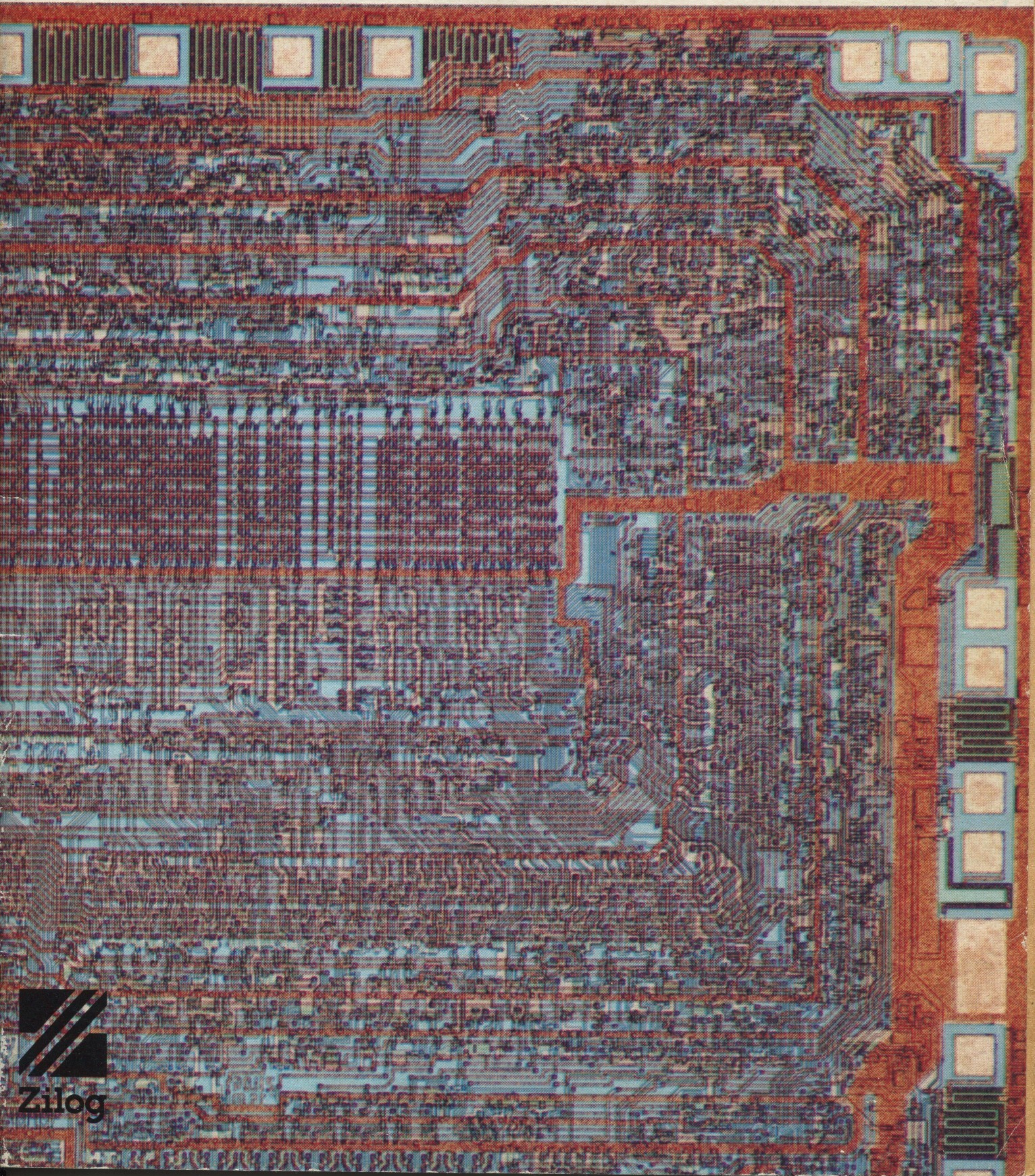# Tandy TC COMPUTERS

1978 CATALOG

Zilog

Microcomputers — The Beginning of a New Era

Low-cost computing has come of age. A basic system — consisting of a Central Processing Unit, a Memory Unit, a keyboard input, and a printer or video output — is able to perform a variety of operations.

Large firms have long profited from computerizing their operations, but the only computers available have required huge outlays of cash. The microcomputer is an inexpensive solution for businesses that have wanted to computerize certain operations but couldn't, until now, afford to.

Computers bring with them a new management science that any businessman can appreciate. Computerized profit and loss statements presented on a *daily* basis alone could change "guesswork" into productive decision-making. And because it can handle complex work like statistics, trend analysis and even simulations, a microcomputer is a fantastic time-saving aid to strategic planning.

Even if its full capabilities are never used, a microcomputer can become an important addition to any business. Small businesses especially, that use the computer for bookkeeping and general accounting functions such as accounts receivable and payroll, can use the time saved by the computer for more important matters.

Of course, you don't have to be a businessman to appreciate a microcomputer. Whatever your interest in computers is, remember that computers have already helped shape our society. Your ideas and applications may develop into a whole new standard of living!

Computer Terms You May Want to Learn

Bus Structure — The type of common connection among a number of locations over which information is transferred.

Central Processing Unit (CPU) — The principal unit of the computer which controls the processing and maintains a quickly accessible memory.

Input/Output (I/O) — The transmission of data from an external source (I/O device) to the computer or from the computer to an external device.

Instruction Set — The group of different instructions that a particular CPU is designed to execute. The more instructions, the greater the power of the processor.

Interrupt — A signal that forces the computer to divert from the main program to a specific address which is directly related to the type of interrupt that has taken place.

Memory — An electronic storage medium (the terms "memory" and "storage" are interchangeable), used mainly for retrieving information and data.

> **Internal Memory** — A storage device that is an integral part of a computer and which is automatically accessible without human intervention.
>
> **External Memory** — Off-line storage device that is not an integral part of the computer, such as magnetic-tape or disk devices.
>
> **Random Access Memory (RAM)** — The segment of the computer's internal memory where programs or data can be stored. The contents of the memory may be changed to another program or another set of data at any time. When power is shut off, memory content is lost.
>
> **Read-Only Memory (ROM)** — A permanent storage segment that retains memory content whether power is on or off. Like RAM, it can be read from but not altered or written into.
>
> **Programmable Read-Only Memory (PROM)** — Similar to ROM except that its memory can be programmed, one time only, by the user.
>
> **Erasable Programmable ROM (EPROM)** — A ROM that can be programmed by the user, erased and reprogrammed with new information. In normal use, it acts just the same as ROM — it cannot be written into.

Peripherals — Any machine that is used with the computer but is not part of the computer itself, such as discs, printers and terminals.

Processor Speed (Cycle Time) — The actual computational time necessary to process a set of instructions in the arithmetic and logic units of the computer.

Register — A circuit designed to temporarily store one or more words to facilitate arithmetical, logical or transferral operations.

Kit or Assembled IMSAI Keeps an Eye on the Future!

Modular design, large card-cage and heavy-duty power supply make your expansion ideas come alive.

IMSAI 8080. The power you need for today's applications plus the flexibility you want for future expansion! And with the included 22-slot card cage, S-100 bus and 28-ampere power supply, the IMSAI can grow into virtually any application.

Using the Intel 8080-A microprocessor, it offers a basic cycle time of ½ millionth of a second and makes up to 65K words (bytes) of memory directly accessible. Up to 256 Input/Output communication channels are directly accessible.

The front panel includes the switches, indicators and logic needed for manual operation. It features logic that drives the programmed output indicators, and reads the input byte from the high-order address switches. DATA BUS indicators show data either read or written by the processor.

The back panel accommodates ten EIA-type 25-pin connectors. Opening and cable clamp furnished for flat cables to exit from cabinet.

Learn to operate your computer with the included IMSAI 8080 System User's Manual, Intel 8080 Microprocessor System User's Manual, and An Introduction to Microcomputers.

Software provided includes monitor, assembler, editor, loader and debugger (punched paper tape and source listings).

The IMSAI 8080 comes complete with Mother Board with 22 board slots, two 100-pin edge connectors with card edge guides and dust cover.
81-1301. Kit Form. 39 lbs. 699.00
81-6301. Factory Assembled. 39 lbs. 931.00

Specifications

Memory: 65,536 words, directly addressable. **Register Instruction Cycle Time:** $2\mu s$. **Basic Machine Cycle Time:** $0.5\mu s$. **Number of Input/Output Ports:** 256. **Machine Instruction Set:** 78 basic instructions, 174 including variants. **Nested Subroutine Calls:** Number limited only by memory size. **Interrupts:** 8 hardware levels (optional). **Registers:** 6 plus stack pointer, program counter, accumulator and status register. **Board Capacity:** 22 max. **Power:** 120VAC, 50-60 Hz, single-phase, 28 amperes. **Size:** 7x19½x17".

Save! Buy a Complete System Featuring The IMSAI 8080

Beginner's System

SAVE 255⁸⁵ Reg. Separate Items 2050.85 **1795⁰⁰**

- IMSAI 8080 Assembled Microcomputer with 8K RAM (81-6301)
- IKB-1 Intelligent Keyboard (87-2200)
- Koyo 9" Monitor (87-602)
- Realistic CTR-41 Cassette Recorder (14-841)
- Software and All Necessary Interfaces
System Shpg. Wt. 53 lbs. 1795.00

Standard System

SAVE 200⁹⁵ Reg. Separate Items 2799.95 **2599⁰⁰**

- IMSAI 8080 Assembled Microcomputer with 16K RAM (81-6301)
- Lear Siegler Terminal (87-5301)
- 3M3 Digital Cassette System (83-1001)
- Software and All Necessary Interfaces
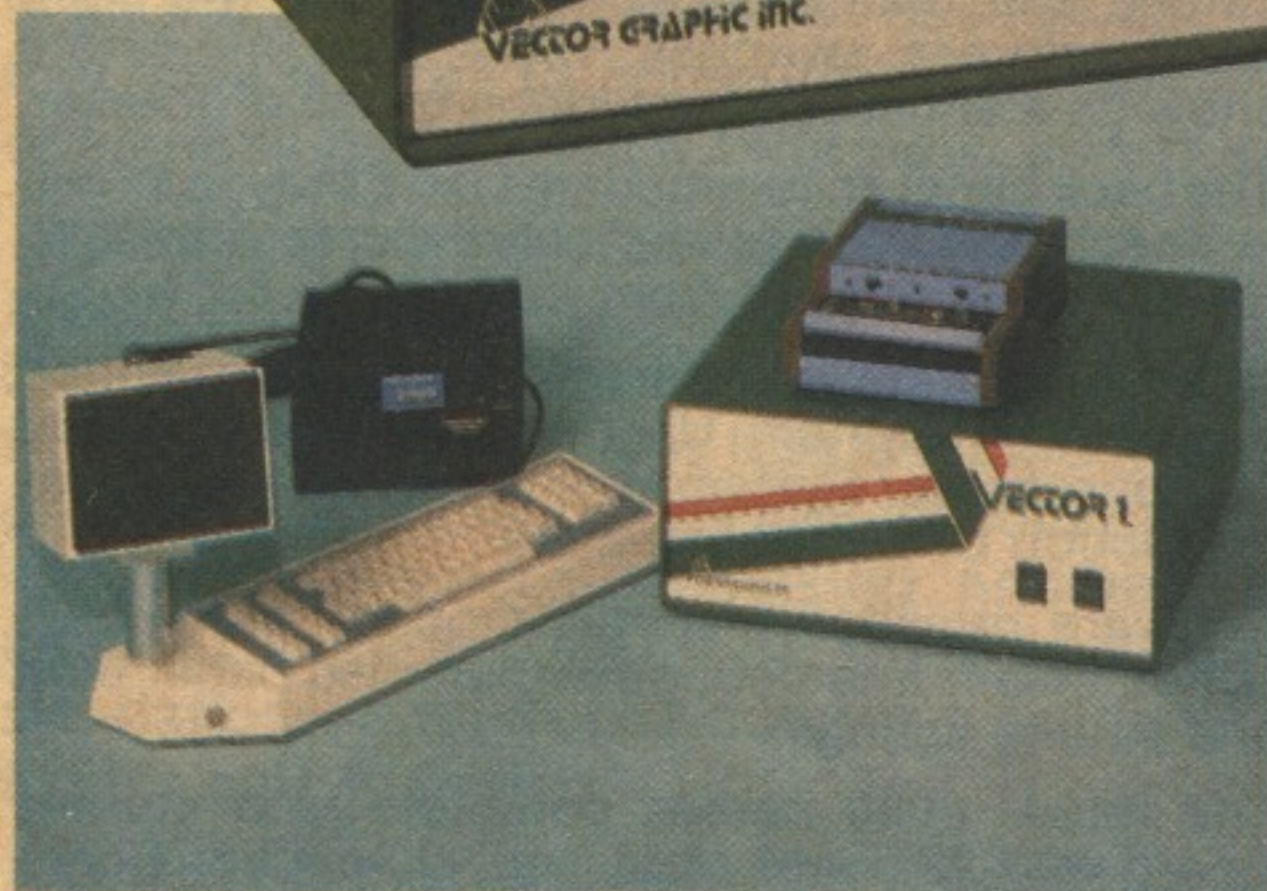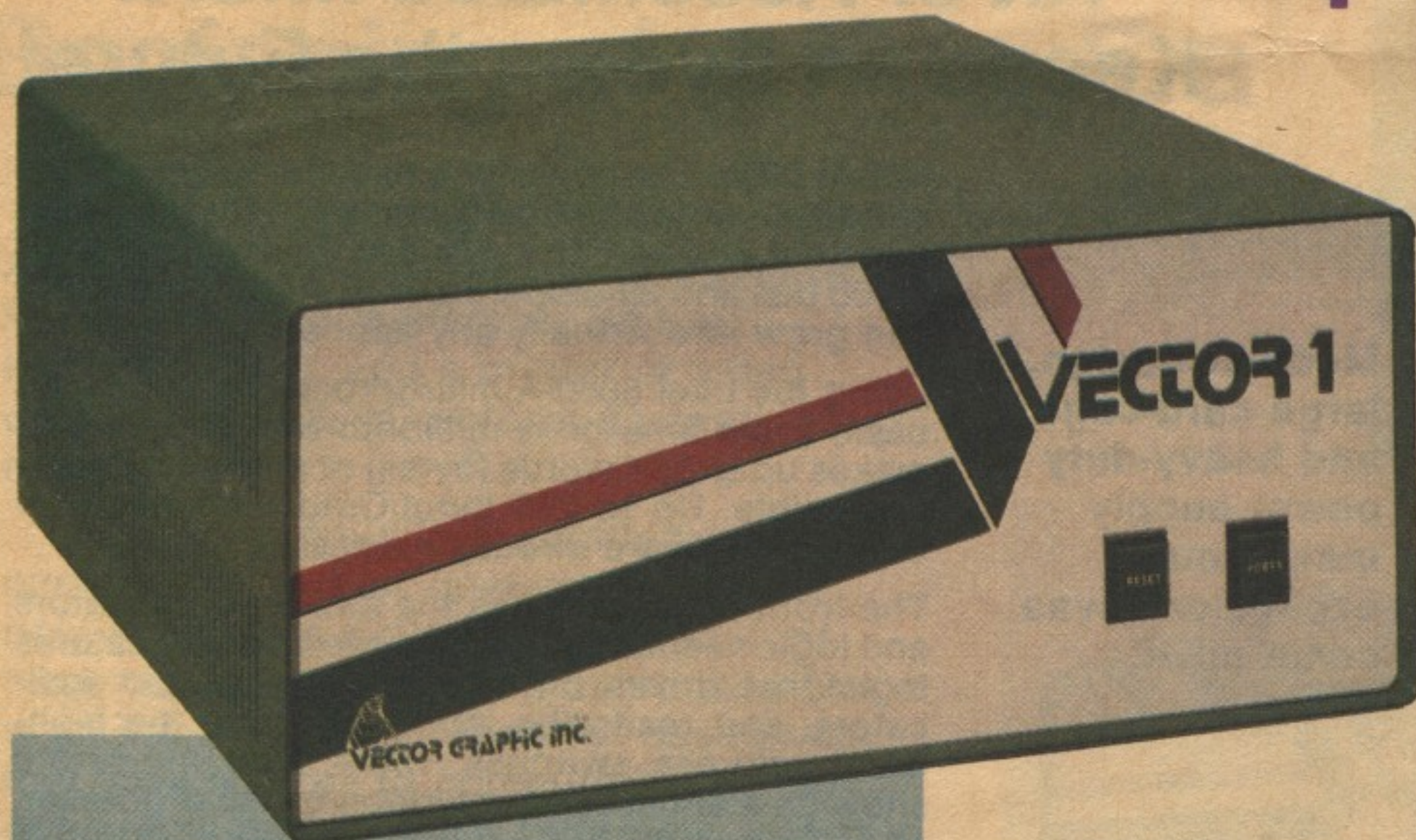System Shpg. Wt. 74 lbs. 2599.00

Business System

SAVE 279⁹⁵ Reg. Separate Items 5274.95 **4995⁰⁰**

- IMSAI 8080 Assembled Microcomputer with 32K RAM (81-6301)
- Soroc Terminal (87-202)
- Dual Floppy Disk System (84-5801)
- Software and All Necessary Interfaces
System Shpg. Wt. 110 lbs. 4995.00

Order by Mail – Tandy Computers, P.O. Box 2932, Fort Worth, Texas 76101

3

Build a VECTOR-1 Computer or Buy It Assembled

VECTOR 1. A microcomputer ready to be the workhorse of your system. Space is provided for 18 additional boards using the S-100 bus. Ample power is supplied by the heavy duty 18-ampere power supply.

The 8080A-based CPU board contains the master timing circuit, eight input and eight output data lines to the bus and control circuits and interrupt circuitry. Features 8-level vectored priority interrupts with a current status register to control the interrupt threshold and real time clock which can be used with the interrupt circuitry to generate timing synchronized with 60Hz. Cycle time is $2\mu s$.

The PROM/RAM board has 1K of RAM and space for 2K of 1702A-type EPROM and a jump-on-reset feature — hit reset and go to any location in memory determined by the first command on the PROM. A powerful 512-byte Monitor capable of 9 commands is programmed on two 1702A PROMS: A, ASCII memory dump; D, HEX memory dump; G, Go to and execute program; L, Load program from Tarbell tape cassette interface and execute; P, Program memory from terminal; R, Read Tarbell cassette; T, Test any block of memory, using a pseudorandom number sequence; V, Verify cassette tape; W, Write Tarbell cassette.

Includes front panel power and reset switches, six edge-connectors and card guides, heavy-gauge cabinet and full instructions. Software includes system monitor in ROM. 7x17x17". For 120VAC, 60Hz. A 220VAC model is available on Special Order.
81-1305. Kit Form. Shpg. wt. 38 lbs. 619.00
81-6305. Factory Assembled. Shpg. wt. 38 lbs. 819.00

Save 134⁸⁰

Reg. Separate Items 2529.80 **2395⁰⁰**

- Vector-1 Assembled Microcomputer with 16K RAM (81-6305)
- Informer Terminal (87-203)
- 3M3 Digital Data Recorder (83-1001)
- Software and All Necessary Interfaces

System shpg. wt. 51 lbs. 2395.00

The "1+" Featuring Built-In Floppy Disk Option

Shown with optional disk drive installed

VECTOR-1+. All of the features of the Vector-1, above, *plus* provisions for a built-in floppy disk-drive unit! Having the disk drive built-in is both convenient and space-saving. And the computer can load diskette as soon as the power is turned on, eliminating tedious loading of bootstraps with front panel switches.

The "1+" features a power supply arrangement and front panel cutout to accommodate a Shugart SA-400 minifloppy or exact size equivalents from other manufacturers. A +12V, +5V regulator board is provided to operate the disk drive directly from the main supply.

A mechanically rigid, heavy .093" gauge cabinet retains its structural integrity even with the cover removed. The power supply components transfer their heat directly to the case bottom for cool operation. A line filter is provided to prevent transients on the power line from causing memory errors.

By providing a system monitor program on PROM, several advantages are achieved: Wiring cables and unreliable front panel circuitry are eliminated allowing the 8080A MPU to operate as it was intended.

Software includes the system monitor in ROM. With full instructions. 7x17x17".
81-1306. Kit Form. Shpg. wt. 38 lbs. 659.00
81-6306. Factory Assembled. Shpg. wt. 38 lbs. 859.00

Save! Buy a Complete System Featuring the VECTOR-1+ and Floppy Disk Drive

Save 188⁸⁵

Reg. Separate Items 2983.85 **2795⁰⁰**

- Vector-1+ Assembled Microcomputer with 16K RAM (81-6306)
- North Star Disk Drive (84-1702)
- Lear Siegler Terminal (87-301)
- Software and All Necessary Interfaces

System shpg. wt. 56 lbs. 2795.00

Save 278²⁰

Reg. Separate Items 3473.20 **3195⁰⁰**

- Vector-1+ Assembled Microcomputer with 32K RAM (81-6306)
- North Star Disk Drive (84-1702)
- Soroc Terminal (87-202)
- Software and All Necessary Interfaces

System shpg. wt. 58 lbs. 3195.00

Buy Now, Pay Later – Use Your Master Charge, Visa or American Express Card

A Computer Worthy of the Term "Sophisticated"

- *Extra-Fast Z80 Microprocessor*
- *Complete with ROM Monitor and I/O Board*
- *Buy It Fully Assembled or in Kit Form*

XITAN alpha-2. The high-powered "extras" are already built-in! The alpha-2 provides you with 2K of RAM, 2K of ROM, 2 serial I/O ports, a parallel I/O port and a 1200-baud audio cassette interface that utilizes an asynchronous phase-encoding technique.

The CPU board is based on the Z80 — one of the most powerful microprocessors to date. It features 158 instructions, 696 op-codes, 22 registers, single-voltage power requirements and static operation allowing clock speeds from DC up to 4MHz or greater. Two clocks are maintained, one variable for fine-tuning your system and one set for accessory cards requiring a 2MHz signal. Interrupts, in 3 modes, are up to 6 times faster than the 8080 MPU.

The system monitor board fully integrates the functions of 4 basic boards into a single module and maximizes the user's system executive control. Features 2K of high-speed, low-power RAM (350ns, static) for monitor extensions and/or program work space and 2K "zapple" monitor in masked-ROM that gives full system control and multiple breakpointing and debug capability.

The rear-panel power switch avoids accidental shut-off of power and isolates line noise from the system. Rear panel also accommodates ribbon cable slots and an AC fuse holder. Power supply output is also fused for system protection.

The software package includes 8K "zapple" basic, text output processor, "zapple" text editor and the relocating macro-assembler. The text output processor features automatic paging, concatenation and justification and other formatting functions. The text editor control may be effected by 24 alphanumeric commands which may be strung together in macro-like statements yielding superlative editing capability. The relocating macro-assembler is a sophisticated programming tool that generates a fully relocatable object code, has complete macro generation and allows infinite nesting of macros.

Eight-slot mother board allows for expansion up to a full 64K system with disk, line printer, etc. The rugged card cage is enclosed in a .092" gauge aluminum cabinet. The front panel has a reset switch and LED power indicator.

Operates on either 110-120VAC or 220-240VAC. With full instructions. 7x12x12½".
81-1304. Kit Form. Shpg. wt. 25 lbs. **868.00**
81-6304. Factory Assembled. Shpg. wt. 25 lbs. **1138.00**

Buy the "alpha" at a Low System Price and Save!

Save 187⁸⁵ Reg. Separate Items 2482.85 229500

- XITAN alpha Assembled Microcomputer (81-6304)
- Two 8K RAM Boards (82-801)
- Lear Siegler Terminal (87-301)
- Realistic CTR-41 Cassette Recorder (14-841)
- Includes Software and All Necessary Interfaces

System shpg. wt. 62 lbs. 2295.00

Save 282⁷⁰ Reg. Separate Items 7777.70 749500

- XITAN alpha Assembled Microcomputer (81-6304)
- Four 8K RAM Boards (82-801)
- Soroc Terminal (87-202)
- ICOM Disk Drive (84-805)
- Centronics 779 Printer (88-1002)
- Realistic CTR-41 Cassette Recorder (14-841)
- Includes Software and All Necessary Interfaces

System shpg. wt. 152 lbs. 7495.00

Equinox Computer Systems

- **Keyboard for Programming and Debugging Without Peripherals**
- **10-Digit LED Display – No Hard-to-Read Binary Lights**
- **Key-Operated Power Switch Guards Against Accidental Shutoff**

Equinox 100. For the "hardware-buff," this kit is unusually easy to build and surprisingly versatile—even before peripherals are added. The front panel plugs into the bus-board with no complex cables and the power supply plugs together to eliminate soldering and exposed wiring. And it's based on the 8080A microprocessor and the S-100 bus for maximum compatibility with other systems.

The keyboard has 12 keys to manipulate the contents of all CPU registers, I/O devices and memory locations. You can monitor these operations in single-step or Slow-Step® from 1 to 64K steps per minute! Front panel functions include Halt, Run and Reset, Examine and Deposit. It can also be program-controlled for direct data display and input, like asking for data or having it perform as a digital clock.

A 20-ampere constant voltage power supply guards against program crashes due to AC line-surges and brownouts as low as 90VAC. It also provides ample power for up to 19 additional circuit boards which can be accommodated by the 20-slot bus. Ventilation is provided by a built-in fan. The 20-slot bus-board is fully shielded and actively terminated to eliminate noise and crosstalk. Reserve space for peripheral power regulators.

Includes two 100-pin edge connectors, 19 pairs of card guides, detailed supporting documentation and fully-illustrated assembly manual. Aluminum case with black vinyl trim and smoked plexiglas. 7x17x20".
81-1307. Kit Form. Shpg. wt. 39 lbs. **799.00**
81-6307. Fully Assembled. Shpg. wt. 39 lbs. **1099.00**

Buy an Equinox Computer System — Assembled and Ready to Go!

Save 233⁷⁵ Reg. Separate Items 2528.75 **2295⁰⁰**
- Equinox 100 Assembled Microcomputer (81-6307)
- Informer Video Terminal (87-203)
- CTR-41 Cassette Recorder (14-841)
- Software and All Necessary Interfaces
System shpg. wt. 65 lbs. 2295.00

Save 208⁸⁰ Reg. Separate Items 2903.80 **2695⁰⁰**
- Equinox 100 Assembled Microcomputer with 24K RAM (81-6307)
- 3M3 Digital Recorder (83-1001)
- Lear Siegler Terminal (87-301)
- Serial I/O Interface (87-2302)
- Software and All Necessary Interfaces
System shpg. wt. 84 lbs. 2695.00

Save 453⁶⁵ Reg. Separate Items 7448.65 **6995⁰⁰**
- Equinox 100 Assembled Microcomputer (81-1307)
- 32K RAM Memory Board (81-3201)
- Soroc Terminal (87-202)
- Dual Disk FDS-1 (84-802)
- Centronics 779 Printer (88-1002)
- Software and All Necessary Interfaces
System shpg. wt. 140 lbs. 6995.00

Computer and Integral Disk Operating System

PolyMorphic System 8813. A complete system — keyboard, video monitor and microcomputer with a built-in Shugart floppy disk drive and provisions for two optional drive units.

The 8080A processor has an 8-level interrupt system, instruction length of 8, 16 and 24 bits and a cycle time of $2\text{-}9\mu s$. 65,536 byte memory addressing capability. Memory includes 16,896 bytes RAM and 3,072 bytes ROM — access time; 500ns.

Video terminal interface features 16 lines of 64 characters each and includes 96 ASCII and 32 special symbols. 7x9 dot matrix character font with a graphics resolution of 128 horizontal; 48 vertical. 70,000 characters per second update speed.

Disk drive unit transfer rate is 125,000 bits/sec. with a latency of 100ms. 35 tracks per disk, 10 sectors per track with a track-to-track access time of 40ms. 89,600 data bytes per disk with a hard error rate of less than 1 in 10^{11} bits read. Software includes BASIC interpreter, easy-to-use text editor, assembler and other system utilities.

105-130VAC, 50-60Hz power supply, fan, ten S-100 card slots and walnut-look cover. Keylock power switch. With full instructions. 8x20x17¾".
81-1401. Shpg. wt. 60 lbs. **3250.00**

Additional Shugart Disk Drive Unit. Add up to two more for advanced capabilities.
84-909. Shpg. wt. 4 lbs. .... **Each 590.00**

Software Specifications (11K BASIC): Read and Write Disk Files from BASIC; Input type-ahead; Cassette Save, Load, and Verify of Named Programs; Multi-line Functions; Point-Plotting on Video Display; Real-Time Clock; String Manipulation and String Functions; Formatted Output; Memory Load and Store; 8080 Input and Output; Multiple Statements per Line; Renumber; If Then Else; Array Dimensions limited by Memory; Single Character Input. **Commands:** RUN, LIST SCR, CLEAR, REN, CONT, SAVE, LOAD, VERIFY. **Statements:** LET, IF, THEN, ELSE, FOR, NEXT, GOTO, ON, EXIT, STOP, END, REM, READ, DATA, RESTORE, INPUT, GOSUB, RETURN, PRINT, OUT, POKE, PLOT. . **Built-in Functions:** FREE, ABS, SGN, INT, LEN, CHR$, VAL, STR$, ASC, SIN, COS, RND, LOG, TIME, EXP, CALL, SQRT, PEEK, INP. **Scientific Functions:** Sine cosine, log, exponential, square root, random number, x to the y power.

Shown with two optional disk drives

The Compact Microcomputer from PolyMorphic Systems

- *Buy the Complete Package or Just the Circuit Boards*
- *Assembled or in Kit Form for "Do It Yourselfers"*

POLY 88-2. Beginners will appreciate the modest price and being able to choose between assembled or kit form. Experienced users will like the POLY 88 kit because it's compact enough to be a portable yet powerful enough for sophisticated operations.

Packed into the space-saving 6¾x4¼x17" cabinet is an S-100 compatible microcomputer that lets your system grow as your budget grows.

The 8080A-based CPU board has a resident real time clock and vectored interrupt. And there's ½K of RAM and 1K monitor on ROM with provisions for an additional 2K of ROM. The video terminal interface board displays 16 lines of 32 characters on a home tv screen and is expandable to 64 characters. Limited graphics (48 by 128 grid) are useful for video games and other applications.

The POLY 88 ROM monitor is used to display data on a tv screen, enter data into memory keyboard and read and store data on audio cassette tape. It also allows for single-stepping through a program while displaying the contents of the 8080A internal computation registers.

Front panel controls include on-off power switch, reset button, halt acknowledge indicator and power indicator. Handles up to 5 cards per chassis and is expandable for more chassis with optional edge connector socket.

Includes cabinet, power supply, CPU, video circuit card, cassette interface and complete assembly and operation instructions.
**81-1303. Kit Form.** Shpg. wt. 21 lbs. **735.00**
81-6303. Factory Assembled. Shpg. wt. 21 lbs. **935.00**

POLY 88-0. The circuit cards an S-100 mainframe owner needs to be compatible with the POLY 88 software library. Consists of the central processor card with monitor ROM, the video circuit card and cassette interface.
81-1302. Kit Form. Shpg. wt. 10 lbs. **595.00**
81-6302. Factory Assembled. Shpg. wt. 10 lbs. **795.00**

Low-Cost 6800 Kit Systems
by Southwestern Technical Products
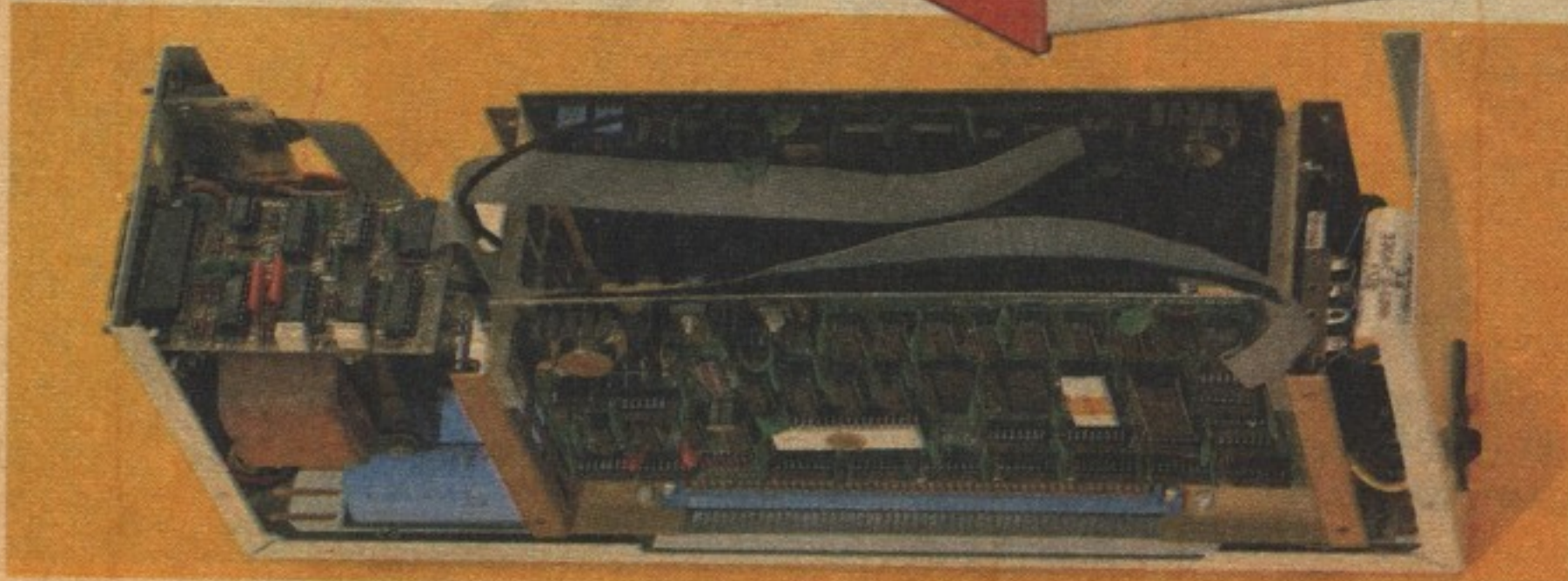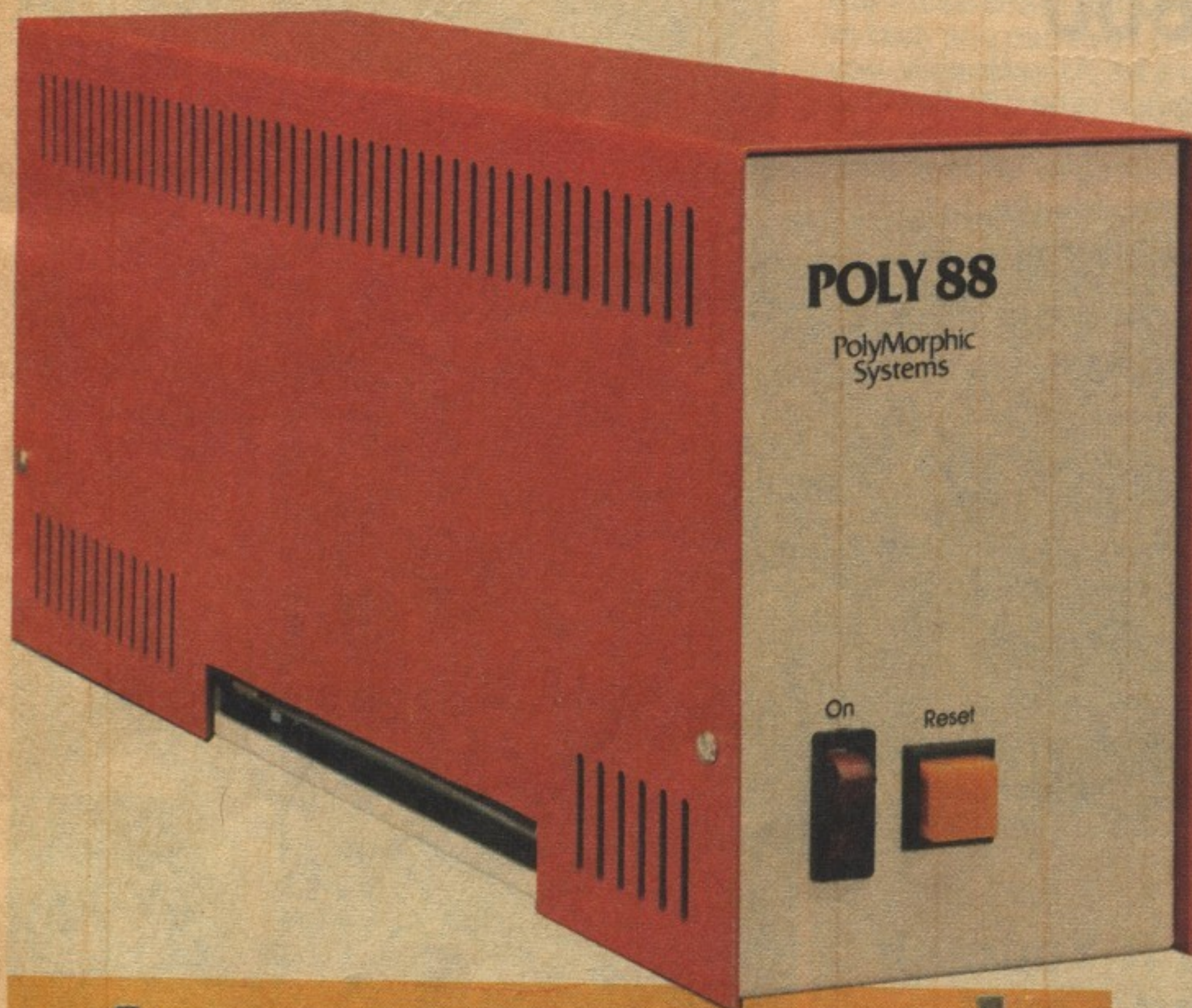
Save 179⁰⁵

Reg. Separate
Items 2979.00

2799⁹⁵
(Assembled)

- SWTPC 6800 Microcomputer w/12K Memory (81-6202)
- Soroc IQ 120 Terminal (87-202)
- BFD-68 Floppy Disk System (84-1707)
- Extra Floppy Disk (84-905)

Complete System. Shpg. wt. 75 lbs.
Assembled 2799.95

Save 170⁸⁵

Reg. Separate
Items 1370.80

1024⁹⁰

- SWTPC 6800 Microcomputer (81-1202)
- CT-64 Terminals (87-302)
- PerCom I/O Cassette (83-1203)

Complete System. Shpg. wt. 48 lbs.
Kit 1024.90

SWTP 6800 COMPUTER SYSTEM

- 4K of 8-Bit RAM
- Monitor ROM
- TTL Compatible
- DMA Capability
- Documentation Package
- Thorough Assembly Instructions

SWTPC 6800. Designed around Motorola's 6800 microprocessor chip, the 6800 kit is versatile in all applications. The basic system includes the chassis, motherboard, memory card with 4096 bytes of 8-bit RAM, 20mA/RS232 interface, and a power supply capable of driving the system with a full 32K bytes of memory. The Motorola MIKBUG® mini-operating system in ROM enables complete terminal control the instant the system is turned on. No time-consuming switching! In fact, the need for a program console is eliminated. A debug routine is contained in the computer for debugging user programs. All data input and output is in convenient hexadecimal (base 16), a pleasing alternative to confusing binary switching. A thorough documentation package is included with the kit. For 120VAC, 60Hz.

81-1202. Kit. Shpg. wt. 27 lbs. 395.00
81-6202. Assembled. Shpg. wt. 27 lbs. 495.00

Value Begins with ICOM 6800

- Load and Run Programs without Entering Bootstraps
- I/O Operation on RS232 or TTY Levels
- ACIA for Interfacing Software to Serial Devices
- 1K RAM • 256-Byte PROM Monitor

ICOM 6800. Extensive computing capabilities at a reasonable price make the ICOM 6800 the perfect choice for home or business use. The system, based on the 6800 microprocessor chip, contains a mainboard with 1K RAM memory, 256-byte PROM monitor, and a 6850 Asynchronous Communication Interface Adapter (ACIA). An extra 1K of PROM can be added. This highly functional system takes very little space, and future expansion is easy because of the simple one-board construction. The PROM monitor allows immediate loading and running of programs in both BASIC and Assembly languages. No hassle with bootstrapping! Software-controlled interfacing to serial terminal devices is made possible by the ACIA. Input/Output operation may be configured for either RS232 or TTY levels. An Expansion Card is also included to facilitate fast and easy expansion. The card plugs into the mainboard, and up to three extra boards may be inserted. Clock frequency of the 6800 is 500KHz, and add time, register to register, is 2 microseconds per data word. The 6800 system accommodates 72 instructions. For 120VAC, 60Hz.
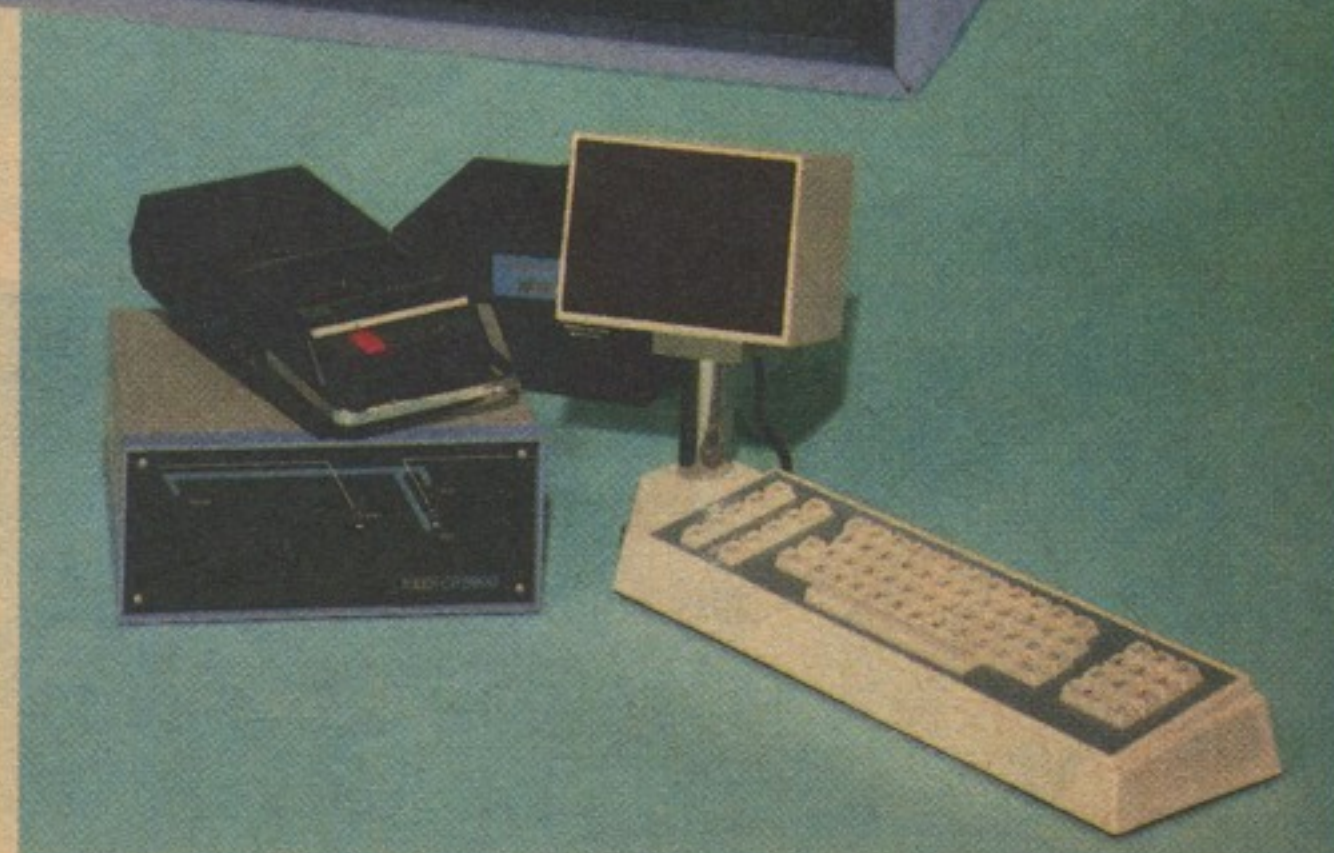
81-1201. Shpg. wt. 10 lbs. 395.00

icom CP6800
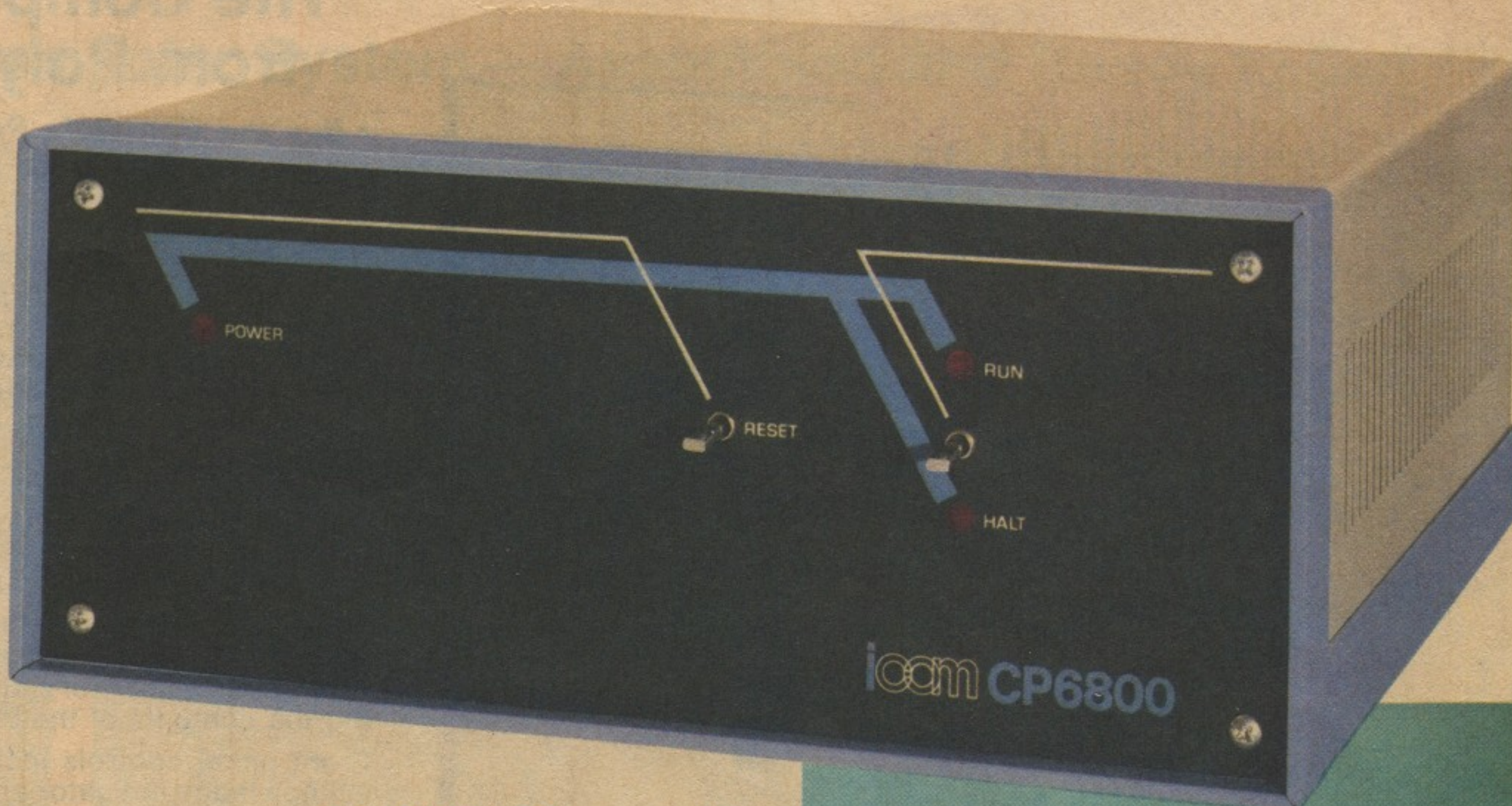
Build It Yourself and Save!

1294⁹⁵ Kit

- ICOM 6800 Microcomputer (81-1201)
- Informer Terminal (87-203)
- Cassette Data Recorder (14-841)

Complete System. Shpg. wt. 34 lbs.
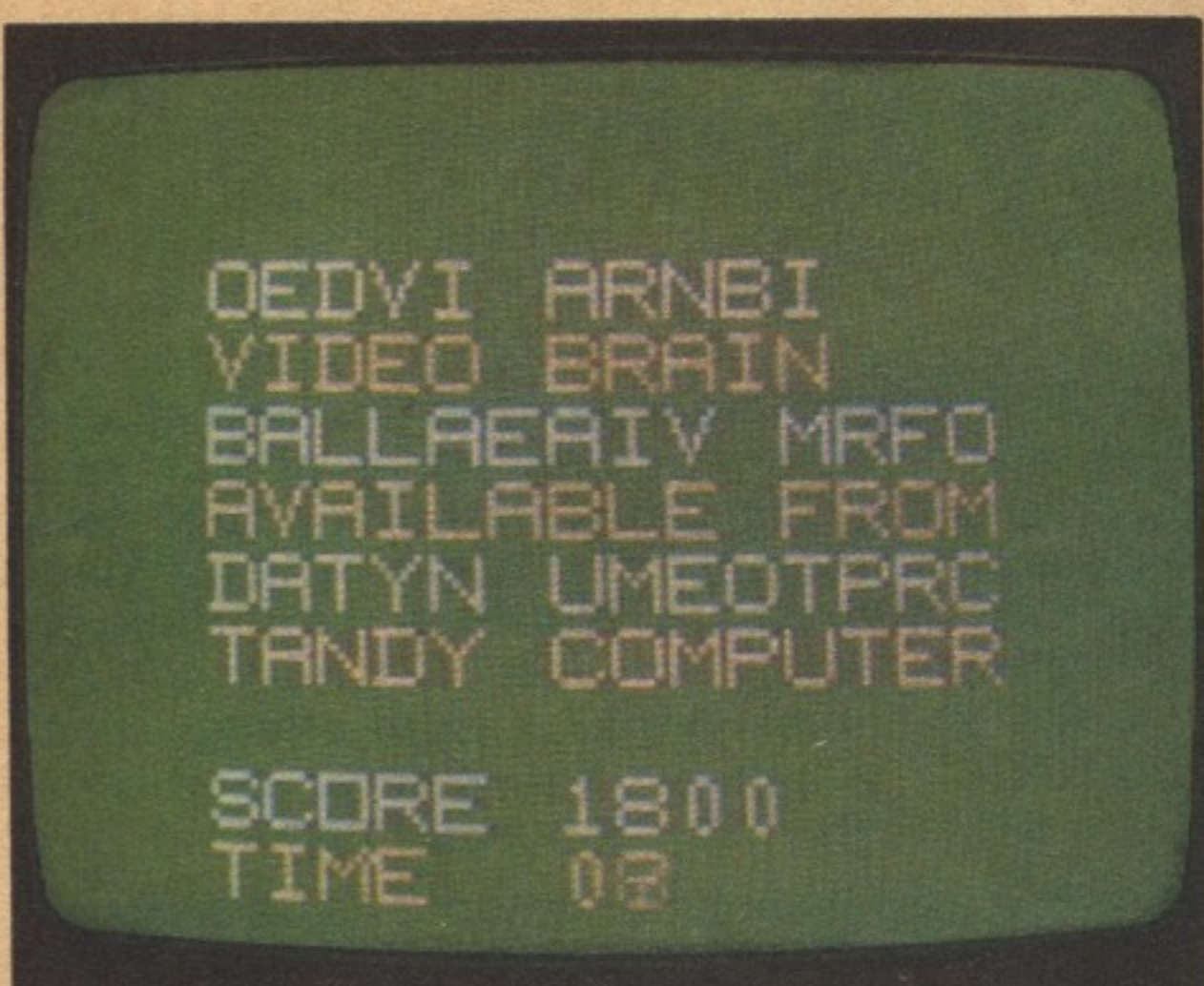Kit 1294.95

A Home Computer Ideal for Family Use

Wordwise®-2 program cartridge features Cypher, a game of scrambled messages. Figure them out and enjoy hours of "spellbinding" fun!

Suddenly you're an ancient Roman gladiator, fighting for survival. Use your supply of arrows, but take care of your Achilles' heel.

It's an intergalactic battlefield. Laser beams penetrate the eerie stillness. Can you destroy the enemy starship? Watch out for space mines!

Learning is Fun with Video Brain

Video Brain®. Now there is a computer that the entire family can enjoy together, day after day. The Video Brain is a true, multi-purpose computer designed to be used in the home for education, household management and entertainment. It's easy to use for mom and dad as well as the kids, and its applications are ideal for all family members. The Video Brain comes ready for use—just plug it in, hook it up to a TV, and insert one of the programming cartridges. The TV is used as a display; if a color TV is hooked up, sixteen different colors are at your command for dazzling visual impact. And the Video Brain even has a built-in clock, alarm and calendar! There's no need to learn difficult computer language, because the computer communicates in everyday English. Programmed instructions come on ready-to-insert cartridges; each cartridge program lets you do something new, such as learn music, play checkers, or manage a budget. Two introductory cartridge programs are included with the Video Brain, but you'll soon want to add to your collection as the computer's usefulness increases. In fact, you can even purchase a special cartridge program and manual (available later) that will teach you VideoBasic®, so that more complex tasks can be accomplished using programs that you write yourself. Put your computer to work! Some of the Video Brain's many applications include checkbook balancing, metric conversions, and math and music education. It's ideal for filing medical and tax data, and for organizing addresses, phone numbers—just about anything. A "light pen" (available later) will let you "write or draw" directly on your TV screen, and compose and correct correspondence. Video Brain will even be able to record telephone messages, start up the morning coffee, and regulate your house temperature for maximum efficiency. And, of course, there's always the popular video games, which take on an added dimension with the Video Brain — you'll enjoy rich colors, exciting sounds, songs, and fast animated action! Because the Video Brain is a true computer, it is designed from the beginning to expand and never become obsolete. Future cartridges will always be available to add to the unit for increased versatility. The Video Brain, available now, includes two joysticks, TV hookup cord, antenna switchbox, two program cartridges, owner's manual, and AC adapter. For 120VAC.
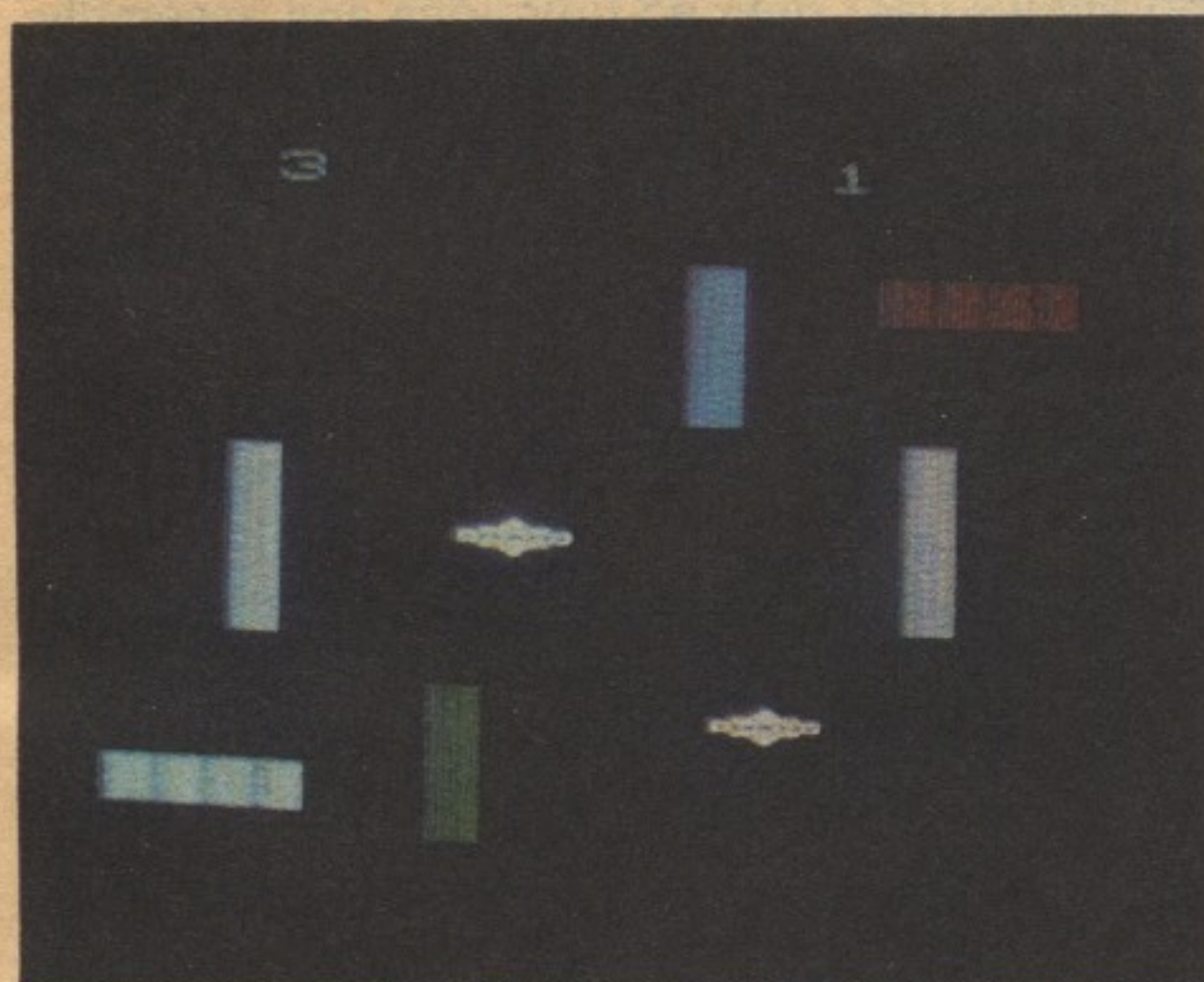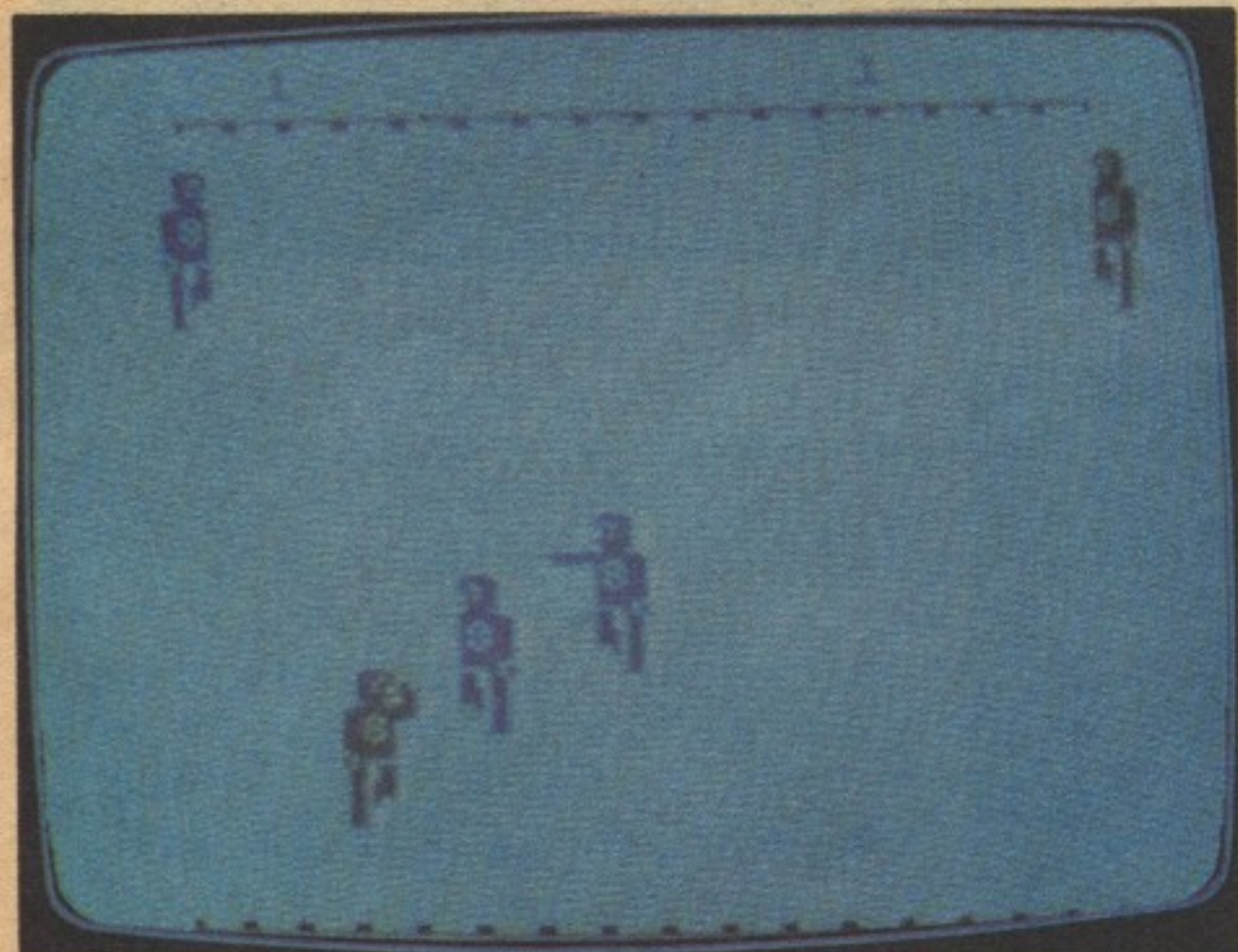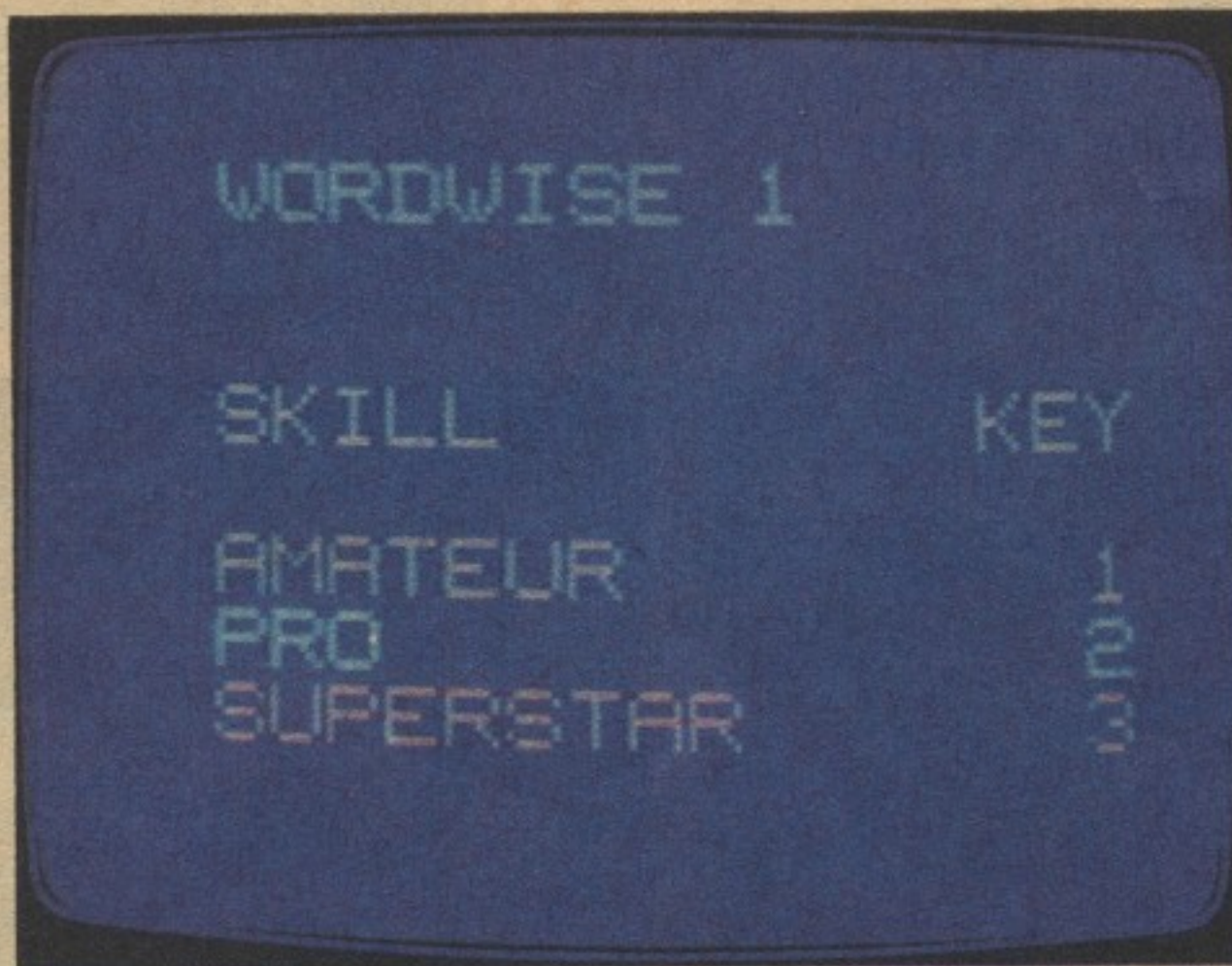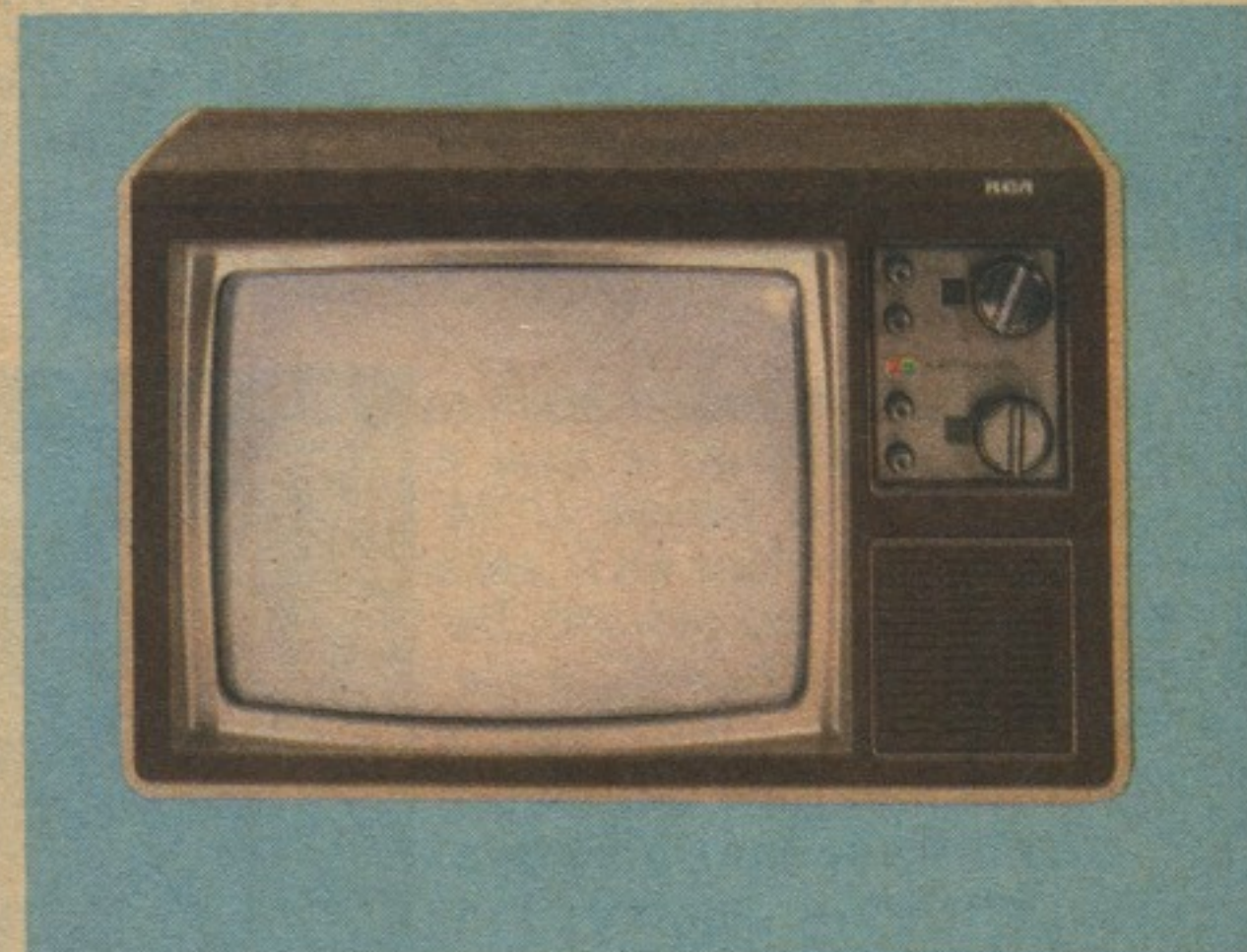81-1407. Shpg. wt. 10 lbs. **495.95**
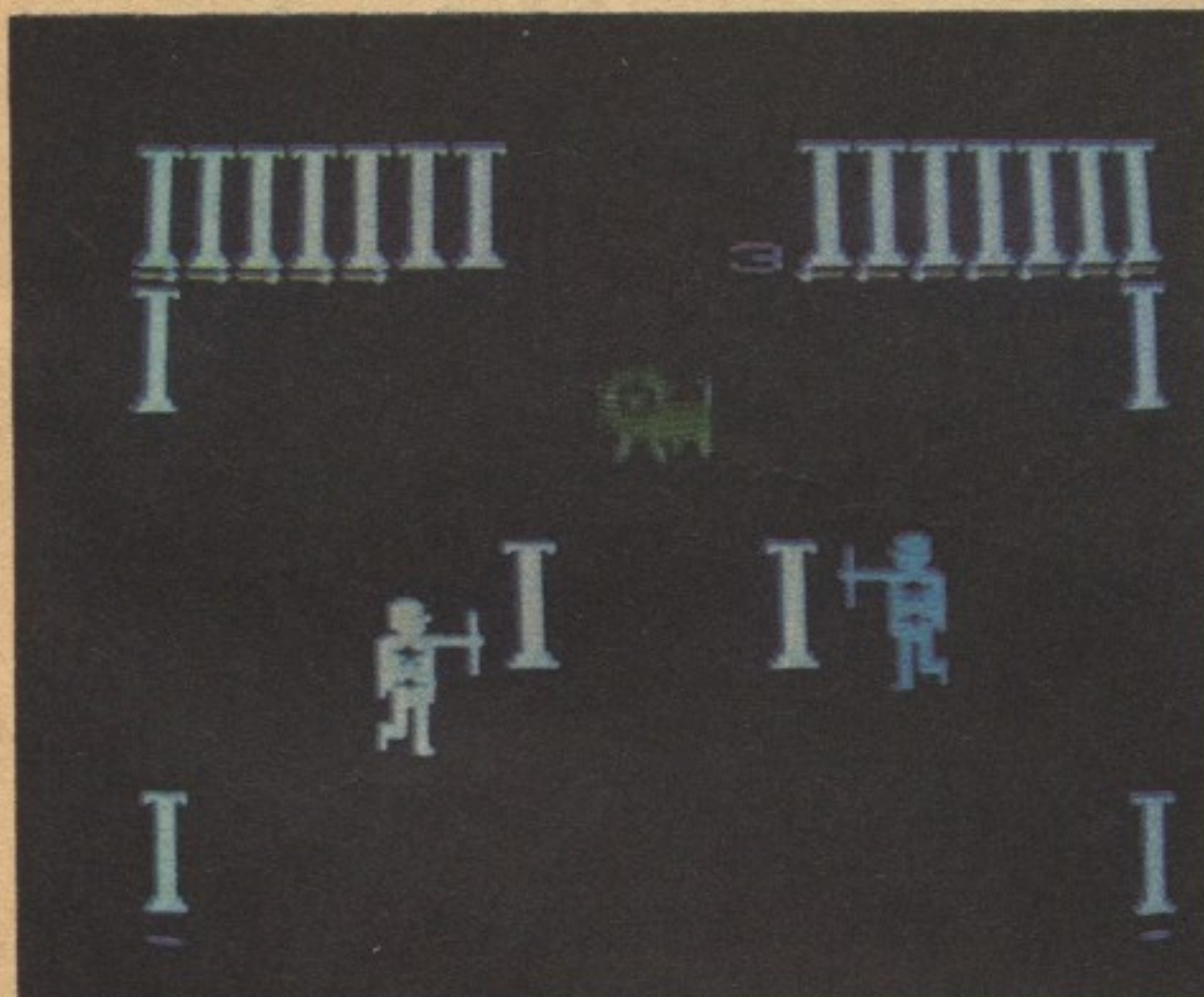
Hut, hut! The wide receiver takes off on a deep post. How's your defense? You dodge the blocking back, but can you get to the quarterback in time? Only a jarring tackle can save a touchdown.

