Comet CAT-300 1.8 – 50 MHz Manual Antenna Tuner

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I suspect that one of the most common accessories found in the ham shack is an antenna tuner. And while autotuners have become quite popular, the manual antenna tuner fills the needs of many hams. The Comet CAT-300 antenna tuner is a rugged manual antenna tuner that handles power levels up to 300 W.

Basic Description

Like most manual antenna tuners, the CAT-300 is a **T**-configuration antenna tuner. This antenna tuner can handle up to 300 W PEP of RF from 160 through 6 meters. It includes a colorful 1.8 × 2.5-inch analog cross-needle meter that simultaneously displays forward, reflected power, and SWR. There is a pair of high-voltage variable capacitors, and a tapped shunt inductor (actually, two series inductors). Controls include a 30/300 W range selector, PEP and average power reading, a **TUNER** switch that bypasses the CAT-300 while leaving the power and SWR functions intact, an **ANTENNA 1** or **ANTENNA 2** switch, the normal transmit and antenna variable capacitor, and tapped inductor (**BAND**) control. On the rear panel, you will find three SO-239 connectors — one **INPUT** to connect your transceiver, and two outputs to connect your antennas (see Figure 2). Please note that there are two possibilities for the **ANTENNA 2** output, using either the SO-239 or the **WIRE ANT** banana jack for a wire antenna. There is no internal balun. Figure 3 shows the internal view of the CAT-300, and the complete specifications are given in Table 2.

The **BAND** switch selects the shunt inductor tap. This may or may not be associated with the listed band, depending on the mismatch. The CAT-300 two-sheet manual lists starting capacitor and inductor positions for a 50 Ω input and 50 Ω output. This was a good starting point for my adjustments, as I was gradually increasing the resistive mismatch. However, for real on-the-air SWR adjustments, I recommend the technique described by Andrew S. Griffith, W4ULD, in "Getting the Most Out of Your **T**-Network Antenna

Table 2
Comet CAT-300
Manufacturer's Specifications
(not tested by the ARRL Lab)

Frequency range:	1.8 – 54 MHz
Input impedance:	50 Ω
Output impedance:	10 – 600 Ω
Maximum TX power:	300 W PEP
Minimum SWR measurement power:	6 W
Lighting power supply:	11 – 15 V dc at 250 mA maximum*
Dimensions (width, height, depth):	9.8 × 3.9 × 9.5 inches
Weight:	6 pounds

*The actual current was only about 20 mA. I suspect that the original CAT-300 used an incandescent lamp for meter illumination. When this was changed to LEDs, apparently the current spec was not revised.

Figure 2 — The Comet CAT-300 rear panel.

Bottom Line

For those hams interested in a manual antenna tuner, the Comet CAT-300 is certainly worth considering. It should easily satisfy the needs of 100 – 200 W radios for most any antenna system mismatches.

Tuner" in the January 1995 issue of *QST*. This entails the following procedure:

1. Start with both capacitors in their center (half-meshed) positions.

2. Switch the shunt inductor to find maximum receiver noise.

3. Transmit 5 – 10 W and rotate the output capacitor, looking for an SWR dip.

4. If no dip is seen, switch the inductor up or down and try again.

5. Once an SWR dip is found, adjust the input capacitor for best SWR.

6. Rock the output capacitor, and vary the input capacitor, until you find the lowest SWR.

Table 3
Comet CAT-300 Resistive Load and Loss Testing

VSWR/Impedance	160 M	80 M	40 M	20 M	10 M	6 M
10:1/5 Ω Loss (%)	65%	46%	40%	45%	19%	23%
VSWR	1.1:1	1.1:1	1.1:1	1.1:1	1.2:1	1.2:1
8:1/6.25 Ω Loss (%)	58%	41%	30%	26%	10%	15%
VSWR	1:1	1.1:1	1.2:1	1.2:1	2:1	1.3:1
4:1/12.5 Ω Loss (%)	44%	29%	20%	24%	<5%	6%
VSWR	1.1:1	1.1:1	1.2:1	1.1:1	1.2:1	1.1:1
3:1/16.7 Ω Loss (%)	37%	23%	20%	19%	<5%	13%
VSWR	1.1:1	1.1:1	1.1:1	1.1:1	1.1:1	<5%
2:1/25 Ω Loss (%)	26%	20%	16%	18%	6%	14%
VSWR	1.2:1	1.1:1	1:1	1.1:1	1:1	1.1:1
1:1/50 Ω Bypass Loss	0%	0%	0%	1%	2%	3%
Bypass VSWR	1:1	1:1	1:1	1:1	1.1:1	1.3:1
2:1/100 Ω Loss (%)	18%	10%	10%	16%	10%	7%
VSWR	1.1:1	1:1	1:1	1.1:1	1.3:1	1.1:1
3:1/150 Ω Loss (%)	16%	10%	7%	16%	10%	<5%
VSWR	1.1:1	1.1:1	1.1:1	1.1:1	1.1:1	1.1:1
4:1/200 Ω Loss (%)	12%	8%	8%	20%	12%	<5%
VSWR	1:1	1:1	1.1:1	1.2:1	1.1:1	1.1:1
8:1/400 Ω Loss (%)	12%	12%	15%	23%	26%	40%
VSWR	1:1	1.1:1	1.2:1	1.1:1	1.3:1	1.1:1
10:1/500 Ω Loss (%)	15%	12%	<5%	25%	30%	44%
VSWR	1.1:1	1.1:1	1.1:1	1.1:1	1.2:1	1.6:1

