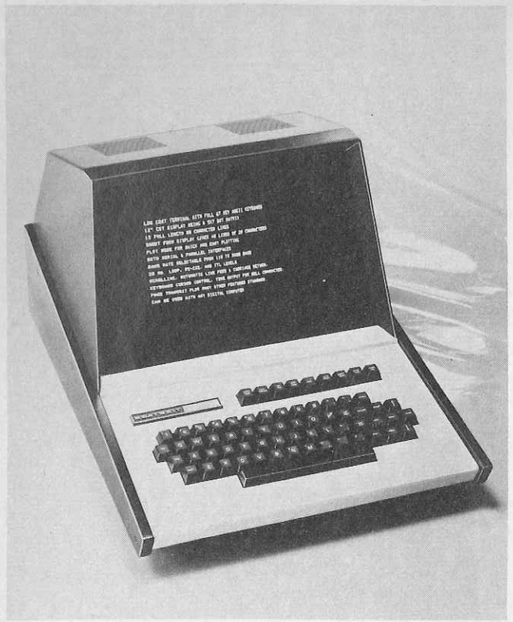


New Hobby You Can Build

Two machines: one an 8080A, the other an a long list of peripherials, accessories and

On May 30, 1977, Radio-Electronics was invited to preview the new computers at the Heath plant in Benton Harbor. This is our preliminary report on what we were shown. At a later date, after we have had the opportunity to construct our own machines we will update this report.

The new line, and it is a full line, consists of two computers, the H8 and the H11. The H8 is an 8-bit system based around the 8080A microprocessor. It features an intelligent front panel with octal data entry and display, and a resident monitor with built-in bootstrap for one-button program loading or storage.

The H11 is a much more sophisticated machine. It is a 16-bit computer that uses the D.E.C. (Digital Equipment Corporation) LSI-11 with 4K memory, a built-in backplane and a regulated switching power supply.

Peripherials, that are compatible and can be used with either system include a video terminal, paper-tape reader/punch/duplicator. System dedicated peripherials include a hard-copy printing terminal and a cassette recorder. I/O (input/output) interfaces, additional memory and supplimentary software paclages complete the initial products and additional hardware and software will be added later.

Both systems are backed with complete documentation—assembly and user manuals, schematics and pictorial diagrams, printed circuit board layouts—all the great aids that Heath had traditionally provided its kit builders. There is even a Heath Users group already being formed and Heathkit H11 owners are automatically eligible for membership in DECUS, the Digital Equipment Corp. users group.

The H8—an 8080A machine

This is the basic hobby computer in the newly announced Heath line. The 8080 is a well-known stardard microprocessor. In the H8 it comes with a built-in 1K ×8 ROM (Read Only Memory) that contains a monitor program for controlling the front panel and load/dump operations. The H8 cabinet is designed to accomodate up to 32K of memory and has a total capacity for 65K of addressable memory.

The intelligent front panel has a 9-digit 7-segment octal display that permits the user to dynamically display register and memory contents while programs are running. A 16-digit keyboard allows quick and accurate data entry. A built in programmable audio circuit and speaker makes possible a wide variety of special audio effects while a set of LED status lights make it possible for the operator to monitor important machine states.

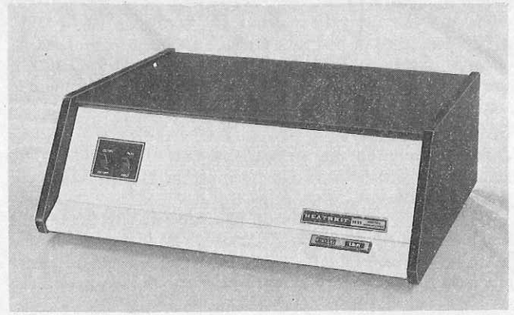
The CPU board that houses the 8080A comes factory-wired and tested to eliminate the most common source of errors that a kit builder might encounter. The system bus that Heath is using is a 50-line bus that is not compatible with any other 8080 bus currently in use. This means that any accessory items you may have for the Altair or S-100 bus *cannot* be used in the Heath computer. A built-in convection-cooled power supply completes the main frame. It can handle up to 32K of memory and two I/O interfaces. The basic H8 kit includes the wired and tested CPU, complete assembly and operations data as well as all systems software in audio cassette for,. It sells for $375 in kit form.

