

The Tenna-Tune *Audio* – An audio SWR tuning indicator
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Introduction

I've received a lot of great comments on the original Tenna-Tune published in the December 2004 QST hints & Kinks. Additionally, I have received requests about making an audio SWR version of the unit for vision-impaired hams. As I've found out, an audio SWR indication is extremely convenient for all hams to use.

The Tenna-Tune *Audio* Circuit Design

The new SWR circuit is shown in Figure 1. First you'll notice that I've updated the original SWR circuit design to use the LED as both the SWR indicator and the RF detector (this idea came from one of the many emails I'd received). This simplifies the circuit a bit ("You know you have achieved perfection in design, not when you have nothing more to add, but when you have nothing more to take away." - Antoine de Saint Exupery). And, I found a 4PDT switch that is perfect for not only switching the SWR bridge in-line, but it also keys the IC-706/703 and turns on power to the audio circuit. As before, the heart of the circuit is based around three Caddock 50-ohm 15-watt power resistors (don't forget the heat-sink grease under the resistors).

The oscillator circuit, shown in Figure 2, is based on a CD4001 quad NOR gate used as an audio oscillator. The SWR LED is now mounted inside the aluminum box and illuminates the CDS photocell, which then controls the oscillator frequency. The external speaker I used is a tiny telephone-type speaker, and it works pretty well in a moderately quiet location. The larger the speaker you can use, the better the sound. You can also plug an earphone or a cassette adapter into the front jack to get plenty of sound.

I built everything into the same small aluminum box from the original QST Hints & Kinks article. However, I've called out a larger box in the parts list, as getting everything into the original box is tricky. Also, to save space, I used phono-jacks for the RF input and output connectors. These work fine on HF, and I figured that if they were good enough for Collins and Heath, they should be OK for this project. BNC connectors will also work. However, if you use the larger box, you can still use the SO-239 connectors – and you'll have more area for a larger speaker. The oscillator circuitry is built on a small piece of perf-board, mounted with a solder-lug attached to the perf-board and bolted to the box. In my case, power is derived from the IC-706/703 antenna tuner connector. A 3-terminal regulator (78L08) drops the 12V input voltage into a safe range for the CD4001. If you have a different radio, you'll obviously need to find another source of power.

The wiring diagram of the bridge and switch connections is shown in Figure 3. This figure is shown as if the aluminum box were folded out flat for clarity. Wiring should be as point-to-point as possible. I used a Casio labeler with "black on clear" tape for all labeling. I also added stick-on rubber feet on the bottom of the unit. And finally, I put a switch on the side of the box to disable the IC-706 automatic keying in case I wanted to tune with a string of dits instead of using the 10-watt tune mode.

Set-up and Operation

To set-up the unit, in a very dark room adjust the 200K pot that is in parallel with the photocell for the lowest tone you want to hear when your antenna is matched (the LED will be out when the antenna is matched). Don't set this tone too low, as you want to easily hear a "lowest-tone" point when tuning. Then, connect your transmitter to the RF input connector and adjust the 200K pot that is in series with the photocell to give you the highest frequency you want to hear while you are transmitting into an open circuit (maximum LED brightness). Don't worry - your transmitter is protected by the 50-ohm bridge. When finished, you can replace the pots with fixed resistors if you wish. The pots are necessary for set-up since I'm sure there will be variations in LED/photocell orientation in your hand-wired circuit.

