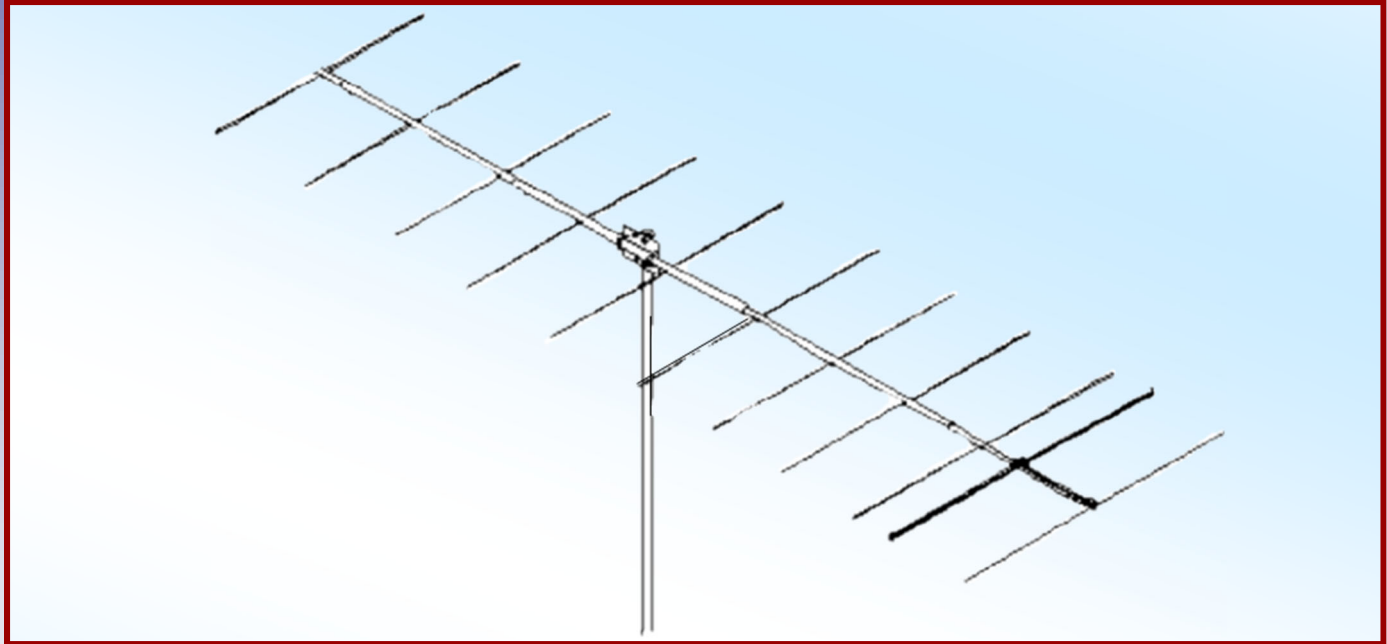




M2 Antenna Systems, Inc. Model No: 167-11



SPECIFICATIONS:

Model	167-11	Boom Length / Dia.....	204" / 1-1/2" To 1"
Frequency Range.....	163 to 175 MHz	Maximum Element Length.....	37" / 3/16"
*Gain	14.21 dBi	Turning Radius:	Call
Front to back	18 dB Typical	Stacking Distance.....	Call
Feed type	"T" Match	Mounting.....	1-1/2" to 2" Nom.
Feed Impedance.....	50 Ohms Unbalanced	Wind area / Survival	1.5 Sq. Ft. / 100 MPH
Maximum VSWR.....	1.5:1 Typical	Weight / Ship Wt.....	8 Lbs. / 10 Lbs.
Input Connector.....	"N" Female		
Power Handling.....	1.5 kW		

