Packaging the Elecraft XG2 Receiver Test Oscillator and 2T-gen 2-Tone Test Oscillator
Phil Salas – AD5X

My recent test equipment additions are an Elecraft XG2 Receiver Test Oscillator, and an Elecraft 2T-gen 2-Tone Test Oscillator. As supplied, both kits are meant to be used unpackaged as the switches, controls and connectors are mounted directly on the PC boards. The kits even include rubber mounting feet that attach to the pc board assemblies. While OK for occasional use, with a little thought packaging is not difficult.

The Elecraft XG2
The Elecraft XG2 receiver test oscillator has accurate switch-selectable 50uV (S9) and 1uV (S3) crystal controlled signals on 3.579 MHz, 7.040 MHz and 14.060 MHz. The pc board-mounted controls include an ON/OFF switch, a 3-position rotary switch, and a DPDT slide switch. To enclose the entire unit in a metal project box with access to all controls, the rotary switch, a new DPDT level-select switch, the power LED and a new transmit power warning LED are mounted on the back of the PC board. And a chassis-mount BNC connector and miniature toggle switch are mounted on the metal box.

First, build the pc board assembly MINUS the LEDs, switches and RF connector. If you have a built-up unit, you must remove the existing rotary switch, the DPDT level switch, the LEDs and the RF output connector from the board. The ON/OFF switch can be left in place, but place the switch in the OFF position. File the leads of the new DPDT switch called out in the parts list so the switch contacts slide into the holes on the pc board. The original switch used pc pins, but the new switch has solder-lug pins. Solder this switch flush to the backside of the pc board. Next, solder the small rotary switch to the backside of the board, but elevate the switch above the pc board as much as possible. Finally, mount the power LED and the new round transmit power alarm LED on the backside of the PC board such that the bases of the LEDs are 0.350” above the PC board. The last thing to do is to drill two 1/8” diameter mounting holes on opposite corners of the PC board. When finished, you should have a backside assembly that looks like Photo A.

Now drill clearance holes in the box for the DPDT slide switch, the LEDs, the rotary switch, the pc board mounting screws, the ON/OFF toggle switch, and the BNC output connector. Figure 1 shows the dimensions. Dimensions aren’t shown for the mounting screws as this varies based on where you drilled these holes in your pc board. Next solder wire leads to the ON/OFF switch position, and wire leads to the pc board for the new BNC output connector. Mount the 3/8” standoffs to the PC board with ¼”x4-40 hardware, and mount the pc board assembly to the metal box as shown in Photo B. The rotary switch, DPDT level switch and LEDs should protrude through the metal box. Finally, attach the knob to the switch (the switch has a 4mm shaft). Your final assembly should look like Photos C and D. I called out a BNC cable and a BNC/UHF adapter in the part’s list in case you don’t want to build up your own interface cable.

There you have it. Couple this test oscillator with a step attenuator and you now have an extremely useful piece of test equipment for serious receiver testing.

