The MFJ Versa-Tuners

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Front view of the MFJ-962 Versa-Tuner III.

MFJ Enterprises brought out a series of antenna tuners dubbed "Versa-Tuners." Units in the series differ according to the power level they can handle and whether they include metering facilities or a built-in dummy load for the lower power units. However, they all use the same basic circuitry for impedance matching. This review only goes into detail about a Versa-Tuner III unit (rated at 1500 watts), which falls in between the Versa-Tuner II and IV units (rated at 300 and 3000 watts respectively), but the general performance features noted should be applicable to all units in the series. The features of the IV are discussed, however, as a basis of comparison.

The Versa-Tuner III, Model MFJ-962, is a full feature unit. As can be seen from the front view, the front panel contains quite a few controls. Aside from the three controls directly associated with the impedance matching network (Antenna Matching, Transmitter Matching and Inductor), there is an antenna selector switch and two meter controls. The antenna selector switch allows one to select either one of two output coaxial lines either directly, without going through the internal impedance matching network, or through the matching network. Also the switch can route the input through the matching network to a single wire output or to a balanced line output via a built-in balun. Regardless of which output is selected, the metering circuitry remains active. The meter switch allows the usage of the metering circuitry as either a conventional s.w.r. meter, where one has to set the meter for full scale deflection in the forward reading position using the s.w.r. set control, or as a direct reading r.f. wattmeter for both forward and reflected power requiring no meter adjustments. The wattmeter is calibrated to measure r.f. power either in the forward or reflected directions in two ranges—200 and 2000 watts. On the 200 watt range, the lowest power level which can be read is about 5 watts. The tuner itself is rated to handle 1500 watts r.f. output into most antenna loads.

The rear view shows the rear panel of the tuner. SO-239 connectors are used for all input and output coaxial line connections. Generously dimensioned ceramic feed-through insulators are provided for the connection of a balanced transmission line and/or a single wire feeder. There is also a small jack provided for an external 9-12 volt source to power a lamp which provides back-lighting of the panel meter, an option not found in the IV.

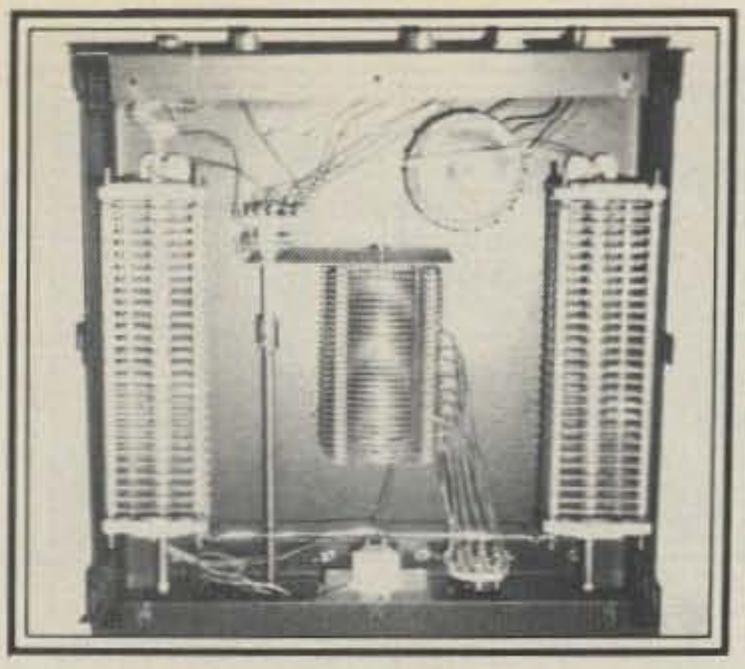
Fig. 1 shows the schematic diagram of the tuner. Note that the basic configuration of the impedance matching network is a T network with two variable capacitor arms. This network is not as commonly found in tuners as perhaps some variation of the familiar pi-network. However, the T network usually can match a wider range of complex impedances over the h.f. range with more reasonable component values than those required by a pi-network. The pi-network, particularly on the lower frequency bands and when working into low load impedances, can require very high values of capacitance, which usually necessitates the switching in of fixed capacitors across the variable ones used for tuning purposes. Such an arrangement is awkward and can introduce additional loss in the matching network. The author makes no particular claim for being the first to point out the advantages of the T network configuration. However, his first articles on the subject appeared in *CQ* almost 13 years ago! (See references at end of the article.) The only real disadvantage of the T network is in its construction in that both variable capacitor arms have to be insulated from ground.

