BY FRANKLIN J. MILLER

Build Your Own Audio Oscillator

ONE OF THE MOST IMPORTANT PIECES OF AUDIO TEST EQUIPMENT THAT YOU WILL EVER OWN IS AN AUDIO OSCILLATOR. IN THIS COLUMN I WILL SHOW YOU THE BASICS OF BUILDING ONE FOR YOURSELF. IT IS THE FIRST OF A SERIES OF AUDIO test instruments that will be discussed in the coming months.

For those that are regular builders, you know that making your own test instruments, having them work well, and having them look impressive to others can be extremely satisfying. It can also save you a lot of dollars. For those that rarely, if ever, build, why not give this a try; along the way, I will do my best to help you overcome some of the typical frustrations that newcomers face.

Part of my job as the author is to work all the kinks and bugs out of the design and make the instrument easy to duplicate. To make that happen, I have used standard, easily available parts wherever possible. Occasionally some specialized part is needed to make the project work properly. Whenever that happens, the part is fully identified. In addition, I will make sure that the part is available, at a reasonable cost. I will also make available a complete kit of all parts for those readers who prefer that approach.

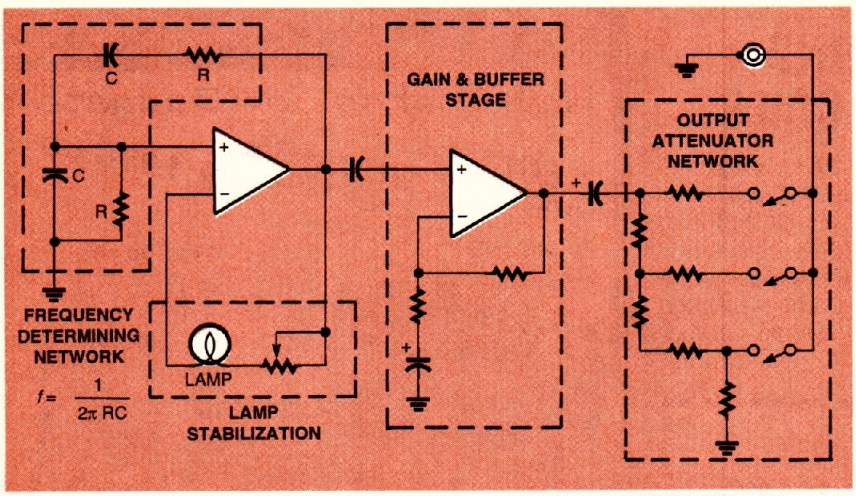

FIG. 1—HERE'S THE BLOCK DIAGRAM of our audio oscillator. The parts designated R and C in the frequency-determining network actually represent banks of precision resistors and capacitors that are switched using a pushbutton switch assembly.

The simple audio oscillator we are about to describe is needed to test all kinds of audio devices. While researching the different types of oscillators that might lend themselves to this task, I discovered that a Wien type was the best choice. One of its advantages is that by changing the values of two precision resistors or capacitors, the output frequency can be easily varied.

The Simple Audio Oscillator

My Wien-type circuit generates four basic frequencies and uses them to cover the entire audio band, and somewhat beyond. Although once we get outside of the fundamental 20—20,000 Hz range, output-signal amplitude is no longer constant. The unit is controlled using three banks of switches—one to set the frequency, one to set the multiplier, and one to select the output level. The output itself is an unbalanced low-impedance type that will drive loads of 600 ohms or greater. The unit is AC powered and physically small (2½-inches high, 4½-inches deep, and 8-inches wide). It is also inexpensive to build. Ordinary hand tools and soldering equipment will help you complete the job.

As I stated, the oscillator is a standard Wien bridge circuit. The resistors and capacitors used in the frequency-determining part of the circuit (the bridge itself) should be high-tolerance parts. I used 1% resistors and 5% capacitors in the design. Also, the more closely you match the resistors and capacitors, the lower the distortion the circuit produces. The oscillator frequency is set using the formula:

$$f = 2\pi RC$$

If we choose the capacitance carefully, a range of 1000:1 becomes practical. However, I chose to switch capacitors in BCD (Binary-Coded Decimal) format to produce whole-number frequencies (more on the switching scheme in a moment). That produces a very large range of possible frequencies from an

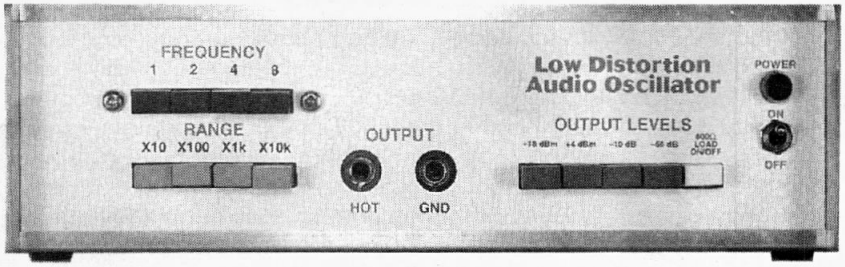

FIG. 2—HERE'S THE FRONT-PANEL layout for the instrument. The frequency and range selector switches discussed are on the left-hand side.

instrument that is small and inexpensive.

The exact frequency is determined by the tolerance of the components. For example, if we set a test frequency of 1 kHz and the true exact frequency is 1057 Hz, will it affect the readings? The answer is probably not. Of course that might not be true if we were trying to set up a crossover or some filter circuit where a more precise standard is needed.

ORDERING INFORMATION

The following items are available from Franklin J. Miller, 2100 Ward Dr., Henderson, NV 89015: A complete kit of all parts, including case, circuit boards, front panel label, $110.00; a partial kit of essential parts (pre-punched case, two circuit boards, three pushbutton-switch assemblies, and front-panel label), $45.00. Shipping in US included.

Frequency-Selector Switches

Two switch banks are used to select the generator's output frequency. The top bank (see Fig. 2), marked FREQUENCY, changes the resistor values in the Wien Bridge. Note that the switches are labeled 2, 4, 8, and 16. They are additive. So if you push 2 and 4 you get 6. If you push 2, 4, and 16, you get 22. The lower bank of switches, labeled RANGE is the range selector. Those switches are marked X1, X10, X1K, and X10K. Only one switch can be depressed at a time in this bank. So to select a 10,000-Hz output, we would depress 2, and 8 (= 10) in the top bank, and X1K in the bottom bank. No, you cannot select every specific frequency—for example, 33 Hz and 77 Hz are not available. But more than enough frequencies are available, and I felt the trade-off was worthwhile to keep the cost down

The switching arrangement is really handy if you want to look at amplifier performance at two different frequencies. Just set up the first and look at the output from the amplifier. Then switch frequencies and see what happens to the output.

Getting Started

You have a variety of choices in building your oscillator. You can order a complete kit of all parts; a partial kit consisting of the unit's two PC boards, three pushbutton switch assemblies, pre-punched cabinet, and preprinted front-panel label; or you can build your own from scratch. For those interested in the complete or partial kits, details are in the Ordering Information box. If you want to build your own from scratch, the next column will present the foil patterns, full schematic, and a detailed parts list. See you then. EN