***Subtract 2.14 from dBi for dBd**

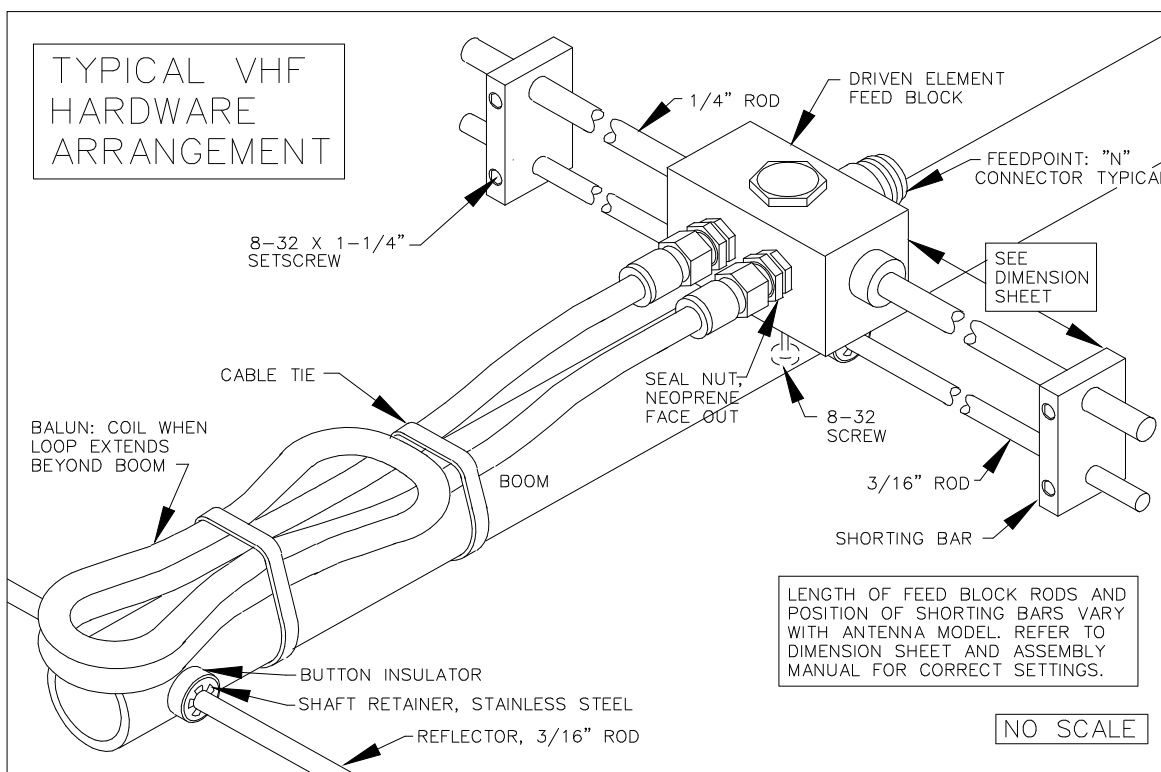
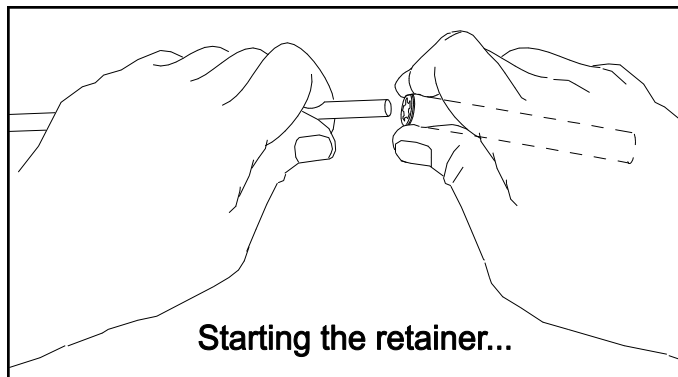
FEATURES:

Performance has been computer optimized to meet your application. Physical construction emphasizes long term electrical and mechanical durability. Elements are 3/16" 6061-T6 aluminum rod, mounted through the boom on UV stabilized polyethylene button insulators, and locked in position with stainless steel shaft retainers. The "T" Match driven element, uses a CNC machined central block with O-ring sealed connectors. Internal connections are encapsulated in a silicone gel with a dielectric strength 3.7 times greater than air for enhanced power handling. Balun connectors are triple O-ring sealed to the coax.

167-11 ASSEMBLY MANUAL

TYPICAL TOOLS REQUIRED: measuring tape, std slot or phillips screwdriver, 11/32, 7/16, and 1/2 spin-tite, end wrenches and / or sockets. Heavy duty models may require larger sizes.

1. Lay out the boom sections and assemble using the DIMENSION sheet as a guide for position and hardware.
2. Lay out the elements by length and position as shown the DIMENSION sheet. Find rough center of the reflector (longest) element by balancing it across finger. Push on a black button insulator to about 1/2" from center. Insert the element through the holes at the rear of the boom and install the second button. Install the 3/16" rod DRIVEN ELEMENT as you did the reflector. Then continue with the installation of the DIRECTORS. **Note that the Director Elements may not consistently diminish in length from rear to front, so pay close attention to length and position.**
3. Now begin centering the elements. Use a tape measure to EQUALIZE the amount the element sticking out on each side of the boom. Once all are centered, sight down the antenna from the rear and compare tip symmetry. Look for any obvious discrepancies and correct if found.
4. Stainless steel SHAFT RETAINERS are used for securing the elements and insulators. Always use for permanent and long term antenna installations. For most portable or temporary use, the button insulators are satisfactory and the retainers may be left off.
5. Use thumb and index finger to hold a Shaft Retainer over end of the 3/8 x 3" push tube (internal fingers dished into tube). Hold the element firmly and start the keeper onto the rod by applying pressure with the push tube. Push the Shaft Retainer down element until tight against the button insulator (Locking pliers, **lightly** clamped up against opposite button insulator will help maintain center reference and keep you from pushing the first Shaft Retainer too far). Repeat for the opposite side. Continue installing Shaft Retainers until all elements are locked in place.
6. Mount the DRIVEN ELEMENT FEED BLOCK



