A New Take on the "Simple" 2m/70cm Dual Band J-Pole

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Why This Again?

Many people, including me, have passed around plans for a "simple J-Pole"

As I was giving out a link to one for the Ohio VHF+ Simplex Contest I wondered how easy it really was to build since I'd never actually done it

Every plan I looked at had one of two deficiencies:

- 1. At least one of the key parts is not a "common" part
- 2. The directions do not provide sufficient detail and measurements





Problem 1: Parts

Red-Flagged Parts

Any plans with the following parts are not plans using "common" parts:

- 3/8"-24 fine-threaded rod
- 3/8"-24 fine-threaded nuts
- "CB Antenna" mounts SO-239 to 3/8"-24 adapter
- 300Ω TV twinlead

Didn't even try to find TV twinlead or a CB mount locally – it's 2021!

I did try to find find-threaded rods locally:

Stores attempted:

- Lowes
- Home Depot
- Tractor Supply
- Ace Hardware
- Menards

Successful Stores:

Fastenal *****



Problem 1: Parts

How can we use the most possible common local parts for costeffectiveness and availability?

- CB SO-239 to 3/8-24 is just flat-out a "buy online" part but they are small and cheap
- >3/8-16 is the common threading in the SAE standard and common is good (and cheap)

Research uncovered that a dual-stud converting between 3/8-16 and 3/8-24 is found in automotive applications, but they aren't a stocked item either.



<u>Solution</u>

- Develop plans for both 3/8-24 rod and 3/8-16 rod
- Clubs/orgs could stockpile the CB mounts and the double-end studs cheaply and easily



Uncommon Parts

3/8-24 Threaded Rod







\$4.87ea + tax (Fastenal) Fastenal #47062

\$3.50 / 5pk + tax (Fastenal) Fastenal #3116727



Uncommon Parts

3/8-24 to UHF SO-239 Female Antenna Mount

Dorman Double Ended Stud 3/8-16 x 1/2 In. and 3/8-24 x 3/4 In





\$4.49ea + \$3.35 S/H https://ebay.us/kloDB2

\$1.29ea Advance Auto Parts #675-098 Must be special ordered, in-store pickup



Common Parts

Item	Home Depo Part	Cost (NE Ohio price pre-tax)
EMT Conduit, 1/2", 10ft	SKU #203106	\$4.35
3/8 in. x 36 in. Zinc Threaded Rod	SKU #671223	\$3.58
5 in. Zinc-Plated Corner Brace	SKU #243078	\$2.98
1/2 – 1-1/4 Stainless Steel Host Clamp x2	SKU #100589	\$1.15ea
3/8-16 zinc-plated steel nut x2	ACD	\$0.15ea
3/8-16 x 1-1/8in Coupling Nut	SKU #1000016180	\$1.32 (2pk)



Bill of Materials

Fine-Threaded Rod

- 3ft 3/8-24 Threaded Rod
- 3/8-24 Hex nut 5pk
- 3/8-24 to SO-239 Adapter
- EMT Conduit, 1/2", 10ft
- 5 in. Zinc-Plated Corner Brace
- 1/2 1-1/4 Stainless Steel Host Clamp x2

Coarse-Threaded "Two Part" Rod

- 3ft 3/8-16 Threaded Rod
- 3/8-16 zinc-plated steel nut x2
- 3/8-16 x 1-1/8in Coupling Nut
- Dorman Double Ended Stud
- EMT Conduit, 1/2", 10ft
- 5 in. Zinc-Plated Corner Brace
- 1/2 1-1/4 Stainless Steel Host Clamp x2

Total Cost: \$23.96 pre-tax (\$25.58 OH Tax)



Tools & Other Stuff Needed

Tools

- Drill with 1/2" and 3/8" bits suitable for metal
 - Recommend using 3-in-1 or cutting oil while drilling
- Hacksaw (or something else to cut rods like a Dremel)
- Flat-blade screwdriver
- Two wrenches, pliers, etc. to secure the nuts
- Vice, clamps, or some other way to secure the bracket while drilling and the all-thread while cutting
- Safety glasses or other eye protection

Other Stuff

- PL-259 to ?? Feedline Get what your radio wants or else get PL-PL with an adapter
 - Note: For non-trivial lengths get at least RG-8U coax if not LMR400



Problem 2: Vague on Key Points

Most types of the plan have statements like:

- "Cut long then adjust..."
- "Measure your SWR then adjust..."
- "Use the formula of X to estimate...."

These should be "red flags" in plans for new hams:

- Most FM radios do not have an SWR meter built in
- The cost of a VHF/UHF-capable SWR meter is three-times the cost of the parts for this antenna
- How many hams have an Antenna Analyzer or a VNA to do the finetuning anyway?





