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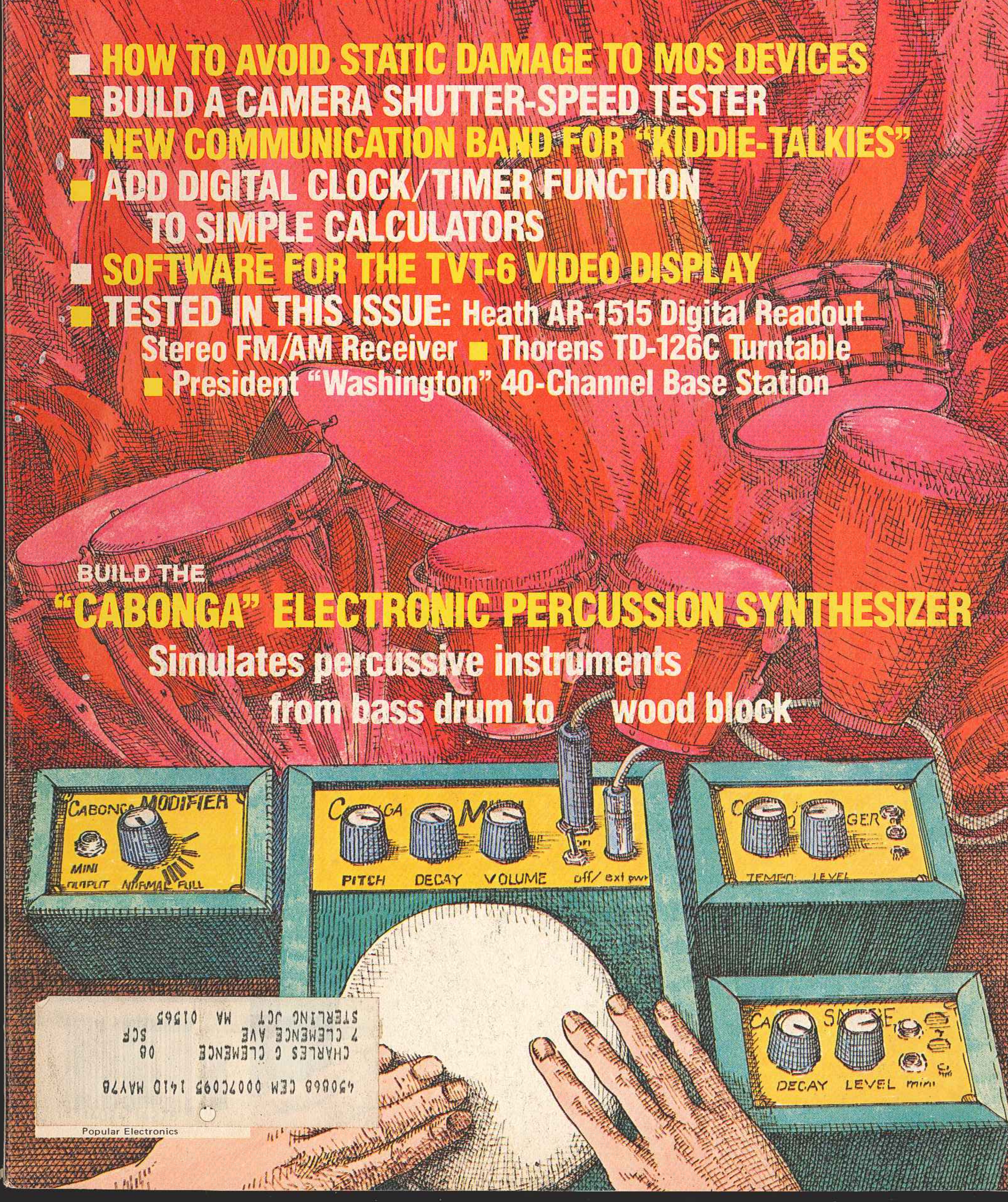
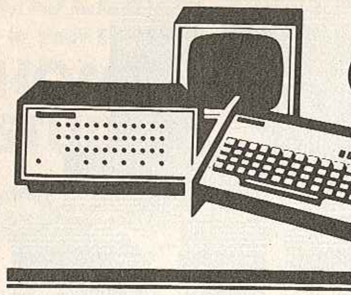
BUILD THE
"CABONGA" ELECTRONIC PERCUSSION SYNTHESIZER
Simulates percussive instruments from bass drum to wood block





