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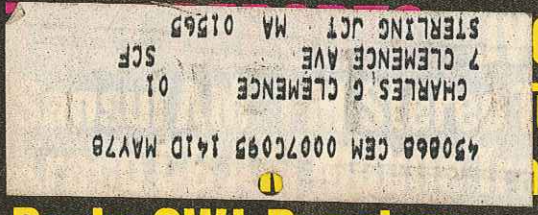
Test Meters For Electronics

A Low-Distortion, Low-Cost Audio Generator Project

How To Interface Computer Terminal Keyboards

SWR- Facts and Fallacies

Build A Direction-Sensing Photoelectric Switch/Counter



C AM/FM Stereo Receiver,
uner, Kenwood Integrated Amplifier,
nsceiver,

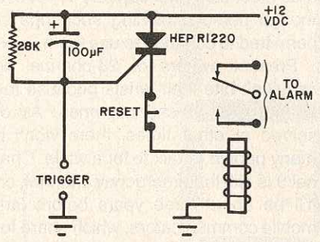
Drake SWL Receiver

(1) Many of the responses to the CB theft article were from CBers who wanted to relate how their own rigs were ripped-off.

We received several responses from readers who were inquiring about the best way that they could register the serial numbers of their rigs in order to increase the chances of recovery in case of theft. In our article, we recommended against such registration programs because such lists, if published, might provide excellent shopping lists for would-be thiefs. However, one company came up with a plan which showed promise. They planned to list subscriber's serial numbers in their computer in such a manner that they could quickly recover the name and address of the registered owner upon request of bonafide law enforcement agencies who could make use of a confidential toll-free number.

This plan has stirred the interest of several law enforcement agencies. It should be especially useful now that all new rigs must include a permanently-affixed, unique serial number. Unfortunately, we have not been able to contact that particular company recently to confirm the fact that they are still in business at the original address.

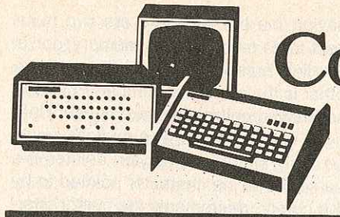
We received many announcements from commercial interests plugging anti-theft products, but one of the more interesting devices brought to our attention was sent in by an electronics experimenter, Dave Medlin of Northfield, MN, who sent us a simple circuit diagram for an SCR trigger device which will sound an alarm when the ground circuit from the rig is broken (see diagram). It only draws about ½ mA of idle current and should not discharge a vehicle's battery even over an extended period of time; or it could be rigged to include an independent battery.



(2) The "Class E" article, which described a proposed class of CB radio in the high VHF frequencies and utilizing frequency modulation, drew a deluge of angry letters from Hams who are understandably concerned that they may lose a part of their frequency allocations to CB for the second time. But not all the letters, not even all of those from Hams, disagreed with the Class E proposal. It has now become evident that a new band must eventually be established to provide our citizens with high-quality personal communications. Whether or not the "Class E" band is the way to go is another question.

Keep Letters Coming. This type of feedback from our readers is very important because it lets us know who is reading our column and what they'd like to see covered.

We know that many CBers are reading our column and subscribing to POPULAR ELECTRONICS by the tremendous response we have had to the offer to send a Form 555-B to anyone who will send us a self-addressed, *stamped* envelope (more than 500 received). We'll continue to supply these forms and will also keep a supply of license applications (Form 505) on hand as well, even though they will be packed with all new sets sold after January 1, 1977. Please send requests to REST MARINE, Box 170, Old Greenwich, CT 06870. ◇



Computer Bits

TEXT EDITING

By Hal Chamberlin

TEXT EDITING is a fundamental function that almost every hobby computer will be called upon to perform. Even an operation as simple as typing a command into a monitor program and then backspacing to correct an error is a form of text editing. Preparing programs in assembly language or BASIC is primarily program text editing. In fact, most BASIC language systems have a built-in text editor. A good program editor can greatly increase the speed, accuracy, and fun of writing large programs.

An editor designed for English text would be useful to non-computer-oriented family members as well. For people who hate to write letters, a text-editor program makes it so easy that the relatives will be swamped with mail. Maybe your sister types dissertations and reports for students at a nearby university. A good text-editing program could increase her speed and accuracy to the point of making it a lucrative business. An author is much more productive (at least this one is) when sentences and paragraphs can be rearranged on the spot to make the work "sound right."

