

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 do prefer to separate music that is modified, deliberately or unintentionally, from those instruments that can 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 could 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 provide 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 their desired

audio-frequency range. The latest hardware is getting away from this because being able to hold 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. But with the "digital electronic revolution" centered around the 5-cent gate in full swing, things are happening so fast that any articles and person 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 might take: subscribing to the 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 offers a wide variety of technical material, including a good bibliography, and has 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 known as Numus West, located at Box 146, Mercer

NOTE TO READERS

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

Island, WA98040 Numus does concern itself more with musicians and the end product, while Electronotes is the more hardware oriented.

Synthesizer design articles most often appear in the *Journal of the Audio Engineering Society* (60 East 42 St. Room 428, New York, NY 10017) But 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 45th Street, 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 do not 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 offered several electronic music projects in the past. Among these were the "Pitch Reference" (Sept. 1968), "Thumpa-Thumpa Box" (Feb 1970) "Psc-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 at 180 Varick St., New York, NY 10014. A second 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 62nd St., Indianapolis, IN 46268. Tab Books, Blue Ridge Summit, PA 17214 has *Electronic Musical Instruments* by Norman Crowhurst priced at

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

Horns, Strings, and Harmony by Arthur Benade can be obtained for \$1.75 from Doubleday/Anchor Books, at 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 several parts for build-your-own keyboards.

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 Street
Newton Highland, MA 02161
Buchia Associates, Box 5051, Berkeley,
CA 94705
CBS Laboratories, 1300 E. Valencia St.,
Fullerton, CA 92631
Electronic Music Labs Inc. Box H, Ver-
non, CT 06080
Electronic Music Studios of Amherst
460 West
St. Amherst, MA, 01002
Eμ Systems, 3455 Homestead Rd. #59,
Santa Clara, CA 95051
Ionic Industries, 128 James St., Morris-
town, NJ, 07960
Moog Music Inc., P.O. Box 131, Will-
iamsville, NY 14221
PAIA Electronics, PO Box 14359, Okla-
homa City, OK 73114
Southwest Technical Products Corp., 219
Rhapsody, San Antonio, TX, 78216
Total Technology, P.O. Box 828, Bel-
mont, CA 94002
Electronic Music London Ltd., 49 Deodar
Rd., London England, SW15 2NU

Organ kits:

Artisan Organs, Wheeler St. Arcadia,
CA 91006
Devtronix Organ Products, 5872 Anapola
Dr., San Jose, CA 95129
Heath Company, Benton Harbor, MI
49022
Newport Organs, 845 Production Place,
Newport Beach, CA 92260
Schober Organs, 43 W. 61 St., New York,
NY 10023

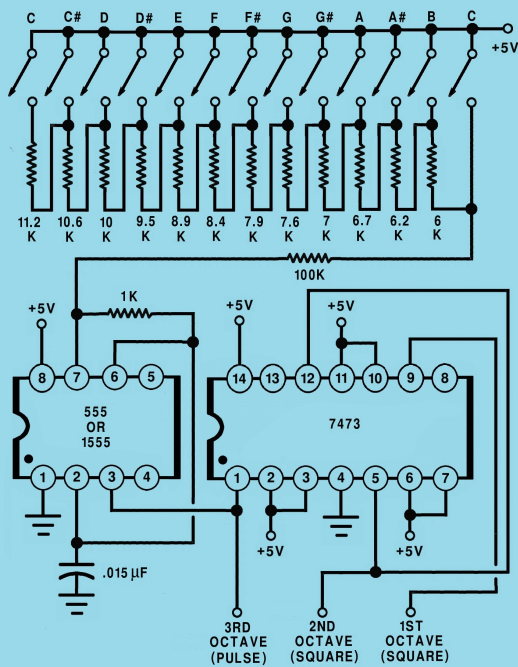


Fig 1. Equally tempered tone generator can generate 37 notes. Components can be trimmed to tolerances needed.

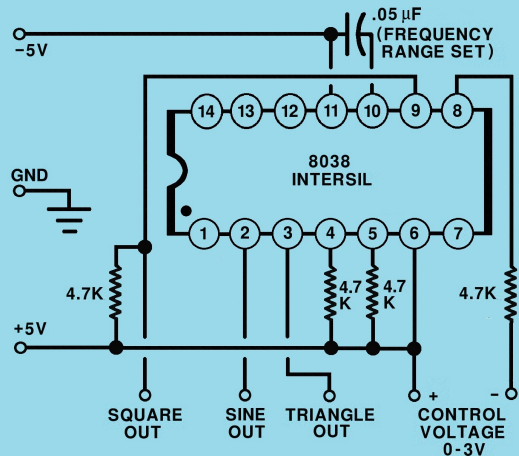


Fig 2. This simple vco, above, can offer sine, square, and triangle waveforms.

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 any one switch, 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 seems 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 end up 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 the 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 \$8.91 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. Manufacturers trade literature can also be 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. ♦