167-11 ASSEMBLY MANUAL

to the boom using a single 8-32 screw 1/4" longer than the boom diameter. Orient with feed and balun connectors oriented as shown on the Dimension Sheet.

7. Thread a 3/8" SEAL-NUT fully onto each balun connector on the feed block, with black Neoprene side facing out. Generally the balun is installed in one long loop. Rear mounted baluns may be coiled once if length extends beyond boom. Attach balun to the block connectors and tighten **gently** using a 7/16" end wrench. Then back the Seal Nuts out and finger-tighten firmly up against the face of the connectors (or tighten **gently** with 1/2" end wrench). Form the balun coax close to the boom and secure with cable ties (snug but not crushing or kinking the coax).
8. Install the 8-32 x 1/4" set screws (internal Allen head - tool supplied) into the SHORTING BARS. Slide the bars onto the 3/16" rod driven element tips and the 1/4" Feed Block Rods. Position the Shorting Bars as specified on the DIMENSION SHEET: the distance given is between the outer face of the Feed Block and the inner face of the Shorting Bar. Align the bars and rods with each other and tighten the sets crews.
9. For center mounted antennas, the boom to mast plate is normally mounted as close as possible to the balance point (with feedline or a temporary equivalent attached). For rear mounted antennas, use the boom length provided behind the reflector element. Keep mounting plate at least 1" from any element. Secure plate with two U-bolts and the stainless nuts and lock washers provided. DO NOT OVER TIGHTEN. Additional U-bolts and stainless nuts / lockwashers are provided for mounting the antenna to your mast. THIS COMPLETES THE ANTENNA ASSEMBLY.
10. For optimum performance, mount antenna high and in the clear. **Always** use high quality coax and connectors. Old, corroded, or poor quality materials can SERIOUSLY affect VSWR, gain, and pattern. If possible, test the antenna, connectors and feedline BEFORE installation. At 6' in height, the antenna will exhibit performance **approaching** the specifications. If it doesn't, check feedline and connectors for continuity and shorts. Check antenna shorting bars, element placement and length, against Dimension Sheet.

11. MOUNTING AND STACKING INFORMATION

Rear mounted antennas can generally be mounted in any polarization to any type of mast, conductive or non-conductive.

Center mounted antennas can also be mounted in any polarity. **However, a mast or crossboom in-line (parallel) with the element plane must be non-conductive.** Anything conductive in the element plane will disrupt the pattern and reduce performance (even the feedline). When a non-conductive mast or crossboom is in-line with elements, route feedline away at right angles to the elements and reattach at least 6" beyond element tips. Fiberglass is the recommended material for a non-conductive mast or crossboom because of it's strength and weather resistance.

Stacking: See the Dimension Sheet for stacking separation dimensions.

1. All driven element blocks MUST be oriented to the same side of boom.
2. All boom-to-mast plates MUST be mounted at the same point on the boom.
3. Feed / phasing lines MUST be of equal electrical length or, ideally, multiples of 1 wavelength in order to maintain equal phasing in the array.

M² ANTENNA SYSTEMS, INC.