Computer Bits

By Leslie Solomon, Technical Editor

REMOTE CONTROL

There has been lots of *talking* in various computer circles about the possibility of using a computer and a special program to control appliances around the house. However, there has been very little *doing* on the subject after the expense of the necessary rewiring was calculated.

While considering this problem at one club meeting, I was reminded of an article published in this magazine some time ago that just might be of some help. The article was "Wireless Audio System for Remote Speakers" (January 1976) and it described the concept of using a wide-band (30 Hz to 17 kHz) FM carrier-current transmitting system operating at approximately 200 kHz, to pipe hi-fi music around the house using the ac power lines already existing in the structure. Wherever you wanted a loudspeaker, you merely installed a matched FM carrier-current receiver and used the audio output from this device to operate the remote speaker system.

Now, why couldn't the same idea be applied to a computer system since just about every structure where a computer is installed is already wired and the existing power lines could be used: The only requirement is to substitute discrete tone signals for the hi-fi music. Since the wireless system has excellent specifications (S/N is −65 dB, frequency response is 30 Hz to 17 kHz ±0.2 dB, and audio distortion is less than 2%), good results could be expected.

Although I am still in the process of building what I am about to describe, I want to pass the idea along so that any one who is interested can make his own modifications or redesign the system for better operation.

Modulating With a Program. The first requirement is a program that will turn on an audio tone generator at a frequency determined by a given command. This tone is then used to modulate the wireless intercom system. A separate decoder can be installed in each room where there are appliances to be controlled and each decoder supplies a number of output signals.

The decoded outputs could be used to turn on an SCR or triac, which, in turn, would supply power to a conventional appliance socket. If each socket is color-coded, or otherwise identified as to which tone turns it on, the computer can control power to any socket in the system. To avoid having to keep a tone on-line while each socket is powered, the decoded output pulse can be used to turn on a flip-flop that operates the SCR or triac. Thus, the first transmitted tone turns on a socket. Then, because of the flip-flop action, the socket remains powered even when the tone is removed. The second time the tone occurs, the power is removed from the socket.

Because of the 30-Hz-to-17-kHz bandwidth of the system, quite a number of discrete tones can be transmitted. The use of high-Q filters can increase even that number.

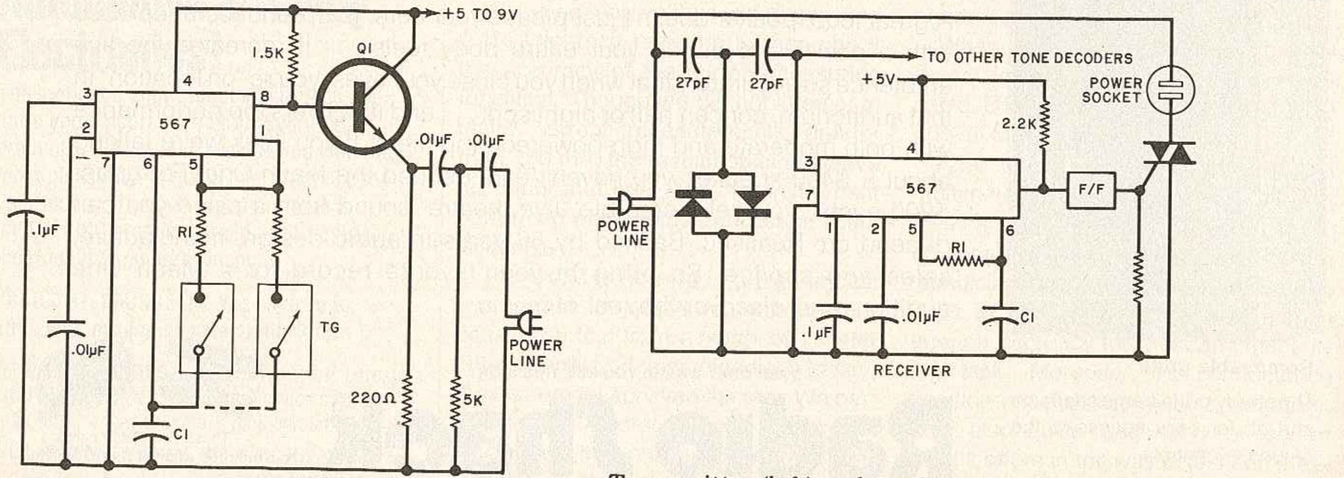
The Circuits. Transmitter and receiver circuits that can be used are shown here. Note that both are connected directly to the ac power line, so great care must be taken when working with the circuit to avoid electrical shock.

