

Your experience with personal computers is going to open an unlimited career at TI.

TI is into personal computers in a big way, and that means a ground floor opportunity is going to be open for you, the personal computing innovator. You'll be joining the undisputed world leader in creating new products and markets for consumer electronics with the company that invented the calculator on a chip. And it's all going to happen in TI's new Management and Technology Center for Consumer Products in Lubbock, Texas. Located in the high, dry, and cool plains of West Texas, Lubbock is about halfway between Dallas and Albuquerque. It is the home of Texas Tech University. You are just a few hours' drive from skiing in Taos, or touring and shopping in Juarez, Mexico.

Make your career opportunities in the following areas:

Personal Computer Product Marketing Manager

Responsible for establishing distribution channels for personal computer products, developing advertising and sales promotion programs, training, quoting and providing market requirements for new products and software. Requires BS in EE, math, physics or Computer Science. MBA preferred. Minimum of 5 years' experience in consumer sales or marketing related to desk programmable calculators, minicomputer

systems, microcomputer systems, or small business systems.

Systems Programmers

Outstanding opportunities — design, code, integrate and debug operating system modules, including device service routines, self-test diagnostics, and system utilities. Requires BSEE or Computer Science plus minimum of 3 years in assembly programming with some high level language experience.

Digital Design Engineers

Opportunity to design and develop digital subsystems for major new products. Projects will require design-to-cost discipline with internal and external component vendors, vendors of peripheral devices and making trade-offs of hardware and software. Requires BSEE with 2 years' experience. Prefer experience in design of bubble and/or flexible disk computer memory subsystems.

Product Design Engineer

Responsibility for mechanical design on major new personal computer products. Interface with electrical design engineers, software development personnel, marketing, purchasing, planning and all areas involved in taking a product from concept through initial production. Requires BSME with a minimum of

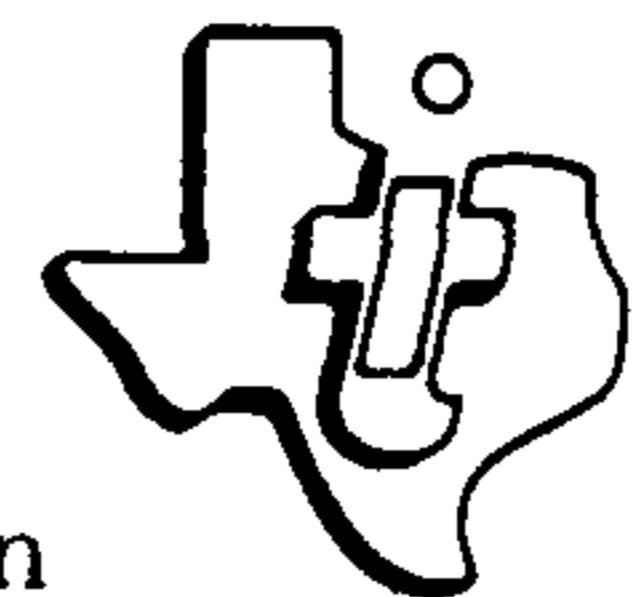
3 years' experience in design or closely related field. Knowledge of plastic tooling preferred.

Application Software Specialist

Total responsibility for development of complete application packages for specific business sectors and professionals. Specifications, design, coding, program check-out and documentation for personal computer systems. Requires BA or BS in math or Computer Science or BBA with data processing major with 2-3 years' experience. Program in high level language on mini, micro, or business computer systems.

Marketing Support Engineers

Project responsibility for future product service direction concerning existing as well as future products. Develop and maintain total service program for personal computer systems and field testing/check-out. Requires BSEE or equivalent with at least 3 years' experience with programmable desk calculators, minicomputer systems, microcomputer systems, small business systems, or product service management.

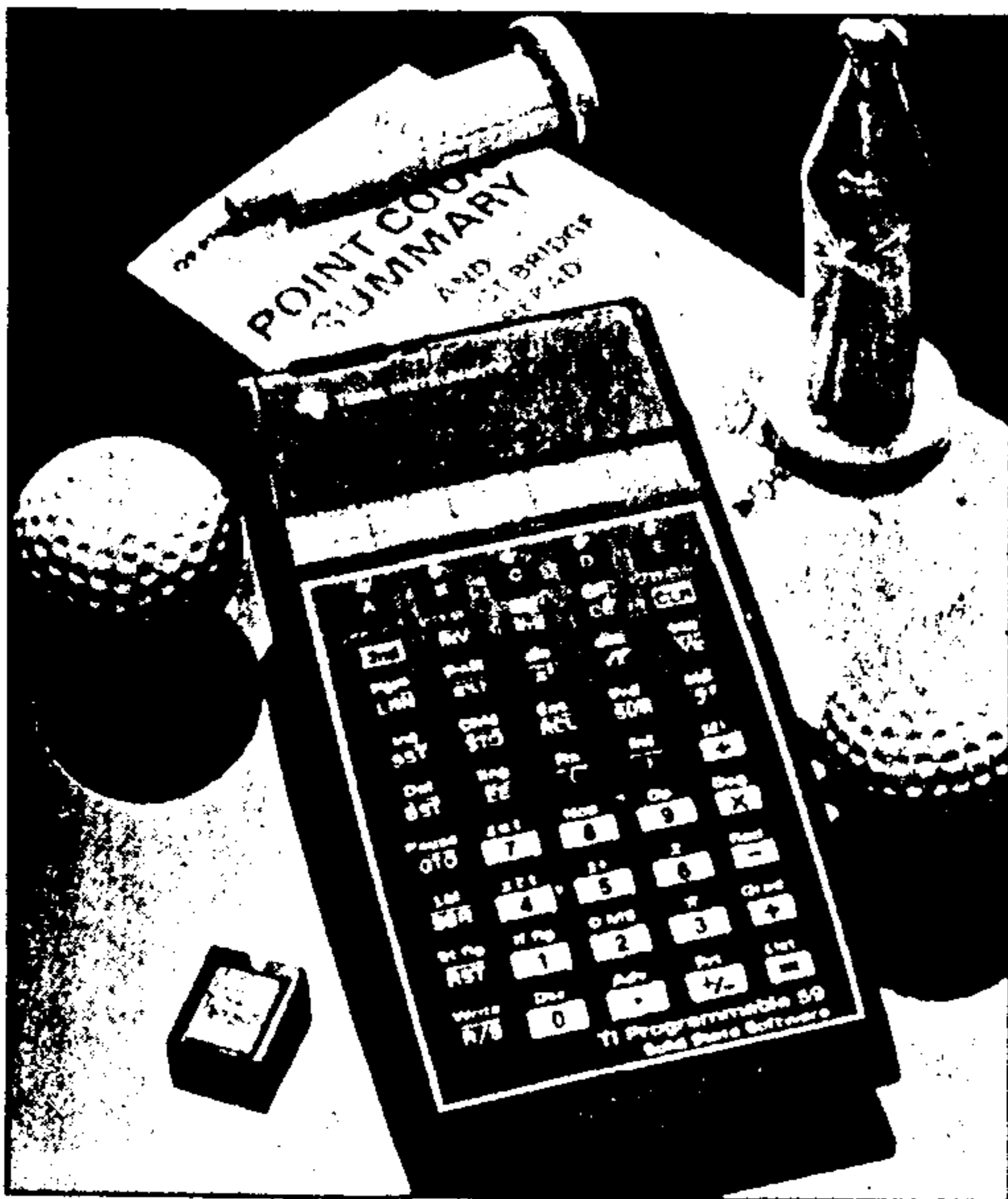


Send your resume in confidence to: Bill Toomey / P. O. Box 10508, M.S. 5807, Dept. B / Lubbock, TX 79408.

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Leisure Program Library for New TI Calculators



Owners of the Texas Instruments Programmable 58 and 59 calculators (see December 1977 *BYTE*, page 204) can now enjoy recreational applications of their pocket sized computers with the Solid State Software Leisure Library module. This plug in read only memory unit contains 20 different keystroke programs for golf handicaps, bowling scores, chess ratings, results of deals in duplicate or triplicate bridge, blackjack, acey deucey, craps, NIM, biorhythms, a spacecraft landing and a sea battle game, and other applications. Two programs use the alphabetic and plotting capabilities of the PC-100A printing cradle. The module is \$35 from Texas Instruments Inc, Inquiry Answering Service, POB 53 (attn: Leisure Library), Lubbock TX 79408. ■

Circle 574 on inquiry card.

