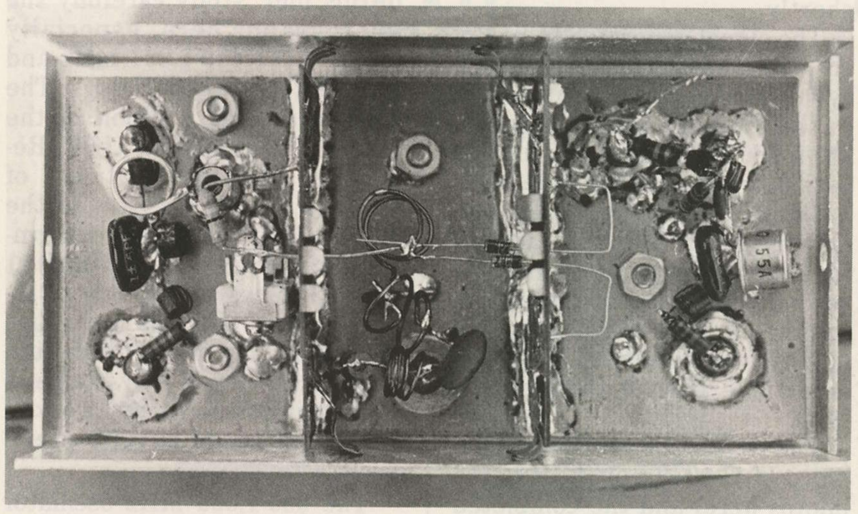
TEST EQUIPMENT ALA YOU

Part Three Explores A Do-It-Yourself Signal (Marker) Generator

Number Three

One of the most useful tools around the CATV test bench is a good marker generator. A marker generator in all other worlds is generally called a "signal generator" because that is what it does. Generate a signal. We have come to call such instruments "marker generators" primarily because more often than not we use them to "mark" or locate, or position a specific point in the spectrum. Most often they are employed in conjunction with sweep equipment, although as wide band noise tests become more common one would also suspect that the "marker generator" will become equally important there also.

In our application, following up on our October *CATJ* treatment of wideband noise generation for in-channel response testing, our application of the signal/marker generator is for the purpose of locating for us the precise frequency where some band or channel edge, or carrier, should be. Very high quality laboratory quality signal/marker generators include accurate frequency readouts, which tell us in the single instru-



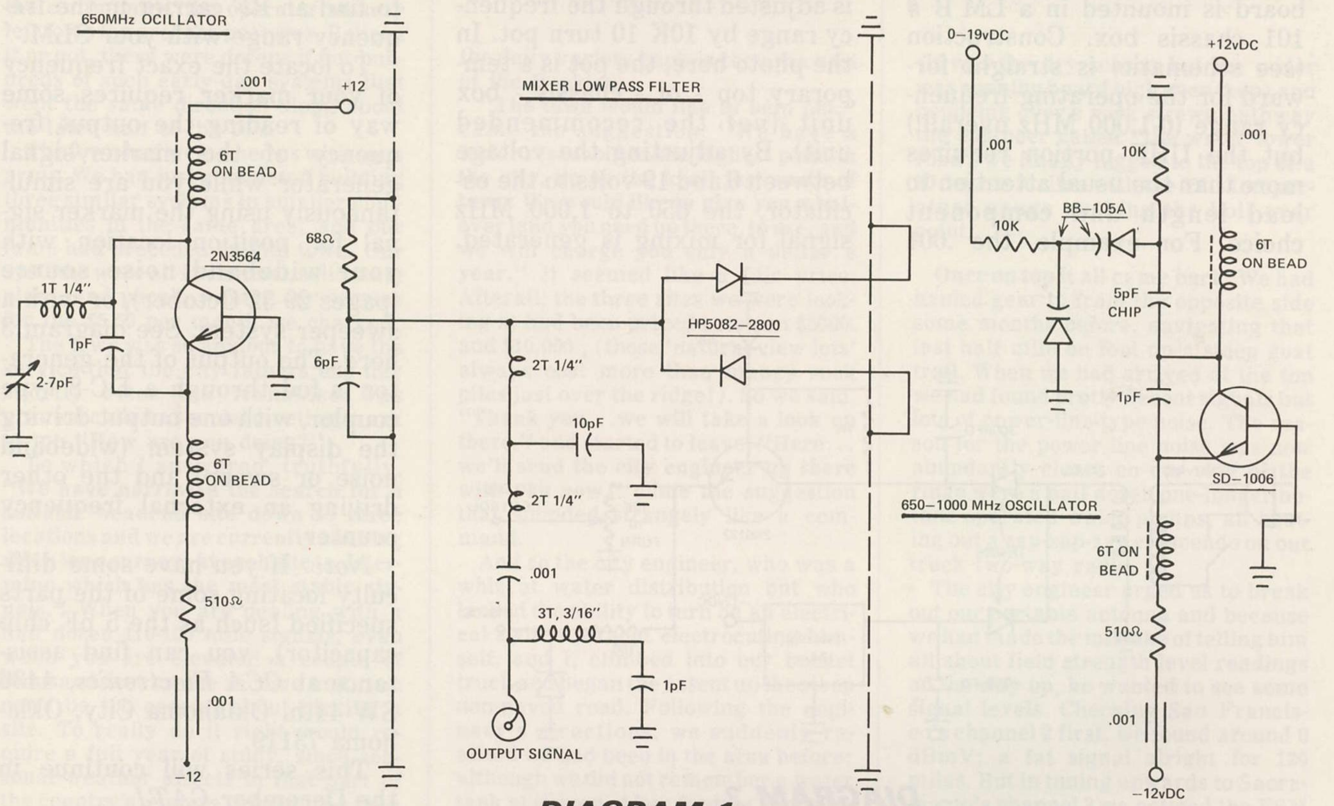


DIAGRAM 1

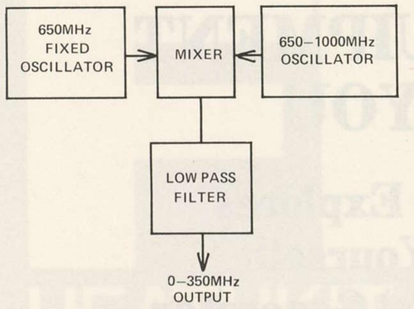


DIAGRAM 1A

ment where the generated signal is in the spectrum. For our purposes, we will have to rely on a second package or a separate instrument to measure the frequency. But more about that shortly.

