

## The Tenna-Tune – A simple SWR tuning indicator for your screwdriver antenna By Phil Salas – AD5X

### Introduction

Don Johnson's (W6AAQ) screwdriver-type of antennas have become extremely popular in the past several years, due to their great performance and remote tuning ability. Recently, miniature screwdriver antenna versions have become available from numerous sources. These miniature antennas are of more interest to me, as I like to operate mostly "mobile-at-rest" and so I wanted a small antenna package that I could easily pop off my car after use. After looking at the several different antennas currently available, I settled on the Little Tarheel screwdriver antenna ([www.tarheelantennas.com](http://www.tarheelantennas.com)). The Little Tarheel has a lower mast length of just 16-inches (full-size screwdriver antennas are generally about 36-inches) and it weighs only 1.8 pounds. It covers 40-6 meters and can handle 400 watts PEP. This antenna even includes sensors so it can be used with the different remote tuning devices and indicators available on the market. I like to couple my Little Tarheel with the MFJ-1954 10-foot telescoping whip. This combination makes a very effective mobile-at-rest and portable package, and permits operation down to 60 meters, and even 80 meters if you don't mind changing the base-matching coil for that band.

Rather than purchase a commercial tuning device, I decided to try to build a simple, effective and inexpensive tuning indicator to help me tune the antenna. This circuit also includes the ability to key a IC-706 series or IC-7000 transceivers utilizing the 10-watt tune mode of these radios.

### The Tenna-Tune

I wasn't originally going to name this unit – but I had extra space on the front panel and so felt I had to fill it in with something!

The circuit is shown in Figure 1, and the parts list is shown in Table 1. This is just a resistive 50-ohm bridge coupled with an IC-706MKIIG "tune" interface. The bridge is the same I used in my previous article "Add an absorptive SWR indicator to the MFJ-902 antenna tuner" in the October 2005 QST. The advantage of the resistive bridge is that it is simple and protects your radio during high SWR conditions (worst case SWR presented to your radio should be only 2:1). The disadvantage, however, is that you have to dissipate up to 100% of your tune-up power in two of the three resistors (assuming an open circuit at the output, and your transmitter can deliver full power into a 2:1 SWR), so finding "RF-friendly" power resistors can sometimes be difficult. However, the heart of this circuit is based around three Caddock 50-ohm 15-watt power resistors in TO-126 packages (Mouser 684-MP915-50 at \$2.78 each). These are excellent broadband truly resistive power resistors. If you want a little more power dissipation, there is a 30-watt TO-220 packaged version also available (Mouser 684-MP930-50 at \$3.58 each). However, the 15-watt resistors are fine for tune-up powers up to 20-25 watts for short periods of time, assuming they are properly heat-sinked.

The IC-706 tune interface is very simple. The 10K ohm resistor “fools” the IC-706 into thinking that an antenna tuner is connected, and so the radio will be keyed in the 10-watt cw mode whenever the “key” pin (pin 1 on the antenna tuner interface) is connected to ground by the SPST toggle switch. I mounted the 10K ohm resistor directly on the 4-pin plug so only two wires are necessary to run to the Tenna-Tune.

The most difficult part of the assembly is cutting out that rectangular hole for the DPDT slide switch. You may wish to use a toggle switch (round hole mounting) to make things easier, I just preferred the look of the slide switch. I assume you won't have a problem with the SO-239 holes, because every ham has a Greenlee 5/8" punch for these, right?

I built everything into the tiny aluminum box called out in the parts list. This is a painted box, so you should scrape off paint around the SO-239 mounting screws, and around the base of the power resistors. Also, use heat-sink grease under the power resistors. The LED I chose is a 6000mcd ultra-bright red LED. This LED requires pretty minimal current to give a good SWR indication. I mounted this LED on the upper right corner of the front panel as can be seen in one of the photo. I used the LED clip called out in the parts list which requires a 1/4" diameter mounting hole. You could drill a smaller 3/16" diameter hole and hold the LED in place with some hot glue if you prefer. The two SO-239 connectors just fit on the back panel as seen in another photo.