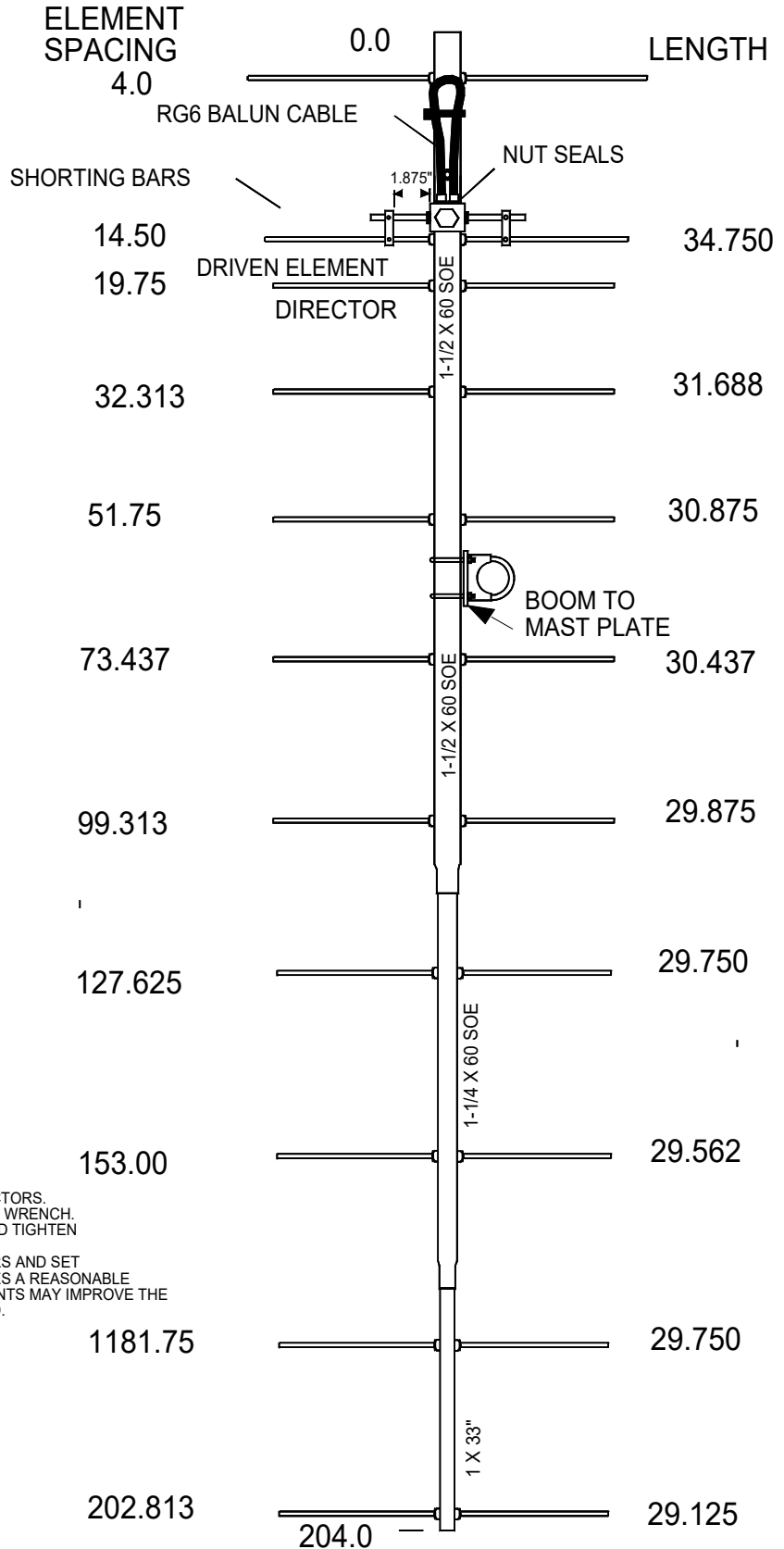
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167-11 DIMENSION SHEET



INSTALL ELEMENTS AND CENTER TO WITHIN 1/16".
 HOLD ELEMENT FIRMLY AND INSTALL KEEPERS.
 INSTALL GOLD NUT SEALS ON THE SMALL "F" CONNECTORS.
 INSTALL BALUNS AND GENTLY TIGHTEN WITH 7/16" END WRENCH.
 RUN NUT SEAL UP AGAINST THE CONNECTOR FACE AND TIGHTEN
 1/2 TURN WITH 1/2" END WRENCH.
 INSTALL 8-32 X 1/4 SET SCREWS IN THE SHORTING BARS AND SET
 TO THE DIMENSION SHOWN ABOVE. THIS SETTING GIVES A REASONABLE
 MATCH ACROSS THE WHOLE BAND. MINOR ADJUSTMENTS MAY IMPROVE THE
 MATCH AT ONE SPOT OR THE OTHER WITHIN THE BAND.