Hardware. Every microprocessor in common use by hobbyists is ideal for text editing applications. The amount of memory required is not great; 4k bytes is adequate for a useful system but 8k allows a sophisticated editor program, as well as a full single-spaced page of text, to fit in memory at once.

If the goal is quality editing of English text for reports, then an upper- and lower-case keyboard is needed. A good "feel" is helpful if a touch typist will be using the system. A useful keyboard feature is a shift-lock key that affects only the letters of the alphabet. There are many suitable keyboards on the surplus market. The best ones for text editing are those made by Microswitch and Clare-Pendar.

Since the goal of most text editing is to produce letter-perfect printed pages, some kind of printer is necessary. For informal work a Teletype, either ASCII or Baudot, is acceptable. For higher quality *upper-* and *lower-*case reproduction, about the only present possibilities for the hobbyist are a used Selectrio terminal (golf-ball printer) or a manual Selectric typewriter converted to computer operation. In a year or so, used "daisy wheel" printers made by Diablo and others, should be appearing on the surplus market. These are an absolute "dream come true" in a text-editing application. A printer is the biggest obstacle to overcome in setting up a text-editing system.

Having a CRT display on a text-editing system is like having a picture with your TV sound. Usually the text being typed in or edited is shown on the screen exactly as it would appear when printed out. When editing, finding the exact phrase or word to be changed is very rapid and the result of the change is instantly visible. If the change involves an insertion or deletion, the editing software automatically moves words from line to line to maintain an even right margin. Similarly, if a sentence or paragraph is moved elsewhere on the page, the movement appears immediately on the screen.

By far the best kind of video-display interface to use for text editing is one that generates the display from directly addressable computer memory. Here, merely moving bytes around in memory will also move the text around on the screen. If your computer has an "ALTAIR" bus, the VDM-1 from Processor Technology or the PolyMorphic Systems video interface are ideal. In addition they offer both upper- and lower-case characters and a line length of 64 characters, as wide as a typewritten page with one-inch margins. The typical "TV typewriter," although excellent for communicating with the computer, is less suited to editing applications, because most changes to text on the screen require retransmission of the whole page through a serial I/O port. Also, the 32-character line with upper-case only is awkward in most cases.

Video monitor driven by computer displays first lines of this column.

A mass-storage device, while not required, can greatly increase the usefulness of an editing system. Without mass storage you are limited to editing what can fit in your available memory. For short reports this might not be much of a restriction since one page at a time can be typed in, edited, and printed. With long reports or programs, mass storage allows editing and updating to be done days or weeks later. Because of frequent insertions, deletions, and updates, a floppy disk is better suited to text editing than the low-cost tape cassette approach. However two high-speed program-controlled cassette decks can be successfully used. A sophisticated system with mass storage allows text to be appended from one page onto another as well as provide for maintaining full pages during insertions. In fact, a good editing program also makes a dandy general-purpose information storage and retrieval system.

Software. Once the needed hardware has been assembled, the key to a useful system is the editing software. Unlike most other applications, very little specialized knowledge is required to write an editing system; only a good knowledge of programming techniques. In most cases common sense and experience with manual editing of text will be sufficient to keep system development on the right track.

One of the fundamental decisions to be made is whether a program editor or an English-text editor is desired. The main difference is that programs are line-oriented (each line of text is independent) and English text is sentence- and paragraph-oriented, with little importance attached to actual lines. A strict program editor is easier to write but is of limited use on English text. On the other hand, a good English text editor can handle programs well also.

A related decision is whether text stored in the system is page-oriented or handled as a long scroll. A page is the amount of text that fits on a standard typewritten page; about 50 lines single-

spaced or 25 lines double-spaced. A scroll has a variable number of lines according to the particular text being edited. Programs are best handled as a long scroll, since actual printed-page boundaries are of little significance. One scroll might be an entire program of hundreds or thousands of lines. A page-oriented system is better suited to English text, since one could not expect titles and paragraph breaks to come out right if a long scroll were printed simply as 50 lines per page.

When text is stored on a mass storage device, a software-maintained *index* is quite helpful to both the operator and the software in locating the desired page or scroll. Each index entry could give a name, a sequence number , and the location on the storage medium for each page or scroll stored. The name identifies and briefly describes the associated text. The sequence number might be a page number in a particular report. The storage location gives a record number or a track and sector number of the text depending on whether a tape or disk is used. Software could be written so that a user command such as "GET (name)" would search the index for the requested name and read the text into memory for display and editing. Additional commands and associated software would be available for creating new pages, deleting unwanted pages, and renaming or resequencing pages. Some of these index-manipulation commands may not be needed with a program editor.