FDOS III for iCOM Floppies

FDOS III is a new operating system for 8080 and Z-80 computers using any of iCOM's family of floppy disk drives and interfaces. It is compatible with programs written under FDOS II and has relocatable driver modules for file access. The system includes a string oriented text editor and a relocatable assembler for 8080 or Z-80 programs. Single commands provide for functions such as loading of files, editing and assembly, disk to disk, disk to punch and reader to disk IO. Files may be deleted, renamed or merged to create new files, and may be tagged with attributes to prevent deletion, for example. FDOS III is available from Pertec Computer Corp Microsystems Division, 21111 Erwin St, Woodland Hills CA 91367, (213) 999-2020. ■

Circle 575 on inquiry card.

Complete ANSI FORTRAN Compiler for Z-80

This FORTRAN compiler implements full American National Standard FORTRAN IV with a number of extensions, including one and two byte integers, double precision reals, complex, logical and string data types, named COMMON, sequential and direct access IO, and hexadecimal constants. A full library of scientific and string functions is provided, and a linking loader with automatic library search capabilities can link FORTRAN with assembler programs. Generated code can be placed in read only memory, and the package may be used optionally with a planned hardware multiply and divide module for greater speeds of execution. The compiler runs in 24 K bytes of memory in both FDOS IV and CP/M versions. It is available on floppy disk with a user's manual for \$349 from Technical Design Labs, Research Park, Bldg H, 1101 State Rd, Princeton NJ 08540, (609) 921-0321. ■

Circle 576 on inquiry card.

A FORTRAN Compiler for 8080s

Microsoft, 300 San Mateo NE, Suite 819, Albuquerque NM 87108, has just prepared a brochure on their FORTRAN-80 package, summarizing the features of the compiler for 8080 processors. User's guides for the FORTRAN-80 compiler, MACRO-80 assembler, LINK-80 loader and LIB-80 library packages are available for a price of \$20 each. Single user price for the FORTRAN-80 compiler is \$500. Versions are said to be available for CP/M, ISIS-II, DTC Microfile and MITS DOS floppy disk operating systems. Write the company for complete details or phone Steve Wood, (505) 262-1486. ■

Circle 578 on inquiry card.

Where Do New Product Items Come From?

The information printed in the new products pages of BYTE is obtained from "new product" or "press release" copy sent by the promoters of new products. If in our judgment the neat new whiz-bang gizmo or save the world software package is of interest to the personal computing experimenters and homebrewers who read BYTE, we print the information in some form. We openly solicit such information from manufacturers and suppliers to this marketplace. The information is printed more or less as a first in first out queue, subject to occasional priority modifications.

TDL Version 3.0 "Super BASIC"

Technical Design Labs has introduced Version 3.0 of "Super BASIC," a 12 K BASIC interpreter. Version 3.0 upgrades and supersedes Version 2.1 with improvements in speed and error handling features. Included with the announcement of this improvement was *The 12 K BASIC User's Manual* of approximately 70 pages in length.

Version 3.0 of Super BASIC provides programmable error handling that allows the user to specify special error handling routines processing any error occurring in the basic program without aborting the program. In addition, the ERR and ERL functions are available to provide further flexibility in error processing.

Version 3.0 of Super BASIC allows for the serial input and output of data from the firm's Zapple Monitor defined reader and punch devices. This data may be in ASCII (using INPUT and PRINT commands), or in binary (READ and WRITE). For noncontrolled reader/punch devices, a high speed binary mode is provided (MLOAD and MSAVE). During data input, end of file detection is provided through the ON EOF GO TO construct.

Version 3.0 provides the VARADR function which allows the address of a particular variable to be passed to an assembly language routine through the CALL statement. This allows routines to return data to the calling program.

Version 3.0 also has a provision to associate arbitrary file name strings with LOAD, LOADGO, and SAVE commands.

Version 3.0 of Super BASIC is being released for use with the CP/M disk operating system and is expected to be available soon in a serial paper tape version.

As with all TDL software it is relocatable and uses the monitor's operating system for its IO handling. It comes with the user's manual and occupies 12 K of core. Although primarily designed to run on TDL's Z-80 microcomputer system, it is adaptable to other systems which use the Zilog Z-80 processor. Super BASIC Version 3.0 is on a diskette and is a part of TDL's Software Package A which consists of Version 3.0, The Macro Assembler 2.2, Z-TEL Text Editing Language and the Text Output Processor. This entire package is available now for \$249.

For further information contact Technical Design Labs, Research Park, Bldg H, 1101 State Rd, Princeton NJ 08540, (609) 921-0321. ■

Circle 577 on inquiry card.

Correction

The price of the Equinox 100 computer system is \$799, not \$699 as we stated in the new product release on page 172 of the January 1978 issue. Our thanks to Linda Hall of Parasitic Engineering for calling this to our attention.



Introducing the personal computer you've waited for. The Exidy Sorcerer.

I didn't buy my personal computer until I found the one that had all the features I was looking for.

The Exidy Sorcerer does everything I wanted to do and a few things I never dreamed of.

It isn't magic. Exidy started with the best features of other computers, added some tricks of their own, and put it all together with more flexibility than ever before available. Presto! My reasons for waiting just disappeared.

I wanted pre-packaged programs. Software on inexpensive cassette tapes for the Sorcerer is available from Exidy and many other software makers.

I wanted user programmability. The Sorcerer's unique plug-in ROM PAC™ Cartridges contain programming languages such as Standard (Altair 8k*) BASIC, Assembler and Editor (so I can develop system software), operating systems such as DOS (so I can also use FORTRAN and COBOL) and applications packages such as Word Processor.

* Altair is a trademark of Pertec Computer Corp.

Circle 137 on inquiry card.

I wanted graphics, and the Sorcerer is super. Its 256 character set—more than any other personal computer—includes 128 graphic symbols that I can define.

I wanted high resolution video. With 122,880 points in a 512 x 240 format, I get the most detailed illustrations.

I wanted to display more information. The Sorcerer displays 1920 characters in 30 lines of 64 characters—equal to a double-spaced typed page.

I wanted a full, professional keyboard. The Sorcerer's 79-key data processing keyboard provides designated graphics, the complete ASCII character set in upper and lower case, and a 16-key numeric pad.

I wanted memory. The 12k of ROM holds a Power-On Monitor and Standard BASIC; the 8k of RAM is internally expandable to 32k.

I wanted expandability. Serial and parallel I/Os are built in, and the optional 6-slot S-100 expansion unit lets

my system grow.

I wanted a computer that's easy enough for children to use. I just connect my Sorcerer to a video display and a cassette tape recorder, and if I have any questions the easy-to-understand Operation and BASIC Programming manuals have the answers.

I wanted to buy from an experienced manufacturer. In five years Exidy has become the third largest producer of microprocessor-based video arcade games.

I wanted to spend less than a thousand bucks. (This is where Exidy does a little magic.) My Sorcerer cost me \$895!

Now, what are **you** waiting for?

Call Exidy for the name of your nearest dealer. (408) 736-2110. Or write Exidy, 969 W. Maude Ave., Sunnyvale, CA, 94086.

Exidy
inc.

BYTE News...

ATARI'S NEW COMPUTERS. The recently announced Atari Model 400 and 800 personal computers are major entries into the market. The 8 K nonexpandable 400 (suggested retail \$500) sports a touch audio feedback keyboard and a single read only memory cartridge slot, plus cassette I/O. It also has 16 color graphics with eight luminance levels (!) The 48 K expandable 800 (suggested retail \$1000 with 8 K and cassette recorder) has additional color features, full keyboard, 8 K BASIC, high resolution graphics, two read only memory cartridge slots, and much more. Both units use a modified 6502. Availability: August 1979 (limited quantities); full availability: Fall 1979. More details next month.

TI'S NEW PERSONAL COMPUTER. Rumors are flying about Texas Instruments' impending entry into the personal computing market. The unit will reportedly use the TMS 9900 processor with 40 K of read only memory circuits, will generate 20 lines of 40 characters on a standard television, will have provisions for accommodating video disk players and video tape recorders, and will have sophisticated sound production. Sources predict a mid-1979 unveiling.

TI AND GTE DEVELOPING HOME DATA RETRIEVAL SYSTEMS. Since Labor Day, Texas Instruments has been testing a "Teletext" home information system which displays on a standard home television set via a decoder unit. The decoder can be internal or external to the television set. It is expected that the decoder should add about \$50 to the television's cost. The data is transmitted during the frame blanking time. The viewer can elect to view the data, the standard picture, or the data superimposed on the picture. Testing should continue throughout 1979. FCC approval is required.