Problem 2: Vague on Key Points

<u>Solution</u>

- 1. Provide detailed measurements so hams without SWR meters or antenna analyzers can build this <u>exact</u> antenna and have it work on generally-useful frequencies
- 2. Target best SWR in the repeater and FM simplex regions of 2m and 70cm



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Notes on Lengths / Frequencies

- This design's measurements are specific for the frequency ranges indicated previously
- The design can be changed for resonance by altering the following:
 - Cut the 2m rod at $\frac{432}{freq in MHz} \times 6 + 1.5$ for inches length (starting point)
 - Cut the 70cm rod at $\frac{432}{freq in MHz} \times 6$ for inches length (starting point)
 - Start the bracket down the EMT at $\frac{705}{2m \ freq \ in \ MHz} \times 12 1$ for inches from top (starting point)

You will then need an antenna analyzer or a VNA to measure SWR and do trimming and adjusting



Step 1 – Modify the Bracket

- Drill out the outer-most hole on one end with the 1/2" drill bit
- ➢Drill out the middle hole next to the 1/2" hole just made with the 3/8" drill bit
- Remove the label on the bracket cleanly for a good electrical connection





Step 2A – Cut the Threaded Rod (Fine Thread)

Cut the threaded rod into the lengths necessary:

18.5" for 2m

6 ³/₄" for 70cm

Be sure to measure and cut from the machined ends so there is no clean-up work on the threads. Make sure to err on cutting long!





Step 2B – Cut the Threaded Rod (Coarse Thread)

Cut the threaded rod into the lengths necessary:

17" for 2m

6 ³/₄" for 70cm

Be sure to measure and cut from the machined ends so there is no clean-up work on the threads. Make sure to err on cutting long!





Step 3A – 2m Assembly Layout (Fine Thread)





Step 3B – 2m Assembly Layout (Coarse Thread)





Step 4 – 2m Assembly

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Coarse-Thread Version Shown – Fine-Thread Version lacks the coupling nut

Step 5 – Mast and Bracket Mount

- ➢Measure and cut the EMT conduit at 70½" long
- ➢Measure down 56 7/8" from the uncut end of the EMT and mark a line
- Place the bracket the EMT using the two hose clamps. The part of the bracket that touches the EMT should be towards the bottom
- If you are going to measure your own SWR, tighten the host clamps enough to hold the bracket when standing for testing but can still move with light tapping up and down





Step 6 – Measure SWR for 2m (Optional)

- Connect your analyzer or VNA using a cable so the device can be moved far enough away from the antenna so as not to affect the result
- Sweep the antenna from 144 MHz to 148MHz the SWR should be under 1.5:1 across the whole range
- For small adjustments, tap the bracket up and down on the EMT with a screwdriver handle
- If the SWR is high, open the range to 120 MHz to 160 MHz and see where the dip is. If it's below 144 MHz, the rod can be trimmed shorter. If it's above 144 MHz, the rod is too short and must be replaced
- Make sure to tighten the hose clamps when done

	M1 142.825 08 M3 146.525 08	0 MHz 1.3058 0 MHz 1.3884	M2 144 M4 147 &1	.400 000 MHz .900 000 MHz -2‡-1.575 000 M	1.3707 1.3731 Hz	
<u>C</u> 1						
R R S T						
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	START 140.000 000 MHz bw:4000Hz 101p STOP 150.000 000 MHz					

SWR Sweep for 2m of this design



Step 7 – Install 70cm Rod

- ➤Thread on one of the nuts onto the 6¾" rod so that ¾" of the rod is "below" the top nut. Seat the rod into the hole.
- ➤Add the second nut on the bottom and tighten well, even if just measuring SWR. 70cm is very sensitive to even the smallest gaps/offsets if the nuts are loose





Step 8 – Measure SWR for 70cm (Optional)

- Sweep the antenna from 440 MHz to 450MHz – the SWR should be between 1.4:1 and 1.8:1 across the whole range with a minimum at 446 MHz
- Very minor adjustments can be made by raising or lowering the 70cm rod
- More adjustment requires a different length rod

	M1 446.000 00 M3 449.200 00	8 MHz 1.3901 8 MHz 1.3527	1	
C 2				
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SWR Sweep for 70cm of this design



Final Assembly

- The final assembly should appear as shown here
- For long-term outdoor use, apply silicone to all nuts and other fasteners to prevent corrosion from water and water from entering the coax
- Ensure that the PL-239 connection is wrapped well in electrical tape to prevent corrosion and water entrance into the coax
- Mount as convenient
 - Drill a hole in the top and hang
 - More hose clamps
 - Drill a hole in the bottom, pin, and sit on a pole











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