The signal generator to be described is basically a heterodyne type signal generator. As shown in the diagram here, we generate a 650 MHz carrier with one oscillator and a variable 650-1,000 MHz carrier with the second oscillator. The two carriers (one fixed in frequency and the second adjustable) are mixed or combined in a single balanced mixer. The resultant output is adjustable from 0 through 350 MHz.

The circuit is constructed on a piece of G-10 circuit board (see photos here) and the completed board is mounted in a LM B # 101 chassis box. Construction (see schematic) is straight forward for the operating frequency range (0-1,000 MHz overall!) but the UHF portion requires more than the usual attention to lead length and component choice. For example, the .001 feedthru capacitors cannot be omitted or replaced with discs. The 5 pF chip capacitor in the 650-1,000 MHz oscillator *must be* a chip type capacitor. Normal disc capacitors simply have too much self (lead) inductance for use in this frequency range. The *base* of both transistors go *directly to ground,* and because of the frequencies involved, this base lead needs to be just as short as you can make it and still get adequate heat sinking applied while soldering between the grounded end and the case.

If you undertake construction of this unit, study carefully the photographs here, especially those of the 650-1,000 MHz and 650 MHz (fixed) oscillators. The lead dress, and position of the parts, is all critical at UHF. Remember *CATJ's* treatment of UHF to VHF converters in the June 1976 issue; what is a harmless piece of wire (as in a lead) at VHF becomes a capacitor or inductor at UHF. This can cause circuit loading, or circuit de-tuning which you will play the devil finding if you have not worked with UHF range circuits previously.

The 650-1,000 MHz oscillator is adjusted through the frequency range by 10K 10 turn pot. In the photo here, the pot is a temporary top - of - chassis - box unit (*not* the recommended unit). By adjusting the voltage between 0 and 19 volts to the oscillator, the 650 to 1,000 MHz signal for mixing is generated.

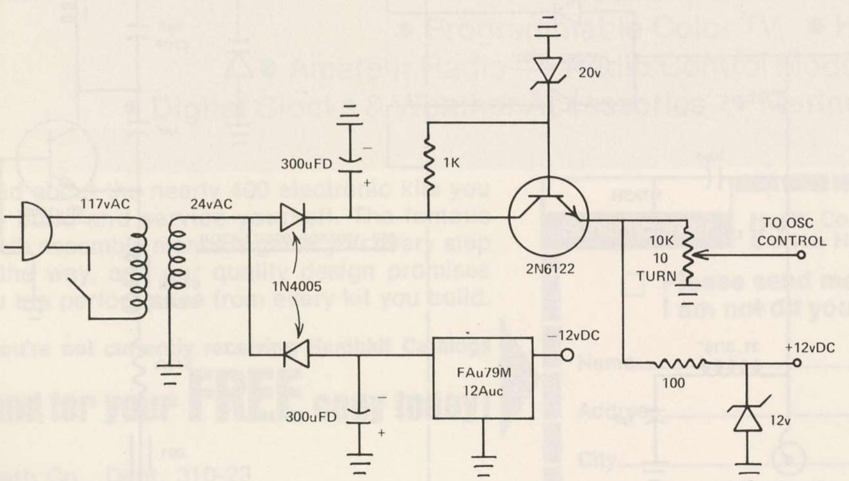


DIAGRAM 2

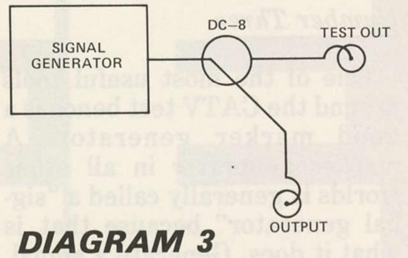


DIAGRAM 3

Set the voltage with the pot so there is zero volts present. Hook the output jack of the marker/signal generator to your external detector and run the detected voltage to the scope's vertical drive. When you have zero volts to the oscillator control line, you should have 0 MHz on the marker (i.e. a zero-beat display). At the opposite end of the range, when you have 19 volts to the oscillator control point, you should have 350 MHz out of the signal/marker generator. If you do not have a detector and a scope, there are at least two other options. A small audio amp connected to the output should produce an audio frequency beat (i.e. indicating a very small descrepency between exactly 0 MHz and a slight beat between the two 650 MHz carriers), or, between the 0 MHz position (0 volts) and 350 MHz (19volts)you should be able to find an RF carrier in the frequency range with your SLM.

To locate the exact frequency of your marker requires some way of reading the output frequency of the marker/signal generator while you are simultaneously using the marker signal for position location with your wideband noise source (pages 29-32 October), or with a sweeper system. See diagram 3 here. The output of the generator is fed through a DC-8 type coupler, with one output driving the display system (wideband noise or sweep) and the other driving an external frequency counter.

Note: If you have some difficulty locating some of the parts specified (such as the 5 pF chip capacitor), you can find assistance at *CCA Electronics,* 1436 SW 44th, Oklahoma City, Oklahoma 73119.

This series will continue in the December *CATJ.*