Last October General Telephone & Electronics gave a presentation and demonstration to the FCC of their system, which uses a microprocessor. It would allow a user to retrieve data from a number of different data banks and have it appear on their television screen. The system is still in a very early stage of development.

A television based data retrieval system, called Viewdata, is already in operation in Great Britain. It was developed by the British Post Office.

WORD PROCESSING PRINTERS USING DOT MATRIX ARE COMING. All present word processing printers use character impact printing mechanisms and are expensive (typically over \$2000). The most popular are the Selectric, Diablo and Qume printers. Dot matrix printers are faster and cheaper but produce crudely formed characters generally considered undesirable for word processing applications. However, several companies are working on dot matrix printers to improve their printing quality. By moving the dots closer together to 1000 dots per inch or closer, characters can be formed which are very close to those of the Selectric. Further, since the dot matrix is under direct processor control, changing a character font requires only a program change rather than a type element change. Imagine being able to change from standard to italic type faces using only software! Although the initial entries (from RC Sanders Technology Systems Inc) in this area will cost more than present impact units, costs should decrease substantially to well below present units.

8080/8085 MICROPROCESSOR PRICES DROP. The 8085, Intel's 1 chip version of the 8080 with added features is now selling for \$10 in OEM (original equipment manufacturer) quantities. The 8080 is now down in the \$4 to \$5 range. Actually the 8085 is in effect cheaper than the 8080 since it does not need extra support devices and works off only 5 VDC. Therefore, most of the new 8080 designs now use the 8085. It is expected that the 8085 will be down in the \$4 to \$5 range by year's end. The importance of this is that the microprocessor is now insignificant in cost compared to memory and peripheral circuits.

WILL 16 BIT PROCESSORS TAKE OVER? Not yet, at least. There is reason to question whether or not 16 bit processors have achieved the success in the personal computer marketplace achieved by the 8 bit machines. The fact is that there have been at least three 16 bit mainframes available in the personal computer marketplace for over a year now, namely the Technico 9900 computer, the Alpha-Micro computer, and the Heath H-11 computer. Although all three provide better performance than the 8 bit machines, their acceptance does not compare to the smaller machines. It will be interesting to see if any 16 bit mainframes using the Intel 8086 processor will be forthcoming in the near future.

16 BIT PROCESSORS TO BE SECOND-SOURCED. Intel has entered into an agreement with National Semiconductor for the latter to also manufacture the 8086, Intel's 16 bit processor. Zilog has also arranged for second sourcing of their new Z-8000 16 bit processor, but does not expect to be in production until the middle of the year. Intel has been in production on the 8086 since May of last year.

What's New?

SILICON

Speech Synthesis Integrated Circuit from TI



A significant new speech synthesis monolithic integrated circuit has been developed by Texas Instruments Inc, POB 5012, Dallas TX 75222. The circuit, along with two 128 K byte dynamic read only memories, each with

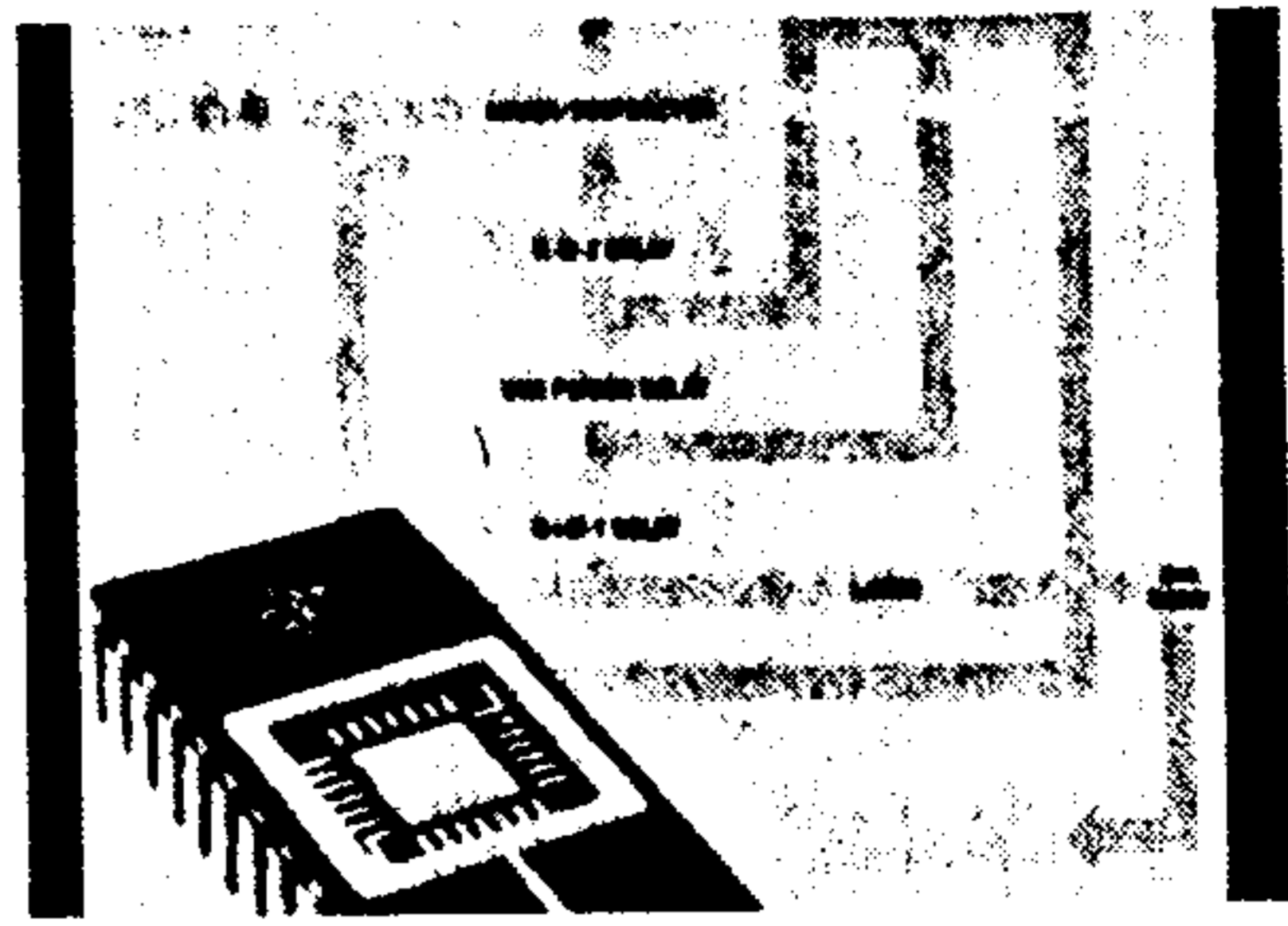
the capacity to store over 100 seconds of speech, and a special version of the TMS1000 microcomputer, serve as the main electronics for a new talking learning aid called Speak and Spell, for ages seven and up.

Speech encoding is achieved through pitch-excited linear predictive coding (LPC). LPC is a technique of analyzing and synthesizing human speech by determining from original speech a description of a time varying digital filter modeling the vocal tract. This filter is then excited by other periodic or random inputs. An 8 bit digital to analog converter on the chip transforms digital information processed through the filter into synthetic speech.

Codes for 12 synthesis parameters (ten filter coefficients, pitch, and energy) serve as inputs to the synthesizer chip. These codes are stored in read only memory and, once decoded by on chip circuitry, represent the time varying description of the LPC synthesis model. The LPC speech synthesizer is an advanced design 10 stage lattice filter which has an integrated array multiplier, an adder coupler to the multiplier output and various delay circuits coupled to the adder output. ■

Circle 568 on inquiry card.

Dual Tone Separation Filter Integrated Circuit



The Model AF-100 dual tone separation filter integrated circuit provides channel isolation between the low frequency group tone (DTMF) frequencies 697 Hz thru 941 Hz and the high frequency group tone frequencies 1209 Hz thru 1633 Hz. It is intended for applications in which dual tone separation is required, eg: touch tone decoders, transceivers, modem interfaces, etc.

Contained in a 16 pin dual-in-line package, the dual resistance capacitance active filter chip features 30 dB minimum separation between high and low group tones, 1.5 dB maximum in-band deviation, dual and single power supply operation ± 12 VDC at 2.5 mA each.

