# Test Equipment Scene

By Leslie Solomon

## CHECKING THE SWEEP GENERATOR "BIRDIE"

THERE are many uses for sweep generators in aligning FM, TV, and other r-f systems. Most of these sweepers include some form of variable-frequency oscillator to produce the "birdie" markers used to identify particular points along the viewed trace.

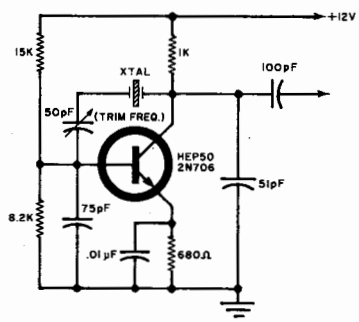
Obviously, the more accurate these marker frequencies are, the more accurate the alignment. So, the question is, just how accurate are your markers? It should be noted that some sweeper manufacturers include crystal-controlled frequencies (4.5, 10.7,TV frequencies, etc.), but here we are discussing those older sweepers that use a vfo and do not have the crystal-controlled provision.

Possibly, you have stored away in a small cardboard box a number of quartz crystals obtained from long-forgotten CB rigs, ham gear, or old test equipment. Here is your chance to determine their frequencies and make use of them.

**Determining the Frequency.** First you have to make sure just what the crystals' frequencies are. Despite the markings that may be on them, many crystals have fundamental frequencies far different. The identification process is quite simple. All you need is a conventional r-f signal generator (a sweeper will do if you can tune it manually without sweep), a frequency counter, and a scope.

Connect the signal generator ground to the scope's ground. Then connect the unknown crystal between "hot" leads of the generator and scope. A quartz crystal is a very-high-Q device, and when the generator is tuned to the frequency of the crystal, the scope will suddenly display a waveform (should be a sine wave). There will be almost no waveform when the generator is not tuned to the crystal frequency.

Starting at a low frequency, tune the signal generator until you see the display on the scope. This will be (roughly) the fundamental frequency of the crystal (despite what it may say on the box). Now couple the frequency counter to the r-f generator; and, as you carefully tune for maximum waveform display on the scope, note and record the frequency. Use a felt-tipped marker pen to identify each crystal. As we said, however, this is a rather rough frequency value; so it is necessary to take one more step to refine the value. At least this test has given you a "ballpark" figure




In the *Radio Amateurs Handbook*, we found a good transistor crystal-oscillator circuit. We built the oscillator circuit on a small pc board and "stole" the required power from the solid-state r-f generator we were using.

With the oscillator circuit operating, we plugged the known good crystals in and checked the operation on the scope. Then we used the frequency counter to get the exact frequency. Once we had a decent selection of frequencies, we used a multiple-pole rotary switch for crystal selection and marked the switch with the frequencies. Using the same approach as that of the vfo within the sweeper, we coupled the crystal oscillator to the sweeper mixer.

**Tuning the Birdie.** If you are lucky, you will have some good frequencies to use. (Of course, you can always buy a low-cost crystal with a useful frequency.) Now, with the sweeper working with a scope and an r-f circuit to be swept, turn on the sweeper's vfo and tune the birdie. Then turn on the crystal oscillator to a frequency that is within the swept range and note its birdie. Operate the vfo dial until you get a zero beat between the two birdies. The vfo dial should now indicate the exact frequency of the selected crystal. If not, you can make the necessary adjustments to the vfo dial so that it is correct. You can use harmonics of a crystal or higher-frequency crystals to check the other ranges of your sweeper. ◈