

AUTUMN 1980



Cromemco

Tomorrow's computers today

Microcomputer Systems



High-performance computerized color graphics system

POPULATION DISTRIBUTION: 1978

Demographic Display

Accounts Payable

Management information

CROMEMCO process control:

Control system display

3-D display with angled labels

3-D plots

High-resolution display with alphanumerics

482 (vertical) x 756 (horizontal)



Cromemco's offices, laboratory and manufacturing facility are located in these modern buildings in the heart of "silicon valley," the well-known electronics/semiconductor center

on the San Francisco Peninsula. Up-to-the-minute production methods and automatic test equipment are used to achieve highest product reliability.

CROMEMCO FOR QUALITY AND PERFORMANCE

Complete Systems - Memory - I/O cards - Software

Cromemco, Inc., specializes in quality computers and high-performance computer support products in the microcomputer field.

These products are designed around the industry-standard S-100 bus.

Our products range from complete computer systems (see the System Two, System Three and Z-2H in this catalog) and color graphics systems (Z2H/GS) through more basic configurations (System Zero) to add-on-memory and I/O cards.

Lastly, an especially wide range of system and application software lets the user choose from an extremely broad equipment-software combination to best meet his present (and future) needs.

Cromemco software support is, in fact, widely recognized as the best and strongest in the field. A full section of this catalog is

devoted to our broad line of software, while more is coming all the time.

For applications where quality and performance count, you can depend on Cromemco. Cromemco is the industry leader in quality and reliability as determined by a recent independent industry-wide survey.

CROMEMCO IS THE STANDARD

Cromemco products have come to be known as the benchmark of the field. In a recent independent report* Cromemco received such comments as "Our survey revealed totally satisfied business users" . . . "users' impressions were extremely favorable" . . . "the data storage system . . . received an 'outstanding' rating."

*Benchmark Report, April, 1980; Association of Computer Users.

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NEW ASSOCIATION OF CROMEMCO USERS

An independent new organization known as the International Association of Cromemco Users has recently been announced.

The Association publishes a bi-monthly magazine, *I/O News*, that contains information of interest to all Cromemco users.

For application information, contact:

**The International Association
of Cromemco Users
P.O. Box 17658
Irvine, CA 92713**

Section I

Computer Systems

Cromemco offers you a wide choice in high-capability computers with outstanding features such as high speed, many card slots to allow for broad system expansion, wide card support, fast memory and our much-admired Cromemco software.

Further, Cromemco computers are of a rugged, all-metal construction that immediately

tells you these computers are built to be dependable and long-lived.

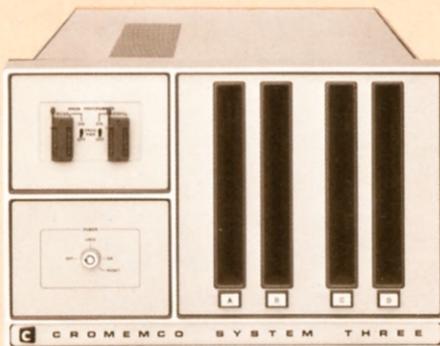
OBSOLESCENCE INSURANCE

The nature of their construction also promises versatility and long life. Built with easily-accessible card slots, these computers can be configured to meet the needs of an almost endless variety of applications.



SYSTEM ZERO WITH DDF

Two disks
Up to 512 Kilobytes of RAM/ROM
Up to 780 Kilobytes of disk storage



System Three
Two to four disks
Up to 512 Kilobytes of RAM/ROM
Up to 4.8 Megabytes of disk



Model Z-2H
11 Megabytes of hard disk storage
Up to 512 Kilobytes of RAM/ROM
Up to 780 Kilobytes of floppy disk storage



Model Z-2
Up to 512 Kilobytes of RAM/ROM



System Two
Dual disk
Up to 512 Kilobytes of RAM/ROM
Up to 780 Kilobytes of disk storage

System Zero Computer



SYSTEM ZERO/D WITH DDF DISK DRIVE

- **Small but powerful**
- **Up to 780K bytes of diskette storage**
- **Self-test diagnostics**

Here is a small-sized new computer that is especially suited to dedicated as well as general applications.

The computer comes in two versions. For one version there is a matching dual-diskette drive.

BASIC SYSTEM ZERO

The basic System Zero is provided with our fast, powerful Z80A-based single card computer, one kilobyte of RAM memory, and our 3K Control BASIC in ROM memory.

This arrangement gives you a basic configuration in which you also have three extra card slots on the S-100 bus for use in tailoring the system to your particular purpose.

We also offer a wide range of computer cards such as memory, interfaces, etc., which can be used in these slots (see Section III).

This arrangement gives you a basic configuration in which you also have three extra card slots on the S-100 bus for use in tailoring the system to your particular purpose.

The basic System Zero is designed for ROM-based programs but the system can be expanded, by adding additional memory and disk interface cards, to take full advantage of Cromemco floppy and/or hard-disk systems. The System Zero/D (next column) is a special configuration of the System Zero ready for use with floppy disks.

SYSTEM ZERO/D

The "D" version of the System Zero is specially suited to be operated with the Model DDF drive to give you considerable computer power and storage capability in a small physical package.

The System Zero/D includes the Cromemco Z80A-based card computer as well as 64K of fast RAM. In addition, there is our new disk controller that itself has exceptional features.

First, the controller permits use of the high-capacity disk drives storing 390 kilobytes on each 5-inch diskette (780 kilobytes total).

Next, the controller has on-board our new resident disk operating system RDOS-2 which gives you the ability to read or write single-sided, double-sided, single-density or double-density diskettes.

RDOS-2 also has a number of powerful, simple commands and other features including a printer driver.