Table 1: Parts List for Electraft XG2 Receiver Test Oscillator

| QTY	Description	Source/Part Number	Price each
1	4x2.13x1.63" AL Box	Mouser 537-00-P	$6.26
1	BNC Chassis connector	Mouser 530-CP-1094-AST	$1.13
2	0.375"x4-40 tapped spacer	Mouser 561-L4.375	$0.53
1	Knob – 4mm shaft	Mouser 45KN050	$1.09
1	Ultra-bright Red LED	All Electronics LED-94	$0.55
2	SPDT Sub-Mini Toggle	All Electronics SMTS-4	$1.35
1	6-foot BNC 50 ohm cable	All Electronics CBL-28	$3.25
1	BNC-F/UHF-M adapter	All Electronics BNC-UHF	$2.00
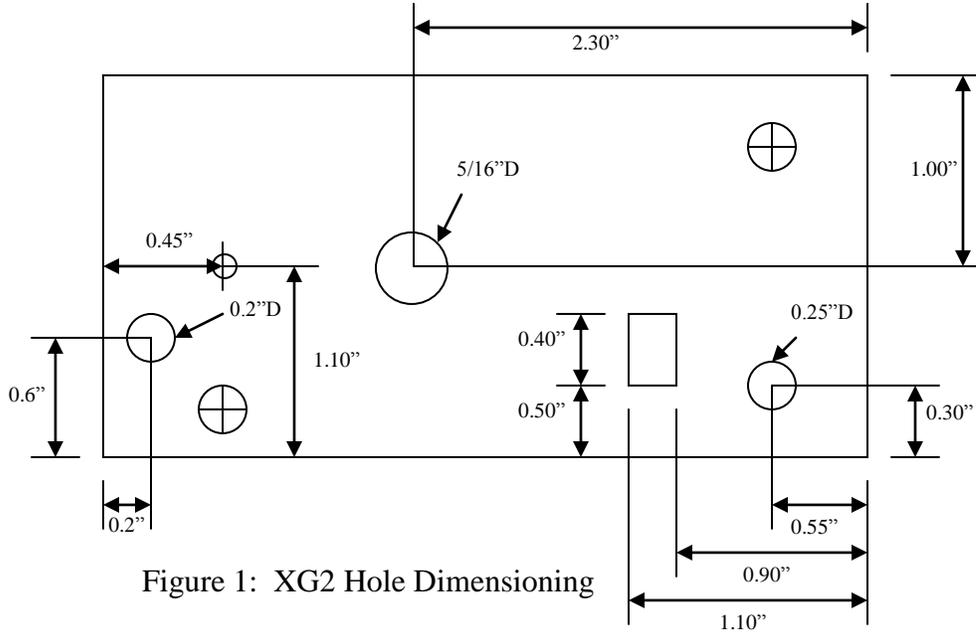
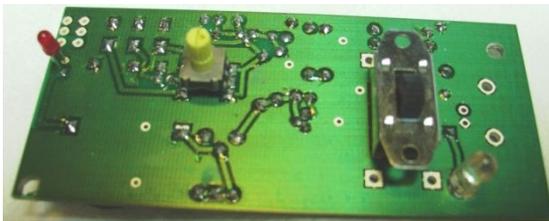Figure 1: XG2 Hole Dimensioning

Photo A: Backside mounted components

Photo B: XG2 mounted in box

Photo C: Control side of the new assembly

Photo D: Different view – better shows the BNC connector output.

Now for the Electraft 2T-gen
The 2T-gen provides 700 Hz and 1900 Hz tones for transceiver and/or amplifier 2-tone testing. Besides a protected assembly with access to all controls, I provided transceiver keying and a range control the 300mv p-p output level is too high for easy transceiver input level adjustment (typical microphone drive levels are 5-20mv p-p).

If you have an un-built 2T-gen kit, build it EXCEPT solder only one end of R18 to the pc board, and don't mount the power switch, RCA jack, LED, and balance and level controls. If you have a built-up unit, you must remove the LED and level and balance controls, the RCA jack and lift one end of R18. Now from the backside of the pc board, mount the LED so its base is 0.30 inches above the pc board. Mount the balance control on the back of the pc board. The output level control should have the two outer pins bent straight outward before mounting, as these two outer pins must be wired to the opposite mounting holes on the pc board with small pieces of bus wire otherwise the level will adjust backwards. The balance control actually works better (in my opinion) as the level of the higher frequency tone increases as you turn the knob clockwise. When finished, you should have a backside assembly that looks like Photo E.

Now drill clearance holes in the aluminum box for the LED, level and balance controls, mounting holes, and toggle switch holes as shown in Figure 2. Mount the 3/8" standoffs to the PC board with ¼"x4-40 hardware through the battery holder. Drill holes for a 1/8"

stereo jack and another toggle switch on the output side of the metal box in convenient positions. Solder wires to the strap positions, on/off switch, open end of R18, and the audio output on the pc board, and mount the pc board assembly to the metal box using ¼"x4-40 hardware. Solder the strap, switch, and output wires to the switches and connectors. Solder a wire from open end of R18 and from the pc board to the output range switch, and solder a 270K resistor across the switch's pins as shown in Figure 3. Finally, solder wires from the PTT switch to the ring of the 1/8" output stereo connector and ground (the output connector is a 1/8" stereo jack which has the audio output on the tip, and PTT on the ring). The output range control will switch between 300MV p-p and 30mv p-p maximum. Photos F, G and H show the 2T-gen mounted in the box, the control side, and the output connector/range control side respectively.

Finally, I built-up a microphone interface cable for my ICOM IC-706MIIG (Figure K). I bought a CAT-5 cable, cut off one end and added a 1/8" stereo plug to the cut-off end. Your radio operating manual will provide specific connector wiring information.