In the transmitter, which will be located at the computer, the selection of *R1* and *C1* will determine the oscillation frequency. In the circuit shown, *C1* can be about 0.001 μF, while *R1* is in the range of 1500 to 4700 ohms for a transmitting frequency of about 300 kHz. Other values may be used to set the desired operating frequency. Although you can use a single resistor for *R1*, switches may be used to select other values for other frequencies. In the circuit shown, transmission gates (TG) such as the CMOS 4016 can be operated by a computer signal. If desired, simple pushbutton switches can be used.

The output of the transmitter's 567 drives a transistor emitter follower (any good silicon type can be used) with the output passing through a high-pass filter to the ac line.

The receiver section to control only one socket is shown. Its input is coupled to the power line through a high-pass filter which also includes diode signal clipping (optional). The *R1-C1* combination in the receiver is selected to mate with that used in the transmitter. The decoded tone output, which occurs when the 567 receives the correct frequency, is used to operate the flip-flop. This stage, in turn, drives the SCR or triac. This controls the ac line supply to the power socket.

When the correct frequency is received, the flip-flop turns on the SCR or triac. The latter then remains on even when the tone is removed. When the correct frequency is detected the second time, the flip-flop changes states. Then, at the next zero crossing of the power supply, the triac is turned off, removing power from the controlled appliance. As previously mentioned, this system has not been built, but it looks workable. The reader can select his own frequencies, method of keying the tones, type of flip-flop, etc.



Transmitter (left) and receiver (above) circuits for a wireless system of remote control by computer.

Suggestions. It is also possible to use a conventional wireless intercom system, available from most electronics parts distributors and catalogs. They can be modified to use tone generators at the transmitter end and phase-locked loops (like the 567) at the receiver end.

No matter what kind of system you use, the important thing is to remember that any home, farm, or factory wired for power is automatically wired for remote control. All you have to do is generate the correct activating signals.

Newsbreak. There have been rumors in the wind for more than a year now that Heath, among other well-known companies, was planning to introduce a hobbyist computer. Well, it has happened! Heath has entered the hobby computer field. Here is a brief description of what was shown to us at a Heath press conference in Benton Harbor, Mich.

Based on the 8080A microprocessor, the new Heath H8 Digital Computer (kit price $375) features a 1k ROM operating system, a 9-digit, 7-segment LED octal display and a 16-key keypad. The readouts are used to display register and memory contents, even when the machine is running. Four discrete LED's are used as system status indicators, while a built-in loudspeaker can be used for a variety of audio effects.