The Model AF-100 is priced at \$32. For further information write to Data Signal Corp, 40-44 Hunt St, Watertown MA 02172. ■

Circle 569 on inquiry card.

TRS-80™ SOFTWARE

Cat No.	Level	Description	Price
1041	2	Star Trek III	\$14.95
1036	1/2	Sci-Fi Game Sampler	5.95
1061	1/2	Hamurabi	6.00
1040	1/2	Galactic Blockade Runner	9.95
1053	1/2	Slot Machine	6.00
1042	1/2	Tarot	5.95
1038	1/2	Modular Inventory	19.95
1039	1/2	Renumber	14.95
1042	1/2	Bingo	5.95
1173	2	Bridge	14.95
1174	2	Sargon Chess	19.95
1048	1/2	Mach. Lang. Monitor	23.95
1051	1/2	Biorhythm	5.95
1171	1/2	Space Trek II	7.95
1172	1/2	Lunar Lander	7.95

DATA CASSETTES

Perfect for recorders operating under KC or Tarbell standards, (TRS-80, etc.) With positive tape path control.

Cat No. TM2

\$2.00 each

VERBATIM DISKETTES

Soft Sector (TRS-80)
Cat No. 1147
10 Hole hard sector
Cat No. 1148
16 Hole hard sector
Cat No. 1149

box of 10 \$31.50

CALIFORNIA COMPUTER SYSTEMS® TRS-80™ & APPLE 16K MEMORY EXPANSION KIT

Easy to install, requires no special tools! Includes factory fresh prime rams, jumpers, and complete instructions.
Cat No. 1156

\$95

16K STATIC RAM KIT

5-100 compatible, true static operation. Requires only +5 volts. Fully buffered, 450 ns, bank switching capability, addressable in 4K blocks. Easy to assemble!
Cat No. 1151

\$265 kit

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ELECTRONICS SHUGART SA-400 MINIFLOPPY DRIVE

Same unit as used in TRS-80 minifloppy. Offers hard and soft sectoring, single density, 35 track. Random access storage, cassette drive size. Superior data integrity, faster data throughput. Equipped with interface which allows upward expansion. Requires power supply.
Cat No. 1154

WRITE FOR OUR FREE SPRING 1979 CATALOG Featuring FACTORY FRESH PRIME IC's, LEDES, READOUTS, RECTIFIERS, ZENERS, TTL, CMOS, LOW POWER SCHOTTKY, MEMORY, BRIDGES, RIBBON CABLE, TOOLS, DISKETTES, FLOPPIES, LINEAR IC'S, VOLTAGE REGULATORS, TRS-80 ACCESSORIES, EDGE CONNECTORS, TEST EQUIPMENT, SPEECHLAB, CHASSIS BOXES, RESISTORS, CAPACITORS, MOS-LSI CIRCUITS, SOLDERING AIDS, PC AIDS, FANS, COMPUCRUISE, INTROL, MUSIC BOARDS, SSM BLUEBOARDS, CCS BOARDS, WIREWRAP AIDS, AND MORE!

BYTE News . . .

NCC/NYC TO BE THE BIGGEST COMPUTER SHOW EVER. The National Computer Conference (NCC) will happen again June 6 thru 9. Last year 57,224 attendees turned out for the show, held in Anaheim CA. This year the NCC will be held in the New York City Coliseum. AFIPS, the sponsoring organization, expects attendance to top that of last year. Approximately 400 companies have reserved 1,700 booth spaces on four floors of the Coliseum, with overflow at the New York Hilton and Americana hotels. Last year 396 companies occupied 1,400 booths.

NCC will have a personal computing adjunct at the Americana Hotel, a few blocks away. It will probably be played down, as it was last year. By way of example, the personal computing exhibitors and speakers were not listed in the regular show program book handed out to each attendee; hence, many attendees last year were unaware of the personal computing part of the show.

S-100 BUS STANDARD TO BE ADOPTED SOON. An IEEE committee has been working on a standard for the S-100 bus for over a year, and adoption is expected very soon. Much of the credit for this standard goes to George Morrow of Thinker Toys.

This standard will do two things. One, it will resolve the conflicts between the use of many bus pins by different manufacturers and eliminate the lack of compatibility between many "S-100 compatible" plug-in boards. Two, and possibly more important, it provides use of the S-100 bus for 16 bit processors for extended addressing of up to 8 M bytes of memory and for master-slave multiprocessor systems. This will make the S-100 bus the most powerful bus around and will, no doubt, continue and increase its popularity.

TI AND HP PC SYSTEMS RUMORS. Texas Instruments and Hewlett-Packard continue to maintain tight lips on their rumored personal computer systems. As TI has said, "TI will not discuss products that have not yet been announced." However, information has leaked out on these units which are expected to have a tremendous impact on the personal computing market. Several rumors have been reported in previous BYTE NEWS columns. The latest is that TI will introduce their entry at either the NCC show in June or the Consumer Electronics Show in July. In either event, it is expected to be ready for the 1979 Christmas market.

The HP computer is also expected to be ready by Christmas, and is anticipated to be a stripped down version of their current table-top system. This means that it will use BASIC and be expandable.

Both HP and TI are expected to have \$500 list prices for the basic unit. Key retailers have already been approached by both TI and HP to set up a selective distribution. It is rumored that they will favor selected personal computing stores that can do justice to software requirements.

INTEL TO PRODUCE ANALOG MICROPROCESSOR AND SUPER 8 BIT MICROPROCESSORS. Real time processing of analog signals by microprocessors has been severely limited by the slow speed of most microprocessors. For example, an 8080 clocked at 2 M Hz can, at best, synthesize clean sine waves at about 1 to 2 k Hz, which is the low end of the audio spectrum. This fall, Intel will introduce an integrated circuit which combines an analog-to-digital converter, a digital-to-analog converter, microprocessor and read only memory on a single device. It will be capable of processing analog signals up to 13 k Hz. Called the 2920, the integrated circuit will have a 9 bit conversion register. It could be used in conjunction with an 8080 processor, where the 2920 does the signal processing while the 8080 does the data processing.

Intel has done another clever thing. They have taken an 8086 and limited its data I/O (input/output) to 8 bits and memory addressing to 16 bits. It is called the 8088 and will deliver five times the performance of the 8080 (2 M Hz). Actually, the 8088 is an 8086 split into two 8 bit microprocessors on one integrated circuit, one handling I/O and the other data processing. It offers most of the features of the 8086 (eg: hardware multiply/divide).

NATIONAL SEMICONDUCTOR TO INTRODUCE NEW MICROS. It is nearly three years since National introduced their last microprocessor. (Actually, we must give National credit for pioneering the 16 bit microprocessor with the PACE and IMP-16 microprocessors introduced in 1975.) Now National is bringing out a new CMOS 8 bit microprocessor that will be software compatible with the 8080, have added features and consume less power. Further, they will introduce a 16 bit microprocessor that is a "cut above" the Z-8000 and 68000. Production is expected by the end of the year.

MICROPROCESSORS FOR \$1 APIECE? Maybe not this year. . .but it is approaching fast. Synertek recently reduced the 100 lot price for the 6502 (used in the PET, Apple, OSI, etc) from \$10 to \$7. In high volume they have reduced the price from \$4 to \$2.50. I can still remember paying \$350 for an 8080, just four years ago!

BYTE News . . .

FCC TRYING TO CRACK DOWN ON TV INTERFERENCE. The Federal Communications Commission (FCC) has asked Atari, Apple, Commodore, Heath, Southwest Technical Products, and Radio Shack to submit their personal computer systems for TV interference testing. The systems made by these companies are presently exempted from FCC regulations since they are not directly connected to a TV set. However, there have been complaints regarding radio frequency (RF) interference from personal computer systems, and the FCC has decided to develop regulations regarding permissible RF radiation levels.

The computer manufacturers involved have indicated a willingness to cooperate with the FCC's effort. The regulations could fine noncomplying manufacturers and permit the issuance of cease and desist orders. Some industry experts feel that a few manufacturers' computer systems would not pass the FCC regulations.

INTEL ENHANCES 8086 FAMILY WITH I/O PROCESSOR. Intel continues to lead the way in microprocessor and microcomputer systems. Recently they announced the 8089, an I/O (input/output) processor to work with the 8086 16 bit microprocessor. This processor can more than double the performance of the 8086 by relieving it of I/O operations, much like the communications channel on an IBM 370.