My matching tests are shown in Table 3. I found that the adjustments were very touchy on 20 meters and above. However, it was fairly easy to null the SWR using the analog meter on the CAT-300. The input SWR was measured using a NIST-traceable power meter, as I wanted to more precisely measure the matched SWR.

For these resistive SWR tests, all best SWR adjustments coincided with the corresponding band setting, except the high impedance 10-meter tests. In these cases, I had to use the 6-meter inductor position. And I could not find a tuning solution better than 2:1 SWR for the 6.25 Ω (8:1 SWR) low-impedance test on 10 meters. Also, as you can see in Figure 3, there are insulated shaft extensions on the two variable capacitors. Other manual antenna tuners I've reviewed just used the plastic knobs to isolate the user from the high RF voltages on the capacitors, but I would often get RF burns from the setscrews in the knobs. This is not a problem with the CAT-300.

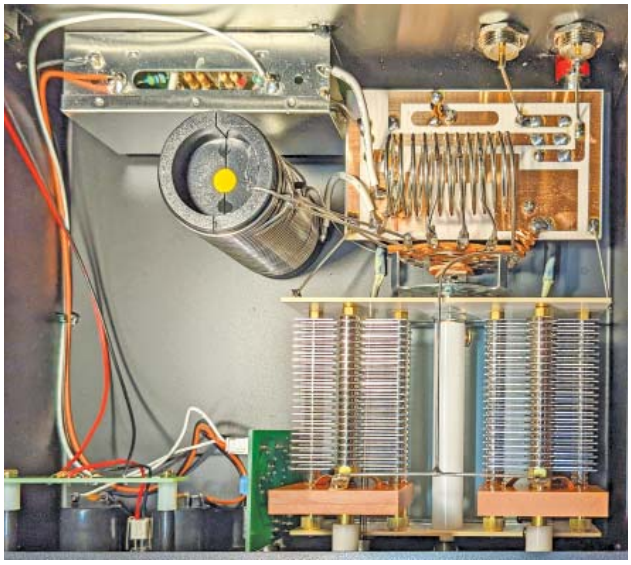

Figure 3 — The Comet CAT-300 internal view.

Table 4
Comet CAT-300 SWR and Power Reading Accuracy

	Low Impedance		High Impedance		30 W Scale		300 W Scale	
Band	2:1 SWR	3:1 SWR	2:1 SWR	3:1 SWR	10 W	20 W	50 W	80 W
160 M	1.4:1	1.9:1	1.7:1	2.7:1	9.5 W	20 W	50 W	80 W
20 M	1.4:1	2.2:1	1.5:1	2.4:1	8.7 W	16 W	50 W	70 W
10 M	1.4:1	2.0:1	1.6:1	2.5:1	8.2 W	15 W	50 W	70 W
6 M	1.3:1	1.8:1	1.7:1	2.5:1	9 W	17 W	50 W	75 W

Next, I measured the SWR and power readings versus my NIST-traceable equipment with the CAT-300 placed in the bypass mode. The CAT-300 readings are my best attempts to interpolate the readings on the analog CAT-300 meter. The results are shown in Table 4.

The SWR readings are reasonably accurate when the impedance is high. The low-impedance SWR measurements are much less accurate. However, the SWR meter is quite adequate for dipping the SWR during tuning.

Finally, I looked at the peak meter-reading position. The peak reading meter circuitry is not powered. Apparently, a larger capacitor is used to hold the sampled energy a little longer than normal. However, this also means it takes longer to charge this capacitor and, thus, display the peak power. On CW, I found that it took four dits before a true peak reading could be observed. This was more difficult on SSB. I found that I needed to talk fast and continuously for several seconds in order to see a peak reading. However, the CAT-300 meter only ever showed about 80% of the peak reading displayed on my Array Solutions PowerMaster.

Conclusion

The Comet CAT-300 manual antenna tuner is a well-made and rugged product. I was particularly impressed with the bypass SWR, especially on 10 and 6 meters. This shows that Comet was careful to ensure that stray wiring inductances were kept to a minimum. I was also pleased with the insulated variable capacitor shafts.

Manufacturer: Comet Co., LTD (Japan). Distributed in North America by the NatCommGroup, NCG Companies Inc., 15036 Sierra Bonita Lane, Chino, CA 91710. **www.cometantenna.com**. Price: $280.