMBLY (kit separate)	
CW Relay-coil-balun housing (with connector)	1
Mounting plates (for housing)	2
Jumper strap (for coil housing connections)	2
U-bolt, 3"	2
Nut 3/8-16 ss	4
Lock washer, 3/8 split ring, ss	4
Screw, 10-32 x 3/8" ss	4

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