

TH-3JRS Deconstruction

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One day, at the end of a 20 meter CW QSO, the SWR shot up. I was running about 500 watts and figured I blew one of the traps. I've replaced the TH-3JRS with a Cushcraft A3S, rated at 2 kW PEP. The TH-3JRS is rated at 600 watts PEP.

To determine which trap was bad, I measured the parallel resonant frequency (frequency with maximum equivalent series resistance) of each trap with a SteppIR SARK-110 as shown below..



Note that the ground lead of the Sark is connected to the head of a screw on the case of the trap. This sheet metal screw connects the shell of the trap to the tubing on the side of the trap towards the boom. By orienting the trap in this direction, the shell becomes part of the radiating element “before” the trap. For example, the 10 meter trap is closest to the boom. The 10 meter radiator is the tubing from the boom to the trap PLUS the shell of the trap. The 15 meter radiating element extends from the other side of the trap. The ground side of the SARK 110 was connected to the head of the screw connecting the shell to the tubing. The non-grounded side of

the SARK-110 was connected to the tubing end away from the self tapping screw. This grounds the shell of the trap and *should* minimize issues with capacitive coupling to surroundings and reduce reactance due to tube length (ground connection at trap instead of at end of tube). Below is an inside view of a trap.



Note the hole in the tube to the right of the second white spacer from left and the hole in the trap shell on the right. A self tapping screw goes through the shell and is threaded into the inside tube. Several of these screws were loose, and, on one trap, the hole on the inside tube was stripped. Since the hole goes all the way through the tube, I rotated the shell so the screw went into the other side of the tube. Stripped hole problem fixed!

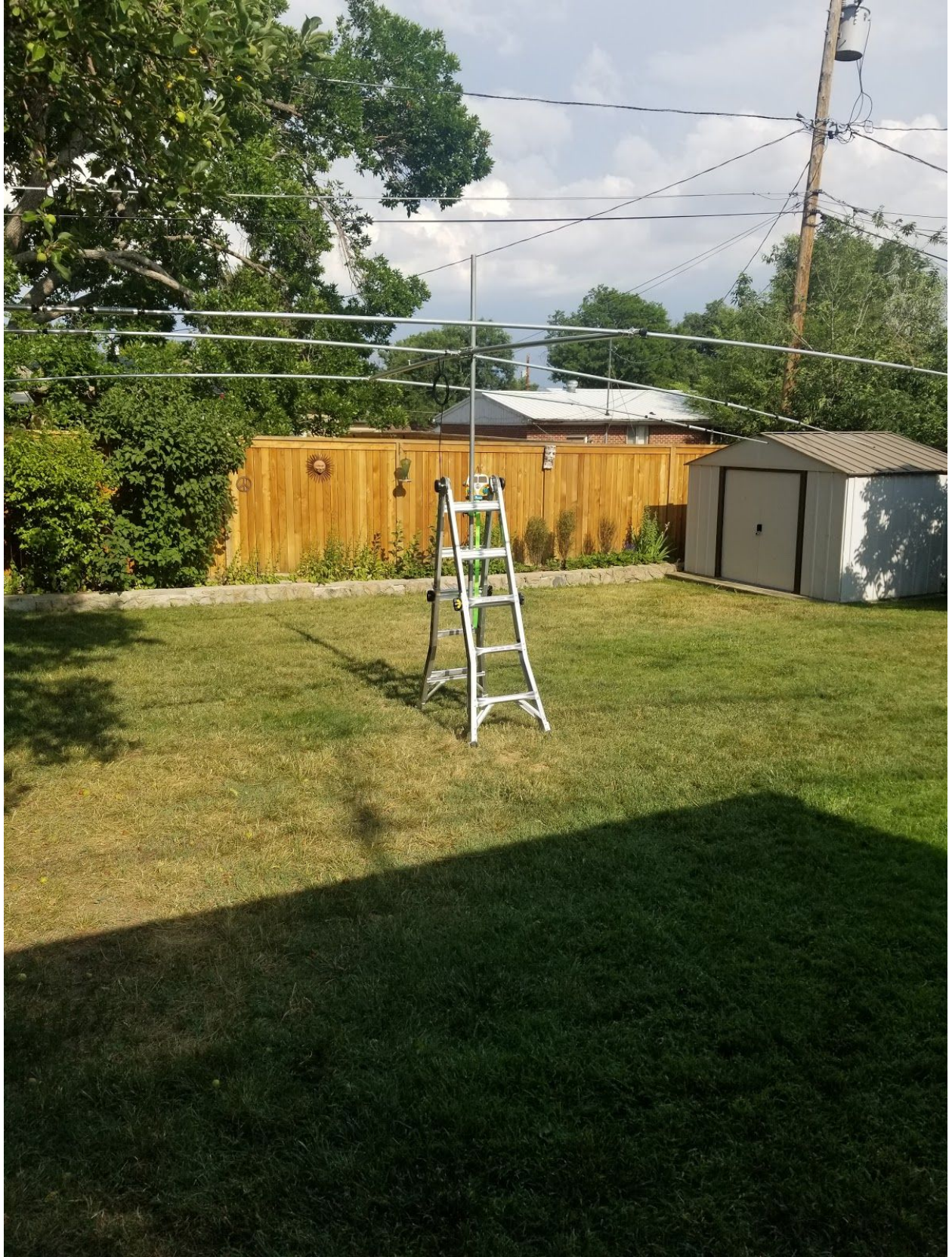
The table below shows the measured parallel resonant frequency (maximum equivalent series resistance) for each of the traps. Two frequencies are listed for each band and element, the first for the left side of the boom, the second for the right side of the boom.

