

130-1-1  
134

### A CRYSTAL CALIBRATOR

by Bruce Fortzer

A crystal calibrator, also known as a frequency standard, is a device which generates harmonics of a particular frequency, such as 100 or 1000 kHz, well into the shortwave bands. This type of device can be used to calibrate the dials of medium and short wave receivers lacking digital readout, since it generates carriers at known multiples of a particular frequency. For example, this calibrator has a fundamental frequency of 100 kHz, and as a result it will produce signals at 200, 300, 400, 500, 600, etc kHz. Crystal calibrators were quite commonly used up until a few years ago, when receivers with Wadley loops (i.e. the FRG-7) and/or digital readout became widely available. Before then, most communications receivers had "slide rule" dials which were difficult to get your bearings on without some sort of reference signal. They're still useful for those of us who have held on to the old Hammarlund and Hallicrafters rigs, or for those of us using portables with relatively poor calibration (i.e. the Realistic TRF).

This particular circuit is a modified version of Radio Shack's "Science Fair" frequency standard, sold as a kit a few years ago but since discontinued. Many other crystal calibrator circuits have appeared in amateur, SWL, and general electronics publications over the years. I built this particular circuit because Radio Shack was clearing them out at a dollar each when they discontinued them (I bought three or four, hi).

The basic circuit furnished with the kit consists of the crystal, transistors Q1 and Q2, and the associated resistors and capacitors. These components form a Colpitts oscillator and an amplifier. Variable capacitor C2 is used to fine tune the crystal, by zero-beating the calibrator signal against WWV or some other station on a multiple of 100 kHz.

The integrated circuit IC1 is a dual D flip-flop which I added. When wired as shown, it divides the input frequency by four to produce harmonics every 25 kHz, instead of every 100 kHz. Switch S3 is used to select between 25 kHz and 100 kHz marker intervals. Note that both the calibrator output and the integrated circuit power (pin 4) are switched. The latter was done to turn off the IC when "100 Khz intervals" is selected, in order to save battery power and to prevent possible stray 25 kHz "blips" from showing up.

Also added to Radio Shack's original design were a light emitting diode (as an on-off indicator) and two power switches. S1 is a momentary contact switch used for quick spot checks, while S2 is a toggle switch used when I want to leave it on for a while.

Parts layout isn't too critical (I hope, hi). I built it on a piece of vector board rather than the plastic case furnished by Radio Shack, but followed their layout as much as possible. Although the circuit is no longer available as a kit, all parts should be readily available, including those I added. The whole thing fits rather nicely into a small (2"x4"x6") metal case. S1