SELF-TEST DIAGNOSTICS

With this controller in the System Zero/D, you also get system diagnostics in the RDOS-2 program. This enables a quick self-test of the computer-plus-drive system to see that memory, the controller, and the drives are properly functional.

System Zero Computer (cont'd)



SYSTEM ZERO COMPUTER



MODEL DDF DISK DRIVE

MODEL DDF DISK DRIVE

This new dual disk drive is housed in a small cabinet matching that of the System Zero/D.

The DDF uses 5-inch diskettes, either single- or double-sided and either single- or double-density.

TERMINAL/PRINTER

The System Zero/D can be used with virtually any terminal and/or printer including those described in Section II of this catalog.

TECHNICAL SPECIFICATIONS

System Zero Computer

Processor: 4 MHz version Z80-A
Cycle time: 250 nanoseconds
Minimum instruction execution time: 1 microsecond
Instruction set: 158 instructions including the 78 instructions of the 8080
System bus: industry standard S-100
Board capacity: 4 boards
Boards supplied: SCC
RAM memory: 1K byte
ROM firmware: 4K bytes
Power: operates from 110/120/220/240 volts; 50/60 cycle
Operating environment: 0-55°C
Dimensions: 14.2"W x 3.45"H x 13.4"D
Weight: 15 lbs.
Mounting: cabinet; optional rack-mount brackets available

PRICE

System Zero Computer \$995.

System Zero/D Computer

Processor: 4 MHz version Z80-A
Cycle time: 250 nanoseconds
Minimum instruction execution time: 1 microsecond
Instruction set: 158 instructions including the 78 instructions of the 8080
System bus: industry standard S-100
Board capacity: 4 boards
Boards supplied: SCC, 64KZ, 16FDC
RAM memory: 64K bytes
ROM firmware: 4K bytes
Power: operates from 110/120/220/240 volts; 50/60 cycle
Operating environment: 0-55°C
Dimensions: 14.2"W x 3.45"H x 13.4"D
Weight: 15 lbs.
Mounting: cabinet; optional rack-mount brackets available

PRICE

System Zero/D Computer \$2995.

Model DDF Disk Drive

Disk drive capacity: 2 drives
Diskette size: 5-inch
Diskette sides: single or double
Diskette density: single or double (software selectable)
Formatted disk capacity:
 Single-sided, single density: 83K bytes
 Single-sided, double density: 190K bytes
 Double-sided, single density: 173K bytes
 Double-sided, double density: 390K bytes

Power: operates from 110/120/220/240 volts; 50/60 cycle
Operating environment: 10-40°C
Dimensions: 14.2"W x 3.45"H x 13.4"D
Weight: 15 lbs.
Mounting: cabinet; optional rack-mount brackets available

PRICE

Model DDF Disk Drive \$1295.

System Two Disk Computer

**Now with quad-capacity
disk drives**



**An advanced professional
microcomputer with all the features
you want including a two-disk drive**

The Cromemco System Two is a real workhorse — a highly professional computer system that gives you the performance you want in professional work.

Besides its two-disk drive, the System Two gives you our well-known 4 MHz Z-80A CPU circuitry, our proven chassis with its 21-card shielded motherboard

that lets you plug in an almost endless variety of memory, I/O, and peripheral interfaces.

Thus, you can tailor the computer to your particular job whether in the laboratory, the business office, the factory production line or process control, or in education work.

System Two Disk Computer (cont'd)

Here are some of the features you get in the Cromemco System Two computer:

- Two 5-inch quad-capacity (i.e. double sided, double density) disk drives with a combined storage capacity of 780 kilobytes
- Fast μ P circuitry (4 MHz or 250-nanosecond cycle time).
- The power and convenience of the well-known Z-80 microprocessor chip.
- A full-length *shielded* motherboard with 21 card slots to let you plug in almost any conceivable combination of memory, I/O, or your own custom circuits.
- An extremely heavy duty power supply providing 30A from +8V and 15A from +18 and -18V. This will not only power a full set of 21 cards but also

has ample additional power for other peripherals such as a floppy disk drive.

- Power-on jump circuitry to begin automatic program execution when power is turned on.
- S-100 bus — important because it is widely supported by a host of peripherals manufacturers. Thus you get the widest possible array of compatible peripherals.
- All-metal chassis and dust case.
- Card retainer that secures cards in sockets.
- Standard rack-mount style construction suited to dedicated applications. Upward compatible with larger systems. Usable with a variety of cabinets. Bench cabinet optional.
- 110 or 220-volt operation.

ADVANCED CONTROLLER CARD

Included in the System Two is our powerful 16 FDC disk controller card that controls the two built-in disk drives and still has the capacity to control two extra drives. Here are some of its features:

- Capability to handle up to 4 disk drives
- A disk bootstrap Monitor (RDOS II) in a 4K ROM
- An RS-232 serial interface for interfacing your CRT terminal or teletype
- LSI disk controller circuitry

We've been able to put all of these features including a UART for the CRT interface on just one card because we've designed and constructed the controller with LSI circuitry. Our new RDOS II Monitor also

contains extensive system diagnostic software for ease of system trouble-shooting.

Note, too, the heavy-duty 30-ampere power supply in the System Two that can handle this circuitry with ease.

POWERFUL PERFORMANCE AT A MODERATE PRICE

The Cromemco System Two offers features that make it the solution to many professional computer applications at what is indeed a moderate price:

Model CS-2 Computer System fully tested as a unit after our standard 'burn-in' procedure \$3990

System Two Disk Computer (cont'd)

SOFTWARE SUPPORT

Cromemco is committed to extensive software support for our computers and we offer an extensive variety of programs at present. Here is a partial list of software now available; more becomes available all the time. Details of this software are given in Section IV of this catalog.

