An Improved Crystal Tester

Check out those surplus crystals with this portable circuit.

by Larry G. Ledford KA4J

W ayne Green's book Practical Test Instruments You Can Build [currently out-of-print] contains a very useful circuit for a crystal tester developed by Mike Kaufman. It's a good, simple, portable and very handy test item. But with a few modifications it can be made better.

Modifications

See Figure 1 for the original circuit. If you

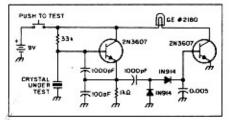


Figure 1. Original crystal tester circuit.

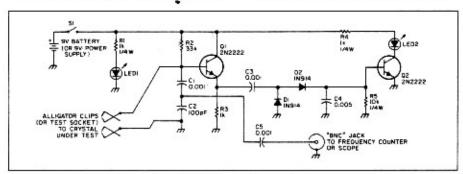


Figure 2. The improved crystal tester.

are building this from scratch, be advised that plastic 2N2222s (the ten-for-a-dollar at any hamfest variety) will work very well in place of 2N3607s.

The first change is to replace the incandescent bulb used for a go/no-go indicator with a lightemitting diode and current limiting resistor. When I did this, the LED switching transistor would "latch" on so I added a 10k resistor from base to ground for a cure. Apparently the transistor had sufficient bias

to turn off the higher current of a bulb, but would allow a lower current LED to stay on.

The next mod is to add another LED and resistor to act as a very simple battery indicator. If the battery were low (or dead), you'd never get a "good" crystal indication and you might discard a non-defective crystal. If the power LED lights but the crystal's "good" LED doesn't, you can assume the crystal is bad! Although you could mount several different crystal sockets on your tester, I used two alligator clips on short leads that will fit any crystal.

The last modification is to add a capacitor

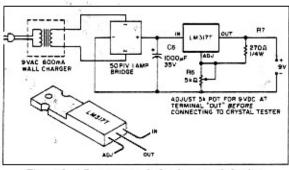


Figure 3. AC power supply for the crystal checker.

and BNC connector so that a counter or scope can be hooked to the oscillator for rough frequency checks. Bear in mind that this circuit will not be the same as the circuit that the crystal will be used in, so the frequency will be different. However, it will give you an idea of where you are.

Due to the lack of any tuned circuits, third overtone crystals will oscillate on their fundamental frequency. It may take some work with pencil and paper to see exactly what frequency a receive crystal is on. You can also plug a short antenna or wire into the BNC jack to loosely couple it to your receiver.

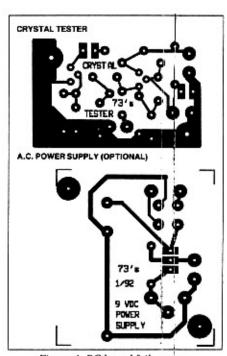


Figure 4. PC board foil pattern.

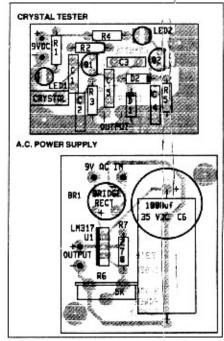


Figure 5. Parts placement. Continued on page 26

with three modes of scar and multiple scan speeds. Very good news--CTCSS encode AND DECODE is "standard" with Standard. With more repeaters going over to PL, it's hard to understand why their competition would still make CTCSS an option.

Programming

Programming the Standard is unlike programming any other 2-meter handheld. With the Standard equipment, you program in layers. For example, first you punch in the repeater output, and program it into any one of 40 memory channels. Then you go back and program the offset and the PL. This is layered on top of that original simplex frequency entry, and stays in memory until you go back and change it. And you don't need to worry about accidentally erasing a memory already programmed-a unique set of keystrokes makes accidental write-over impossible; you must deliberately write over what you want to change.

Once you master the concept of layering in the information for each memory channel, it programs up just as fast as any other handheld out there. But it is different from what you might be used to, when you first start poking away at the rubberized keypads.

Memory Unlimited

But here's the neat thing with the Standard C168A-you can pull out the plug-in 4K EEP-ROM memory cartridge, and plug in a 16K EEPROM memory cartridge for 200-channel storage! Or, if you're like me and can't remem-

ber what you've stored in 200 channels, you could have: several sets of 4K EEPROMs for different geographic regions of the country, or plug-in EEPROMS for 40 air scanner, marine, or repeater channels in different cities. Each PROM retains its memory after you unplug it. When you travel, you can just pick the appropriate PROM and plug it in. But you have to do the initial programming yourself. No one has cloned the ARRL Repeater Directory yet by geographic area in the standard or 16K PROMs.

I run the 200-channel PROM and divide up my frequencies by banks of 20 for different cities. This gives me 10 different banks of 20 channels each, and if I need more, I'll simply buy another \$30 200-channel EEPROM from the factory. They are readily available.

Ham radio dealers should cash in on this feature by offering preprogrammed EEP-ROMS. It takes a maximum of two minutes to clone from one Standard set to another. Just think, Mr. Dealer, of all the time you can save when selling that next 2-meter transceiveryou won't have to stand there for 20 minutes, programming in some popular frequencies for your particular area on this new hand-held set.

Standard has a 440 MHz UHF model, the C468 (for about \$370), which I got my hands on. It's also a good performer. Like the 2-meter set, the big advantages are ultra-compact size, reasonably good audio out, out-of-band scanning capabilities, and the incredible memory expansion EEPROM capabilities.

So, welcome back, Standard. We look forward to some of that exotic equipment we see advertised in some of the Japanese magazines. The new dual-band mobiles look good, and that triband base station, along with the scanner spectrum analyzer, is also a longawaited product here in the U.S.A.

The Standard C168A HT **Test Bench Report**

TX power output (High, with included battery): 2.2 watts at 950 mA.

Second harmonic: -92 dB Frequency accuracy: +094 Hz

Peak deviation: 4.8 kHz

In-band receiver sensitivity: 12 dB SINAD, 0.102 µV

Selectivity (±15 kHz): 32 dB Selectivity (±20 kHz): 60.4 dB Intermodulation rejection: 63 dB

Image rejection: 73 dB

Heat sink capabilities: Good, using diecast aluminum frame. Best feature: Ability to plug in EEPROM for 200-channel capability.

Least desirable function: Must read instruction manual several times to figure out how to program a memory sequence.

Distribution: Available from leading amateur radio dealers throughout the United States.

Availability: Off-the-shelf, including 27 different accessories



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An Improved Crystal Tester

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See Figure 2 for the improved circuit. If you power the tester with a 9-volt battery, it will make a very handy portable test instrument. It's especially useful when rummaging through those bins of surplus crystal at a hamfest or surplus store.

For a more permanent setup, you may wish to run the tester from 110 volts AC. I built the power supply shown in Figure 3 for

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	Parts List
Q1,Q2	2N2222 transistors
D1-D4	1N914 diodes
LED 1 & 2	Red LEDs
R1,R3.R4	1k, ¼W resistor
R2	33k, ¼W resistor
R5	10k, ¼W resistor
C1,C3,C5	0.001 µF capacitors
C2	100 pF capacitor
G4 .	0.005 µF capacitor
S1	SPST switch
Mice: VTAI	enchate (antional) QV hattery

Misc: XTAL sockets (optional), 9V battery, mini alligator clips (2), PC board, case, battery clip.

A blank PC bos for the XTAL tester is available for \$3 + \$1.50 stupping/handling per order (the optional power supply board is \$3.50) from FAR Circuits, 18N640 Field Court, Dundee IL 60118.