CQ REVIEWS:

The AEA Model AT-300 Antenna Tuner

BY LEW McCOY*, W1ICP

When Advance Electronic Applications (AEA) brought out their new antenna tuner (Transmatch), I had the opportunity to review the unit for *CQ*. The Model AT-300 is a departure from the conventional two capacitor, one inductor (Walt Maxwell, W2DU) circuit. I have shown both types in fig. 1 at (A) and (B). Before going ahead, let me backtrack a little into the history of the antenna tuner so you have a better idea of the whys and wherefores.

Back at the inception of the Novice license in the very early 1950s, my main job in the Technical Department of the ARRL was writing articles for the new Novices. We quickly realized at the time that Novices were getting into trouble with second harmonic radiation from 80 meter operation because the harmonics fell just outside the 40 meter band, causing problems to commercial services. The FCC asked the League to concentrate on educating the Novices about the problems, and more important, the cure. It fell to me to do the job.

The solution was to have better harmonic rejection from the rigs of that day, and the simple answer was antenna tuners, because most of these circuits would provide at least 30 to 40 decibels of harmonic rejection, which was more than adequate. I soon found myself describing tuners at least twice a year, and in some years even more often. At about the same time in the technical history of amateur radio, 50 ohm, multiband coaxial output became popular. Therefore, the search was on for a bandswitching—or multiband—antenna tuner that would work into 50 ohms and match a wide variety of antenna loads. The first of these circuits was called the 50 ohm Transmatch, which eventually became the basis of all modern tuner circuits. As an aside, the name "antenna tuner" was never really apropriate, because one doesn't "tune" an antenna, but rather matches an antenna system. Hence the word *Transmatch* was coined.

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Front view of the antenna tuner.

I tried both the circuits shown in fig. 1 back in those days, and my conclusion was that while the two-inductor approach had better harmonic rejection, it was much tougher to get the parts—particularly switches. The use of two inductors and a single capacitor worked just as well as two capacitors and a single tapped inductor in most cases as far as matching was concerned. The main reason I never used the two tapped inductors was simply that it entailed using switches with multi-contacts, and they were hard to come by, as I stated above. Of course, AEA solved that problem by manufacturing their own switches. I am sure that arguments will go on over the merits of the two systems, but from my viewpoint .... Let me tell you about my tests with the Model AT-300.

The Model AT-300 is rated as multiband, or rather continuous coverage from 3.5 to 30 MHz, which of course includes MARS frequencies. It does not cover 160 meters. Fig. 2 is the circuit diagram of the 300. The circuit uses the two tapped inductors; both have 18 positions with a 240 pF maximum capacitance variable (35 pF minimum). Additionally, the unit will handle two coax-fed antennas plus either a balanced or single-wire feed. The antenna switch also provides a switch position for a dummy load and two