Test your skill at word-building with Wordwise-1. How many words can you make out of ten letters? Match your wits with the family. A superstar may be looming on the horizon.

It's easy to enjoy the Video Brain. Just hook it up to any standard TV. And you have 16 different colors at your control if you use a color set! Create your own vivid learning environment!

A Complete Vivid-Color System

Intecolor 8031. Microcomputers are known for their capability for handling an incredibly diverse range of business, control, research and financial applications. The 8031 desk top computer does all of this—*in color!* It features a compact 13-inch 8-color CRT and comes complete with graphics hardware and software. And it includes 12K ROM and 8K RAM, a built-in 5¼" mini-disk drive for extra storage, plus "File Handling BASIC" which lets you create, delete and retrieve program segments from storage by name.

A detachable keyboard presents the standard ASCII code. All of the display commands can be entered either through the serial input port or the keyboard. The keyboard input port has the highest priority of all inputs or outputs. The keyboard keys are optically encoded by means of photo-transistors, a light source and shutters attached to the keys. There are no switches to wear out and the unit is Radio Frequency Interference-free.
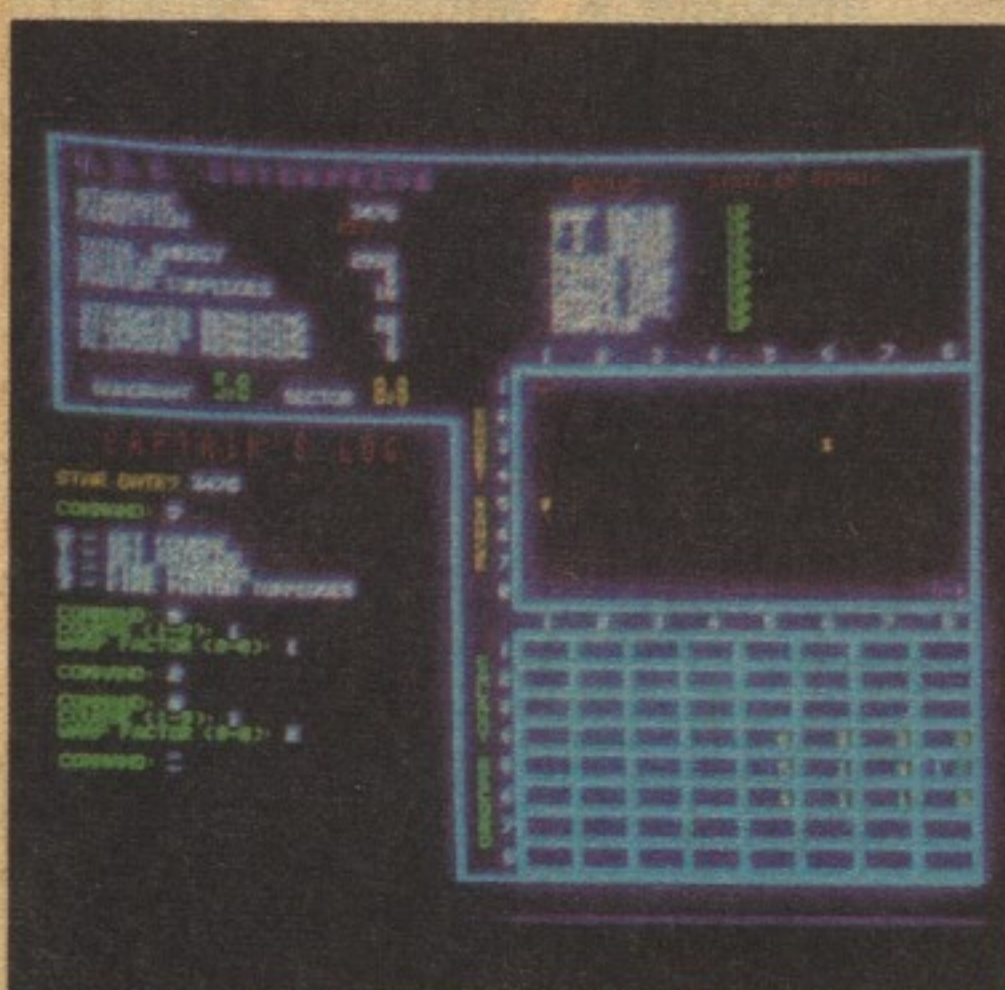
The 8031 can support a number of I/O devices, from the CRT display and the RS232C I/O to devices supplied by the user. Devices may be assigned functions by the System Monitor "S" command or by the user's program. This makes it possible to write programs which read from several different input devices and write to several different output devices of the program's choosing, without requiring any human intervention.

BASIC 8031. An incremental compiler which provides immediate translation and storage of user programs being input is included. This method decreases the response time of a RUN command and increases execution speed. BASIC 8031 has 24 key word programs statements, 13 editing and command statements, 18 mathematical functions, 9 string functions and 18 two-letter error messages.

BASIC 8031 is simple to learn and once learned has the facility of advanced techniques to perform more intricate manipulations or express a problem more efficiently. It provides for alpha-numeric character string, I/O and string variables, and allows user defined functions and assembly language sub-routine calls from user BASIC 8031 programs.

Computer with CRT and disk drive, 8K RAM, 12K ROM. 15¾x21¼x19¾". Keyboard, 2¾x18½x5½". For 120VAC.
81-1410. Shpg. wt. 73 lbs. **4495.00**

- *Intelligent Systems Corporation Brings You Color Graphics with Plotting – At a Black-and-White Price*
- *Includes Built-In Disk Drive and Provisions for One More*
- *Stores Over 80K Bytes Even Before Peripherals Are Added*
- *Complete with an Extended Disk BASIC Software Package*

## Whatever Your Program, It'll Look Better in Color

Star Trek is a good example of the games the 8031 can handle, but also demonstrates the process scientists would use in solving real world problems. The added dimension of color gives it the versatility black-and-white systems lack.

Can you beat the computer? When not using your computer for business purposes you can spend hours playing challenging games — in vivid colors. Many game programs are available or you can design and program your own.
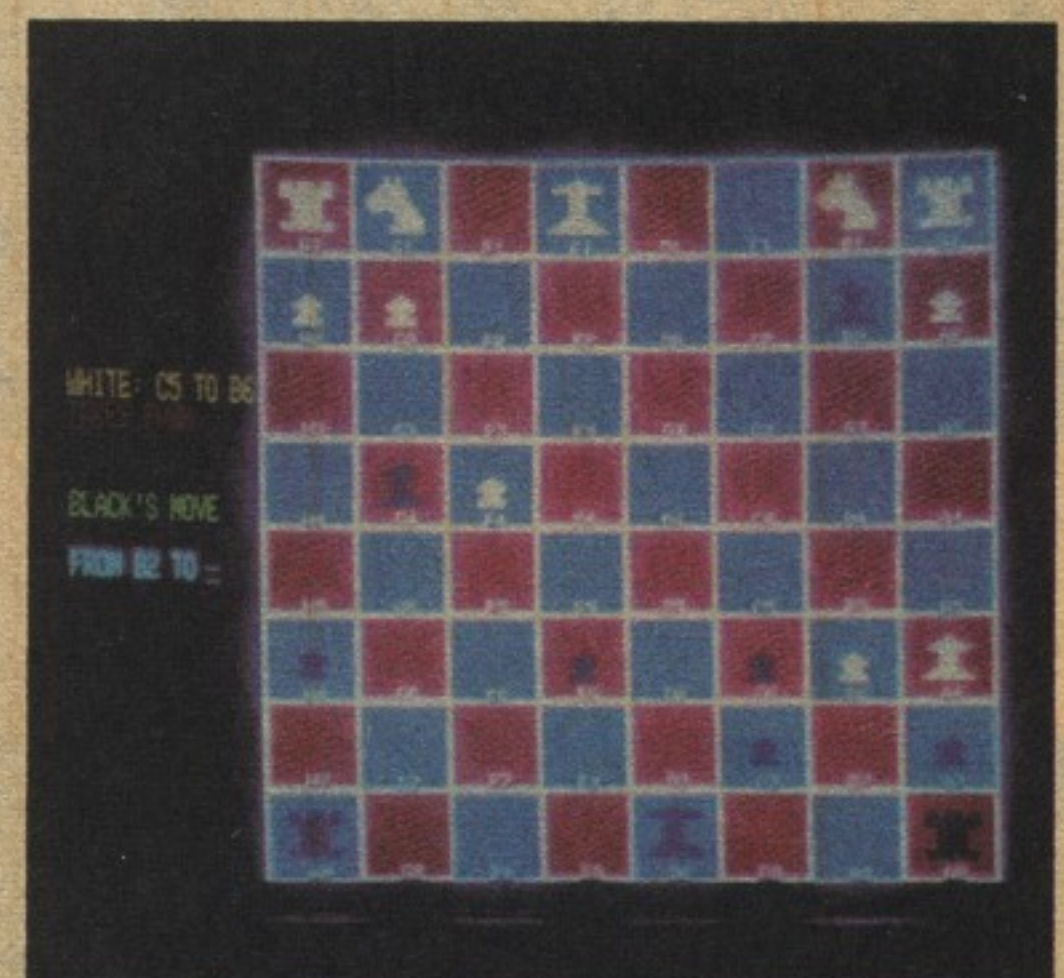
Imagine how difficult it would be to interpret this chart if it were displayed in black-and-white. When your application calls for complex charts, the 8031's color capability is hard to beat.
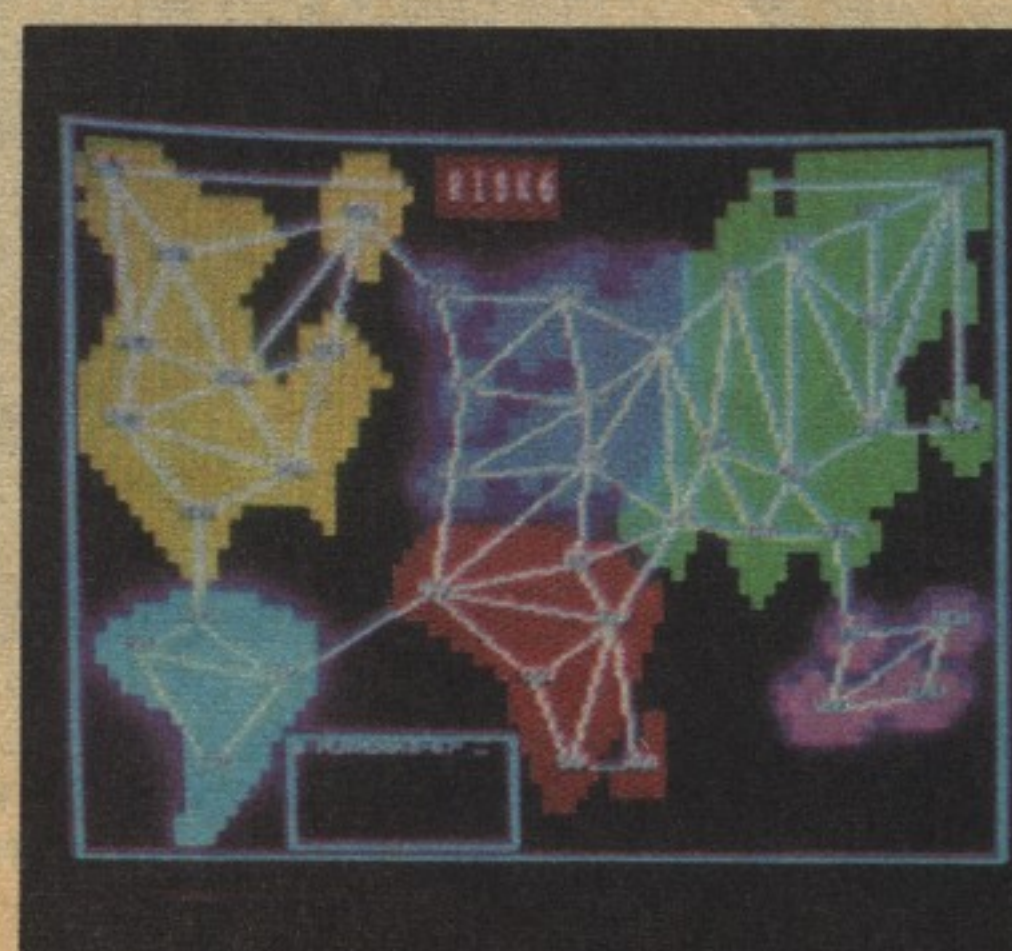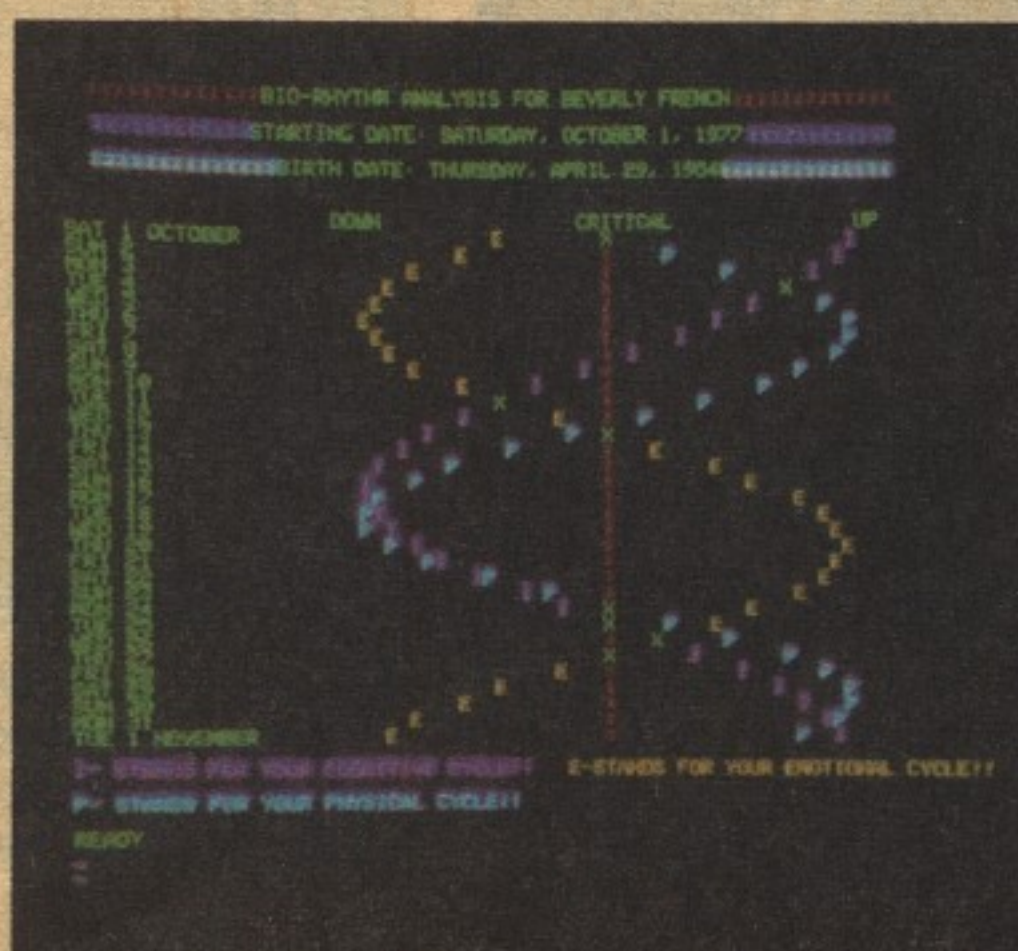
Whether your applications involve international business, financial analysis, engineering or home use, color is the key to easier-to-read charts, graphs and illustrations.

Order by Phone – Call Tandy Computers TOLL-FREE at 1-800-433-1679

IMSAI VDP-80. A compact computer/intelligent terminal with dual floppy disk storage that fills the range of information processing needs for small businesses through major corporations.

The basic configuration consists of a 12" CRT capable of displaying 24 lines of 80 characters per line, dual PerSci floppy disks (512K each diskette), 64K bytes of RAM and a full function microcomputer-based alphanumeric keyboard with 10-key numeric pad and control keys. Memory may be expanded to 196K bytes in 16K byte increments. Under program control, the dual floppy disks are capable of storing 512K bytes each for a total of one megabyte.

The 8085-based microprocessor board comes with parallel and serial I/O ports. The input side of the parallel port handles the keyboard. The output side can be used to drive a printer or a plotter. The serial port supports the synchronous (including bisync) and asynchronous communications with programmable baud rates from 56 baud to 19.2 kilobaud.

Software provided with the VDP-80 comprises a comprehensive array of operating system capabilities within the context of high-level languages such as IMSAI's extended and commerical BASIC or ANSI Fortran IV, and Assembler with relocatable code, linking loader, file management, disk space management, etc.

Protected field formatting in inverse video combined with character and line insert/delete provides the data entry and text editing capabilities required for business applications. 2K ROM monitor for debugging and diagnostic test capability. IMSAI DOS-A required. For 120VAC, 50/60Hz. 14½x24x24". Factory assembled and tested.
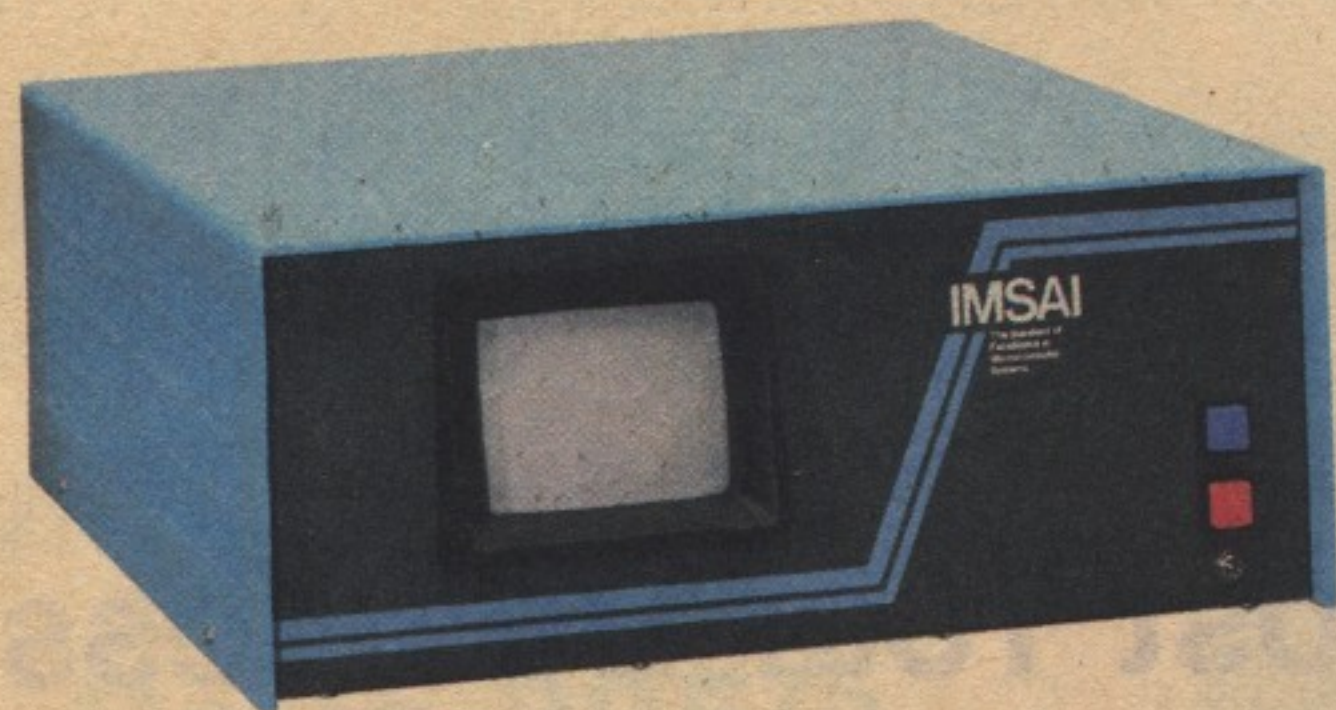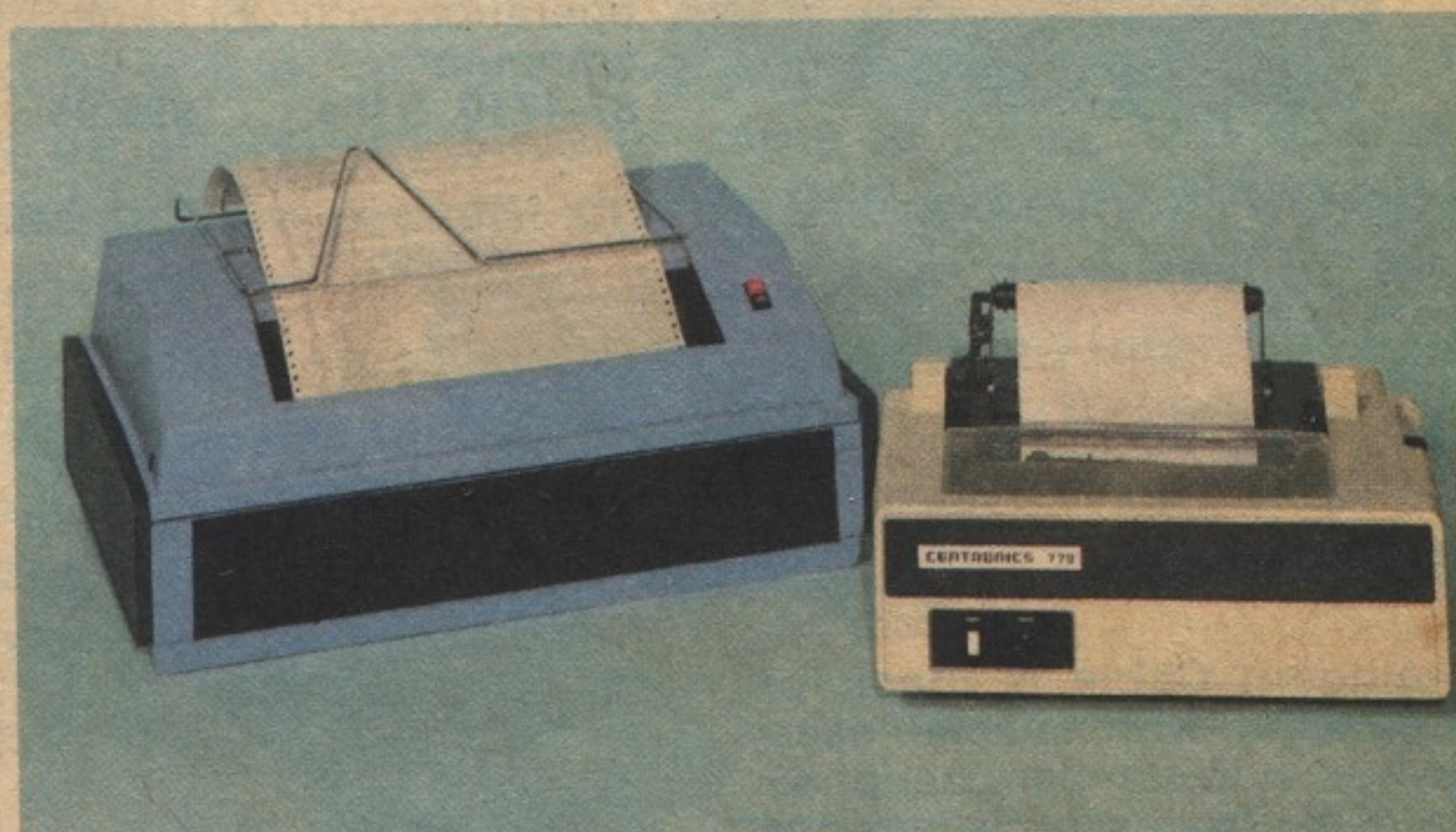**81-1404.** Shpg. wt. 110 lbs. **6740.00**

Self-Contained Computer With Megabyte Disk Memory

Add a printer to your VDP-80! Both feature up to 132 standard ASCII characters per line.
IMSAI PTR-300B. Tractor feed. 300 lines per minute.
88-1007. Shpg. wt. 70 lbs. **3695.00**
Centronics 779. Pinch roll feed. Up to 130 lpm. (Interface required.)
88-1002. Wt. 45 lbs. **1145.00**

Complete Video Computing Unit

Minifloppy Computing System with Intelligent Keyboard

IMSAI PCS-80/30. An integrated video computer with an intelligent keyboard, the IMSAI IKB-1. MPU speed of the 8085 is 3MHz. There's a full 3K of ROM monitor, 2¼K RAM and eight expansion slots on the terminated and regulated 10-slot motherboard for RAM expansion boards. Built-in 5" high-resolution (4MHz) video monitor has an extra-capacity 24x80 screen format. Graphic/edit provides graphics and text editing features with character and line insert/delete on the display. Both ASYNCH and SYNCH data transmission are provided for. Two serial ports and one fully-implemented parallel port. The keyboard is microprocessor driven and has "N" key rollover and tiered construction for a typewriter-like feel. The 28-amp power supply assures stable performance. Computer, 7x19½x17". Keyboard, 3⅛x15x8⁵/₁₆". For 120VAC, 50/60Hz.
81-1406. Kit Form. Shpg. wt. 38 lbs. **1199.00**
81-6406. Factory Assembled. Shpg. wt. 38 lbs. **1499.00**

IMSAI PCS-80/35. This system features an 8085-based computer with two Shugart minifloppy disk drives built in and a microprocessor-driven keyboard. The extra-fast 8085 has an MPU speed of 3 MHz. Control Program/Monitor runs with the minifloppies. The included DIO interface board will simultaneously operate standard, double density and minifloppies. Totally compatible with all IMSAI software. 2¼K of RAM is provided, as are eight expansion slots on the terminated and regulated 10-slot motherboard. Optional 4K, 16K, 32K or 64K RAM expansion boards can be used. Also, there is a full 3K of ROM monitor. The IKB-1 intelligent keyboard features "N" key rollover and tiered construction for a true typewriter touch. Provides both ASYNCH and SYNCH data transmissions. The unit has two serial ports and one fully implemented parallel port. 28-amp power supply for stability. Computer, 7x19½x17". Keyboard, 3⅛x15x8⁵/₁₆". For 120VAC, 50-60 Hz.
81-1405. Kit Form. Shpg. wt. 37 lbs. **1995.00**
81-6405. Assembled. Wt. 37 lbs. **2245.00**

3-Slot Card Cage
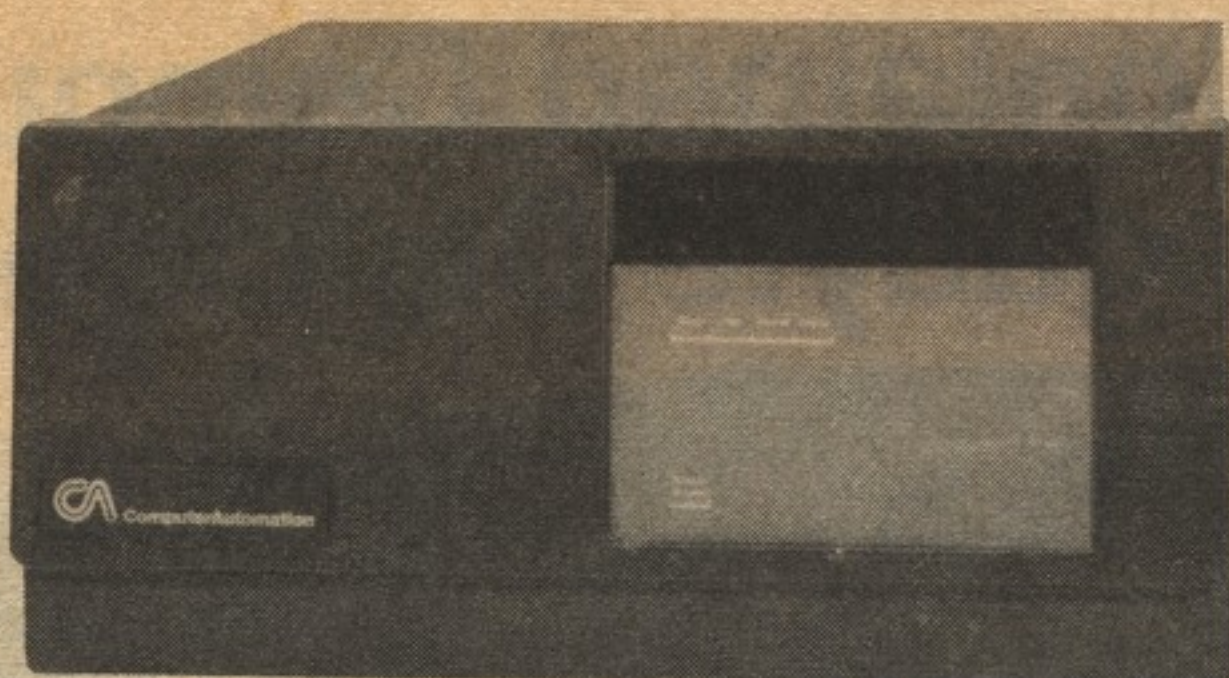
The NAKED MILLI Card Cage is designed for maximum flexibility at minimum cost. Contains motherboard, card guides and retaining hardware for standard half cards. The cage can be mounted on any flat surface in any plane. 8¾x19¼x18½".
87-512. Shpg. wt. 27 lbs. **599.95**

Floppy Disk Controller
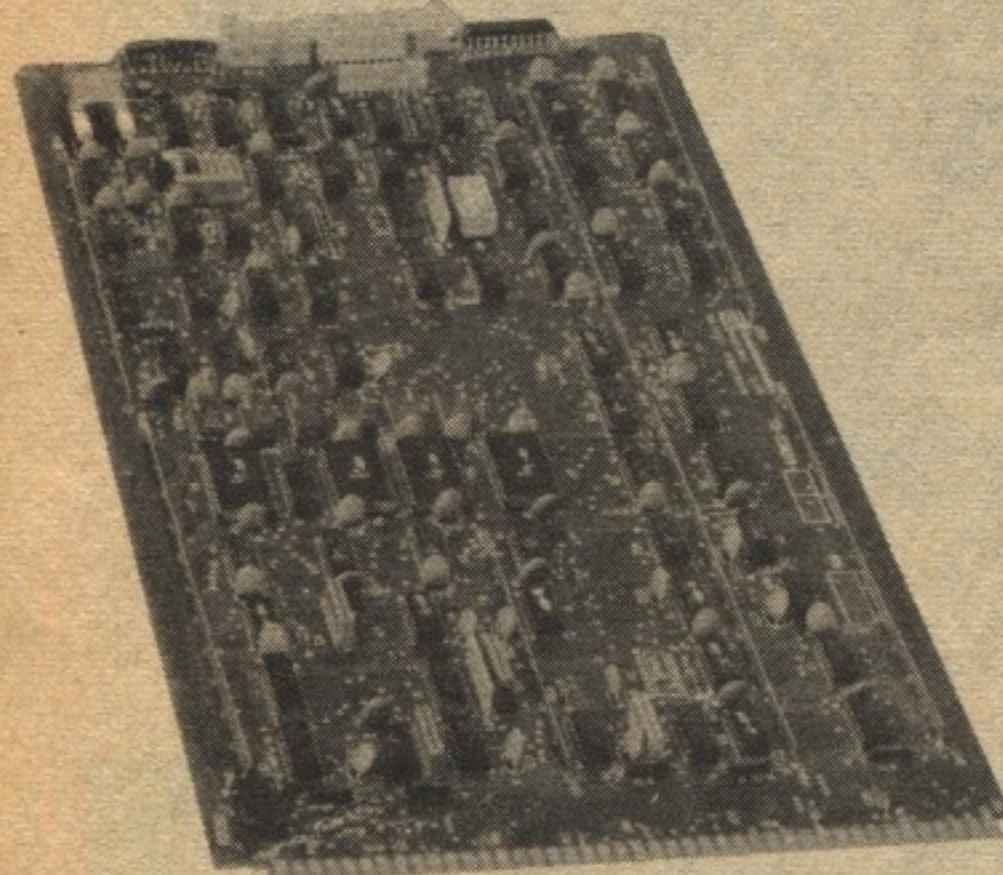
Low cost, micro-programmed controller designed to support up to four floppy disk drives. Includes Direct Memory Access, automatic error detection. Implemented on a standard half card for simple installation and operation with LSI Series computer.
87-1710. 3 lbs. ... **995.95**

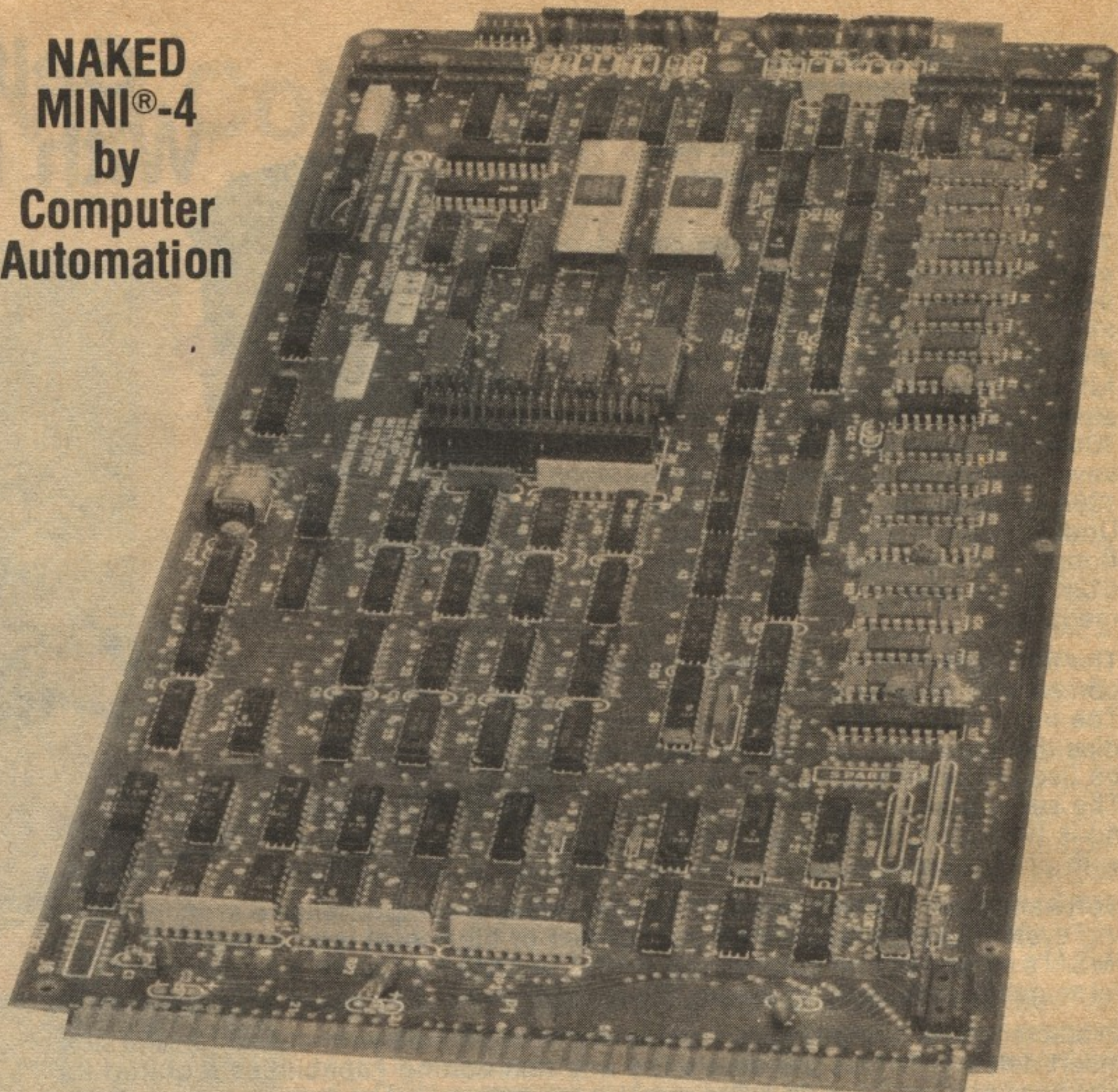## NAKED MINI®-4 by Computer Automation
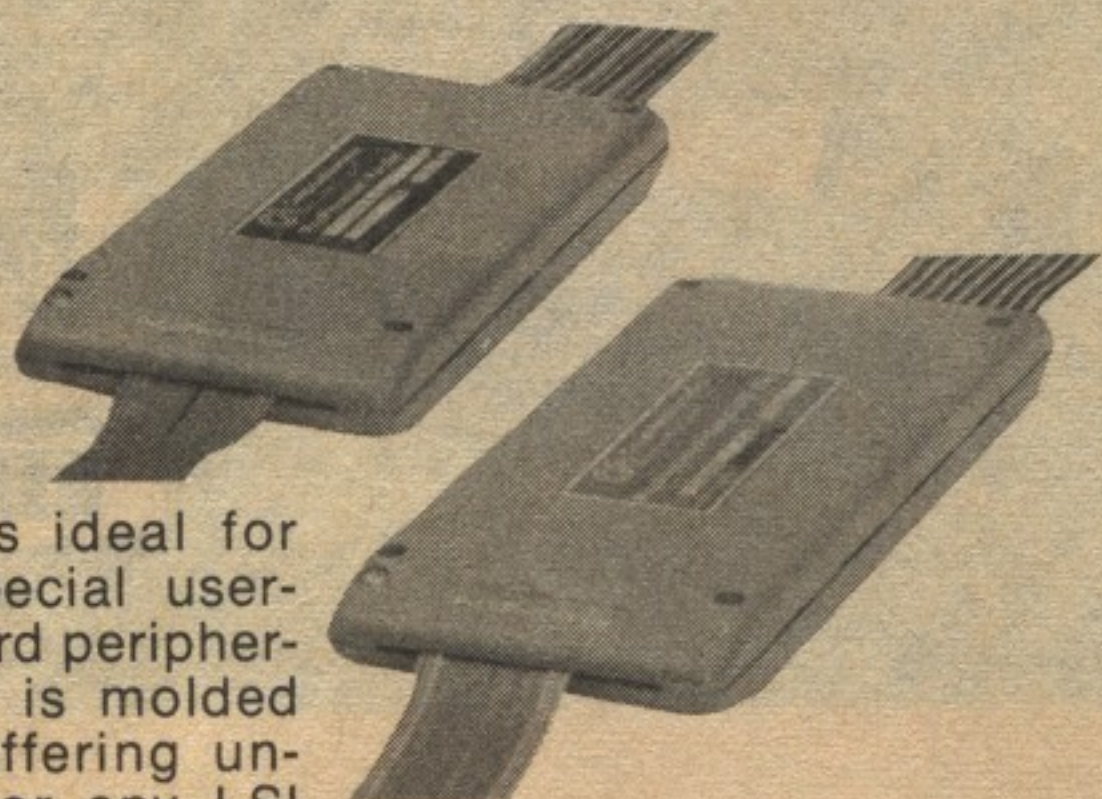
Cable Interface

Intelligent Cable is ideal for interfacing with special user-devices, non-standard peripherals. PicoProcessor is molded into each cable, offering unusual versatility. For any LSI Series computer using Distributed I/O System.
87-1330. Serial I/O. Shpg. wt. 3 lbs. **299.95**
**87-1230. Parallel I/O.** Shpg. wt. 3 lbs. **299.95**

## 16-Bit Processor at an 8-Bit Price

LSI 4/10. The very latest in computer technology—a complete 16-bit minicomputer-on-a-board at a microcomputer price. The single printed circuit board contains a high-speed processor with a powerful instruction set (85 instructions), 4K RAM and four Distributed I/O channels. And all for the price of a typical processor board! The on-board Distributed I/O channels allow ComputerAutomation's PicoProcessor-controlled Intelligent Cables to cut the cost of interfacing by as much as half. The 4/10 features multiple general-purpose registers, stack registers, 64K-word direct addressing, plus word and byte operations. And this capability is supported by six levels of priority vectored interrupts. Addressing modes include absolute, relative and indirect in several combinations with pre and post indexing. Selectable I/O modes are Programmed, Automatic and DMA, all of which transfer word or byte data.
81-1041. Shpg. wt. 3 lbs. **799.95**

Boost Your Business with 16-Bit Power
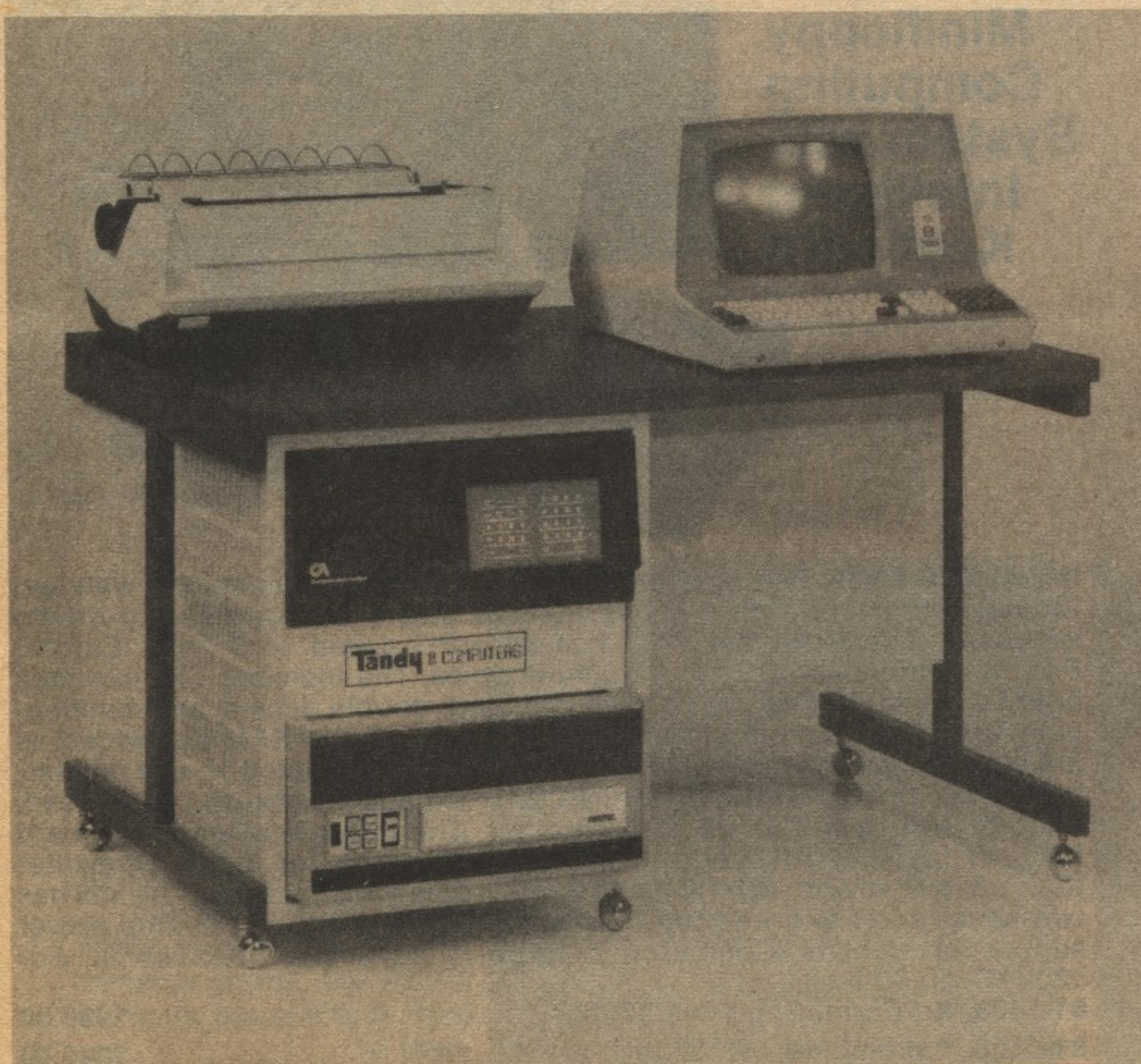
NAKED MINI-4 System. The complete system for all your business needs! ComputerAutomation successfully links the entire minicomputer spectrum with a common system of processor architecture. It's a computerization solution conceived in totality—processors, memories, interface, peripherals, software and support linked in a continuum. Inside the NAKED MILLI card cage is the LSI 4/10, a complete, 16-bit printed circuit board that contains a high-speed processor with an 85-instruction set, 4K RAM and four Distributed I/O channels. The LSI 4/10 includes stack registers, general-purpose registers, 64K-word direct addressing and six levels of priority vectored interrupts. Addressing modes include absolute, relative and indirect. The floppy disk controller used in the system includes automatic error detection and Direct Memory Access. ComputerAutomation's Intelligent Cable is implemented as an interface. Let our sales staff help you choose peripherals to fit your particular needs! The NAKED MINI-4 System can support a floppy disk system for ½ megabyte low-level storage—you get up to 10 megabytes with hard disk access memory storage! A video display capable of displaying 80x24 lines may also be added, along with a hard copy printer terminal. We'll help you form the most cost-effective system possible. And this means unlimited flexibility at a price that won't flex your budget.

Alpha Microsystems Updates the Famous 8080
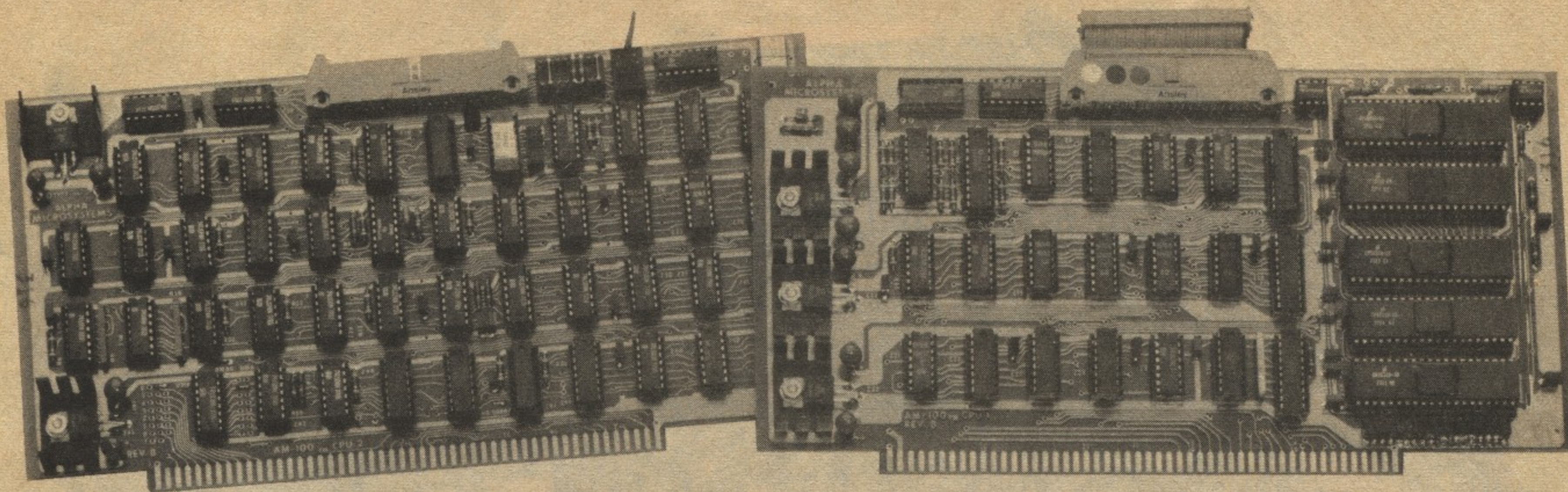
AM-100™. Based on Western Digital's advanced WD-16 microprocessor, the AM-100 is a 16-bit, 2-card CPU that replaces the 8080 microprocessor in an S-100 bus type computer. It gives you the programming power and flexibility of a minicomputer while allowing a large selection of S-100 peripherals for tailoring a system to specific needs. It's the ideal system for businesses—perform daily accounting, inventory control and design problems at the same time! Hardware limitations of the 8080 have made microcomputer timesharing impractical for the personal computer enthusiast. The AM-100 puts at your command a system which easily accepts multi-tasking from a multiple user structure. In addition, the system lets you control priorities and allocate memory requirements for each job activated. There is even a security system to prevent unauthorized access to the data files. No installation problems with the AM-100 — the processor interfaces to the popular S-100 bus by an advanced multiplexing method. Simply replace the 8080 CPU card in your S-100 system with the AM-100, and your micro becomes a mini. The BASIC language processor implemented is a compiler, as opposed to interpreters. It reads the source code statements and generates a compacted and fully resolved object code program. The program is then executed by a special runtime package which is reentrant and may be shared by several users at once. The source code need not be present during this execution, thereby reducing memory requirements. Other features of the AM-100 include multi-level DMA and vectored interrupt system, multiple pass macro level assembler and linking loader, and free-form text editor and letterwriting text formatter. In all, the AM-100 lets you enjoy up to 10 times the throughput of an 8080 system.

81-1001. Shpg. wt. 4 lbs. **1495.00**

Set New Trends with the AM-100

Save 385⁷⁵

Reg. Separate Items 7980.75

7595⁰⁰

AM-100 System. Purchase this deluxe system and enjoy big savings! We've combined the 16-bit flexibility of the AM-100 with hardware and peripherals made by some of the best-known names in computer technology. The system meets the needs of large businesses as well as universities and other schools. And you can use the money you're saving to purchase additional software. There's always room for expansion!

- AM-100 Microprocessor (81-1001)
- Vector I Cabinet (70-408)
- Soroc IQ 120 Video Terminal (87-202)
- 4 8K Boards (82-801)
- ICOM Dual Floppy Disk Drive (84-805)
- Imsai Serial I/O Board (87-1304)
- Centronics 779 Printer (88-1002)

**Complete System.** Shpg. wt. 170 lbs. **7595.00**

Sol-20 Computer by Processor Technology

- *High-Level Computer Power at a Low-Level Price*
- *8080-Based Terminal Computer*
- *8K Static RAM Included*
- *Handsome Case Accented by Solid Walnut End-Panels*

Processor Technology Sol-20. The Sol-20 kit is the *complete* small computer, with sophisticated hardware, powerful software and a full line of versatile peripherals. And it's easy to use! Thanks to Sol's plug-in ''Personality Modules,'' Sol is programmed to receive your instructions the moment you turn it on. Need big-computer versatility? Sol can be tailored to accomplish virtually any task with such optional accessories as additional solid-state memory modules, the Helios II disk storage system, video monitor, joystick, printer and modules. A computer is only as powerful as its software allows it to be. Processor Technology's contribution to software excellence is Sol BASIC, a versatile, impressive collection of three versions of the most popular language ever developed. Sol is based upon the popular 8080A microprocessor, still the benchmark of computers-on-a-chip. And from the custom 85-key upper and lower case keyboard to its handsome walnut and metal cabinet, it's designed for the maximum in user convenience, flexibility and computing power.

81-1403. Kit Form. Shpg. wt. 47 lbs. 1350.00
81-6403. Factory Assembled. Shpg. wt. 50 lbs. 1850.00
88-1003. Sol-20 Printed Circuit Board Alone. Shpg. wt. 5 lbs. 575.00
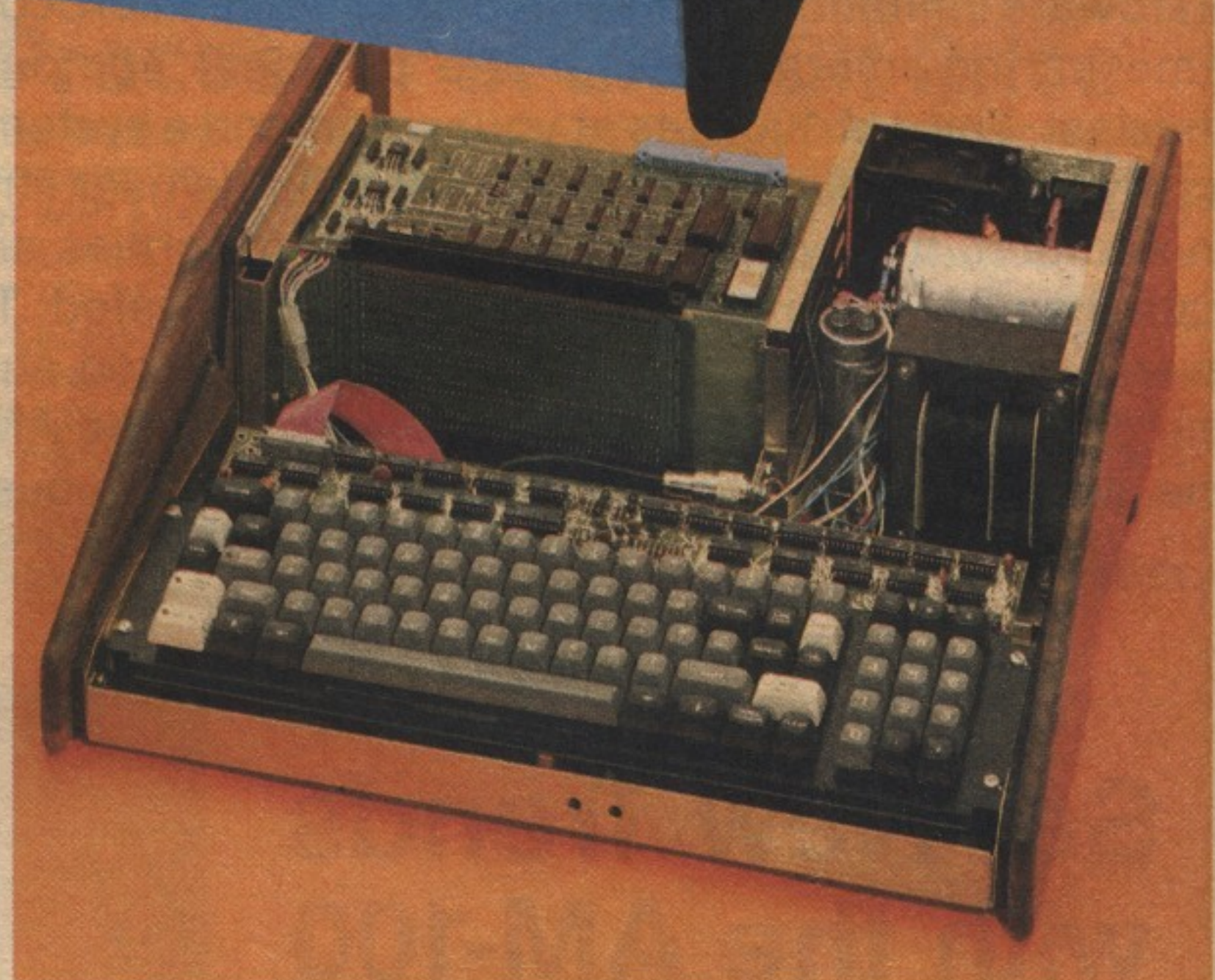
Upgrade Your 8080 or Z-80 Computer with Subsystem B

If you are one of the many computer enthusiasts who acquired one of the early computers, chances are you're the owner of a powerful but now impractical ''metal box'' that can only be programmed by flipping a seemingly endless sequence of front panel switches. Sol-20 ends all that! You can't match its complete systems integration, the typewriter-like keyboard, and the ready-to-use software of a Sol-20, but you *can* upgrade your computer-in-a-box to near-Sol standards with Progressive Technology's Subsystem B. Subsystem B has everything you need to add Sol power to the older 8080 and Z-80 computers-in-a-box made by Mits, Imsai, Byte, Inc., and VectorGraphics.

Subsystem B is available as a complete package of 5 modular cards complete with housing or as individual cards. Three input/output cards give your computer a powerful video display capability, a cassette tape interface, and both parallel and serial input/output channels for con-

necting a keyboard, paper tape reader, teletypewriter, and many other peripherals to your machine.

Will Subsystem B bring your computer up to Sol's capabilities? No computer-in-a-box can match the convenience and versatility of Sol's fully integrated construction and self-contained keyboard. But when it comes to computing power, software's the name of the game, and *all* Progressive Technology software will run in an 8080 or Z-80 machine upgraded with the Subsystem B.

This may be your best solution to the dilemma of the computer-in-a-box. System includes five S-100 boards — three parallel/serial I/O card, 16K RAM, video display monitor, CUTS, GPM. Save $100 off regular separate item prices!