The wiring diagram is shown in Figure 2. This figure is shown as if the aluminum box were folded out flat. Wiring should be as point-to-point as possible, but it is shown as is for purposes of clarity. While I did use a terminal strip to mount some of the parts (see the parts list), this is probably not necessary as there are enough stiff leads on the 50-ohm resistors, SO-239s, and slide switch to support the few parts required. I also nibbled a little aluminum from the corner of the aluminum box cover so that the IC-706 interface cable could easily exit the box. Photo “Inside Wiring.jpg” gives you an idea of what my final wired unit looks like. For all labeling, I used a Casio labeler with “black on clear” tape. I also added stick-on rubber feet on the bottom of the unit.

### Operation

I start with the Little Tarheel in its minimum-length position, which resonates with the fully extended 10-foot MFJ whip just above the 17-meter band. I always return the antenna to this minimum length position when I'm through operating so the Little Tarheel takes up as little room as possible in my trunk when I remove it from the quick-disconnect mount. To tune, I push the slide-switch on the Tenna-Tune to “Tune”, flip the IC706 toggle switch to “Tune” (when using the IC-706MKIIG), and then run the Little Tarheel motor until the SWR LED dims noticeably or, preferably, goes out. Now turn off the IC-706 “Tune” toggle switch, flip the slide switch to “XMT”, and you're ready to go. This entire process is very easy to do, and takes very little time. I haven't had a problem with the case of the Tenna-Tune getting very warm during the time it takes me to tune the antenna. Obviously, the Tenna-Tune can be used with all screwdriver-type of antennas and other brands of radios. Just keep your tune-up power to no more than about 20-25 watts maximum. A good SWR indication occurs with 2-5 watts of power.

Conclusion

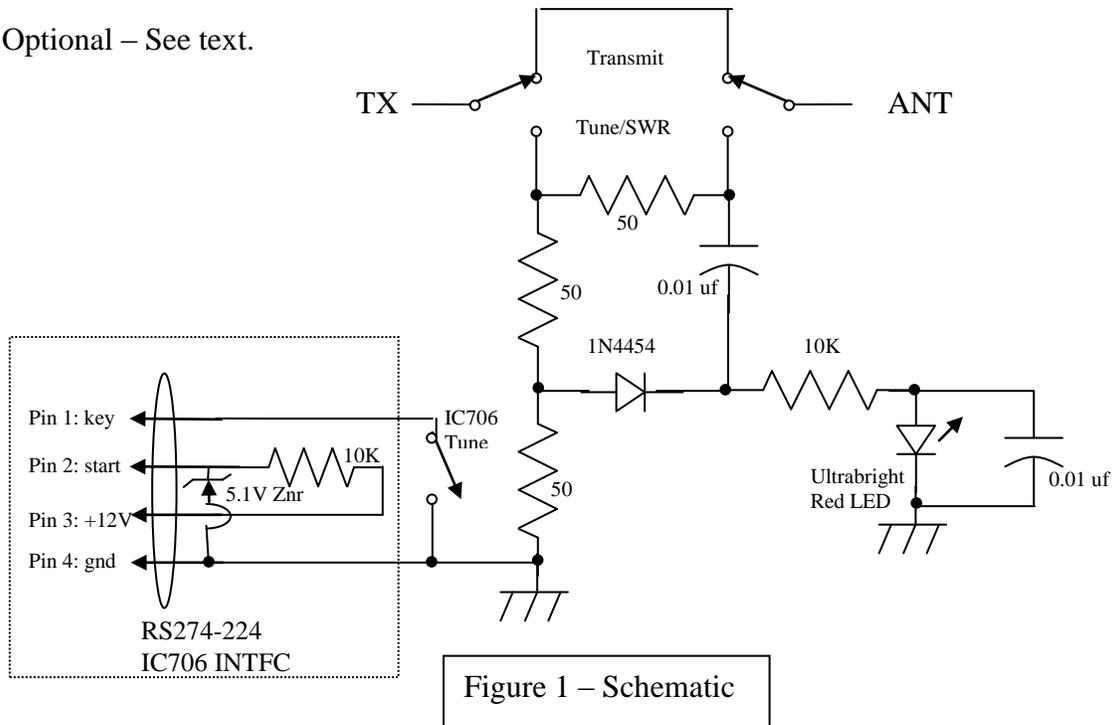
I've described a simple unit that permits rapid tune-up of your screwdriver antenna. And for IC-706 owners, it also provides a means to put that radio into the 10-watt tune mode. While this unit does not provide automatic operation, it is easy to use, inexpensive, and protects your finals during the tuning procedure.