The schematic also shows the details of the s.w.r./power metering circuitry. A balanced r.f. sampling transformer, which is wound on a ferrite core, is used. Adjustments, which are all factory calibrated, provide for nulling out stray capacitance in the transformer and for calibrating the meter on its two power ranges. Finally, the schematic also indicates how a 4:1 ferrite core balun is used to couple the output of the tuner to a balanced transmission line.

The inside view of the tuner reveals a very sturdily built unit. The cabinet consists of two rolled steel sections. One is a bottom section to which the front and back panels are attached, while the other is a top cover section. The cabinet measures about 5 1/8 ×

The rear view of the Versa-Tuner III. A fourth coax connecter is added in the IV which will be seen in a later photograph.

*c/o CQ Magazine

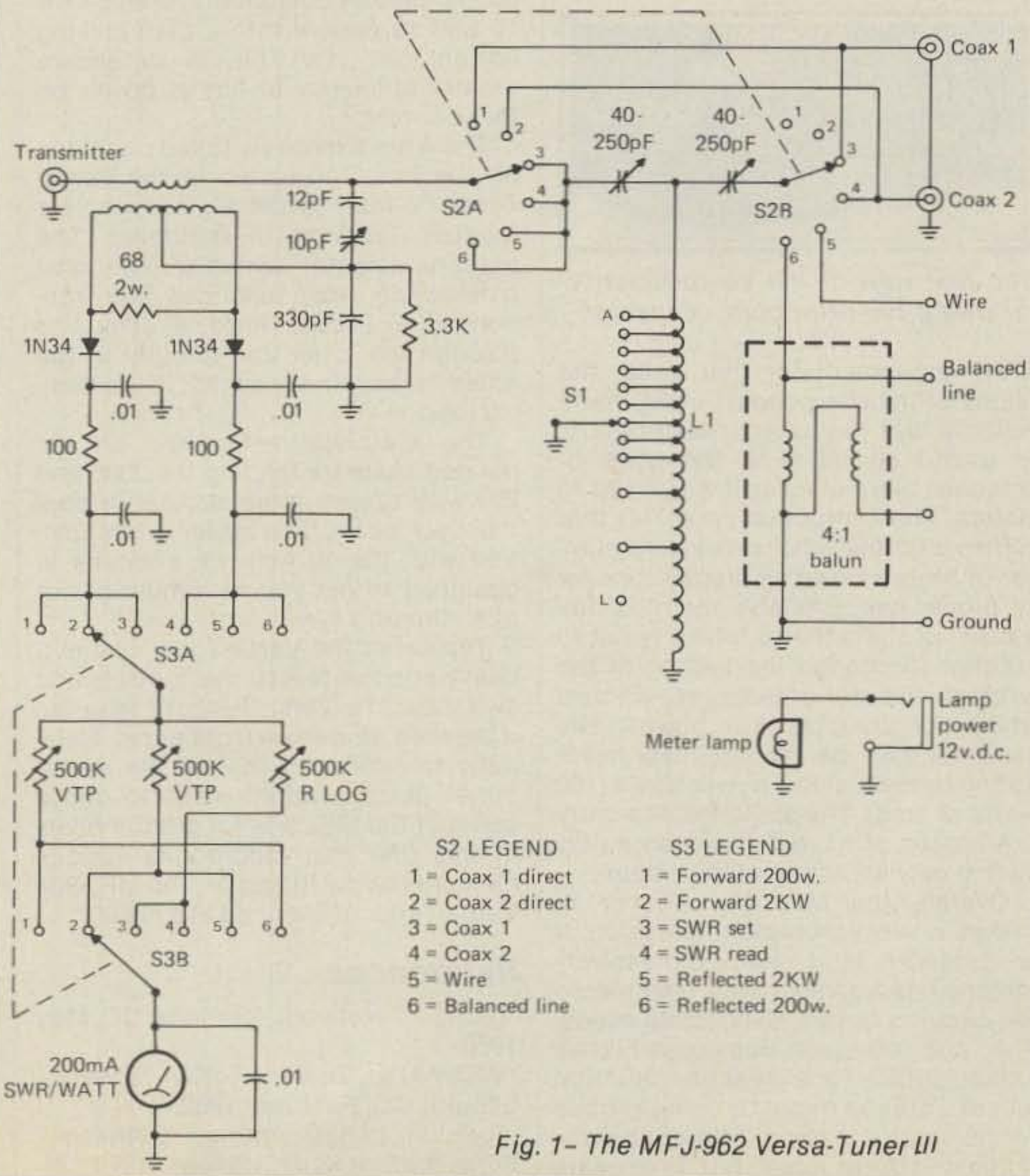


Interior view of the Versa-Tuner III.

14 1/8 × 14 5/8 inches. As can be seen, the two 250 pf/6000 volt variable capacitors dominate the interior of the unit. The 3-inch diameter air inductor has its own support bracket in the middle of the enclosure and is well spaced from all other components. The antenna selector switch (rated to carry 9 Amperes) is located to the left of the inductor. The potted 4:1 balun, which is about 3 inches in diameter, is located to the right of the inductor. A PC board, which contains the s.w.r./power metering circuitry, is not visable but is located on the back panel above the variable capacitor on the left. Both capacitors, of course, are completely insulated from ground by means of standoff mounting insulators and teflon insulated front panel shafts. All r.f. wiring is done with plated, solid conductor wire.