One very useful feature in an English text-editing system which alone increases typing speed substantially is called *word wrap*. With an ordinary typewriter, the user is constantly listening for the end-of-line bell and worrying about fitting words into the right margin. With word-wrap software the computer automatically moves any words that don't fit within the right margin to the next line while they were being typed in. Thus the user simply types away without having to type carriage returns and need not stop until the end of a paragraph.

Within the software there will be a number of elementary subroutines for handling the display. The most basic are the cursor-movement routines. For example, with the VDM-1 display, a cursor is displayed by setting the eighth bit in a byte to one. When this is done the character is shown as black on a white background. Normally only one character will have this bit on and the cursor is said to be at that character position. There is a switch on the VDM-1 board that causes the cursor to flash if desired. Besides having the bit set, there are two numbers to be maintained in memory; one is the line number of the cursor and the other is the character number. Four cursor-movement routines are needed: left, right, up, and down. The routines would be fairly simple; cursor left deletes the cursor bit in the character pointed to by the cursor, decrements the cursor character number, and then sets the cursor bit in the character at the new cursor location. Cursor right is the same except that the character number is incremented. Up and down are also the same except that the line number is manipulated. Note that checking will have to be done to prevent the cursor from going off the page. If the keyboard being used has some extra keys, a good use for them is cursor movement.

Even if the editor is page-oriented, a scrolling routine will be needed to allow the user to see all of the page with a 16-line display. Normally there would be a text buffer in memory to hold the entire page being edited. One k-bytes of that buffer would be stored in the display memory and show up on the screen. One approach simply divides the page into 16-line segments and provides a command to display the desired segment. A better approach would constantly adjust the display and text buffers so that the line the cursor is on is in the middle of the screen. Then in all cases the user could see several lines of text before and after the line being edited. Most microprocessors are fast enough so that the text movement associated with display scrolling is essentially instantaneous.

The actual editing of text is done with a fairly small number of commands. Mostly one wants to insert, delete, and move basic elements of text such as characters, words, lines, sentences, and paragraphs as well as simply type over mistakes. The cursor is very important in performing these fuctions. To perform a typeover, the user positions the cursor at the first character to be changed and starts typing. Actually, simple entering of new text can be considered as typing over blanks. For deleting characters, the cursor is placed at the first unwanted character and a "delete character" key is pressed. For maximum usefulness, the text to the right of the deletion moves left to fill the hole created and the cursor winds up on the next character. Thus multiple characters are deleted by using the "repeat" key with the delete-character key. For insertions, the cursor is placed where the insertion is to be made and an "insert mode" key is pressed. Now, as each character is typed, text to the right of the cursor moves right and down to make room for the next piece of inserted text.

For larger elements of text the concept of "designation" is helpful. First there are commands to designate a word, a line, a sentence, and a paragraph. To perform a designation, the cursor is placed anywhere in the element to be designated and the appropriate command given. The software then searches forward and backward, applying rules for the text element to determine which characters are within the element. The rules for a sentence, for example, might be any string of characters starting with a capital and ending with a period. Designation might be shown on the screen by turning the cursor bit on in the designated block. Once a block is designated, it could be either deleted or moved somewhere else.

In a system with mass storage, a useful function is appending text from one page to another. A simple implementation would allow text from another page to be placed at the bottom of the page being edited. The converse operation would split one page into two or more pages. With these functions, text can be easily moved around in a report. Also, documents can be assembled from previously stored paragraphs.

Finally, there is a large number of possibilities for "justifying" edited text for final printout. The simplest is to make sure that the maximum number of words possible are on each line. This will give a standard typewriter appearance with ragged right margin. If a flush-right margin such as in newspapers is desired, a method that is compatible with standard printers is to distribute the blanks at the end of the line between the words. Unfortunately the word spacing may become a little erratic, but many people prefer the "blocked-off" appearance of the text. In both cases the appearance can be improved by hyphenating long words at the end of the line. Automatic hyphenation according to the rules of English is difficult to program. A good compromise is to have the software ask the user how words that need to be broken should be hyphenated. A very impressive demonstration is provided by a justification routine moving words around on the display screen.