The following is on standard IBM-format soft-sectored mini diskettes (5-inch):

- 16K BASIC (Model FDB-S)\$95
- 32K Structured BASIC (Model STB-S)\$295
- FORTRAN IV (Model FDF-S)\$95
- RATFOR with FORTRAN IV (Model FDR-S) ...\$195
- Z-80 Assembler (Model FDA-S)\$95
- COBOL (Model FDC-S)\$95
- TRACE System Simulator (Model TSS-S)\$95
- Data Base Management System (Model DBM-S)\$95
- Word Processing System (Model WPS-S)\$95
- LISP\$295
- RPG II\$595
- CROMIX\$295
- General Leder\$995
- Accounts Receivable\$995
- Accounts Payable\$995
- Inventory\$995
- SDI GRAPHICS SOFTWARE\$295

SYSTEM SOFTWARE

TECHNICAL SPECIFICATIONS System Two Disk Computer System

Processor: 4 MHz version Z-80
Cycle time: 250 nanoseconds
Minimum instruction execution time:
1 microsecond
Instruction set: 158 instructions including the
78 instructions of the 8080
System bus: Industry standard S-100
Board capacity: 21 boards
Disk drive capacity: 2 drives (supplied)
Disk storage capacity: 390K bytes each disk
RAM memory: 64K bytes
Printer interface: Supports Cromemco dot-matrix
or fully-formed-character printers

ROM firmware: 4K bytes
Serial interface: RS-232 or current loop; 110 to
76,800 baud. Supports Cromemco CRT terminal.
Parallel interface: 8 bit TTL levels
Power supply: +8 volts @ 30A, +18 volts @ 15A,
-18 volts @ 15A
Power: Operates from 110/220 volts; 50/60 cycle
Operating environment: 10°-40°C
Dimensions: 12¼" H x 19"W x 20¾" D
(31.1 x 48.3 x 52.7 cm)
Weight: 49 lbs (22 kg)
Mounting: For rack mounting (optional cabinets
available)

System Two Disk Computer (cont'd)

PRINTERS/TERMINAL

Cromemco offers a range of printers and a 'smart' terminal for the System Two. See Section II of this catalog.



Z-2 Computer System

Z-2 COMPUTER SYSTEM

The Model Z-2 is a building-block computer. It includes the popular Cromemco ZPU processor card and a heavy-duty power supply, all housed in a rugged metal rack-mount cabinet.

The computer further includes spaces for 21 circuit boards so that you can install memory, I/O, or custom circuits as your needs require.

PRICE

Model Z-2W Computer; fully assembled \$995.

Z-2 is supplied for rack mounting.
Attractive bench cabinet shown is also available.



TECHNICAL SPECIFICATIONS Z-2 COMPUTER SYSTEM

Processor: 4 MHz version Z-80
Cycle time: 250 nanoseconds
Minimum instruction execution time: 1 microsecond
Instruction set: 158 instructions including the 78 instructions of the 8080
System bus: industry standard S-100
Board capacity: 21 boards
Power: Operates from 110/220 volts; 50/60 cycles.

Power supply: +8 volts @ 30A, +18 volts @ 15A, -18 volts @ 15A
Operating environment: 0-55°C
Dimensions: 12¼" H x 19" W x 20¾" D (31.1 x 48.3 x 52.7 cm)
Weight: 39 lbs (18 kg)
Mounting: For rack mounting (optional bench cabinet available)

Z-2H Hard Disk Storage Computer System



THE FIRST COMPUTER TO OFFER AN INTEGRAL 11-MEGABYTE HARD DISK SYSTEM

- 11 Megabytes of hard disk storage
- Under \$10,000
- Fast transfer rates
- Two quad-capacity floppy disk drives
- 64K RAM memory

Cromemco's new Model Z-2H not only incorporates an 11-megabyte hard disk drive but also offers the other features you have come to expect from Cromemco. These include large and expandable memory, fast Z-80A processor, rugged construction and broad software support.

This S100-bus computer has a motherboard with 12 slots, 5 of which are occupied by the cards supplied with the computer. Thus, you have 7 slots to use for additional Cromemco cards (such as for additional RAM and interface cards) or for special cards suited to your particular application.

The power supply in the Z-2H is more than ample for nearly any card complement, providing more than 15A at +18V, 15A at -18V, and 30A at +8V.

FEATURES

Model Z-2H Computer

- Fast Z-80A 4 MHz processor
- 11-megabyte hard disk drive
- Two floppy disk drives
- 64K RAM memory
- RS-232 special interface
- Printer interface
- Extensive software available

ADVANCED HARD DISK SYSTEM

The hard-disk system in the Model Z-2H both has large storage and is extremely fast. Eleven megabytes unformatted can be stored. File transfers to and from the hard disks occur from 6 to 10 times faster than is commonly seen in floppy disk systems.

The information transfer rate to and from the disk is 5.6 megabits/second using the fast DMA controller supplied in the Z-2H computer.

64K RAM SUPPLIED

The Model Z-2H is provided with a full 64K of high-speed RAM memory using one of our highly-praised 64KZ RAM memory cards. With 64K of RAM memory you are sure to have enough for most any application whether it be in business, scientific, engineering, or process control applications.