\$200 DISK SYSTEM EXPECTED BY YEAR END. Shugart and Matsushita Electric of Japan have signed an agreement whereby Matsushita will manufacture a low cost version of Shugart's popular minifloppy disk drive. The drive is expected to sell for \$50 in large OEM quantities and retail at about \$125. Add to this the interface/controller circuitry, and the total retail cost should work out to a little over \$200. This is less than a third of the price of current minifloppy systems. Matsushita expects to be making 100 drives per hour by year end.

The drive will store 70 K bytes, use a new head design, and be housed in sheet metal rather than cast aluminum. It will be only 2 inches high, half the height of the current drive. An industrial version with heavy duty components will be sold at \$65 OEM.

Nippon Electric (NEC) is also rumored to be developing a low cost 5 inch disk drive.

14 MILLION MICROPROCESSORS SOLD LAST YEAR. That's right, 14 million microprocessors were manufactured in 1978. One million 8 bit microprocessors and 13 million 4 bit microprocessors were made. If you didn't realize it already, most were used in games. The most manufactured microprocessors were the 8 bit 6502 and the 4 bit TMS-1000. However, sales of electronic games using microprocessors have recently taken a sharp drop. Hence, the probability exists that there may be a slight decrease in microprocessor production in 1979.

16 BIT MICROPROCESSOR PICTURE STILL FUZZY. It is beginning to look as if Intel may have taken the right approach with the 8086 by designing a part which could be placed in production far ahead of the Zilog Z-8000 or Motorola 68000. They have over a year's head start compared to the Z-8000 and possibly another half year's lead over the 68000.

The 8086 part is far simpler than the Z-8000 or 68000 parts, and as a result it is closer to the earlier generations of microprocessors. Support parts for the 8086 such as the new 8087 floating point coprocessor also give the 8086 a commanding availability lead over the other two contenders at this time. All three machines are aimed at the high end of microcomputer application, providing significant computational power equivalent to traditional mini and main frame computers.

BYTE News . . .

BUBBLE MEMORY ARRIVES FOR PERSONAL COMPUTERS. Rockwell International has introduced a bubble memory board for a personal computer system. The board contains 128 K bytes of storage and plugs directly into the expansion bus for the AIM-6502 processor (which is the same as the KIM-1 bus). Rockwell also supplies a controller card which allows the bubble memory to function as a floppy disk replacement. The controller will control up to 16 memory boards for a total of 2 M bytes of bubble memory. However, before you rush out to buy it, be aware that each bubble memory board costs \$2500 and the controller board costs \$1000.

Intel and National will also soon become manufacturers of bubble memory. Texas Instruments and Rockwell are currently supplying bubble memories. Texas Instruments and Rockwell devices contain 256 K bits. The Intel device, which will be in volume production in early 1980, will contain 1 M bits, while the National device will contain 256 K bits. Texas Instruments and Rockwell have been producing limited quantities of the bubble memory devices and they do not expect to begin volume production until 1980. Furthermore, one Japanese manufacturer, Fujitsu, appears to be near bubble memory introduction.

MORE LARGE COMPANIES RUMORED ABOUT TO ENTER PERSONAL COMPUTER MARKET. Rumors continue that RCA, Hewlett-Packard and Zenith are seriously considering entering the personal computer market. Each is known to have a personal computer system development project in progress. Other companies seriously investigating the market include IBM and Bell Labs, each of which is known to have personal computer projects at the research facilities.

Several Japanese companies also introduced personal computer systems at the June NCC show in New York, Matsushita introduced its JD-700 to sell for \$5,000 to \$6,000. It has a 2 K byte read only memory, two minifloppies, and a printer, and it uses Extended BASIC. Sord introduced the M200 (\$6,000 to \$7,000), which uses a Z-80 with 64 K memory, up to four minifloppy drives, and BASIC, FORTRAN, or COBOL. Ai Electronics showed its APC-20 (\$7,500) which is Z-80 based, has two 5 inch drives and hardware arithmetic, and has software options which include FORTRAN, BASIC, COBOL, PL/3 and CP/M.

DIGITIZED HI-FI ON THE HORIZON. An industry group called the "Digital Audio Disk Council" was formed in late 1978 to establish guidelines and standards for pulse code modulation (PCM) recordings. The council includes 35 companies and is an international group. The standard is expected to be adopted in one to two years.

It is expected that pulse code modulation recordings will be the next generation of super hi-fi disks. The technique provides wider frequency response and greater dynamic range, and virtually eliminates distortion and noise. The record will also include an address code for random access of selections. Applications to published software products may well impact the small computer field.

INTEL RETIRES THE 1103. Intel has finally retired the 1103-dynamic memory which houses 1 K bits. This was Intel's first successful MOS memory product and it was a pioneer in the field of IC-MOS memories. Intel has made 35 million of these units since its introduction in 1971.

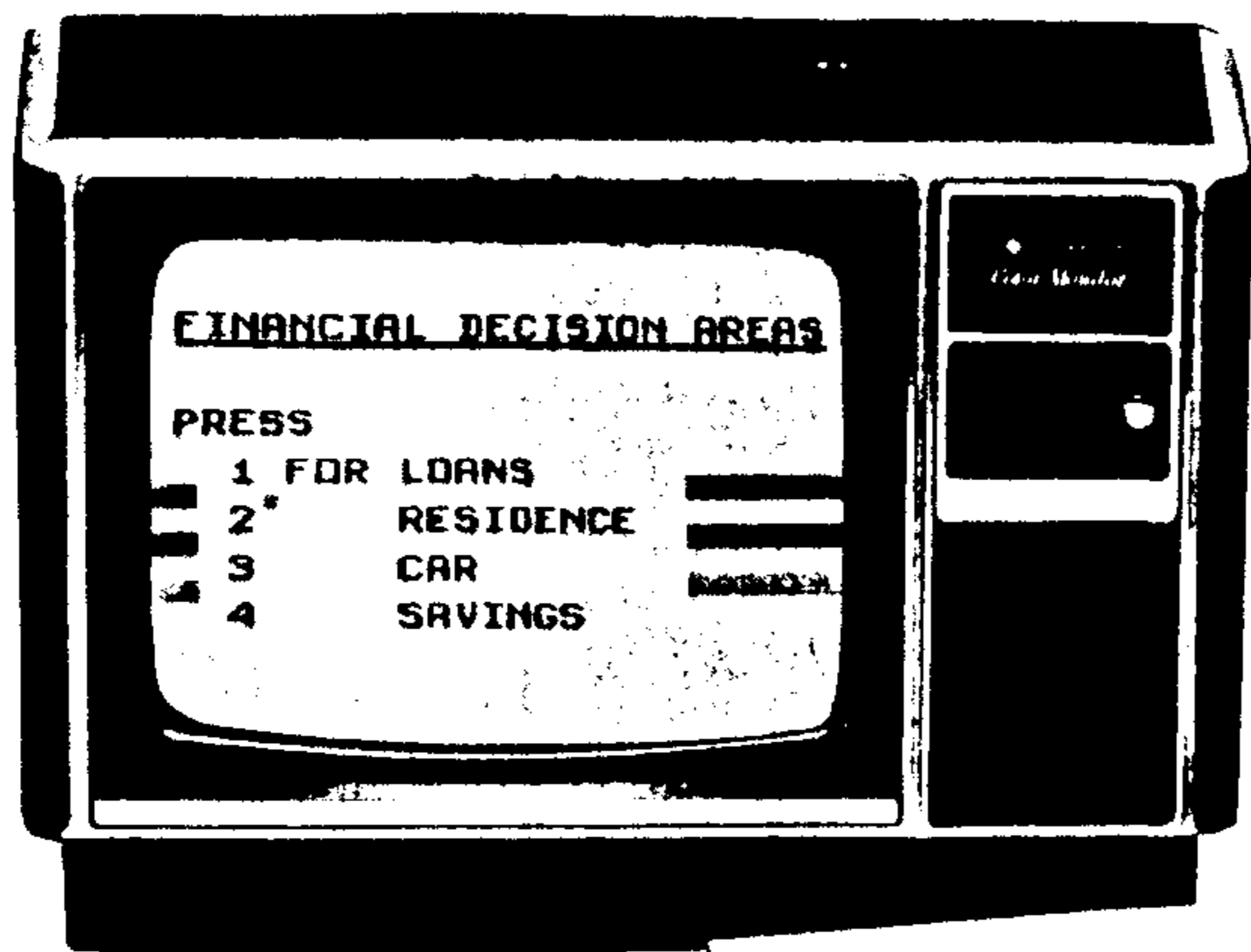
TI INTRODUCES SPEAKING TRANSLATOR. At the June Consumer Electronics show, Texas Instruments introduced a hand-held language translator which displays and speaks the translated words through the use of a speech synthesizer circuit. This is a significant advance over the Craig and Lexicon units introduced six months earlier, which only display translated words. The unit will cost \$250, plus \$50 for plug-in language modules. English, Spanish, French and German modules will be available, with Russian, Japanese and Chinese to follow later. The unit displays 1000 words, 500 of which can be spoken. Craig has also increased their module vocabularies to 2,400 words.

