

Looking for a great first kit-building project? Or an excellent antenna tuner you can build yourself, even if you're already an experienced builder? N2EI suggests taking a close look at Ten-Tec's Model 1215 Ten "T" Tuner kit.

CQ Reviews:

The Ten-Tec Model 1215 "Ten 'T' Tuner" Kit

BY T. J. "SKIP" AREY,* N2EI

Many amateur radio operators, especially those new to the hobby, have a desire to build a project that will enhance their ham radio activities. Quite a few of these folks have trouble figuring out a good place to start, especially if they have little or no electronic kit-building experience. Choosing that first kit-building project can be a tough proposition. Allow me to make a suggestion that will not only give you a great first-time building experience, but will also enhance any operator's station.

The "Ten 'T' Tuner" kit from Ten-Tec can be built in a couple of evenings by anyone with basic soldering skills and a few simple hand tools (see July CQ's "Learning Curve" column for soldering basics and links to online tutorials). All soldering is "large format," mostly point-to-point wiring, with just a small handful of "through-hole" components to populate a single simple printed circuit board.

The kit combines a high pass "T" network with a wattmeter, SWR bridge, and four-position antenna switch, allowing you to match a wide range of antenna impedances to the common 50-ohm impedance most transmitters require. The Ten "T" Tuner can operate efficiently with power levels up to 200 watts.

The key to any high-quality kit is a well-written manual. The Ten "T" Tuner manual covers every aspect of the project, beginning with a discussion of the tuner's specifications, including a circuit overview and a detailed schematic drawing. Before you even unpack the kit, you are starting the project with a clear understanding of how the tuner works.



The Ten-Tec Ten "T" Tuner is an excellent kit for first time builders. (Photo courtesy Ten-Tec)

Next, the manual gives you a checklist of supplied parts—including graphics—to help you identify particular mechanical parts. I cannot stress enough how important it is to conduct a full inventory of this or any kit! Not because of any concern for missing parts, but mostly to help you sort the parts into easy-to-identify and handle groups. Old-timers often made use of cupcake tins to keep parts laid out in good order. It is still a good way to go.

Kit assembly is broken down into six phases. Each step of each phase has two check boxes. You want to check and then *recheck* each step before going forward. It's easy to let your enthusiasm move forward with a project, which may lead to slip-ups. True "double-checking" will assure you will make it to the end with a working unit.

Phase 1: Rotary Inductor Assembly

The first phase of the project is the construction of the rotary inductor assembly.

bly. Ten-Tec makes the process of coil-winding relatively easy by supplying coil forms with grooved patterns to assure proper wire spacing. The combination of careful directions and clear graphics makes winding the coil fairly simple. The biggest problem I encountered was



The finished rotary inductor assembly ready for installation.

*P.O. Box 236, Beverly, NJ 08010
e-mail: <tjarey@gmail.com>

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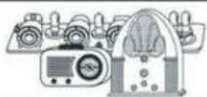
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allowing enough room in my rather cramped workshop to manage the long piece of silver-plated wire needed to wind the coil. Be sure to give yourself plenty of room to work with the wire during this step. At this stage, Ten-Tec recommends a small, soft-jawed vise to hold the coil form while guiding the wire. If one is not available, a patient assistant can perform the same function. The goal is to get the coil wire in place without scarring or kinking the silver-plated wire used for this variable inductor. If you take the time to pull the wire flat and tight over the coil forms, you will have a beautiful assembly you can point to with pride and say, "I made that!"

Getting this more complicated stage out of the way isn't just to make things seem easier down the line. Once the coil is formed, it is necessary to glue the

variable-inductor hubs in place. Building the coil first while moving forward with further assembly assures that the epoxy will have more than enough time to set and make for a solid piece.

Phase 2: SWR Bridge Circuit

Phase two is the assembly of the SWR-bridge circuit. In this phase you have to populate a small printed circuit board with 11 components and a small toroidal RF transformer. Careful reading of the manual and attention to detail with all soldering to assure there are no *solder bridges* will produce a simple but well-designed SWR monitoring circuit. After building the rotary inductor in phase one, winding the RF transformer should be easy. Just remember to make sure



The completed Ten "T" Tuner ready for testing.



The Ten "T" Tuner ready to go QRV with my classic Ten-Tec Triton IV transceiver.

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that you clear the connecting points on the transformer's wires of any varnish insulation. I like to scrape this off with a small hobby knife and then tin the wires with a thin coat of solder to assure a solid connection.

Phases 3–5

Phases three, four, and five divide up the point-to-point wiring of the unit's switches, chassis wiring and final mechanical assembly into easy-to-follow subsections. After populating and soldering the SWR bridge board, you may have an attack of overconfidence. Take your time and don't forget that sage advice: "Measure twice; cut once!" After you complete these stages, you will walk away with a whole new respect for color-coding your wiring in future projects. By following the wiring color scheme and cutting wire to the lengths listed in the manual, it is hard to go wrong at this point in the project.

At certain points, you will be warned to secure a wire at a particular location but not (yet) solder it. This is to allow for placing additional wires at that connection point prior to final soldering. But, hey, we all make mistakes, right? Keep a roll of *desoldering wick* handy just in case you go to place a wire and find you have inadvertently soldered something ahead of the need.

Phase 6: The "Smoke Test"

Phase six is the *smoke test*. The good news here is that even if you have made an error or two, you will be hard-pressed to get any smoke to leak out of this unit. This is one of the reasons why I recommend this as a great *first kit* experience.

The wattmeter circuit can be calibrated in one of two ways: (1) by using a transmitter capable of generating at least 100 watts and a 50-ohm dummy load capable of handling this power level; or (2) in the absence of a transmitter, the unit can

be brought into *pretty good* calibration using a DC power source. The manual recommends a simple calibration source made out of a 9-volt battery and a 10K-ohm potentiometer. An accurate adjustable DC power supply will also work for this method.

With the meter calibrated, the final operational test is to put the tuner on the air. If the unit does not appear to be working correctly, the most likely problem is miswiring. Going over the wiring checklists, particularly in phases three through five, and following the manual's troubleshooting chart should get you back on the air in no time at all.

As constructed, the Ten-Tec Ten "T" Tuner will provide a match for single-wire or coaxial-fed antennas. If you are planning to use the tuner with an open-wire or ladder-line feedline, you will need to add a 4:1 balun to the circuit. You can either purchase this optional accessory from Ten-Tec or construct your own using T-200-2 series toroidal cores. Ten-Tec even gives you all the information to *roll your own* balun if you so choose. If you want one of the best low-profile, multi-band antenna systems available, a dipole or doublet cut to a length accommodating the lowest frequency you plan to operate and fed with ladder line through a 4:1 balun to a tuner will allow you to work the world in high style. I have the awards to prove it!

I must confess that several of the newer transceivers at N2EI are equipped with automatic tuning units. That said, I love restoring older equipment, and the Ten-Tec Ten "T" Tuner makes it possible for me to get on the air with my classic rigs using very modest wire antennas. If you want an enjoyable kit-building experience that will give you a real workhorse accessory for your shack, the Ten-Tec Ten "T" Tuner is the kit to consider. The kit retails for \$259 and is available direct from Ten-Tec at [http://www.tentec.com/products/Ten-"T"-Tuner-Kit.html](http://www.tentec.com/products/Ten-).