87-2201. Kit Form. Shpg. wt. 9 lbs. 895.00
87-7201. Factory Assembled. Shpg. wt. 10 lbs. .. 1095.00

Order by Mail – Tandy Computers, P.O. Box 2932, Fort Worth, Texas 76101

Expand Your System with Disk Storage

Helios II. The best way to increase the power of a computer is to add a fast-access memory system with mass data storage capability like the Helios II. A dual flexible disk driver and controller, Helios II is one of the fastest, highest capacity microprocessor-based disk storage systems available. Helios II can load an 8000-byte program in a scant 0.3 second. Storage capacity? Helios II can squeeze an incredible 386,000 bytes on any standard 32-hole flexible diskette. And that's not all. Helios II is a complete data storage package, not an incomplete collection of parts and programs. The hardware consists of a precision dual drive, microprocessor-based controller, power supply and interconnection cables — all enclosed in a striking cast-aluminum cabinet. The software is equally impressive. A 12K assembly language program is included with the system as is DISK FOCAL, a conversational language that will allow you to immediately write your own programs. A powerful DISK BASIC with many advanced programming features is available as an optional accessory. Helios II is supplied with full system documentation.

84-807. Kit Form. Shpg. wt. 145 lbs. 2295.00
84-5807. Factory Assembled. Shpg. wt. 145 lbs. 2595.00

Save 334⁹⁵

Reg. Separate Items 6929.95

6595⁰⁰

- **Sol-20 Microcomputer Kit (81-1403)**
- **Helios II Disk Storage System (84-807)**
- **Centronics Printer w/Interface (88-1002)**
- **Koyo Terminal (87-602)**
- **48K RAM (3 each) (82-1602)**
- **Realistic Cassette Recorder (14-841)**
System shpg. wt. 150 lbs. 6595.00

Save Now and Enjoy These Complete Sol-20 Systems

1560⁰⁰

- Sol-20 Microcomputer Kit (81-1403)
- Koyo Terminal (87-602)
- Software and Interfaces
- Realistic Data Cassette Recorder (14-841)
System shpg. wt. 62 lbs. Kit 1560.00

Save 233⁹⁰

Reg. Separate Items 4128.90 **3895⁰⁰**

- Sol-20 Microcomputer W/16K RAM (81-6403)
- Koyo Terminal (87-602)
- ICOM MiniFloppy Dual Disk System (84-1703)
- Software and Interfaces
- CTR-41 Realistic Data Cassette Recorder (14-841)
System shpg. wt. 73 lbs. Assembled 3895.00

Save 309⁹⁵

Reg. Separate Items 3304.95 **2995⁰⁰**

- Sol-20 Microcomputer W/8K RAM (81-6403)
- Koyo Terminal (87-602)
- ICOM MiniFloppy Disk System (84-1703)
System shpg. wt. 70 lbs. Assembled .. 2995.00

Save 500⁹⁰

Reg. Separate Items 6495.90 **5995⁰⁰**

- Sol-20 Microcomputer (81-6403)
- Koyo Terminal (87-602)
- Practical Automation Printer (88-1102)
- Digital Systems Dual Disk (84-802)
- Realistic Data Cassette Recorder (14-841)
- Software and Interfaces
System shpg. wt. 145 lbs. Assembled 5995.00
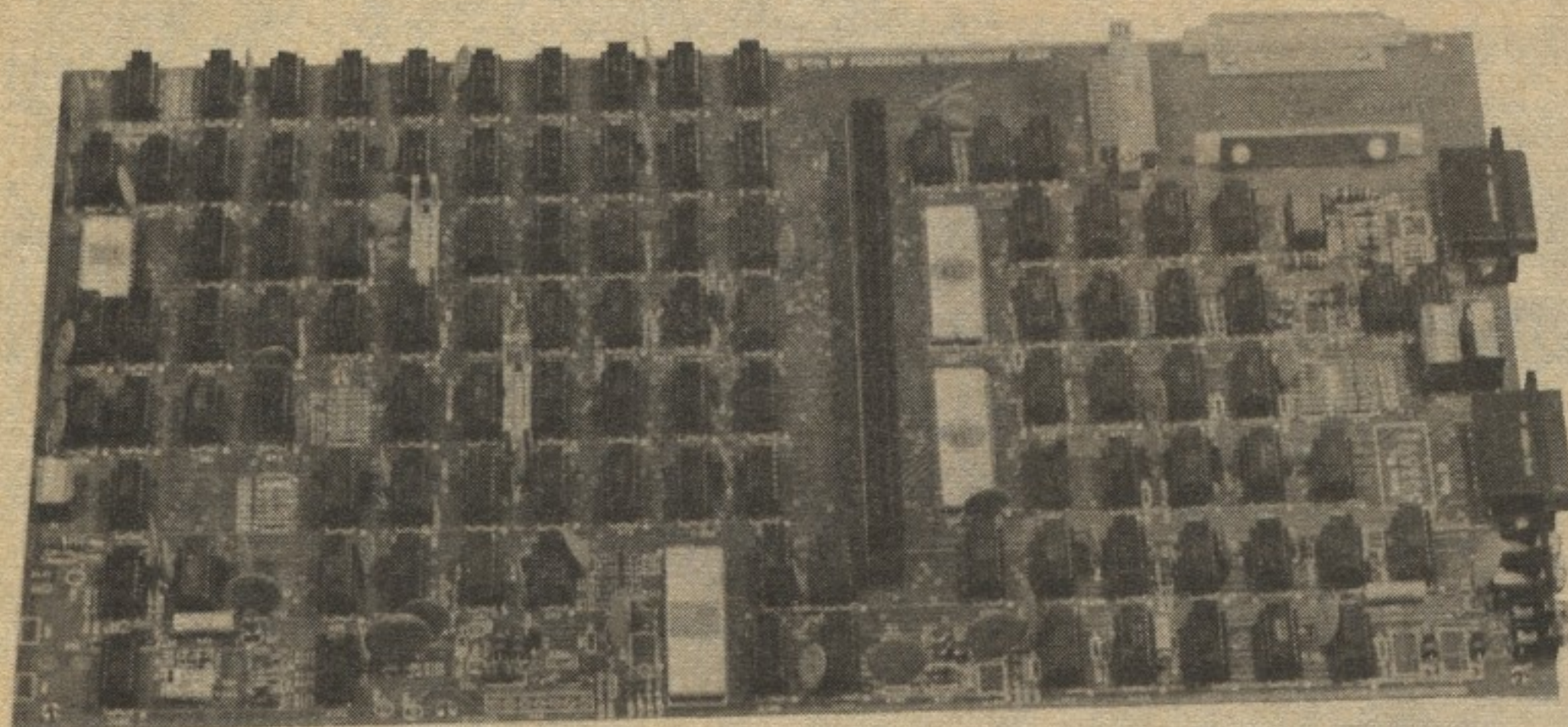
Tandy Has CPU Boards for Any System

Get More Computing Power with the Sol-20

Build your system around this powerful microprocessor board. Processor Technology's Sol-20 is based on the ultra-successful 8080 chip. Power and versatility highlight the Sol's operation — includes 78 instructions with 244 variations, 10 CPU registers, 8-level vectored interrupts. The addressing range contains 65,536 bytes of memory and 256 ports. Addressing modes include direct, immediate, register and register direct. A crystal-controlled clock is incorporated into the processor board. Operates with single voltage requirements.

**81-1003.** Shpg. wt. 4 lbs. **575.00**

Poly 88
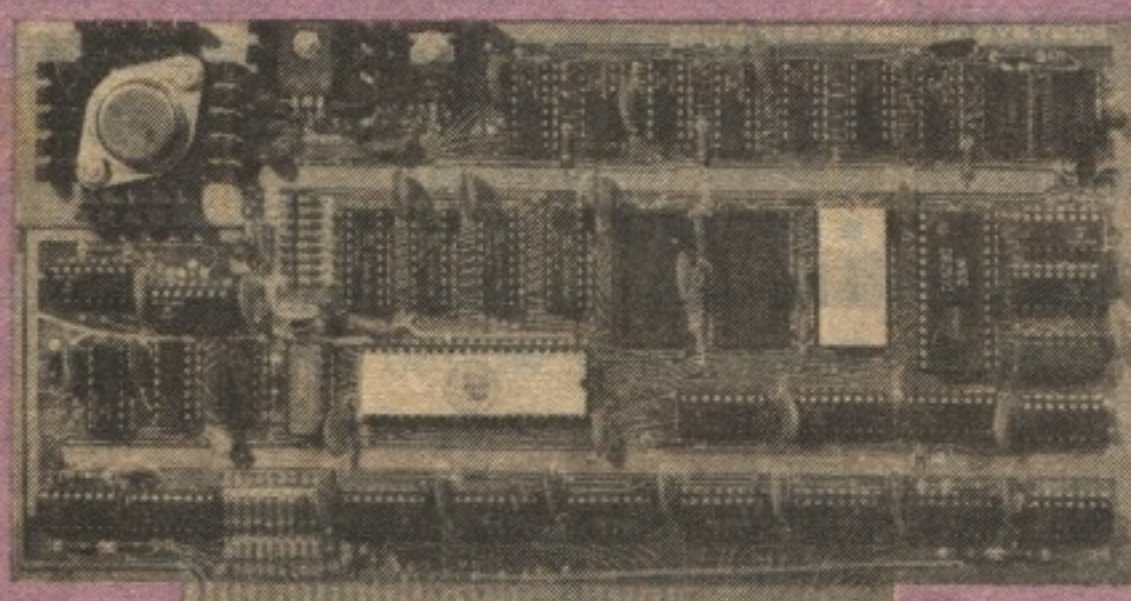
PolyMorphic Systems' microprocessor is an 8080A type card, S-100 compatible, and features 78 instructions with 244 variations, 10 CPU registers, an addressing range of 65,536 bytes of memory and 256 ports and 8-level vectored interrupts. Addressing modes include direct, immediate, register and register direct. The Poly 88 incorporates crystal-controlled and real-time clocks, and has a software-controlled baud rate. Its outputs drive 30 TTL loads, and inputs are rated at one TTL load. Requires 8VDC and ±16VDC.

81-1002. Shpg. wt. 2 lbs. **215.00**

ZPU Card
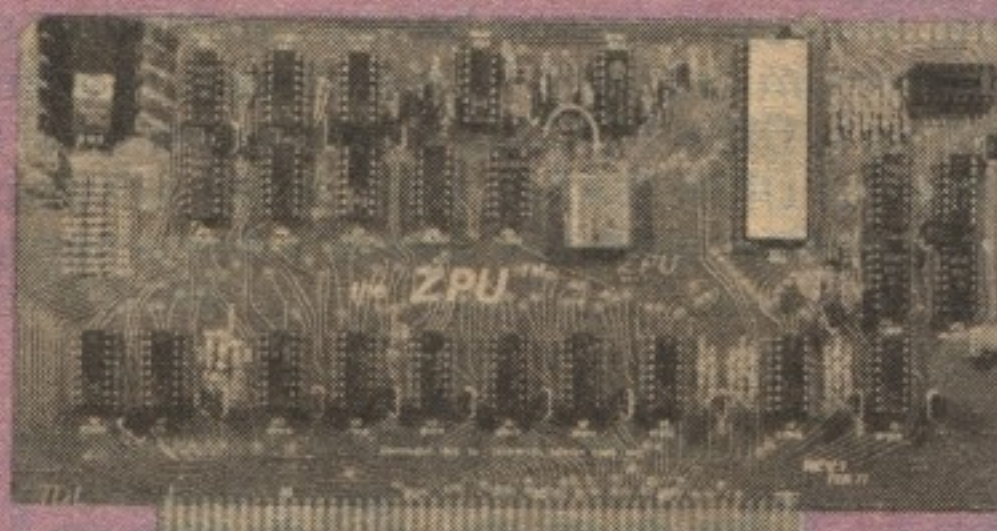
Technical Design Labs' ZPU is an S-100 compatible CPU card based on the Z-80 microprocessor by Zilog. Unmatched power is realized with 158 instructions, 696 opcodes, 22 registers, single voltage power requirements and static operation. One of two on-board clocks is a variable oscillator that lets you "fine-tune" your system. Bus lines are fully buffered to prevent static damage. Extensive use of bypass and decoupling capacitors facilitates higher clock speed operation.

81-1004. Shpg. wt. 2 lbs. **269.00**

Equinox 100

One of the most powerful front panels available. Based on the 8080A, the Equinox 100 combines the CPU board and the front panel board into a single, intelligent, highly accessible unit with complete programming and debugging capability. The CPU is S-100 compatible with an extensive choice of peripheral components and software, including BASIC. All 8 internal registers can be accessed directly from the front panel. Large LED digits display contents of any CPU register, I/O device or memory location in concise octal format.

81-1010. Shpg. wt. 3 lbs. **250.00**

SWTP MP-A for the 6800
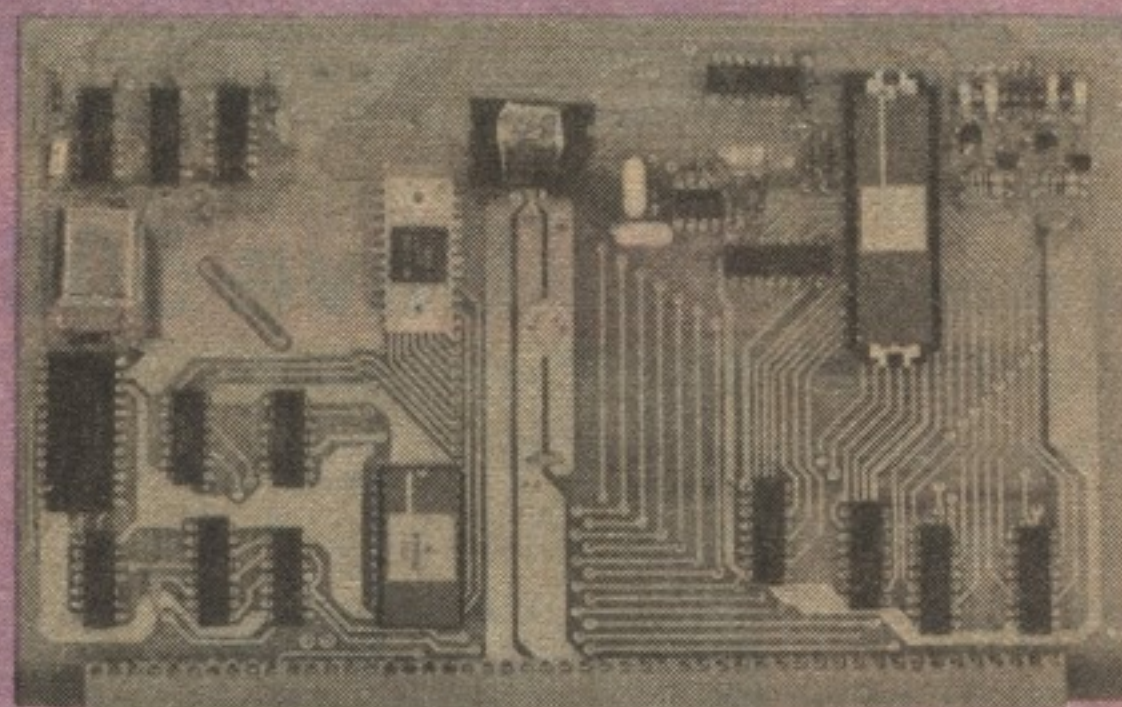
The 6800 microprocessor chip is the heart of SWTP's MP-A board, which contains ROM and 128-byte scratch pad memory for the ROM. There is a full complement of 72 basic instructions, with six internal registers. Addressing modes include direct, relative, immediate, indexed and extended. The MP-A features a clock oscillator, crystal-controlled clock driver, baud generator and data bus buffers. The 6800 chip has 16 memory/peripheral address lines. Operates with single voltage requirements. The 6800 uses a 50-conductor bus.

81-1006. Shpg. wt. 2 lbs. **145.00**

Tandy CPU-1 Contains 8080A
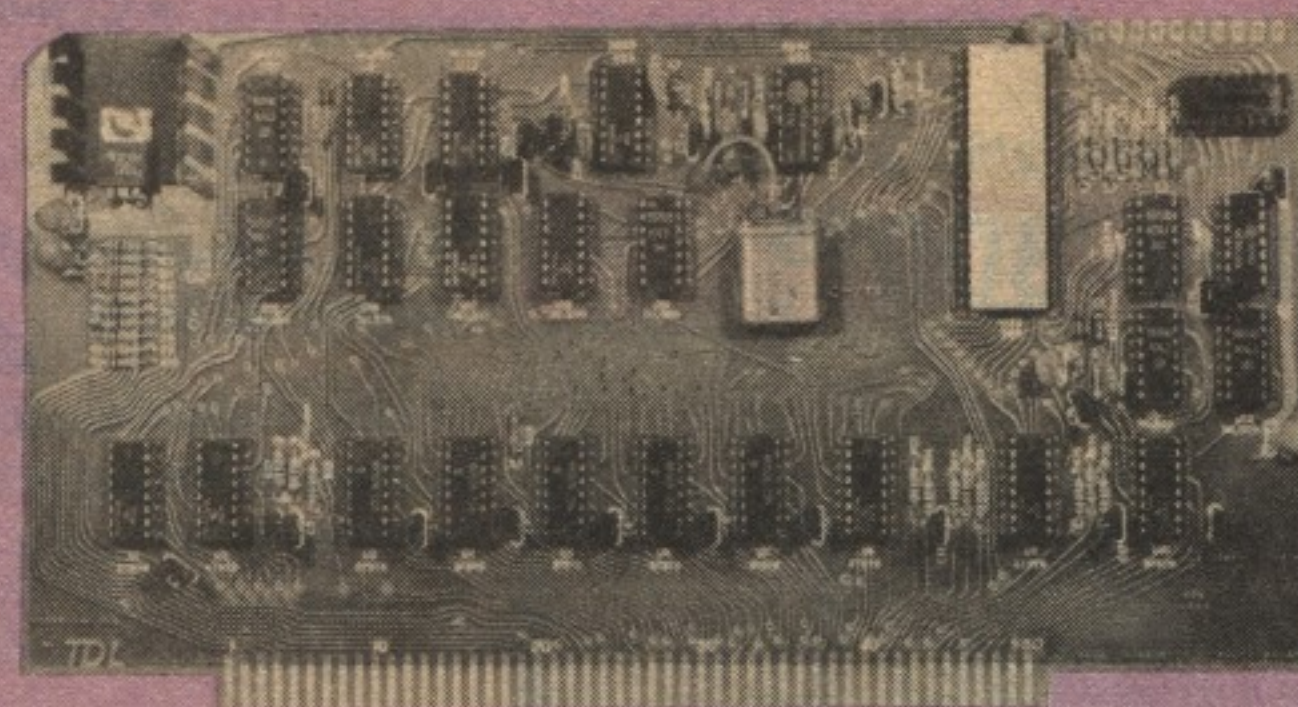
The CPU-1, S-100 compatible, incorporates the Intel 8080A microprocessor chip into a processor board that has a clock crystal oscillator and clock drivers, ROM monitor, automatic jump starts, parallel interface and on-board power supply voltage regulators. The CPU-1 features 78 instructions with 74 variations, a directly addressable memory of 65,024 words, 8-level hardware interrupts, and six registers plus stack pointer, program counter, accumulator and status register. Requires +8VDC and ±16VDC.

81-1005. Shpg. wt. 2 lbs. **99.95**

Tandy Hard Copy Printers Are Easy on the Budget

Many computer users require a permanent copy of a computer run for record keeping, correspondence, billing, financial statements or other reasons. This printed copy, or *hard copy*, can be produced by a Teletypewriter™-style terminal or a stand-alone printer designed specifically as a hard copy output unit.

Printers have several advantages over Teletypewriter terminals. Since printers are output devices *only*, they don't tie up an input keyboard when printing. Printers are also very fast and are ideal for use as a hard copy output alongside a video terminal.

Impact vs. Non-Impact Printers

All printers can be classified as either impact or non-impact. Impact printers produce print in the traditional way by striking a hammer against a ribbon and paper sheet. The simplest impact printers print a line character-by-character like a typewriter. A more advanced and correspondingly more expensive impact printer prints all the characters in a line of print simultaneously. These models can print up to a few thousand lines per minute.

Non-impact printers provide an even faster printing speed — up to 5,000 lines per minute. Some non-impact printers are more economical than the impact type, but their print quality is usually not as good. There are several types of non-impact printers. One kind uses heat-sensitive paper. Charac-

ters are formed by passing the paper over a row of thermal elements that produce outlines of digits and characters. Another kind prints on electro-sensitive paper. This paper is coated with a thin layer of black ink and then covered with an ultra-thin film of aluminum. An electrical pulse through a whisker-like print wire removes a small circle of aluminum and exposes a black ink dot. Characters are formed by dot patterns. Some very fast kinds of non-impact models project diagrams or characters on a video display onto light-sensitive paper. Another uses the Xerox process. Both of these methods are extremely fast (up to 18,000 lines per minute). Both are also extremely expensive.

Selecting Your Printer

No matter what your application happens to be, if speed is necessary then chances are one of the non-impact printers that prints on electro-sensitive paper will fill the bill. You can even purchase one that can print Lincoln's Gettysburg Address in under a second. If graphics is a desire you'll be pleased to know that most printers can be used to produce crude bar graphs and simple figures under computer control. Carefully consider the merits of both Teletypewriters and printers before buying. Some applications will benefit from both a Teletypewriter terminal *and* a printer, while others may require only a video terminal and printer.
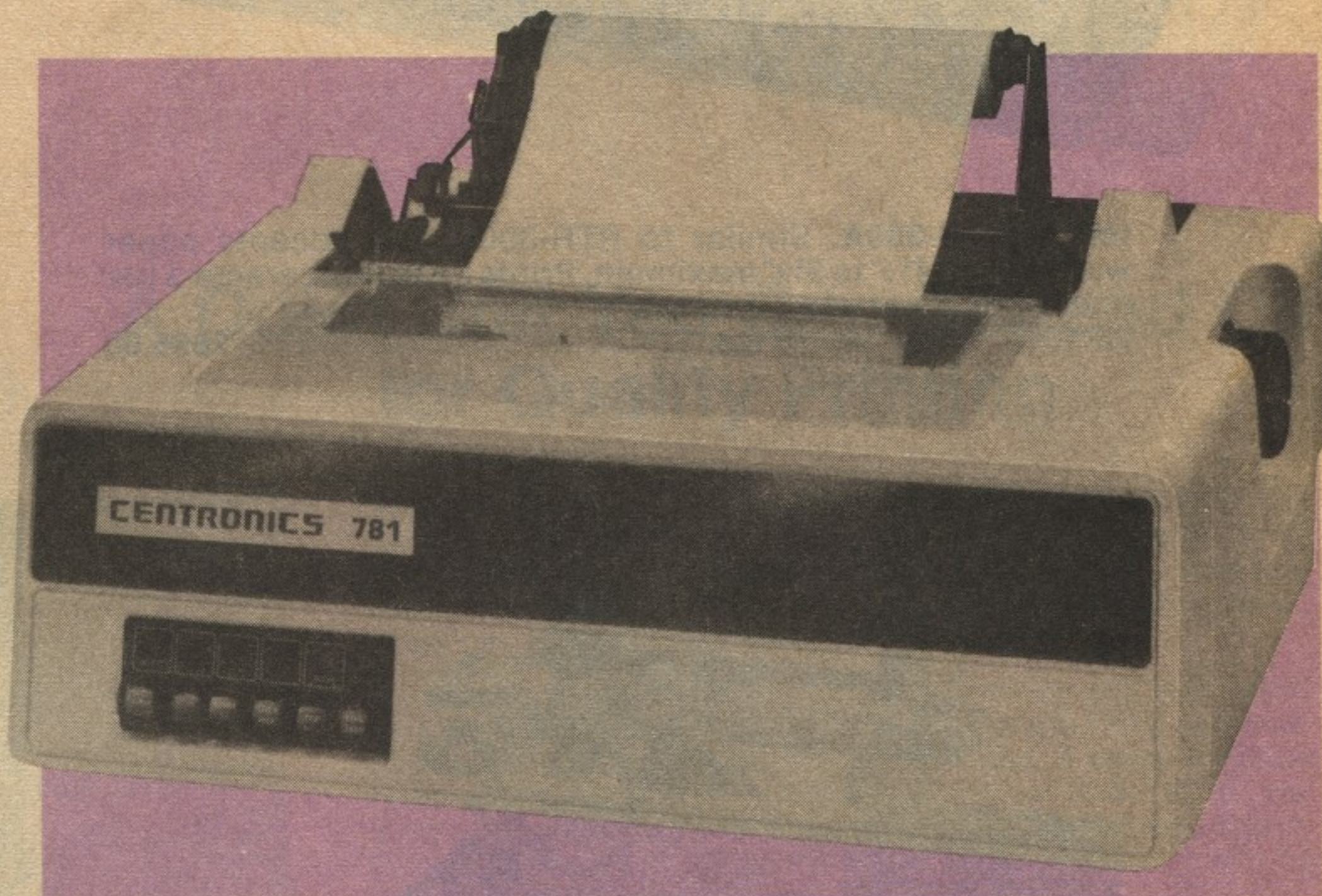
Expand with Centronics

Centronics 779. An excellent serial printer from Centronics' famous 700 Series. It prints the standard 64-character ASCII set using a 5x7 dot matrix. Character per line widths of 10, 80 and 132 are selectable. Speed is 60 characters/second at 10 cpi, and 110 cps at 16.5 cpi. At the 10 cpi density, it prints 90 lines/minute with a 10-character line, and 21 lpm with an 80-character line. At 16.5 cpi, the 779 prints 130 lpm with 10, 36 lpm with 80, and 21 with the 132-character line. Format is 6 lines per inch vertical. Maximum print width is 8.0". Roll paper to 9.8" width with a 6.7" diameter and one inch core can be used. Forms handling operations include a pinch roll feed, rear mounted paper roll holder, and column scale and tear bar. The cartridge contains a continuous $9/16$" ribbon, 10 yards long; a Mobius loop allows printing on upper and lower portions of the ribbon on alternate passes. Controls include print switch, forms thickness, horizontal and vertical forms positioning, print density. Data input is handled along 7-bit ASCII parallel lines, TTL compatible. 8x19½x18". For 115/230VAC, 50/60Hz.

88-1002. Shpg. wt. 45 lbs. 1145.00
88-1003. Centronics 781 Printer. Shpg. wt. 60 lbs. 1675.00
87-1910. S-100 Interface to Centronics.
Assembled. Shpg. wt. 3 lbs. 349.95

Enjoy High-Speed Printing with Centronics 703

Centronics 703. Outstanding design and value from one of the best known names in dot matrix printers. The 703 serial printer utilizes a 7x7 dot matrix and prints the standard 64-character ASCII upper case set. Print speed is a fast 180 characters per second. Line widths of 20, 80 or 132 characters per line are software selectable. The 703 prints 370 lines per minute with a 20-character line, 120 lpm with an 80-character line and 75 lpm using the 132-character line setting. Format is 10 characters per inch horizontal and 6 lines per inch vertical. Elongated (double width) characters are software selectable. Maximum print width is 13.2". Paper from 4" to 17.3" width can be used. Positive forms handling action is made possible with use of a tractor feed for rear or bottom feed forms, a 15 inches per second slew, paper-out sensor and paper tension adjustment. A ribbon cartridge houses a continuous $9/16$" ribbon, 10 yards long; a Mobius loop allows printing on the upper and lower portions of the ribbon on alternate passes. Operator controls include select/deselect, forms thickness, horizontal and vertical forms positioning, single line feed, paper empty override and self-test. An internal auto motor control turns the main motor off when no data is received. An electronic top-of-form control allows paper to space to top of form when command is received. Data input is along 7 or 8-bit parallel ASCII lines at TTL levels with strobe. 8x24½x18". For 115/230VAC, 50/60Hz.

88-1004. Shpg. wt. 90 lbs. 2795.00
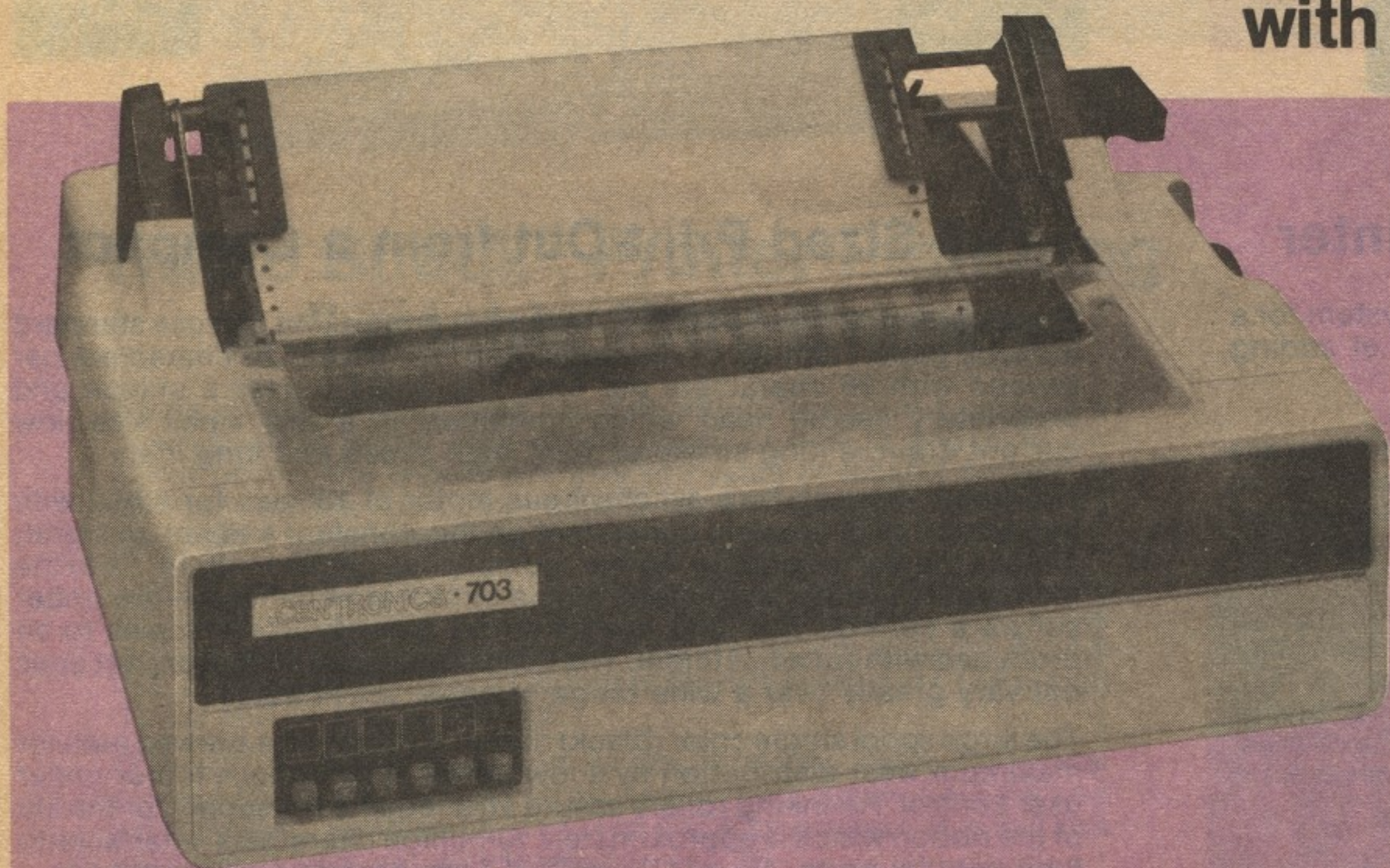
- *Modular Construction Makes Maintenance Easy*
- *Bidirectional Logic Seeking Printing* • *Ribbon Cartridge*
- *Prints Original Plus Five Copies* • *Character Elongation*

Printers from High Speed to Low Cost

IMSAI Line Printer
Up to 300 Lines Per Minute!

IMSAI PTR-300B. For business and professional uses, it's hard to beat. Chances are the high-speed output is more than adequate for even the most sophisticated operations. And it features a 100% duty cycle — you can operate the PTR-300 24 hours a day without it overheating or wearing down.

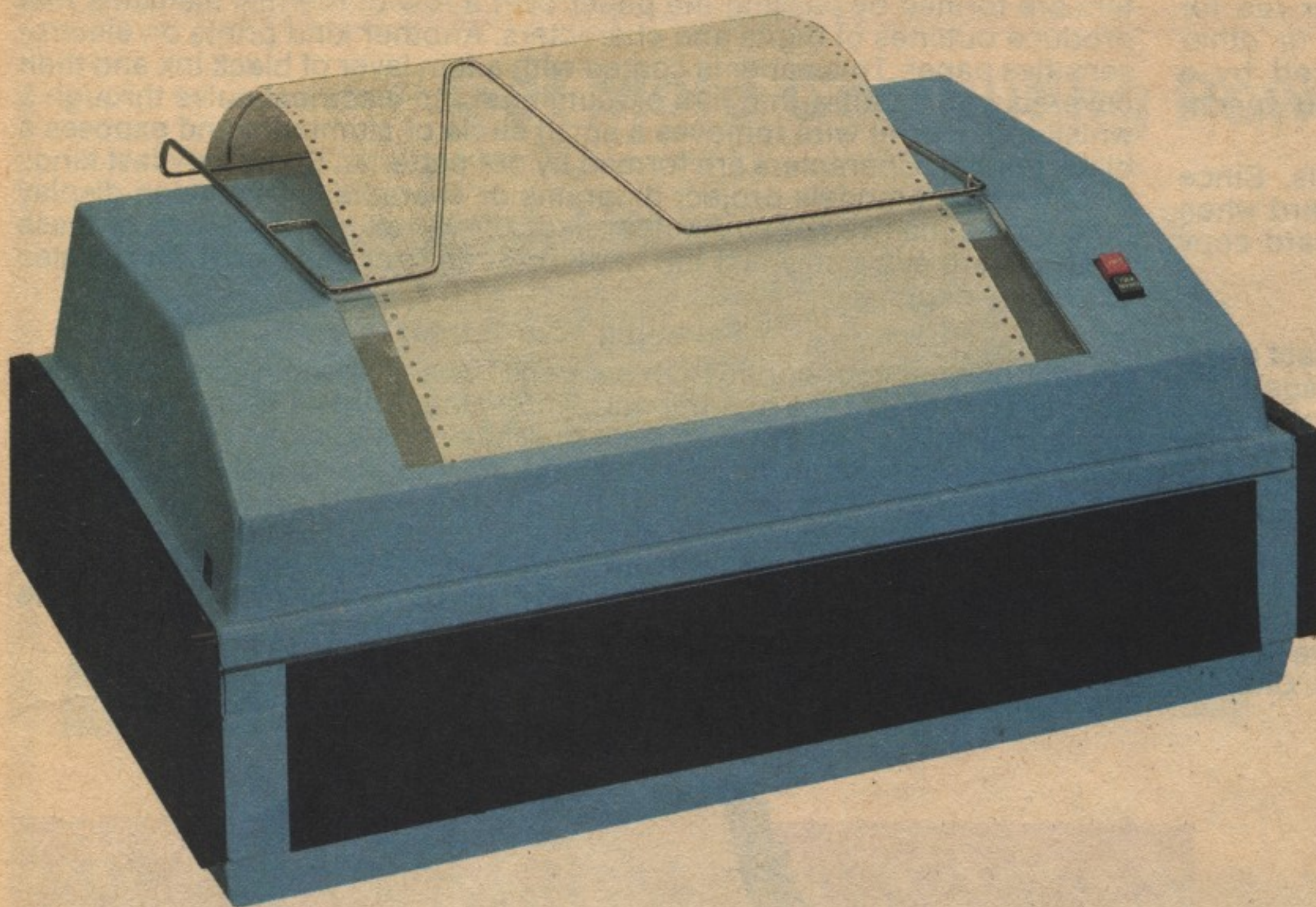This impact line-printer produces solid characters of very fine print quality. Striking force is enough to print on the original plus five copies (less with carbons). Print density is 10 characters per inch. The printer will print 6 lines per vertical inch single-spaced and 3 lines per vertical inch double spaced. And it can print up to 132 characters per line.
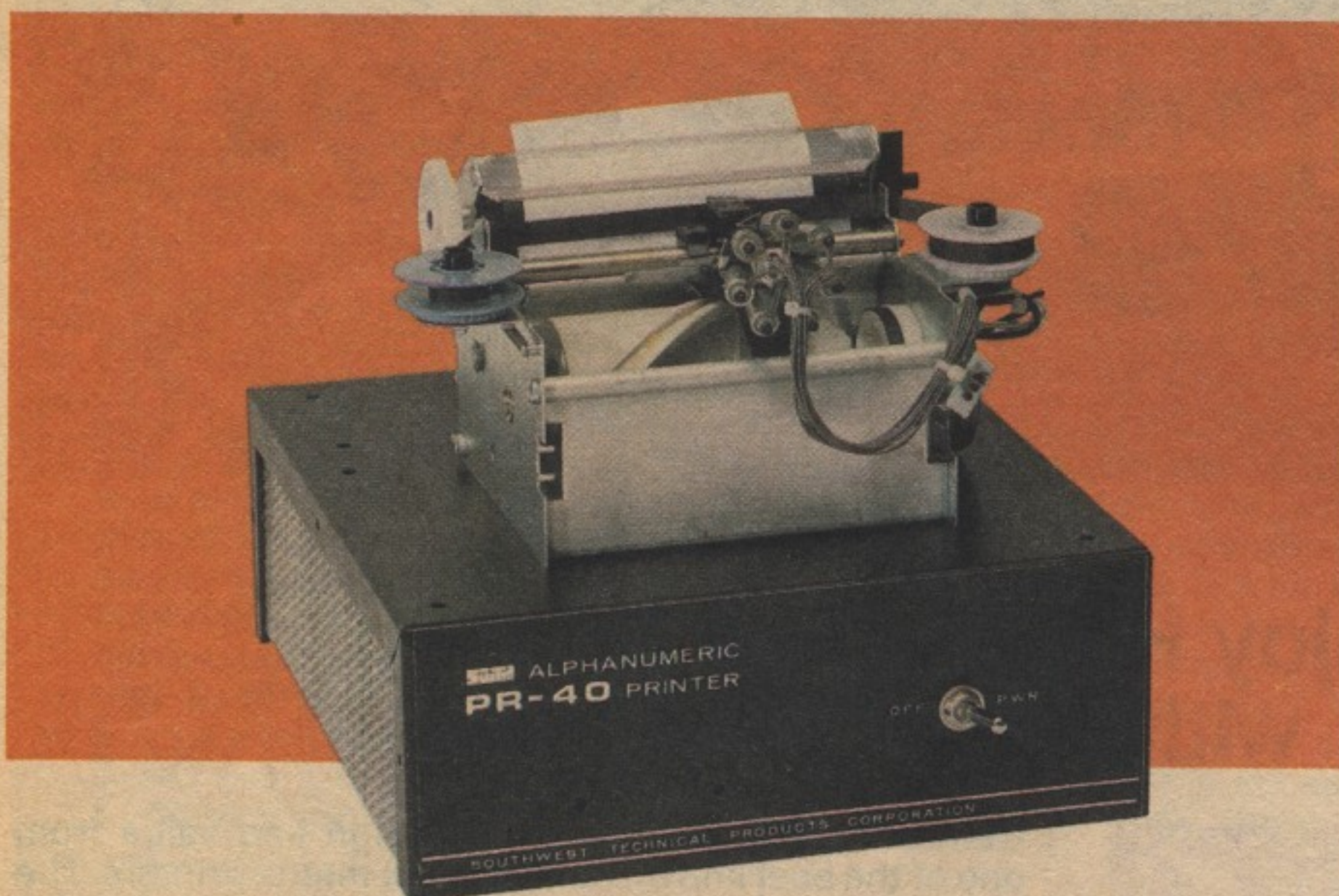
The built-in tractor feed is adjustable for smaller sized paper than the full 132-column paper. The printer will accept paper widths ranging from 4⅛" to a maximum of 15".

Form size can be selected by the user. An adjustable control with four settings lets you select from a standard 11" form size down to 3⅔".

The PTR-300 features a ribbon with a 10-million character life. When necessary, you'll find ribbon changing quick and easy. You will also like the built-in diagnostics and test features should you ever need to troubleshoot.

The printer requires an SI02-1, SI02-2 or MIO board. Power consumption is 150 watts. With operating manual. 13.3x27.6x21.4". For 120VAC. U.L. listed.
88-1007. Shpg. wt. 70 lbs. **3695.00**

IMSAI PTR-300A. Similar to PTR-300B, but accepts paper widths from 4⅛" to 9½" maximum. Prints up to 80 characters per line. 13.3x20x21.4". U.L. listed.
88-1017. Shpg. wt. 70 lbs. **2695.00**

Low-Cost Alphanumeric Line Printer

SWTPC PR-40. Add a 5x7 dot matrix impact printer to your system for a reasonable price. The PR-40 uses standard 3⅞" wide rolls of adding machine paper available at most office supply stores.

Prints the 64 character upper case ASCII set with 40 characters/line at a rate of 75 lines/minute. One complete line is printed at a time from an internal forty character line buffer memory. Printing takes place either on receipt of a carriage return or automatically whenever the line buffer memory is filled.

Character data is accepted as fast as one character per microsecond or as slow as you wish to send it. Its seven parallel data lines are TTL compatible and may be enabled by a single "data ready" control line or by separate "data ready" and "data accepted" handshake control lines. Compatible with all computer and terminal systems having an 8-bit parallel interface, including most "8080" based systems.

The printer mechanism is mounted on a black anodized aluminum chassis which houses the electronic circuits and the 115/230VAC 50-60Hz power supply. With one ribbon and roll of paper. 8¾x9⅝x10½".
88-1103. Kit Form. Shpg. wt. 14 lbs. **250.00**
88-6103. Factory Assembled. Shpg. wt. 14 lbs. **399.00**
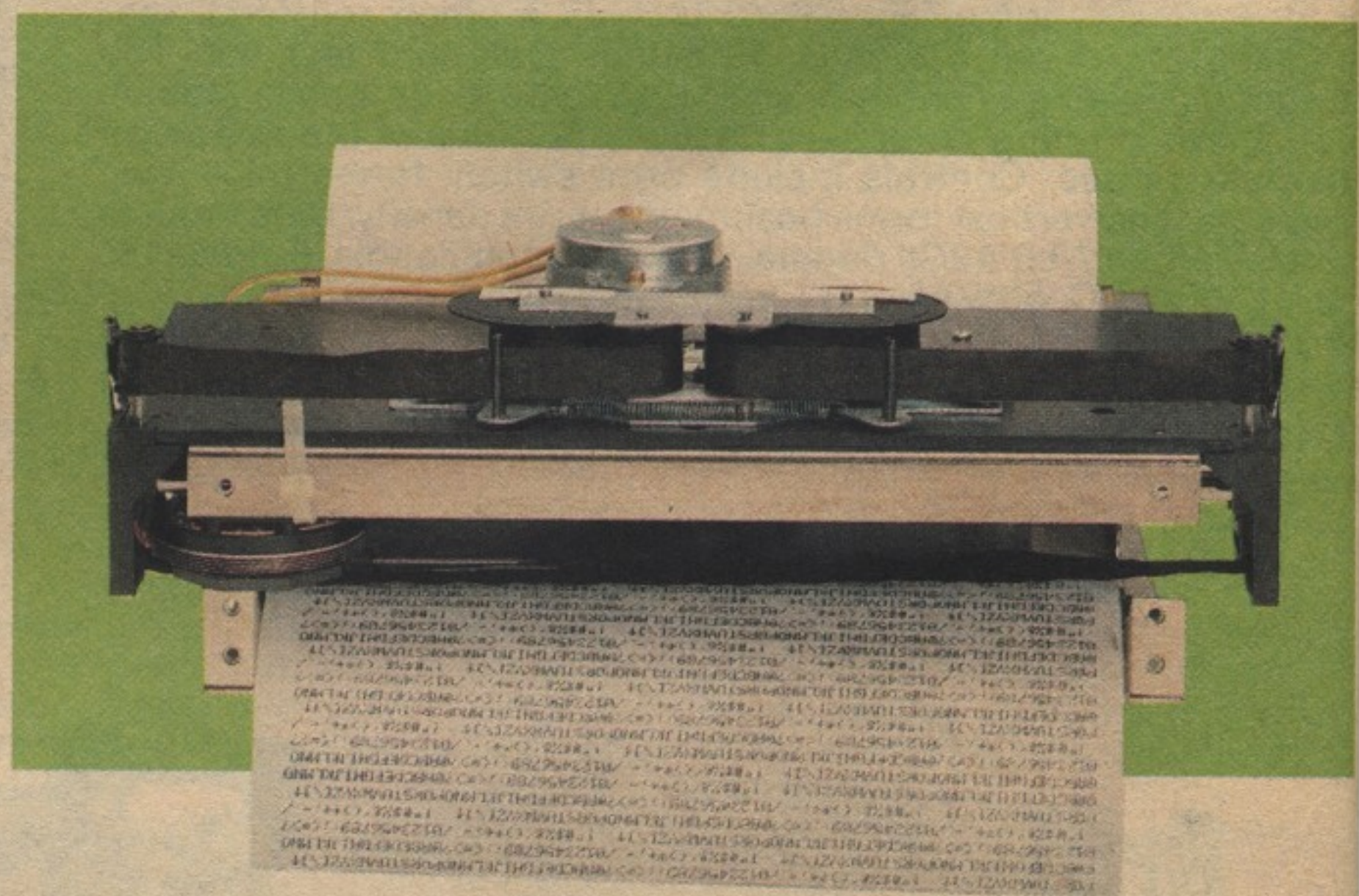
Full-Sized Print-Out from a Compact

Practical Automation DMTP-6. An impact printer that can use standard 8½" roll paper, fanfold or cut page. And it's fast — 120 characters per second with 96 characters per line. The DMPT-6 uses a unique and proprietary needle head which combines, in a very small size, low current drain, a long stroke of .025", high speed and long life.

The head is driven by a synchronous motor at 10"/sec. for 60Hz, with generation of characters dependent on this constant and not on a grid; pitch is therefore variable. All the ordinary line pitches—8, 10, 12 to the inch, double width characters, single stroke or enhanced — are under software control. The long needle stroke permits 1 to 4 copies to be produced without adjustment. The head is designed so that impact does not vary greatly over a wide range of paper thicknesses.

The large spool single color (black) ribbon is driven on a skewed path for maximum wear distribution by a low power synchronous motor under user control. Re-inking rollers assure an adequate ink supply for the life of the ribbon which is approximately 10-million characters. Interfaces to 8-bit parallel ports. 4⁷/₁₆x11¹¹/₁₆x9²⁹/₃₂". Less case and power supply.
88-1102. Shpg. wt. 10 lbs. **395.00**
87-1904. UP72 Microprocessor-Controlled Interface. Serial and Parallel. Shpg. wt. 2 lbs. **162.00**
87-505. Power Supply for both of above. Shpg. wt. 8 lbs. **110.00**

"Hard Copy" is Hard to Beat at Tandy Computers

## Diablo Printer Featuring "Daisy-Wheel" Print Head

Diablo HyType II. The HyType II is designed for terminals, word processing, text editing systems, mini-peripherals, small accounting systems — any application needing typewriter-like print quality. It operates at a speed of 30 characters per second. And everything—from the paper feed circuit to the die-cast aluminum frame—is designed to assure optimum performance reliability.

Plug-in circuit boards simplify maintenance and provide easier implementation of optional accessories and interfaces. Microprocessor-based control logic increases the flexibility of the printer logic and allows the implementation of additional features.

Rigid castings, a new carriage with a lower center of mass and a new bearing system result in improved print registration. A taller hammer configuration distributes hammer energy more evenly over the character area, resulting in better print quality and longer character life. With operating manual. 22¾x8½x15½". For 120VAC.
88-1020. Shpg. wt. 45 lbs. **3195.00**
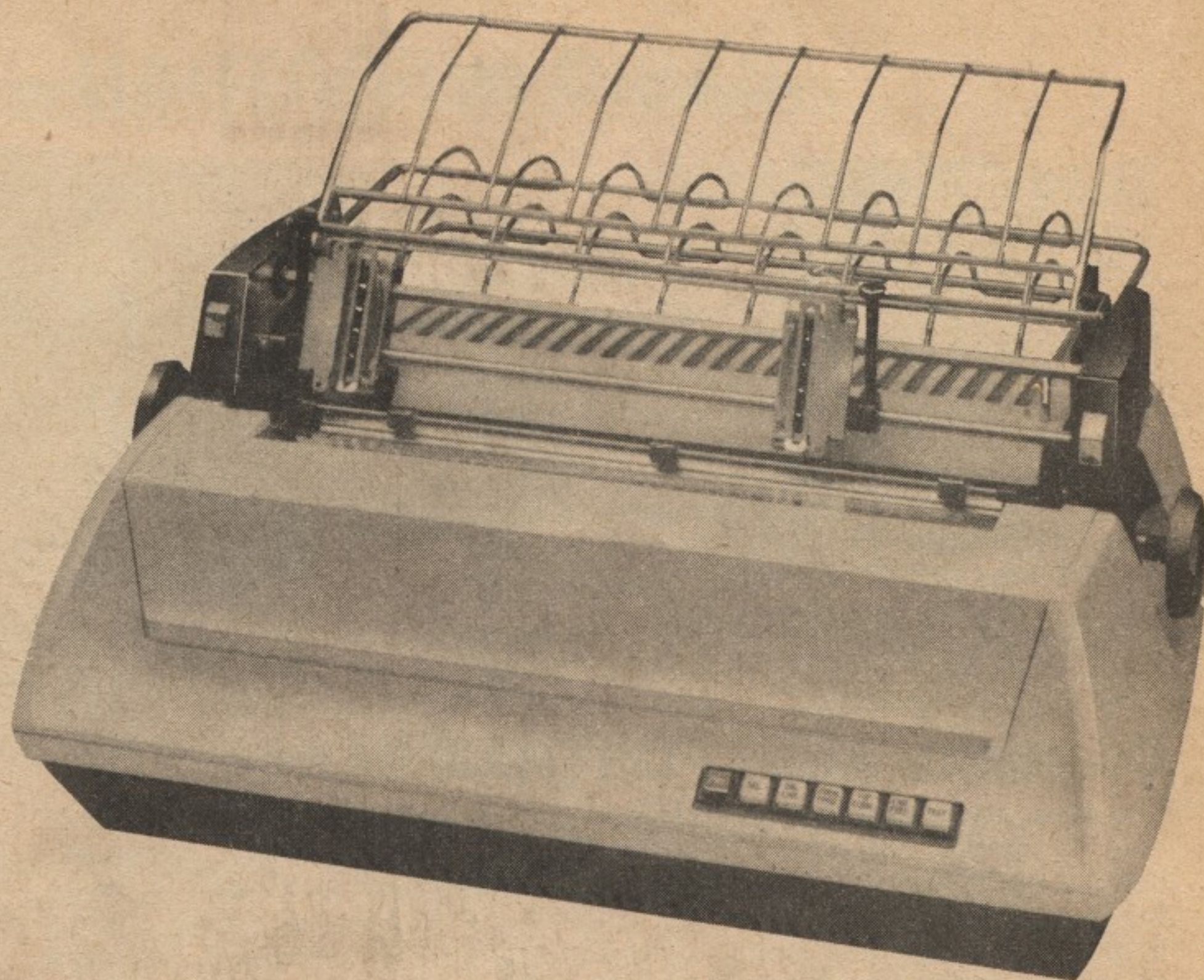
A Quiet Unit You Can Depend On for Quality Printing

Okidata CP110. This desktop high-speed impact printer can produce multiple copies, paychecks, precision print business forms, letters and other documents—it's the ideal business printer! It prints 5x7 dot matrix characters at 65 lines per minute (bidirectional printing).

It uses standard teletype ribbon to print on 8½" roll paper up to 5" in diameter. And you can use 4-ply fanfold paper up to 9½" wide with the optional tractor feed. A stepper motor results in a paper slew rate of 400 lines per minute (150 ms single space) and line advancing that is virtually silent. Print speed is 110 characters per second with 10 characters/inch and 80 characters/line.

Parallel-buffered interface. Printer contains all control electronics, character generator and buffer, panel switches and self-test circuitry. 8x18x22". For 120VAC.
88-1008. Shpg. wt. 45 lbs. **1300.00**
88-1009. Tractor Feed. As above, but uses fanfold paper. Shpg. wt. 47 lbs. **1510.00**
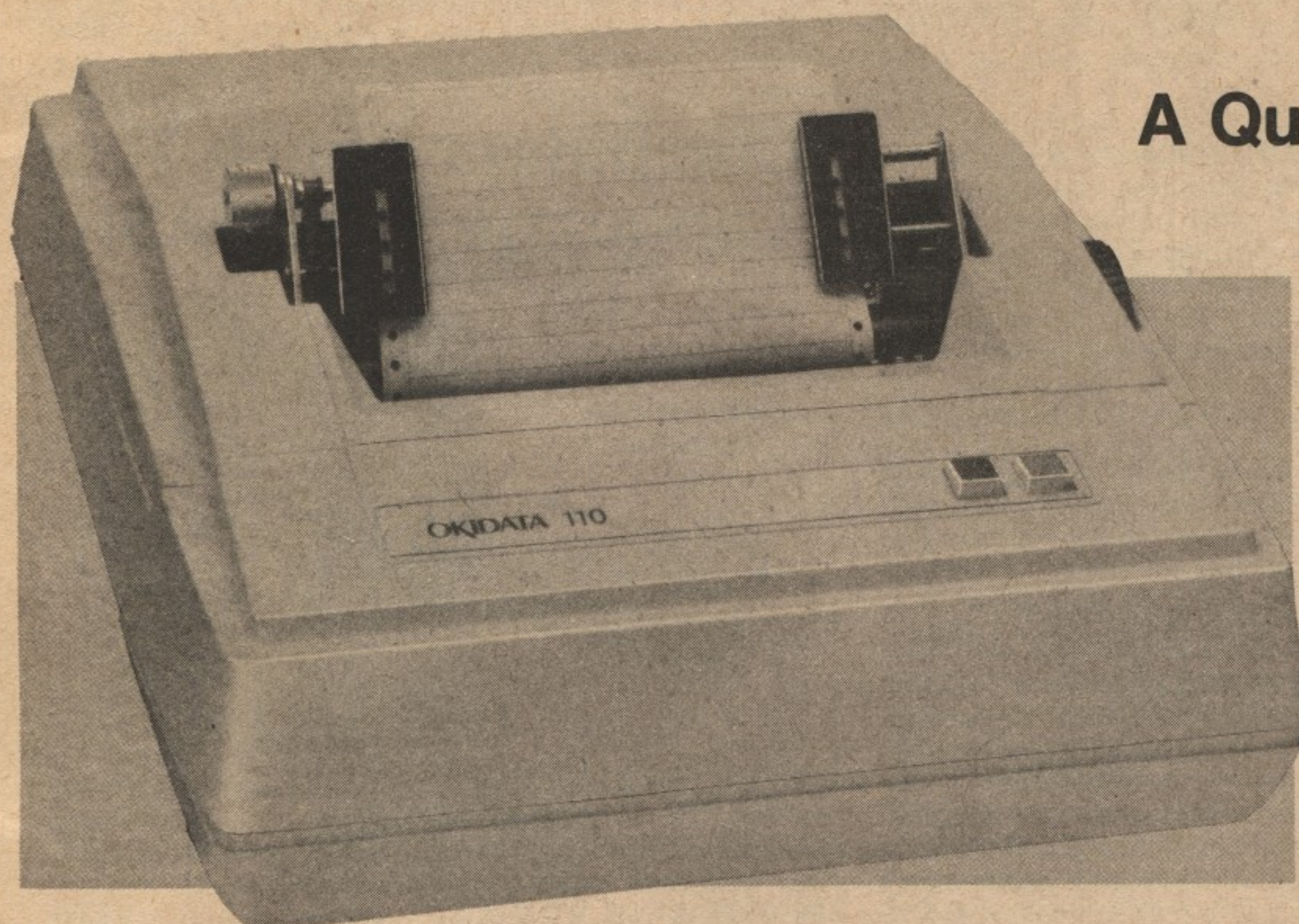
Radio Shack® Printer Featuring Adjustable Print Density

Radio Shack TRS-80. Now you can afford fine print quality at a down-to-earth price! With its simplicity of design and modular construction, the TRS-80 will give you years of reliable service. A cartridge means you'll never have to handle messy ribbons, and an adjustable control lets you choose the print density you want.

Maximum print width is 8". At 10 characters/inch (cpi), print speed is 60 characters/second (cps). With this density it will print 90 lines/minute (lpm) at 10 characters/line (cpl) and 21 lpm at 80 cpl. At 16.5 cpi, print speed is 110 cps. With this density it will print 130 lpm at 10 cpl and 21 lpm at 132 cpl.

Operator controls include print switch, forms thickness, horizontal forms positioning, vertical forms positioning, power ON/OFF and print density. Handles 64 standard ASCII characters in a 5x7 dot matrix at 6 lines per vertical inch.

Pinch roll feed system and rear mounted roll paper holder handles roll paper from 6.7" to 9.8" diameter with one inch core. Built-in column scale and tear bar. 8x19½x18". For 120VAC.
26-1150. Shpg. wt. 45 lbs. **1299.00**
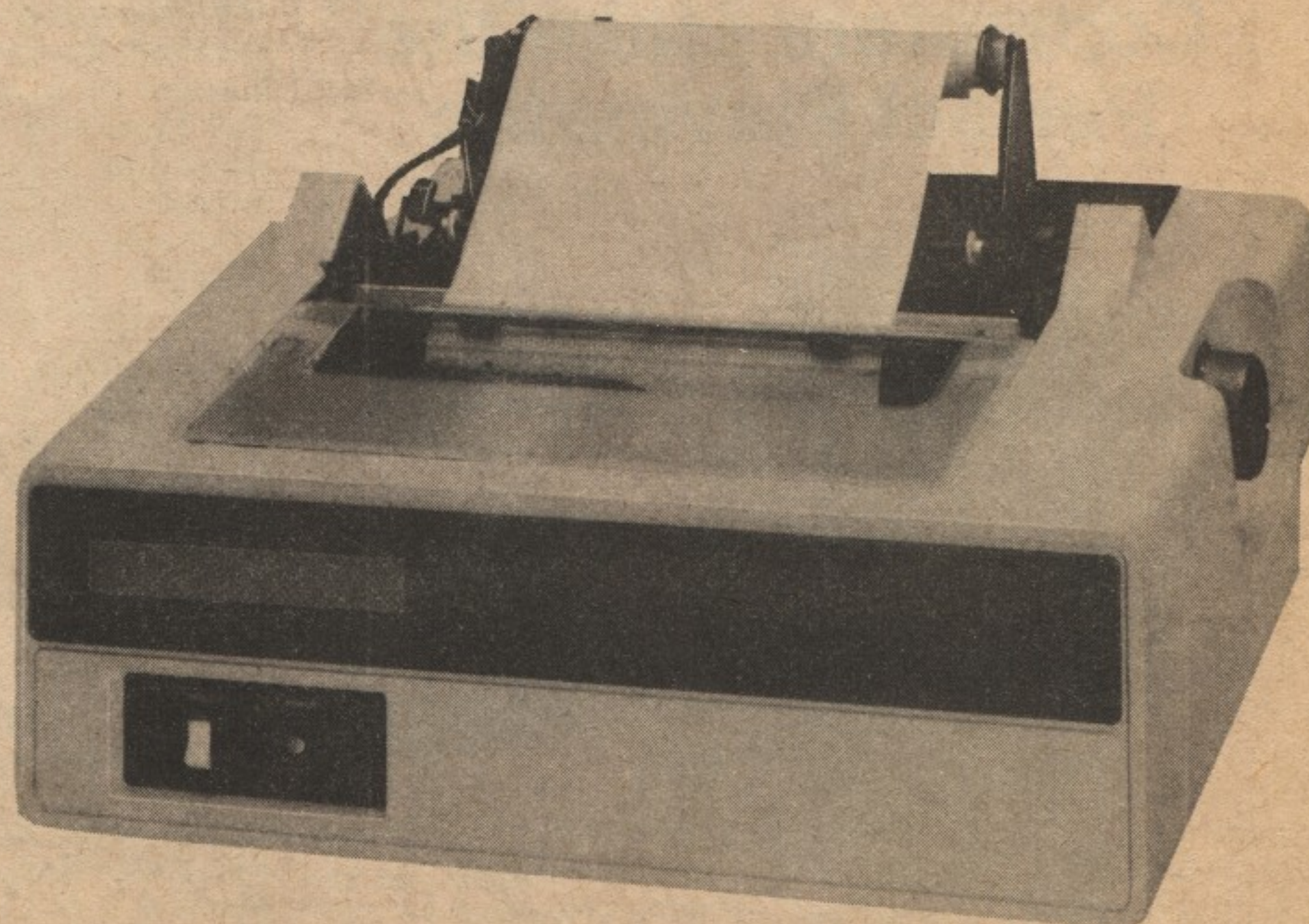
We Have More Than Just a BASIC Selection

BASIC or FORTRAN—The Choice is Yours!

Tandy Disk BASIC

SUPER BASIC for scientific, business, home and game programming. Ideal for use with your floppy disk drive. Software includes six file manipulation commands plus save, load, and two special integer functions for file tracking. Up to three memory buffer files are available. Contains same features as tape BASIC (below) plus extant command options, additional statements and 11 more functions. Requires 12K of memory plus 1K scratchpad. Available in 5½" or 8" floppy disk. Includes comprehensive user's manual.
89-1051. Shpg. wt. 1 lb. **149.95**

Microsoft BASIC

This high-level programming language, designed for interactive systems, runs on CP/M and has provisions for editing and string processing as well as numerical computation. Features print using, trace on/off, air trapping, random and sequential disk files, character editor for program correcting and extended air messages. A memory of 32K is desirable but not required. A comprehensive user's manual is included.
89-1045. Shpg. wt. 2 lbs. **350.00**

Complete ANSI FORTRAN IV from TDL

The most advanced high-level software tool available for an 8-bit micro — a complete (not a subset) ANSI Standard FORTRAN IV. Technical Design Labs' disk-oriented system runs in 24K with DOS, and features full type conversion, full library of scientific and string functions, linking loader with automatic search, cross compiler, hex constants. Package includes floppy diskette with object code, user's manual.
89-1170. Shpg. wt. 2 lbs. **495.00**

Tempos Multi-User DOS

Flexibility is the key of this disk operating system, designed for the 8080. It allows up to eight users at one time, accessing common files as required. Users are logged in under terminal numbers. Supports an editor, assembler and Opus 2—a business programming compiler language similar to BASIC but with more extended commands. Outstanding peripherals for the serious computerist.
89-1172. Shpg. wt. 2 lbs. **750.00**

Tandy Computer Tape BASIC. Low-cost BASIC system is perfect for business applications and game programming. Includes 31 commands and statements, and eight functions plus user-defined functions. Features direct memory and I/O addressing, subroutine nesting, character/line editing and string variable capability. Available on cassette. With complete user's manual.
89-1029. Shpg. wt. 1 lb. **99.95**

SWTP 8K BASIC. For the 6800 system. Features fixed and floating point math with full number range, direct-execution mode, trig functions and string variables. Provision is made for BASIC loading to and from cassette or paper tape. A user function is provided for jumping to subroutines.
89-1032. Shpg. wt. 1 lb. **9.95**

SWTP 4K BASIC. Software designed for the 6800 system. Includes fixed and floating point math with full number range, direct-execution mode. Provision is made for BASIC loading to and from cassette or paper tape. A user function is provided for jumping to machine language subroutines.
89-1031. Shpg. wt. 1 lb. **4.95**

IMSAI BASIC-9A. High-level language in 8K plus 1K scratchpad memory contains standard statements and features plus trig functions and string variables. Available on tape cassette, EPROM and diskette.
89-1003. Shpg. wt. 2 lbs. **100.00**

PolyMorphic 11K BASIC. Poly 88 BASIC provides some of the most advanced features available today in the personal computing market. It's the efficient way to program, with features like graphic plotting, tape save and dump with named files, time function and self-explanatory messages.
89-1004. Shpg. wt. 1 lb. **15.00**

Computers Speak Your Language With BASIC

Cassette, Instructions Included

TDL Zapple Basic. Backed by the Z-80's speed and power, it's relocatable, occupies 12K of core and utilizes I/O handling of routines for greater versatility, hardware independence. Many extras!
89-1028. Shpg. wt. 2 lbs. **95.00**
89-1027. 8K Zapple Basic. Shpg. wt. 2 lbs. . . . **50.00**

Computers Make the Perfect Playmates

You Didn't Know Computers Were So Much Fun!