UPI NEWS WIRE NOW AVAILABLE TO PERSONAL COMPUTER USERS. United Press International (UPI), one of the prime sources of news used by newspapers throughout the country, has made their service accessible to personal computer users. The UPI wire can be dialed as a local number in most US cities. UPI will charge \$15 per hour during business hours, and \$2.75 during other times.

IBM DEVELOPS ULTRA-HIGH SPEED LOGIC. The IBM Research Center at Yorktown Heights NY has disclosed their development of logic circuits with switching speeds of 13 picoseconds. Based on

NEECO

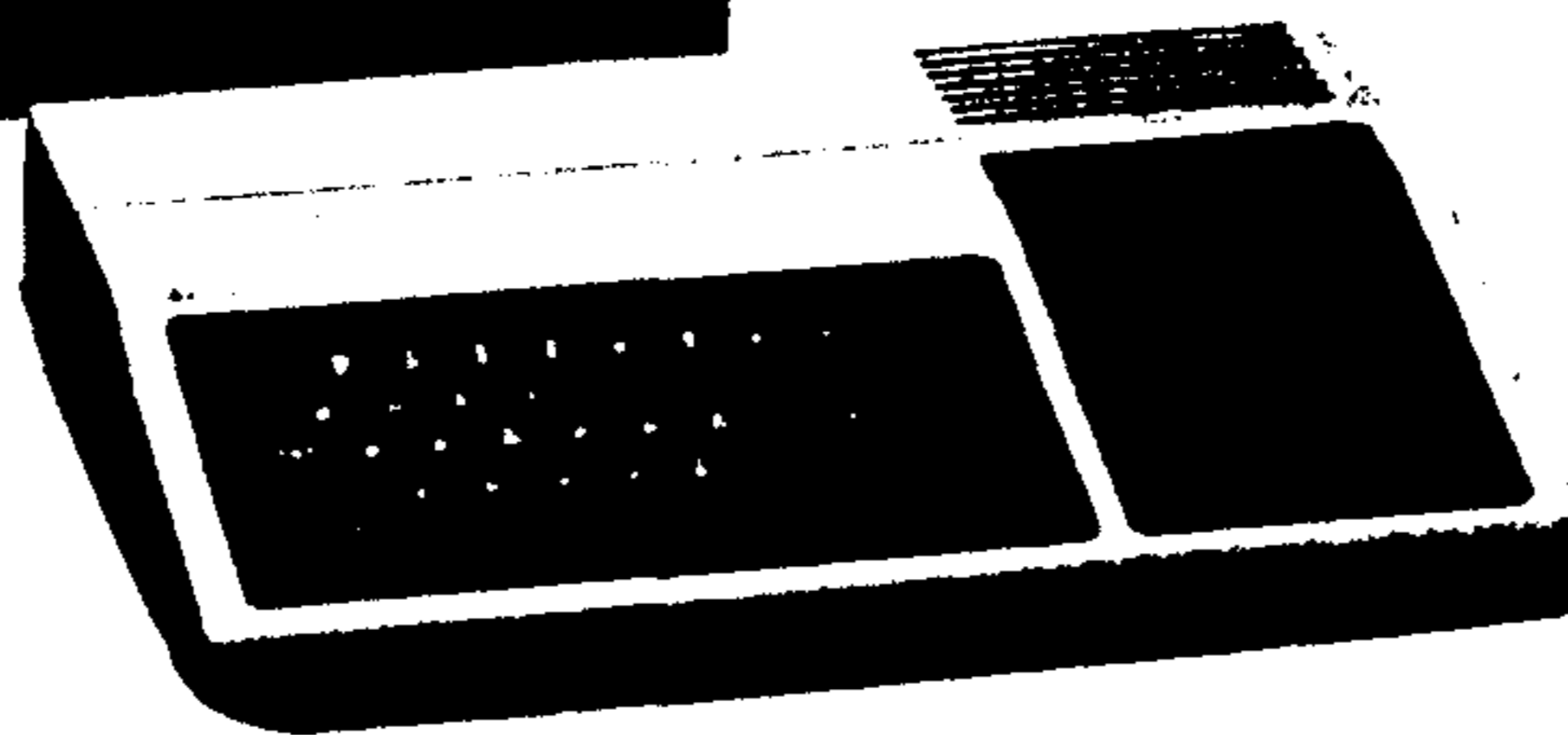
PROUDLY ANNOUNCES THE REVOLUTIONARY TI 99/4 PERSONAL/EDUCATIONAL COMPUTER!



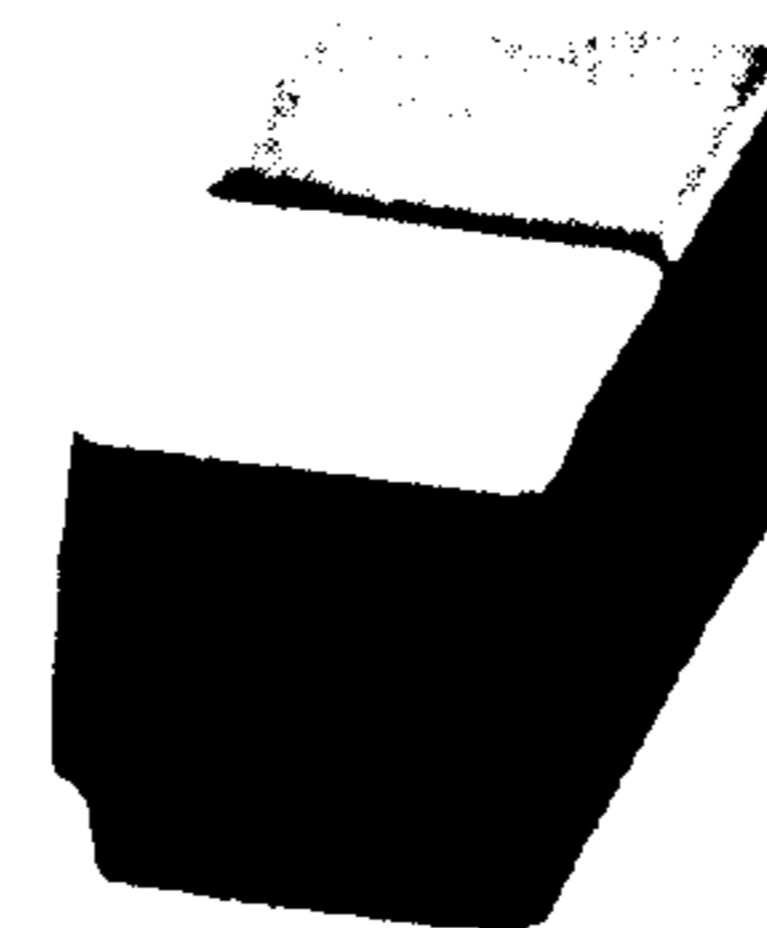
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There's a computer in your future. And the future is now.

We've entered a new and exciting era—the age of the home computer. Maybe you're already quite knowledgeable about computers, and are looking for the most programming power and versatility for your money. Maybe you've just read about it, and want to learn more. Either way, you need to look closely at Texas Instruments TI 99/4 Home Computer.

The TI-99/4 was designed to be the first true home computer—skilled computer users and beginners alike will be able to put it to effective use right away.

If you know computers, you'll quickly see the difference in the TI-99/4.