In putting the tuner into operation, the first thing that was checked was the accuracy of the s.w.r./power metering circuitry. Using various value dummy load resistors, the s.w.r. meter scale checked out exactly over the 1:1 to 1:3 s.w.r. range. The r.f. power measuring circuitry checked out to within a few percent over its various ranges as compared to an industrial wattmeter, although the 2000 watt range could only be checked to 1200 watts because of the equipment available.

In operation the tuner was easy to use and seemed able to match a linear having 1200 watts output to any "reasonable" antenna load on the 80-10 meter bands without any signs of arcover or component overheating. By a "reasonable" antenna is meant coaxial fed dipoles used on their designed



S2 LEGEND	S3 LEGEND
1 = Coax 1 direct	1 = Forward 200w.
2 = Coax 2 direct	2 = Forward 2KW
3 = Coax 1	3 = SWR set
4 = Coax 2	4 = SWR read
5 = Wire	5 = Reflected 2KW
6 = Balanced line	6 = Reflected 200w.

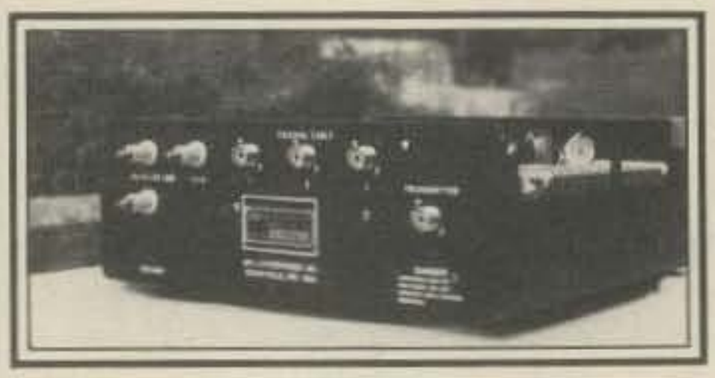
Fig. 1- The MFJ-962 Versa-Tuner III

band as well as on a band higher or lower, various length long wires operated against ground and 1/4 λ or longer on the operating frequency and dipoles

Front view of the Versa-Tuner IV.

fed with a balanced transmission line where the total dipole length was at least 1/4 λ on the lowest operating frequency. The tuner will probably match into a far greater range of loads than could be tried at the 1200 watt level. Its usage would undoubtedly allow many amateurs to operate what normally would be single band antennas on two or more bands as well as provide a constant load to a linear across the entire extent of any band when a single band antenna is used.