Table 2: Parts List for Electraft 2T-gen 2-Tone Test Oscillator

| QTY	Description	Source/Part Number	Price each
1	3.75x3x2.13" AL Box	Mouser 537-135-P	$8.73
2	0.375"x4-40 tapped spacer	Mouser 561-L4.375	$0.53
1	270K 1/4-watt resistor	Mouser 660-CF1/4C274J	$0.10
2	Knob, 0.54"D, ¼" shaft	All Electronics KNB-187	$0.85
5	SPDT Sub-Mini Toggle	All Electronics SMTS-4	$1.35
1	3.5mm stereo jack	All Electronics MJW-20	$0.50
1	3' CAT-5 cable	All Electronics CB-53	$2.35
1	3.5mm stereo plug	All Electronics SMPM	$0.65
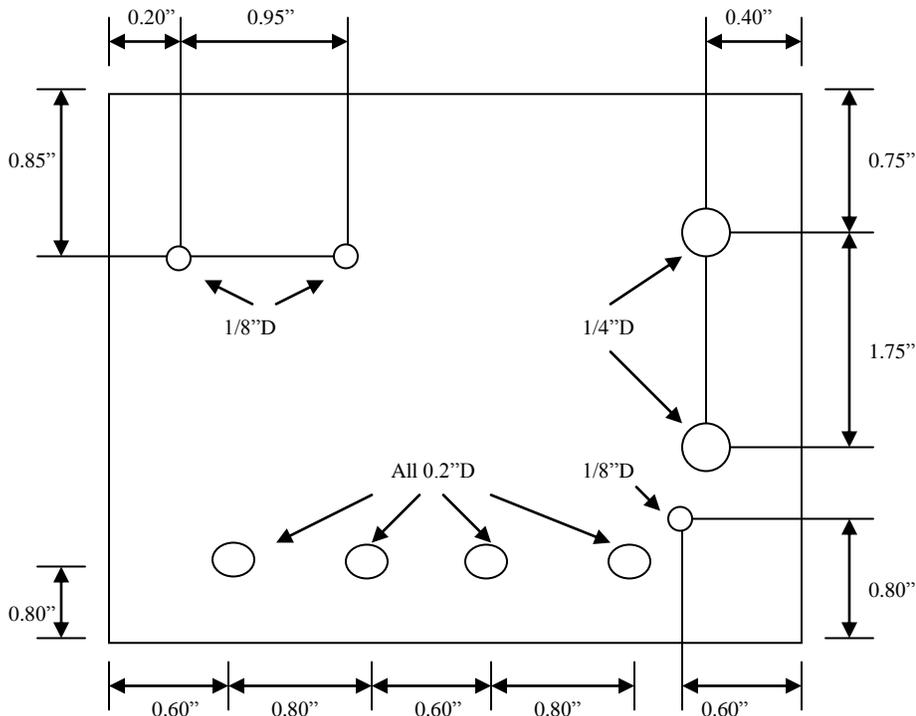
Figure 2: 2T-gen Hole Dimensioning
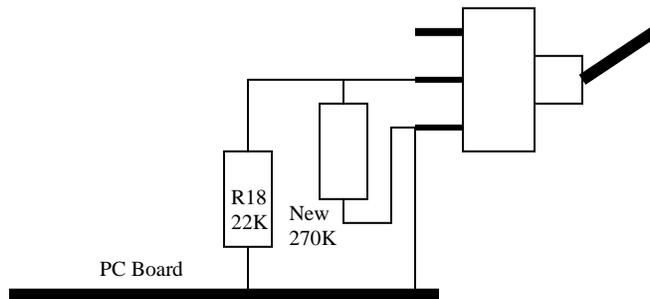
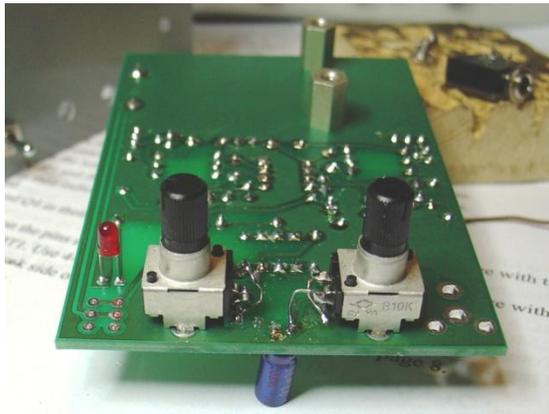Figure 3: Output Range Control

Photo E: Re-mounted backside parts

Photo F: 2T-gen mounted in aluminum box

Photo G: 2T-gen external controls

Photo H: Range control & output connectors

I built a second 2T-Gen into a cast aluminum box as shown in Figures I & J. And rather than a switched output level, I provided separate jacks for the two output levels.

Photo I: Cast AL box version

Photo J: Low- and High-Level outputs

Photo K shows the completed interface cable for my IC-706MKIIG that provides the audio input and radio keying via the radio's RJ-45 mic connector.

Photo K: IC-706MKIIG Interface Cable