PolyMorphic Game #1. Features four games! Attempt a safe lunar landing in Lander or, in Stock, play the market without touching your bank account. Puzzle your way through Reverse, or try Hammurabi — will Sumeria become rich under your rule? Requires 16K of memory.
89-2101. Shpg. wt. 1 lb. **15.00**

PolyMorphic Game #2. Four games to quadruple your fun. In addition to traditional backgammon and craps, enjoy Hangman, where you stake your life against your word guessing skill, and Wumpus — hunt for a monster never before seen! Requires 16K of memory.
89-2102. Shpg. wt. 1 lb. **15.00**

Processor Technology Trek 80. Based on the NBC series Star Trek, this machine language program uses 8K of memory and display graphics for real time war with the Klingons. Requires VDM-1 Video Display Module if not used with a Sol computer.
89-2108. Shpg. wt. 1 lb. **14.50**

Processor Technology Gamepac 1. Show off your Sol system with an exciting lineup of video games, each included on the CUTS cassette or paper tape. Play target, zing, life, pattern — all different, all fun!
89-2105. Shpg. wt. 1 lb. **14.50**

Play some games with your computer — have a little fun, relieve a little tension. Let the kids join in, too!

Tic-Tac-Toe/Blackjack. Have hours of enjoyment playing these two time-honored games. Program requires 6K of memory.
89-2130. Shpg. wt. 1 lb. **4.95**

Animals. A children's learning game. Think of an animal—the computer will try to guess it — and it's smart as a fox! Requires 2K of memory.
89-2131. Shpg. wt. 1 lb. **4.95**

Race. Maneuver a space ship from the bottom of the screen to the top without being crunched by asteroids. Requires 4K of memory.
89-2132. Shpg. wt. 1 lb. **4.95**

Check Our Variety of Assemblers/Editors

Assemblers and Disassemblers for All Systems

PolyMorphic Assembler. Designed to run on the Poly 88 computer, this system includes an executive to handle memory and tape files, an assembler and a line-oriented editor. System requires a minimum 8K of memory.
89-1103. Shpg. wt. 1 lb. **15.00**

Processor Technology Assembler I. Flexible package contains an assembler, editor, loader, debugger and monitor. Functions include memory modifying, file managing, file listing and program executing. Available on paper tape, cassette, EPROM and diskette. Requires at least 8K memory for storage and user programming.
89-1110. Shpg. wt. 1 lb. **14.50**

Smoke Signal Broadcasting Disassembler. Converts 6800 object code files to easy-to-handle source code files. Files can be listed on any output terminal device, or formed directly in memory. The disk-based disassembler is compatible with most 6800 assemblers. Requires 4K of memory.
89-1124. Shpg. wt. 1 lb. **19.95**

SWTP CO-RES Assembler/Editor. Reduce writing time! Text editor accepts numbered lines, stores them in line number sequences. Uses Mikbug® ROM and associated RAM. Assembler translates source programs for the 6800 to object form.
89-1132. Shpg. wt. 1 lb. **14.95**

Processor Technology ALS-8. An assembler/monitor system designed for development of programs which must be stored in system RAM for assembly. Up to six source programs can be stored in memory as named files and called at will to be listed, edited, assembled or simulated. Enter and call up to 20 custom commands. Requires 2048 bytes RAM (4096 recommended).
89-1140. Shpg. wt. 1 lb. **35.00**

Technical Design Labs Relocating Macro Assembler. This sophisticated programming tool generates a fully relocatable object code and has complete macro generation and infinite macro nesting capability. The Z-80 opcode set contains a subset of 8080 opcodes, logically derived mnemonics.
89-1139. Shpg. wt. 1 lb. **50.00**

Everything You Need for an Assembler System

Smoke Signal Broadcasting Super Assembler. Inputs source code from file and outputs object code to disk file. Assembly listings include alphabetized and tabulated symbol table.
89-1122. Shpg. wt. 1 lb. **29.00**

Vector Graphic Sourcerer. A must for the true software buff. The disassembler allows you to create source files from all those 8080 object code files that you want to modify, but are reluctant to hack up with haywire patches. Plus you can add commands, change subroutines or delete unused features. Your newly assembled program will be as efficient and compact as the original! Requires 4K of memory.
89-1142. Shpg. wt. 1 lb. **25.00**

Editors Bring Changes to Incorrect Data
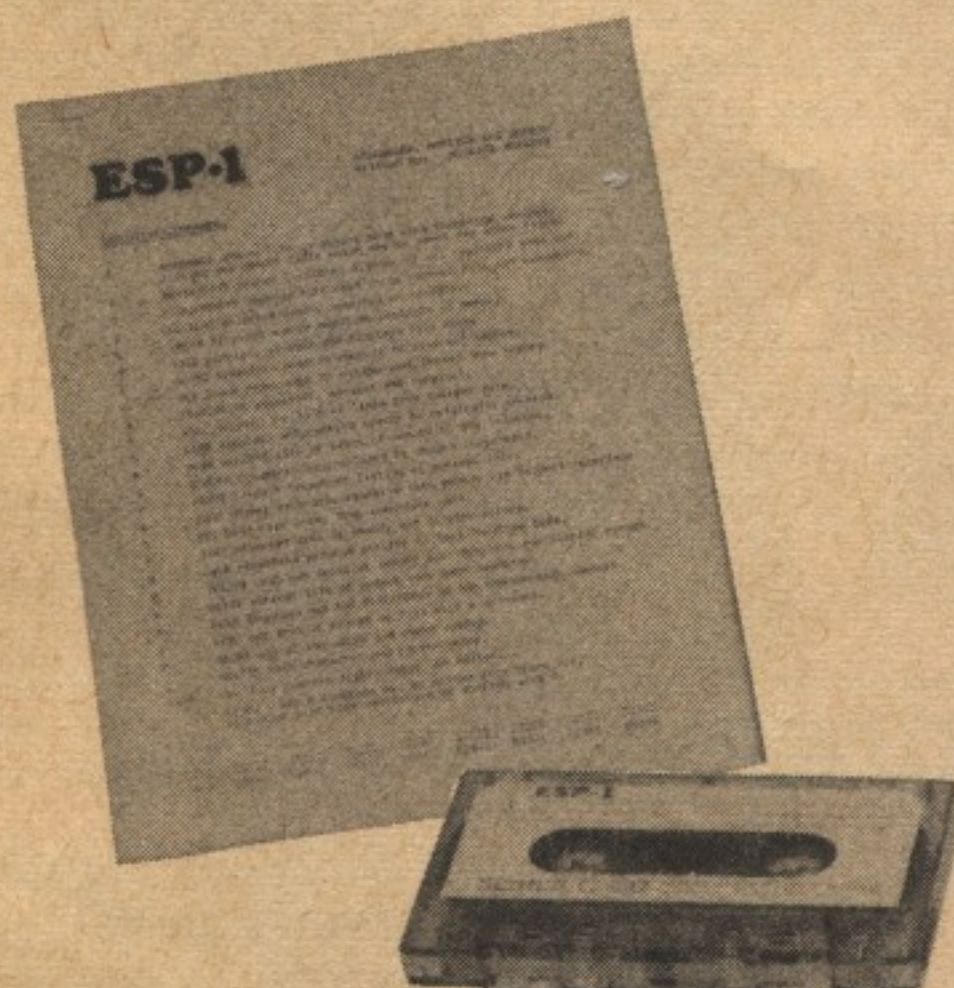
Create Your Own Programs — Choose an Editor from Our Famous-Name Selection and Get Started!

Smoke Signal Broadcasting Super Editor. A content-oriented editor with string search and block move capability. Changes may be made by referring either to line number, string content or a combination of references. Designed for file transfers to and from the disk system.
89-1121. Shpg. wt. 1 lb. **29.00**

TDL Z-Tel Text Editing Language. Character-oriented for Z-80 computers. Features include expression evaluation capability, ability to move large text blocks, macro capability and branching commands. Runs under CP/M, FDOS and Zapple.
89-1135. Shpg. wt. 1 lb. **40.00**

TDL Zapple Text Editor. Versatile relocatable editor useful in assembly language program writing and word processing applications. It is both line and character-oriented, features internal pointer for insertion and deletion functions.
89-1138. Shpg. wt. 1 lb. **35.00**

Vector Graphic ESP-1. An assembler, monitor and editor—all in one. With ESP-1 you can write an executive program, housekeeping program—use your imagination. Executive commands control many functions, such as source file to object code assembly, concatenation, formatted register display, file display, line/character deletion.
89-1141. Shpg. wt. 1 lb. **29.50**

TDL Text Output Processor. A general-purpose word processor for the Z-80. Used in conjunction with a text editor and monitor, it occupies 3K of core and provides powerful word processing capability. Features automatic paging, concatenation, justification. Straightforward command entry directly into the text puts you in total control. Output from the editor is run through the processor to produce output exactly as commanded.
89-1143. Shpg. wt. 1 lb. **50.00**

Operating Systems Add Flexibility

Processor Technology FOCAL. A high-level math language originally written for the PDP-8 minicomputer — now updated. It has a driver for VDM-1 or Sol displays and CUTS cassette program save and load. Available only on CUTS 1200 bps cassette. Resides in 8K memory.
89-1105. Shpg. wt. 1 lb. **14.50**

Processor Technology Mathpac. Group of subroutines allows an assembly language programmer to use standard routines instead of constantly rewritten routines. A calculator drive lets you use the computer as a calculator — add, subtract, multiply, divide. Accurate to 11 digits.
89-1109. Shpg. wt. 1 lb. **14.50**

Smoke Signal Broadcasting Smartbug. A super-smart Motorola-Mikbug replacement that preserves almost all Mikbug entry locations so your present programs will run without modification. Uses ACIA instead of PIA and includes software single-step trace command and other features. Source listing only.
89-1130. Shpg. wt. 1 lb. **19.50**

TDL Zapple Monitor. Supports a CRT, teletype and audio cassette — provides exceptionally powerful hardware and software debugging capability. Contains all I/O drivers. Modular construction allows easy expansion. Only 2K core needed for the 27 commands.
89-1136. Shpg. wt. 1 lb. **25.00**

Includes Cassette, Manual
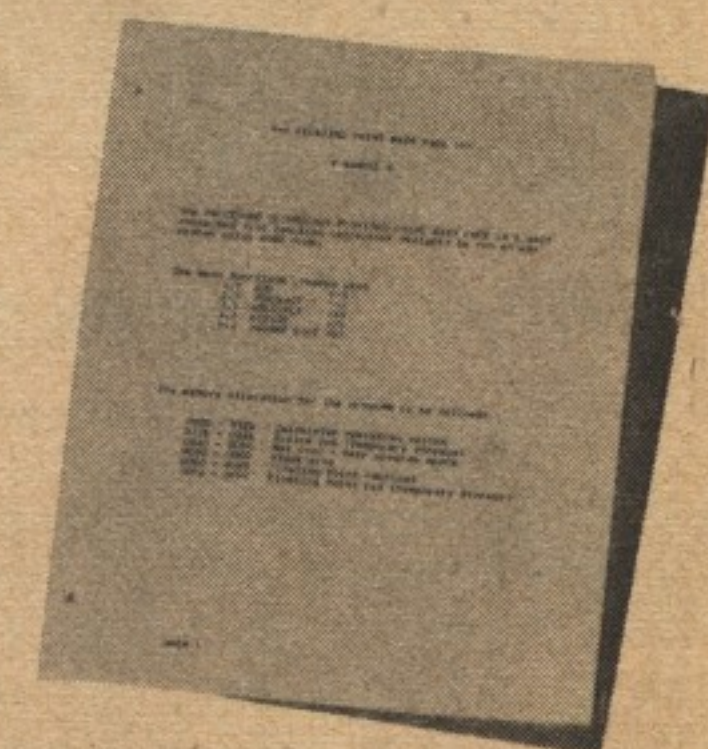
PolyMorphic ROM Monitor. This handy device lets you display an 8080's internal registers as you single-step through a program and enter, display and transmit data.
89-1204. Shpg. wt. 1 lb. **60.00**

Operating Systems and Programs

Disk Operating Systems

Tandy Floppy Disk Operating System

Tandy Corporation floppy disk operating system is a comprehensive collection of system routines and file management utilities for standard and mini disk systems. It was written for Z-80 systems with the non-technical hobbyist and consumer in mind. The system's versatility makes it useful for a wide range of applications from handling business programs such as payroll and inventory, to maintaining a home inventory. The advanced concept of completely dynamic disk space allocation is used within this system in order to allow files to be efficiently manipulated without regard to the actual amount of disk space used. Data files are always created implicitly so the user will never be burdened with file creation tasks. TOPS system provides the sophisticated user with a powerful set of facilities for data management, while preserving a very simple user/machine interface for the novice.

89-1205. Shpg. wt. 3 lbs. ..... **Call for Price**

CP/M Basic DOS-A with System Utilities

Designed for use with IMSAI FDC systems, it handles CP/M program format. This "unbundled" software package can be easily adapted to any 8080 or Z-80 computer system with at least 16K of main memory and one or two IBM-compatible disk drives. Functions include program editing, assembly, debugging, named dynamic files, batch processing and instantaneous program loading. CP/M components include an editor that allows preparation of programs and text using powerful context editing and display commands, an assembler that's compatible with both the standard Intel assembler and Processor Technology assembly language. PIP allows transfer of files between various devices and disk files, as well as concatenation of files on the diskettes. And, a Dynamic Debugging Tool allows symbolic program tracing, debugging and testing.

89-1203. Shpg. wt. 00 lbs. **150.00**

CP/M Basic Disk Operating System

This advanced disk operating system is designed for use with IBM-compatible diskette-based computer systems which employ the 8080 microcomputer. Functions include named dynamic files, program editing, assembly, debugging, batch processing and instantaneous program loading. An "unbundled" software package, it can be easily adapted to any 8080 or Z-80 computer system with at least 16K of main memory and one or two IBM-compatible disk drives. CP/M components include the Peripheral Interchange Program, which allows transfer of files between various devices and disk files, as well as concatenation of files on the diskettes. The editor allows preparation of programs and text using powerful context editing and display commands. The assembler is compatible with both the standard Intel assembler and Processor Technology assembly language. And, the Dynamic Debugging Tool is a monitor which allows symbolic program tracing, debugging and testing.

89-1250. Shpg. wt. 2 lbs. **95.00**

ICOM's New FDOS-IIIR for Microcomputers

The ICOM FDOS-IIIR is a complete program development system which, along with the microcomputer's monitor, provides high-speed software development tools usually available only on large minicomputer systems. With ICOM FDOS-IIIR, you can virtually eliminate the need for paper tape or cassette storage handling. Program storage and back-up is now on low-cost, reusable, compact and reliable diskettes. The system features relocatable assembler and string oriented test editor. Single command operations of FDOS-IIIR gives you disk-to-disk program editing and assembling; disk-to-memory program loading; named files; disk-to-punch device transfer, reader-to-disk transfer; disk-to-disk transfer, and more.

89-1201. Shpg. wt. 3 lbs. **50.00**

Business and Personal Finance Programs
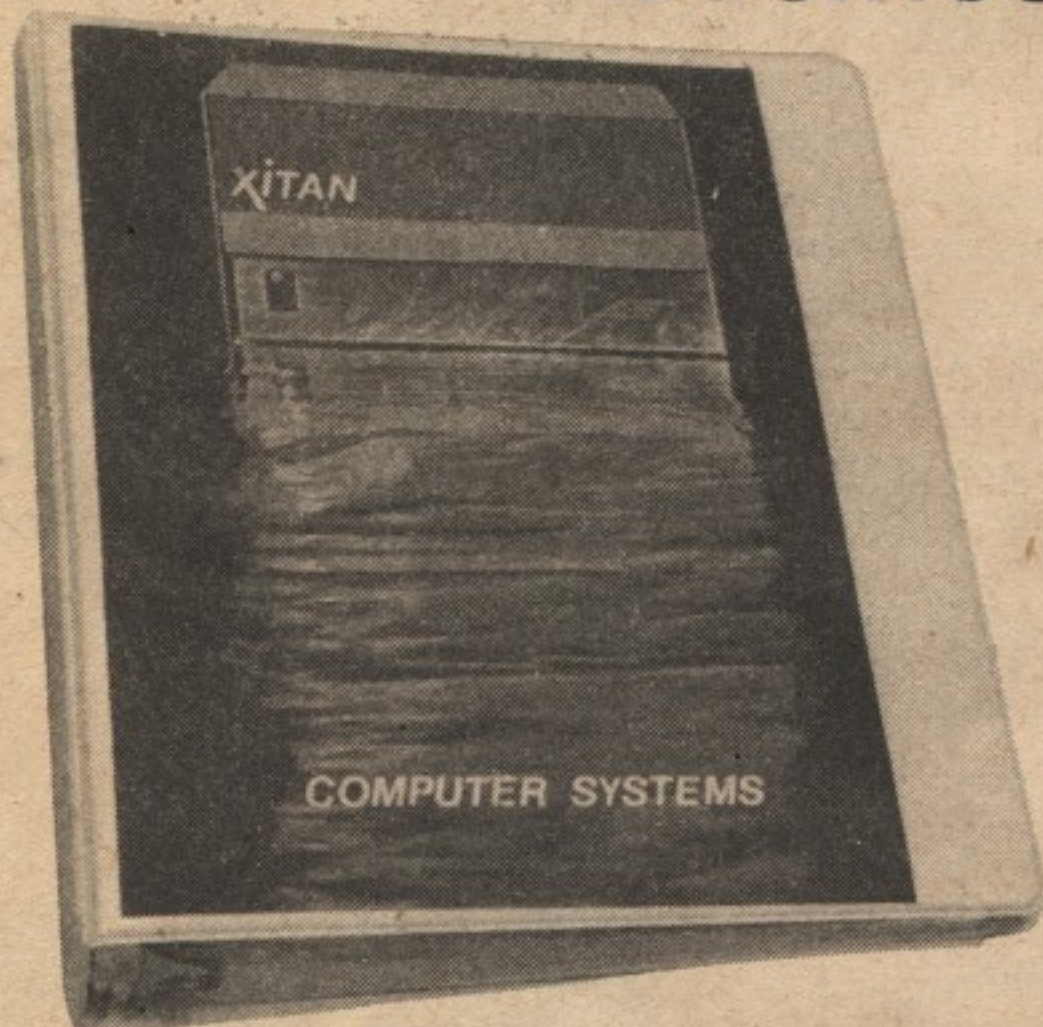
Word Processing

TDL's Package A is a complete software package for the Z-80, available in CP/M and FDOS IV. The system includes 12K BASIC, the Zapple Monitor with 27 commands, 24-command Zapple Text Editor, Relocating Macro Assembler and Text Output Processor. A general word processor resides in 3K of core.

87-1070. FDOS Version.
Shpg. wt. 2 lbs. **229.00**
87-1071. CP/M Version.
Shpg. wt. 2 lbs. **249.00**

Payroll

Radio Shack Payroll is a complete computer and manual system designed to reduce the workload involved in writing paychecks and keeping account balances. It contains two program tapes and six data tapes. The programs are: PAYROLL CHECKS and PAYROLL UPDATE & QUARTERLY SUMMARY. The data tapes are blank originally but both of the programs will write information on them.

26-1501. Shpg. wt. 2 lbs. **19.95**

Cashflow

Polymorphic's Cashflow is an automatic ledger that lets you do your family budget quickly and accurately. Has 28 separate budget areas or "accounts" that represent the different types of expenses.

89-2201. Shpg. wt. 2 lbs. **15.00**
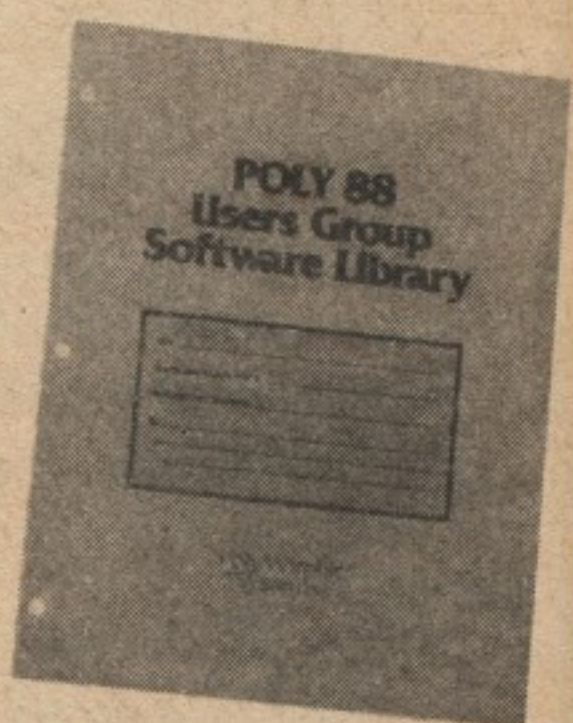
Personal Finance
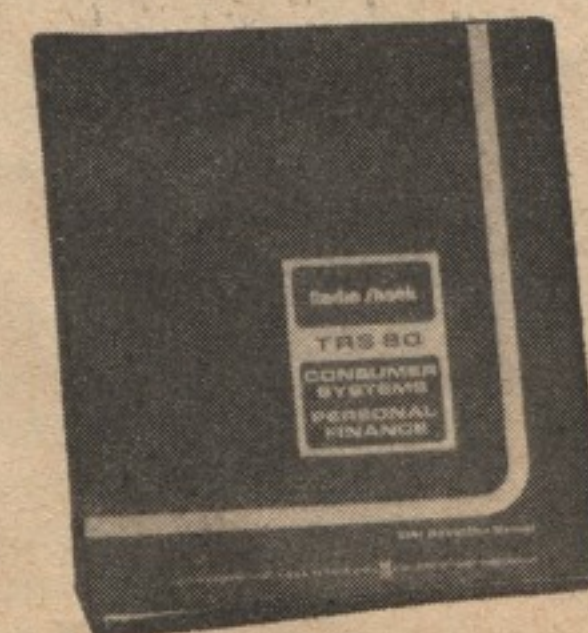
Radio Shack's Personal Finance system tracks and totals all income or expenses by user defined categories. All checks are automatically added to the proper account, and the summary program gives a complete recap at tax time.

26-1601. Shpg. wt. 2 lbs. **14.95**

Handy Accessories for Smoother Operation
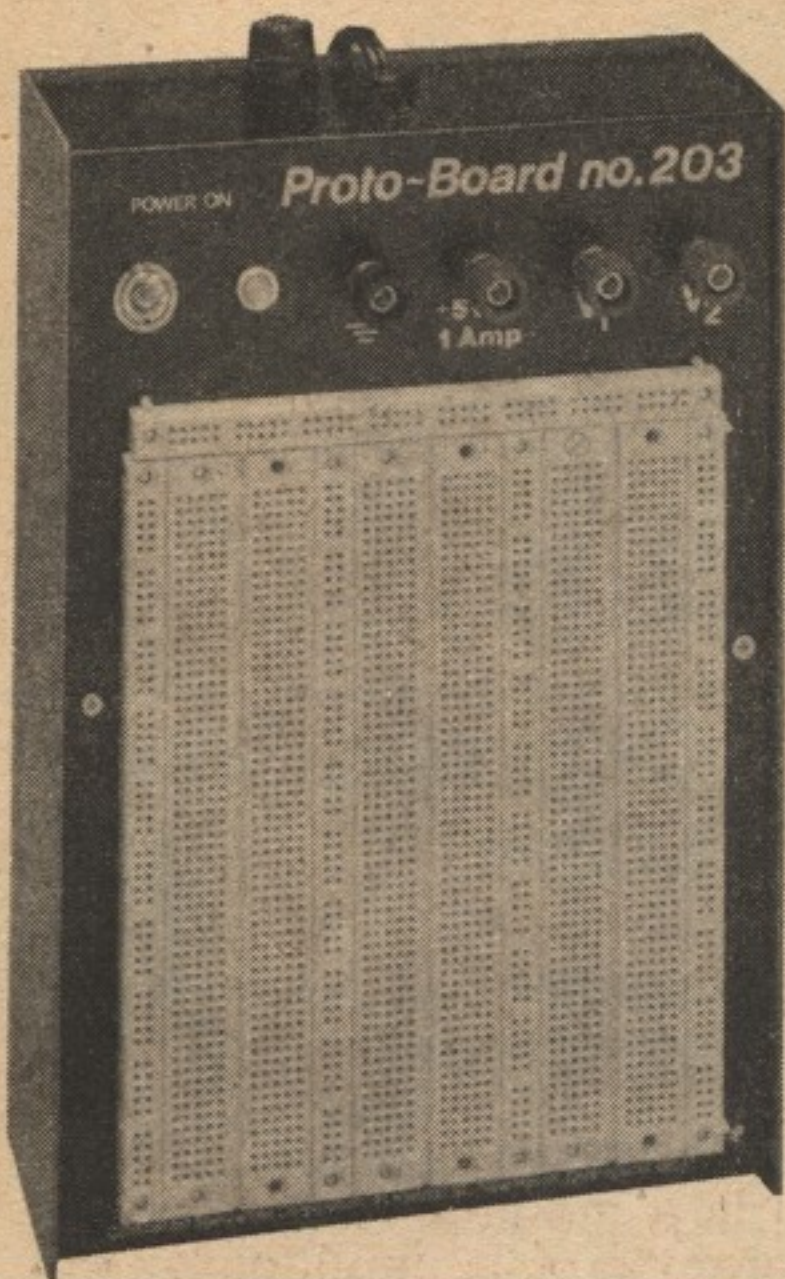
Proto-Board® with Power Supply

- **2250 Solderless Tie-Points**
- **24 14-Pin DIP Capacity**

Proto-Board PB-203. Enough capacity for large projects, plus the proper voltage for most digital IC's. Built-in shortproof, fused 5VDC, 1A regulated supply with only 10mV ripple and noise at 0.5A. Power-on switch with pilot light. Versatile hook-up — three QT-59S breadboarding sockets plus four QT-59B and one QT-47B bus strips (total of 10 bus lines). 3¼x6⅜x9¾".
73-1025. Wt. 5 lbs. **80.00**

Design Mate™-4 Pulse Generator for Design, Trouble Shooting and Testing

Compatible with All Major Logic Families

CSC Design Mate-4. A pulse generator with the precision, flexibility and versatility of a laboratory instrument, yet priced low enough for the workbench of any engineer, technician, student or hobbyist who works with digital circuitry. Frequency range: 0.5Hz to 5MHz. Pulse width and spacing controls: 100 nanosec to 1 sec in 7 overlapping decade ranges. Two single-turn vernier controls for continuous adjustment. 3¼x7½x6¾".
73-1023. Shpg. wt. 2 lbs. **129.95**

Ungar Solder Station

Iron and holder with power supply.
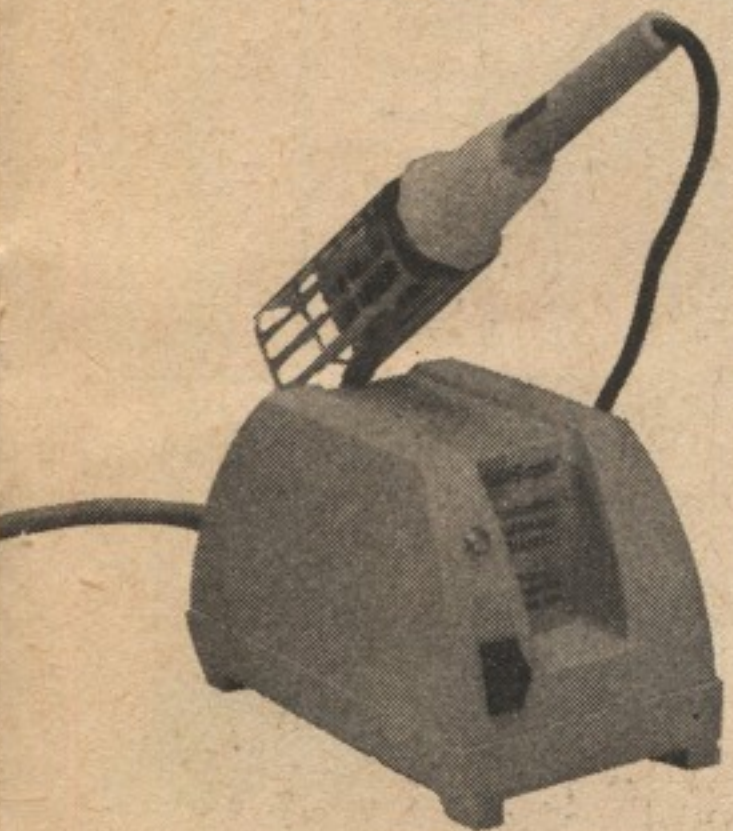**73-1001.**
4½ lbs. **49.95**
Needle Tip.
73-1002.
Wt. 2 oz. **2.49**
Spade Tip.
73-1003.
Wt. 1 oz. **2.49**

Ungar Iron and Holder

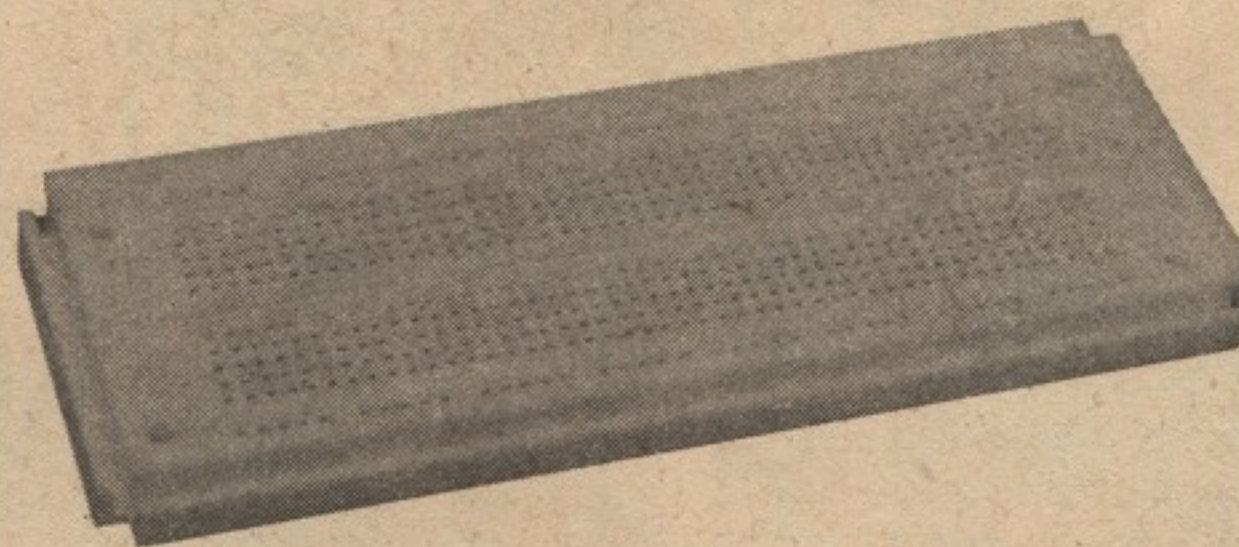Princess holder with slim, perfectly balanced iron.
73-1010. Wt. 1 lb. ... **24.95**
Replacement Tip. Plated.
73-1011. Wt. 1 oz. **1.99**

CSC Experimentor™ Breadboarding Sockets

Parts not included

Expandable snap-together one-piece socket with 550 solderless tie-points (94 five-point terminals and two 40-point bus strips).
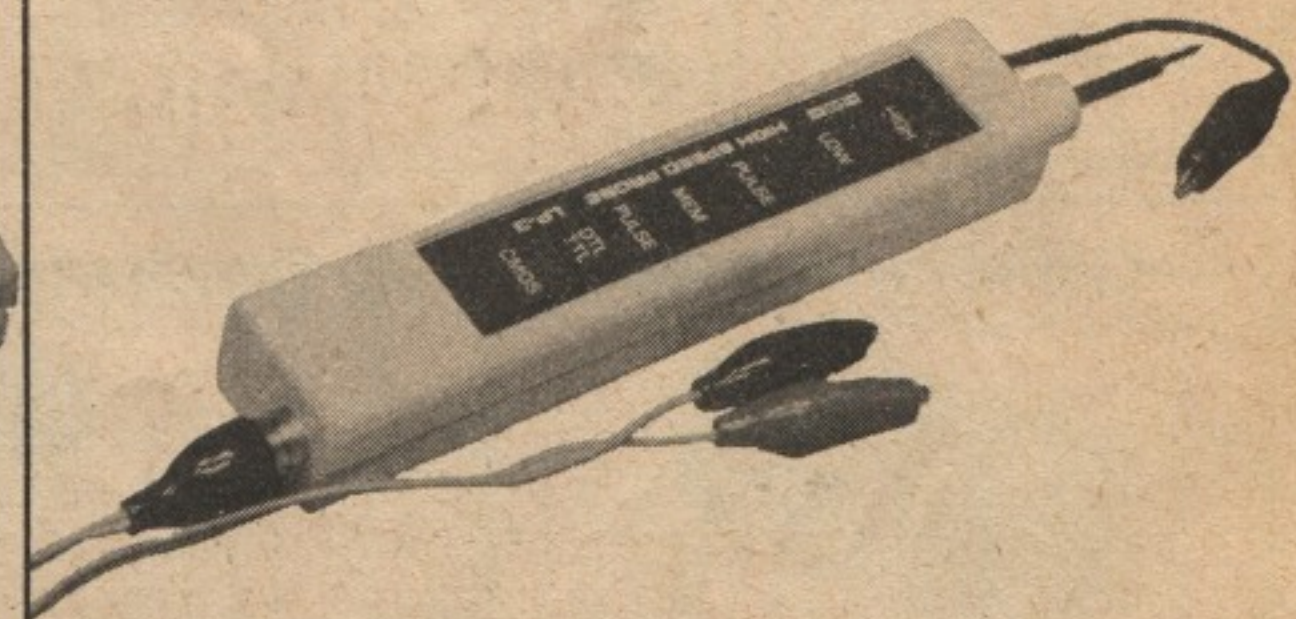**Experimentor-300.** 6x2.1", 0.3" center.
73-1030. Shpg. wt. 5 oz. **9.95**
Experimentor-600. 6x2.4", 0.6" center.
73-1031. Shpg. wt. 5 oz. **10.95**

CSC High-Speed Logic Probe

CSC LP-3. Minimum detectable pulse width of 10 nanoseconds, monitors pulse trains at 50MHz or better. 30mA at 5V, 40mA at 15V, with reverse voltage protection. Nickel-plated, screw-in tip. 5.8x1x.7".
73-1027. Shpg. wt. 10 oz. **69.95**
DP-1 Digital Pulser with LED Pulse Indicator.
73-1028. Shpg. wt. 10 oz. **74.95**

IC Socket Wrapping Tool

For Fast Connections
For 30-ga. Kynar wire below. 4½" long. 5 oz.
276-1570 .... **6.95**
50' Red Wire. **278-501** **1.99**
50' White Wire. **278-502** **1.99**
50' Blue Wire. **278-503** **1.99**

Proto IC Test Clips
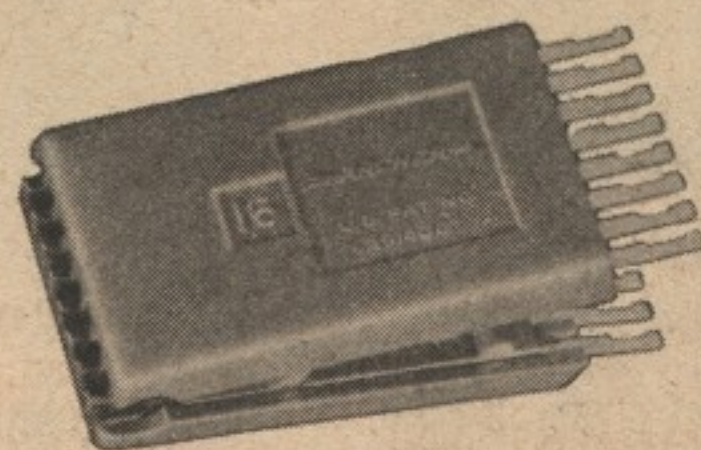
Test hands-free. Avg. wt. 3 oz.
14-Pin. **73-1040** **4.50**
16-Pin. **73-1041** **4.75**
24-Pin. **73-1042** **8.50**
40-Pin. **73-1043** **13.75**

Battery Wire Wrap

BW-630. For 30 awg .025 sq. post. Req. "C" batts. Shpg. wt. 1 oz.
74-1026 ..... **34.95**
BT-30 Replacement Bit. Wt. 3 oz.
74-1027 ..... **3.95**

Slit 'n Wrap Tool
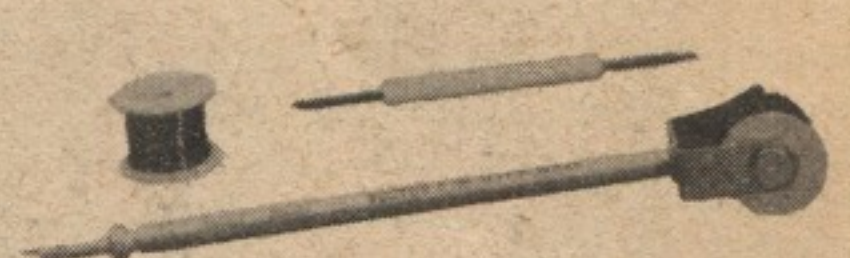
No Pre-Cutting or Stripping
Vector P180. With two spools of 100' 28-gauge wire.
74-1019. Shpg. wt. 9 oz. **24.50**
Two 100' Spools 28-Gauge Wire.
74-1017. Shpg. wt. 3 oz. **2.95**

Wire-Wrapping Kit
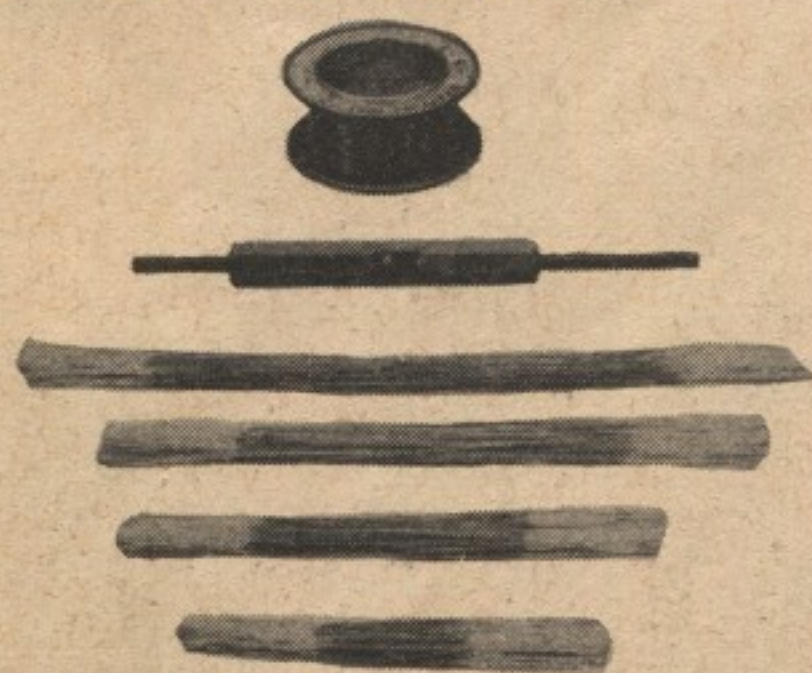
WK-2-B Kit. Wire-wrapping tool, 50 feet of 30-gauge Kynar wire, pre-cut insulated jump wires.
74-1038. Shpg. wt. 10 oz. ... **11.95**

Wire-Wrapping Tools for Best Results

50 "J" Pins. **74-1012.** Shpg. wt. 3 oz. **1.69**
100 Wrap-Post Terminals. **74-1016.** 3 oz. **2.28**
Wire Dispenser w/50' Wire. **74-1050.** 5 oz. **3.45**
IC Insertion Tool. **74-1037.** 4 oz. **3.49**
20 Wiring Spacers. **74-1015.** 3 oz. **1.95**
25 Single-Sided Posts. **74-1047.** 3 oz. **3.98**
25 Slotted Posts. **74-1046.** 3 oz. **2.98**
25 Socket Terminals. **74-1061.** 3 oz. **3.98**
25 Socket Pins. **74-1023.** 3 oz. **4.14**
25 Double-Sided Posts. **74-1048.** 3 oz. **1.98**

Wiring Pencil

"Draws" Circuits

Wiring pencil and bobbin with 200' 36-ga. green "solder-thru" wire, plus extra 200' red wire, threading loop, instructions. Shpg. wt. 5 oz.
74-1014 .... **9.50**

You Can Count on Tandy for Parts and Accessorie

½-Watt Resistors

92 values — specify when ordering.
71-1100 Series. Avg. shpg. wt. 2 oz. .... Each 7¢

2.7Ω	12Ω	56Ω	200Ω	510Ω	1.8k	5.1k	12k	39k	130k	680k	2.2m
3.9Ω	13Ω	68Ω	220Ω	560Ω	2.0k	5.6k	15k	47k	150k	750k	2.7m
4.7Ω	15Ω	82Ω	240Ω	680Ω	2.2k	6.2k	18k	56k	200k	820k	3.0m
6.2Ω	16Ω	100Ω	270Ω	820Ω	2.4k	6.8k	22k	68k	220k	1m	3.6m
7.5Ω	22Ω	120Ω	300Ω	1k	2.7k	7.5k	24k	75k	240k	1.1m	...
9.1Ω	27Ω	150Ω	370Ω	1.2k	3.3k	8.2k	27k	82k	270k	1.2m	...
10Ω	33Ω	160Ω	390Ω	1.3k	3.9k	9.1k	33k	100k	330k	1.3m	...
11Ω	47Ω	180Ω	470Ω	1.4k	4.7k	10k	36k	120k	470k	1.5m	...

¼-Watt Resistors

89 values — specify when ordering.
71-1300 Series. Avg. shpg. wt. 2 oz. .... Each 7¢

3Ω	22Ω	150Ω	560Ω	2.0k	6.8k	27k	91k	560k
4.3Ω	27Ω	180Ω	620Ω	2.2k	7.5k	33k	100k	680k
5.6Ω	39Ω	200Ω	680Ω	2.7k	8.2k	39k	120k	1m
7.5Ω	47Ω	220Ω	750Ω	3.0k	9.1k	47k	150k	1.5m
8.2Ω	51Ω	270Ω	820Ω	3.3k	10k	51k	180k	2.0m
10Ω	56Ω	300Ω	910Ω	3.9k	11k	56k	200k	2.2m
11Ω	68Ω	330Ω	1k	4.7k	12k	62k	220k	3.3m
13Ω	82Ω	390Ω	1.2k	5.1k	15k	68k	270k	3.9m
15Ω	100Ω	470Ω	1.5k	5.6k	20k	75k	330k	4.7m
16Ω	120Ω	510Ω	1.8k	6.2k	22k	82k	470k	...

Electrolytic Capacitors

Avg. shpg. wt. 5 oz.

Cat. No.	µF	WVDC	Each	Cat. No.	µF	WVDC	Each
	Radial			72-1076	1.0	50	.19
72-1051	.47	50	.19	72-1077	2.2	50	.19
72-1052	1.0	50	.19	72-1078	3.3	50	.19
72-1053	2.2	50	.19	72-1079	4.7	35	.29
72-1054	3.3	50	.19	72-1080	10	25	.35
72-1055	4.7	35	.29	72-1081	15	25	.35
72-1056	10	25	.35	72-1082	22	25	.39
72-1057	22	25	.39	72-1083	33	25	.45
72-1058	33	25	.45	72-1084	47	25	.49
72-1059	47	35	.49	72-1085	100	25	.59
72-1060	100	35	.59	72-1086	150	25	.65
72-1061	220	35	.69	72-1087	220	25	.69
72-1062	330	35	.79	72-1088	330	25	.79
72-1063	470	35	.89	72-1089	470	25	.89
72-1064	1000	35	1.19	72-1090	1000	25	1.19
72-1065	2200	35	1.99	72-1091	2200	25	1.99
	Axial			72-1092	3300	25	2.69
72-1075	.47	50	.19	72-1093	4700	25	2.99

Poly Film Capacitors

Rugged Construction

Avg. shpg. wt. 5 oz.

Cat. No.	µF	Each	Cat. No.	µF	Each
72-1001	.001	.10	72-1009	.022	.15
72-1002	.0015	.10	72-1010	.033	.19
72-1003	.0022	.10	72-1011	.047	.19
72-1004	.0033	.10	72-1012	.068	.19
72-1005	.0047	.10	72-1013	.1	.19
72-1006	.0068	.10	72-1014	.15	.29
72-1007	.01	.10	72-1015	.33	.39
72-1008	.015	.15	72-1016	.47	.49

Ceramic Disc Caps

50WVDC
Avg. shpg. wt. 3 oz.

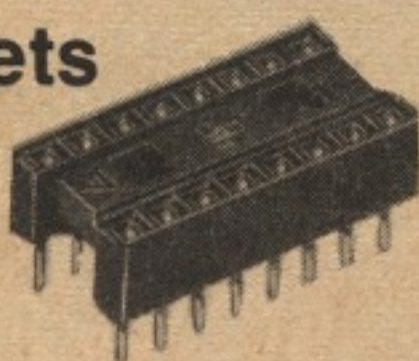| Cat. No.	Cap.	Eac
72-1101	33pF	.10
72-1102	47pF	.10
72-1103	68pF	.10
72-1104	100pF	.10
72-1105	150pF	.10
72-1106	330pF	.10
72-1107	.002mF	.10
72-1108	.003mF	.10
72-1109	.005mF	.10
72-1110	.01mF	.10
72-1111	.02mF	.10
72-1112	.04mF	.10
72-1113	.05mF	.10
72-1114	.1mF	.15

DIP Switches
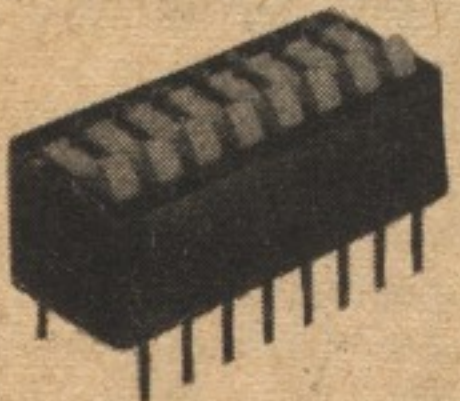
For easy change of preset logic states. Standard .100" by .300". DIP centers. Wt. 5 oz.
14-Pin. 75-207 .... 1.99
16-Pin. 75-208 .... 2.19

IC Sockets

Avg. shpg. wt. 5 oz.
8-Pin. 75-308 .... Each 25¢
14-Pin. 75-314 ...... Each 25¢
16-Pin. 75-316 ...... Each 25¢
18-Pin. 75-318 ...... Each 30¢
24-Pin. 75-324 ...... Each 35¢
28-Pin. 75-328 ...... Each 35¢
40-Pin. 75-340 ...... Each 45¢

Wire-Wrapping Sockets

Avg. shpg. wt. 5 oz.
8-Pin. 75-358 .... Each 35¢
14-Pin. 75-364 ...... Each 45¢
16-Pin. 75-366 ...... Each 55¢
18-Pin. 75-368 ...... Each 65¢
24-Pin. 75-374 ...... Each 79¢
28-Pin. 75-378 ...... Each 89¢
40-Pin. 75-390 ...... Each 99¢

Connectors
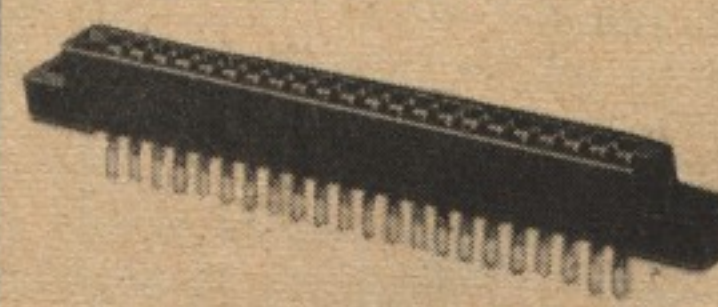
100-pin. Solder eyelet. With .125" centers. Shpg. wt. 5 oz.
IMSAI. 75-850 .... 4.99
MITS. 75-851 .... 4.99
22-Pin Edge-Card Connector.
74-1053. Wt. 5 oz. 2.99

Connectors
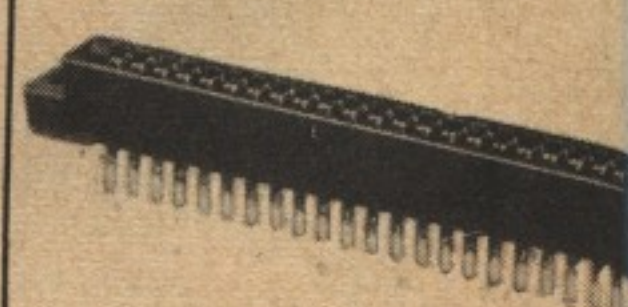
Same as connectors at le but wire-wrapped. Wt. 5 o
100-Pin. 74-1055 ....
22-Pin. 74-1054 .... 3.

DB25 Connectors

Male/female. 25-pin subminiature. Crimp-on mounting. Wt. 5 oz.
Male. 74-1051 .... 7.95
Female. 74-1052 .... 7.95
Solder eyelet mounting.
Male. 75-827 .... 5.95
Female. 75-828 .... 5.95

PC Boards

All accept 22-pin connector. ¹/₁₀" grid. Copper-clad holes.
1-Voltage Bus. 1295 holes.
276-152. Shpg. wt. 5 oz. .. 2.99
2-Voltage Bus. 1368 holes.
276-154. Shpg. wt. 5 oz. .. 2.99
3-Voltage Bus. 1368 holes.
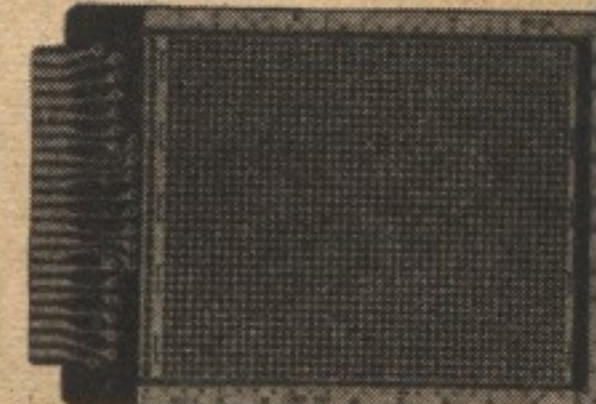**276-153.** Shpg. wt. 5 oz. .. 2.99

DIP Plugboard

Vector 3662 DP. Mates with R644DP or R644-3DP receptacles.
74-1010. Shpg. wt. 5 oz. ... 7.76

DIP Plugboard

Vector 3677-2DP. Mates with R644DP or R644-3DP receptacles.
74-1011. Wt. 5 oz. 9.86

DIP Plugboard

Vector 4112-4DP. Wi ground plane. R644 type i ceptacles.
74-1021. Wt. 5 oz. ...... 9.

Etchant Solution

Removes excess copper from PC boards. 16 fl. oz. Wt. 1 lb.
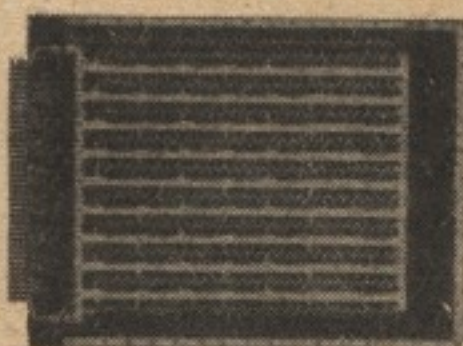**74-1009** ... 1.61
Developer. Wt. 1 lb.
74-1002 ... 1.83

Photo Etch Kit

Includes everything needed to produce "professional quality" PC boards.
74-1003. Wt. 2 lbs. 12.95

DIP Plugboard

Vector 4350DP. Microprocessor logic. 40/80 contacts. .125" centers. Use with R680-1DP receptacles.
74-1022. Shpg. wt. 5 oz. .. 17.95

Terminal Strips

Avg. shpg. wt. 5 oz.
4-Pin. 74-1039 .... 39¢
8-Pin. 74-1040 .... 89¢
12-Pin. 74-1045 .... 1.39

Perf Boards

Avg. shpg. wt. 5 oz.
4½x6½". 74-1005 .... 2.1
4¾x8½". 74-1006 .... 2.7
4½x17". 74-1007 .... 4.8
4¾x17". 74-1008 .... 5.7

Design Block
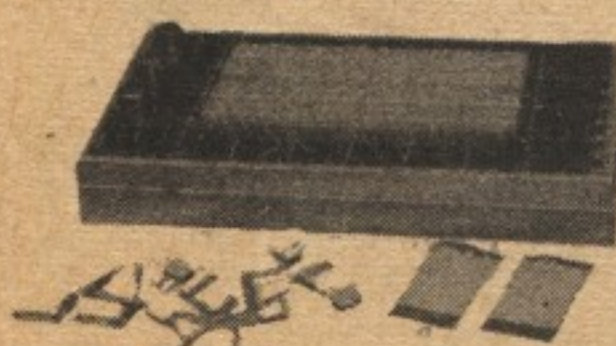
Vector 51XDP Klip-Blok. Solderless DP breadboard.
74-1004. Wt. 10 oz. 25.50

DIP Plugs
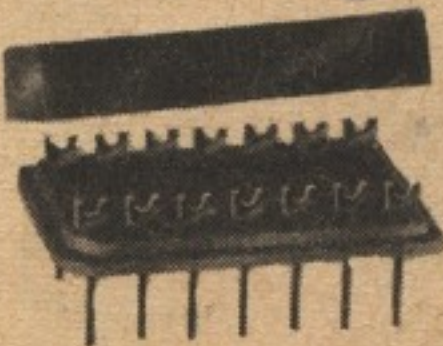
Two plugs, two covers. .100" center spacing. Wt. 5 oz.
16-Pin. 74-1036 .... 1.59
14-Pin. 74-1035 .... 1.45

Ribbon Cables

Avg. shpg. wt. 5 oz.
DE 14-2. 74-1029 .... 3.75
DE 14-4. 74-1030 .... 3.85
DE 14-8. 74-1031 .... 3.95
DE 16-2. 75-1032 .... 4.15
DE 16-4. 75-1033 .... 4.25
DE 16-8. 75-1034 .... 4.35

Jumper Cables

One end terminates with connector. 24" cable. Wt. 5 oz.
16-Pin. 74-1028 .... 3.75
14-Pin. 74-1027 .... 3.55

IC Perf Boards

.100"x.100". Hole size, ³/₆₄ Shpg. wt. 5 oz.
2¾x6". 276-1395 .... .99
4½x6". 276-1394 .... 1.2
6x8". 276-1396 .... 1.9

It's Tandy for Top-Quality Semiconductors

8-Bit Microprocessor Chips

- **100% Prime**
- **Mechanically, Electrically Guaranteed**
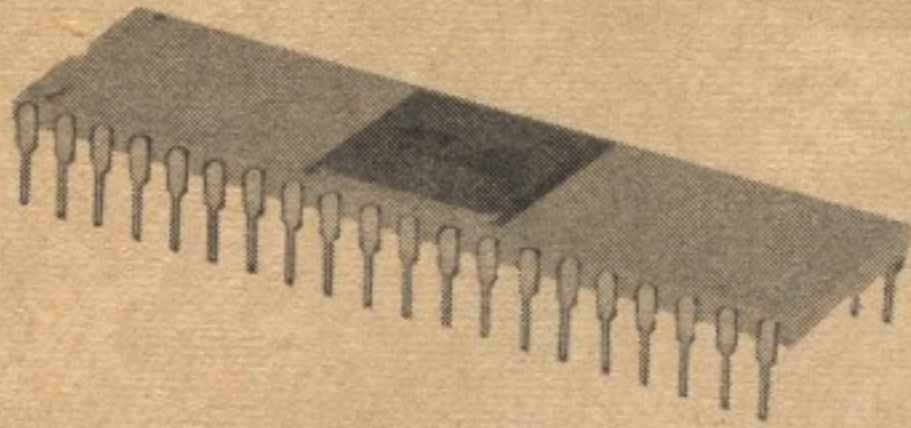
Intel 8080A. Requires +5V, +12V and −5V power supplies. Instruction execution times range from 2 to 9μ sec., using a 500 nS clock. TTL-compatible.
76-3001. Shpg. wt. 5 oz. 14.95

Motorola 6800. Requires a +5V power supply. Instruction execution times range from 2 to 12 microseconds, using a one microsecond clock. TTL-compatible.
76-3102. Shpg. wt. 5 oz. 29.95

Fairchild F8. Requires +5V and +12V power supplies. Instruction execution times range from 2 to 13μ sec., using a 500nS clock.
76-3201. Shpg. wt. 5 oz. 29.95
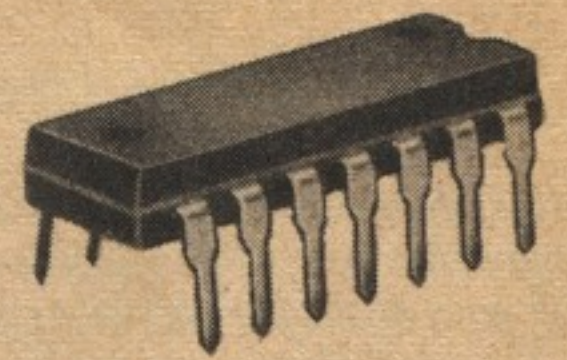
Signetics 2650. Requires a +5V power supply. Instruction execution times range from 4.8 to 9.6 microseconds, using a 0.8 microsecond clock. TTL-compatible.
76-3203. Shpg. wt. 5 oz. 29.95

Interface IC Chips

8216 Address Buffer/Decoder. Provides logic needed to decode 8080A address lines.
76-3010. Shpg. wt. 5 oz. 6.95

8212 I/O Port. Can be used as an address buffer/decoder, 8080A I/O interface.
76-3011. Shpg. wt. 5 oz. 4.95

8224 Clock Generator/Driver. Provides timing signals for the 8080A microcomputer system.
76-3012. Shpg. wt. 5 oz. 8.95

8228 System Controller. Demultiplexes the data lines of the 8080A CPU.
76-3013. Shpg. wt. 5 oz. 8.95

6820 Peripheral Interface Adapter. For 6800 systems. Contains two 8-bit I/O ports.
76-3110. Shpg. wt. 5 oz. 14.95

6810 RAM. 128-byte Random Access Memory for the 6800 System.
76-3111. Shpg. wt. 5 oz. 5.99

6830 ROM System. MikBug Read-Only Memory Operating System for the 6800
76-3112. Shpg. wt. 5 oz. 17.95

2102L4A. A 450nS low-power 1K RAM designed to run in any microprocessor system.
76-3501. Shpg. wt. 5 oz. 1.49

1702. A 256-byte EPROM chip designed to run on any microprocessor system.
76-3502. Shpg. wt. 5 oz. 14.95

2708. A 1K-byte EPROM chip designed to work with any microprocessor system.
76-3503. Shpg. wt. 5 oz. 24.95

2513. Generates a total of 64 characters for video circuits. For all sytems.
**76-3504.** Shpg. wt. 5 oz. 9.95
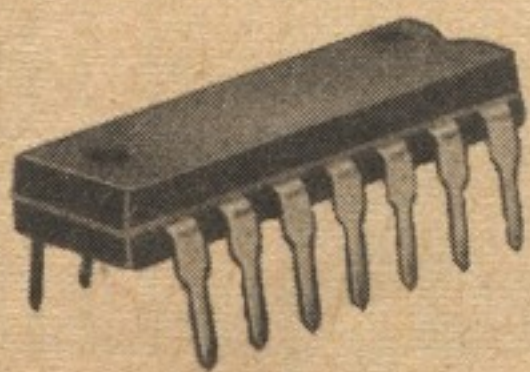
74LS Series IC's

Low-power Schottky IC chips provide faster speed and require less power than standard 7400 Series TTL types. Direct from major semiconductor manufacturers — no fall-outs or rejects. Electrically and mechanically guaranteed. Avg. shpg. wt. 5 oz.

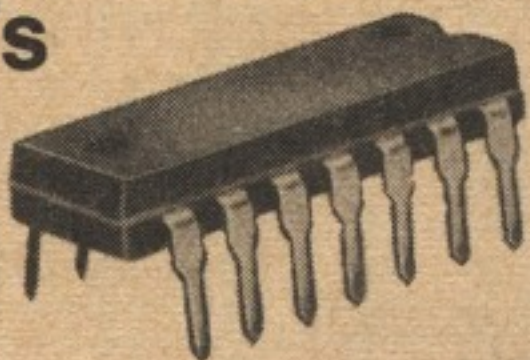| Type	Cat. No.	Each	Type	Cat. No.	Each	Type	Cat. No.	Each	Type	Cat. No.	Each
74LS00	76-1000	.29	74LS47	76-1047	.79	74LS155	76-1155	.99	74LS132	76-1132	1.19
74LS01	76-1001	.29	74LS48	76-1048	.79	74LS157	76-1157	.99	74LS136	76-1136	.59
74LS02	76-1002	.29	74LS51	76-1051	.29	74LS160	76-1160	1.19	74LS151	76-1151	1.49
74LS03	76-1003	.29	74LS53	76-1053	.29	74LS161	76-1161	1.19	74LS153	76-1153	1.99
74LS04	76-1004	.29	74LS54	76-1054	.29	74LS162	76-1162	1.19	74LS154	76-1154	1.19
74LS05	76-1005	.35	74LS73	76-1073	.49	74LS163	76-1163	1.19	74LS155	76-1155	.99
74LS08	76-1008	.29	74LS74	76-1074	.49	74LS164	76-1164	1.39	74LS157	76-1157	.99
74LS09	76-1009	.35	74LS75	76-1075	.69	74LS173	76-1173	1.49	74LS160	76-1160	1.19
74LS10	76-1010	.29	74LS76	76-1076	.49	74LS174	76-1174	1.19	74LS161	76-1161	1.19
74LS11	76-1011	.35	74LS83	76-1083	1.69	74LS175	76-1175	1.19	74LS162	76-1162	1.19
74LS12	76-1012	.29	74LS85	76-1085	1.99	74LS190	76-1190	1.99	74LS163	76-1163	1.19
74LS13	76-1013	.69	74LS86	76-1086	.49	74LS191	76-1191	1.99	74LS164	76-1164	1.39
74LS14	76-1014	.79	74LS90	76-1090	1.25	74LS192	76-1192	1.99	74LS173	76-1173	1.49
74LS20	76-1020	.29	74LS92A	76-1092	1.25	74LS193	76-1193	1.99	74LS174	76-1174	1.19
74LS21	76-1021	.35	74LS93	76-1093	1.25	74LS196	76-1196	1.19	74LS175	76-1175	1.19
74LS22	76-1022	.49	74LS107	76-1107	.59	74LS197	76-1197	.99	74LS190	76-1190	1.99
74LS26	76-1026	.39	74LS109	76-1109	.59	74LS112	76-1112	.59	74LS191	76-1191	1.99
74LS27	76-1027	.39	74LS123	76-1123	.69	74LS367	76-1367	.99	74LS192	76-1192	1.99
74LS30	76-1030	.29	74LS125	76-1125	.69	74LS368	76-1368	.99	74LS193	76-1193	1.99
74LS32	76-1032	.39	74LS126	76-1126	.69	74LS365	76-1365	.99	74LS196	76-1196	1.19
74LS37	76-1037	.35	74LS132	76-1132	1.19	74LS366	76-1366	.99	74LS197	76-1197	.99
74LS38	76-1038	.35	74LS136	76-1136	.59	74LS113	76-1113	.39	74LS365	76-1365	.99
74LS40	76-1040	.39	74LS151	76-1151	1.49	74LS123	76-1123	.69	74LS366	76-1366	.99
74LS42	76-1042	.69	74LS153	76-1153	1.79	74LS125	76-1125	.69	74LS367	76-1367	.99
74LS45	76-1045	.89	74LS154	76-1154	1.19	74LS126	76-1126	.69	74LS368	76-1368	.99

7400 Series IC's
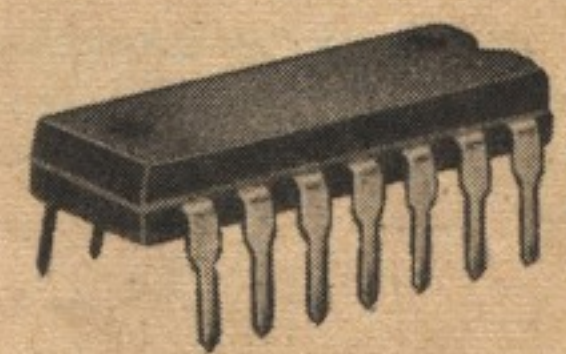
100% prime — no fall-outs or rejects. Made by major semiconductor manufacturers. Medium-speed operation. Static-protected. Electrically and mechanically guaranteed. Avg. shpg. wt. 5 oz.