Obviously, the Tenna-Tune is also great for using with any antenna tuner as well, since it protects your finals during tuning. You can even switch inductor settings on the antenna tuner while transmitting! I've now built the Tenna-Tune circuitry into all the antenna tuners I currently own.

TABLE 1 – Tenna-Check Parts

<u>Qty</u>	<u>Description</u>	<u>Source</u>	<u>Cost</u>
3	50 Ω 15-watt resistor	Mouser 684-MP915-50	\$2.78 ea
1	DPDT Slide Switch	Mouser 611-S602031SS03Q	\$2.38
1	SPST Toggle Switch	Mouser 1055-TA1120	\$1.45
1	Mini-box (2.25x1.5x1.38")	Mouser 537-M00-P	\$3.63
2	0.01 uf 500V capacitor	Mouser 75-5HKSS10	\$0.26 ea
1	5.1V Zener diode	Mouser 78-BZX85B5V1	\$0.08
2	10K ¼-watt resistor	Radio Shack 271-1335	5/\$0.99
1	6000mcd red LED	AllElectronics LED-94	\$0.75
1	*Terminal strip	Radio Shack 274-688	\$1.29/4
1	Heat sink grease	Radio Shack 276-1372	\$1.99
3	#2 screws	Radio Shack 64-3010	\$1.49/pk
3	#2 nuts	Radio Shack 64-3017	\$1.49/pk
1	4-pin Molex plug	Radio Shack 274-224	\$1.19
2	SO-239 RF connectors	AllElectronics SO-239	\$1.00 ea
1	2-piece LED Clip	AllElectronics HLED-4	\$1.20/10*

\*Optional – See text.



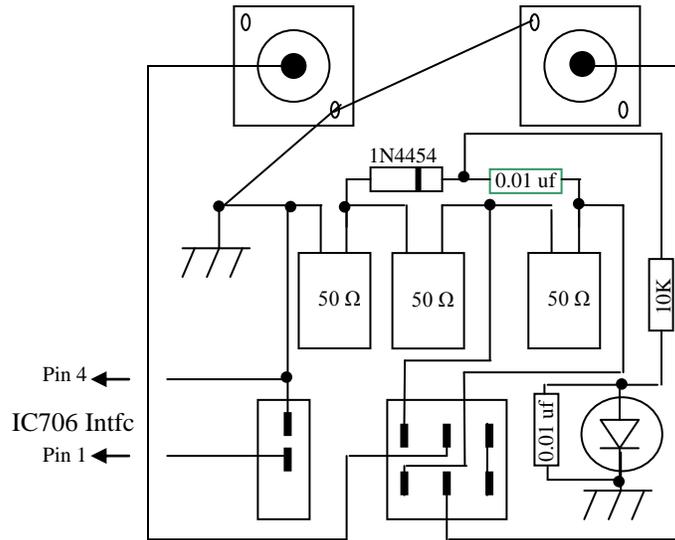
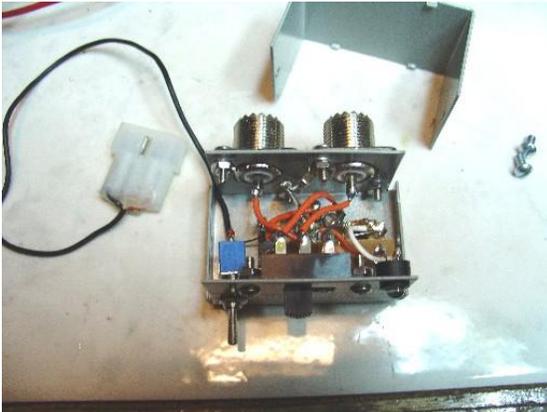


Figure 2 – Physical Wiring Diagram  
(View as if box is opened out in a flat plane)



Inside Wiring



Front Panel



Back Panel



Tenna-Tune with IC-706MKIIG