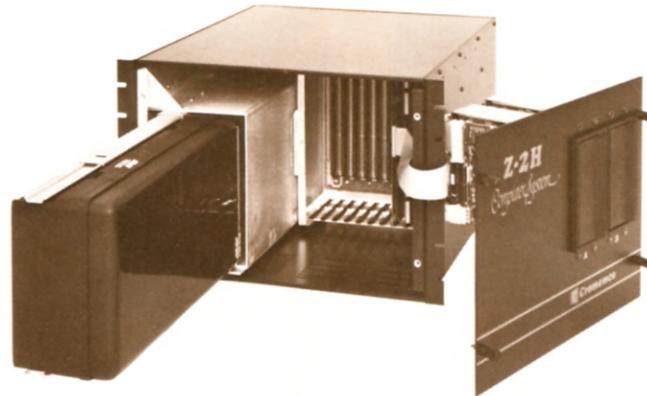
RAM EXPANDABILITY

Even the 64K RAM is greatly expandable, however, since you can add additional RAM to give you as much as 512K bytes of RAM using our Cromemco Model 64KZ RAM cards.

PRINTER INTERFACE STANDARD

Every Z-2H is also supplied with a Cromemco Model PRI printer interface card. This card supports the Cromemco dot-matrix printers as well as our fully-formed character printer.

Z-2H Hard Disk Storage Computer System



SOFTWARE SUPPORT

With the Z-2H you receive a copy of our new extended CDOS operating system. This CDOS has been extended to support the system floppy disks as well as the integral hard disk. With extended CDOS you have access to the full range of Cromemco software — software widely regarded to be the finest in the industry including:

- FORTRAN IV
- Extended BASIC
- Structured BASIC
- COBOL
- RATFOR
- Z-80 Macro Assembler
- Word Processing System
- Data Base Management System
- LISP
- RPG II
- CROMIX
- Business application software
- SDI Graphics Software

See the complete list in section IV of this catalog.

RELIABILITY/CONSTRUCTION

The disks and drive are housed in a sealed chamber (photo) so that the user has no need to provide filtered air for the unit. The chamber holds two rotating disks that provide 3 data surfaces.

To achieve fast transfer rates, the disks rotate at 3600 rpm and have a rotational latency of just 8.3 milliseconds. Head positioning is done with a linear actuator mechanism which is much faster than stepping motors and which achieves an average disk access time of only 50 msec.

Precise head positioning is achieved by using a servo track follower which is located on the fourth disk surface. Head positioning is thus maintained precisely despite temperature or humidity variations.

Servo track following also permits the system to operate in various orientations — there is no need to level the unit before using.

Head tracking pressure is very light—just 10 grams—thereby virtually eliminating the source of “head crashes” common with other disk drives.

The 11 megabytes of storage in this compact drive is achieved by using a low head flying height of 19 micro-inches. This low height coupled with the precise servo track positioning allows a radial data density of 5868 bits per inch and an axial density of 300 tracks per inch.

PRICE

Hard Disk Computer System (Model Z-2H) \$9,995

TECHNICAL SPECIFICATIONS Model Z-2H Hard Disk Computer System

Processor: 4 MHz Z-80A
Cycle time: 250 nanoseconds
Minimum instruction execution time: 1 microsecond
Instruction set: 158 instructions including the 78 instructions of the 8080
System bus: Industry Standard S-100
Card capacity: 12 cards
Standard card complement: Cromemco ZPU, 16FDC, 64KZ, PRI, and WDI
Number of floppy disk drives: 2 quad-capacity drives
Floppy disk storage capacity: 390K bytes each disk (780K total)
Hard disk drive storage capacity: 11 Megabytes
ROM firmware: 4K bytes

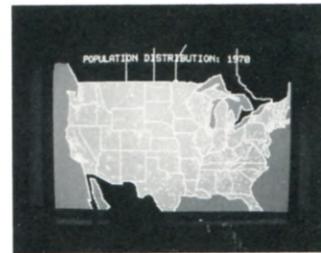
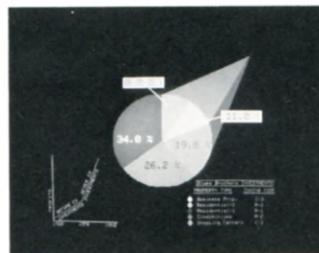
Serial interface: RS-232 or current loop, 110-76,800 baud. Supports Cromemco CRT terminal.
Printer interface: Supports Cromemco dot-matrix or fully-formed character printer.
RAM memory: 64K Bytes
Power: Operates from 110/220 volts; 50/60 cycle; 600 watts
Dimensions: 12¼" H x 19"W x 20¾" D (31.1 x 48.3 x 52.7 cm)
Weight: 90 lbs. (41 kg)
Mounting: For rack mounting (optional cabinets available)

Data subject to change without notice.
Prices f.o.b. Mountain View, CA

High-Performance Color Graphics System



- A professional color system
- High resolution
- A powerful computer
- NTSC conformance
- A low price



PROFESSIONAL COLOR DISPLAY

The Cromemco Color Graphics System gives you professional level resolution, enormous color range, easy-to-use software instructions, a powerful computer, NTSC conformance and a low price.

In short, it gives a highly-flexible color graphics display and unusual computer power at a price far below that of comparable systems.

The computer has 11 megabytes of hard-disk storage in a fast Z80A-based desk-top type unit. It further offers two 5" floppy disks that provide an additional 800 kilobytes of storage. This computer is also usable with a range of Cromemco peripherals.

EASY COLOR/FORM SELECTION

The range of color choices is enormous. Colors can be software-selected from a color menu of 4096 choices.

Selection of colors and of common geometric forms is done with simple software instructions like DEFCLR (c, R, G, B) and XCIRC (x, y, r, c).

HIGHEST RESOLUTION

The high resolution of 754 x 482 pixels in a system that conforms to NTSC standard RS-170. In fact, the resolution exceeds

that of a color TV picture and is the highest possible in an NTSC-conforming display. The NTSC conformance makes the system useful in TV work.