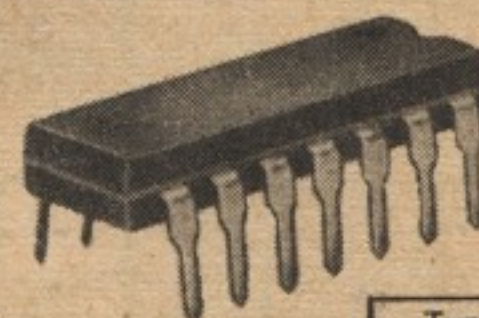| Type	Cat. No.	Each	Type	Cat. No.	Each	Type	Cat. No.	Each	Type	Cat. No.	Each
7400	76-2000	.19	7430	76-2030	.25	7491A	76-2091	.79	74163	76-2163	.99
7401	76-2001	.19	7432	76-2032	.25	7492A	76-2092	.49	74164	76-2164	.99
7402	76-2002	.19	7437	76-2037	.35	7493	76-2093	.49	74165	76-2165	.99
7403	76-2003	.19	7438	76-2038	.35	7495	76-2095	.79	74173	76-2173	1.49
7404	76-2004	.19	7440	76-2040	.25	7496	76-2096	.79	74174	76-2174	1.25
7405	76-2005	.19	7441	76-2041	.89	74107	76-2107	.39	74175	76-2175	.99
7406	76-2006	.35	7442	76-2042	.69	74109	76-2109	.95	74181	76-2181	2.49
7407	76-2007	.35	7445	76-2045	.75	74121	76-2121	.39	74182	76-2182	1.95
7408	76-2008	.19	7446	76-2046	.89	74123	76-2123	.49	74184	76-2184	1.95
7409	76-2009	.25	7447	76-2047	.69	74125	76-2125	.59	74185	76-2185	1.95
7410	76-2010	.19	7448	76-2048	.89	74126	76-2126	.59	74190	76-2190	1.79
7411	76-2011	.29	7451	76-2051	.25	74132	76-2132	1.29	74191	76-2191	1.29
7412	76-2012	.35	7453	76-2053	.25	74136	76-2136	.95	74192	76-2192	.89
7413	76-2013	.69	7454	76-2054	.25	74141	76-2141	1.19	74193	76-2193	.89
7414	76-2014	.69	7472	76-2072	.25	74145	76-2145	1.19	74194	76-2194	1.29
7416	76-2016	.35	7473	76-2073	.39	74150	76-2150	1.29	74195	76-2195	.79
7417	76-2017	.35	7474	76-2074	.35	74151	76-2151	.79	74196	76-2196	.99
7420	76-2020	.19	7475	76-2075	.49	74153	76-2153	.89	74197	76-2197	.99
7421	76-2021	.29	7476	76-2076	.35	74154	76-2154	1.29	74198	76-2198	1.79
7422	76-2022	.49	7483	76-2083	.70	74155	76-2155	.89	74251	76-2251	1.19
7423	76-2023	.39	7485	76-2085	.89	74157	76-2157	.89	74365	76-2365	.99
7425	76-2025	.29	7486	76-2086	.39	74160	76-2160	1.29	74366	76-2366	.99
7426	76-2026	.35	7489	76-2089	2.49	74161	76-2161	.99	74367	76-2367	.99
7427	76-2027	.39	7490	76-2090	.45	74162	76-2162	1.95	74368	76-2368	.99

4000 Series CMOS IC's

A superior combination of noise immunity and standardized drive characteristics. Electrically and mechanically guaranteed. Avg. shpg. wt. 5 oz.

Type	Cat. No.	Each	Type	Cat. No.	Each
4000	76-4000	.25	4029	76-4029	2.89
4001	76-4001	.25	4030	76-4030	.59
4002	76-4002	.25	4035	76-4035	1.79
4006	76-4006	2.49	4040	76-4040	2.39
4007	76-4007	.25	4042	76-4042	1.89
4009	76-4009	.59	4044	76-4044	1.49
4010	76-4010	.59	4046	76-4046	2.49
4011	76-4011	.25	4047	76-4047	2.69
4012	76-4012	.25	4049	76-4049	.79
4013	76-4013	.49	4050	76-4050	.79
4016	76-4016	.59	4051	76-4051	2.95
4017	76-4017	1.29	4053	76-4053	2.95
4019	76-4019	.49	4060	76-4060	2.99
4020	76-4020	1.49	4066	76-4066	1.79
4023	76-4023	.25	4069	76-4069	.45
4024	76-4024	1.49	4071	76-4071	.45
4025	76-4025	.25	4081	76-4081	.45
4027	76-4027	.69	4511	76-4511	1.49
4028	76-4028	1.59	4518	76-4518	1.49

Linear IC's

Avg. shpg. wt. 5 oz.

- **100% Prime**
- **Made by Major U.S. Manufacturers**

Type	Cat. No.	Each		Type	Cat. No.	Each
301CN	76-5001	.39		566CN	76-5036	1.69
308CN	76-5004	.99		567V	76-5037	1.49
310CN	76-5005	1.19		703CN	76-5050	.45
324N	76-5010	1.49		709N	76-5053	.29
339N	76-5012	.99		710N	76-5054	.79
360CN	76-5018	.99		711N	76-5055	.39
555V	76-5025	.39		741CN	76-5060	.35
560B	76-5030	4.99		741-14N	76-5061	.39
561B	76-5031	4.99		747N	76-5065	.79
562B	76-5032	4.99		3909	76-5070	1.19
565N	76-5035	1.19		8038	76-5080	4.95

Books

Avg. shpg. wt. 1½ lbs.

Title	Cat. No.	Each
NS Digital IC	62-1370	3.95
V R Book	62-1371	2.95
Linear IC	62-1372	3.95
Linear Applications	62-1373	2.95
Linear App. Vol. 2	62-1374	2.95
CMOS	62-1375	3.95
Memory	62-1376	3.95
Audio Handbook	62-5900	4.00
FET Data	62-5901	3.00
Interface Book	62-5902	4.00
MOS/LSI Data	62-5903	5.00
8080 Design	62-5904	5.00
Power Transistors	62-5905	3.00

Transistors
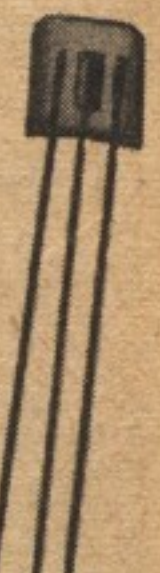
Avg. shpg. wt. 5 oz.

Type	Cat. No.	Each		Type	Cat. No.	Each
2N2219	76-6001	.39		2N3704	76-6011	.25
2N2221	76-6002	.29		2N3705	76-6012	.25
2N2222A	76-6003	.25		2N3706	76-6013	.25
2N2369A	76-6004	.29		2N3903	76-6014	.29
2N2484	76-6005	.29		2N3904	76-6015	.29
2N2906	76-6006	.29		2N3905	76-6016	.29
2N2907	76-6007	.25		2N3906	76-6017	.29
2N3055	76-6008	.99		2N4400	76-6020	.29
MJE3055	76-6009	.99		2N5088	76-6021	.29
MJE2955	76-6010	1.19				

IC Voltage Regulators

Avg. shpg. wt. 5 oz.

Type	Cat. No.	Each		Type	Cat. No.	Each
320K-5	76-5101	1.79		323K-5	76-5120	7.95
320K-5.2	76-5102	1.79		340K-5	76-5131	1.49
320K-12	76-5103	1.79		340K-12	76-5134	1.49
320K-15	76-5104	1.79		340K-15	76-5135	1.49
320T-5	76-5111	1.39		340T-5	76-5141	1.35
320T-5.2	76-5112	1.39		340T-12	76-5145	1.35
320T-12	76-5113	1.39		340T-15	76-5146	1.35
320T-15	76-5114	1.39				

Complete Shipping Information

CASH ORDERS

Be sure to include all transportation and insurance charges. Tandy Computers will ship your order the best way possible (see charts for Parcel Post and United Parcel Service charges). No Back Orders will be made on Cash Orders for under $100.00 per line item. Please re-order in 30 days.

TRUCK SHIPMENTS

Truck is the most economical way to ship items weighing approximately 50 lbs. or more. Contact your local agent for approximate shipping charges.

EXPRESS SHIPMENTS

Fastest way to ship unmailable items. For items weighing over 50 lbs. contact your local agent for approximate shipping charges.

AIR EXPRESS AND AIR FREIGHT SHIPMENTS

We will ship your order Air Freight or Air Express on your instructions. Consult your local Express office for Air Express charges; contact your local airport for Air Freight charges.

INSURANCE

To protect you, we insure all shipments. Allow for insurance as follows:

SMALL PACKAGES

If Shipping Charges Are	Add for Insurance
.01 to .50	.30
.51 to 1.00	.40
1.01 to 2.50	.60
2.51 to 5.00	.80
5.01 and Up	1.00

IF SHIPPED FREIGHT OR AIR — 10% OF SHIPPING CHARGES

MERCHANDISE RETURN

Tandy Computers' prior written authorization must be issued before merchandise is returned. Detailed instructions for returning merchandise will accompany your return authorization.

DAMAGED MERCHANDISE

Since the terms of sale are F.O.B. shipping point, all claims for loss and damage are to be filed against the carrier by the consignee. This does not apply to shipments via Parcel Post or U.P.S., in which case you should write to us for instructions on handling the claim.

Parcel Post and U.P.S. shipping charges are those in effect at the time of printing—they are subject to increase at any time.

HOW TO ESTIMATE U.P.S. CHARGES

WEIGHT AND SIZE LIMITS:
Maximum Weight per package, 50 POUNDS.
Maximum Weight of all packages from one shipper to one consignee in one day, 100 pounds.
Maximum Size per package, 108 INCHES IN LENGTH AND GIRTH COMBINED.
Minimum charge for a package measuring over 84 inches in length and girth combined will be equal to charge for a package weighing 25 pounds.

ANY FRACTION OF A POUND OVER THE WEIGHT SHOWN TAKES THE NEXT HIGHER RATE

Weight Not To Exceed	2	3	4	5	6	7	8	Weight Not To Exceed	2	3	4	5	6	7	8
1 lb.	$ .77	$ .79	$ .82	$ .85	$ .89	$ .94	$ .99	26 lb.	$2.52	$2.97	$3.72	$4.47	$ 5.57	$ 6.71	$ 8.06
2 lb.	.84	.88	.94	.99	1.08	1.17	1.27	27 lb.	2.59	3.05	3.84	4.62	5.75	6.94	8.35
3 lb.	.91	.97	1.05	1.14	1.27	1.40	1.55	28 lb.	2.66	3.14	3.95	4.76	5.94	7.17	8.63
4 lb.	.98	1.05	1.17	1.28	1.45	1.63	1.84	29 lb.	2.73	3.23	4.07	4.91	6.13	7.40	8.91
5 lb.	1.05	1.14	1.28	1.43	1.64	1.86	2.12	30 lb.	2.80	3.31	4.18	5.05	6.31	7.63	9.19
6 lb.	1.12	1.23	1.40	1.57	1.83	2.09	2.40	31 lb.	2.87	3.40	4.30	5.20	6.50	7.87	9.48
7 lb.	1.19	1.31	1.52	1.72	2.01	2.32	2.69	32 lb.	2.94	3.49	4.42	5.34	6.69	8.10	9.76
8 lb.	1.26	1.40	1.63	1.86	2.20	2.55	2.97	33 lb.	3.01	3.58	4.53	5.49	6.88	8.33	10.04
9 lb.	1.33	1.49	1.75	2.01	2.39	2.78	3.25	34 lb.	3.08	3.66	4.65	5.63	7.06	8.56	10.33
10 lb.	1.40	1.57	1.86	2.15	2.57	3.01	3.53	35 lb.	3.15	3.75	4.76	5.78	7.25	8.79	10.61
11 lb.	1.47	1.66	1.98	2.30	2.76	3.25	3.82	36 lb.	3.22	3.84	4.88	5.92	7.44	9.02	10.89
12 lb.	1.54	1.75	2.10	2.44	2.95	3.48	4.10	37 lb.	3.29	3.92	5.00	6.07	7.62	9.25	11.18
13 lb.	1.61	1.84	2.21	2.59	3.14	3.71	4.38	38 lb.	3.36	4.01	5.11	6.21	7.81	9.48	11.46
14 lb.	1.68	1.92	2.33	2.73	3.32	3.94	4.67	39 lb.	3.43	4.10	5.23	6.36	8.00	9.71	11.74
15 lb.	1.75	2.01	2.44	2.88	3.51	4.17	4.95	40 lb.	3.50	4.18	5.34	6.50	8.18	9.94	12.02
16 lb.	1.82	2.10	2.56	3.02	3.70	4.40	5.23	41 lb.	3.57	4.27	5.46	6.65	8.37	10.18	12.31
17 lb.	1.89	2.18	2.68	3.17	3.88	4.63	5.52	42 lb.	3.64	4.36	5.58	6.79	8.56	10.41	12.59
18 lb.	1.96	2.27	2.79	3.31	4.07	4.86	5.80	43 lb.	3.71	4.45	5.69	6.94	8.75	10.64	12.87
19 lb.	2.03	2.36	2.91	3.46	4.26	5.09	6.08	44 lb.	3.78	4.53	5.81	7.08	8.93	10.87	13.16
20 lb.	2.10	2.44	3.02	3.60	4.44	5.32	6.36	45 lb.	3.85	4.62	5.92	7.23	9.12	11.10	13.44
21 lb.	2.17	2.53	3.14	3.75	4.63	5.56	6.65	46 lb.	3.95	4.71	6.04	7.37	9.31	11.33	13.72
22 lb.	2.24	2.62	3.26	3.89	4.82	5.79	6.93	47 lb.	3.99	4.79	6.16	7.52	9.49	11.56	14.01
23 lb.	2.31	2.71	3.37	4.04	5.01	6.02	7.21	48 lb.	4.06	4.88	6.27	7.66	9.68	11.79	14.29
24 lb.	2.38	2.79	3.49	4.18	5.19	6.25	7.50	49 lb.	4.13	4.97	6.39	7.81	9.87	12.02	14.57
25 lb.	2.45	2.88	3.60	4.33	5.38	6.48	7.78	50 lb.	4.20	5.05	6.50	7.95	10.05	12.25	14.85

We limit Parcel Post Shipments to 40 lbs. and 84 inches length plus girth (maximum measurement around widest point of package). Estimate charges from table below.

The post office charges a fraction of a pound as a full pound. For example if the total weight is 4 pounds and 1 ounce to Zone 4, postage would be for 5 pounds ($1.10).

HOW TO ESTIMATE PARCEL POST CHARGES

WEIGHT 1 Lb. & Not Exceeding	Local	1st & 2nd Zone up to 150 mi.	3rd Zone 150 to 300 mi.	4th Zone 300 to 600 mi.	5th Zone 600 to 1000 mi.	6th Zone 1000 to 1400 mi.	7th Zone 1400 to 1800 mi.	8th Zone Over 1800 mi.
2	$ .77	$ .90	$ .93	$1.04	$1.15	$1.28	$1.40	$ 1.48
3	.82	.97	1.02	1.15	1.29	1.46	1.62	1.74
4	.86	1.04	1.10	1.25	1.42	1.63	1.84	2.00
5	.91	1.11	1.19	1.36	1.56	1.81	2.06	2.26
6	.95	1.18	1.27	1.46	1.69	1.98	2.28	2.52
7	1.00	1.25	1.36	1.57	1.83	2.16	2.50	2.78
8	1.04	1.32	1.44	1.67	1.96	2.33	2.72	3.04
9	1.09	1.39	1.53	1.78	2.10	2.51	2.94	3.30
10	1.13	1.46	1.61	1.88	2.23	2.68	3.16	3.56
11	1.18	1.53	1.70	1.99	2.37	2.86	3.38	3.82
12	1.22	1.60	1.78	2.09	2.50	3.03	3.60	4.08
13	1.27	1.67	1.87	2.20	2.64	3.21	3.82	4.34
14	1.31	1.74	1.95	2.30	2.77	3.38	4.04	4.60
15	1.36	1.81	2.04	2.41	2.91	3.56	4.26	4.86
16	1.40	1.88	2.12	2.51	3.04	3.73	4.48	5.12
17	1.45	1.95	2.21	2.62	3.18	3.91	4.70	5.38
18	1.49	2.02	2.29	2.72	3.31	4.08	4.92	5.64
19	1.54	2.09	2.38	2.83	3.45	4.26	5.14	5.90
20	1.58	2.16	2.46	2.93	3.58	4.43	5.36	6.16
21	1.63	2.23	2.55	3.04	3.72	4.61	5.58	6.42
22	1.67	2.30	2.63	3.14	3.85	4.78	5.80	6.68
23	1.72	2.37	2.72	3.25	3.99	4.96	6.02	6.94
24	1.76	2.44	2.80	3.35	4.12	5.13	6.24	7.20
25	1.81	2.51	2.89	3.46	4.26	5.31	6.46	7.46
26	1.85	2.58	2.97	3.56	4.39	5.48	6.68	7.72
27	1.90	2.65	3.06	3.67	4.53	5.66	6.90	7.98
28	1.94	2.72	3.14	3.77	4.66	5.83	7.12	8.24
29	1.99	2.79	3.23	3.88	4.80	6.01	7.34	8.50
30	2.03	2.86	3.31	3.98	4.93	6.18	7.56	8.76
31	2.08	2.93	3.40	4.09	5.07	6.36	7.78	9.02
32	2.12	3.00	3.48	4.19	5.20	6.53	8.00	9.28
33	2.17	3.07	3.57	4.30	5.34	6.71	8.22	9.54
34	2.21	3.14	3.65	4.40	5.47	6.88	8.44	9.80
35	2.26	3.21	3.74	4.51	5.61	7.06	8.66	10.06
36	2.30	3.28	3.82	4.61	5.74	7.23	8.88	10.32
37	2.35	3.35	3.91	4.72	5.88	7.41	9.10	10.58
38	2.39	3.42	3.99	4.82	6.01	7.58	9.32	10.84
39	2.44	3.49	4.08	4.93	6.15	7.76	9.54	11.10
40	2.48	3.56	4.16	5.03	6.28	7.93	9.76	11.36

Over 40 lbs. shipped truck or express.

HOW TO ESTIMATE AIR PARCEL POST CHARGES

We will ship your order by Air Parcel Post on your instructions. Size and weight limitations are 70 pounds and 100 inches (length plus girth).

Wt., Lbs.	Zones 1, 2, 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	APO's and FPO's
To 1	$1.56	$1.58	$1.60	$1.62	$1.64	$1.67	
1-1½	1.73	1.77	1.84	1.90	1.97	2.07	
1½-2	1.89	1.96	2.07	2.18	2.29	2.46	APO & FPO San Francisco, 1.30 per lb.
2-2½	2.05	2.15	2.29	2.43	2.59	2.78	
2½-3	2.21	2.33	2.50	2.68	2.88	3.09	
3-3½	2.37	2.51	2.70	2.91	3.15	3.38	
3½-4	2.53	2.69	2.90	3.14	3.41	3.67	APO & FPO New York, 1.25 per lb.
4-4½	2.68	2.86	3.09	3.35	3.65	3.94	
4½-5	2.83	3.03	3.27	3.56	3.88	4.20	
For Each Extra Lb.	Add 48c	Add 50c	Add 56c	Add 64c	Add 72c	Add 80c	

DO NOT WRITE HERE	Page No. of Item	Catalog Number	Quantity: Foot, Set, Pair, Roll, Pkg., Etc.	Manufacturer's Type Number	Description	Quantity Shipped	Price Each Foot, Set, Pair, Roll, Pkg., Etc.	Total Price Put Here and Add This Column	Shipping Weight LBS.	OZ.

"All equipment, computer hardware and systems listed on this order are offered by Tandy Computers subject to the warranties and conditions of sale shown on page 27 of this catalog. Customer accepts the listed products subject to such warranties and conditions."

Enter Amount Enclosed
(Minimum Order $10.00)

Note: If you send currency, be sure to register letter. (No stamps please.)

☐ Cash Order $ _____

☐ Charge $ _____
Be sure to fill out Charge information completely.

AMOUNT FOR GOODS		
SHIPPING CHARGES		
INSURANCE		
DUE TANDY COMPUTERS From Previous Cash Order		
TOTAL AMOUNT		

Total
L B S.
O Z S.

Please Remit for Next Full Pound

C78A — TCG-3

TANDY COMPUTERS   P.O. Box 2932, Ft. Worth, Texas 76101

Print Name, Address, and Phone Number

ALSO CANADA

CHARGE X

Name_____   Phone _____
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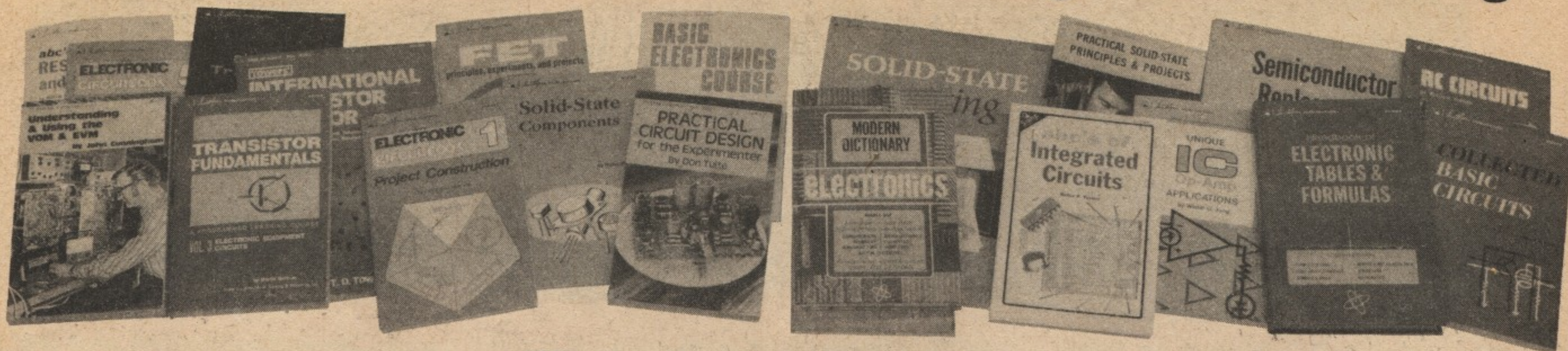**62-2067.** Shpg. wt. 10 oz. 4.50

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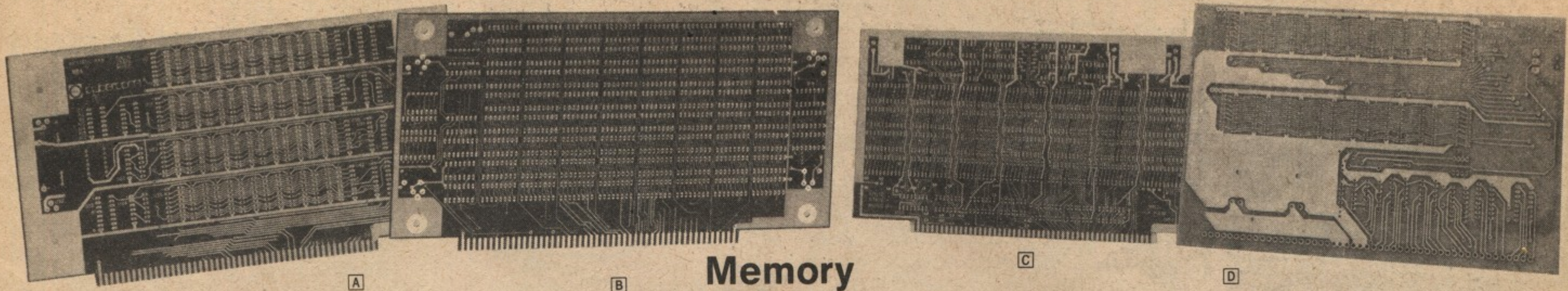
Memory

A Solid State Music 4K RAM Board. Just add the parts and you've got 4K of RAM that uses low-power, 450nS RAMs. No wait cycles, and a DIP switch selects address assignment. Convert to 8K with additional IC's.
**82-501.** Shpg. wt. 1 lb. **29.95**

B Solid State Music 8K RAM Board. An 8K RAM that's ideal for the electronics hobbyist who has the parts and just needs the PC board. Features a selectable memory protect. Uses standard 2102 RAM IC's.
82-901. Shpg. wt. 1 lb. **29.95**

C Solid State Music 16K RAM Board. The low-cost way for the hardware buff to obtain 16K — you supply the parts! Static board inhibit line gives hardware jumps on power up or reset. Provides 200nS access time.
82-1701. Shpg. wt. 1 lb. **29.95**

D SWTP 8K RAM Board. Get 8K of 8-bit RAM by building your own from the board on up! Provides address decoding, data line buffering for 16 4Kx1 bit RAMs.
82-923. Shpg. wt. 1 lb. **14.50**
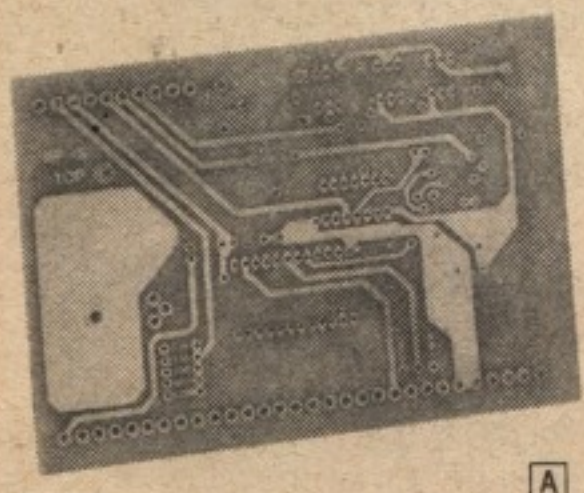
Serial/Parallel Interfaces and Interrupts
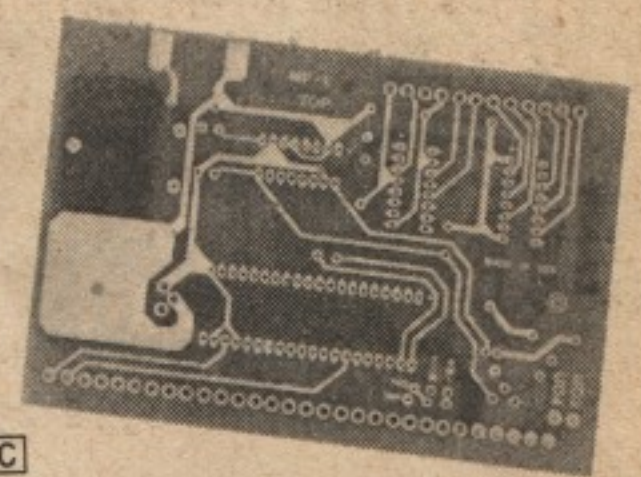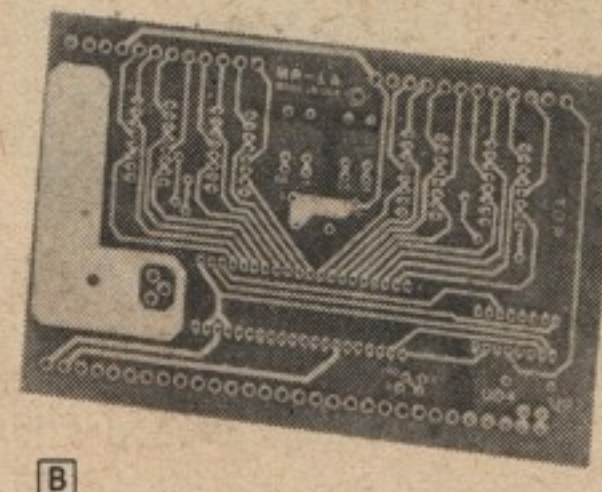
A SWTP MP-S Serial Interface Board. Build a RS232C/20mA compatible board that interfaces a serial device to a microprocessor system. Can be operated serially from 110-1200 bps.
87-1551. Shpg. wt. 1 lb. **9.50**

B SWTP MP-L Parallel Interface Board. For building a parallel interface with 8 fully buffered inputs and outputs. Provides a handshake control.
87-1552. Shpg. wt. 1 lb. **9.50**

C SWTP MPT-B Interrupt Board. Build your own interrupt for the SWTP 6800 microcomputer. Board provides software selectable interrupts from 1 second to 1 hour.
87-2016. Shpg. wt. 1 lb. **9.50**

Handy Aids for the Hobbyist

For Easy Troubleshooting

Solid State Music Extender Card. Great for crowded motherboards—extends boards high enough for easy troubleshooting.
70-103. Shpg. wt. 1 lb. **9.50**

Vector 8800V Designer Board. For two 40-pin, eight 24-pin and thirty-six 14 or 16-pin DIPs or any combination in any location. S-100 compatible.
74-1001. Shpg. wt. 1 lb. .. **19.95**
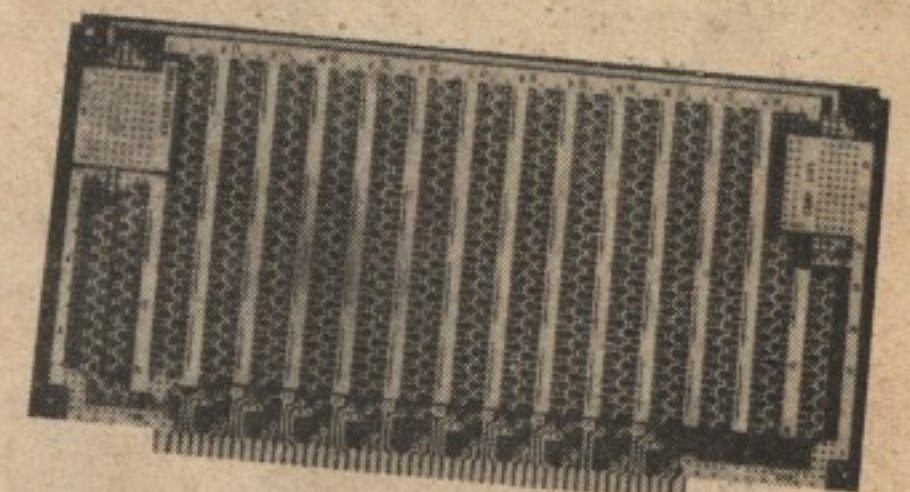
Ideal for Breadboarding

Disk Controller Board
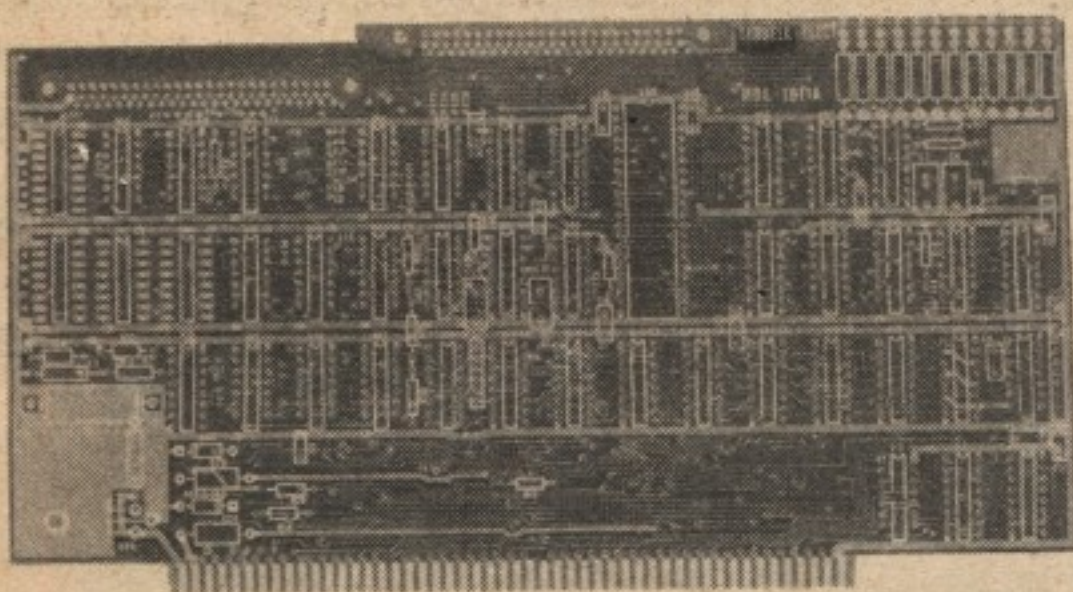
Tarbell FDC Board. Build a controller that handles up to four daisy-chained disk drives. Plugs directly into IMSAI or ALTAIR micros and operates at standard 250K bits per second on normal disk format capacity of 243K bytes. Provisions for phantom bootstrap.
87-2302. Shpg. wt. 1 lb. **40.00**

Video Interface Board
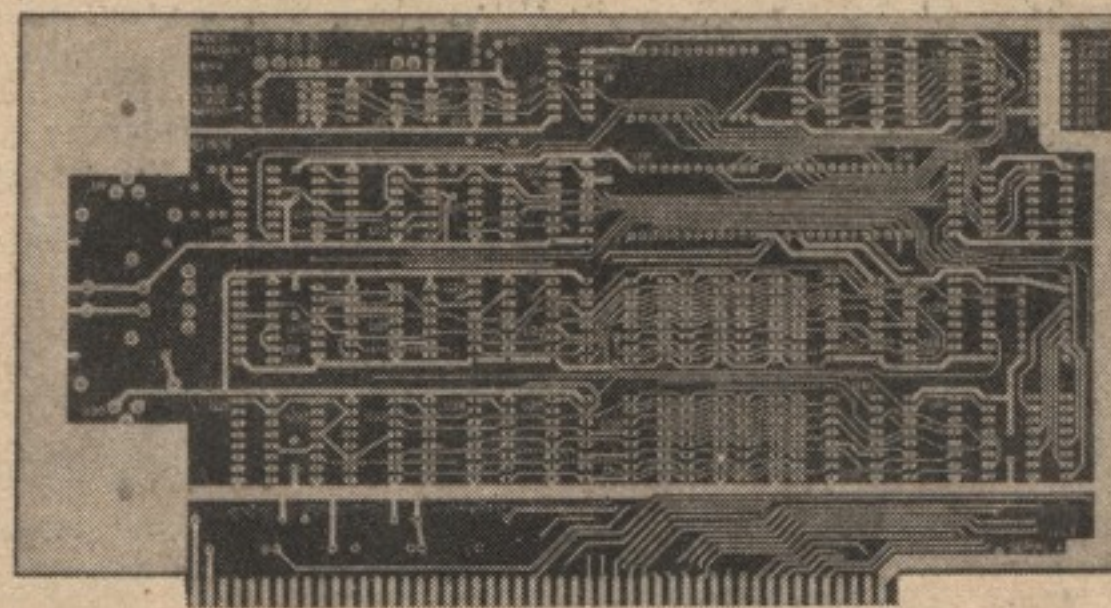
Solid State Music Board. Build this into a video monitor interface that allows 32 or 64 characters per 16 lines in upper/lower case and Greek. 128x48 matrix. Features parallel and serial composite video, reverse video. Graphics capability. Powerful software control.
87-2301. Shpg. wt. 1 lb. **49.95**

Cassette Interface Board
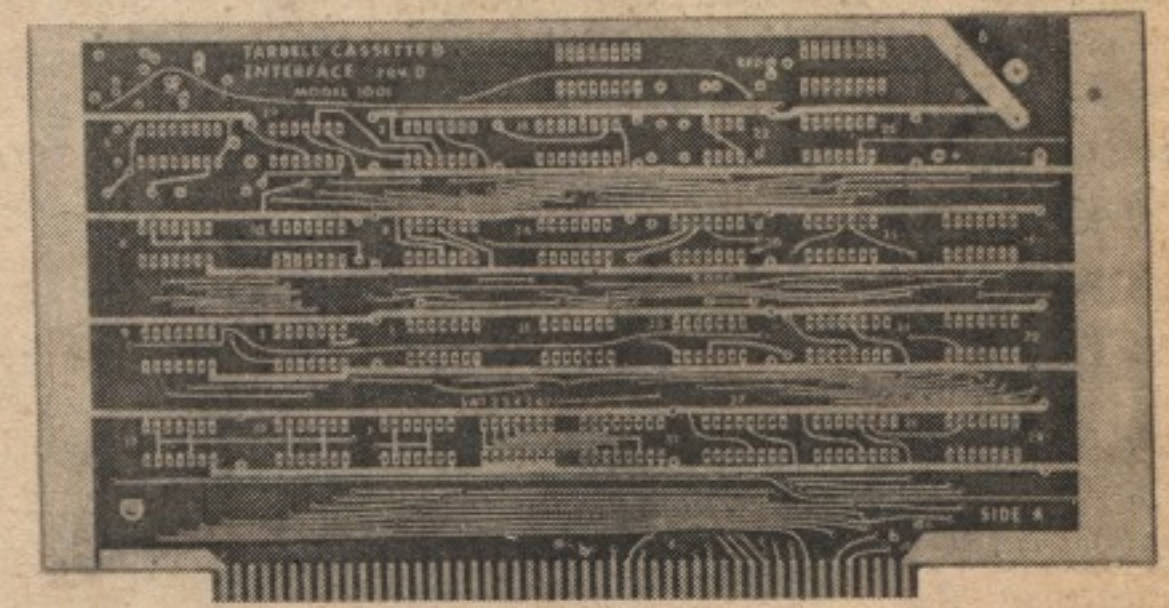
Tarbell Cassette Interface Board. Build your own S-100 compatible cassette interface. Phase encoded self-clocking requires only one channel. Provides 27-540 bytes per second or 1000 bytes per second at 10 inches per second with PHI-DECK.
87-2305. Shpg. wt. 1 lb. **35.00**

Printed Circuit Boards On This Page Do Not Include Parts

Power Supplies, Cases and Accessories

North Star Offers Single-Drive Power
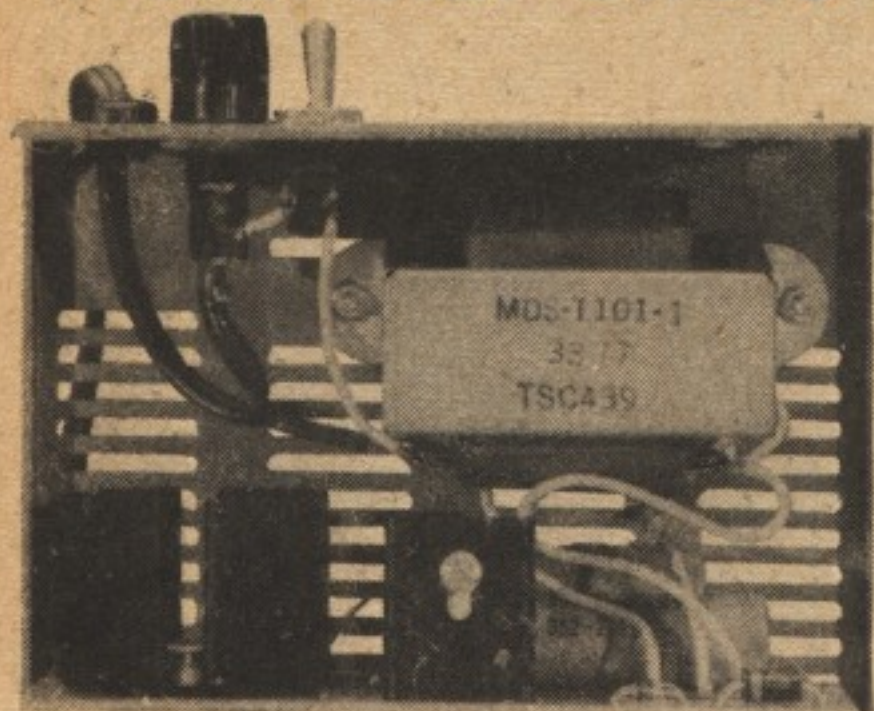
North Star MDS-PS. Regulated, fuse-protected power supply is designed to drive one Shugart disk drive system, and is also suitable for use with the micro disk system by North Star. Input is 110VAC at 60Hz.
87-503. Shpg. wt. 3 lbs. . . **39.00**

Beef-Up Your System with ICOM Power

ICOM PS-171. Fully regulated power supply is designed to drive one or two ICOM or Pertec systems. Input is 150 or 250VAC at 50-60Hz. Output measures 24VDC at 5A, −12VDC at 1A and 5VDC at 6A, all ±5%. 8x11¼x3½".
87-501. Shpg. wt. 10 lbs. **250.00**
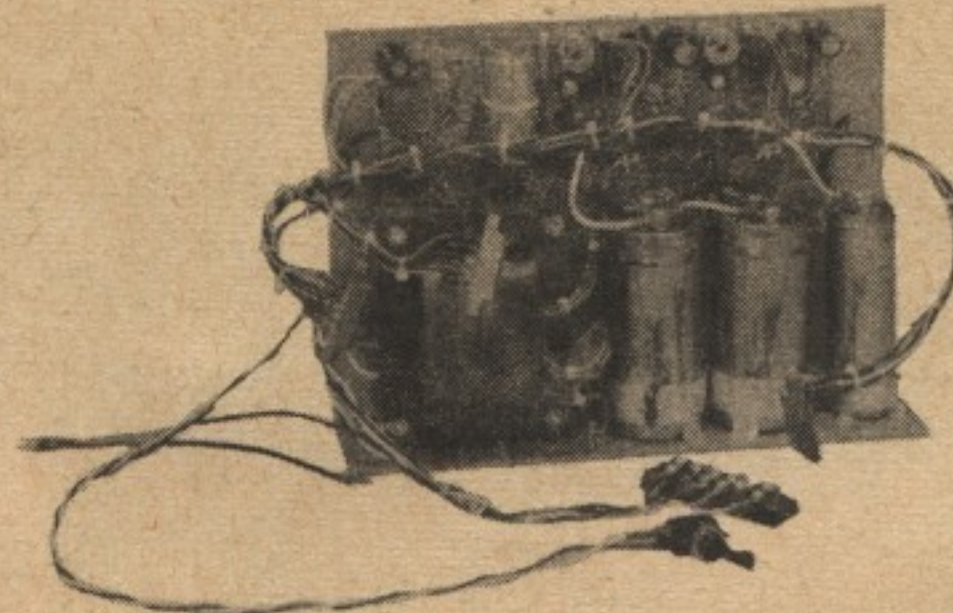
Heavy-Duty Printer Power Supply

Practical Automation 6-28. Variable 36V output provides voltages of 5V at 1A; 36V at .6A avg., 7A peak; 28VAC at .4A. Operates any DMTP series printer and interface combination. Fully regulated logic level, current limiting circuits, input filtering. Power consumption is 55 watts. Operates from 120, 200 or 240VAC at 50-60Hz. 3x4½x6½".
87-505. Shpg. wt. 6 lbs. . **110.00**
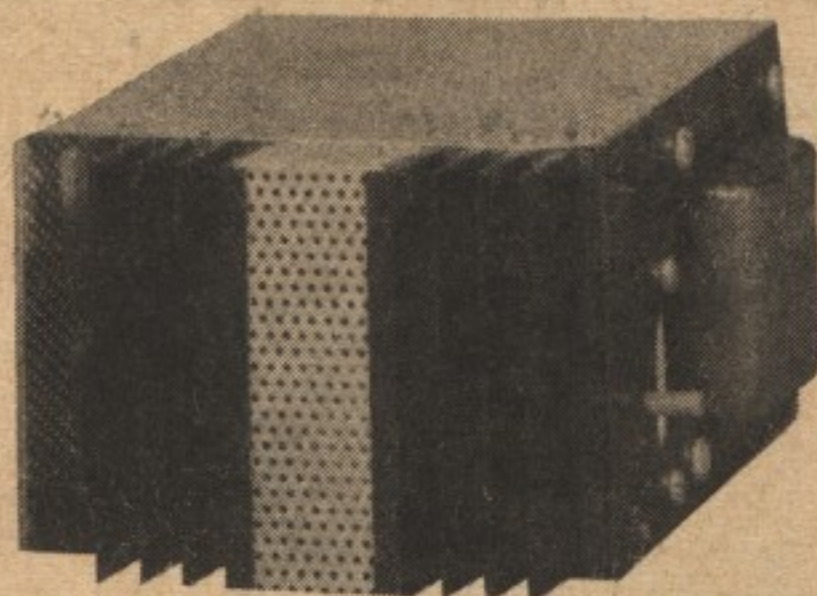
Microfloppy Power Supply

Tandy Mini-Disk Power Supply. Designed for Shugart, Wanco or ICOM microfloppies. Input: 115-230VAC at 47-60Hz. Output: 12VDC, 9A avg., 1.7A peak; ±5V at .5A avg., .7A peak. Output is fold back current limited. 2x 4x5½".
87-510. Wt. 2½ lbs. **69.95**

Microprocessor Power Supply

Tandy Computer Power Supply. Provides sufficient power for 24 S-100 boards. Unregulated output is 8V at 18A, ±16V at 2.5A. Includes multi-tap primary for proper line matching.
87-521. Wt. 2 lbs. **149.95**
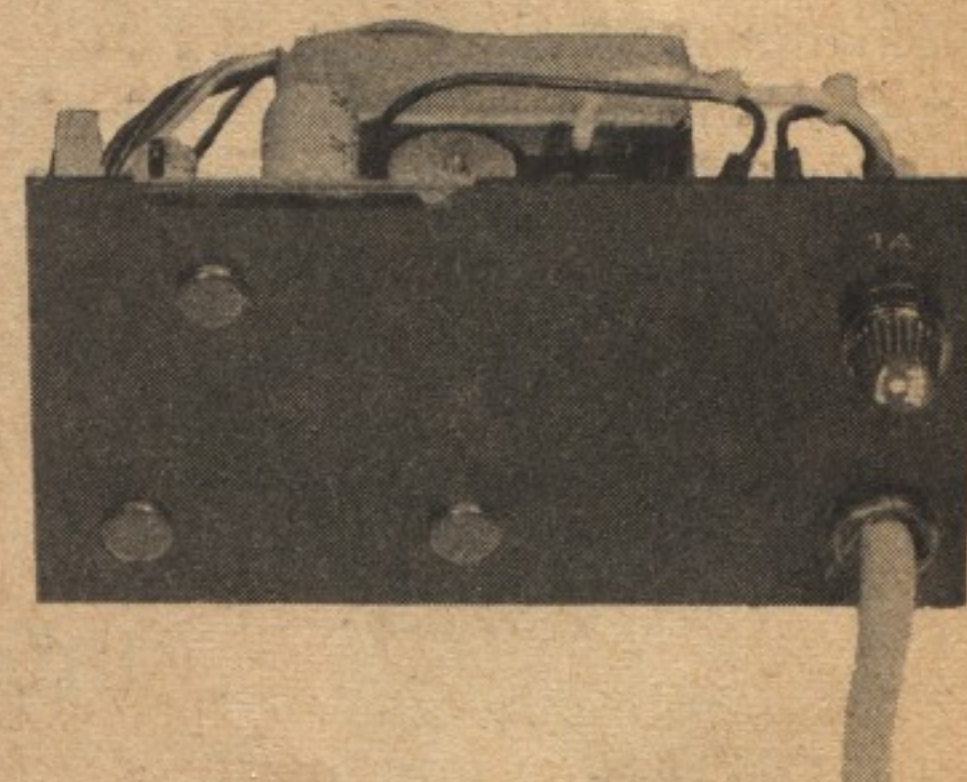
ComputerAutomation Card Cage
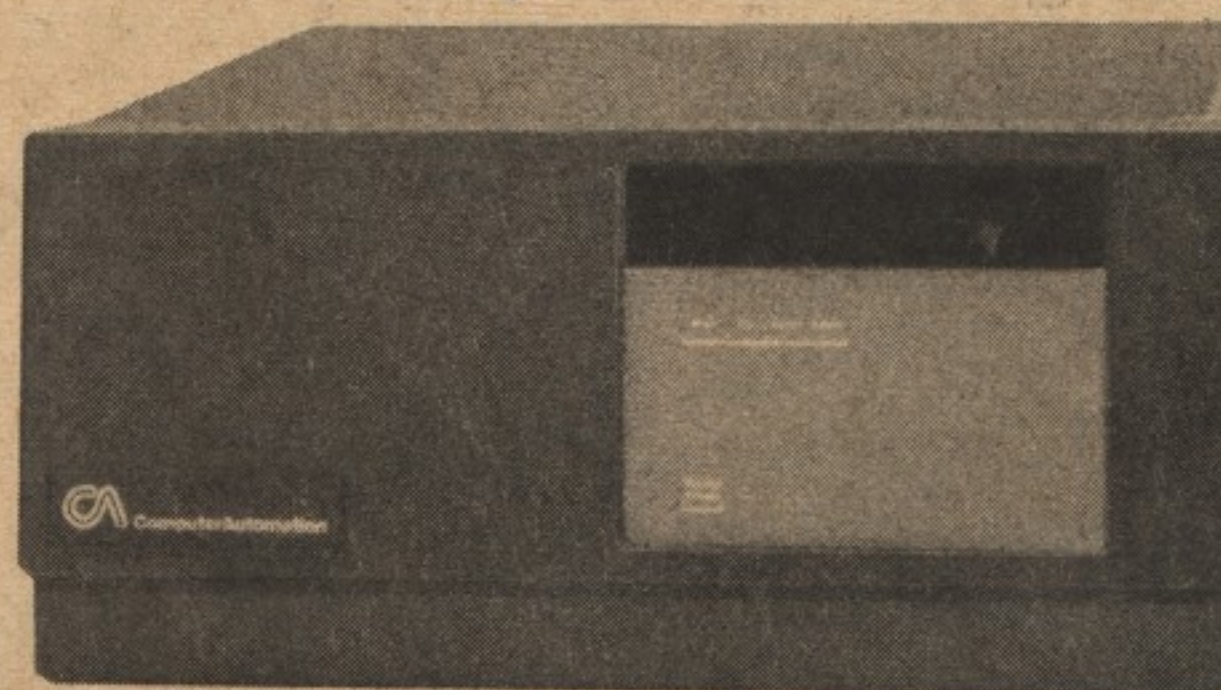
NAKED MILLI. Versatile three-slot cage contains motherboard, card guides and retaining hardware. Designed to mount on a flat surface in any plane. Cooling can be accomplished by convection or forced air. 4x8x17½".
87-512. Wt. 15 lbs. . **599.95**
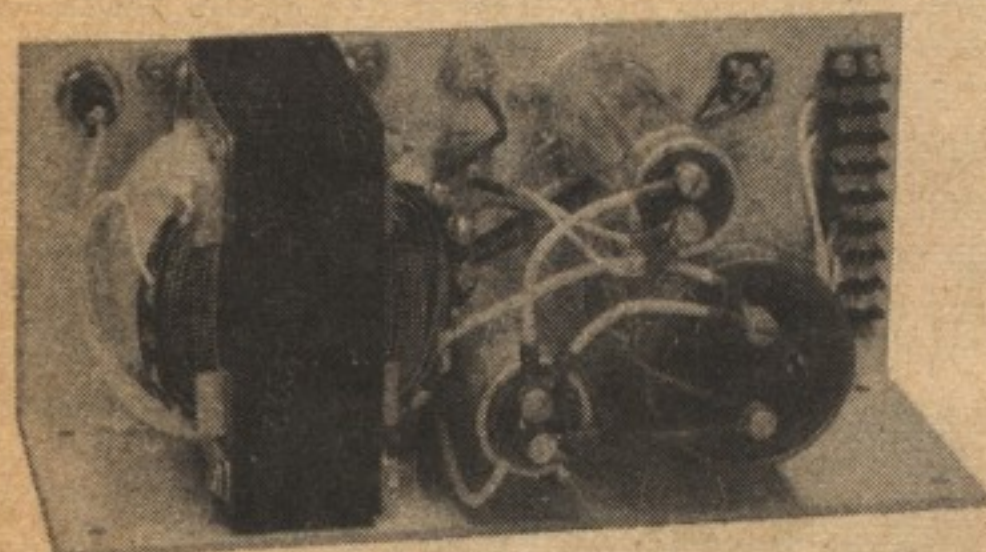
Stylish Case from Vector

Vector-Pak VP1. Ideal home for microcomputer circuitry. Vinyl-finished aluminum case features easy access slide-out covers, heavy chassis plate and perforated bottom cover for cooler operation. Card guides are perpendicular to front panel.
70-410. Shpg. wt. 8 lbs. **128.30**

Feature-Packed Equibox

Equibox™. Sleekly proportioned aluminum case is accented with black vinyl trim and smoked plexiglass — handsome enough to rival the most expensive stereo components. Features key-operated power switch, detachable line cord. 7x17x20".
70-409. Kit. Shpg. wt. 40 lbs. **576.00**

Modern Vector-Pak Case

Vector-Pak VP2. House your processor boards in this vinyl-finished aluminum case. Features heavy chassis plate and perforated bottom cover for cooler operation. Covers slide out for easy inside access. Card guides are parallel to front panel.
70-411. Shpg. wt. 8 lbs. **134.30**

Stock Up on Paper

Roll Paper. Use with teletypes and Radio Shack, Centronics 779 and Practical Automation printers. 3" diameter.
70-203. Shpg. wt. 3 lbs. **6.99**
Perforated Paper. For IMSAI, Centronics and Okidata printers. 8½x11".
70-204. Shpg. wt. 5 lbs. **9.95**

MODEM Acoustic Coupler

Vardon MODEM. Works both acoustically and direct. Enables you to communicate with your computer over telephone lines. Interfaces with RS232 or 20mA current loop. High-impact molded housing.
87-3201. Shpg. wt. 3 lbs. **249.95**

Connecting Cables

Shpg. wt. 1 lb.

Type	Cat. No.	Each
SIO/MIO to backframe; 18"	70-1303	18.00
Parallel I/O to rear chassis	70-1305	29.00
Disk drives, modems, terminals; 4½'	70-1304	25.00
MIO board to backframe	70-1301	12.00
3 ports of PIO-6 board to breadboard; 5'	70-1302	35.00
Data/address lines of PIO-6 board to breadboard; 5'	70-1306	25.00
Practical Automation printer cable; 6'	70-1309	35.00
MPU-B to backframe; 18"	70-1307	18.00

Input/Output — A Determining Factor

One of the most important aspects of a computer from the operator's viewpoint is its input/output (I/O) capability. And the best way to relate to input/output is to think of a pocket calculator. The input to the calculator is its keyboard. The output is its digital readout. Although other input and output devices can be used with a calculator, the machine would not be nearly as useful to the operator.

Computers, however, can be connected to a considerably more diverse range of input and output devices. Some, such as the **Teletypewriter**® and **video terminal**, combine an input mechanism (a typewriter-like keyboard) and output device (printer or video display) in a single housing. These combination input/output devices are very handy when using a computer for such applications as higher language programming, accounting, inventory control, mathematical operations and recreation. **Magnetic tape** and **disk memories** also constitute a common input/output device since they transfer programs and data into and out of a computer.

Still another combination input/output device is the **acoustic coupler**. This device permits computers, or a computer and a remote input/output device, to communicate with one another over an ordinary telephone line. Typically, the coupler has a receptacle for the telephone's handset. Information is transmitted as an audio tone.

Many devices designed solely for input or output are also available. A particularly important input device is the **analog-to-digital (A/D) converter**. This modular electronic circuit is designed to be connected to a source of variable electrical signals, such as a thermostat, fluid level indicator, light-sensitive photocell or any of a wide variety of environmental sensors. It transforms the analog information at its input into the digital form a computer understands.

Another important input device is the **paper tape reader**. This mechanism uses a row of light-sensitive phototransistors to read the perforations in a punched paper tape. Paper tape is commonly used to quickly load programs and data into a computer.

Output devices that can be connected to a computer include **video monitors**, **printers** and **digital-to-analog (D/A) converters**. The digital-to-analog converter is the opposite of the A/D converter. It transforms digital information from a computer into a variable voltage suitable for operating analog devices like motor speed controllers, audio tone generators and a range of mechanical and electrical devices.

Input/Output Interfacing

Computers incorporate a variety of features that enable them to communicate with the input and output devices to which their data buses are connected. Typically, the computer periodically checks to see if an input device is ready to transfer data onto the data bus or if an output device is ready to accept data from the data bus. If an input or output device is ready, the computer's processor interrupts its operation to open the data bus to the appropriate input/output devices.

However, interrupting the operation of a processor is no simple matter. The data being processed along with the status of various condition bits must be saved for use after the input/output request has been serviced. The processor then services the interrupt, retrieves the data it was processing before the interrupt and continues executing the program in its memory. Sometimes several interrupts may occur at closely spaced intervals, such as when both an input and output device notify the processor that they are ready to send or receive data. Computers usually handle this kind of situation on a priority basis with the first interrupt being serviced first, then the second and so forth.

Transferring Data

Almost all microprocessor-based computers incorporate a multiple-bit bus for transferring data into and out of the computer. This permits data to be transferred very rapidly as parallel multiple-bit words (usually 8 or 16 bits).

Often it's not possible to transfer data in parallel form a word at a time. Let's assume, for example, that two computers are to communicate with one another over a distance of several hundred feet. In such a case it's often more economical and practical to connect the two computers to a simple two-conductor cable such as an existing telephone or intercom line. The parallel data from the bus of each computer is then converted into serial form for bit-by-bit transmission down the cable.

The converter circuit in each computer also converts data arriving in bit-serial form into the parallel form necessary for the data bus.

This is only one example of transferring data between computers. You'll become more familiar with the relative advantages and disadvantages of serial and parallel data transfers as you become more involved with computers. The illustrated explanation below will help you understand some of the more important differences between serial and parallel communications.

SERIAL

PARALLEL
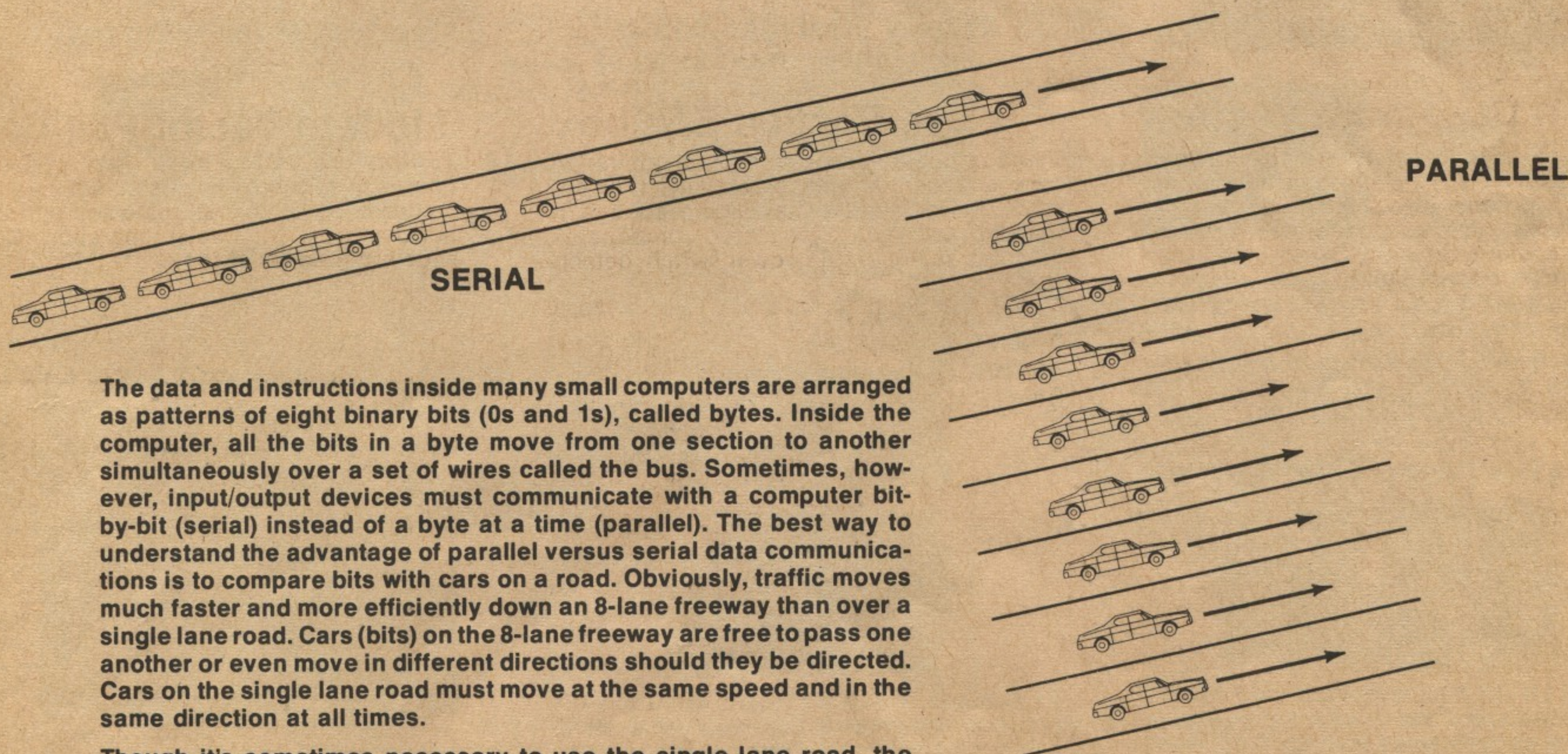
The data and instructions inside many small computers are arranged as patterns of eight binary bits (0s and 1s), called bytes. Inside the computer, all the bits in a byte move from one section to another simultaneously over a set of wires called the bus. Sometimes, however, input/output devices must communicate with a computer bit-by-bit (serial) instead of a byte at a time (parallel). The best way to understand the advantage of parallel versus serial data communications is to compare bits with cars on a road. Obviously, traffic moves much faster and more efficiently down an 8-lane freeway than over a single lane road. Cars (bits) on the 8-lane freeway are free to pass one another or even move in different directions should they be directed. Cars on the single lane road must move at the same speed and in the same direction at all times.

Though it's sometimes necessary to use the single lane road, the multiple lane freeway is much faster and more efficient.