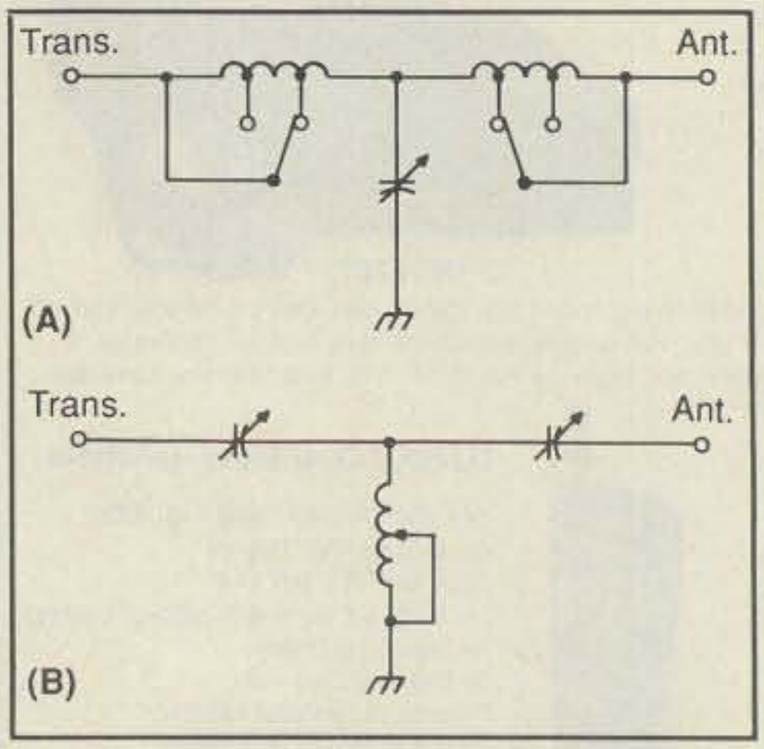


Fig. 1– At (A) is the circuit for the two-inductor-type tuner, while at (B) is the two-capacitor type.

positions (coax feed antennas) for direct feed, bypassing the tuner. There is a two-position rocker switch that selects the range of FORWARD and REFLECTED power displays. HIGH selects forward power of 300 watts, 60 watts full scale reflected. Low selects 30 watts full scale and reflected 6 watts. The meter is a dual-needle type.