A useful editing program need not have all of these features, but one nice property of text-editing applications is that new functions can be easily added when desired up to the limits of available memory. ◇

Operation Assist

If you need information on outdated or rare equipment—a schematic, parts list, etc.—another reader might be able to assist. Simply send a postcard to Operation Assist, POPULAR ELECTRONICS, *1 Park Ave., New York, NY 10016. For those who can help readers, please respond directly to them. They'll appreciate it. (Only those items regarding equipment not available from normal sources are published.)*

Nemsclarke (Div. of Vitro Corp.) Model 1432 Phase Lock receiver. **Air Associates** Model CR3-G receiver. Coil data for Air Associates manuals and schematics for both. Rudy Rutenber, 20632 Hartland #2, Canoga Park, CA 91303.

RCA Model WO54B 3-inch oscilloscope. Need schematic and alignment instructions. Henry M. Gort, Box 289 Chloride Star Rt., Kingman, AZ 86401.

Signal Corps Model BC-348L receiver built by Belmont. Schematic and/or manual. Darhl Boucher, R.D. 1, Falls Creek, PA 15840.

General Electric GE-93 multi-band radio. Schematic and alignment instructions. **Ballantine** Models 220 ac VTVM and 314 decade amplifier. Schematics and operating instructions. Rad Smith, 3188 Rumsey Drive, Ann Arbor, MI 48105.

Atwater Kent Model 60. Schematic and any info on restoring, source for tubes, and speaker rebuilding. Bruce Boyes, 976 River Hts. Blvd., Logan, UT 84321.

U.S. Govt-National R-651/URR39 receiver model NC183MR. Schematic and/or service manual. Sal Ruggieri, 345 Aldrich Rd., Howell, NJ 07731.

Tube source for 19X8 and 12AL5. W. Clumm Entwood, R.R. 1, Amesville, OH 45711.

Precision Apparatus Model EV-10 VTVM, **Precise** r-f/a-f/TV marker/bar generator Model 630. Schematics and/or manuals. David Houston, 1076 Williston Road, Burlington, VT 05401.

Cariole Model 19545 cassette recorder. Schematic and any other information. Max Hatwig, Alexander, IA 50420.

Phone King Model J36 telephone answering device. Schematic and parts list or maintenance manual. Mosha Comfeld, Apt. 2, 1261 N. Laurel Ave., Los Angeles, Ca 90046.

Auditon Model 2515-1 AM/FM/8-track/phonograph. **Matter** SP-200 100-W/ch audio power amp. Schematics, service manuals, or Auditon address. G.D.C., Box 824, Huntsville, AL 35804.

Analab Model 1120 oscilloscope main frame with #700 plug-in. Schematic needed. Ken Lesniak, 15 Academy Road, Somerset, NJ 08873.

Precision Apparatus Co. Series EV-10A VTVM. Schematic. George F. Oelkers, 609 St. James Rd., Newport Beach, CA 92663.

Bradford Model S52506 portable stereo cassette recorder. Schematic and/or service manual and source for replacement heads and switch contacts. Tim Melton, Box 1738, Cave Creek, AZ 85331.

Western Electric Model RU-17 aircraft radio receiver. Built for BuShips contract 84530 21 April 1941. Maintenance and operating manuals, and source for plugs and jacks used on this equipment. S.E. Stokes, 26006 Crenshaw Blvd. #115-B, Torrance, CA 90505.

Keystone Model 2000-CSR stereo cassette deck. Service manual or schematics. Roy Cantu, 1980 Flora Place, Eureka, CA 95501.

Capehart Deluxe Model 411M AM/FM/SW radio and phonograph manufactured by Capehart Division, Farnsworth TV and Radio Serial 18507F. Company address, schematics, and any manuals available. Scott Stockwell, R.R. 1, Box 102, Riley, KS 66531.

Motorola Model AN/VRC-19 transceiver containing transmitter T-278/U and receiver R-394-U. Any available information. Mel Swanberg, 1037 Scripps, Claremont, CA 91711.

RCA Victor Model 8-V-151 Victrola radio phonograph. **Navy** surplus receiver type CAY-46077-A. Schematics needed. Roger Ream, Rte. 5, Box 62-H, Melbourne, FL 32935.

Electronic Tube Corp. Model K470 oscilloscope. Service manual and/or schematics for scope, power supply, and plug-ins. L. Beecroft, 5913-54th Ave., Red Deer, Alta., Canada T4N 4M7.