

# INTRODUCTION TO ELECTRONIC MUSIC

HOW TO GET STARTED AND WHERE TO LEARN ABOUT IT

BY DON LANCASTER

**A** QUESTION often asked about electronic music is: What is it? Stated simply, electronic music is the production and modification of audio tonal effects by electronic means. With this basic definition, we really can't go far wrong because everything but a harmonica, a kazoo, or a chamber music group usually gets electronics involved in it somehow.

We prefer to separate music that is modified, deliberately or unintentionally, from instruments that actually *produce* music by electronic means. *Any* means of producing an electronic audio tone that isn't intimately associated with a traditional non-electronic musical instrument we would define as an electronic synthesizer.

The difference between electronic organs and Moog-style synthesizers is sometimes a very touchy point for both organists and synthesizer people. No one who follows today's circuitry can doubt that the hardware behind both instruments is rapidly converging toward essentially identical, mostly digital, systems. The distinctions lie more in who uses a given instrument and what the instrument is used for than in its hardware. Electronic organs are aimed at a more or less faithful accompaniment or imitation of classical instruments or traditional pipe organ voices through established musical forms. On the other hand, traditional Moog-style synthesizers are much more unstructured and have more freedom for creating new tonal combinations and new sounds.

Incidentally, many synthesizers are *not* real-time devices. They require tape recording techniques to build up one-note-at-a-time sequences and to multiply single voices. Some computer systems are extremely slow and have to be sped up hundreds or even thousands of times to obtain the desired

audio-frequency range. The latest hardware is getting away from this because being able to do live performances and to play more than a single note at a time from a keyboard are essential for a viable instrument.

**Building Up A Library.** At the present time, you can't just run out and buy any one book that will tell you all there is to know about electronic music. With the "digital electronic revolution" centered around the 5-cent gate in full swing, things are happening so fast that articles and personal communications, let alone a book, can't even keep up. So, how do you go about building up a good library? There are four routes you can take: subscribing to association newsletters; building up a file of technical papers; reading over and constructing the electronic music projects that appear in this magazine; and, finally, getting your hands on textbooks.

There are at least two electronic music associations. One is called Electronotes, located at 60 Sheraton Dr., Ithaca, NY 14850. Besides publishing a monthly newsletter, the association has a wide variety of technical material, including a good bibliography, and a loan service on rare or hard-to-find material. The cost of all this is \$2 per year.

Another more arty association that concerns itself more with the "new sound" in general, composition techniques, sound recording and distribution, etc., is called Numus West, located at Box 146, Mercer

## NOTE TO READERS

We would welcome your comments and questions on electronic music, hardware and non-hardware. Write to POPULAR ELECTRONICS Including Electronics World, One Park Ave., New York, NY 10016.

Island, WA 98040. Numus concerns itself more with people and the end product, while Electronotes is more hardware oriented.

Synthesizer design articles most often appear in the *Journal of the Audio Engineering Society* (60 East 42 St., Rm. 428, New York, NY 10017). Their subscription rate may be a bit steep for you at \$30 per year, but you might try a large university library for copies you can browse through. Some two-dozen electronic music articles have appeared in the *Journal* during the last three years, most of them on digital tone generation techniques.

Detailed measurement and analysis of what traditional musical instruments should sound like show up regularly in the *Journal of the Acoustical Society of America* (335 East 45 St., New York, NY 10017), at \$45 per year. Again, try a large university library or check with Electronotes for loan copies.

Several of the "obvious" places to look rarely or only occasionally have electronic music articles of value. These include the *IEEE Transactions on Audio* (345 East 47 St., New York, NY 10017). And don't overlook *Scientific American* (415 Madison Ave., New York, NY 10017); once every three years or so, they come up with an outstanding article on musical instruments.

Most libraries also have the *Music Index*, a "readers guide" sort of thing that reviews the traditional music magazines and occasionally gets involved with the new sounds.

POPULAR ELECTRONICS has had several electronic music projects in the past. Among them were the "Pitch Reference" (Sept. 1968), "Thumpa-Thumpa Box" (Feb. 1970), "Psych-Tone" (Feb. 1971), and the "Drummer Boy" (July 1971).

There are also many books available. One classic is H.F. Olsen's *Musical Engineering* (McGraw-Hill, 1952). It is now out of print but has been updated by *Music, Physics, and Engineering*, available in paperback for \$3.50 from Dover Publications, 180 Varick St., New York, NY 10014. Another classic is R.H. Dorf's *Electronic Musical Instruments* which sells for \$10 from Radiofile, Box 43 Ansonia Station, New York, NY 10023.

*Electronic Organ Handbook*, Volumes I and II, are \$5.75 per volume from Howard W. Sams & Co., Inc., 4300 West 62 St., Indianapolis, IN 46268. Tab Books, Blue Ridge Summit, PA 17214, has *Electronic Musical Instruments* by Norman Crowhurst for

\$4.95 in soft cover, and *Electronic Music* by Allen Strange is available from William C. Brown Co., 135 S. Locust, Dubuque, IA 52001 for \$3.95.

*Horns, Strings and Harmony* by Arthur E. Benade can be obtained for \$1.75 from Doubleday/Anchor Books, 501 Franklin Ave., Garden City, NY 11530. *Piano Tuning and Allied Arts* by William B. White is available from Tuners Supply Co., 88 Wheatland St., Somerville, MA 02145 for \$6.95. It contains a lot of material on piano mechanics. Tuners also has other traditional music books and some parts for build-your-own key-boards.