Texas Instruments has taken those features you've been wanting—plus some you may not have heard about yet—and included them in one incredible, affordable computer system. The TI 99/4 gives you an unmatched combination of features and capabilities, including:

- **Powerful TI-BASIC**—Built-in 13-digit, floating point BASIC. Fully compatible with ANSI Minimal BASIC, but with special features and extensions for color, sound and graphics.
- **Up to 72K total memory capacity**—16K RAM (Random Access Memory), 26K ROM (Read Only Memory) plus up to 30K ROM in TI's Solid State Software Command Modules.
- **26K ROM**—Operating system, BASIC, floating point, sound and color graphics software are contained in ROM.
- **16-color graphics capability**—Easy-to-access, high-resolution graphics have special features that let you define your own characters, create animated displays, charts, graphs... and more.
- **Music and sound effects**—Provides outstanding audio capability. Build three-note chords and adjust frequency, duration and volume quickly and simply. You can build notes with short, straightforward commands. Five octaves from 110 Hz (Hertz) to beyond 40,000 Hz.
- **Built-in equation calculator**—Unique convenience feature helps you find quick solutions to everyday math problems, as well as complex scientific calculations. Directly accessible from the keyboard.

If you're new to computers, the TI-99/4 is for you.

You can begin using the TI Home Computer literally minutes after you unpack it. Without any previous computer experience or programming knowledge. You simply snap in one of TI's Solid State Software™ Command Modules and touch a few keys. Step-by-step instructions are displayed right on the screen. So you or just about anyone in your family can use the TI 99/4.

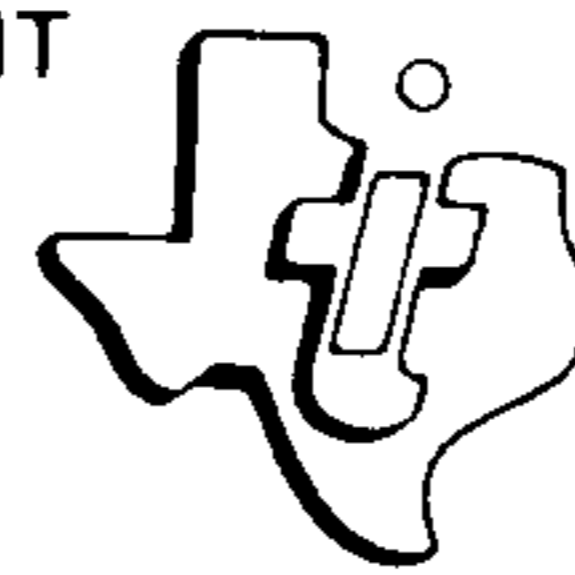
Two pioneering technological developments in particular set the TI-99/4 apart from the rest.

Solid State Speech™—This optional speech synthesizer enables the TI-99/4 to literally speak—to provide verbal prompts and special messages to the user. Actually reproduces the human voice electronically. Hundreds of words are available, and plug-in word modules will add hundreds more. TI's exclusive technology lets you call up the words you want by simply typing them in. Outstanding voice clarity and fidelity. Solid State Speech is a proven technology already on the market in TI's unique Speak & Spell™ electronic learning aid for children.

Solid State Software™ Command Modules—Available in a wide range of application areas, these optional ROM modules actually add application program memory to your TI 99/4. They let you use the TI Home Computer immediately, with no programming. Serious programmers will appreciate the time and effort saved by these pre-programmed modules. Plus, they'll let you introduce your family to the computer in the easiest possible way. Solid State Software was pioneered by TI for use with its powerful programmable calculators.

A world of genuine, practical applications exist for the TI Home Computer right now.

In addition to the many personal finance, home management, educational and entertainment uses for the TI 99/4, there are also a variety of home business and professional applications. The TI-99/4 is a powerful problem-solving tool—an ideal solution where larger, more expensive computers would be impractical.



Texas Instruments

TI-99/4

Home Computer

ACCESSORIES TO BE AVAILABLE:

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- RS232 Peripheral Adaptor
- DISK STORAGE/MEMORY
- MANY COMMAND MODULES

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SPEECH MODULE \$149.95
(263 Words, available OCT/NOV)

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NEECO IS PLEASED TO ANNOUNCE THAT WE HAVE BEEN SELECTED AS ONE OF THE TI 99/4 COMPUTER DISTRIBUTORS FOR THE NEW TEXAS INSTRUMENTS 99/4 HOME COMPUTER. OUR GOAL IS TO MAKE THE TI 99/4 COMPUTER, IN ADDITION TO OUR MANY OTHER PRODUCTS, AVAILABLE TO INDEPENDENT COMPUTER STORES NATIONWIDE. 99/4 PRODUCT AVAILABILITY IS SEPTEMBER/OCT BUT IS ALWAYS SUBJECT TO TEXAS INSTRUMENT'S 99/4 PRODUCT ALLOCATION.

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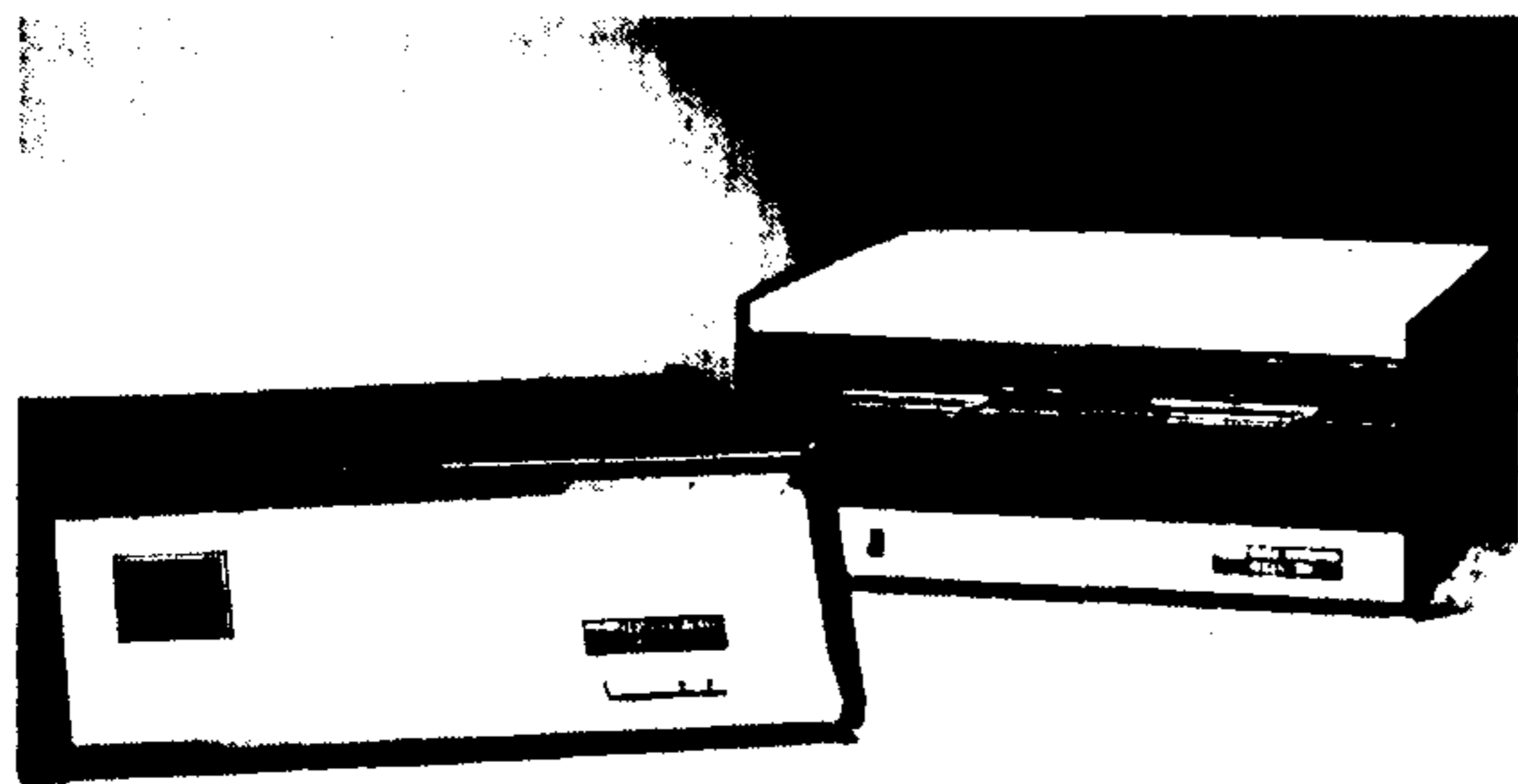
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H/S Data Systems gives you all the power, speed, and flexibility you'll ever need in a microcomputer. The WH11A gives you the 16-bit capacity to run complex programs. It uses the same powerful microprocessor and runs all software designed for the DEC® PDP-11/03. You can choose from scores of practical programs that can reduce your clerical costs and increase efficiency of data management.