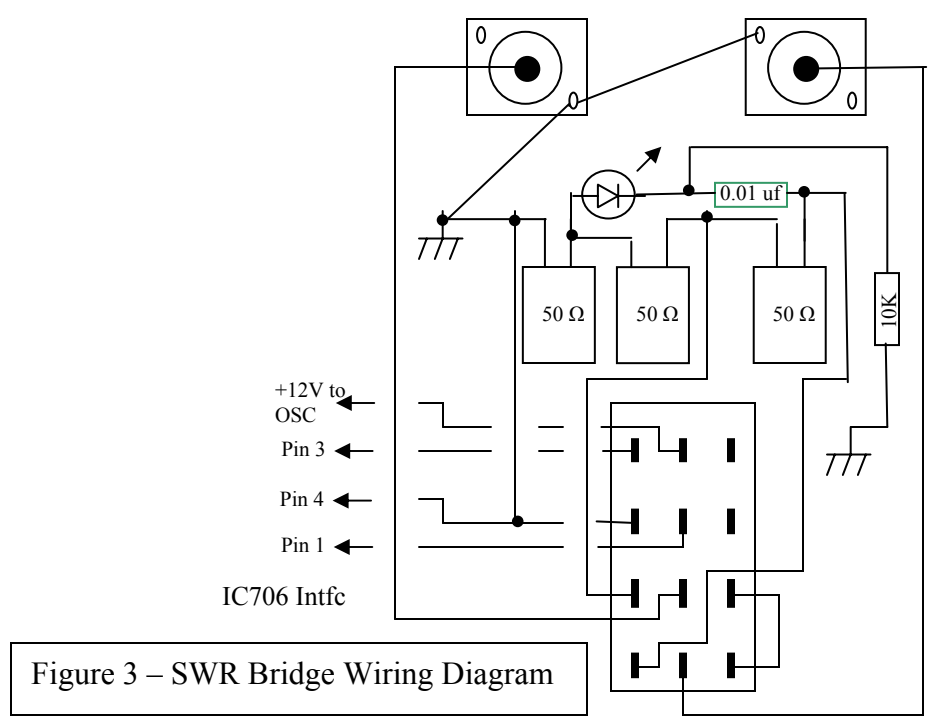
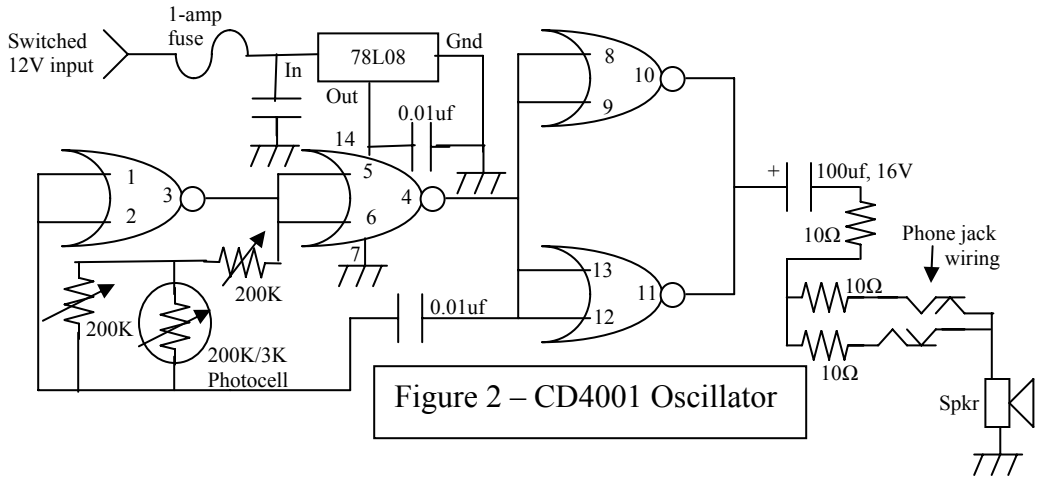
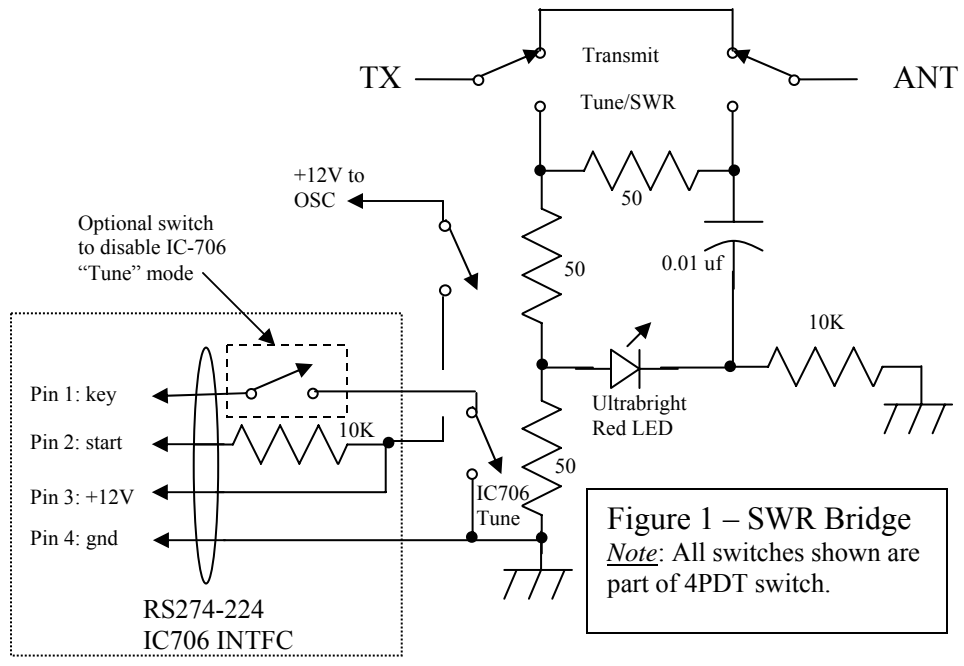
Operation is almost too easy! Flip the switch to "Tune" and tune your antenna tuner or screwdriver antenna until you get a minimum tone. Then flip back to "XMT".

Conclusion

This audio Tenna-Tune is a very handy antenna tuning accessory. The ability to just tune for minimum sound frequency really makes tuning easy. And for IC-706/703 owners, it also provides a means to put that radio into the 10-watt tune mode. Finally, with minor modifications, the LED/oscillator circuit can be easily added to most SWR circuits. So don't feel limited to the Tenna-Tune bridge design.