A *Bibliography of Electronic Music* from the University of Toronto Press sounds like it might be a handy item to have, but its 1967 publication date makes it too old to contain the most modern circuitry.

A number of other books are listed in

#### MANUFACTURERS OF ELECTRONIC MUSIC EQUIPMENT

##### Synthesizers and Kits:

ARP Instruments, 320 Needham St., Newton Highland, MA 02161

Buchla Associates, Box 5051, Berkeley, CA 94705

CBS Laboratories, 1300 E. Valencia St., Fullerton, CA 92631

Electronic Music Labs Inc., Box H, Vernon, CT 06080

Electronic Music Studios of Amherst Inc., 460 West St., Amherst, MA 01002

Ell Systems, 3455 Homestead Rd. #59, Santa Clara, CA 95051

Ionic Industries, 128 James St., Morristown, NJ 07960

Moog Music Inc., P. O. Box 131, Williamsville, NY 14221

PAIA Electronics, P. O. Box 14359, Oklahoma City, OK 73114

Southwest Technical Products Corp., 219 W. Rhapsody, San Antonio, TX 78216

Total Technology, P. O. Box 828, Belmont, CA 94002

Electronic Music London Ltd., 49 Deodar Rd., London England, SW15 2NU

##### Organs and Kits:

Artisan Organs, Wheeler St., Arcadia, CA 91006

Devtronix Organ Products, 5872 Amapola Dr., San Jose, CA 95129

Heath Company, Benton Harbor, MI 49022

Newport Organs, 846 Production Place, Newport Beach, CA 92660

Schober Organs, 43 W. 61 St., New York, NY 10023

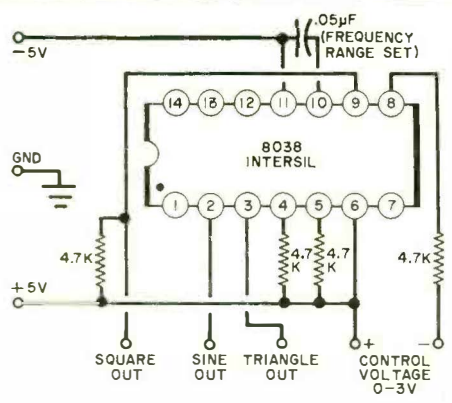
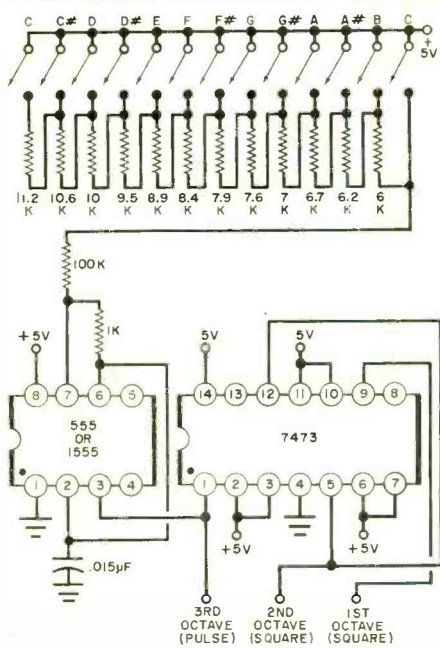


Fig. 2. The simple vco, above, offers sine, square, and triangle waveforms.

Fig. 1. Equally tempered tone generator, left, is inexpensive and can be used to generate 37 notes. Components can be trimmed to tolerances needed; small PC trimmers are the best to use.

## TWO PITCH GENERATORS

Here are two very simple, low-cost pitch generator circuits, shown in Fig. 1 and Fig. 2, with which you can experiment. The circuit in Fig. 1 generates square waves. The 555 IC costs only \$1 and is very stable with regard to power supply and temperature variations. By operating the switches, the equally tempered scale will be generated on a one-note-at-a-time basis. You can shift down an octave by *doubling* the value of the timing capacitor, or up an octave by *halving* the capacitor's value. The output level of the generator is 3 volts.

Another monophonic, or single-note, circuit is that shown in Fig. 2. This cir-

cuit generates sine, square, and triangle waveforms. Its parts cost is about \$3. The generator is stable enough for serious music work.

A future article will explain why you should have a logarithmic characteristic to any wide-range vco (voltage-controlled oscillator), and why digital techniques are better in the long run. To change octaves with this generator, once again, you juggle capacitor values. As a vco, the circuit has a 1000:1 range as you vary the input from 0 to 3 volts following the polarity and connections shown. Best stability is obtained near a 3-volt control potential. ♦

the *Whole Earth Catalog*. And Nonesuch Records (15 Columbus Circle, New York, NY 10023) has a set titled *The Nonesuch Guide to Electronic Music* that can be obtained for \$8.94 through your local record store. The set consists of two records and a comprehensive booklet.

We could go on and on with our bibliography, but you get the idea.

**The Instrument Makers.** Manufacturer trade literature is also a great help and

should become a solid part of your electronic music library. Some of the major synthesizer and organ kit suppliers are listed in the table. You might like to write the companies for catalogs and prices. Depending on the manufacturer and the performance capabilities of his equipment, the instruments range from less than \$100 to more than \$20,000. Of course, there are low-cost, practical ways of doing the same things the very expensive units can. Two examples are described in the box. ♦