My first test was with an 80 meter double extended Zepp with open-wire feed-

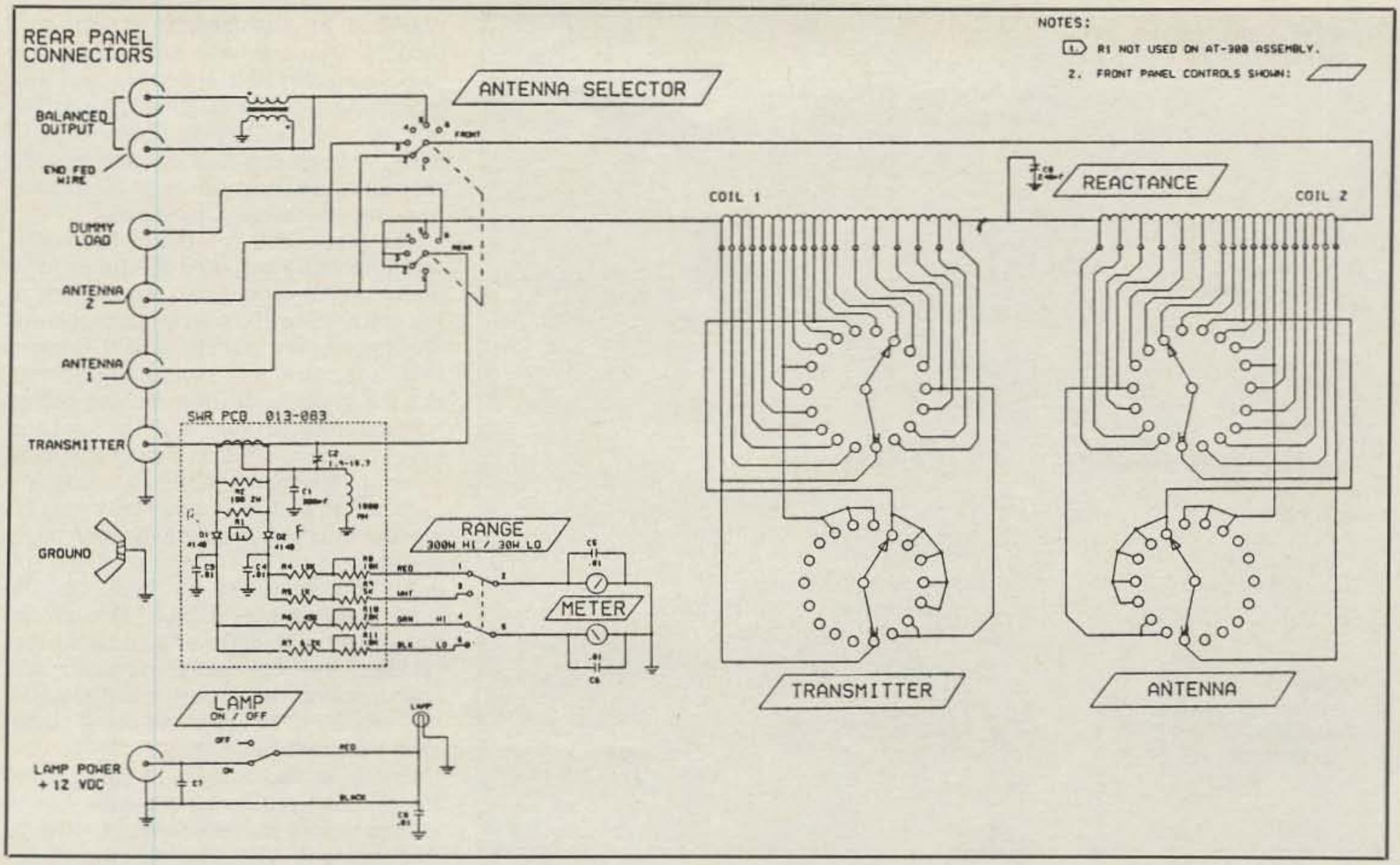
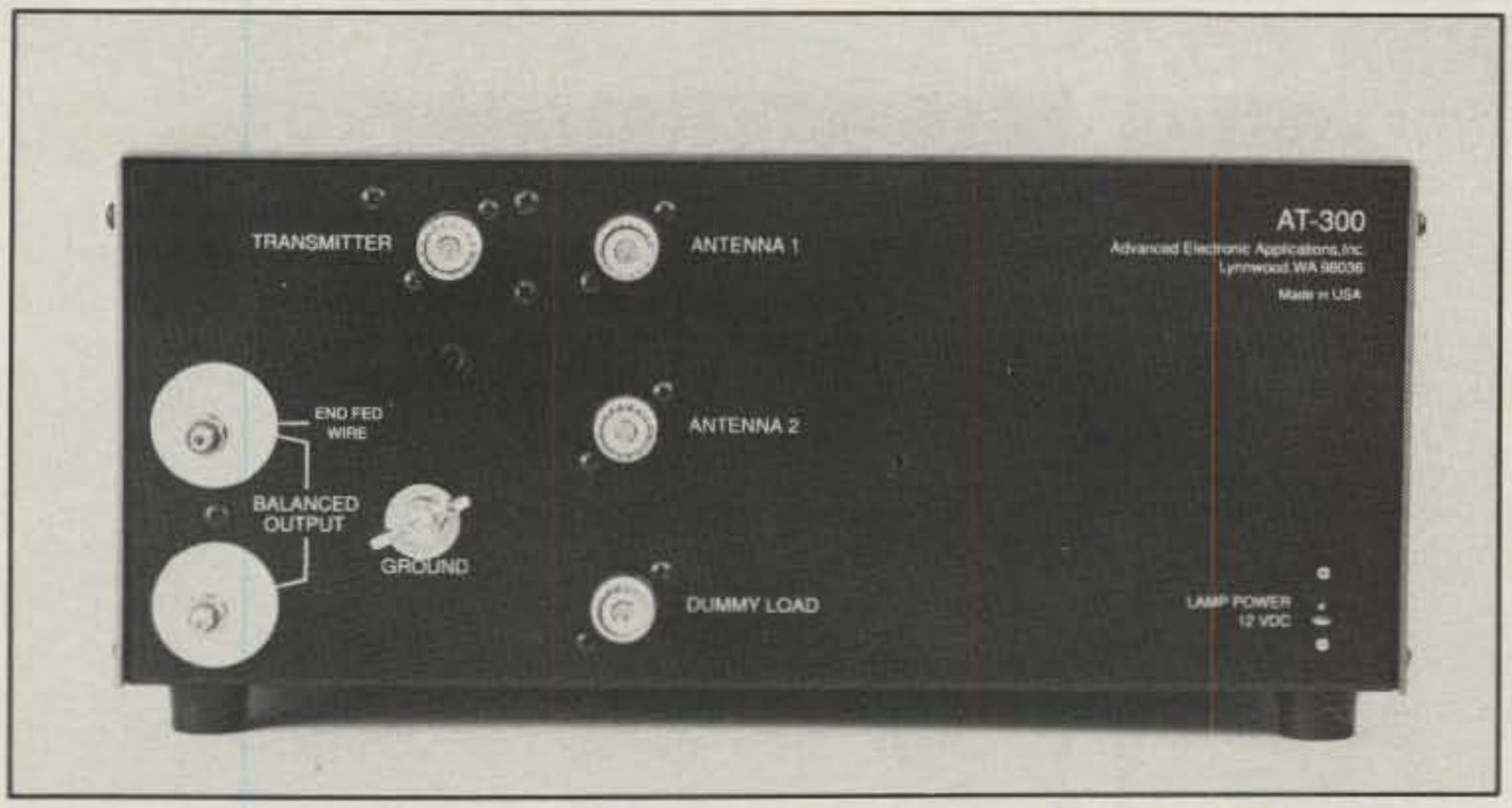