TABLE 1: Tenna-Tune Audio 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	4PDT Slide Switch	Mouser 629-GF6426010	\$1.02
1	SPDT Mini-Slide Switch	Mouser 629-GS1150511	\$0.84
1	3.5mm Stereo Jack	All Electronics MJW-14	\$0.35
1	Mini-box (2.31x2.13x1.75")	Mouser 537-00Z-P	\$4.03
1	Mini-speaker	Mouser 665-AS1308-02	\$2.71
3	0.01 uf 50V capacitor	All Electronics 103D50	10/\$0.60
2	10K 1/4-watt resistor	All Electronics 10K	5/\$0.50
3*	10 ohm 1/4-watt resistors	All Electronics 10	5/\$0.50
2	200K potentiometer	All Electronics TP-200K	10/\$1.00
1	100 uf 16V electrolytic cap.	All Electronics 100/16	\$0.15
1	6000mcd red LED	All Electronics LED-94	\$0.75
1	5.1V Zener Diode	All Electronics 1N4733	4/\$1.00
1	1-amp Pico Fuse	All Electronics PFA-1C	5/\$1.00
1	CDS Photocell (200K/3K)	Jameco 202403CH	\$1.49
1	CD4001 Quad NOR Gate	All Electronics 4001	\$0.25
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	RCA-type Phono-jacks	All Electronics RCMJ	\$0.40 ea

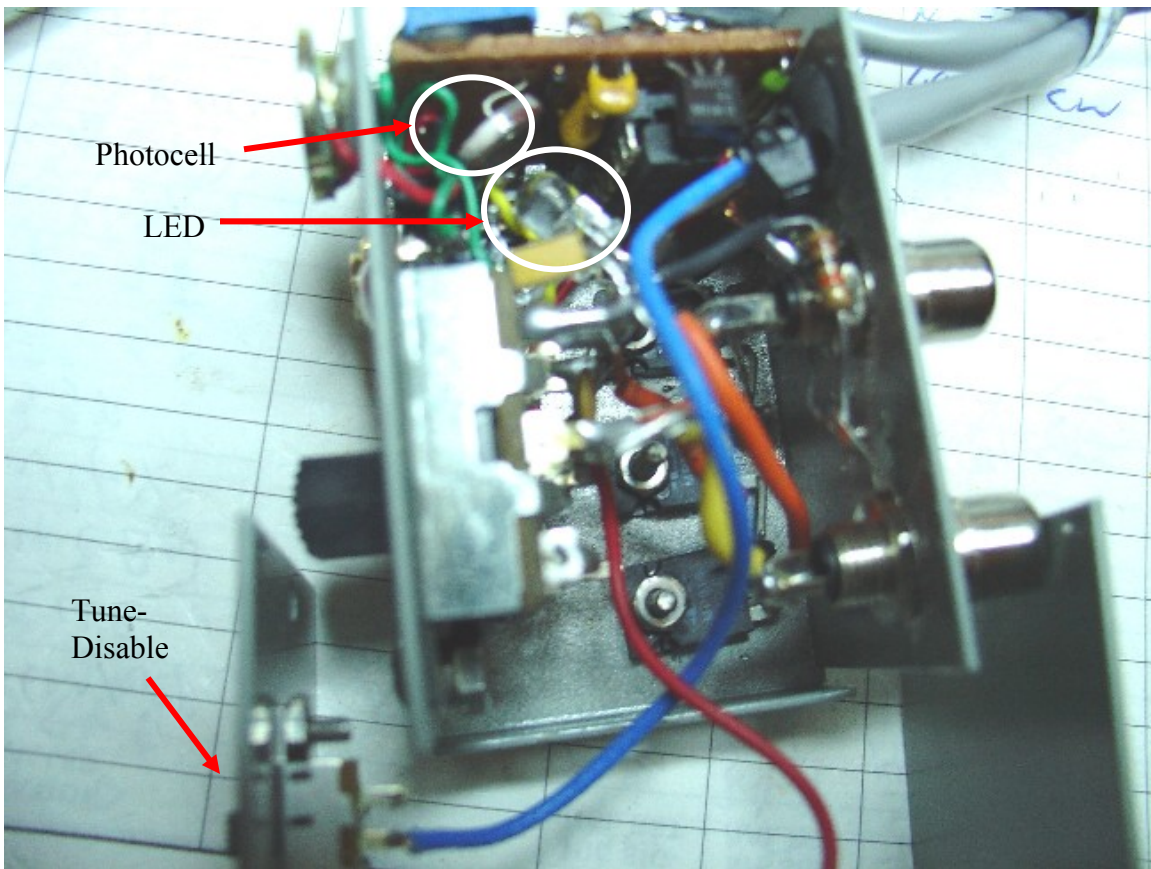




Front – With tiny speaker in upper left corner



Back & side – side has IC-70x disable switch



Internal View