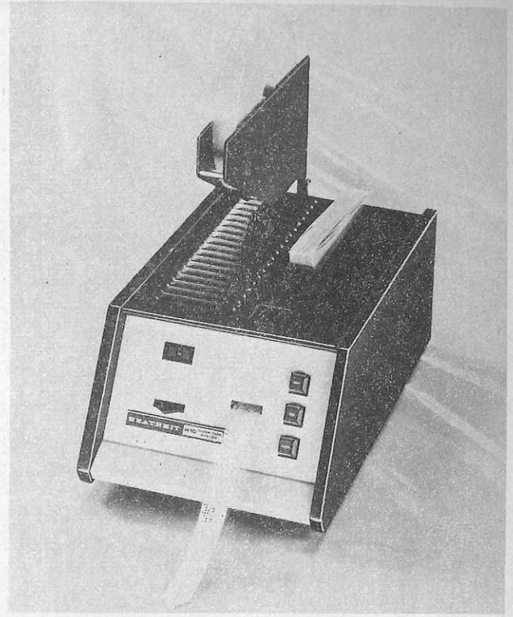
Memory cards for the H8

Additional memory, a must if you are going to do anything with your H8 is available. Model H8-1 is an 8K memory board kit that comes with 4K of static RAM for $140. An additional 4K expansion memory IC set (Model H8-3) is $95. Each static memory card uses TI4044 4K × 1 static memory IC's. Memory PC boards are available only as a part of a memory kit. All IC's are in sockets, and each memory card contains additional on-card power-supply regulation. The memory is addressable throughout the entire memory range and comes complete with a memory test program.

Parallel I/O card for the H8

To interface with outside peripherals you must have an I/O, preferable several. Heath offers their model H8-2 for this purpose. This I/O card kit offers 3-input/3-output 8-bit ports. It is completely compatible with the serial I/O port used to inerface a cassette recorder with the machine. The parallel I/O has complete interrupt control and independent addressing is available. Output polarity is selectable and pulsed or transparant handshaking is included. Like the memory board, on-card power-supply regulation is provided. The H8-2 kit is $150.





Computers From A Kit

LSI-11 are available in kit form from Heath—plus software

Serial I/O card for the H8

When you want to interface a cassette recorder to your H8 computer you must have a serial I/O board. In the H8 system you need the H8-5. It has a 1200 baud rate and sells for $110.

Video terminal kit

The H9 video terminal kit can be used with either the H8 or the H11 computer. It costs $530 and has a 12-inch screen that displays up to 12 lines of 80 characters and contains enough built-in memory for one page of data. It offers long- or short-form display. Long-form is full lines of data 80 characters long. Short form is 4 columns of 20-character lines—quite handy during programming as you can then look at 48 lines of program at a time. Baud rates are variable from 110 to 9600. Editing features are built in. This terminal also includes a parallel interface for the H10 tape reader/punch/duplicator.

Tape reader/punch/duplicator

Like the video terminal, this unit can be used with either computer. It costs $350 as a kit and can read, punch or duplicate paper tape. This multi-purpose device is a 50-CPS high-speed reader; a long life 110-baud 10-CPS punch and has a copy mode duplicating tapes. It uses a parallel interface with handshakes and can accomodate either fan-fold or rolls of paper tape. The unit comes with a chad tray for catching the punched out paper scraps and a fan-fold tape tray.

H11, a 16-bit computer

This powerful machine is designed around the DEC LSI-11, a 16-bit CPU. The CPU board is supplied completely assembled and tested with 4K × 16 dynamic RAM. Memory is expandable to 20K. The unit includes a built-in backplane, power supply with switching regulators and full circuit protection, and flexible I/O interface accessories. A complete DEC system software package is also included. It contains editor, PAL-11 assembler, linker, on-line debug package, input/output executive, BASIC and FOCAL. Mail order price of the H11 is $1295.

The mainframe has no front-panel keyboard or readouts. It does feature a tilt-up removable card cage and a built-in cooling fan.

Static memory for H11

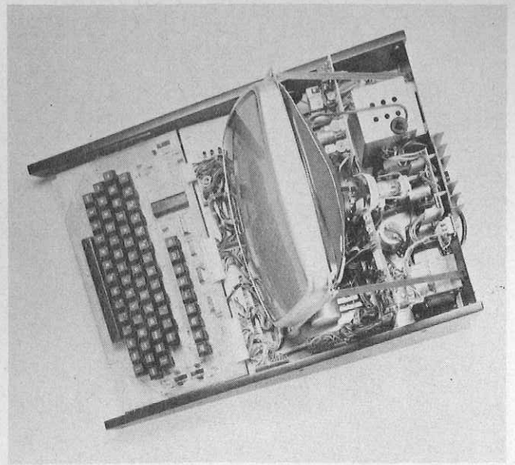
As many as four additional 4K static memory cards can be added to the H11. Heath calls these model H11-1 and cost $275 each. The cards use 1K × 4 static RAM memory (no refresh is required). They are fully compatible with the H11 bus and the PDP 11/03 bus. Only a single jumper is needed for bank selection and maximum read/write time is 500 nS.