The speed of the system is impressive. It contains two special pages of image memory (48K each) that operate to give independent fast access to the computer memory. Each of these 48K display memories can store a full picture, permitting fast computer operation during display and further permitting special effects such as windowing and scrolling.

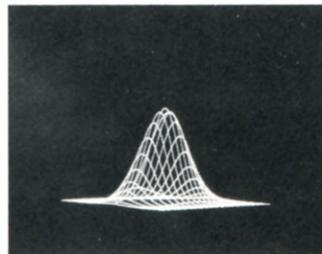
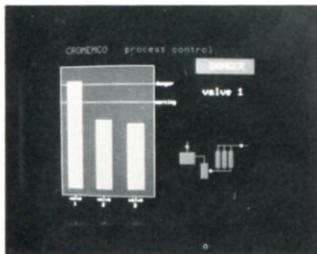
OTHER FEATURES

The system includes such other features as a printer interface to operate with either dot-matrix or character printer and an auxiliary serial interface to permit operation with an X-Y digitizer.

RGB MONITOR

The system includes the Cromemco 13" color monitor as the color display device. This is a quality red/green/blue monitor of the type used in TV work.

High-Performance Color Graphics System



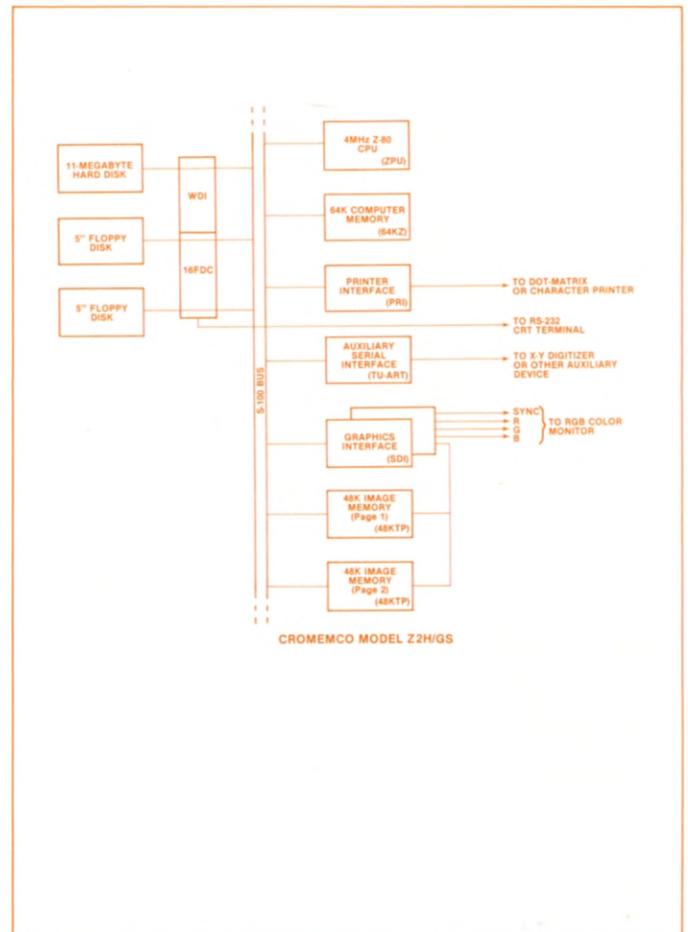
SOFTWARE

The Cromemco graphics software package is included with the system.

This graphics system can be used to display color or black-and-white images-or both simultaneously.

The subroutine calls include such conveniences as:

- fast line generation
- fast generation of shapes such as circles, rectangles and polygons
- area fill of these shapes in a designated color at video rates
- text generation and rotation
- the ability to open and close windows in the memory page being displayed
- the ability to simulate motion (animation)
- the ability to CLIP which eliminates problems that might arise from trying to plot outside the screen area
- the ability to scale the display area of the work page



TECHNICAL SPECIFICATIONS

Model Z-2H/GS Color Graphics System

MODEL Z-2H/GS COMPUTER

Processor: 4 MHz Z80A
Cycle Time: 250 nanoseconds
Minimum Instruction Execution Time: 1 microsecond
Instruction Set: 158 instructions including the 78 instructions of the 8080
System Bus: Industry Standard S-100
RAM Memory: 64K bytes
Card Capacity: 12 cards
Mapping Modes: Bit or nybble; software selected
Resolution: 754 x 482 pixels maximum using 48K display memory. 12K display memory may also be used at lower resolution.
Video Outputs: Three analog outputs for R/G/B monitor.
Sync Signal: Composite Sync signal is switch-selectable. Separate RS-170 Sync signal available.
Number of Floppy Disk Drives: 2
Hard Disk Drive Capacity: 11 Megabytes
ROM Firmware: 4K*Bytes
Serial Interface: RS-232 or current loop, 110-76, 800 baud. Supports Cromemco CRT terminal.

X-Y Digitizer Interface: RS-232
Printer Interface: Supports Cromemco dot-matrix or fully-formed character printers.
Display Memory: 2 pages (image planes) of 48K*
Power: Operates from 110/220 volts; 50/60 cycle; 600 watts
Dimensions: 12¼"H x 19"W x 20¾"D (31.1 x 48.3 x 52.7 cm)
Weight: 90 lbs. (41 kg)
Mounting: For rack mounting (optional cabinets available)

MODEL RGB-13 COLOR MONITOR

CRT: 13" shadow mask, delta gun
Technology: All solid state except for CRT.
Video signal input: RGB 0.3 - 2.0 v., 75 ohm. Fully compatible with Cromemco model SDI interface outputs.
Video amplifier bandwidth: 50 Hz to 15 MHz ± 3 db
Power requirements: 120 or 220 volts 50/60 Hz.
Power consumption: 250 VA
Weight: 20 Kg
Operating Environment: -5° to 40°C

System Three Disk Computer

Now with quad-capacity
disk drives —
Up to 4.8 megabytes
of storage



The power, speed, and expandability you need
for business, science, industry, education

Here's a microcomputer with the features you want and need to do professional work in almost any field: engineering, science, business/accounting, word processing, data-based management, education, medicine, and others.