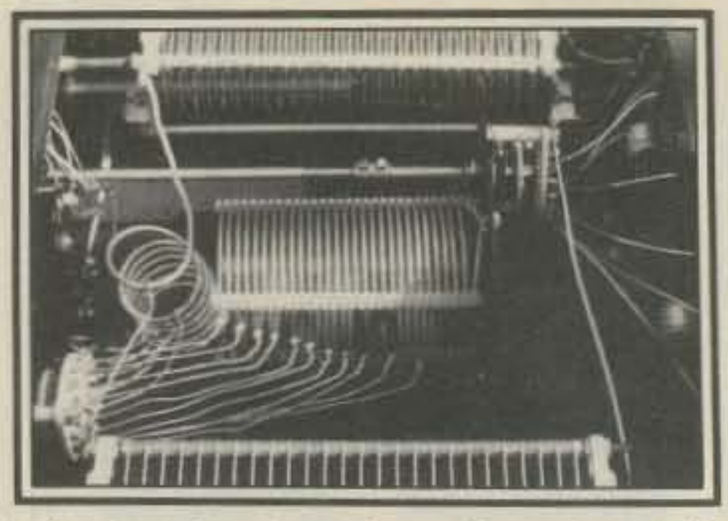
One should not expect unreasonable results out of this or any antenna tuner. For instance, one cannot expect efficient operation of a 16-foot whip on 80 meters even if the tuner seems to provide proper loading for a transmitter or linear amplifier. Because of the extremely low base impedance of such an antenna, only a fraction of the power which can be generated at the output of a transmitter or linear will be radiated. Ohmic losses that cannot be avoided in the ground system, connectors, tuning network components, transmission line, etc., will consume the major portion of the output power. Although 160 meter operation could not be tried because of lack of high-



The rear view of the Versa-Tuner IV showing the extra coax connector.

power equipment for that band, the values of the components used would indicate that the tuner should be just as useful on 160 with the types of antennas mentioned as it was on 80-10 meters. The instruction pamphlet that comes with the tuner provides a number of hints as well as precautions for its proper use. Probably the most important of the latter to follow is not to attempt to change the setting of the antenna selector or inductor switches while operating at full power. The switches can be manipulated freely during tune-up at low power levels (100 watts or less). The switches can carry 9 Amperes of r.f. but they can safely switch only a fraction of that value.

Overall, the MFJ Versa-Tuner III makes a very favorable impression. It is ruggedly built with impressively dimensioned components. The metering circuitry covers all possible needs. The antenna selection possibilities should suffice for almost any situation where a station might be using various forms of antennas on different bands. It doesn't tune itself, but it appears



The interior view shows the extra coil for 10 and 15 meters. The dummy load resistor can be seen to the right.

capable of doing just about anything one might expect out of a high-power antenna tuner up to that point.

The MFJ-984 Versa-Tuner IV

The MFJ-984 Versa-Tuner IV is the big gun of the MFJ line. It is rated at handling power up to 3 kw and will match coax, balanced or random wire feedline. Several nice features are included in this model. They include a built-in 200 watt, 50 ohm dummy load, and a unique 10 Amp r.f. ammeter.

As can be seen from the internal view of the Versa-Tuner IV, a separate coil is used in conjunction with L1 for 10 and 15 meters rather than picking up another tap. This is to ensure greater efficiency at higher power on these bands.

There are 6 more switched positions on the inductor switch in the Versa-Tuner IV than in the III, allowing for greater flexibility in matching. The antenna selector switch (7 positions) can switch from balanced line, random wire, 3 coax lines, 1 coax line through the tuner and directly to the antenna, and finally switch in the dummy load.

The s.w.r./wattmeter has an expanded scale for reading the 2000 and 200 watt ranges more accurately plus the s.w.r. scale. This meter in conjunction with the 10 Amp r.f. ammeter is designed to get you maximum power at minimum s.w.r.

Typical in the Versa-Tuner line is a heavy positive feel to the controls and switches. The Versa-Tuner IV features a brushed aluminum front panel. Cabinetry is similar to that of the Versa-Tuner III. You might want to check some of the MFJ ads for other models in this line that incorporate various elements of the III and IV. The MFJ-984 Versa-Tuner IV is priced at $299.95.

References

"Using a T Network," Schultz, *CQ*, May 1968.
"W8NWU's Teeter Totter Tuners," Schultz, *CQ*, February 1969.
"Random Length Antenna Couplers," Schultz, *Ham Radio*, January 1970.