Parallel I/O for H11

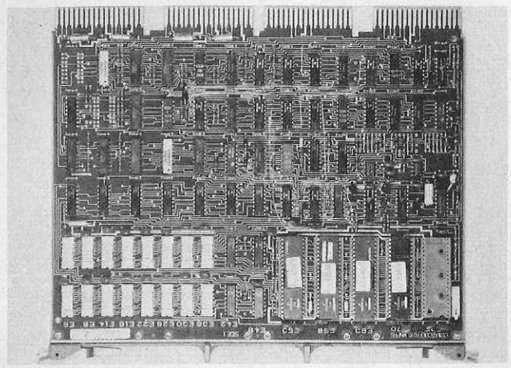
The H11-2 is a parallel I/O for the H11. It costs $95. It offers 16 diode-clamped data input lines. Inputs and outputs are latched. 16-bit words are on 8-bit byte programmed data transfers. Also provided are jumper-selectable address and vector generation. Four control lines go to each peripheral device—reader enable low, data valid low, new data valid low and punch ready low. The logic lines are TTL compatible.

Serial interface for the H11

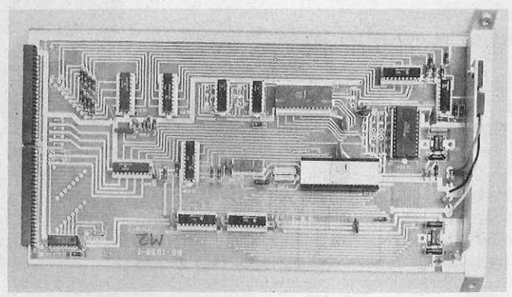
Labeled as the Heath model H11-5 this serial interface card can be either EIA or optically isolated. It offers selectable crystal-controlled baud rates of 50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 4800, and 9600. Also provided are jumper-selectable stop-bit and data-bit formats and H11 bus interface and control logic for interrupt processing and vector generation. Interrupt priority is determined by the electrical position along the H11 bus. All control/status register and data registers are compatible with H11 and PDP-11/03 software.



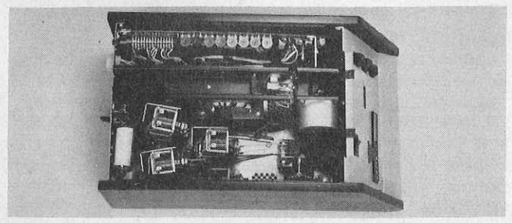
INSIDE THE VIDEO TERMINAL you'll see the CRT, keyboard, electronics and power supply that make it work.



CPU CARD FOR THE H11 includes the LSI-11 microprocessor and comes completely assembled as you see it here.



CPU CARD FOR THE H8 includes the 8080A microprocessor and is supplied with the kit as a fully assembled board.



WITH ITS COVER REMOVED you can see the works of the paper tape printer/punch/duplicator. It can be used with both computers.

Printing terminal

To complete the system Heath is offering an LA36 DEC writer. The price of this unit has not yet been announced. It offers a tractor paper feed, a maximum line width of 132 characters and baud rates of 110 and 300. In addition there is auto line feed.

Software systems

Two entirely separate software systems are provided. The H8 software goes with the H8 machine, the H11 package with the H11 machine.

The H8 software is made up of BH Basic (BH stands for Benton Harbor), expanded BH Basic, TED-8 (a text editor), HASL-8 (an assembler), BUG-8 (debug), PAM-8 (panel monitor). These programs come in cassette tape form and are supplied with the H8.

For the H11 the following software is now available: PTS Basic-11, 8K Focal-11, 4K Focal-11, Edit-11, Link-11, PAL-11S

All software for the Heath H11 computer is completely compatible with the DEC PDP-11 and can run on any operating PDP-1103 system.

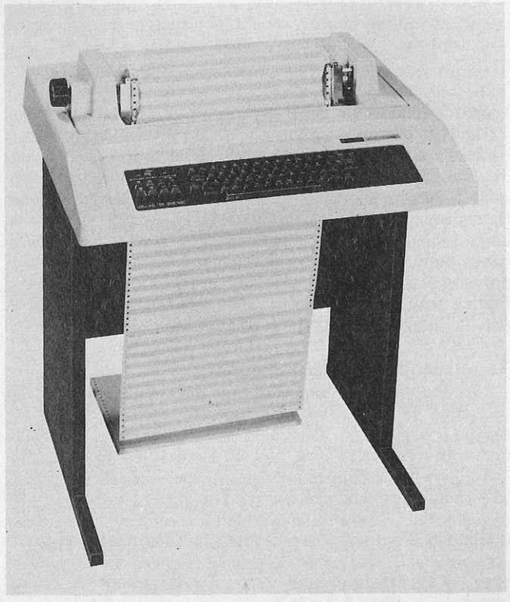
Heath software will be supplied in three forms; cassette magnetic tape, paper tape and read-only memory (ROM). The panel monitor for the H8 (PAM-8) is supplied in a ROM and like all ROM, cannot be modified by the user.