In the microcomputer field the new Cromemco System Three stands alone in the range of features and capabilities it offers. The System Three consists of a fast, powerful, Z80-based microcomputer with capability for enormous RAM memory expansion and with provision for up to four floppy disk drives. No other microcomputer offers four drives.

The computer has a large 21-slot motherboard to accept a large variety of memory and I/O to suit virtually any application.

Further, Cromemco offers a wide range of plug-in memory and I/O for use with the computer.

Large, expandable memory

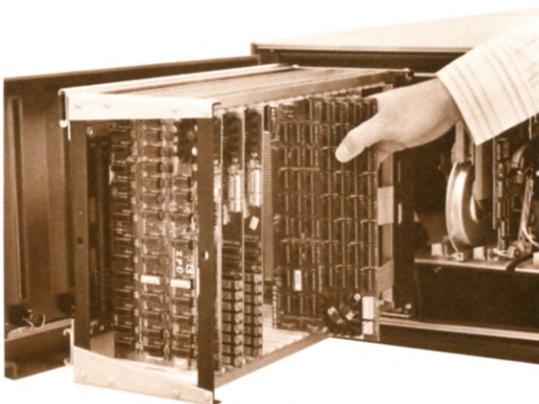
One of the most important aspects of a computer has proved to be its capability for memory expansion. Experience has shown over and over that the need for memory capacity is often difficult to assess at the start of a project and is typically underestimated.

Consequently, Cromemco has designed the System Three with generous provision for memory, both RAM and disk.

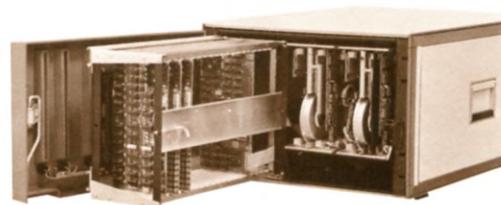
First, the unit is supplied with 64 kilobytes of RAM. This can be expanded to 512 kilobytes in 8 banks.

Next, the System Three is supplied with a dual disk drive providing 2.4 megabytes of memory. Using Option 002, this can be increased to 4.8 megabytes of magnetic storage.

With the System Three you have the security inherent in an enormously-expandable memory.



System Three computer is constructed so that hinged front panel swings open and motherboard/card cage slide out for easy insertion of circuit boards.



Retainer bar keeps circuit cards firmly in sockets.

System Three Disk Computer (cont'd)

System Three Features

- Z-80A microprocessor
- 64-kilobyte RAM
- Dual disk drive (four drive controller)
- Power-on-jump circuitry to begin automatic program execution when power is turned on
- RS-232 interface
- S-100 bus
- Heavy-duty 30 ampere power supply
- All-metal chassis and dust case
- Rack or optional bench cabinet mounting
- 110- or 220-volt operation

CRT terminal

Here is a high-capacity CRT terminal for use with your Cromemco computer system.

The terminal has a solid-state keyboard for long, reliable life and quiet operation.

It also has a separate numeric keypad and a cursor keypad.

Other features in the Model 3102 terminal include 20 software-assignable function keys and a local editing mode.



Fast line printer

The Model 3703 line printer available for the System Three prints at a maximum speed of 180 characters/second using its bi-directional printing.

Printing line width is 132 columns. Paper feed is tractor type.



MULTI-USER VERSIONS OF SYSTEM THREE COMPUTER

The System Three is available in a multi-user system that lets you do the tasks usually associated with much more expensive time-sharing computers.

You can have up to seven terminals, a fast printer, a large RAM memory expandable to one-half megabyte, and many more features. Check this system for speed—you'll be surprised.

Multi-user versions of the System Three are available to support from two to seven users. In the accompanying price list the number following the slash indicates the number of users supported by the system. Prices include our BASIC Multi-User Operating System that supports single-sided, single-density operation of Cromemco disk drives.



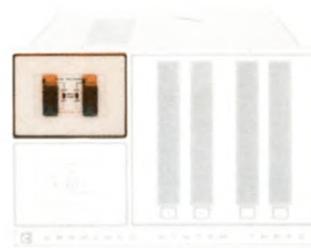
CS3/2 — \$10,275	CS3/5 — \$14,140
CS3/3 — \$12,060	CS3/6 — \$14,435
CS3/4 — \$12,355	CS3/7 — \$16,220

System Three Disk Computer (cont'd)

Disk protection

The System Three has several provisions for protection of disks from damage:

- The computer provides for ejection of disks under software control if desired.
- When the key switch is in the LOCK position, the eject buttons under the disks are disabled—an unknowing person can't eject the disks while they are running. Disks and programs are thus prevented from damage and loss.
- Disk loading and unloading are motor-driven, providing gentle handling of these long-life disks.



PROM programmer option for development work

Easy PROM programming is provided (option 001) right on the front panels of the System Three. In fact, two sockets are provided so that the memory in one PROM can easily be duplicated in a second one.



BROAD SOFTWARE SUPPORT

Following is some of the outstanding software support available to you for the System Three. More becomes available all the time.

These disk software packages comprise a totally integrated system running under our CDOS Operating system.