Band	Reflector	Driven Element	Director
15 m	10.872 MHz 10.87 MHz	10.9 MHz 11.22 MHz	10.8 MHz 10.9 MHz
10 m	13.023 MHz 13.023 MHz	13.1 MHz 13.2 MHz	13.14 MHz 13.14 MHz

Note that the parallel resonant frequencies are below the band frequencies. For example, the 15 meter traps are in the 10.9 MHz area, while the 15 meter band starts at 21 MHz. Below the parallel resonant frequency, the trap is inductive. The traps serve as both a trap and a “loading coil,” allowing the elements to be shorter than the typical half wavelength.

Reassemble and Test

The antenna was reassembled and put on a “test tower” as shown below. The boom is 7.75 feet above ground (not ideal!). SWR and center frequency would be improved with the antenna higher off the ground and away from nearby power lines, telephone lines, rain gutters, etc. Since I moved the balun to the new antenna, a common mode choke was made with several turns of coax.



SWR sweeps were run on the reassembled antenna.



10 meters (28.0 to 29.7 MHz). Minimum SWR is 2.34 at 28.85 MHz.



15 meters (21 to 21.45 MHz). The minimum SWR is off the low end of the sweep. The plot below shows a minimum SWR of 1.53 at 20.79 MHz. This low frequency is probably due to the proximity to the ground.



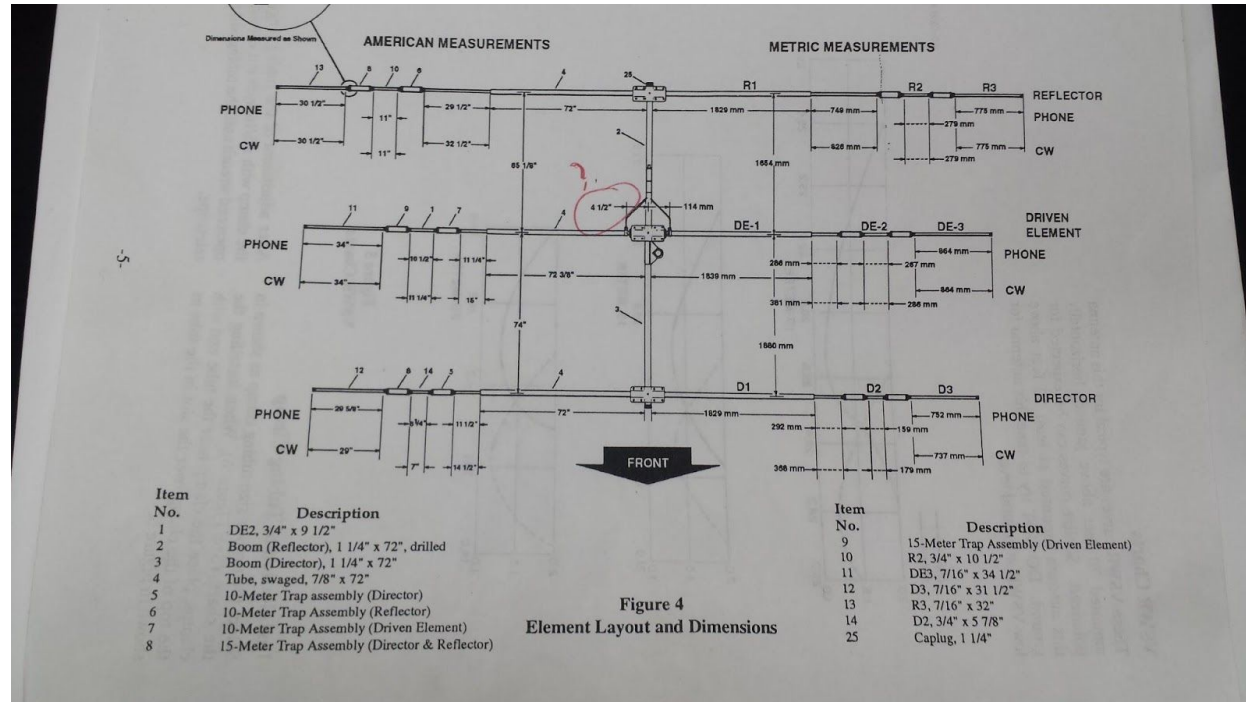
20 meters (14 MHz to 14.350 MHz). The minimum SWR of 1.82 is at 14.160 MHz, well within the band. Again, I expect the SWR to improve with the antenna higher off the ground.



Links and Notes

- [hy-gain TH-3JRS Product Page](#)
- [TH-3JRS Manual](#)
- TH-3JRS Assembly Notes
 - I recommend doing a complete inventory of parts before starting assembly. I received two of the director boom pieces and no reflector boom piece. Also, the driven element to boom bracket was the wrong one (stamped #4 instead of #1). hy-gain quickly shipped replacement parts.

- The phone number listed in the manual is out of date. The correct number is +1 662 323 9538.
- Dimensions in figure 4 are quite unclear. A better copy of figure 4 is available [here](#) and is shown below. Even this is not extremely clear. You can get US measurements by dividing the millimeter distances (right side of page) by 25.4 . The millimeter measurements are often more clear.



- When assembling the antenna, make sure the trap drain holes are on the bottom of the trap so no water can get in (and any that does can drain). This IS included as the very last instruction, but it would be helpful to know this as traps are placed so they do not need to be rotated later.