BUG-8, TED-8, HASL-8 and BASIC are provided with the H8 computer in cassette form and are available as an option in paper tape form. Both the cassettes and the paper tape are compatible with the required error checking and synchronising characters used by the front panel monitor system.

Also packed with the H8 is a six-section software manual. This is, however, a reference manual and is not intended to teach the owner how to use the software. If you have never used a text editor and an assembler, for example, it would be best to obtain an introductory text in that subject.

Conclusion

As you can see there are two great systems here with more accessories still to come. There will be more I/O interfaces more memory, a floppy disc, and printers. **Radio-Electronics** will present more details on all of these new systems as we get them. **R-E**



THE LA-36 DEC WRITER II keyboard printer terminal. The price of this unit has not yet been determined.

Add Sound To Your Home Movies

Making home movies is a popular hobby throughout the world. Here are details on one moviemaker's approach to adding sound to his movies with the aid of a stereo tape recorder

ANDREW JAREMKO

EVER SINCE THE INVENTION OF MOTION pictures and sound recording, attempts have been made to give pictures a voice. Edison experimented with talking films in his Kinetophones, using his cylinder recorder. Commercial films, with Hollywood leading the way, eventually evolved a set of reliable but cumbersome techniques for adding sound to the movies. Magnetic recording simplified sound film production tremendously and also made it possible for the amateur film maker to add sound to his films. A great number of gadgets and systems have been constructed for this purpose over the years, beginning with mechanical gadgets and eventually using electronics. Many of these were designed to allow the hobbyist to run a sound track on a tape recorder, unlike the professional system that puts both picture and sound on the one strip of film.

The problem of making a circuit that would reliably synchronize a movie projector and a tape recorder to produce sound movies has occupied me for some time. I worked through a couple of very bad discrete component designs and a couple of versions using RTL logic IC's, one of which worked fairly well. My latest version uses CMOS logic throughout and represents my state-of-the-art. The movie projector has to be modified to allow the synchronizer to work, but after that any stereo tape recorder can be used to provide fully synchronized soundtracks. It should be possible to build the circuit for under $75, depending on where you shop.

The problem in playing a tape recorder and projecting a film so that the result is a talking picture is *synchronization*. This means that the sound that matches a particular image in the film should always match that image every time the film is projected. We are used to seeing voices match lip movements, and talking is the main thing that people expect from sound films. At the normal home movie speed of 18 frames per second (fps), lip movements will appear to be out of sync if the sound comes in more than one frame early or late.

All we really need is a system in which both the tape and the film run at a speed accurate enough so that at the end of a reel they haven't drifted apart by more than one frame. With a 400-foot reel of super-8 film, this is an accuracy of one part in 28,800, or about 33 parts per million. If our projector and recorder can run this accurately, allowing for all the factors that can affect their speed—tape stretch and slip, motor warmup, line voltage variations, etc.—the problem is solved. All we have to do is start the two in sync and they will stay in sync. This procedure has been a part of professional filmmaking for some time and is called "crystal sync" (since accurate crystal oscillators are used to regulate running speeds). But that kind of accuracy is expensive.

The professional method of making talking pictures is of course to put the soundtrack on the film. Sound-on-film (SOF) has always been around in home movies, and Kodak's recent entry into the market with SOF super-8 equipment will of course make it much bigger. Relatively recent improvements in projectors have resulted in sound on 8-mm film that is often superior to the sound on 16-mm film. But putting the sound on the film as it is shot and leaving it there creates many serious problems in the editing stage. Trying to make a film without editing is roughly comparable to trying to paint a picture without removing the brush from the canvas.

In professional productions the sound is virtually always recorded separately and handled separately through the editing process. It gets onto the film only at the final stage, when the print is made. The main use for SOF is news, and even here it is frequently taken off the film for editing. Once it is removed from the film, the problem of getting it back on in the right spot comes up.

We can get around the need for extreme accuracy by recording a signal on a tape that will tell the projector how fast it is to run. (The tape should be allowed to run free, since any interference with its speed is likely to cause wow and flutter.) This means that the stereo recorder will be carrying a mono soundtrack in one channel and sync information in the other. Since the two tracks are on the same piece of magnetic tape, anything that affects the soundtrack will affect the sync track and the sound will remain in sync.

The most logical method to use is simply to record one signal of some sort