- **CROMEMCO DISK OPERATING SYSTEM (CDOS).** This is the framework through which all disk file management is handled. The primary purpose of CDOS is to perform disk Input and Output. It is designed to allow users of Cromemco microcomputer systems to create and manipulate both random and sequential access disk files using symbolic file names.

- **DATA BASE MANAGEMENT SYSTEM.** This advanced software package can be used for inventory control, mailing lists, personnel records, order entry and other important business applications.

To create a data base, an operator simply specifies the field attributes, then the sorts by which the data can be retrieved (e.g., by state, by name, by state by city by name, etc.).

- **MULTI-USER BASIC.** Up to 7 users can independently run BASIC Programs with Cromemco's new multi-user software.

- **CROMEMCO 16K DISK-EXTENDED Z-80 BASIC.** This disk or PROM-based Extended BASIC was specifically designed to meet the most demanding requirements of business firms while also providing the flexibility and speed necessary for real-time control applications. It fully utilizes the extensive 158-instruction set of the Z-80 microprocessor to maximize computational precision (a full 14 digits), programming power, and speed of execution.

- **COBOL.** The Cromemco compiler contains all the features of level 1 COBOL as defined by the 1974 ANSI standards as well as the most useful options of Level 2.

For example, this COBOL includes the verbs SEARCH, COMPUTE, STRING, and UNSTRING.

Our Cromemco COBOL also supports Computational-3 data to give more compact storage of decimal data.

- **FORTRAN IV.** Cromemco FORTRAN IV provides new capabilities for users of Z-80 based microcomputer systems. This is a complete implementation of ANSI standard FORTRAN X3.9-1966, except for complex data types.

- **TRACE SYSTEM SIMULATOR.** TRACE is a powerful software system simulator designed to facilitate assembly language program development.

Virtually all aspects of system operation can be simulated including interrupts and I/O operations. A historical record of the program execution is maintained in a 100-instruction circular queue.

- **WORD PROCESSING SYSTEM.** The Cromemco word processing system is a combination Screen Editor and Formatter for the quick preparation of professional looking documents.

Lines of text may be left- or right justified or centered.

- **Z-80 RELOCATABLE MACRO ASSEMBLER.** This is a two-pass assembler which reads source code from a disk file, assembles it, and produces an object file either in relocatable format or in Intel hex format.

OTHER SOFTWARE

- **LISP.** A powerful programming language developed for artificial intelligence applications. Cromemco LISP embodies many advanced features.

- **RPG II.** Cromemco is the only microcomputer manufacturing on IBM-compatible RPG-II compiler. This is a powerful business oriented programming language very widely used in small business computers.

- **BUSINESS SOFTWARE.** This includes General Ledger, Accounts Receivable, Accounts Payable and Inventory.

See Section IV of this catalog for more software and details.

System Three Disk Computer (cont'd)



DESKS AVAILABLE

Two handsome desks are available for your System Three. The larger desk accommodates the computer and terminal, and provides extra work surface as well.

The smaller desk is useful for a printer or terminal. Styling of both is suited to the nicest of office surround-

- ings • Larger desk (Model Z3-MDSK): \$695.00.
- Smaller desk (Model Z3-SDSK): \$395.00.

METAL DESK CABINET AVAILABLE

All-metal brown-trimmed beige cabinet for System Three Computer (Model Z3-CAB) \$295.

TECHNICAL SPECIFICATIONS AND PRICES

SYSTEM THREE COMPUTER (Model CS-3)

Processor: 4 MHz version Z-80A
Cycle Time: 250 nanoseconds
Minimum Instruction Execution Time: 1 microsecond
Instruction Set: 158 instructions including the 78 instructions of the 8080
System Bus: Industry standard S-100
Board Capacity: 21 boards
Disk Drive Capacity: 4 drives (supplied with two drives)
Disk Storage Capacity: 1.2 megabytes each disk (2.4 MB with 2 drives; 4.8 MB with 4 drives).
ROM Firmware: 4K bytes
Serial Interface: RS-232 or current loop; 110 to 76,800 baud. Supports Cromemco CRT Terminal.
Printer Interface: Supports Cromemco Model 3709, 3703, or 3355A Printers.
RAM Memory: 64K bytes
Power supply: +8 volts @ 30A, +18 volts @ 15A, - 18 volts @ 15A
Power: Operates from 110/220 volts; 50/60 cycle
Operating Environment: 0-40°C
Dimensions: 12¼"H x 19"W x 20¾"D (31.1 x 48.3 x 52.7 cm)
Weight: 65 lbs
Mounting: For rack mounting (optional cabinets available)
Price, Model CS-3: \$7395.

CRT TERMINAL (Model 3102)

Format: 80 characters/line; 24 lines; upper and lower case; solid state capacitive keyboard
Additional Capabilities: line editing; block mode transfer; 16 software-assignable function keys
Price: \$1995

LINE PRINTER (Model 3703)

Format: 180 characters/sec.; 132 cols., 18" platen; impact printer. Bidirectional printing; tractor feed.
Price: \$2995.

FULL-FORMED LETTER PRINTER (Model 3355A)

Format: 55 characters/sec.; 15-inch platen; tractor feed and friction platen; quality impression suited to camera copy.
Price: \$3395.

LINE PRINTER (Model 3779)

Format: 60 characters/sec.; up to 132 ch/line, 12" platen; impact printer; tractor feed.
Price: \$1495.

OPTION 001 2708 PROM PROGRAMMER

Sockets: Two sockets for ease of PROM duplicating
Price: \$495.

OPTION 002 DUAL DISK DRIVE

Capability: Provides for a total of four disk drives
Price: \$2895.