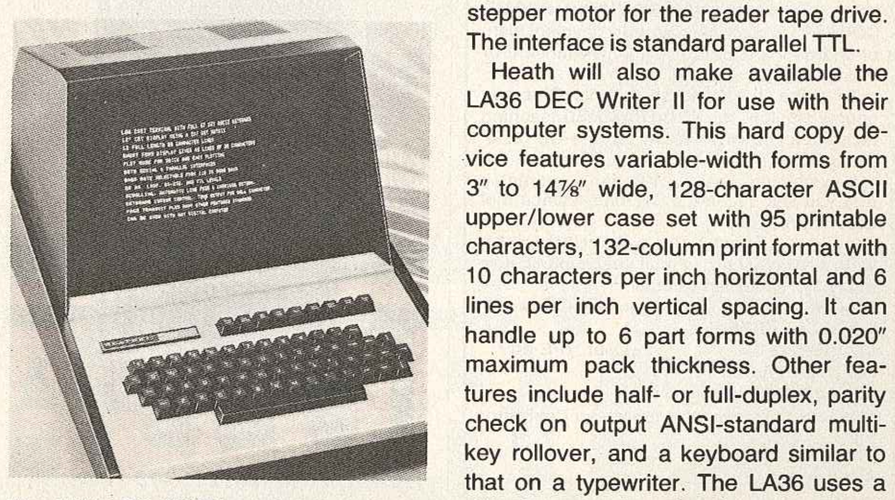
The bus design features two 25-pin connectors, and the bus has provisions for 10 plug-ins. The plug-in boards are tilted at the same angle as the sloping front panel. The "edge" connectors are on one side, and the other side of each board is supported by a metal bracket. The chassis is convection-cooled by a series of louvres on the top and bottom surfaces.

The kit contains everything but RAM memory. A 4k static RAM board kit is available for $140, and a 4k chip set to expand the board to 8k costs $95. There is also a serial I/O board that contains a 1200-baud audio cassette (modified Manchester code, KC standard) for $110, and a three-port parallel I/O for $150.

Heathkit H8 digital computer.

The Heath H9 CRT terminal (kit price $350) features a 67-key board, and an 80-character by 12-line display on its built-in 12" glare-free monitor. Other features include a format option of four columns of 20 characters by 12 lines, full cursor control, batch transmit, and a plot mode. Standard serial I/O includes EIA (RS-232), 20-mA current loop, and TTL levels. The baud rate is selectable between 110 and 9600.

There are several other items in the Heath computer line, including the H11, a 16-bit machine for $1295. Based on the Digital Equipment Corp. LSI-11 microcomputer module (KD11-F), and featuring the PDP-11 software, this new computer comes with a wired and tested CPU board, and 4k x 16-bit RAM memory. The memory is expandable to 20k. The system includes a built-in backplane, power supply with switching regulators and full circuit protection, and I/O accessories. A complete DEC software package that includes an editor, PAL-11 assembler, linker, on-line debug package, I/O executive, BASIC and FOCAL, is also included. Accessories include a 4k x 16-bit RAM board at $275, a serial and a parallel interface at $95 each. Purchasers of the H11 are eligible to join DECUS (Digital Equipment Computer Users Society), whose library contains over 800 programs for the PDP-11 which can be run on the H11.



Heathkit H9 CRT terminal.

Another new item is the Heath H10 paper tape reader-punch for $350. Although intended for the Heath H8 and H11 computers, the H10 can be used with any other computers. This peripheral employs standard 1"-wide paper tape (roll or fan fold), and the reader operates at 50 characters per second and is silent. The tape punch operates at 10 characters per second and either function is independent of the other and may be operated simultaneously. The device also features a copy mode for tape duplication, a built-in power supply, and a stepper motor for the reader tape drive. The interface is standard parallel TTL.

Heath will also make available the LA36 DEC Writer II for use with their computer systems. This hard copy device features variable-width forms from 3" to 14⅞" wide, 128-character ASCII upper/lower case set with 95 printable characters, 132-column print format with 10 characters per inch horizontal and 6 lines per inch vertical spacing. It can handle up to 6 part forms with 0.020" maximum pack thickness. Other features include half- or full-duplex, parity check on output ANSI-standard multi-key rollover, and a keyboard similar to that on a typewriter. The LA36 uses a 20-mA current loop interface. ◇