Add an Accessory Board to Your Computer

Music Synthesizer Board
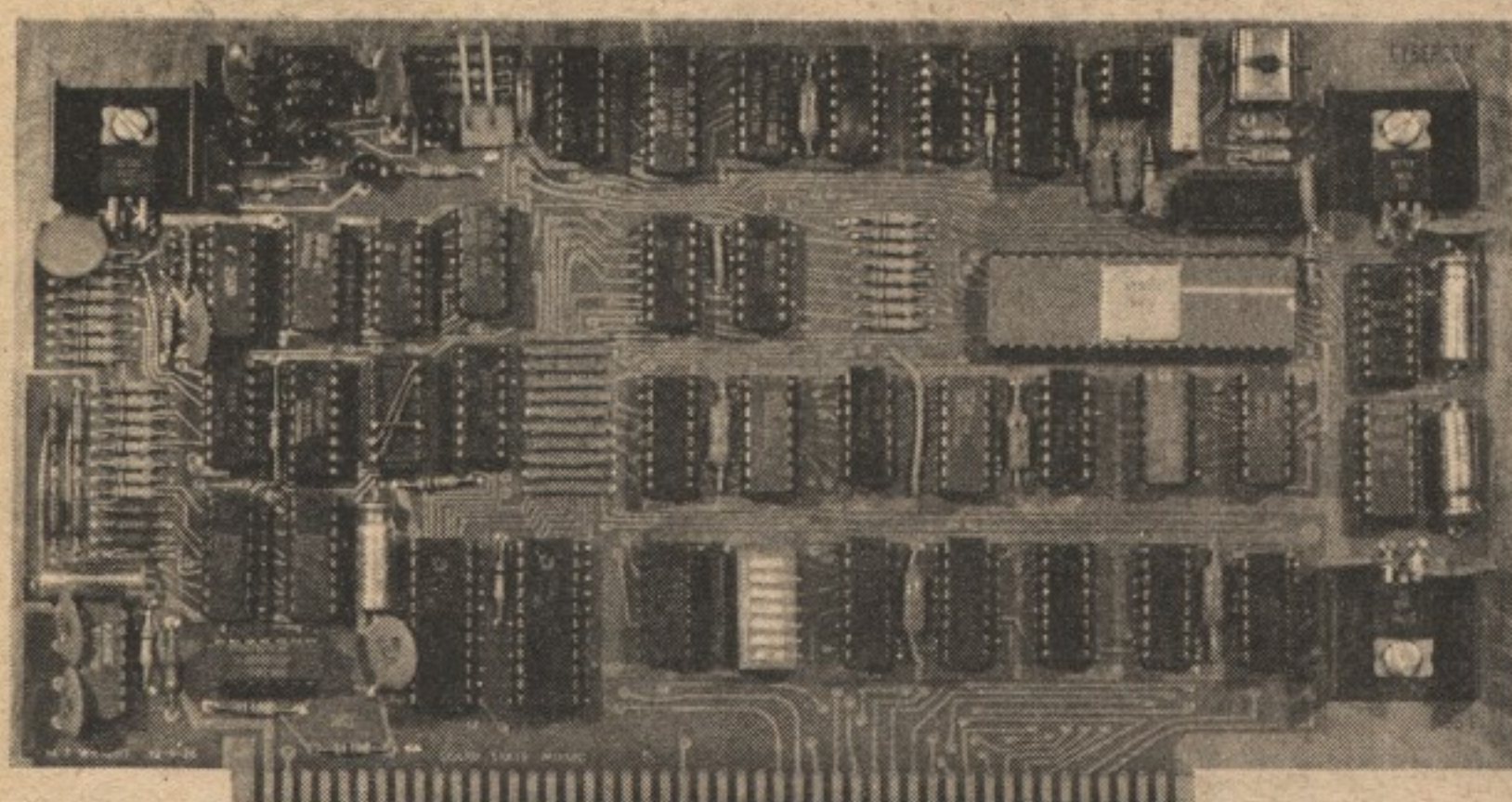
- *Use Your Computer to Create Music*
- *For Any S-100 Based Microcomputer*

Solid State Music SB1. Your computer can be music to your ears! With the SB1 synthesizer, all you need is your computer and an audio amplifier. Let it play its own music, or "write" your own using a simplified music language. Helps you compose your tune and then lets you listen to your finished piece.
87-2006. Kit Form. Shpg. wt. 2 lbs. **250.00**
87-7006. Factory Assembled. Shpg. wt. 2 lbs. **350.00**

Speech Synthesizer Board
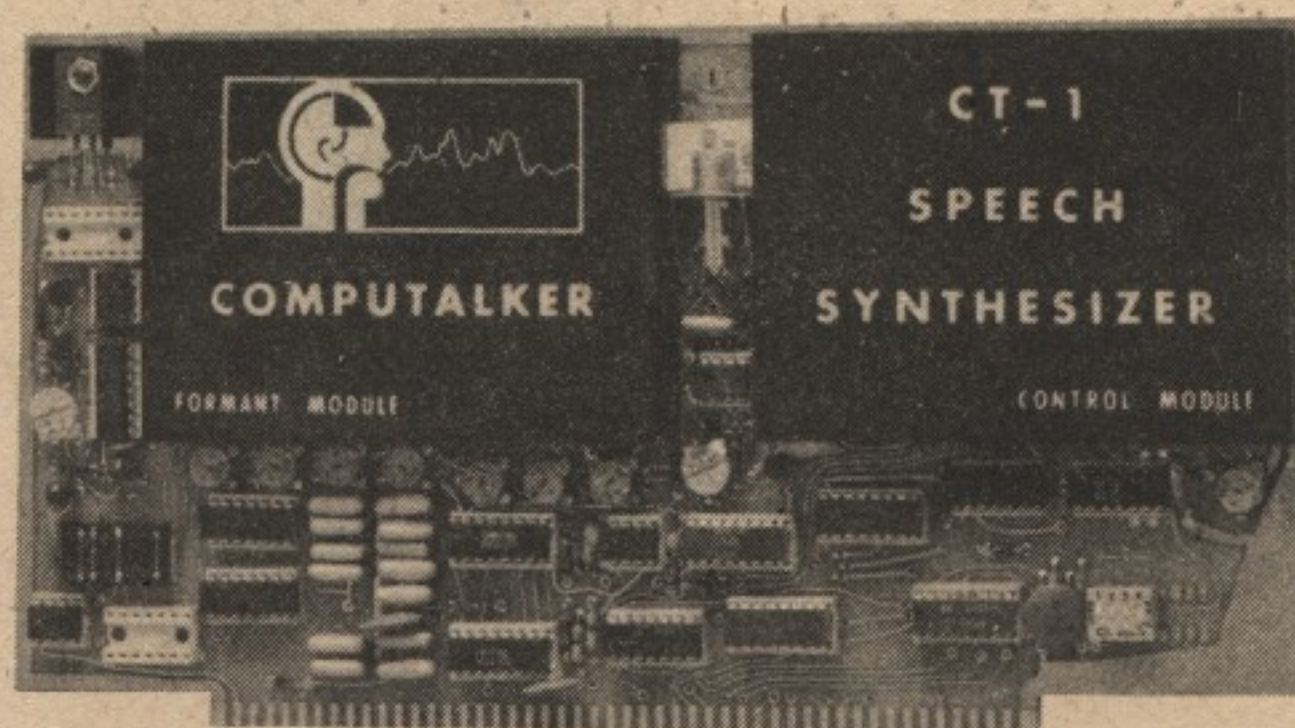
- *Highly Intelligible, Quite Natural Sounding Speech*
- *Uses Standard S-100 Bus, Phono Jack Audio Output*

Computalker CT-1. Sounds are defined in real time under software control. The synthesizer is controlled by 9 acoustic parameters which represent the phonetic structure of human speech. They are transmitted to the CT-1 at a rate of 500 to 900 bytes per second, depending on the data compression techniques used. Requires +8VDC at 170mA typically (250mA max.) and ±16VDC at 85mA.
87-2101. Factory Assembled. Shpg. wt. 2 lbs. **395.00**
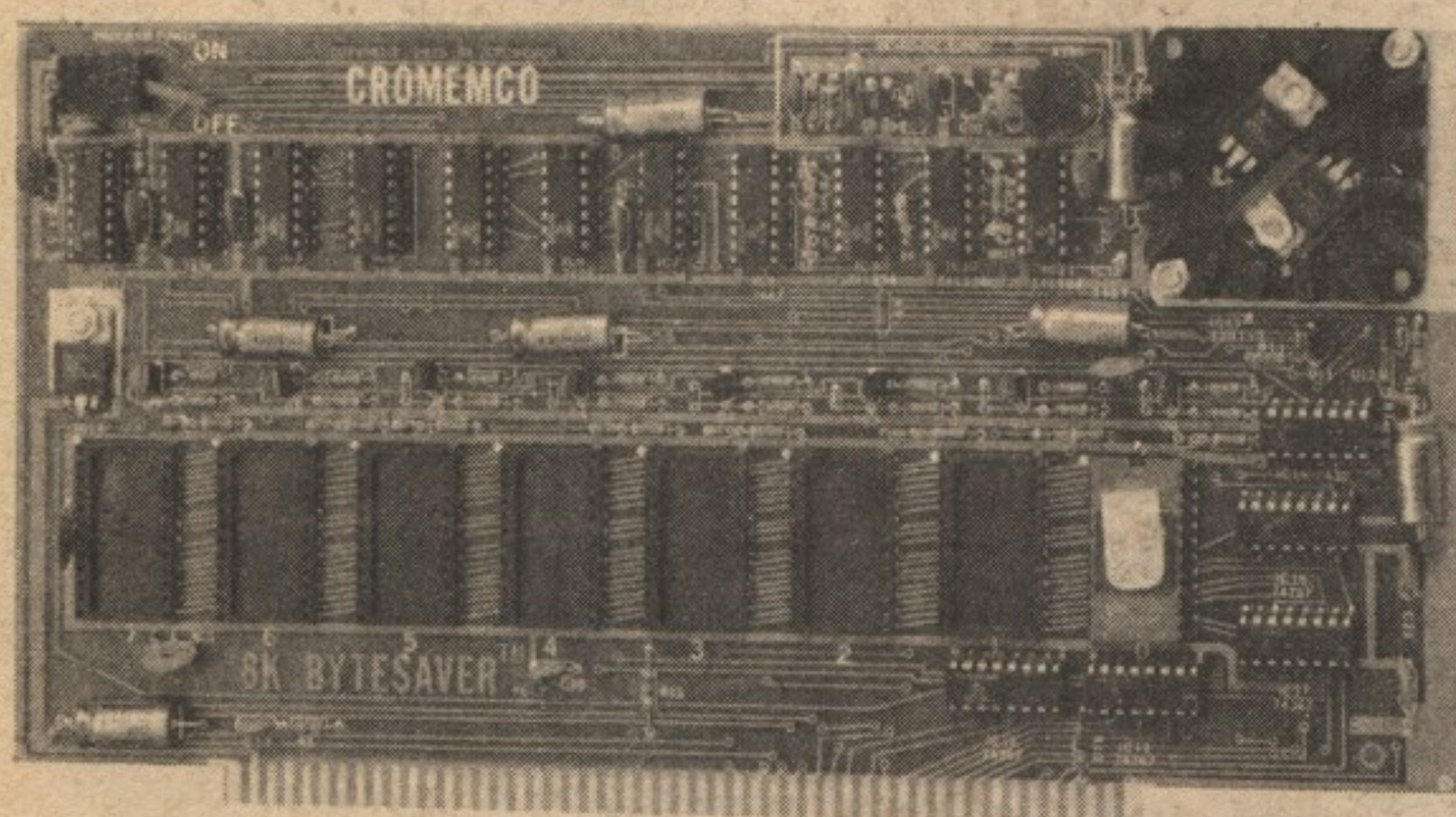
PROM Memory Board

- *Simple, Easy Way to Store Your Computer Programs in PROM*
- *Full 8K-Byte Capacity of Programmable Read Only Memory*

Cromemco BYTESAVER ™. Transfer your computer programs from volatile RAM to permanent PROM memory. Features a built-in programmer designed for 2708 PROMs. The 2708 has a 450nS access time and lets your computer work at its speed without a wait state. And with 2708s in all 8 sockets, only 500mA is drawn from the +8V bus. S-100 bus compatible. PROMs not included.
87-2203. Kit Form. Shpg. wt. 2 lbs. **145.00**
87-7203. Factory Assembled. Shpg. wt. 2 lbs. **245.00**

Interrupt Timer Interface Kit
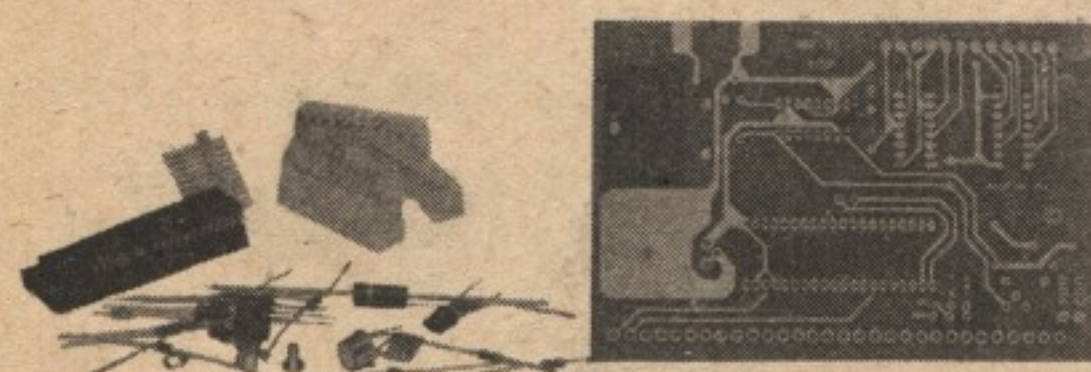
SWTP MPT. Provides software selectable interrupts from $1\mu S$ to 1 hr. For SWTP 6800.
87-2016. Shpg. wt. 2 lbs. **39.95**
MPT-B. Board Only. Above, less parts.
87-2116. Shpg. wt. 2 lbs. **9.50**

Priority Interrupt Board
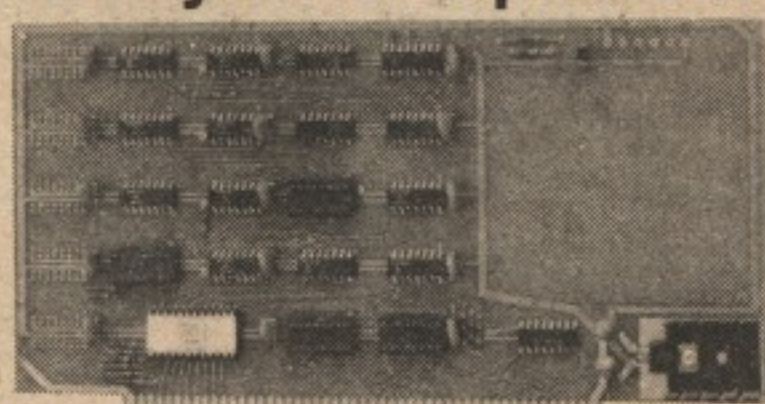
IMSAI PIC-8. Lets your processor perform jobs between interrupts without continually polling devices to see if any require service. Requires S-100 bus.
87-2004. Kit Form. 2 lbs. **125.00**
87-7004. Factory Assembled.
2 lbs. **238.00**

System Monitor Board
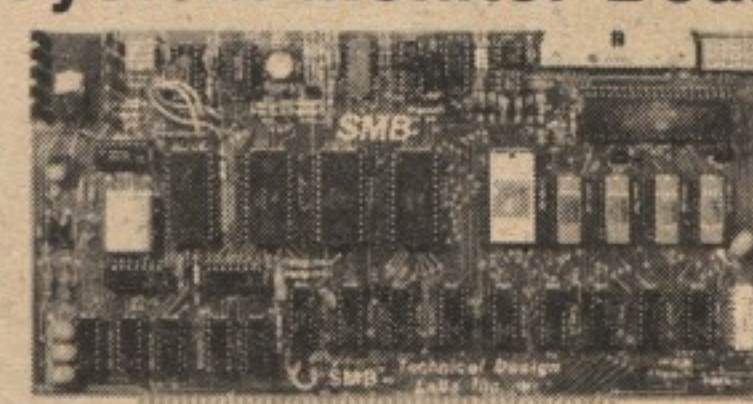
TDL SMB. The equivalent of a 2K ROM, 2K RAM board, sophisticated I/O board, and a hi-speed cassette interface! Requires 5V, S-100 bus.
87-2023. Kit Form. 2 lbs. **295.00**
87-7023. Factory Assembled.
2 lbs. **395.00**

Line Printer Interface
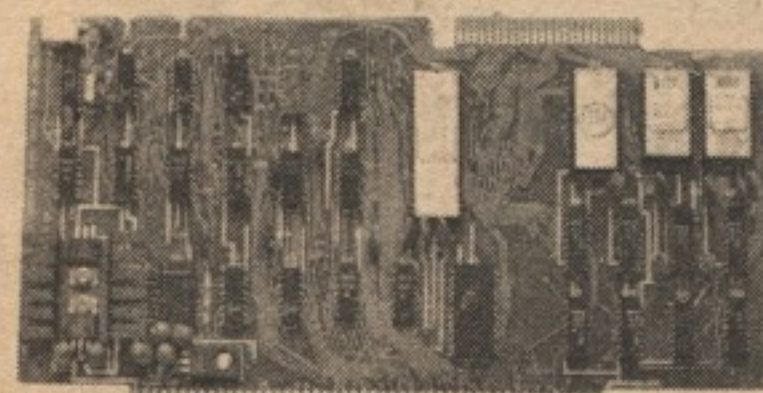
IMSAI LIF. An intelligent controller including DMA transfer permits computer to perform other tasks while printing. S-100 bus.
87-1901. Kit Form. 2 lbs. **599.00**
87-6901. Factory Assembled.
2 lbs. **799.00**

Printer Interface
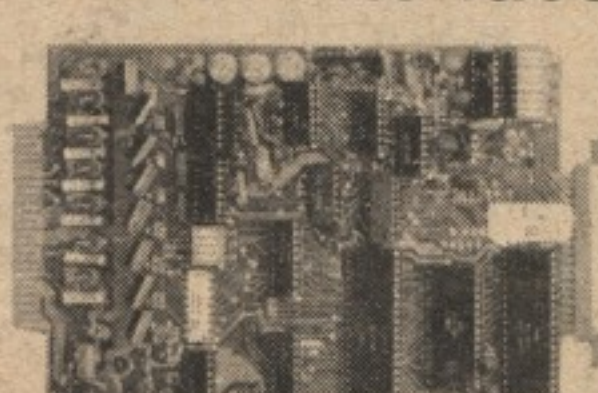
Practical Automation. A microprocessor-controlled interface serial capable of up to 120 baud. Provides for serial or parallel input. Accepts 10 or 11 bit format.
87-1904. Assembled. 2 lbs. **199.95**

I/O Kit-Design Board
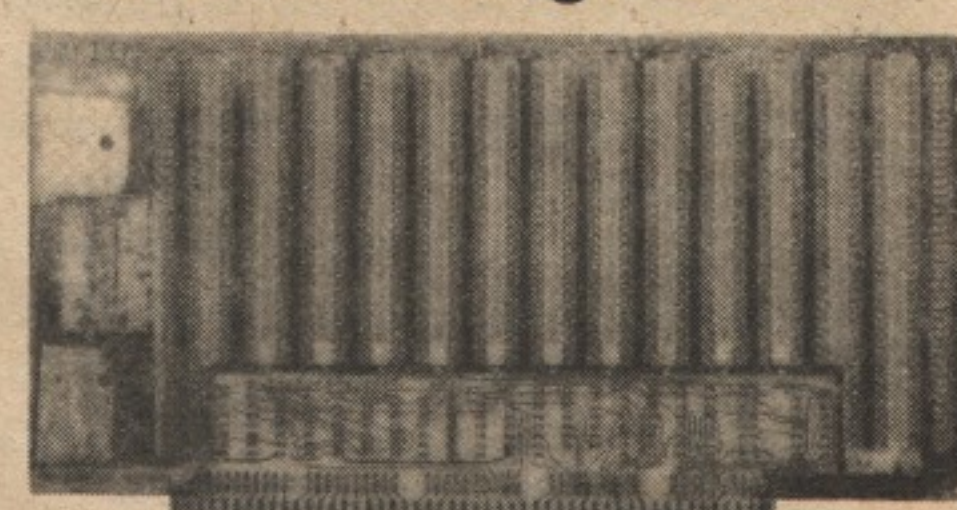
PolyMorphic I/O Idea Board. Provides parallel I/O plus locations for designing your own special interface. S-100 bus.
87-701. Kit Form. 1 lb. **55.00**

Complete Computer System Accessories
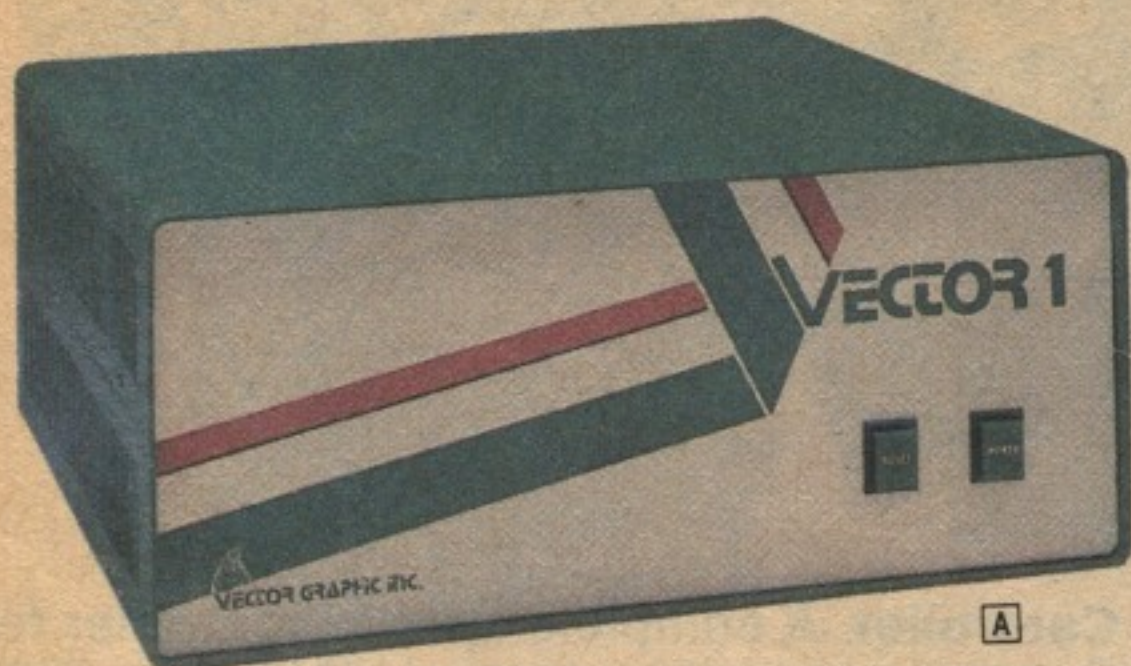
Computer Chassis

A Vector Graphics. Custom design your own microcomputer! The .093" thick 18-slot motherboard is soldermasked on both sides, with plated through holes and provisions for bus termination. The 18-amp 8V and 2.5 amp ±16V supply provides power for a full 18 boards and has a multi-tapped primary. S-100 bus. 7x17x17".
70-408. Kit Form. With 6 edge connectors and card guides. Shpg. wt. 34 lbs. **375.00**
70-5408. Factory Assembled. With 18 edge connectors and card guides. Shpg. wt. 34 lbs. **575.00**

B PolyMorphic. A real space saver — only 6¾x4¼x17". Provisions for up to five S-100 compatible computer boards. Front panel on-reset switch lights to indicate a halt condition. Six-amp +9V unregulated power supply. Built-in card supports.
70-405. Shpg. wt. 17 lbs. **235.00**
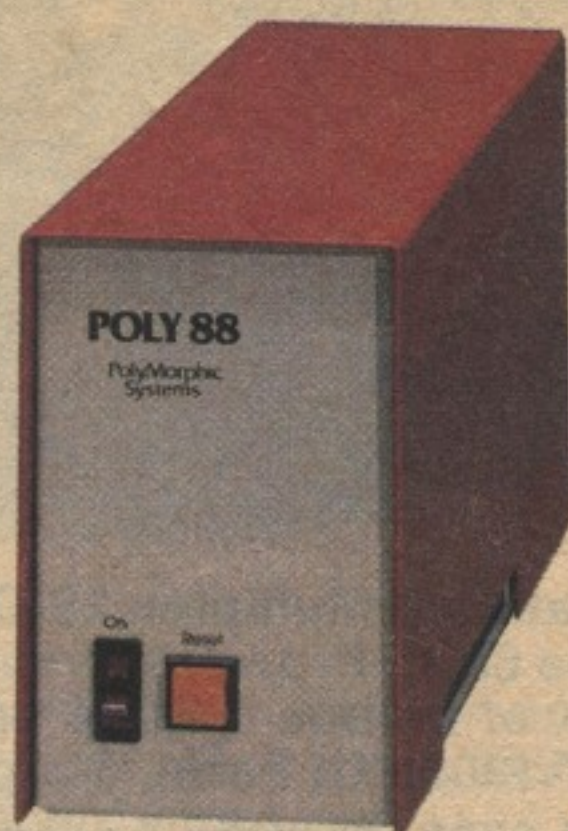
Custom Cases by Enclosure Dynamics
Low As 29⁹⁵

Gives your system a professional look. All molded plastic cases.
A System Case. Enclose your CRT, computer and keyboard. 15½x 18½x20½".
70-401. Wt. 5 lbs. **79.95**
B TV Typewriter Case. Houses keyboard and video logic. 6½x 18½x20½".
70-403. Wt. 5 lbs. **49.95**
C Keyboard Case. 3½x18½x7½".
70-402. Wt. 5 lbs. **29.95**
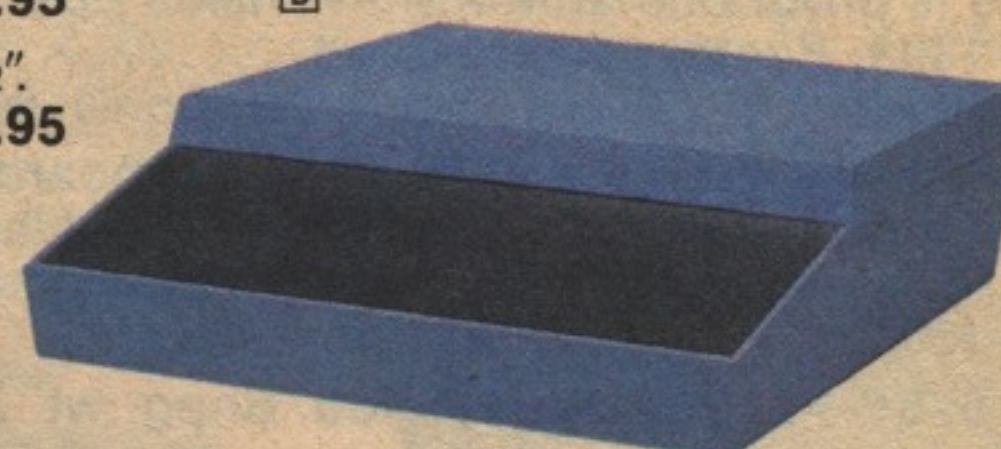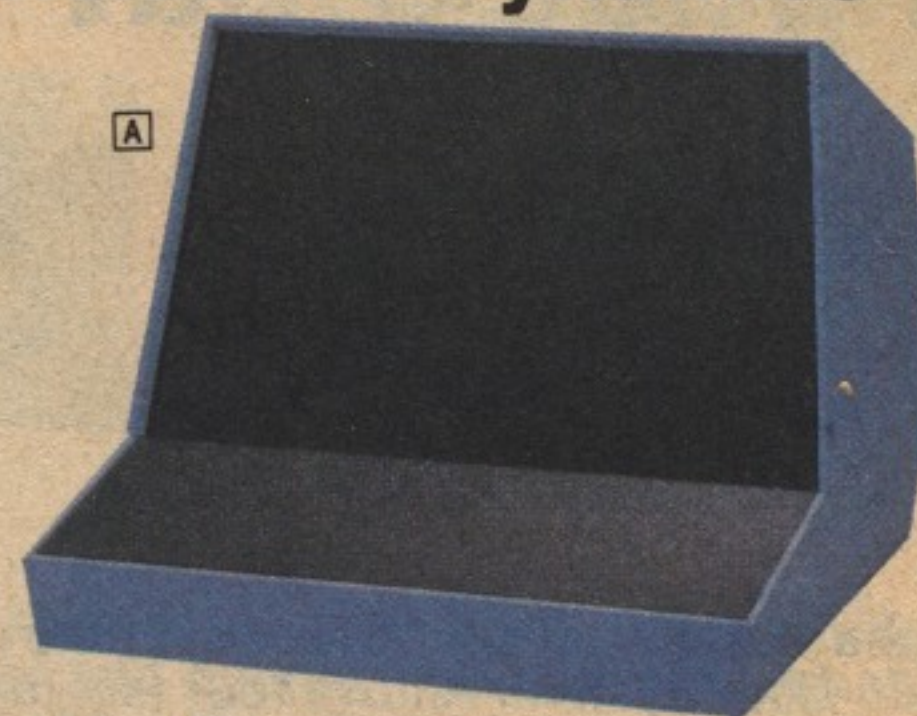
Intelligent Keyboard

IMSAI IKB-1. Microprocessor based, on-board ROM. Parallel and RS232 interfaces. Upper and lower case ASCII output. Three LED monitor lights.
87-103. Wt. 4 lbs. **275.00**
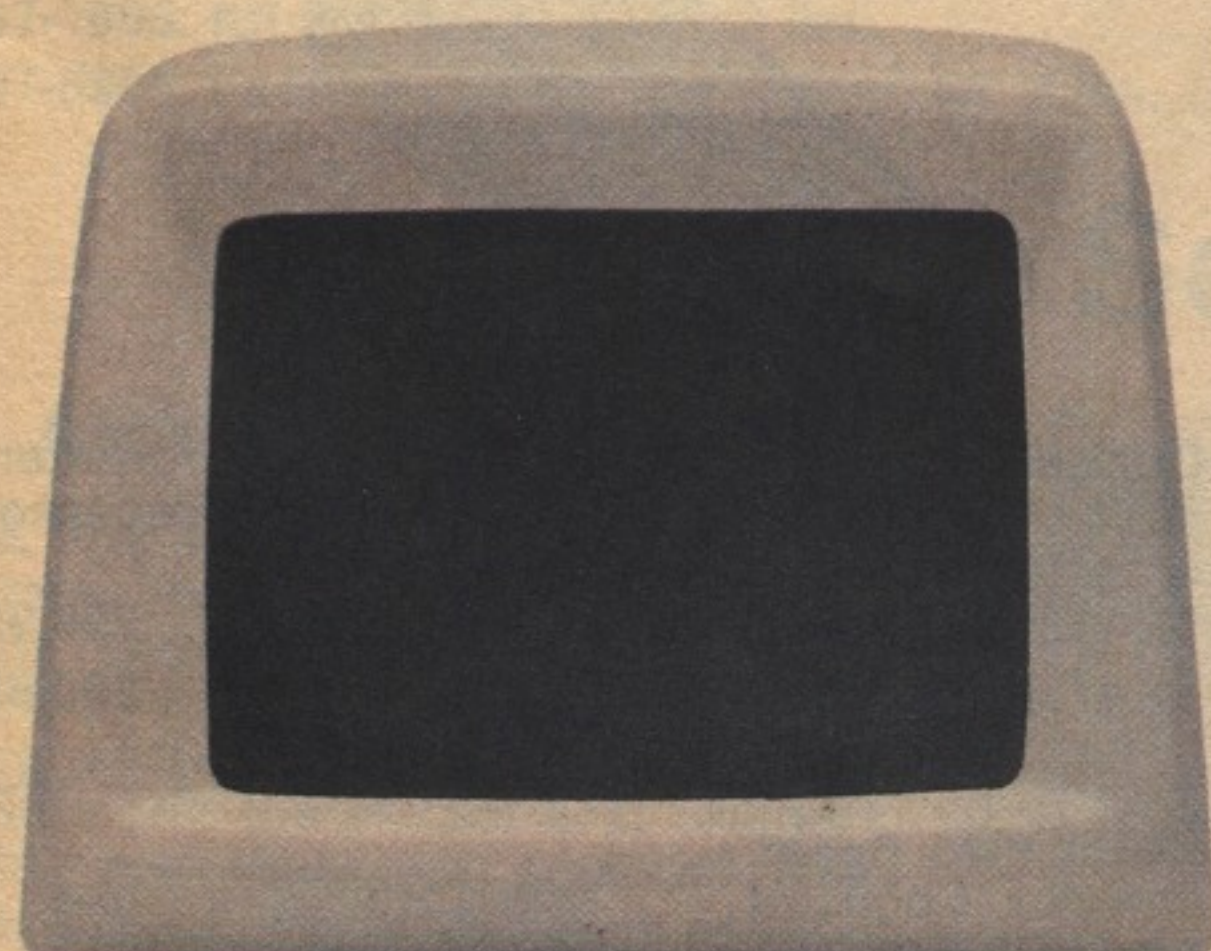
Black-and-White Video Monitors
Low As 175⁰⁰

- 9" (Diagonal) Screens • Wide Band
- 75-Ohm and High-Impedance Inputs

SWTP CT-VM. A compact, all solid-state monitor ideal for data entry type terminals. 12MHz bandwidth. Input can be composite or TTL separate horizontal, vertical and video. Requires +12VDC (regulated) at approx. 900mA. 9¾x8x11½".
87-601. Shpg. wt. 13 lbs. **175.00**

Koyo KV-9. Features a stabilized power circuit that assures a stable, trouble-free and sharp picture. Front panel controls include power, horizontal and vertical holds, contrast and brightness. 9⅛x8¼x8¾". For 120/ 220VAC, 50/60Hz.
87-602. Shpg. wt. 5 lbs. **210.00**
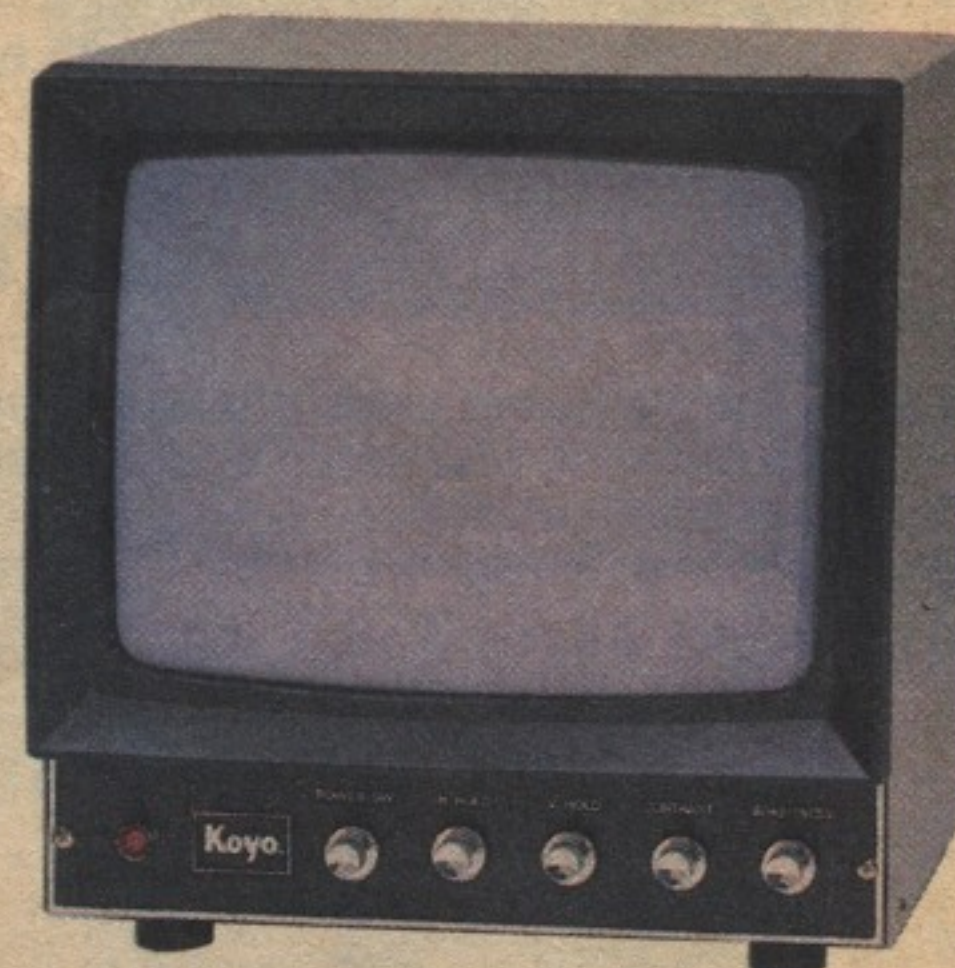
Backplane and Motherboards
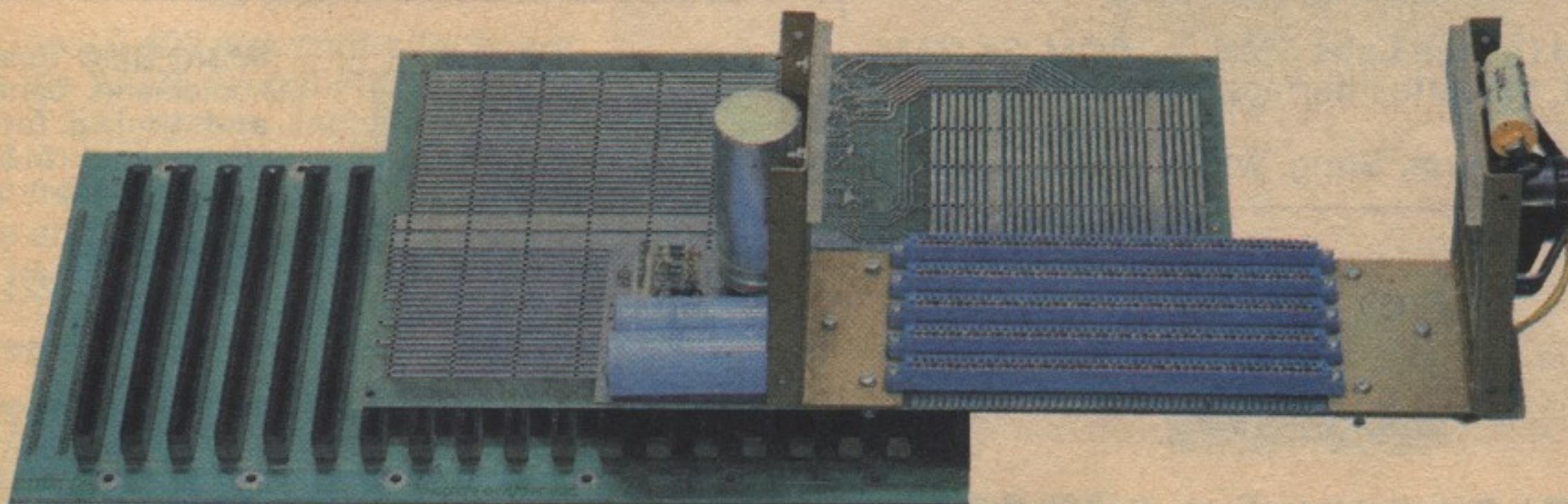
A Solid State Music MT-1. 15-slot motherboard fits IMSAI-style chassis or your own design. ⅛" thick Cybercom "blue board" prevents warpage. Uses S-100 type connectors, provisions for Altair-style edge guides.
70-1102. Shpg. wt. 2 lbs. **49.95**

B Vector 8803. Motherboard mounts 11 receptacles. With 12 tantalum capacitors for +5, +12 and −12 volt buses. For S-100 bus.
70-1106. Shpg. wt. 2 lbs. **29.95**

C PolyMorphic Poly 88 Backplane. This backplane/motherboard handles up to five S-100 compatible cards. Because the power supply is integrated, unnecessary wiring is eliminated. Provides 6 amps of current.
70-1101. Shpg. wt. 6 lbs. **195.00**

D SWTP MP-B Motherboard. Provisions for CPU board, up to 4 memory boards, 2 unused slots and up to 8 interface boards. 9x14" board.
70-1104. Shpg. wt. 2 lbs. **30.00**

Rack Mount Motherboard

Standard RETMA Rack Mount

Fully Assembled with All Connectors

Vector Graphics. An 18-slot motherboard and frame designed for rack mounting. With all S-100 connectors. See page 32 for power supply. 7½x12¼x19".
70-420. Shpg. wt. 13 lbs. **225.00**

Serial/Parallel Input/Output Interfaces
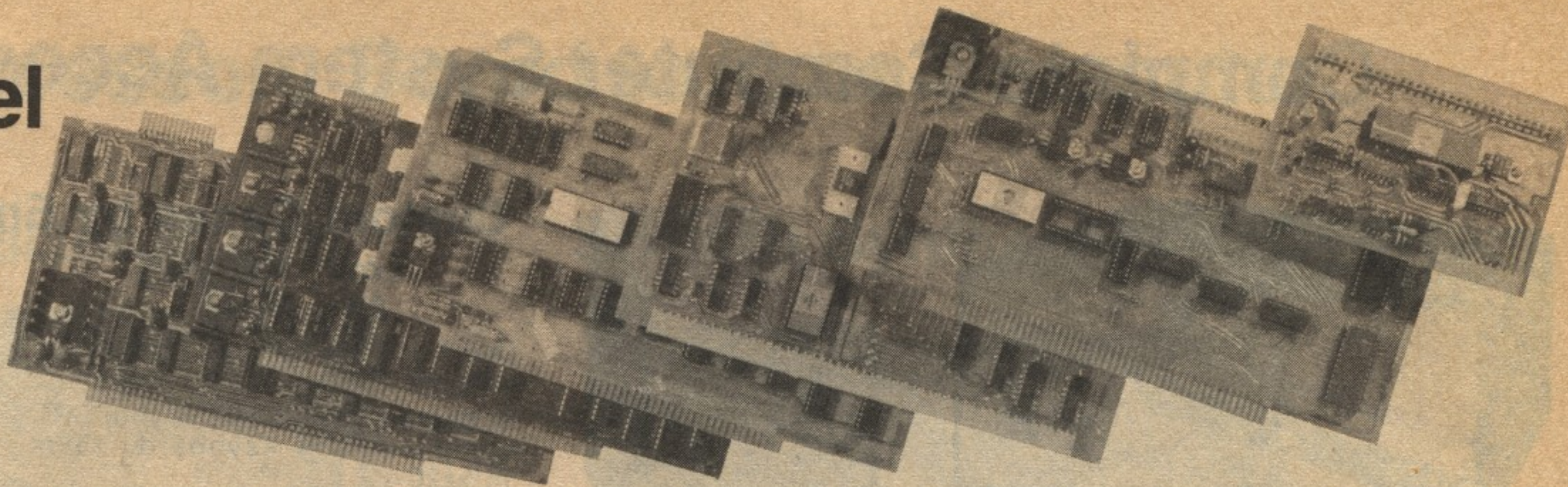
Alpha AM-300. A six port serial board designed especially for the Alpha Multi-User System. Allows four (six independent) serial I/O devices. Baud rate is programmable from 75-9600 bps. Uses Western Digital's USART.
87-1303. Factory Assembled. **695.00**

IMSAI SIO 2-1. One channel serial board interfaces to any commercially available terminal device. Synchronous/asynchronous operation. 75 baud to 56 kilobaud transfer rates, user selectable.
87-1304. Kit Form. Shpg. wt. 2 lbs. **125.00**
87-6304. Factory Assembled. Shpg. wt. 2 lbs. **235.00**

National Multiplex 2SIO (R) Controller. A complete 8080, 8085 or Z-80 controller. Provides terminal I/O plus motor-controlling parallel I/O latches. With 2K of on-board ROM, search routines, 2708-type EPROM's.
87-1302. Kit Form. Shpg. wt. 2 lbs. **160.00**
87-6302. Factory Assembled. Shpg. wt. 2 lbs. **190.00**

National Multiplex 2SIO (R) Controller. A complete system controller for the 6800. Provides terminal I/O motor-controlling parallel I/O latches. With 2K of on-board ROM, search routines, 2708-type EPROM's.
87-1305. Kit Form. Shpg. wt. 2 lbs. **160.00**
87-6305. Factory Assembled. Shpg. wt. 2 lbs. **190.00**

SWTP MP-S Serial Interface. RS232C/20mA compatible board interfaces a serial device to the microprocessor system. It may be jumper configured to operate serially from 110-1200 bps. Complete interrupt control.
87-1351. Kit Form. Shpg. wt. 1 lb. **35.00**
87-6351. Factory Assembled. Shpg. wt. 1 lb. **55.00**
87-1551. Board only. Shpg. wt. 1 lb. **9.50**

Vector Graphic Bit Streamer. Two parallel ports and one serial port are incorporated in this I/O board, which employs an 8251 USART for both asynchronous and synchronous communication protocols, including IBM, BI-SYNC.
87-1310. Kit Form. Shpg. wt. 2 lbs. **155.00**
87-6310. Assembled. Shpg. wt. 2 lbs. **185.00**

Multi-Purpose Input/Output Interfaces
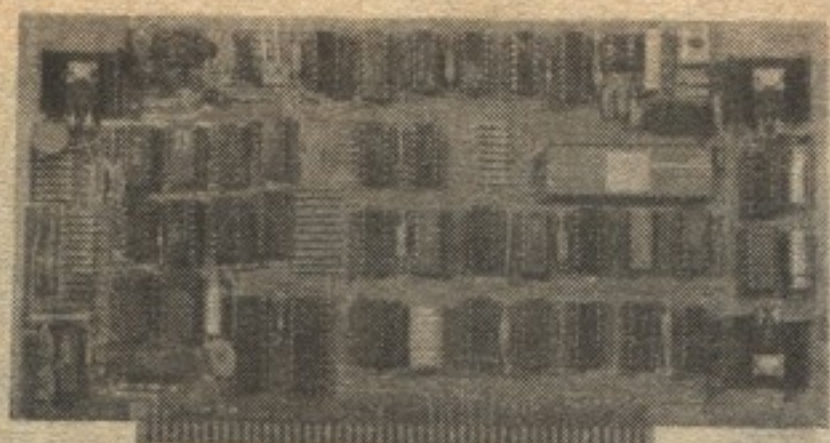
IMSAI MIO. Single board interface with one dual cassette, two parallel, one serial and one control port. Multiple applications.
87-1301. Kit Form. Shpg. wt. 2 lbs. **195.00**
87-6301. Factory Assembled. 2 lbs. **350.00**
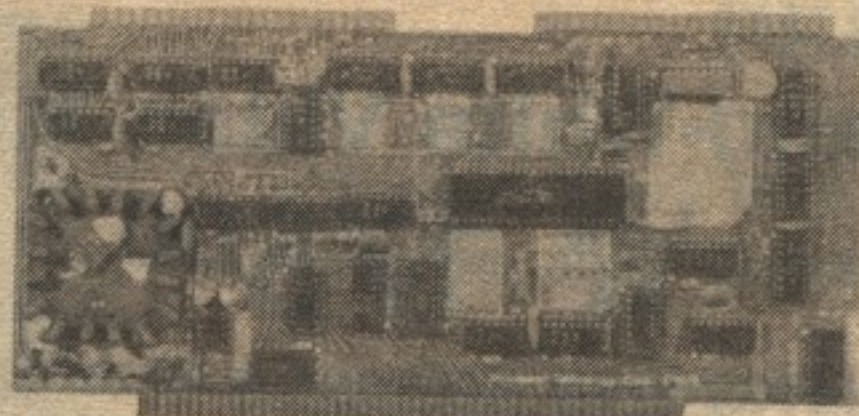
Processor Technology 3P+S. Contains two 8-bit parallel I/O ports with full handshaking logic, plus a serial I/O port with 35-9600 baud range.
87-702. Kit Form. Shpg. wt. 2 lbs. **149.95**
87-5702. Factory Assembled. 2 lbs. **199.00**
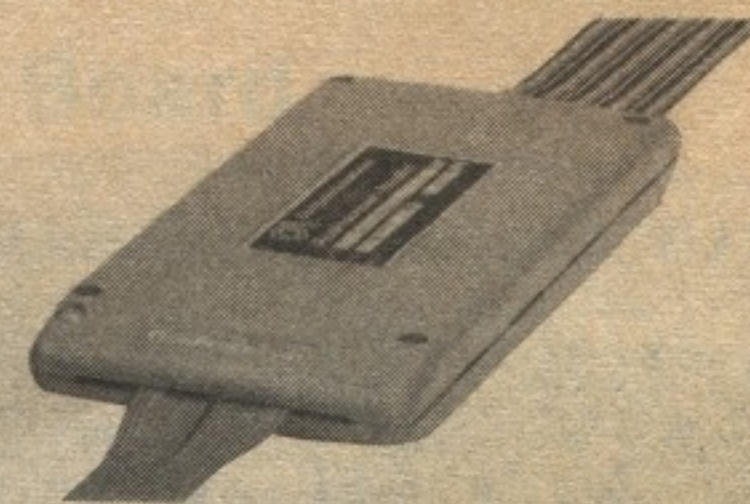
ComputerAutomation I/O Cable. Ideal for interfacing with special user devices. PicoProcessor is molded into each Intelligent Cable.
87-1330. Serial. Shpg. wt. 3 lbs. **299.95**
87-1230. Parallel. Shpg. wt. 3 lbs. **299.95**

Parallel and Miscellaneous Interfaces
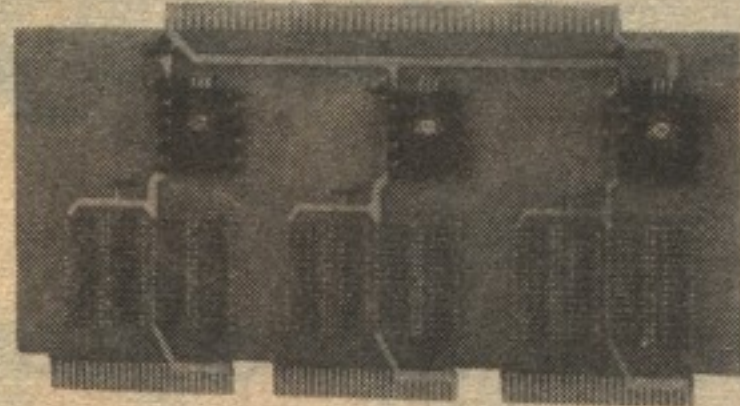
IMSAI SMT Board. Electrical line terminator board for connecting processor cables in system.
87-1854. Kit Form. Shpg. wt. 2 lbs. **98.00**
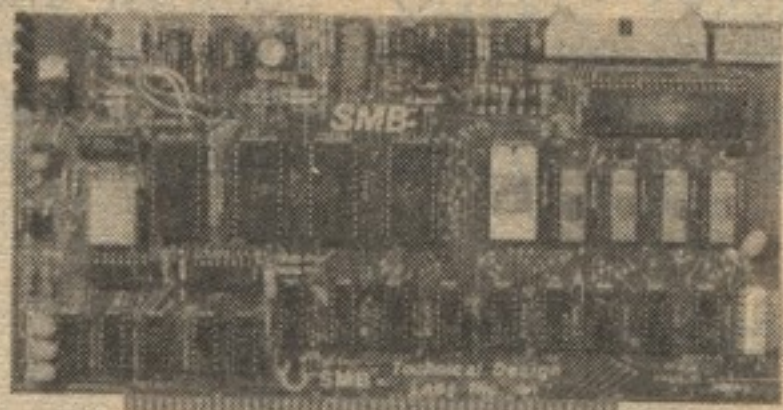
Technical Design Labs SMB. 2K ROM, 2K RAM, I/O board, cassette interface in one control center.
87-2023. Kit Form. Shpg. wt. 1 lb. **295.00**

IMSAI SMS Board. Provides 3 ports of switched bi-directional I/O between memory module and up to 3 CPU's.
Kit. Wt. 1 lb.
87-1855 . . . . . **325.00**

Solid State Music I/O-2 Board. With provisions for designing your "own thing." S-100 bus.
87-703. Kit Form. Shpg. wt. 2 lbs. **30.00**
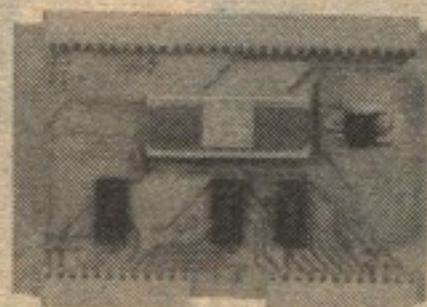
SWTP MP-L Parallel Interface. Contains 8 fully-buffered inputs, outputs. Handshake control.
87-1251. Kit Form. Shpg. wt. 1 lb. **35.00**

IMSAI SMC Board. Implements control and timing functions for IMSAI Shared Memory Facility.
Kit. Wt. 1 lb.
87-1852 . . . . . **225.00**

IMSAI SMB Board. Connects to CPU's local bus to provide multiplexing for IMSAI Shared Memory Facility.
Kit. Wt. 2 lbs.
87-1853 . . . . . **113.00**
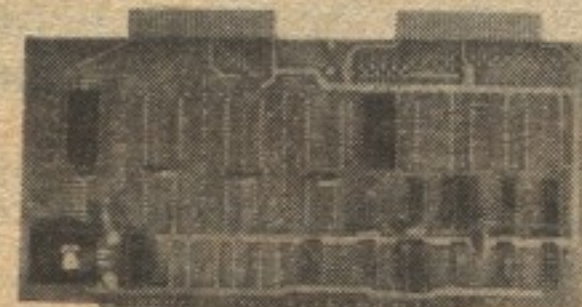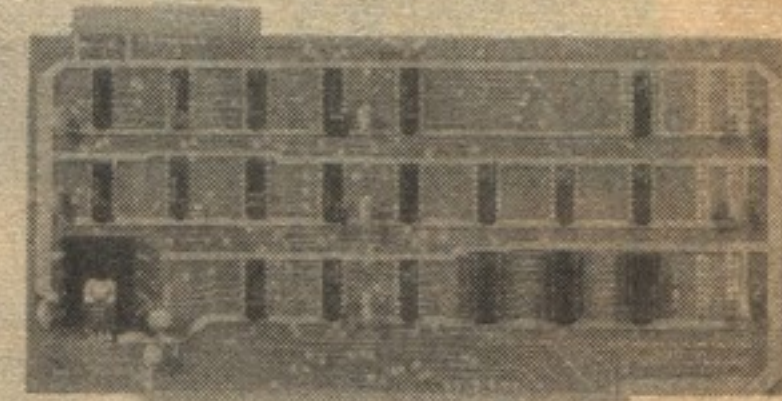
IMSAI PIO 4-1 Parallel I/O Board. Contains components for an 8-bit input, 8-bit output port.
87-1202. Kit Form. Shpg. wt. 1 lb. **93.00**
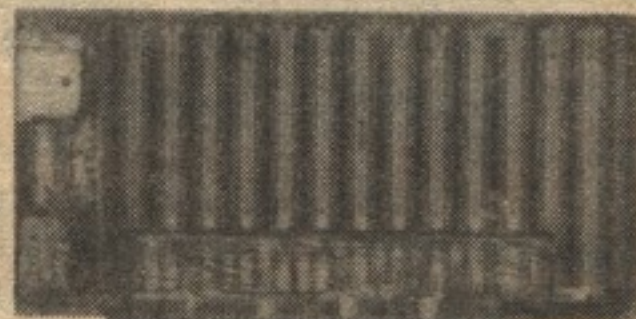
PolyMorphic I/O Idea Board. Switch-selectable I/O port address. Fully buffered inputs, outputs.
87-701. Kit Form. Shpg. wt. 1 lb. **55.00**
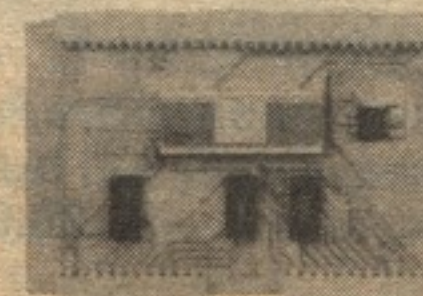
SWTP MP-C. Operates serially with an upper case ASCII terminal at 110 or 300 baud. RS232C/20mA compatible.
Kit. Wt. 1 lb.
87-1308 . . . . . . **40.00**

Order by Mail – Tandy Computers, P.O. Box 2932, Fort Worth, Texas 76101

Video Monitor Interface Boards

PolyMorphic Systems
Monitor Not Included.
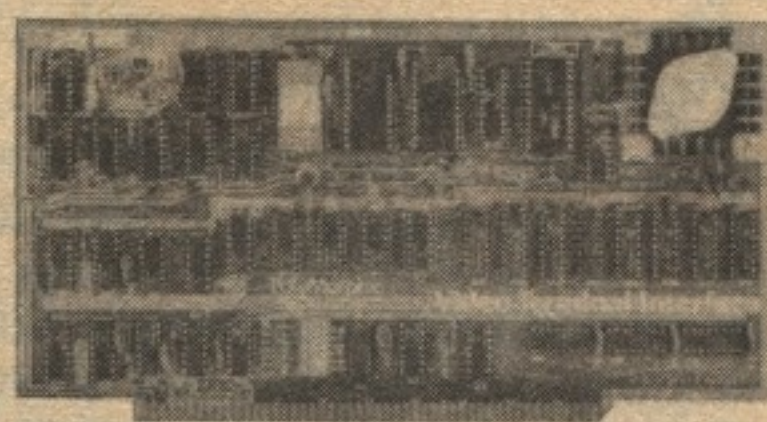
Generates 16 lines of 64 characters on a standard video monitor or modified TV. Characters are stored in 1K RAM. Upper/lower case, 7x9 dot matrix. Graphics and text display. With keyboard input port.
87-1804. Kit Form. Shpg. wt. 2 lbs. **210.00**
87-6804. Factory Assembled. Shpg. wt. 2 lbs. **249.95**

Solid State Music
Monitor Not Included.

Allows 32 or 64 characters per 16 lines in upper/lower case and Greek. 128x48 matrix. Features parallel and composite video, reverse video. Graphics capability. Powerful software control.
87-1816. Kit Form. Shpg. wt. 2 lbs. **189.95**
87-6816. Factory Assembled. Shpg. wt. 2 lbs. **249.95**

Processor Technology
Monitor Not Included.
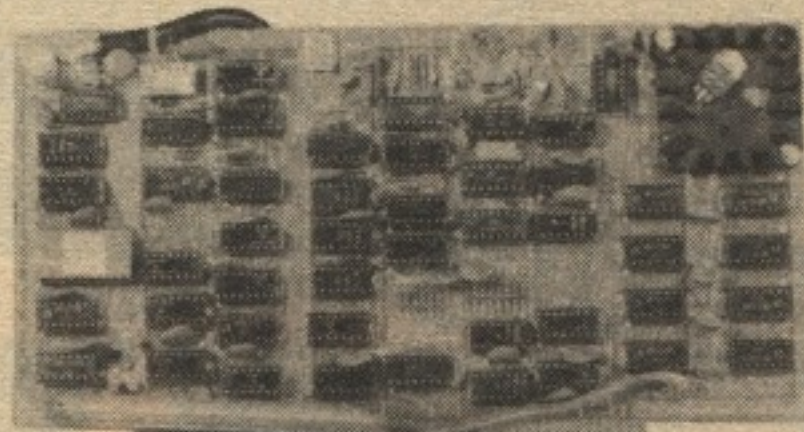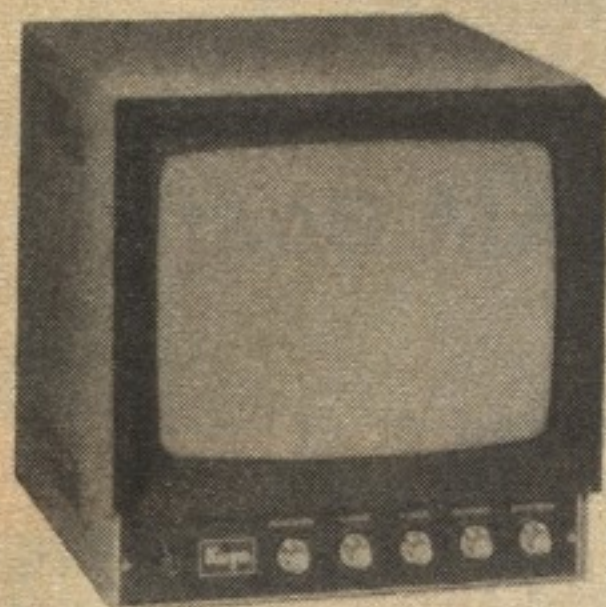
The high-speed VDM-1 displays 16 lines of 64 upper and lower case characters. Contains 1024 bytes of RAM. 7x9 dot matrix. Features vertical scrolling speed of 2000 lines per minute.
87-1805. Kit Form. Shpg. wt. 2 lbs. **199.00**
87-6805. Factory Assembled. Shpg. wt. 2 lbs. **295.00**

IMSAI
Monitor Not Included.
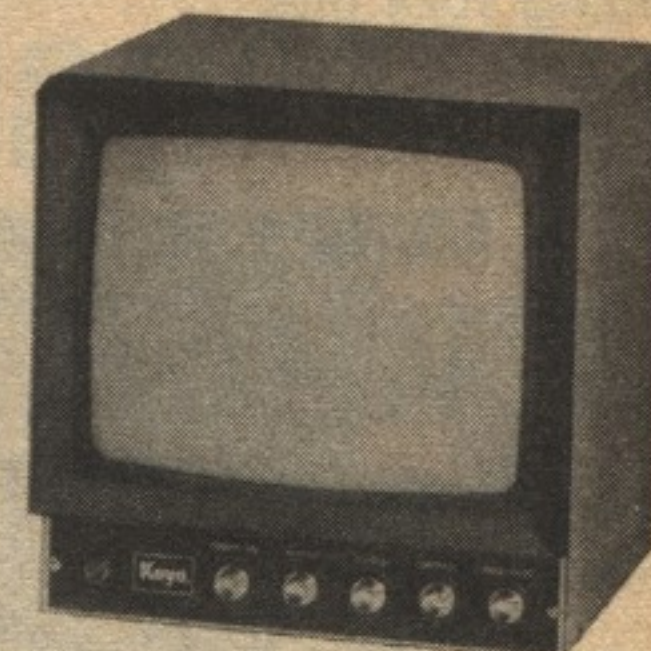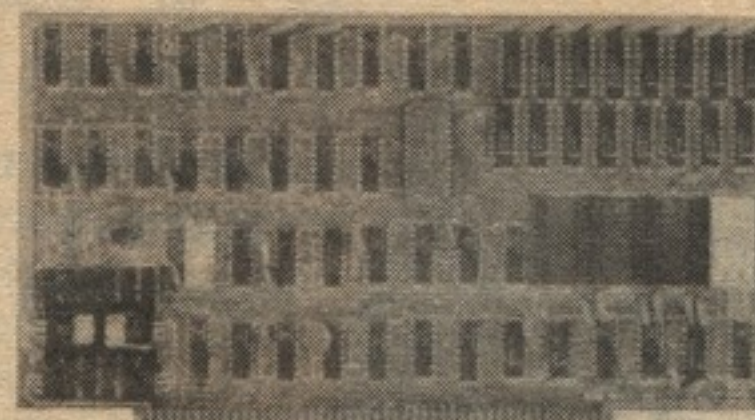
IMSAI's VIO generates a 24x80 CRT and features protected field, character and line insert/delete, and inverse video. User-selectable font of up to 256 characters. Graphics capability. ROM firmware driver.
87-1825. Kit Form. Shpg. wt. 2 lbs. **190.00**
87-6825. Factory Assembled. Shpg. wt. 2 lbs. **335.00**

Wide Selection of Disk Controllers

Alpha Microsystems
A This full DMA floppy disk controller features full and partial sector reading, multiple drive control and multi-level interrupt capabilities. S-100 compatible. Supports the PerSci 277, Shugart 850 and other soft sectored disk drives. Complements the AM-100 processor.
87-1701. Factory Assembled.
Shpg. Wt. 3 lbs. **695.00**

ICOM
An ideal S-100 disk controller board for the ICOM Frugal Floppy or the 3712 disk system. Includes an on-board mini monitor in 2708 EPROM for memory display/alter, memory test and run programs. Controls up to four daisy-chained disk drives.
87-1703. Factory Assembled.
Shpg. Wt. 2 lbs. **300.00**

ComputerAutomation
E Designed to support up to four floppy disk drives, this micro-programmed controller includes Direct Memory Access, automatic error detection. Implemented on a standard half card for simple installation and operation with any LSI Series computer.
87-1710. Kit. Wt. 3 lbs. **999.95**

Realistic Controls
S-100 Mini Controller is designed for Shugart SA-400 drives. On-board monitor allows up to three disk drives. Includes provisions for powering one drive from the CPU power supply on most systems. FORTRAN and BASIC available — see page 21.
87-1721. Assembled.
Wt. 2 lbs. **399.95**

IMSAI FIF
B An intelligent interface/controller consisting of IMSAI's Interface Master Board and Floppy Disk Interface Board. Contains its own 8080A processor with a program stored in 1K byte EPROM chips. Disk bootstrap capability. Controls up to four daisy-chained disk drives. Features software-controlled write protect, cyclic redundancy checks.
87-1705. Kit. Wt. 3 lbs. **599.95**
87-6705. Assembled. 3 lbs. **799.95**

SSB P-38-FF
C Smoke Signal Broadcasting's 8K EPROM board is a plug-in interface to the ICOM Frugal Floppy. It contains room for eight 2708's, or seven plus a Motorola Mikbug or Minbug II ROM. Interfaces with the Oliver Paper Tape Reader and SSB's EPROM programmer. Just plug the P-38-FF into your SWTP 6800 and your ICOM into the P-38-FF.
87-1706. Factory Assembled.
Shpg. wt. 2 lbs. **299.00**

Tarbell
D Plugs directly into your IMSAI or ALTAIR — handles up to four daisy-chained disk drives. Operates at standard 250K bits per second on normal disk format capacity of 243K bytes. Works with modified CP/M Operating System and BASIC-E Compiler. Hardware includes four extra IC slots, built-in phantom bootstrap, on-board crystal clock.
87-1708. Kit. Wt. 2 lbs. **190.00**
87-6708. Assembled. 2 lbs. **265.00**

Digital Systems
For use only with Digital Systems' dual disk drive, this controller board provides up to 512K bytes per disk for a total of one megabyte on line in a dual system. Features DMA for fast disk access and automatic/phantom bootstrap for power initialization. CP/M software is available for the dual density — see page 22.
87-1702. Assembled.
Shpg. wt. 2 lbs. **200.00**

Memory Boards Give Your Computer More Power

The simplest way to expand the power of a computer is to improve its ability to store and retrieve information. The fastest and most efficient information storage devices available today are semiconductor memories.

Magnetic memories like tapes and floppy disks can store more information for less money than semiconductor memories. But tapes and disks are considerably slower, at least electronically, than semiconductor memories. One reason is that tapes and disks are mechanical memories with no moving parts. Another is a capability called **random access**. The only way to retrieve data stored on a tape, for example, is to search the tape inch by inch and bit by bit until the desired data is located. This is called **serial access**. Random access means any stored bit or word can be addressed within some identical and fixed time limit. Apply the appropriate address code to the address input of the memory and within microseconds—or less—you can retrieve data from or load data into the memory.

Both ROM's and RAM's store information in similar formats. Smaller memories, for instance, often store data as individual bits or as 4 or 8-bit words. Thus a 16x4 bit RAM can store 16 4-bit words and a 256x1 bit ROM can store 256 bits. Larger memories usually store data as individual bits (1024x1, 2048x1, etc.). Many memories can store more than a thousand bits. It's common to designate memories like this with a "K" factor, representing 1024 bits.