Its teammate, the dual-drive WH27 Floppy Disk, gives you limitless storage capacity for data and programs. The 8-inch disks have 512 K bytes of storage area, enough to hold entire files. Disks are IBM® compatible. See all the Heath/Schlumberger data systems at ComputerLand.

The Remarkable Home Computer

The TI-99/4 was designed to be the first true home computer — skilled computer users and beginners alike will be able to put it to effective use right away. You simply snap in one of TI's Solid State Software™ Command Modules and touch a few keys. Step-by-step instructions are displayed right on the screen of its 13" color monitor. So you or just about anyone in your family can use the TI-99/4 for applications in personal finance, home management, education, and entertainment.

The TI-99/4 offers an unmatched combination of features and capabilities including an optional speech synthesizer that enables it to literally speak — to provide verbal prompts and special messages to the user. At ComputerLand the TI-99/4 is one incredible, affordable computer system.

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*Product availability may vary by regional location

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BYTE News . . .

HOME BUS STANDARD BEING DEVELOPED: Stanford Research Institute, Menlo Park California, and the Home Bus Standard Association, Washington DC, are conducting a feasibility study to develop a home bus standard. It will allow home electronic appliances to interact with one another over regular home wiring.

TI MICROCOMPUTER PICTURE IN TRANSITION: Although Texas Instruments finally introduced its 99/4 personal computer system in June, it is expected to be an interim product. TI failed to get FCC approval for the original version and also ran into processor production difficulties which forced the introduction of a high-priced personal computer system (\$1150). TI is still pursuing a rule change request with the FCC and the development of its 9985 stripped down version of its 9940 16-bit processor. TI hopes to then introduce a personal computer system for under \$500 which connects to a standard color-television receiver.

TI has also expanded its small business computer (99/7) marketing efforts. The 99/7, which starts at \$5000, will be marketed by Moore Business Forms, through over 750 sales offices as well as through computer stores and TI's own retail outlets.

AT&T TESTING HOME INFORMATION SYSTEMS: American Telephone and Telegraph Co has undertaken customer acceptance tests of several home information systems similar to the Viewdata system. Among the systems AT&T will test are the Knight-Ridder system (reported in the August BYTE News), a system developed by McDonnell Douglas, and a Bell Labs developed system.

The Knight-Ridder system test will take two years and involve 150 to 200 families in Miami, Florida. The system will transmit news, sports results, weather, and public information. The McDonnell Douglas system will be tested in Kansas City, Michigan, and New York. It will allow users to call a special number, key a special code on a push button phone, and receive the requested information in audible form. No details are as yet available on the Bell system.

HEATH ACQUIRED BY ZENITH: Heath Co, a leader in the consumer electronic kit business, was sold by Schlumberger Ltd to Zenith Radio Corp for \$64.5 million. In 1977 Heath introduced two personal computer kit systems, the H-8 which is based on the 8080 processor, and the H-11 which is based on the Digital Equipment Corp (DEC) LSI-11. Heath entered into a three-year contract with DEC. Heath also entered the adult-education market. Heath sales for the last several years have declined at a 3 to 5% rate.

Zenith, a manufacturer of radio and television receivers, has been diversifying. They have been making video monitors for terminals and cable-television converters. Immediately after the acquisition was completed, Heath announced an aggressive marketing program to sell assembled computer systems through a network of distributors and original equipment manufacturers.

8-INCH WINCHESTER DISK MARKET STILL TRYING TO GET OFF THE GROUND: Despite the publicity and advertising, only one manufacturer is presently shipping production quantities of 8-inch hard-disk drives. The company is International Memories Inc (IMI), which is currently shipping limited quantities of their 11 M byte drive at \$1775. IMI will introduce a 20 M byte unit early next year, and expects to reduce the price on the 11 M byte unit 10 to 20% by midyear as production is increased.

Micropolis expects to start shipping limited quantities of its 27 and 45 M byte drives soon. The introductory price for the 45 M byte drive is \$2688 and should drop to under \$2000 by midyear.

Shugart has not yet revealed its marketing plans for its 8-inch rigid drive.

COMPUTERIZED PORTABLE HOME ENTERTAINMENT CENTER SHOWN: Sharp Electronics recently showed a portable unit, about the size of a typical portable stereo system, which included the following: a television receiver with a 4.5 inch screen, an AM/FM radio, a stereo cassette, a digital clock, a calculator, and a personal computer. The computer's 48-key keyboard slides into the unit for storage, when it becomes necessary to transport the unit. The video screen is used for display, and the audio cassette recorder is for data and program storage. It uses BASIC, has graphics capabilities, and is expandable. No immediate marketing plans have as yet been announced.

BYTE News . . .

INTEL 32-BIT MICROPROCESSOR RUMORED: As reported in this column last April, Intel was rumored to be working on a 32-bit microprocessor. The project is moving closer to reality as Intel has assigned a part number to the device. It will be called the 8800 (not to be confused with the Altair 8800 computer). The instruction set will not be compatible with Intel's 8-bit or 16-bit microprocessors. The device will be housed in the new 64-pin QUIP (quad-in-line package, see "BYTE News," June 1979) which is cheaper, smaller, and easier to test than dual-in-line packages. The 8800 is reportedly being developed at Intel's facility in Aloha OR. The first test prototypes are reported to have been produced.

TI RF MODULATOR FCC WAIVER GRANTED: The Federal Communications Commission (FCC) has granted Texas Instruments a waiver which permits TI to connect its personal computers to home color television receivers using a radio frequency (RF) modulator. TI originally petitioned the FCC for approval of the RF modulator system in February 1979. The petition was rejected since the regulations required that the complete system be submitted for approval: TI submitted only the RF modulator for approval. Subsequently, Texas Instruments applied for a waiver, provided that the modulator unit met the standards.

The FCC asked other personal computer system manufacturers to comment on the TI request. Radio Shack, Apple Computer, Commodore, Mattel, and Atari responded negatively to the request. Apple, Atari, and Mattel went to great expense to comply with the FCC regulations. The Radio Shack and Commodore systems, which contain integral displays and do not use RF modulators, do not come under the FCC regulations.

The FCC decision further waives testing by the FCC and merely requires that the manufacturer provide the FCC with test results showing compliance. In a related action, the FCC relaxed the standards on RF interference generated by commercial and personal computer systems.

Several personal computer manufacturers that compete with TI have already stated that this waiver will give TI a competitive advantage. Furthermore, several firms publicly questioned the FCC's rule-making methods in making its decision. The likelihood now is that the other personal computer makers will offer systems with RF modulators. It will probably take these manufacturers at least a year to bring out such competing systems.

ULTRA MINI-FLOPPY DRIVE INTRODUCED: Sanyko Seiki Manufacturing Co, Tokyo, Japan, has begun producing samples of an ultra-small floppy disk drive and controller. Called the FMC-100, it uses a 2-inch floppy disk that stores 8 K bytes on one track. It is intended for use in word-processing typewriters and personal computer systems.

THWARTING COMPUTER SOFTWARE PIRATING: A patent (number 4,168,396) has been issued to Robert M Best, Seattle WA, for a "microprocessor which prevents the piracy of computer programs." The device reportedly uses cryptography to protect the software. It is called a *crypto-microprocessor* and stores software in cipher to prevent it from being copied, disassembled, or altered by unauthorized processes. Authorized users can decipher the software with special encryption keys. The patent states that the device is intended primarily for use in personal computer systems.

AC LINE TO TTL INTERFACE IC INTRODUCED: General Instrument Optoelectronics of Palo Alto CA has introduced a low-cost, 8-pin integrated circuit that can be used to directly monitor AC power line circuits and provide transistor-transistor logic (TTL) outputs. The device, therefore, can be used to interface your microprocessor inputs easily and directly to monitor AC power-line-operated devices such as motors, solenoids, relay contacts, and the like. It can also be used to detect power failure and other such applications.

FLAT PANEL TERMINAL DISPLAYS BECOMING AVAILABLE: Computer terminals using flat-screen video displays are getting close to the marketplace. The technology is based on the plasma panel developed by Owens-Illinois, Toledo OH, in the late 1960s. Currently, Interstate Electronics of Anaheim CA, IBM, and Fujitsu have these panels in production. Control Data and NCR are planning large-scale production. IBM now makes approximately 100,000 plasma panels annually, which