167-11 PARTS & HARDWARE

DESCRIPTION.....	QTY
BOOM SECTION, 1-1/2 X .058 X 60" SOE TFS*	1
BOOM SECTION, 1-1/2 X .058 X 60 SOE TF1-1/4.....	1
BOOM SECTION #3 1-1/4 X .058 X 60 SOE	1
BOOM SECTION #4, 1" X .058 X 33"	1
ELEMENTS, 3/16 ROD x Dimension Sheet	11
FEED BLOCK,	1
BALUN, RG-6 U, 1/2 WL	1
BOOM-TO-MAST PLATE, 4 X 6 X 3/16" STANDARD" ..	1
U-BOLT AND CRADLE, 2".....	2
U-BOLT, 1-1/2".....	2
ASSEMBLY MANUAL.....	1

IN HARDWARE BAG:

BUTTON INSULATORS	22
SHAFT RETAINER, SS	22
NUT, 5/16-18 SS.....	8
LOCKWASHER, 5/16 SS.....	8
SCREW, 8-32 X 2", SS	2
SCREW, 8-32 X 1-3/4, SS	3
SCREW, 8-32 X 1-1/2 SS	2
LOCKNUT, 8-32 SS.....	6
SHORTING BAR, 1/4 AND 3/16 HOLES	2
SET SCREW, 8-32 X 1/4, SS	4
CABLE TIE, NYLON	3
SEAL NUTS, 3/8-32	2
ALLEN HEAD WRENCH, 5/64"	1
PUSH TUBE, 3/8 X 3"	1

*TFS = TO FIT ITSELF

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2M12 PARTS & HARDWARE

Tools handy for assembly process: screwdriver, 11/32" spin-tite or socket, 7/16" and 1/2" end wrenches / sockets, measuring tape.

1. Start by laying out the boom sections using the DIMENSION sheet as a guide. Use 8-32 X 1-1/2 screws and locknuts to join 1" to 1-1/2" sections, 8-32 x 1-3/4" screws to join 1-1/4" to 1-1/2" sections.
2. Lay out the elements by length and position as shown the DIMENSION sheet. Start with the reflector (longest) element. Balance on finger to find rough center and push on a black button insulator to about 1/2" from center. Push the element through the holes 1/2" from the rear of the boom and install the second button, snugging it up into boom. **DO NOT BOTHER WITH ACCURATELY CENTERING** the element at this time and **DO NOT INSTALL** the stainless steel internal locking "KEEPERS" yet. This is easier to do after all the elements are installed in the boom.
3. Install the 3/16" rod DRIVEN ELEMENT as you did the reflector. Then continue with the installation of the DIRECTORS. **Note that the Director Elements do not consistently diminish in length from rear to front, so pay close attention to length and position.**
4. Now begin centering the elements. Use a tape measure to EQUALIZE the amount the element sticking out on each side of the boom. Once you have all the elements centered, sight down the element tips from the rear comparing each side. Look for any obvious discrepancies and correct if found.
5. Begin installing the stainless steel SHAFT RETAINERS. Use thumb and index finger to hold a retainer over end of the 3/8 x 3" push tube (retainer dished into tube). Hold the element firmly and start the retainer onto the rod by applying pressure with the push tube. Push the retainer until up tight against the button insulator (Locking pliers, **lightly** clamped up against opposite button insulator will help maintain center reference and keep you from pushing the first retainer too far). Repeat for the opposite side. Continue installing retainers until all elements are locked in place.
6. Mount the DRIVEN ELEMENT BLOCK ASSEMBLY to the top of the boom using a single 8-32 X 1-1/4" screw. Orient the block with feed connector facing forward and balun connectors facing to rear.
7. Before installing the balun, thread a 3/8" SEAL NUT all the way onto each connector, with the black Neoprene face of the nuts facing out. Attach balun to the Block and tighten the connectors **gently** using a 7/16" end wrench. Once the connectors are tight, back the Seal Nuts out and finger-tighten firmly up against the face of the connectors (or tighten **gently** with 1/2" end wrench). A lot of torque is unnecessary. Form the balun close to the boom and secure with a nylon cable tie. Tie should be snug but not crushing or kinking the coax.
8. Install the 8-32 x 1/4" set screws (internal Allen head - tool supplied) into the SHORTING BARS. Slide the bars onto the 3/16" rod driven element tips and then onto the Driven Element Block Rods. Position the Shorting Bars as specified on the Dimension Sheet: 17.75" out from the block. Align the bars and rods with each other and tighten the setscrews. **NOTE: THE DRIVEN ELEMENT CAN BE REVERSED IF FEEDLINE OFF THE REAR IS DESIRED.**
9. The boom to mast plate is normally mounted at the balance point. Since the feedline represents significant weight it is best to have it attached and fastened along the boom with cable ties before final mounting of the plate. Use two 1-1/2" U-bolts and the stainless nuts and lock washers provided. **DO NOT OVER TIGHTEN.** 2" U-bolts are provided for mounting the antenna to your mast.
10. **INSTALLATION AND STACKING INFORMATION**
A. To protect your investment in this high performance antenna, always use high quality coax and connectors. Old, corroded, or poor quality materials are common sources of serious performance losses.