Fig. 2– Circuit diagram of the Model AT-300. At the upper left at the balanced input is the toroidal transformer for converting from single to balanced input.



Rear view of the Model AT-300. At the bottom left are the two isolantite feed-throughs for the balanced input. To the left of center are the three coax antenna inputs.

ers. This antenna presents a very wide variety of loads, and I consider it excellent for testing Transmatch ranges. I carefully went through each band, including the WARC bands, and found that in most instances I could achieve a perfect match, 1 to 1. Even in those cases where I could not, the match was less than 2 to 1, which is adequate for nearly all modern transmitters.

Next I went to what I call a really acid test. I connected two clip leads with about 3 feet of wire and went to 3550 kHz. This antenna would present a ridiculously low impedance, only a fraction of an ohm. I was pleasantly surprised when I achieved 1 to 1 match! Next I connected an 1800 ohm reactive load (wire wound) resistor and found I could match that. Then I went to a 3600 ohm load and matched that. That was enough to satisfy me—almost.

I had the 3600 ohm load connected across the balanced terminals and adjusted for a match on 15 meters. I heard

Front Panel Indicators and Controls	
Meter	Dual-movement D'Arsonval cross needle power and SWR meter
Controls	
Transmitter Tuning	18 position
Antenna Tuning	18 position
Reactance	Continuous
Antenna Selector	6 position: Antenna 1 tuned and tuner bypass, antenna 2 tuned and tuner bypass, dummy load (external) and balanced antenna
Power Switch	2 position high/low
Lamp	Light control for meter
Rear Panel Connectors	
Antenna 1	SO239 connector
Antenna 2	SO239 connector
Dummy load	SO239 connector
Transmitter Input	SO239 connector
Balanced Output	Ceramic feed-through insulators
Power	12 VDC for meter lamp
Other	
Frequency Coverage	3.5–30 MHz
Power Maximum	300 W continuous
Dimensions	5.8"H × 12.8"W × 15"D
Weight	9.0 lbs

Table I– These are the manufacturer specifications for the Model AT-300.

W4PC in St. Petersburg, Florida, so I thought what the heck and gave him a call. You guessed it. He came back and gave me a nice report. Next, believe it or not, I worked a ZL, New Zealand on 10 meters! I assume that my dummy-load resistor was coupling enough RF to other antennas, but who really knows?

The Model 300 is rated at 300 watts, and I carefully adjusted the tuner for a match on the various bands and then ran the power up to 300 watts—no problems. The instruction manual, which is more than adequate and well written, points out the importance of matching before running power, or you are likely to get arcing of components. You should also keep in mind that some antenna loads are "sharp," in that you cannot QSY very far without retuning. I had that happen on 80 meters and got an arc when running 300 watts, but that was my fault, not the tuner's. As a matter of fact, I actually ran the power up to 500 watts and the tuner handled the load okay. However, the manufacturer rates the unit at 300 watts, so I would not recommend going higher than their ratings.

There is also a lamp to light up the meter, but it requires a separate 12 volt source which I will admit I didn't bother to try. The Model AT-300 is housed in a black cabinet, 5.8"H × 12.8"W × 15"D. CQ