Most ROM's are loaded with a specified set of data when they are manufactured. They're called **mask-programmed ROM's**. These ROM's contain various kinds of electronically coded data and look-up tables. The IC's that produce characters on the video display of computer terminals are actually mask-programmed ROM's. Some specialized ROM's even contain the programs that enable a computer to understand BASIC, COBOL, and other computer languages.

User-programmed ROM's (**PROM**) have become very popular for small quantity applications since they can be programmed with relatively simple equipment. They are supplied by the factory with a logical "1" stored in each of its bit positions. Applying a pulse of electrical current to appropriate connections on the chip will store a logical "0" in the respective bit position. Erasable PROM (EPROM) chips are programmed electrically and erased with ultraviolet light. Some EPROM's can be erased electrically but they're much slower than RAM's.

RAM's are either dynamic or static. Dynamic RAM's can store data for only a few milliseconds so the stored information must be periodically refreshed. Static RAM's store information as long as power is "on." Both static and dynamic RAM's have non-destructive readouts—information can be read out of a RAM without erasing it.

If you intend to expand your computer's memory, be sure that your computer's power supply can handle the additional current requirement.

16K

Expand Your Microcomputer's Power with a 16K RAM
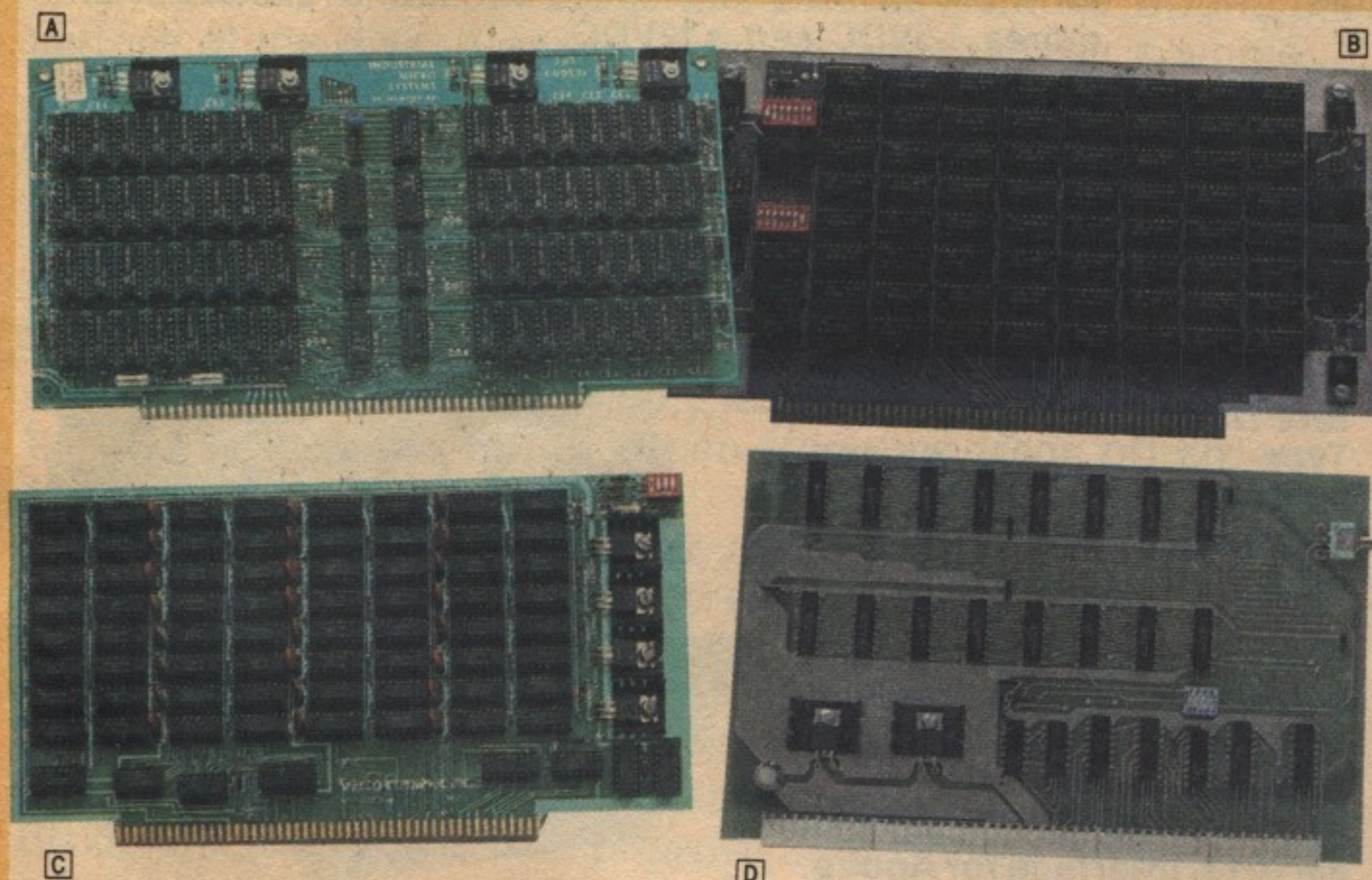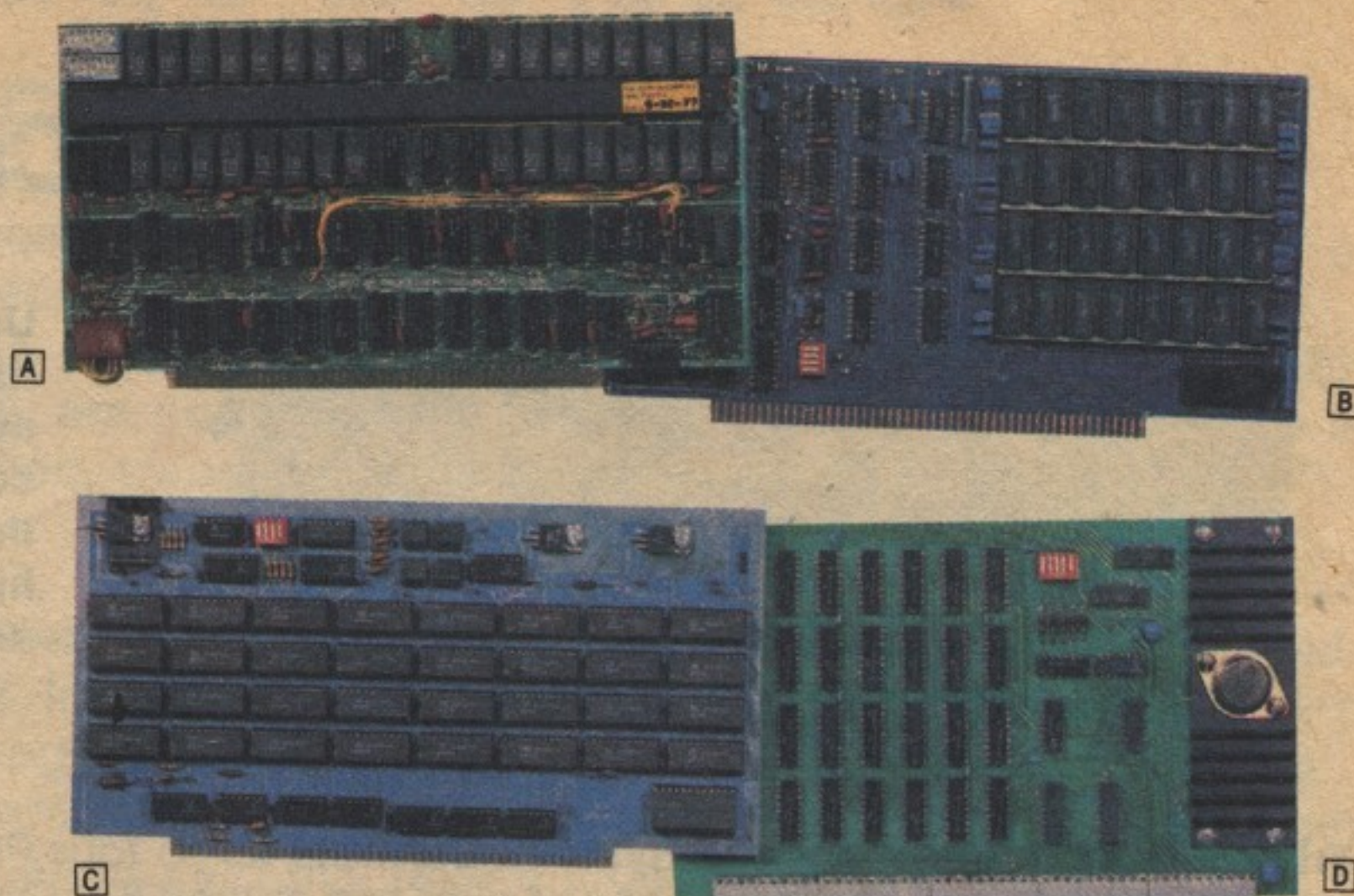
Assembled

Low As 395⁰⁰

[A] **Processor Technology 16KRA.** Dynamic. 400nS access time worst case. Z80, 8080 compatible. Battery back-up capability. For S-100 bus. **82-6602. Assembled. 2 lbs. 399.00**

[B] **Smoke Signal Broadcasting M-16.** SWTP 6800-plug compatible. Static — no refresh required. Req's. +8V. **82-6621. Assembled. 2 lbs. 529.00**

[C] **Solid-State Music MB-7.** Static board inhibit line for hardware jumps on power up or reset. 200nS access time. 550mA at 8V. For S-100 bus. **82-1603. Kit. 2 lbs. 525.00**

[D] **ICOM 16K.** DIP-switch address selection. Access time 215nS, cycle time 390nS. For S-100 bus. **82-6601. Assembled. 2 lbs. 395.00**

Technical Design Labs Z-16. (Not shown.) Static board access time below 250nS. Four 4K blocks can be individually addressed and switch protected. **82-1604. Kit. 2 lbs. 574.00**

8K

Assembled

Low As 188⁰⁰

Add 8K More to Your S-100 Based Microcomputer

[A] **Industrial Micro Systems 8K.** An 8K RAM board designed for use in systems where memory requirements are critical. Less than 450nS access time. **82-5811. Assembled. 2 lbs. ... 229.95**

Equinox Dynamic RAM. (Not shown.) Performs memory refresh cycles in time with the S-100's natural timing. **82-5812. Assembled. 2 lbs. ... 188.00**

[B] **Solid State Music MB6.** Selectable memory protect, 500nS AMD RAMs. **82-810. Kit. 2 lbs. .... 199.95** **82-5810. Assembled. 2 lbs. 249.95**

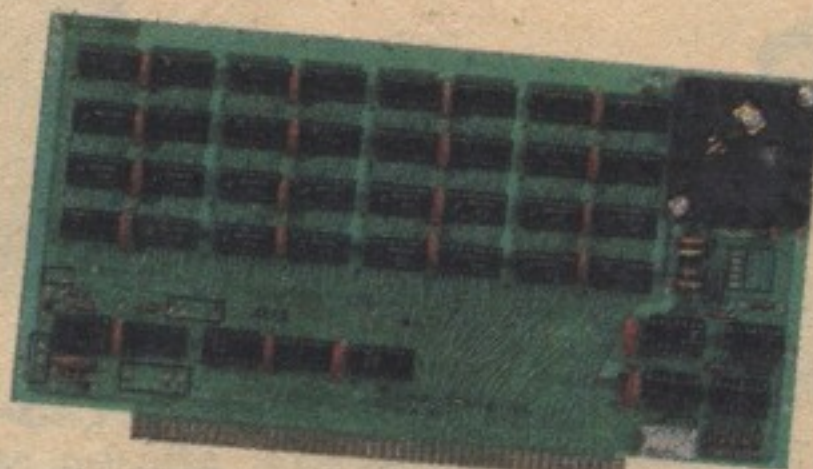[C] **Vector Graphic 8K Baby.** Features "No-wait" states — operates at maximum 8080 MPU speed. Assembled. **82-5803. 450nS. 2 lbs. ..... 265.00** **82-5804. 250nS. 2 lbs. 265.00**

[D] **SWTP MP-8M.** 8K of 8-bit RAM. Provides address decoding, data line buffering for 16 4Kx1 bit RAMs. **82-822. 2 lbs. 250.00**

4K

Low As Kit

100⁰⁰

Put 4K Added RAM to Work for You

Solid-State Music MB4. Features low-power, 450nS RAMs. No wait cycles required. DIP switch selects address assignment and wait cycles. Convert to 8K with additional unit. **82-402. Shpg. wt. 2 lbs. 109.95**
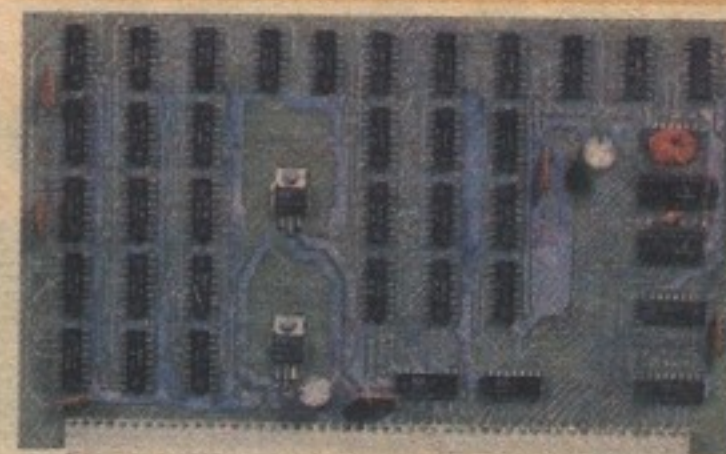
Processor Technology 4KRA. Runs at maximum 8080 MPU speed all the time. Built-in battery connector and recharge circuitry. Low power consumption. S-100 compatible. Shpg. wt. 2 lbs. **82-409. Kit 125.00**
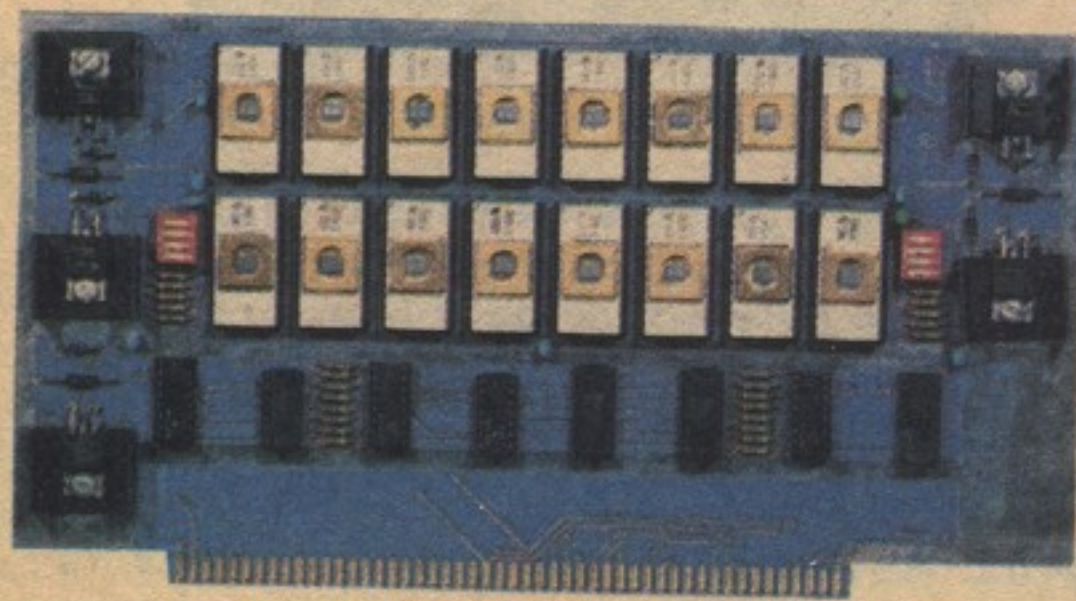
SWTP MP-M. A 2K memory board for the SWTP 6800 microcomputer. For 4K, add the expansion kit below. **82-221. Kit. 2 lbs. .... 65.00** **SWTP MP-MX.** Expands MP-M to full 4K. **82-222. Kit. 2 lbs. 35.00**

PROM Boards

Low As Kit

64⁹⁵

- *For Non-Volatile PROMs*
- *Put Your Operating System On a PROM Board for Easy Boot-Up*

Solid-State Music MB3. This EPROM board comes in kit form and offers you the option of 2K or 4K operation. Requires 8 or 16 1702A EPROMs (optional). DIP switch selection of addressing and wait cycles. Reverse-voltage protection. On-board +5V and −9V regulators. Shpg. wt. 2 lbs. **82-831. Kit 64.95**
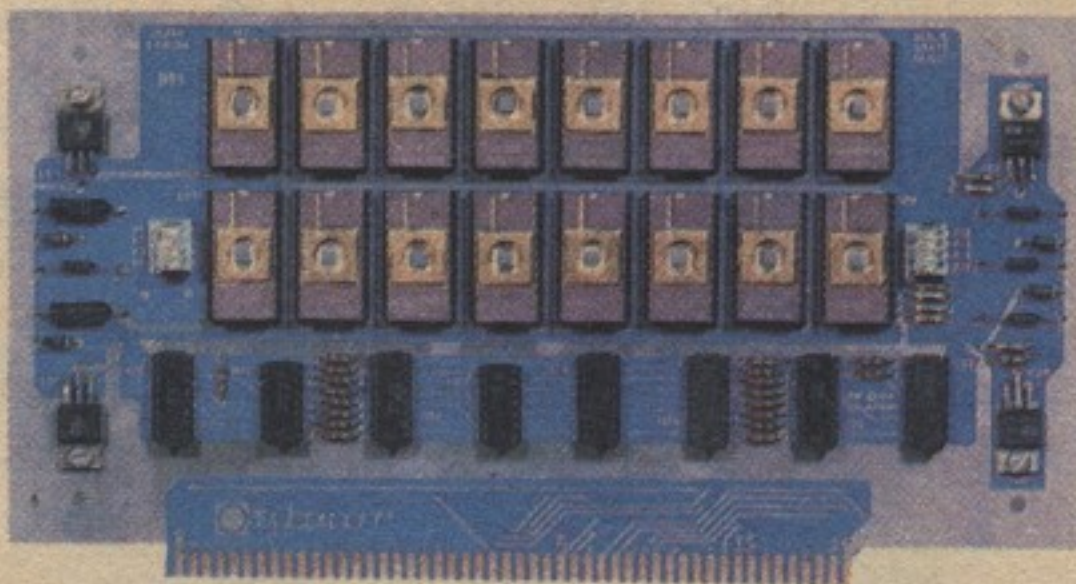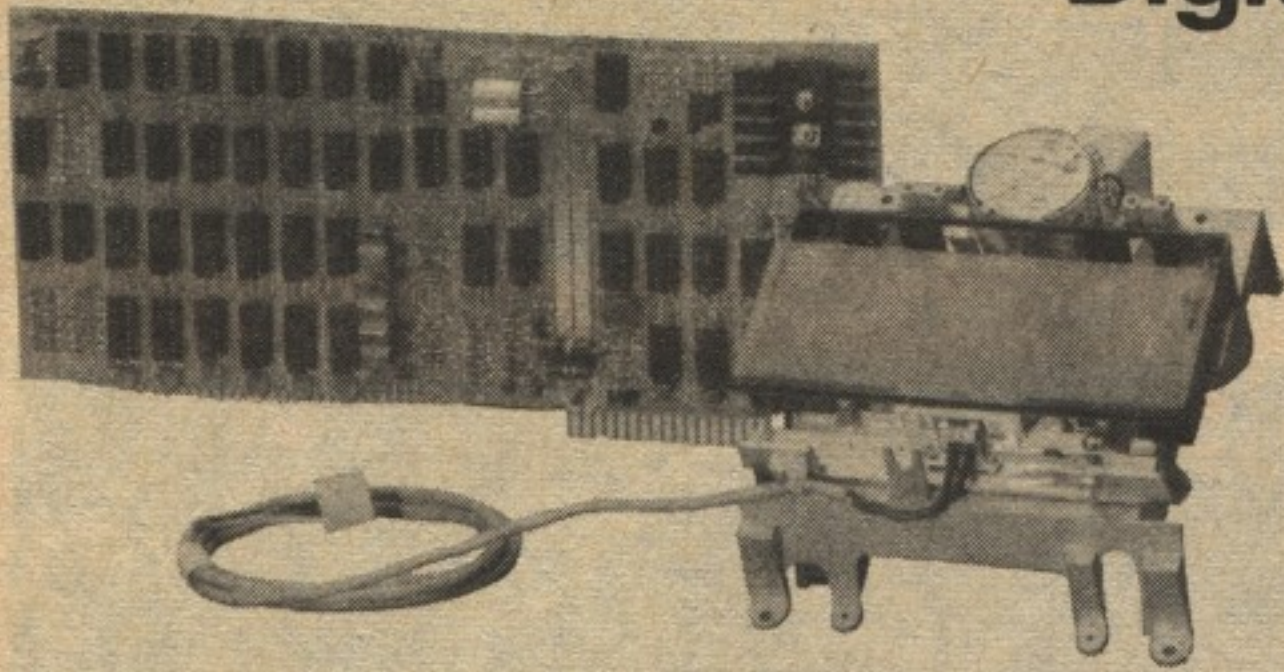
Smoke Signal Broadcasting P-38. Provides room for up to 8 type 2708 EPROMs or any ROM or PROM that is pin and electrically compatible with the 2708. Switch selects any 8K memory location from 0000 to any multiple of 8K. For use with the SWTP 6800. Assembled. Less EPROMs. **82-832. 2 lbs. ... 179.00**

Solid-State Music MB-8. An S-100 bus-compatible PROM board for use with type-2708 EPROMs (optional). DIP switch selection of memory assignment and choice of 8K or 16K complement. Also features switch selection of wait cycles from 0 to 4 and reverse-voltage selection. **82-1651. Kit. 2 lbs. 84.95**
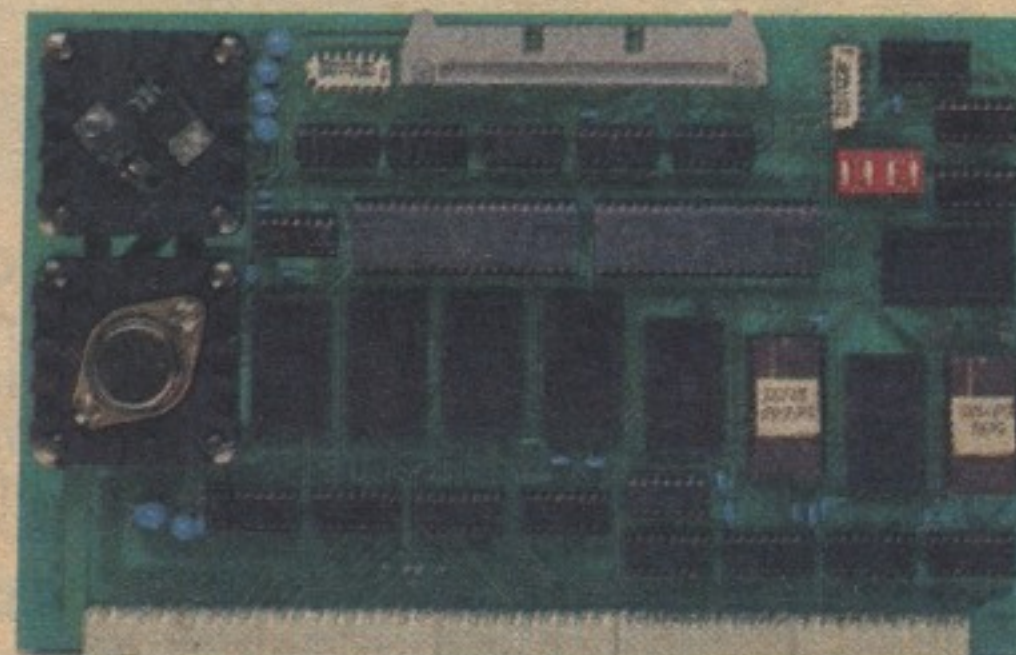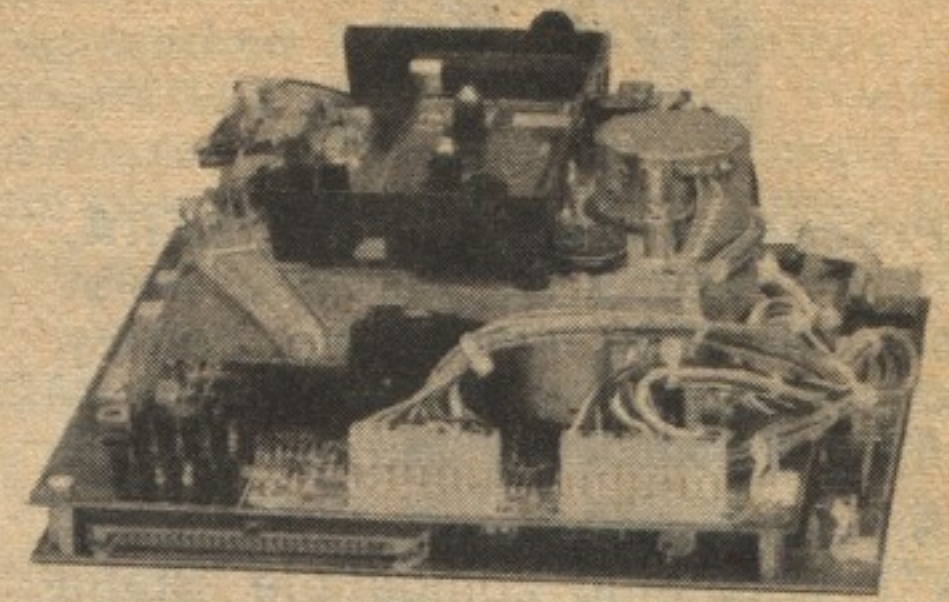
Everything in Cassette Data Storage Systems

Digital Cassette Systems

Use standard or digital cassettes for more error-free recordings. And get the advantage of high speed forward and reverse search.

Triple I GCR Digital Cassette System. Controls up to four Phi-Deck® cassette transports and accessing any of over two million 8-bit bytes within 40 seconds. Soft error rate is less than one bit in 10⁸. 800 bytes/sec. data transfer rate at 5 ips. Electronic braking. Dual 22-pin and dual 36-pin connectors along the 12-inch edge. Requires +5VDC and +12VDC unreg.
83-1004. Shpg. wt. 8 lbs. **379.95**

Triple I STR®-150 Digital Cassette Recorder. Provides full remote control of all transport functions. Includes read-write electronics, control and timing and motor control logic. Just add a power supply and a parallel interface to use with any microcomputer system. Recorder accepts asynchronous 8-bit parallel data and records in a self-clocked serial mode. Exclusive Speed Tolerant Recording (STR) automatically compensates for most cassette tape-speed variations. 3.8x8x8″. Requires +5VDC and ±12VDC.
83-1006. Shpg. wt. 7 lbs. **599.95**

Cassette Mass Storage Devices
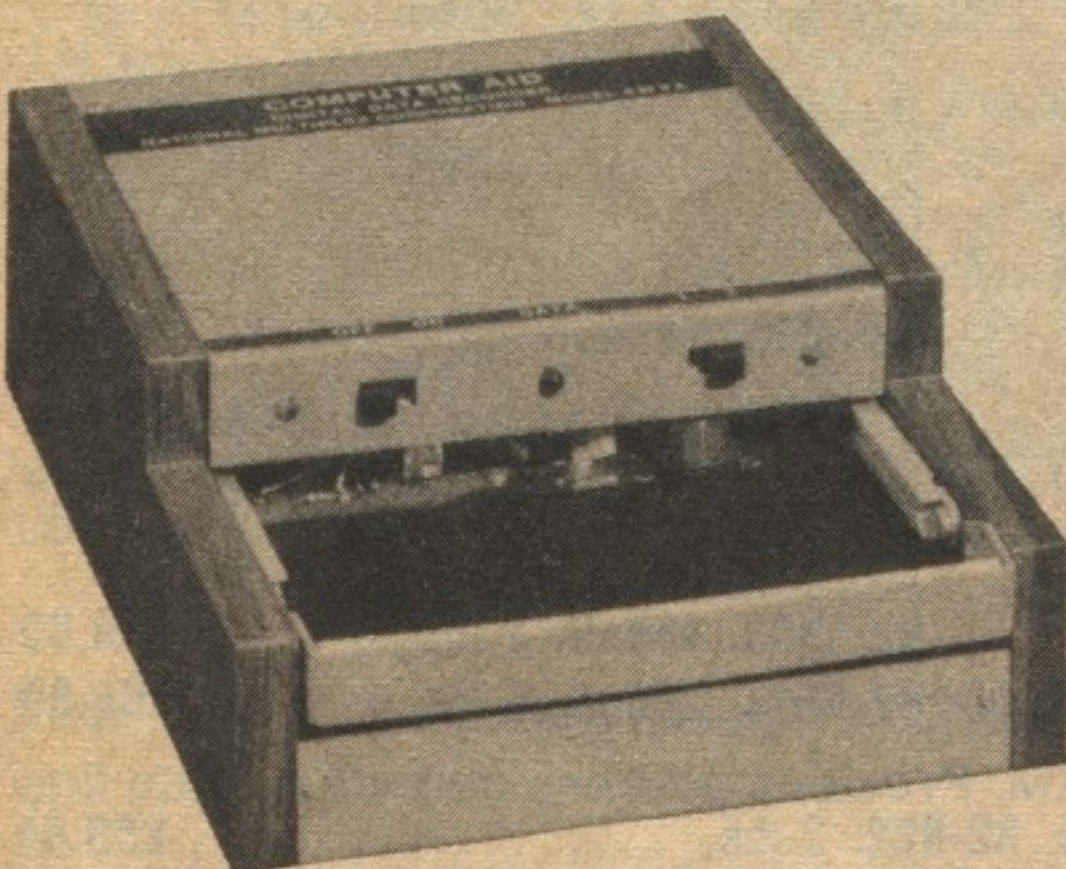
National Multiplex 3M3A Cartridge Recorder. Loads 8K in under 2.0 sec. Recording at 19.2 Kilobaud, playback at 50 Kilobaud. File or record searching at 50 Kilobaud and loading is automatic. Speed is 10″/sec. on record, up to 30″/sec. on playback. Records one clock track and one data track on each pass (2 passes). Built-in 120VAC power supply.
83-1001. 5 lbs. **220.00**

Exclusive! Tandy Computers Data Cartridge Drive. Type 3M DC 100A. 30″/sec. forward/reverse, 60″/sec. fast forward/fast reverse search. Single-gap read/write head (forward or reverse); up to 2000 flux changes/in. 2400 bytes/sec. av. data transfer at 30″/sec. Req's. +12 and +5VDC.
83-1010. 2 lbs. **249.95**
83-1011. Interface for Above. Handles up to 4 drives.
1 lb. **199.95**
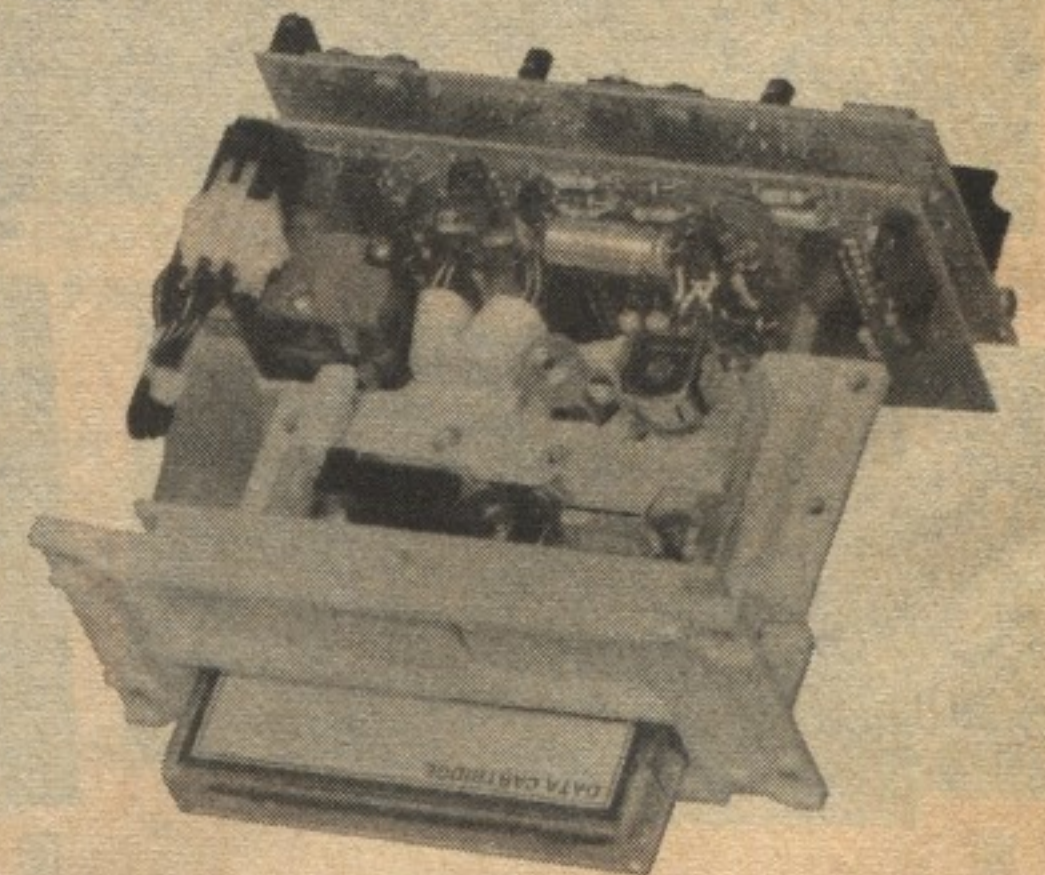
Standard Cassette Interfaces
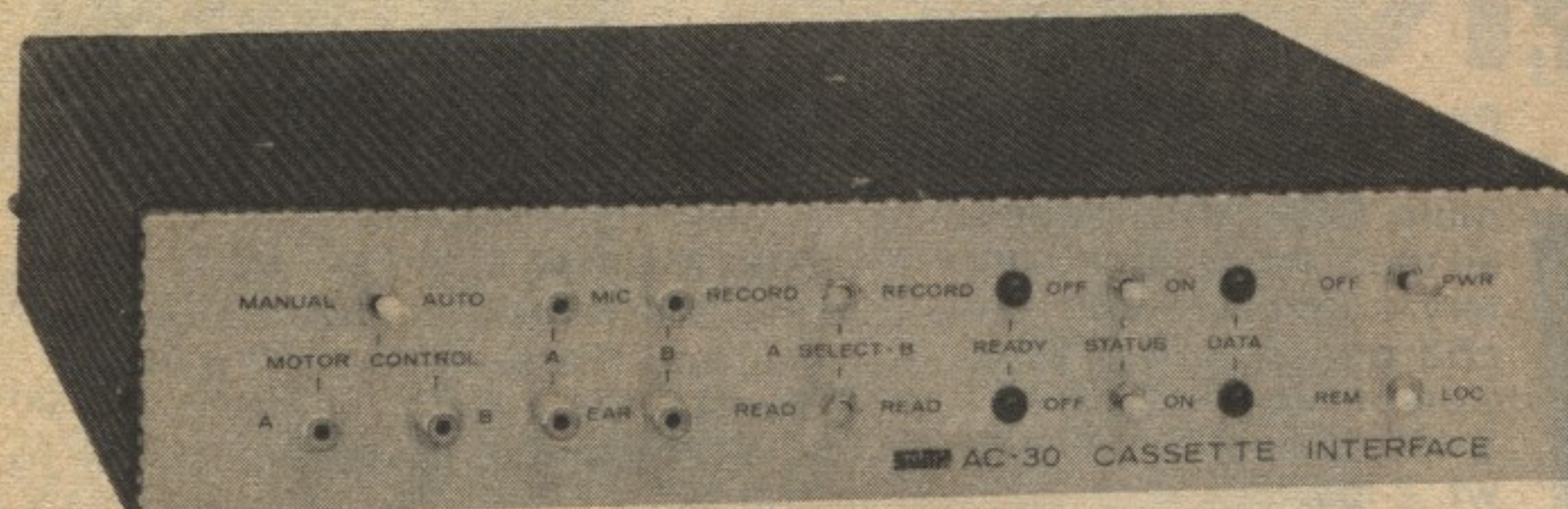
SWTPC AC-30 Audio Cassette Interface. Stores and inputs data to systems with RS232 serial interfaces and a UART circuit with accessible 16x clock frequency. FSK data format uses 1200Hz and 2400Hz at 300-baud data rate. Kansas City Methods. For 120VAC, 60Hz.
83-1206. Kit Form. Shpg. wt. 4 lbs. **79.95**
**83-6206. Factory Assembled.** Shpg. wt. 4 lbs. **99.95**

PerCom Data Co. CIS-30+. Used with SWTP 6800 Computer, the CIS-30+ allows record and playback of data using an ordinary cassette recorder at 30, 60 or 120 bytes/sec. (Kansas City). Connects to terminal and either Control (MP-C) or Serial (MP-S) Interface of SWTP 6800. Also works with 8080. Uses self clocking "Kansas City"/Biphase Standard.
83-1203. Kit Form. Shpg. wt. 2 lbs. **79.95**
**83-6203. Factory Assembled.** Shpg. wt. 2 lbs. **99.95**

Cassette Interface Boards
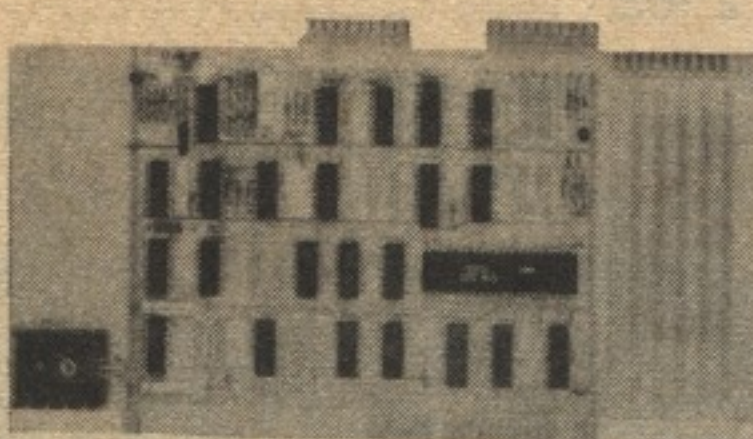
PerCom Data Co. Cassette & Terminal I/O. S-100 plug-in compatible. Works with any cassette recorder. 30-240 bytes/sec. Cassette I/O and 300-9600 Baud Data Terminal I/O (RS232 compatible). Load/Dump Software included.
83-1205. Kit Form. 2 lbs. **99.95**
83-6205. Assembled. 2 lbs. **139.95**
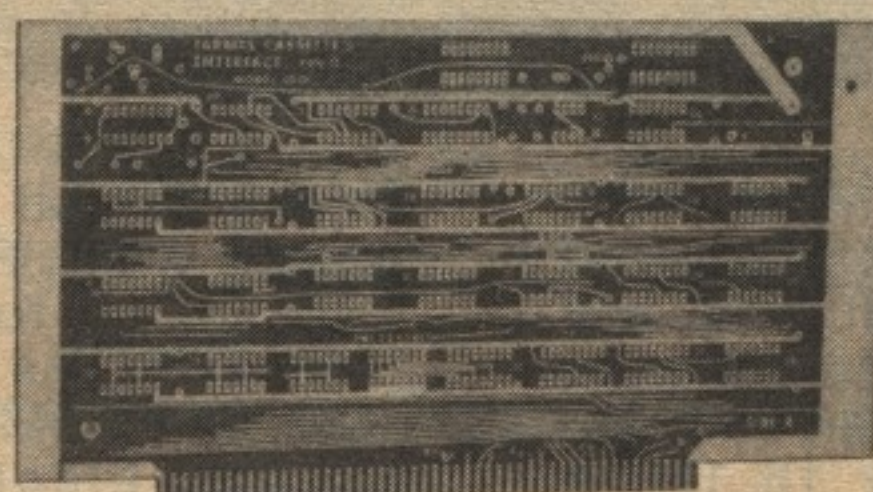
Tarbell Electronics Cassette Interface. S-100 plug-in compatible. Phase encoded self-clocking requires only one channel. 27-540 bytes/sec., 1000 bytes/sec. @ 10 inches/sec. with PHI-DECK.
83-1209. Kit Form. 1 lb. **120.00**
83-6209. Assembled. 1 lb. **175.00**
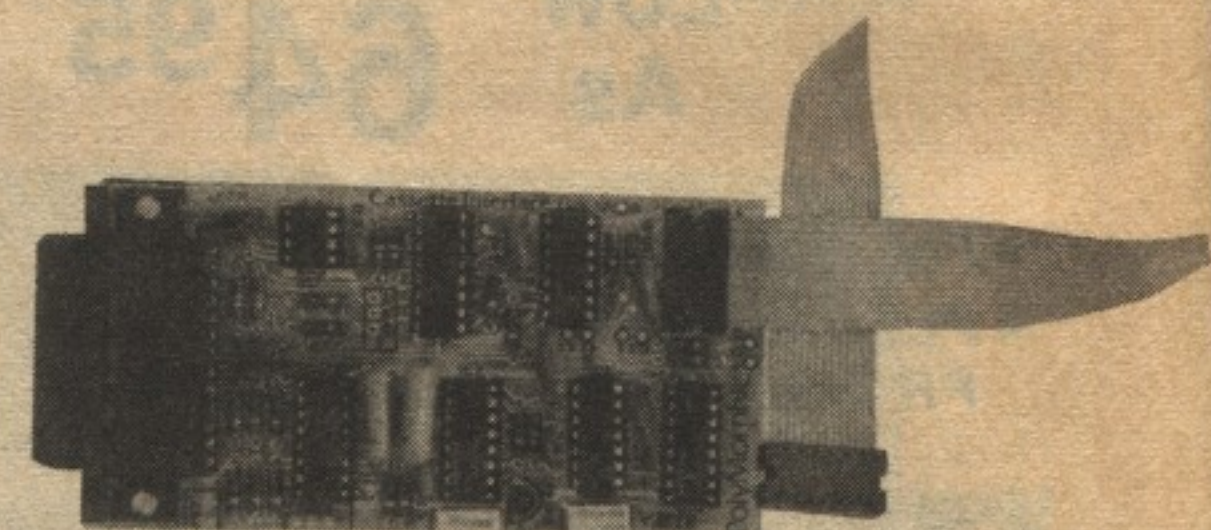
PolyMorphic Systems Cassette Interface. Use with any PolyMorphic system. Provides both Kansas City and PolyPhase recording methods. All PolyMorphic software is provided on PolyPhase tape.
87-1402. Kit Form. Shpg. wt. 1 lb. ... **65.00**
87-6402. Assembled. Wt. 1 lb. **99.95**

Floppy Disk Storage Devices
Beginners Guide to Floppy Disks

Many applications for computers require a mass data storage capability. Magnetic tape offers an economical solution to the mass data storage problem, but access time is simply too long for many applications.

The disk memory neatly fills the need for a fast mass data storage memory system. The disk is a circular metal or plastic plate coated with nickel cobalt or a similar easily magnetized substance. It's rotated much like a phonograph record at several hundred revolutions per minute by a motor drive. A read/write head similar to the recording head in a tape recorder reads data from or writes data onto the magnetic surface of the disk.

The disk storage method is faster than recording tape since data is stored in concentric rings called data tracks around the surface of the disk. A series of read/write heads or a single read/write head on a movable arm give very rapid access (a few tenths of a second) to any of the dozens or hundreds of data tracks on a disk. When the selected data track is accessed, only a brief fraction of a second is required to access data anywhere on the track.

Metal disk memories can store millions of bits on one or both of their two surfaces. Some very large capacity disks are more than a meter in diameter and can store hundreds of millions of bits.

Metal disk memories, however, are expensive. In recent years a new kind of disk made from the same oxide coated plastic used to make recording tape has become very popular. These new disks are called flexible or "floppy" disks.

Floppy disks, or **diskettes** as they're sometimes called, are much smaller than the considerably more expensive metal disks. Still, they have an impressive data storage capacity. One typical floppy disk system can hold a quarter of a million bytes on its 17 centimeter diameter diskette. Any data track on the disk can be reached by a single read/write head within 0.3

second, and the entire contents of the disk can be read out in a second!

An important advantage of floppy disks is their portability. They are no larger than a 45-rpm record so they can be easily mailed, transported and stored.

How Data is Organized on a Disk

There are two ways to keep track of where data is stored on a disk. In both, each of the data tracks is divided into one or more storage locations called **sectors**. A soft-sectored disk is organized by software while a hard-sectored disk is organized by hardware. Let's take a closer look at both methods.

Soft-Sectored Disks. This disk has a single hole called a sector hole near its axis that permits a simple light-sensitive cell to notify the computer each time the disk completes a revolution. A computer program automatically divides the disk into sectors. This method provides the ultimate in versatility, but the sectoring software is hard to develop and expensive.

Hard-Sectored Disks. Most floppy disks are hard-sectored. A series of holes around the center of the disk divides it into fixed sectors and a single marker hole provides a revolution indicator. No software is necessary and electronic control circuits automatically store data in the various sectors.

The Cost Factor

Disk memory systems are one of the more costly computer peripherals. But in terms of data storage capacity, disk memories are considerably more economical than semiconductor RAMs. A typical floppy disk, for example, costs only 0.01 cent per bit of storage capacity. True, a disk drive and control system is more expensive than, say, a cassette recorder. But it's considerably faster, far more versatile and it can be used with dozens or even hundreds of different floppy disks.

Floppy Disk Storage System

- *Hardware Implements 2 Byte CRC Error Check and Generate*
- *Hardware Bootstrap Without Processor Intervention*
- *Hardware and Software is Z80 Compatible*
- *Custom I/O Devices Are Easily Patched Into CP/M*
- *Standard CP/M Disk Operating System*
- *Each Disk Holds Over 243k Bytes*
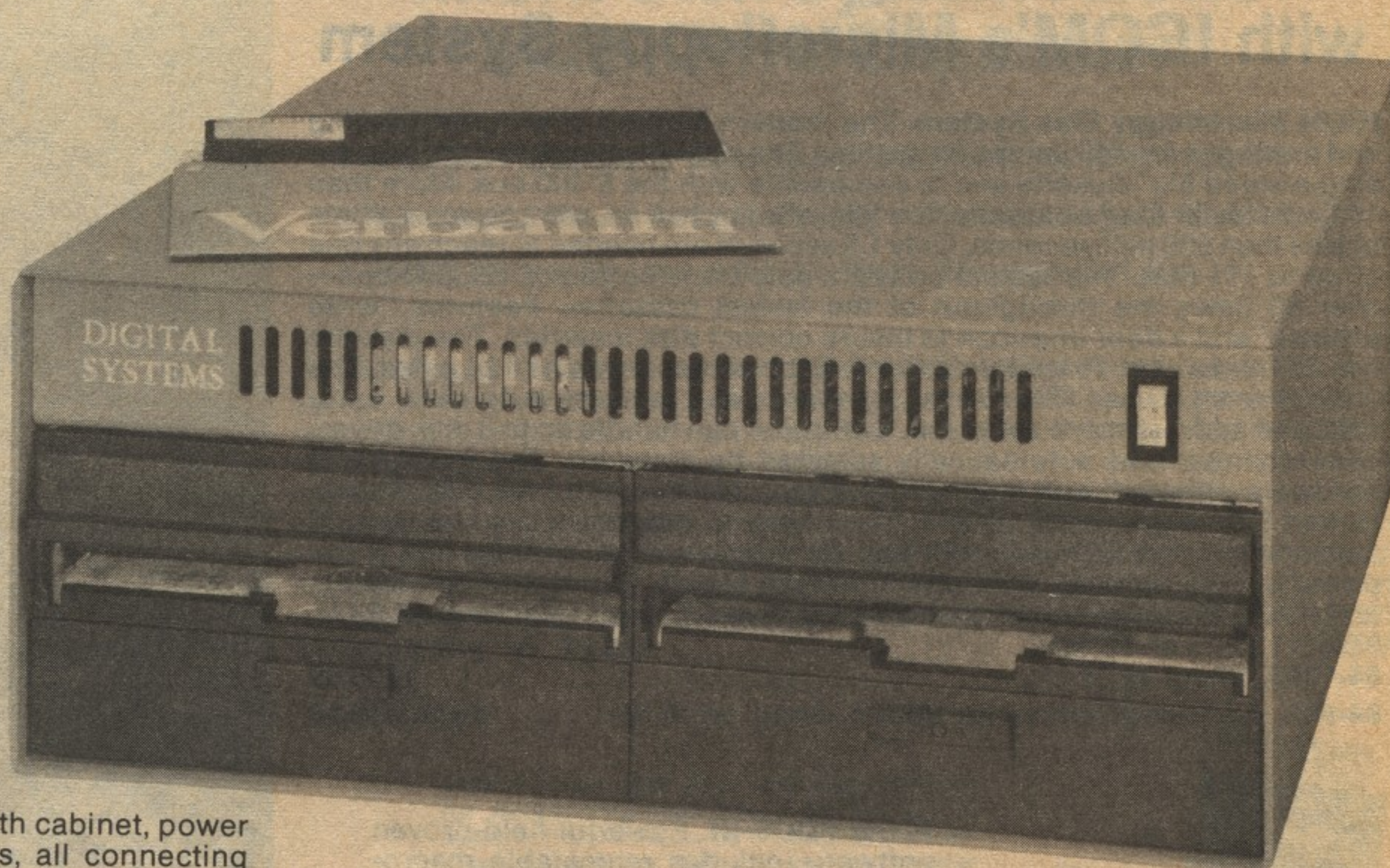
Digital Systems FDS-1. Fully assembled and tested with cabinet, power supply, FDC-1 controller, S-100 interface, disk drives, all connecting cables. An IBM compatible controller for Shugart 800 Series floppy disk drives, implemented with a TTL microcontroller. Once initialized, all data transfers for sector READ or WRITE are handled by the controller via a simple DMA interface allowing concurrent processor execution. Simple COMMAND and STATUS registers are available by programmed I/O. Software driver flowcharts and 8080 assembly language routines for READ, WRITE, and SEEK are provided. The CP/M is a complete software package that consists of BDOS, Basic Disk Operating System; CCP, Console Command Processor; PIP, Peripheral Interchange Program;

ED, CP/M Text Editor; ASM, CP/M Assembler; DDT, Dynamic Debugging Tool with Breakpoint, Trace, and built-in assembler and disassembler. Includes a user library of CP/M compatible software with high-level language processors, including extended disk BASIC. Works with Extensys dynamic memories dual drive. For 120VAC. 7x17¾x20¼".
84-802. Shpg. wt. 43 lbs. **2485.00**
87-1702. Double Density Option. For over 1 Megabyte of on-line storage **200.00**

ICOM Floppy Disk System — Mass Storage at a Minimum Price

- *Capacity of 256K Bytes Per Disk* • *Proven Reliability*
- *Plug-In Convenience Really Simplifies Interfacing*

ICOM FD3712 Floppy Disk System With Dual Drive. Fast, efficient, effective —with ICOM, programs can be loaded in seconds, files updated in minutes and hundreds of programs can be stored on a single disk. It's a fully compatible IBM 3740 media and format system with a full formatter and controller built in. Access time averages a quick 10 milliseconds. Full sector Read/Write buffers allow asynchronous or DMA data transfer. Other features include 256K bytes per disk, seven hardware status flags and TTL compatible signals. Total system integration is simplified with 11 built-in commands. The FD3712 also includes drive and disk "write protect" capability, LED status and drive select indicators, 50 pin flat ribbon cable with 3M interface connector and a positive latching door mechanism for sure disk handling. Fully retracting head and pressure pad promote maximum disk life. With chassis, cabinet, built-in power supply and cooling fan. 7¾x19x20½". For 120VAC.
84-805. Shpg. wt. 55 lbs. 2650.00
84-901. Additional Drives for above. Shpg. wt. 4 lbs. ...... Each 680.00

ICOM FF-36-1 Frugal Floppy. Designed for large-scale applications involving data processing and filing, the Frugal Floppy contains 77 tracks, with 26 sectors per track and 128 bytes per sector. Controller can accommodate up to four disk drives. Up to 256 programs can be stored on a single disk. Two I/O buffers allow quick data transfer by DMA or I/O operations. The Frugal Floppy, S-100 compatible, features "write protect" and CRC error check, and includes disk drive, controller interface cable, disk drive cable and connectors. Controller, two boards 7x15" each. Disk drive, 3½x8½x13¼".
84-804. Shpg. wt. 8 lbs. 1195.00
87-501. Power Supply for above. Shpg. wt. 6 lbs. 250.00
87-1703. S-100 Interface Card with Mini Monitor.
Shpg. wt. 3 lbs. 300.00

Expand Your System at Tandy...

Maintain Storage to a Maximum with ICOM's Microfloppy System

ICOM Microfloppy Disk System. The modern method of program loading and storing in a small computer system! The ICOM system uses the popular single-sided 5¼" diskette and is compatible with the S-100 bus. More than 10 times faster than a cassette, the Microfloppy has an average access time of less than 500 milliseconds. Only 1.5 seconds are needed to reach any one of up to 175 files. The system boasts a data transfer rate of 125,000 bps— over 80 times the throughput of the fastest cassettes. Features "write protect" and a door interlock to insure correct disk insertion. The diskette has 35 tracks with 16 sectors a track. Each sector contains 128 bytes. The controller chip uses IBM format standards and features auto-seek, auto-CRC and address mark detection. Controller can handle up to 3 disk drives, daisy-chained and automatically selected by software. The interface is hardware-oriented, with little software required to control the disk. Phase-locked loop electronics, usually found only in expensive systems, are incorporated in the ICOM Microfloppy. Complete system includes disk drive, power supply, cabinet, controller interface board, cables and connectors and FDOS-M software stored on diskette. System requires at least 8K RAM. 3¾x6x12¾". For 120VAC.
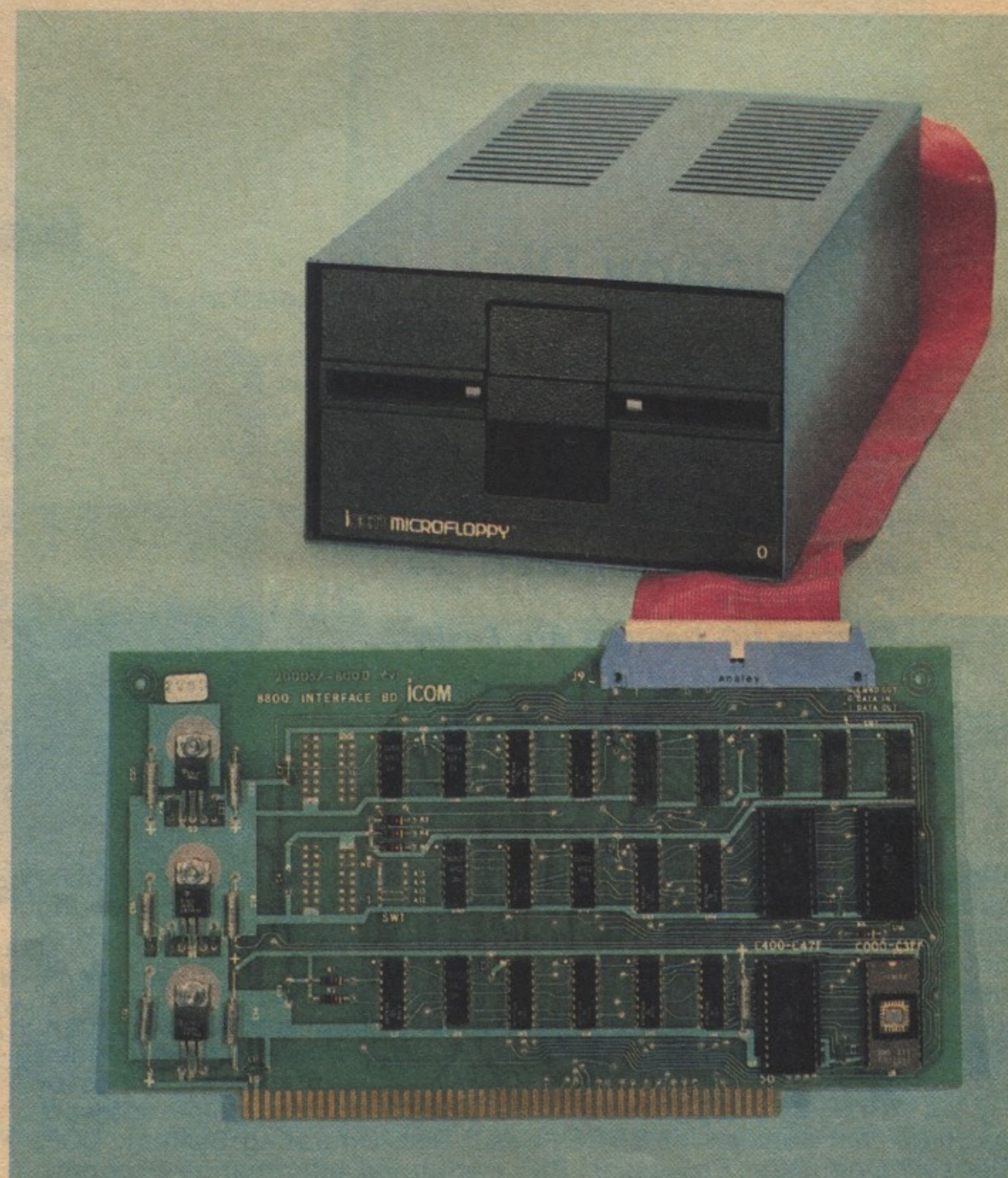**84-1703.** Shpg. wt. 8 lbs. 1095.00
84-902. Additional Drives for above. Shpg. wt. 6 lbs. ...... Each 649.00
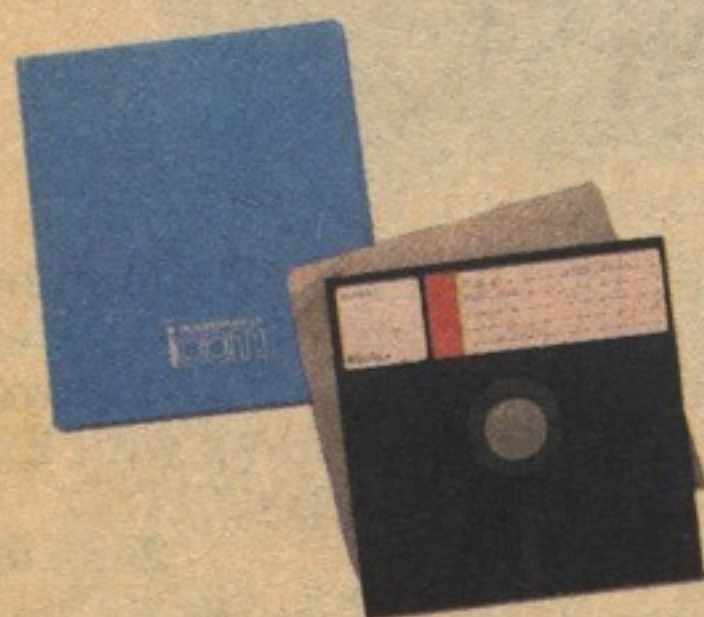
ICOM FDOS-III. Powerful field-proven software includes relocatable macro-assembler, library reloader, I/O generator, string-oriented text editor and file manager. Perfect software addition to the Microfloppy and FD3712.
**89-1201.** Shpg. wt. 3 lbs. 50.00

# IMSAI Offers Large Capacity in a Floppy Disk Drive

- *Reliable Mass Storage from a Major Name in Computers*
- *High-Speed Operations* • *400K Bytes Per Disk*

IMSAI Floppy Disk System Featuring Calcomp FDC 2-2 Drive. High-speed operation and large-size data storage combine to make this a "must" addition to any computer system. The IMSAI has an unformatted capacity of 400K bytes per flexible disk, with 5K bytes per track. The 3740 format capacity is 243K bytes, with 3.3K bytes per track and 128 bytes per sector. Nominal transfer rate is 250K bps. Each floppy disk will store up to 243K bytes of data with an average access time of 100 milliseconds. Connecting the disk drive to the IMSAI 8080 allows up to four connected disk drives through a single interface—tremendous flexibility! This gives you a capacity of more than one megabyte. A phase-locked loop data separator is provided in each cabinet for increased reliability. Front panel indicators include ready and selected drive. The drive is built on a rugged compact casting and uses a positive pressurization with self-contained air filters.
84-801. Factory Assembled. Shpg. wt. 65 lbs. **2390.00**
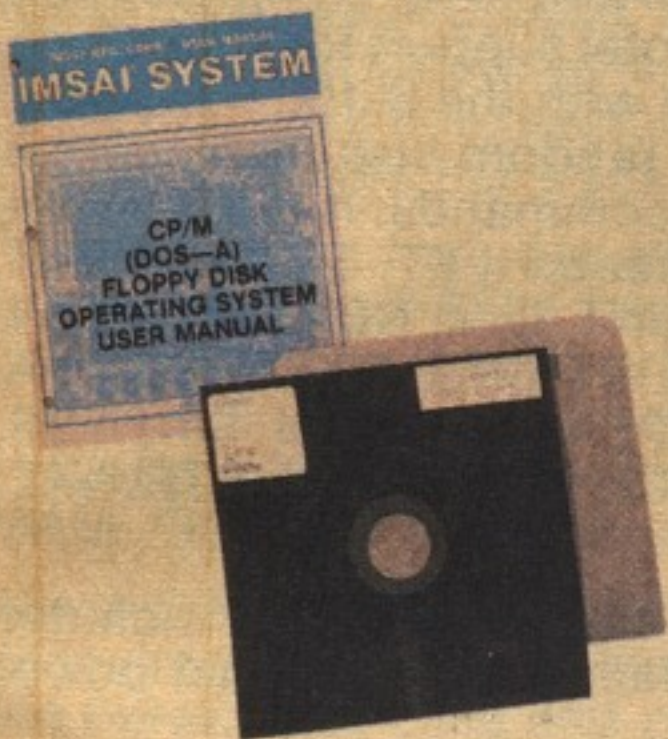
DOS-A. Low-cost disk operating system for microcomputers based on the CP/M system. DOS-A features a peripheral interchange program that allows file transfer between devices and disk files. Other functions include an editor for text and program preparation, an assembler that is compatible with Intel and Processor Technology language and a dynamic debugging tool for symbolic program tracing, debugging and testing.
89-1250. Shpg. wt. 2 lbs. **150.00**
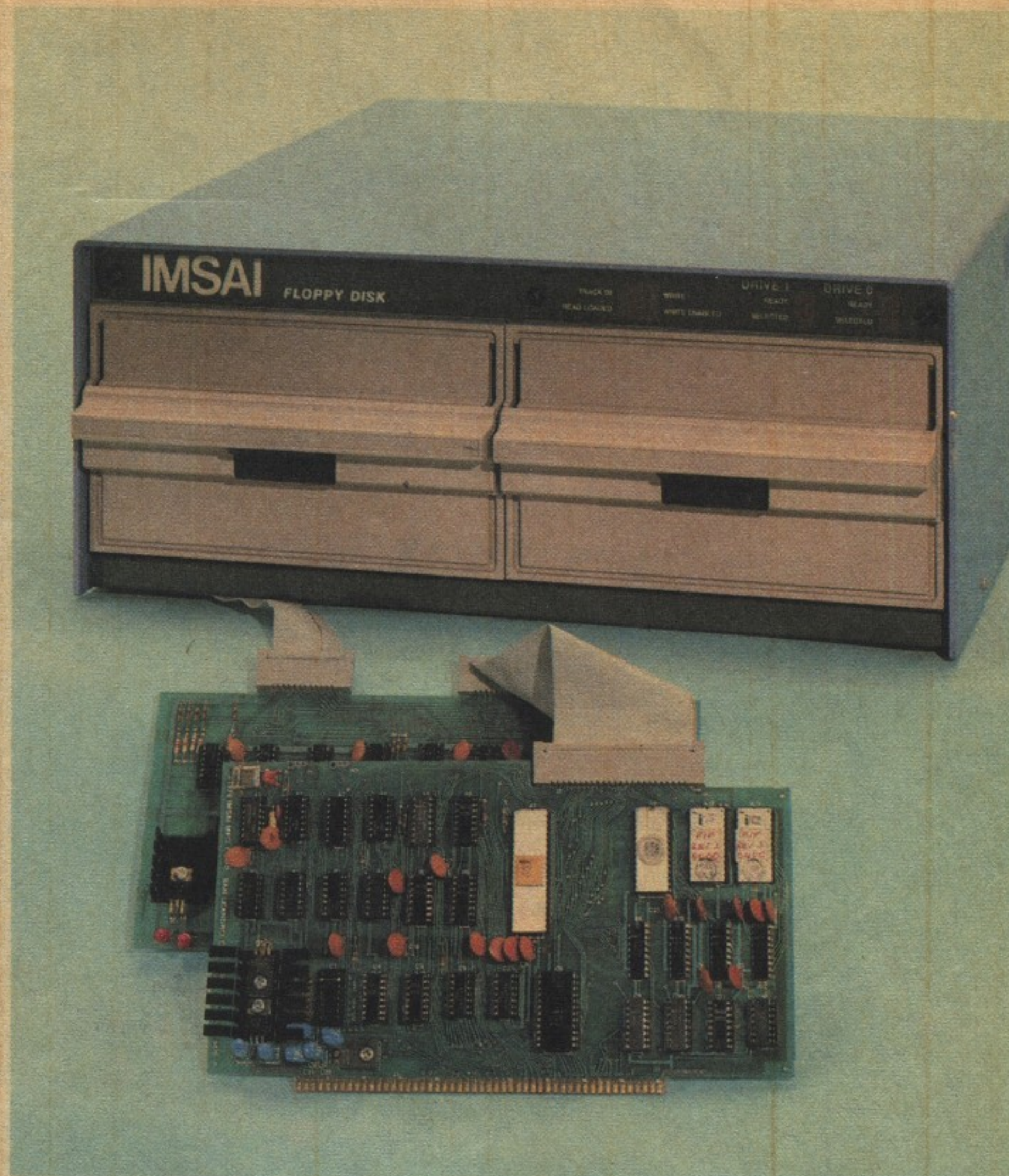
Add-On a Floppy Disk Drive

IMSAI Disk System Allows Multi-Drive Expansion

- *Flexible – Supports Additional Dual Drives, Minifloppies*
- *Automatic Baud Rate Selector* • *Disk I/O* • *Auto Bootstrap*
- *16-Bit Value Search* • *Ideal Mass Storage Set-Up*

IMSAI Floppy Disk System with PerSci PCS 80/25A Dual Drive. Excellent system features multiple functions and superb flexibility using the IBM 3741 recording format. Full control is exhibited over the I/O format. Storage capacity is ½ megabyte on the single-density dual drive, and one megabyte on the double-density dual drive. Data transfer is 250K bps. Monitor software includes display memory to console, protect/unprotect 4K RAM segment of memory, load to memory from keyboard and execute ATA given address. Controller can support additional dual double-density drives and up to three minifloppies, transferring through a port. Routines are available to user-written programs.
84-812. Shpg. wt. 30 lbs. **1995.00**

DOS-A. Low-cost disk operating system for microcomputers based on the CP/M system. DOS-A features a peripheral interchange program that allows file transfer between devices and disk files. Other functions include an editor for text and program preparation, an assembler that is compatible with Intel and Processor Technology language and a dynamic debugging tool for symbolic program tracing, debugging and testing.
89-1250. Shpg. wt. 2 lbs. **150.00**

Dual Disk Storage System with 630K Byte Capacity

- *Automatic Loading with Built-In ROM*
- *Standard S-100 Interface*
- *Extended Disk BASIC Included*

Micropolis 1053 Mod II. This compact dual-disk module lets you copy diskettes from one drive to another, rearrange data files and store 630K bytes! For really sophisticated work, the controller can handle two dual systems. That means your micro can have more than a million bytes of formatted disk storage!

The dual system uses standard 5.25″ single-sided, 16-sector diskettes and offers a track-to-track access time of 30 milliseconds. The capacity per drive is 315,000 bytes and the transfer rate is 250,000 bits per second. It uses the MFM recording scheme.

Included is the Micropolis Disk Extended BASIC — a complete, self-contained software-package which provides total support for BASIC programming. It is designed for microcomputers with the S-100 bus and at least 24K bytes of RAM. Both sequential and random disk file access is provided. In addition to the standard BASIC commands, it includes the following statements and functions. **Statements:** LET, STOP, INPUT, PEEK IF, END, GOSUB, POKE, FOR, REM, PRINT, DIM, NEXT, READ, IN, OUT, GOTO, DATA, ON, RESTORE, DEF, FN, STRING, EXEC, DEF FA. **Functions:** INT, ABS, SGN, MOD, RND, SQRT, EXP, LOG, LN, SIN, COS, TAN, ATAN, FIX, FRAC, CHAR, ASC, LEFT, RIGHT, MID, LEN, STR, VAL, MIN, MAX, REPEAT, INDEX, VERIFY, FMT.

Built-in Autoload ROM eliminates tiresome button pushing. Includes S-100 compatible controller board, 54″ interface cable, internal power supply and user's manual. 8x9.2x13″.
84-1704. Shpg. wt. 25 lbs. **1895.00**
Add-On Dual-Disk Storage Module. Adds another 630K bytes to the above system. With power supply.
84-904. Shpg. wt. 22 lbs. **1345.00**
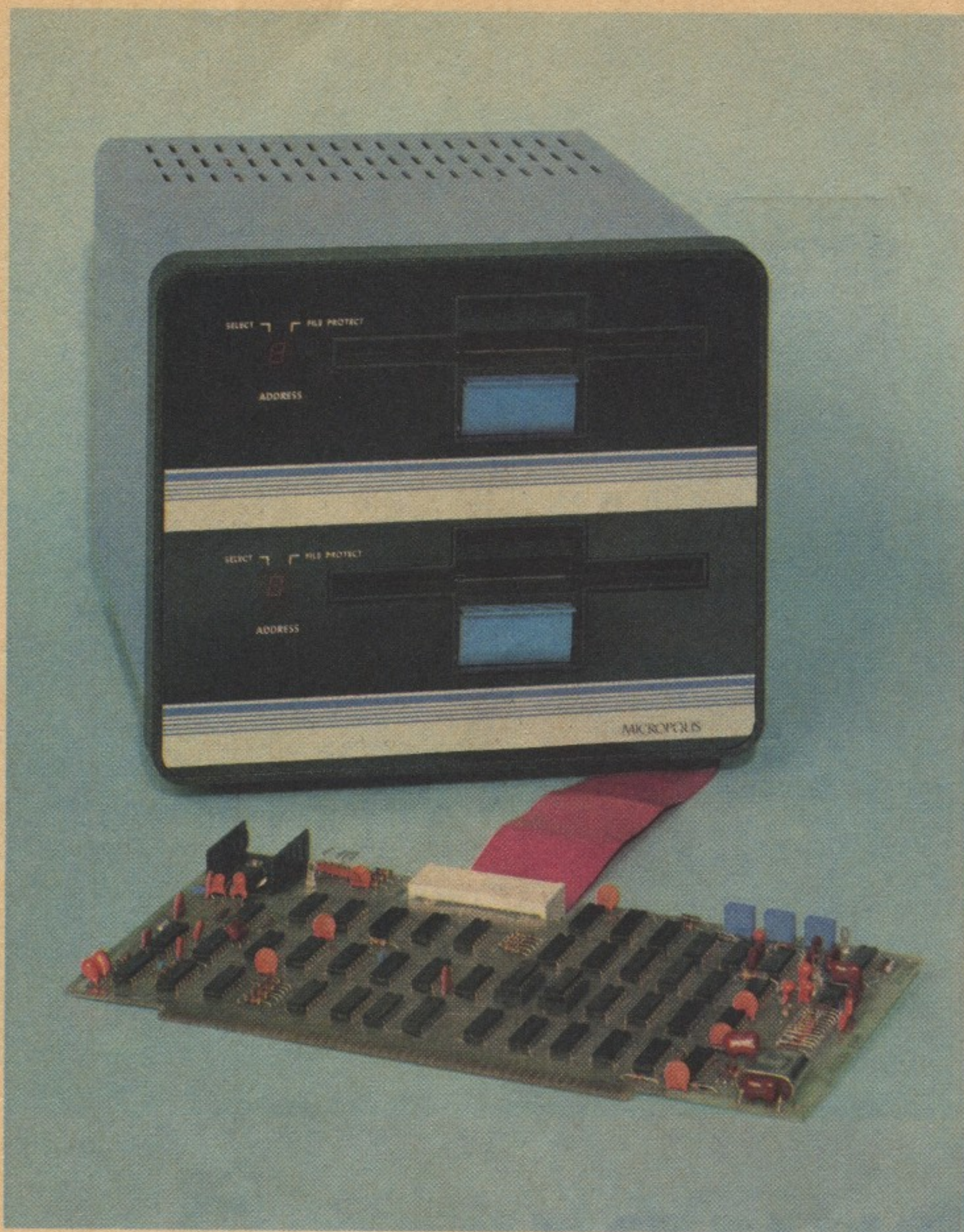
Flexible Disk Systems by Micropolis

Complete Single Disk System

- *Expandable to 3 Drives*
- *Extended Disk BASIC Included*
- *Easy Interfacing to Any S-100 System*

Micropolis 1043 Mod II. Bridges the gap between the high-priced 8″ and previous low-capacity 5¼″ floppy systems. Instead of the limited storage normally found on disks of this size, each Meta-Floppy® 5¼″ floppy disk delivers 315K bytes of formatted, usable storage. This is accomplished by using 77 tracks instead of the usual 35 and recording the data as sixteen 256-byte sectors per track.

This single-drive unit uses standard 5.25″ single-sided, 16-sector diskettes and has a capacity of 315K bytes. In addition, up to 4 disk-drives can be added to double the storage capacity to 630K bytes. The transfer rate is 250,000 bits per second using an MFM recording scheme. High reliability and greater speed and accuracy of head positioning is assured through the use of a precision-ground steel lead-screw.

Built-in File Protect feature prevents accidental loss of valuable data — a file protected diskette cannot be written on. Also built-in is an Autoload ROM for fast and easy cold starts. That means you won't have to key in a bootstrap loader manually or buy a separate bootstrap ROM board for your microcomputer. The included software-package is the Micropolis Disk Extended BASIC, as described above for the 1053 Mod II.

Includes S-100 compatible controller board, 54″ interface cable, internal power supply and user's manual. 4x5.9x12.2″.
84-1705. Shpg. wt. 16 lbs. **1145.00**
Add-On Single-Disk Storage Module. Adds another 315K bytes to the above system. With power supply.
84-903. Shpg. wt. 16 lbs. **645.00**
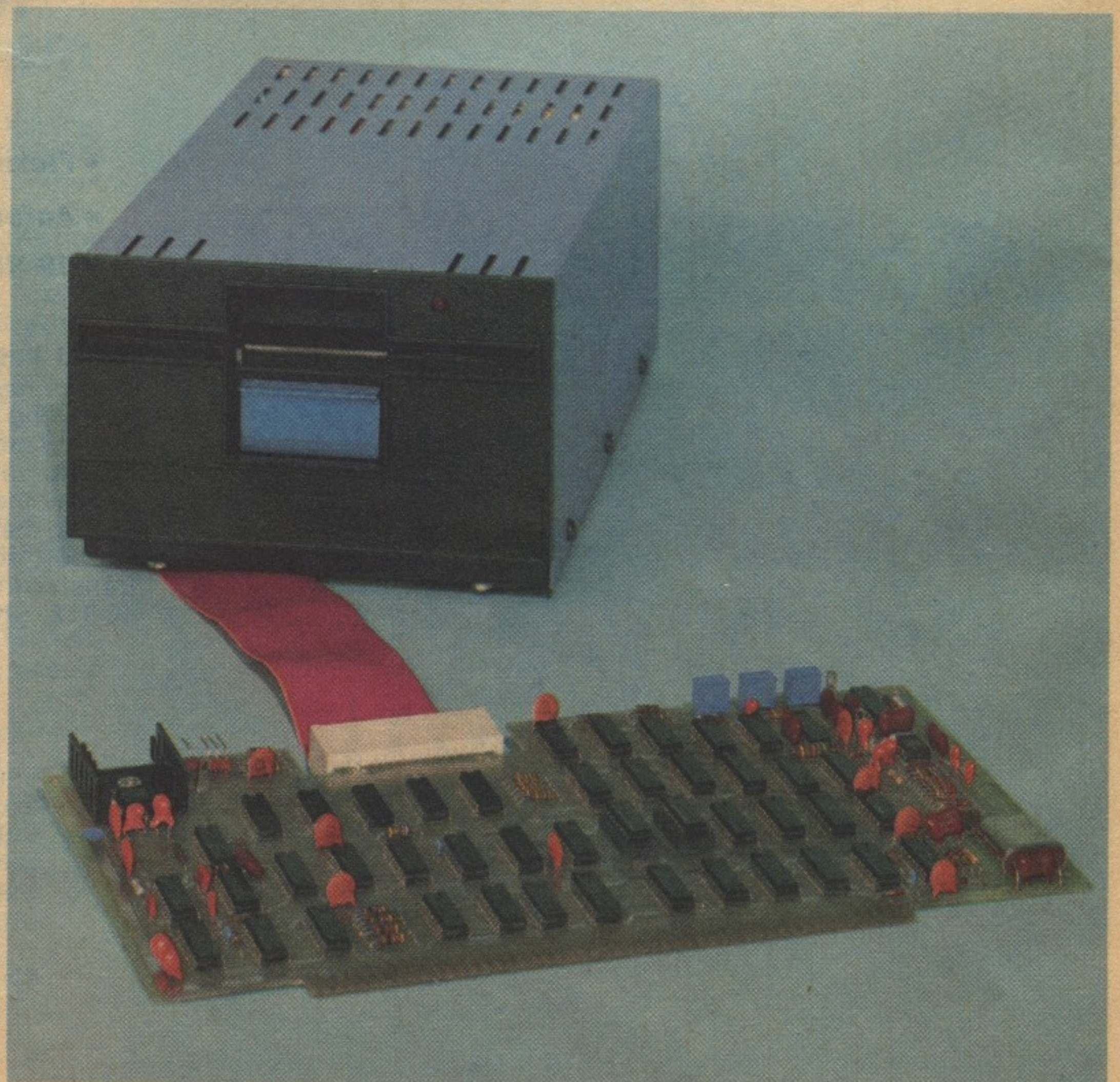
Put Your Memory on a Disk System

Let a NORTH STAR System Solve Your Memory Problems

- **Available As a Complete, Fully-Assembled System Or in Kit Form for "Custom" Installations**
- **For 8080 and Z80 Computer Systems Using the S-100 Bus**
- **Uses the Popular Shugart SA-400 MiniFloppy™ Disk Drive**

North Star MICRO-DISK SYSTEM. For a complete, disk-oriented computer system which can execute BASIC, all that is needed is your computer, 16K bytes of RAM, an I/O terminal and the North Star MICRO-DISK SYSTEM. Each hard sectored diskette can store 89.6K bytes of information, formatted as 35 tracks with ten 256-byte sectors per track.

The controller includes on-board PROM memory, pre-programmed to permit power-on start-up of the computer. The PROM program loads the Disk Operating System from drive #1 into memory and then branches to the loaded program. Disk Operating System is supplied on diskette. Commands include: CR, create a file; LI, list file directory; LF, load file to RAM; CF, copy file to file; IN, initial diskette; CD, copy entire diskette; RD, read from disk; JP, jump to RAM address; DE, delete a file; TY, set file type; SF, save file from RAM; GO, load and execute; DT, disk test; CO, compact file space; WR, write to disk.

North Star extended disk BASIC is supplied as an integral part of the system. Both random and sequential files are supported. 6x3½x12".

Kit Form. Less case and power supply. **84-1702.** Shpg. wt. 10 lbs. **699.00**
Fully Assembled. With case and power supply. **87-170.** Shpg. wt. 15 lbs. **899.00**

256 bytes of space are reserved in the disk operating system for making your I/O routines a permanent part of the DOS. Interfaces to any S-100 computer.
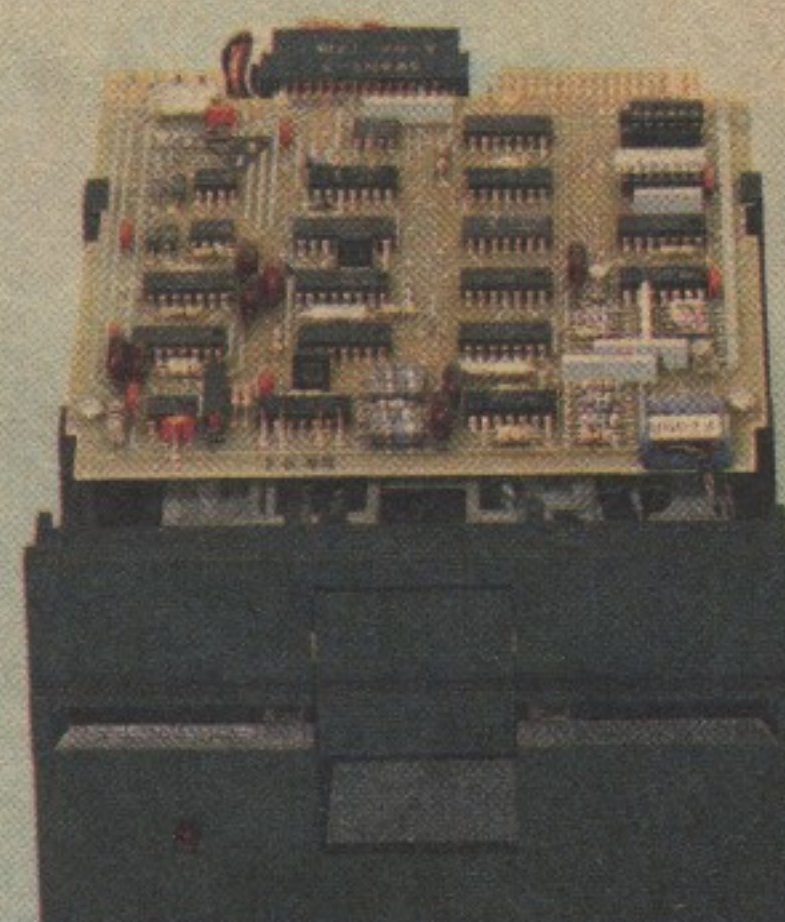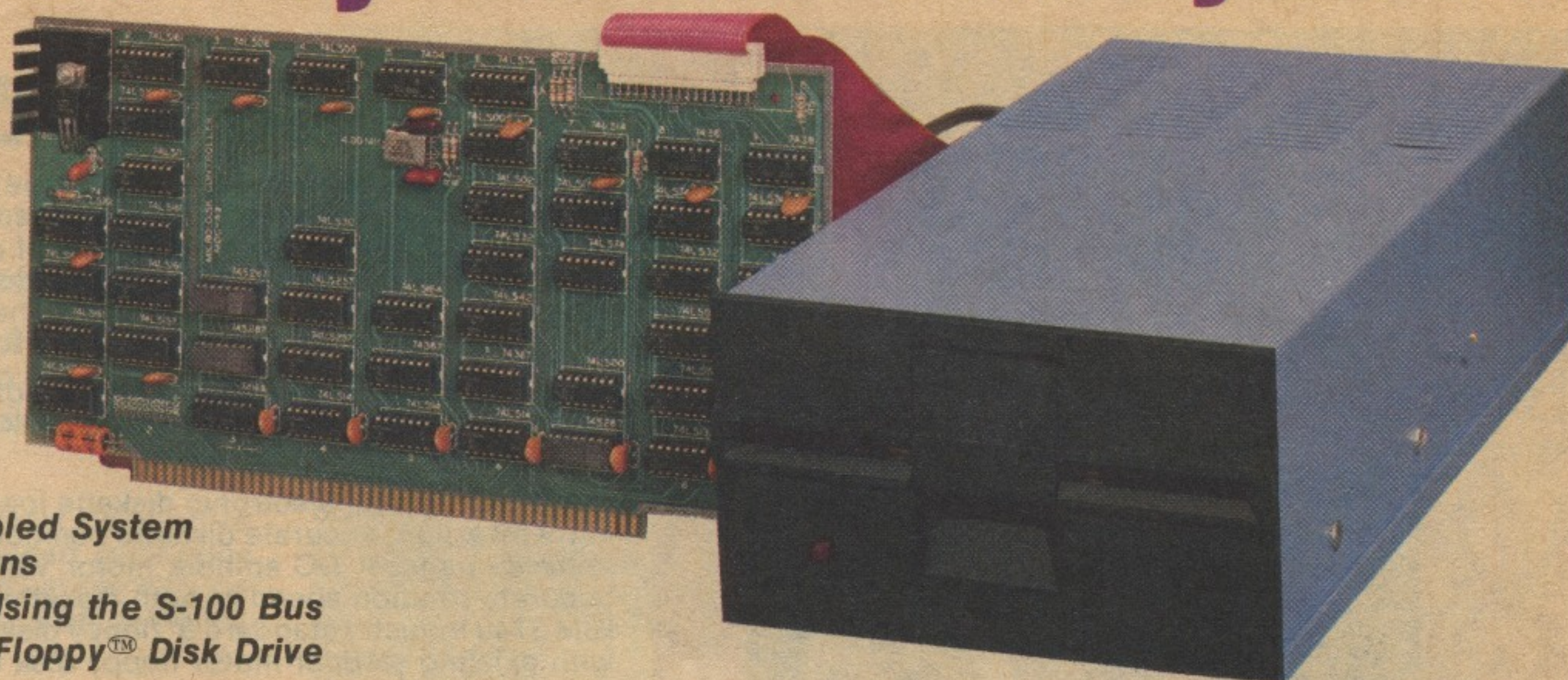
SAVE! Build your North Star disk system using your own power supply and case.

Helios II Makes a Great Addition to Your Setup

Available As a Build-It-Yourself Kit or As a Complete Fully-Assembled System

Helios II. Increase your computer's capacity by adding a fast-access memory system with mass data storage capability like the Helios II. Because it's a dual flexible disk driver and controller, Helios II is one of the fastest, highest capacity microprocessor-based disk storage systems available on the market today. It can load an 8000-byte program in just 0.3 second. And it can squeeze up to 386,000 bytes on any standard 32-hole flexible diskette.

In addition, Helios II offers a complete data storage package, not just an incomplete collection of parts and programs. The hardware includes a precision dual drive, microprocessor-based controller, power supply and interconnection cables—all enclosed in a convenient cast-aluminum cabinet.

The software is equally impressive, consisting of a 12K assembly language program plus DISK FOCAL, a conversational language that will allow you to write your own program as soon as you set up your new computer.

A powerful DISK BASIC with many advance programming features is available as an optional accessory. Helios II is supplied with full system documentation. 14x9x21".
84-807. Kit Form. Shpg. wt. 68 lbs. **2295.00**
84-5807. Factory Assembled. Shpg. wt. 68 lbs. **2595.00**

PerSci and Shugart Disk Storage Drives

PerSci Dual Diskette Drive

PerSci 277. Get twice the on-line storage in the same space as most single diskette drives. A low-cost memory device that records and retrieves data on two removable flexible diskettes providing 6.4M bits of data storage unformatted, or 3.8M bits in IBM 3740 format. Two 8″ floppy diskettes can be run at the same time for greater storage capability at a smaller cost. The unit also has double density capability increasing total data storage capacity to 12.8M bits.

An exclusive voice-coil position system greatly reduces the random track seek time (33ms, average). Provides a 76 track seek in 100ms and a track-to-track access time of 10ms.

A fully automatic, electronic diskette load and unload feature assures simple diskette insertion, accurate diskette positioning and eliminates the possibility of diskette damage. A DC spindle motor with a closed-loop feedback servo insures accurate rotation speed of both diskettes. The 277 is completely compatible with IBM 3740 industry standard 8″ floppy diskette systems, as well as being compatible with existing stepper-motor floppy disk drives.

Power consumption is only 28 watts. Because of its low heat dissipation, a cooling fan is unnecessary. This, along with the low ambient noise motor, results in noiseless operation. 8.6x4.4x15.0″. Requires +5VDC at 4A, −5VDC at .14A, +24VDC at .46A.
84-910. Shpg. wt. 20 lbs. **1145.00**

Shugart Floppy Disk Drive

Shugart Associates SA800 Series. One of the leading floppy disk drives in the computer industry, over 50,000 units have been installed around the world. You get single and double density capability on the same drive for the same price.

The SA800 is a standard floppy disk drive with an unformatted capacity per disk of 3.2 Megabits (single density). The transfer rate is 250 kilobits per second with an average track-to-track access time of 208ms.

A patented diskette clamping/registration design eliminates the possibility of damage to the diskette due to misregistration and assures over 30,000 interchanges with each diskette.

Features a proprietary glass-bonded ferrite/ceramic read/write head designed and manufactured by Shugart to provide media life exceeding 3.5 million passes/track with head life exceeding 15,000 hours. An activity light indicates which drive is in use. Uses ribbon cable or twisted pair connectors for ease of packaging.

Requires 115VAC at 0.4A, +24VDC at 1.3A, +5VDC at 0.8A, and −5VDC at .05A. With instructions. 4⅝x14x8⅞″.
84-907. Shpg. wt. 13 lbs. **595.00**
84-906. Shugart SA850. As above, but double sided. Shpg. wt. 13 lbs. . . **795.00**

Shugart MiniFloppy Diskette Drive

Shugart Associates SA400. This minifloppy diskette storage drive offers the random access storage capability of floppy disk drives in a package the size of most cassette tape units. It also provides superior data integrity and faster throughput of data when compared to cassette drives.

Applications for the minifloppy drive include word processing and text editing systems, mini and microcomputer program storage and power typing systems.

The SA400 is based on the proven floppy disk drive technology of the SA800. It features a unique new direct drive stepping-motor actuator, utilizing a spiral cam with a v-groove positive detent which assures precise location of the read/write head on a track. The drive employs the same proprietary glass bonded ferrite/ceramic read/write head as the SA800. AC power requirements have been eliminated through the use of a DC servo-controlled spindle drive motor. The drive is also equipped with an interface which allows upward expansion of the units within the system and future system enhancements with the large floppy drive.

Using 5¼″ minifloppy diskette, unformatted storage capacity is 109.4K bytes at data transfer rate of 125K bits/sec. Data is recorded on 35 tracks. Soft sector or 16/10 hard sector.

3.25x5.75x8″. Requires 12VDC at 1.8A maximum and 5VDC at 0.7A maximum.
84-905. Shpg. wt. 3 lbs. **355.00**

Multiple-Disk Drive Storage Systems

"Expandable" MiniFloppy Disk System

- *Handles Up to 3 Shugart MiniFloppy™ Drives*
- *Any Number of Files May Be In Use at One Time*
- *No Waiting for the MiniFloppy Disk to Re-Pack*
- *Longer Disk Life and More Even Wear*

Smoke Signal Broadcasting BFD-68. This basic floppy disk system is completely assembled with one Shugart minifloppy drive unit and a disk controller that is plug-compatible with the SWTPC 6800 bus. And it comes complete with disk operating system software.

The software provides for a soft-sectored format consisting of 128 bytes per sector, 18 sectors per track and 35 tracks per disk. The software has direct commands to name and rename files, transfer memory-to-disk and disk-to-memory and to automatically jump to the starting location of any program loaded from disk to memory. Direct command names are RUN, GET, GETHEX, CLOSE, SAVE, DELETE, APPEND, RENAME, COPY, LIST, LINK and PRINT. In addition, the Disk File Management subroutines are available to create files under your program control.

A bootstrap PROM is included on the controller board to initiate the DOS which loads into 4K of RAM. Thus, you can be up and running from a cold start in just a few seconds. Power supply and cabinet can handle up to three disk drive units. 7x17x15".
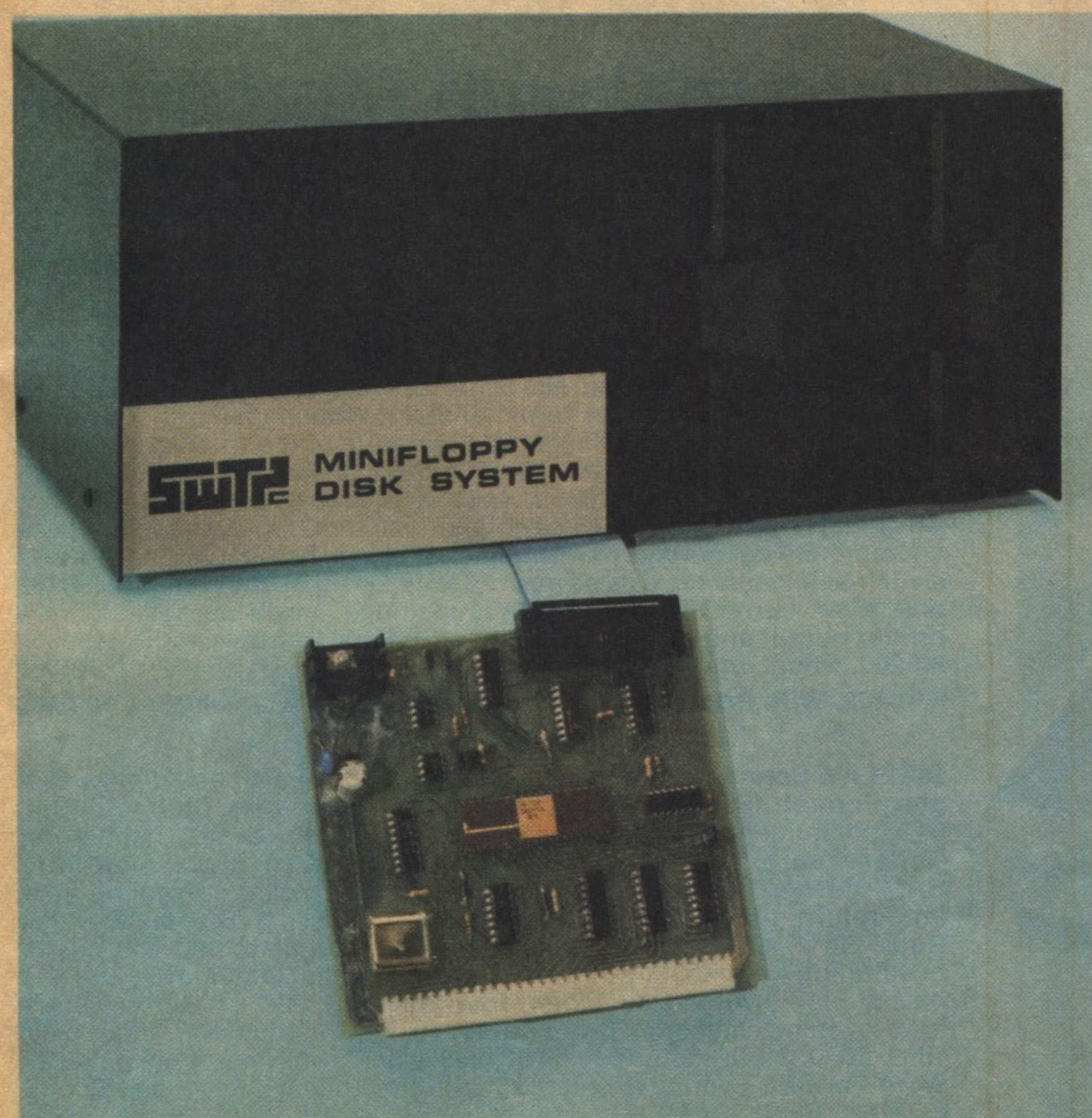**87-1707. Factory Assembled.** Shpg. wt. 25 lbs. **795.00**
Shugart MiniFloppy Drives.
84-905. Shpg. wt. 3 lbs. . . . . **Each 355.00**
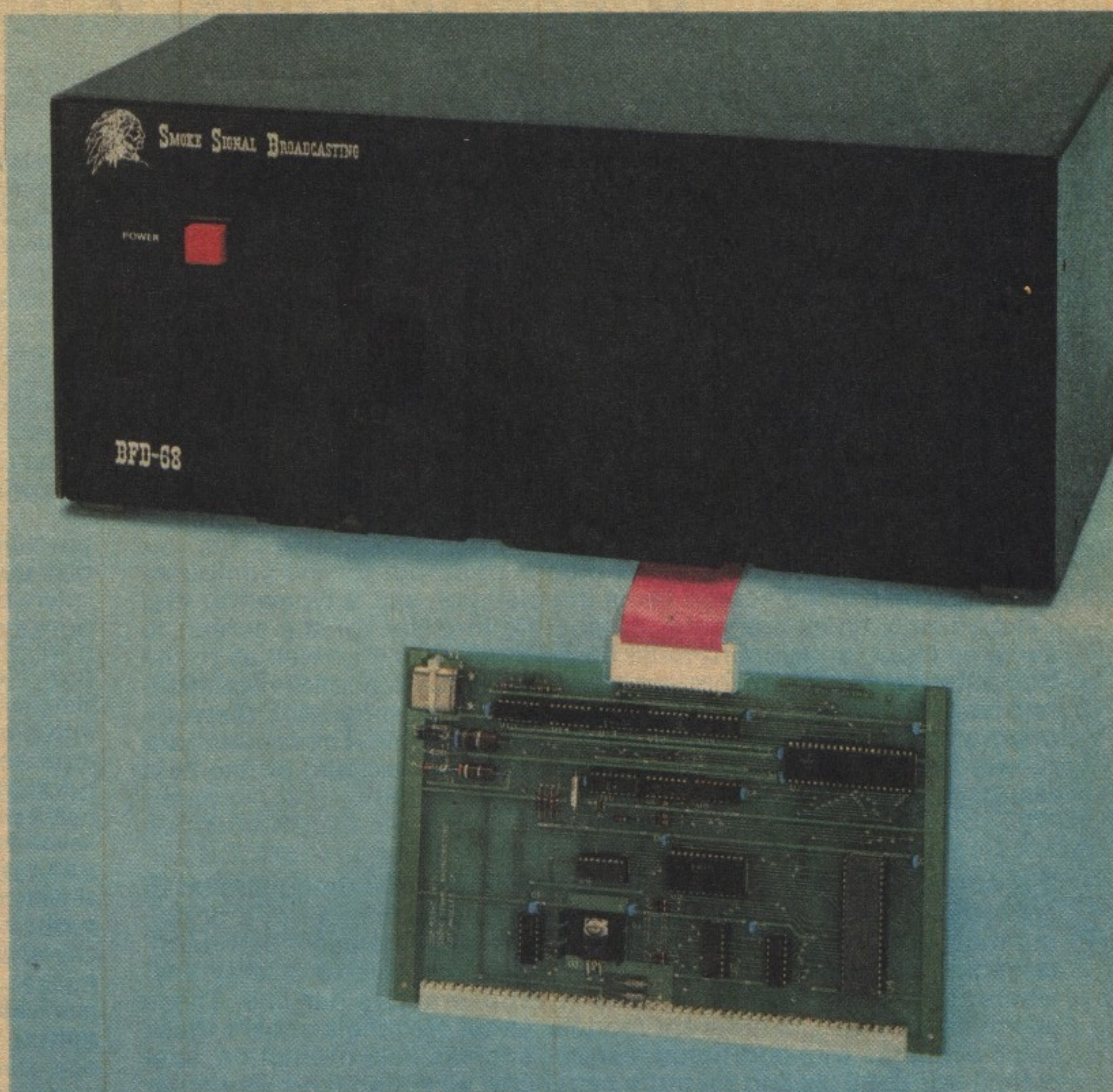
Shown with two optional-extra disk drives installed

SWTPC Dual MiniFloppy Storage System

- *Uses Standard 5¼" MiniFloppy Diskettes*
- *218.8K Bytes Unformatted Storage Capacity*
- *Available Factory Assembled or in Kit Form*

SWTPC MF-68. Designed for a SWTPC 6800 computer system, the MF-68 disk system comes complete with two Shugart SA-400 MiniFloppy disk drives. Also included is the floppy disk operating system and disk BASIC software. Both are provided for on diskette.

The kit is designed for easy assembly and consists of three major parts: the controller, the chassis and power supply, and the drives themselves. The drives come preassembled and require only minor jumper changes to be used. The power supply is assembled partially on a small PC board and partially through point-to-point chassis wiring. The controller is assembled entirely on a 5¾x5" circuit board that will plug into an I/O slot on the computer's mother board. Connection between the controller and the drives is made via a 34 conductor ribbon cable.

The disk controller is designed to load the head and turn on the drive motors only when necessary. When the computer requests data from the disk the motors will activate and the correct head will load. After the information has been retrieved the head will unload and, after approximately 20-30 seconds, the motors will turn off.

Includes two disk drives, disk controller, chassis, cover, power supply, cables and assembly and operating manual. 13⅞x9¾x6¹/₁₆".
87-1708. Kit Form. Shpg. wt. 20 lbs. **995.00**
87-6708. Factory Assembled. Shpg. wt. 20 lbs. **1195.00**

Video Display Terminals from Tandy
Perfect for Computer Communications!

Video display terminals are enjoying a wide popularity today as the major input/output sources in microcomputer systems, perhaps due as much to the advent of computer games as anything else. However, computer hobbyists and professionals are finding that the combination of a video screen display and an ASCII keyboard provides an excellent means of communicating with the computer in all programs.

In introducing this section on video display terminals to the layman, we can eliminate some confusion by explaining the meaning of certain terms such as display, CRT, and monitor. A **display**, of course, is simply a visual presentation of a received signal. The screen used for this presentation consists of a cathode-ray tube, hence the abbreviation **CRT**. This abbreviation is often used alone in referring to a video display screen. A visual **monitor** and display provide the same function so, in this case, the two terms are interchangeable. But all a display or monitor can do is supply a visual means of output for the computer. The electronic video screen takes the place of, say, a typewriter that mechanically types computer output. So in order for the screen to serve as input, a keyboard must be connected to it as well as to the computer, using an appropriate interface. Some keyboards are separate from the screen, and may be purchased independently. Others are integrated with the displays to form a single unit. These units are referred to as **video display terminals**, and can be found on the next few pages.

It is rather obvious that video display terminals contain quite a bit of sophisticated electronics. Models vary in sophistication (and price), but most are designed for business as well as home use. "Standard" terminals today contain 9 to 12" CRT's that are able to display anywhere from 16 to 24 lines, with up to 80 characters per line. These specifications vary in different models. Other terminals accent these basic elements with additional features such as field protection, special cursor controls and memory capability, all suitable for particular applications.

In order to help with terminal selection, we have provided a glossary of several pertinent terms.

Glossary

ALPHANUMERIC — A generic term for alphabetic letters, numerical digits, and special characters.

ASCII — Acronym for American Standard Code of Information Interchange. The seven-bit binary input ASCII character code is the universal standard for keyboard interfaces.

BAUD RATES — A baud is a unit of signaling speed derived from the duration of the shortest code element. The baud rate, then, is the measure of data flow in bits per second. Also known as DATA or COMMUNICATION RATES.

BIT — Acronym for Binary Digit. A unit of information equal to one binary decision.

CRT — Acronym for cathode-ray tube. A video CRT terminal presents data in visual form by focusing controlled electron beams on a television-like screen.

CURSOR — A cursor is an electronically generated line used in displays to identify where the next character will be typed. Varied functions allow the operator to manipulate the cursor across the video display.

DOT MATRIX — In displays, the array of individual LEDs that form numerals and letters on the screen, usually 5x7, or 6x9.

DUPLEX — Mode of transmission/reception in a display terminal. In a FULL DUPLEX, simultaneous send/receive messages can be achieved. In the HALF DUPLEX mode, a message can be received or sent independently, but not simultaneously.

FIELD PROTECTION — A display safeguard in which certain protected areas of displayed material cannot be typed over or transmitted accidentally.

INTERFACE — A device, e.g. formats, codes, etc., that allows communication between two or more electronic components, such as a computer and a keyboard.

PARALLEL INPUT/OUTPUT — This I/O method involves the transfer of bits simultaneously along several parallel lines.

PARITY — A method of checking the accuracy of binary numbers. In a parity check, the total number of binary 1's or 0's is always even or always odd.

RS232 — A standard electronic interface used extensively for serial data communications.

SERIAL INPUT/OUTPUT — This I/O method involves the transfer of bits, one by one, along two lines.

20mA CURRENT LOOP — Transmission current used in applying the RS232 interface in many video display terminals.

VIDEO DISPLAY TERMINAL — General name for a keyboard/CRT display combination used in communicating with a computer.

WORD FORMAT — A specified grouping of data bits, stop bits and parity bits to facilitate storage and movement of data in a computer system.

Terminal with Memory— Allows Data Storage

- *Field Protection Prevents Type-Over, Accidental Erasure*
- *Absolute Cursor Addressing Aids Editing • 73 Keys*
- *MOS RAM Memory • Numeric Pad • Full/Half Duplex*

Soroc IQ 120. Ideal for hundreds of professional and home applications, the IQ 120 is a high quality terminal that contains memory of its own, enabling large amounts of data to be stored. This is particularly useful if editing is required, and the IQ 120 offers a wide variety of editing functions, including automatic repeat and several erase controls. The ASCII keyboard features 73 keys, and includes upper and lower case characters. The terminal has switchable full and half duplex modes, and switch-selectable baud rates from 75 to 19,200 bps. The standard RS232 and 20mA current loop interface is included. Available options are a printer output and a block mode for additional transmission versatility.

87-202. Shpg. wt. 47 lbs. **995.00**

87-5202. With Printer Mode/Block Mode. Shpg. wt. 47 lbs. . . **1095.00**

Specifications

DISPLAY. Screen: 12" diagonal, rectangular CRT, P4 phosphorus. **Display Format:** 1920 characters, 24 lines of 80 characters. **Character Set:** 64 alphanumeric ASCII characters, upper and lower case. **Character Generation:** 5x7 dot matrix. **Display Memory:** 960 character (8-bit) MOS RAM. **Cursor Control:** Forespace, backspace, upline, downline, new line, return, home, tab, absolute cursor addressing. **Display Refresh Rate:** 60Hz. **KEYBOARD:** 73 keys, including numeric pad and cursor positioning keys. **COMMUNICATIONS. Transmission Modes:** Full and half duplex (switch-selectable). **Interface:** RS232C or 20mA current loop (switch-selectable). **Baud Rates:** 75, 110, 150, 300, 600, 1000, 1200, 1800, 2000, 2400, 3600, 4800, 7200, 9600, 19200 bps (switch-selectable). **Word Format:** Switch-selectable 7 or 8 data bits with 1 or 2 stop bits. **POWER REQUIREMENT:** 115VAC, 60Hz, 130W. **WT:** 45 lbs. **SIZE:** 12½x18x21".

Stylish Terminal is Feature-Packed

- **64x16 Display Allows Maximum Visual Impact** • **Two Intensity Levels**
- **Protected Fields for Data Formatting**
- **Choice of 115 or 230VAC Operation**

Informer D311. All the features needed in a terminal are tied together in this uniquely designed, compact package. The D311 contains a 70-key ASCII keyboard, strapped for odd parity, with output channeled in a TTL serial stream. Full and half duplex modes are switchable and aid in transmission flexibility. Cursor controls include direct cursor positioning, return, home and line feed. Data characters may be entered and displayed at either of two intensity levels; those displayed at the lower level are protected against erasure during a selective screen clear. An internal 8-position selector switch selects baud rates from 110 to 9600 bps. A standard RS232 interface connector is mounted on the control unit, which includes a transformer-type power supply with taps for operation at 115 or 230VAC and for normal or low line operation. Special mounting plate is provided for fastening the D311 to a wall or desk.
87-203. Shpg. wt. 21 lbs. **850.00**

Specifications

DISPLAY. Screen: 5″ diagonal, rectangular CRT, P4 phosphorus. **Display Format:** 1024 characters, 16 lines of 64 characters. **Character Set:** 64 alphanumeric ASCII characters, upper case. **Character Generation:** 5x7 dot matrix. **Cursor Control:** Forespace, backspace, upline, line feed, return, home, direct cursor positioning. **Display Refresh Rate:** 60Hz. **KEYBOARD:** 70 keys, including cursor positioning keys. **COMMUNICATIONS. Transmission Modes:** Full and half duplex (switch-selectable). **Interface:** RS232. **Baud Rates:** 110, 150, 300, 600, 1200, 2400, 4800, 9600 bps (switch-selectable). **Word Format:** 7 bit selectable parity. **POWER REQUIREMENT:** 115 or 230VAC, 50 or 60Hz, 40W. **WT:** 20 lbs. **SIZE:** Monitor/Keyboard, 12x23x8″. Power supply, 4½x8x8″.

Terminal Value Begins with the Lear Siegler

- **Direct Cursor Addressing Gives Superior Display Control** • **Full and Half Duplex Modes**
- **End-of-Line Audible Tone Eliminates Guesswork**
- **Extension Interface Allows Future Add-Ons**
- **Modular Construction Means Easier Maintenance**

ADM-3A. Wide performance capabilities and simplified operation combine to make this the perfect terminal for use with professional communications systems or your personal system at home. The ASCII keyboard contains 59 keys, including cursor control keys, with an optional numeric pad and 1920-character format available. Versatile keyboard functions feature such extras as repeat, rubout, reverse cursor and clear screen. Switchable full and half duplex modes, baud rates from 75 to 19200 bps, standard RS232C and 20mA interface. The ADM-3A comes with an extension interface port for easy connection with other terminals.
87-301. Kit. Shpg. wt. 34 lbs. **795.00**
87-5301. Assembled. Shpg. wt. 34 lbs. **895.00**
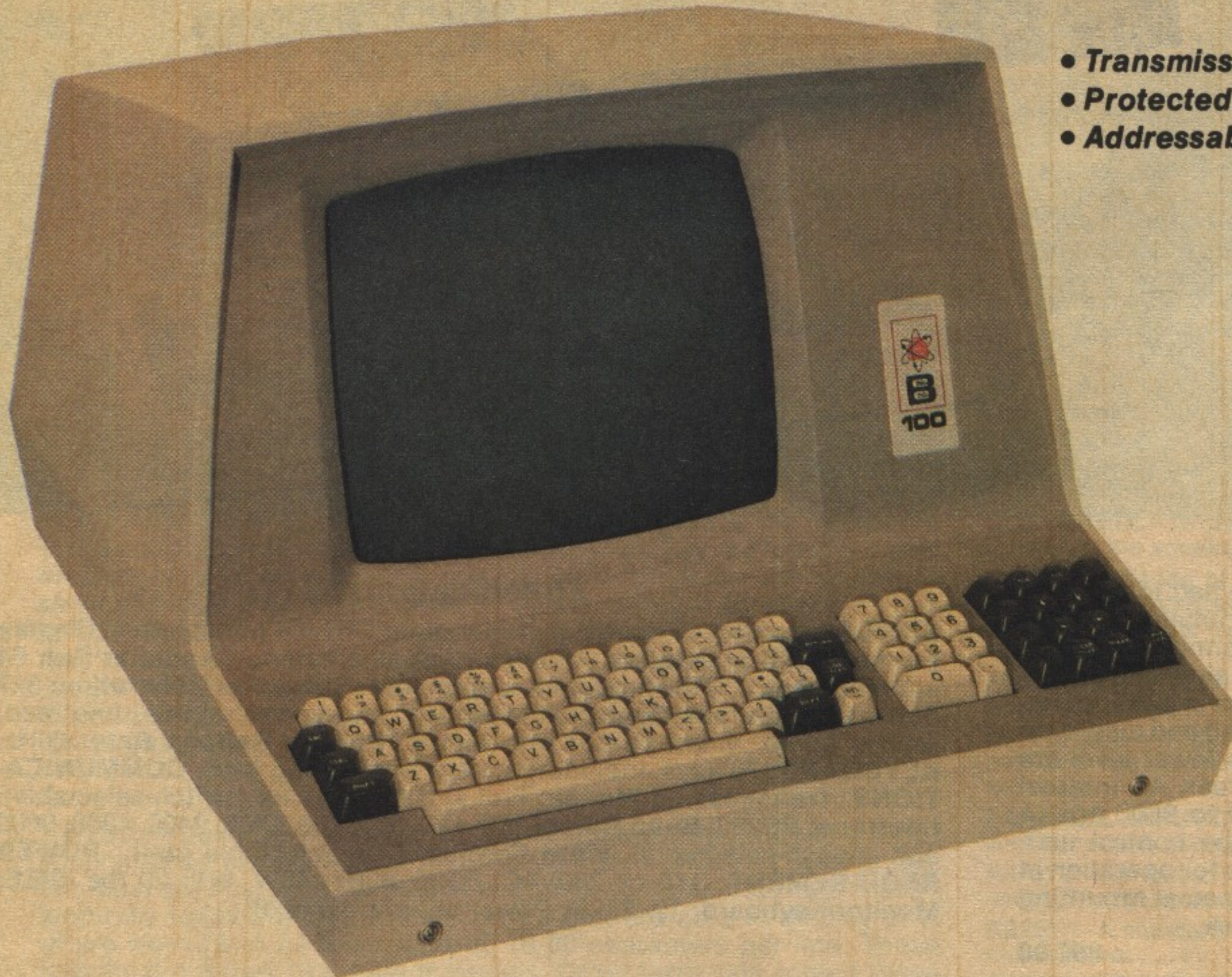
Specifications

DISPLAY. Screen: 12″ diagonal, rectangular CRT, P4 phosphorus. **Display Format:** 1920 characters, 24 lines of 80 characters. **Character Set:** 64 alphanumeric ASCII characters, upper case. **Character Generation:** 5x7 dot matrix. **Cursor Control:** Forespace, backspace, upline, downline, line feed, return, home, direct cursor addressing. **Display Refresh Rate:** 60Hz to 50Hz (switchable). **KEYBOARD:** 59 keys, including cursor positioning keys. **COMMUNICATIONS. Transmission Modes:** Full and half duplex (switch-selectable). **Interface:** RS232C or 20mA current loop (switch-selectable). **Baud Rates:** 75, 110, 150, 300, 600, 1200, 1800, 2400, 4800, 9600, 19200 bps (switch-selectable). **Word Format:** Switch-selectable to 9, 10 or 11 bits. **POWER REQUIREMENT:** 115VAC, 50 or 60Hz, 80W. **WT:** 32 lbs. **SIZE:** 13½x15½x20″.

Terminals to Increase Your Computing Power

It's BEEHIVE for Value and Versatility

- *Transmission Modes Feature Full / Half Duplex, Block*
- *Protected Field* • *11-Key Numeric Pad*
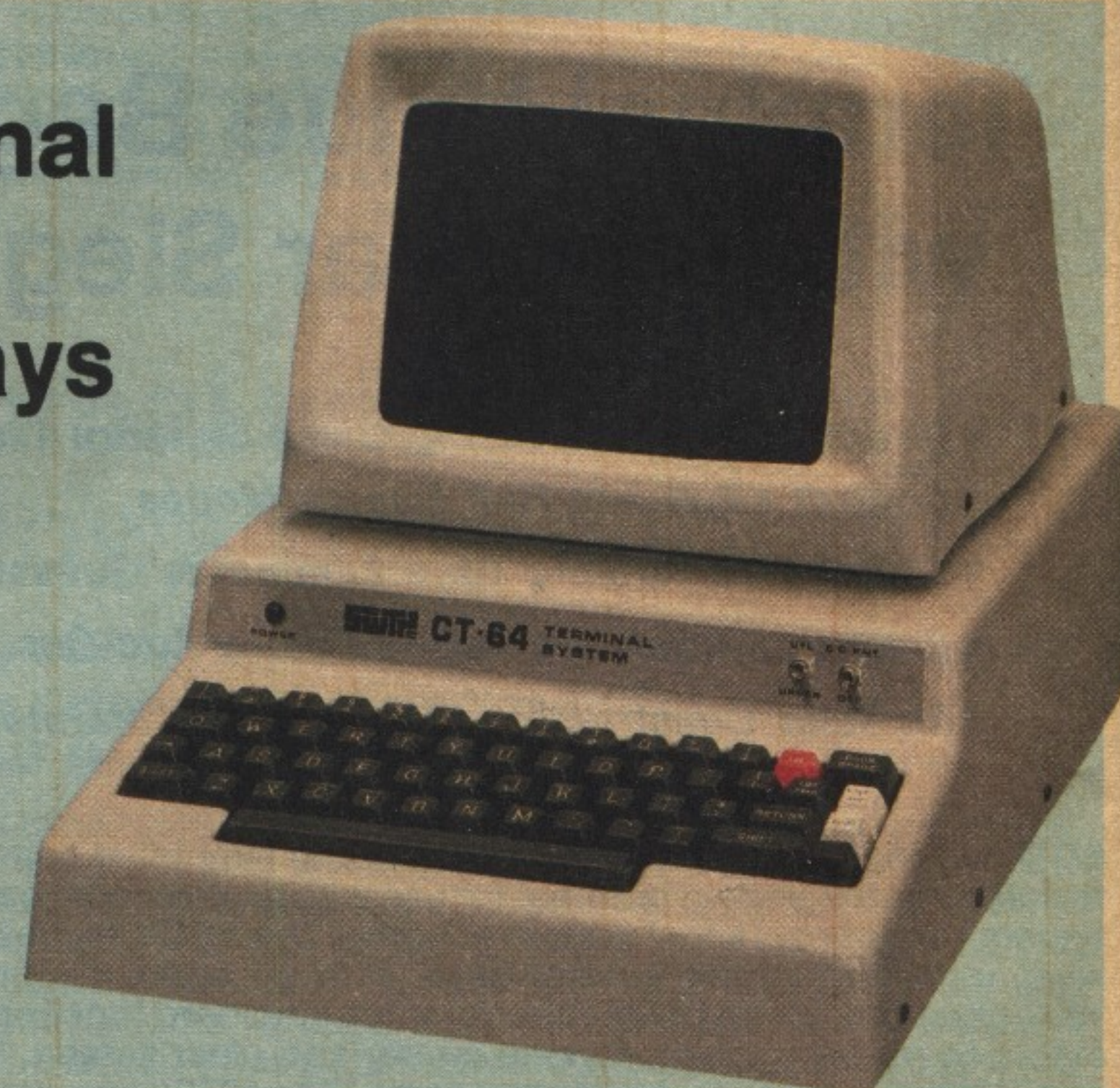- *Addressable Cursor* • *Erase Modes* • *Automatic Repeat*

Beehive B100. A low cost, multi-feature remote video display terminal designed to use with an interconnected data source. Transmission rates range from 75 to 19,200 bps. The 64-character ASCII keyboard has an 11-key numeric pad for easy digital entries. Other features include RS232C/20mA current loop interface, auxiliary input/output port. Expansion options are available.
87-201. Shpg. wt. 47 lbs. **1595.95**

Specifications

DISPLAY. Screen: 12" diagonal CRT, P4 phosphorus. **Display Format:** 1920 characters, 24 lines of 80 characters. **Character Set:** 64 alphanumeric ASCII characters, upper case. **Character Generation:** 5x7 dot matrix. **Cursor Control:** Forespace, backspace, upline, downline, line feed, return, home, direct cursor addressing. **Display Refresh Rate:** 50 or 60Hz (switch-selectable). **KEYBOARD:** 64 keys, including cursor positioning keys. **COMMUNICATIONS. Transmission Modes:** Full/Half Duplex, Block (switchable). **Interface:** RS232C or 20mA current loop (switch-selectable). **Baud Rates:** 75, 110, 150, 300, 600, 1000, 1200, 1800, 2000, 2400, 3600, 4800, 7200, 9600, 19,200 bps (switch-selectable). **Word Format:** Switch-selectable to 9, 10 or 11 bits with 1 or 2 stop bits. **POWER REQUIREMENT:** 115, 100 or 230VAC, 50 or 60Hz. **WT:** 45 lbs. **SIZE:** 13½x19x22¼".

Exciting Graphics by SWTP

SWTP GT-61. Now it's possible to enhance computer games by generating stunning graphic displays while saving hundreds of dollars over most video display terminals. Many people are discovering that games are much more fun when played on a video terminal with a graphic display. With such terminals you can provide instant response and provide a pictorial playing area that cannot be duplicated on any type printing terminal. But the cost of many graphic display terminals is usually prohibitive. With Southwest Technical Products' GT-61 kit, you can enjoy visual effects simply by connecting the unit with video input to any standard TV or monitor. The display is divided into an array of 64x96 cells. Each cell is individually addressable and may be selectively turned on and off by programming commands. With a little imaginative programming, fixed or moving images can be displayed on a screen. And a unique image reversal feature allows you to select between white on black or black on white. The terminal has its own 6144-bit RAM, enabling it to operate with any computer system whose parallel interface outputs an 8-bit data word and "data ready" strobe. Includes circuit board, components, assembly instructions.
87-303. Kit. Shpg. wt. 30 lbs. **98.50**
87-5303. Assembled. Shpg. wt. 30 lbs. **149.95**

Terminal Kit Displays Value

SWTP CT-64. Low cost, compact, lots of features, including 56-key ASCII keyboard, RS232 interface, switchable baud rates from 110 to 1200 bps, full and half duplex modes, screen reversal, automatic repeat. Kit includes board, chassis, cover, power supply, instructions.
87-302. Terminal Kit Only. Shpg. wt. 18 lbs. **325.00**
87-5302. Terminal Assembled Only. Shpg. wt. 18 lbs. **425.00**
87-601. CT-VM Monitor Kit Only. Shpg. wt. 14 lbs. **175.00**
Both Kits. Shpg. wt. 32 lbs. **500.00**
Both Assembled. Shpg. wt. 32 lbs. **600.00**

Specifications

DISPLAY. Screen: 9" diagonal, rectangular CRT, P4 phosphorus. **Display Format:** 1024 characters, 16 lines of 64 characters. **Character Set:** 56 alphanumeric ASCII characters, upper and lower case. **Character Generation:** 7x9 dot matrix. **Cursor Control:** Forespace, backspace, upline, downline, line feed, return. **Display Refresh Rate:** 60Hz. **KEYBOARD:** 56 keys, including cursor positioning keys. **COMMUNICATIONS. Transmission Modes:** Full and half duplex (switch-selectable). **Interface:** RS232. **Baud Rates:** 110, 150, 300, 600, 1200 bps (switch-selectable). **Word Format:** 7-8 bit, even-odd parity. **POWER REQUIREMENT:** 120 or 240VAC, 50 or 60Hz. **WT:** 17 lbs. **SIZE:** 12½x12x19½".

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- Floppy Disk System • Expansion Interface
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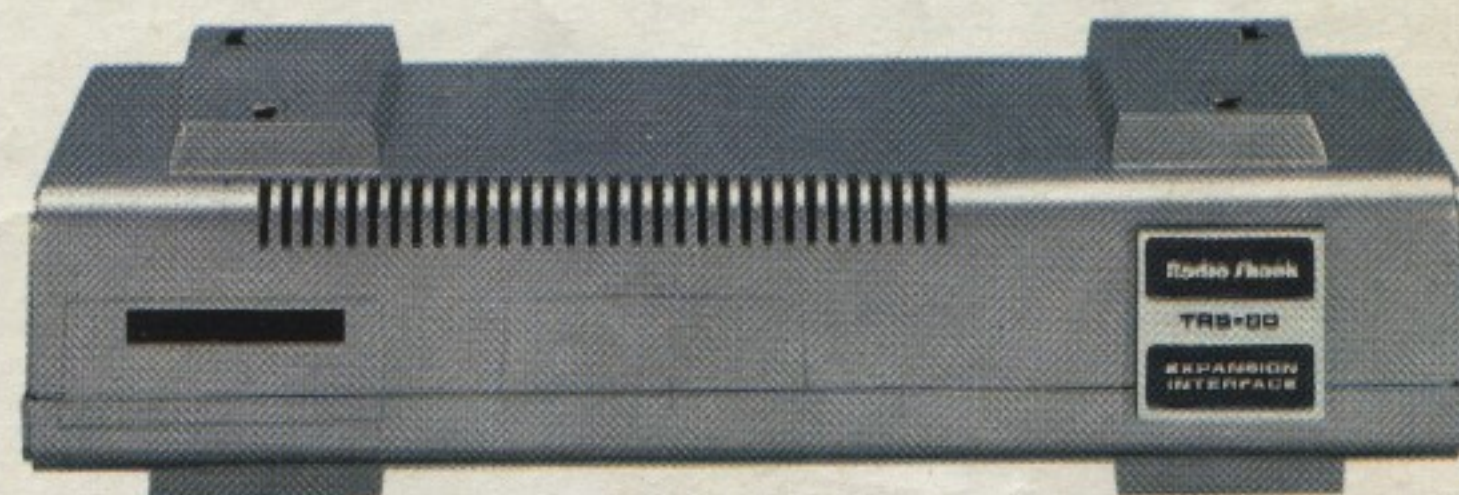
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26-1601. Wt. 2 lbs. **14.95**
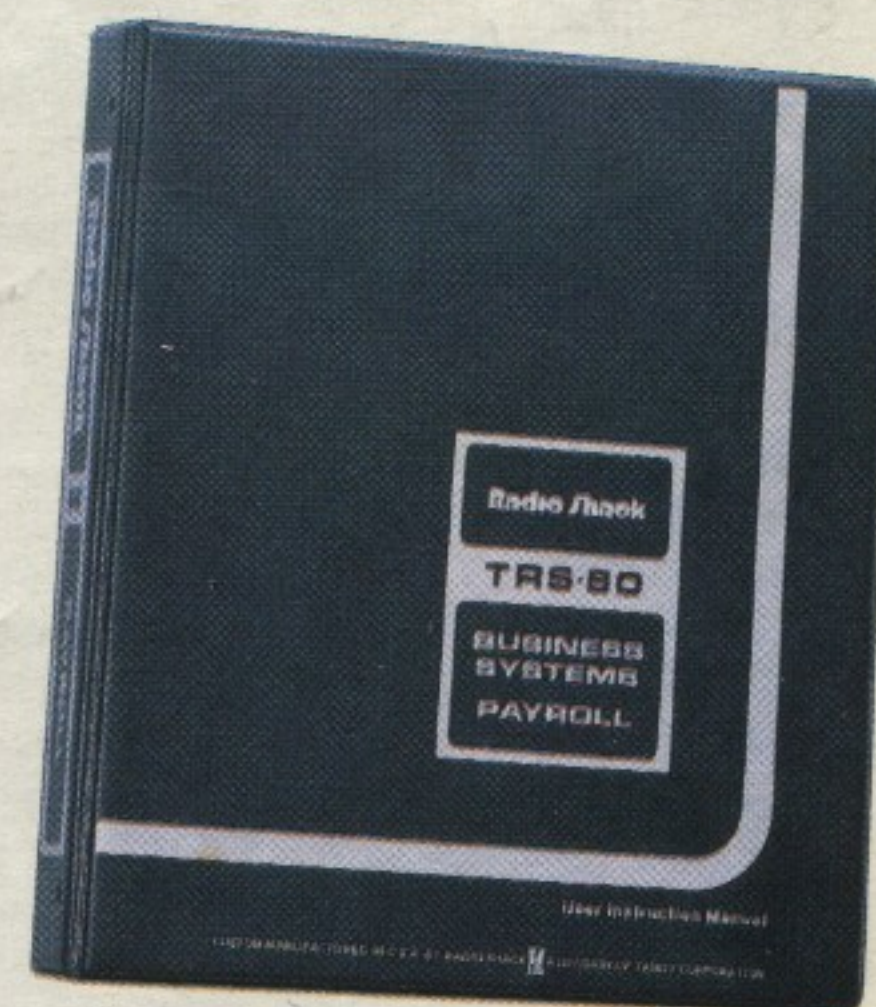
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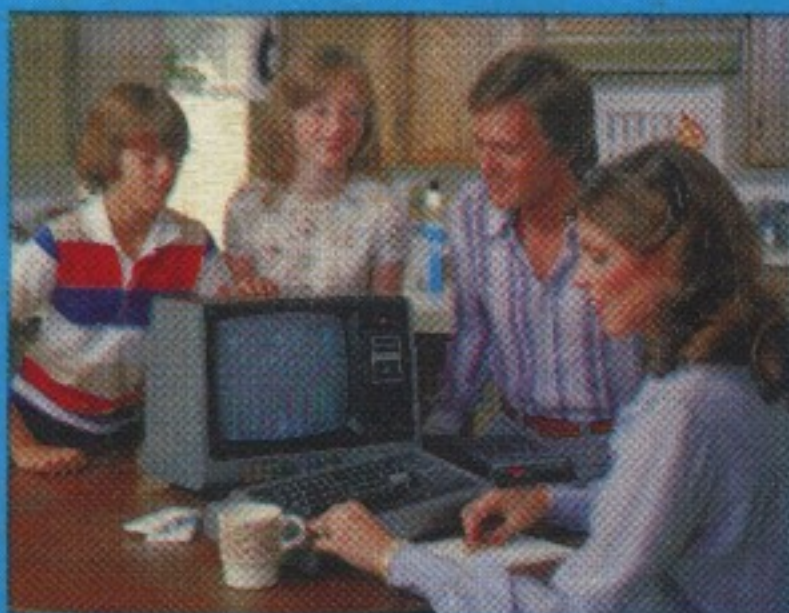
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