Buyer's Guide

SYSTEM THREE BUYER'S GUIDE

Model	ROM	RAM	CRT Terminal Serial Ports	Floppy Disk Drives	Printer Interface	Price
CS-3	1K	64K	1	2	yes	\$ 7,395
CS3/2	1K	128K	2	2	yes	10,275
CS3/3	1K	192K	3	2	yes	12,060
CS3/4	1K	192K	4	2	yes	12,355
CS3/5	1K	256K	5	2	yes	14,140
CS3/6	1K	256K	6	2	yes	14,435
CS3/7	1K	320K	7	2	yes	16,220

NOTES: Any of the above systems can be increased to four floppy disk drives by adding option 002 (\$2895 additional).

All Multi-User systems include 32K of RAM memory per user. All RAM memory has Extended Bank Select capability for future system expansion.

Z2 BUYER'S GUIDE

Model	ROM	RAM	CRT Terminal Serial Ports	Printer Interface	11- Megabyte Hard Disk	Disk Drives	Price
Z2	0	0	0	no	no	0	\$ 995
CS-2	1K	64K	1	yes	no	2	3,990
Z-2H	1K	64K	1	yes	yes	2	9,995
CS2/2	1K	128K	2	yes	no	2	6,870
CS2/3	1K	192K	3	yes	no	2	8,655
CS2/4	1K	192K	4	yes	no	2	8,950
CS2/5	1K	256K	5	yes	no	2	10,735
CS2/6	1K	256K	6	yes	no	2	11,030
CS2/7	1K	320K	7	yes	no	2	12,815

NOTE: 1) All Multi-User systems include 32K of RAM memory per user. All RAM memory has

Z-2H price includes integral 11-megabyte hard disk drive. An 11-megabyte hard disk drive may be added to other systems by ordering Cromemco Model HDD-11 (price \$6,995).

Section II

Computer Peripherals

Cromemco peripherals include a choice of:

- A crt terminal with such features as capacitive keyboards and software-assignable function keys
- Three printers with speeds up to 180 characters/second and up to 132 columns.
- 5-inch and 8-inch disk drives
- 11 Megabyte Hard Disk Drive

CRT Terminal



Model 3102

- 'Smart' terminal
- Detachable hermetically-sealed reed-switch keyboard
- Upper- and lower-case characters with descenders
- Graphic character set

'SMART' TERMINAL

Here's a high-capability, easy-to-use 'smart' CRT terminal especially designed for use for your Cromemco system.

The keyboard is constructed of hermetically-sealed reed switches for long, reliable life.

The terminal's many special modes and features are easily invoked by the host computer system for flexible operation.

COMPUTER INTERFACING

The terminal is interfaced to the computer bus either by a Cromemco TU-ART or Cromemco Model 4FDC interface card using a standard RS-232 interface.

PRICE

Model 3102 CRT Terminal; includes 10-foot cable terminated in DB-25P connector...\$1995

TECHNICAL SPECIFICATIONS

Model 3102

CRT Terminal

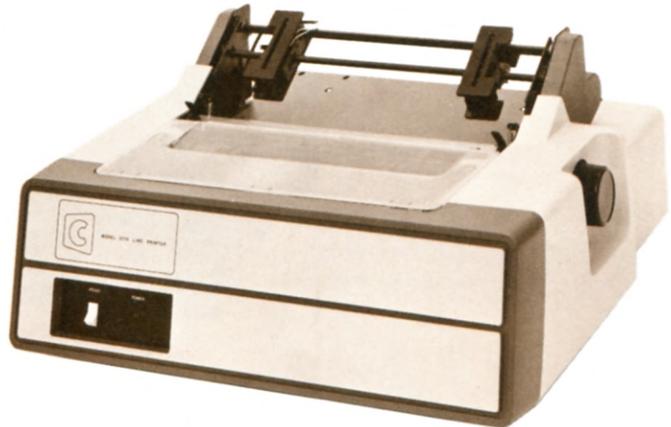
Format: 80 characters/line; 24-line display; upper- and lower-case characters with descenders; optional status line on 25th line.

Special Features: Addressable cursor with position query; cursor data query; second invisible cursor; 14-key numeric pad; graphics character set; line insert, delete; screen formatting including protected, arithmetic, and alphanumeric fields; partial screen lock; line lock; 20 user-definable function keys; time-of-day clock; software-selectable modes; half intensity, reverse video, underlined, and blinking character display; software down-loading capability.

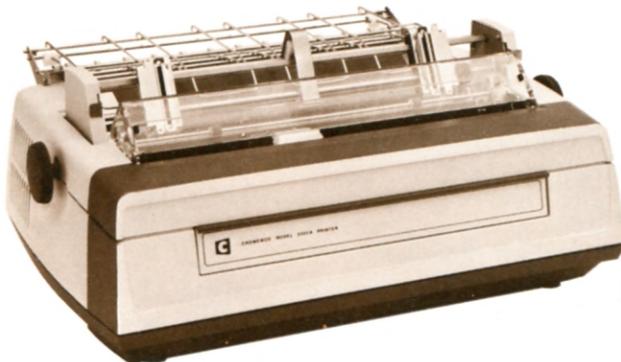
Printers



Model 3703



Model 3779



Model 3355A

DOT-MATRIX OR FULL-LETTER

Here's a choice of three printers to use with your computer system.

Two dot-matrix units offer up to 180 characters/second print speed.

The full letter printer gives you high-quality printing comparable to quality electric typewriters and suitable for camera copy.

You can use this printer in applications such as printing business letters, guides, manuals, etc., where you wish the printed material to have a "finished" look.

WORD PROCESSING SOFTWARE

In many cases you will want to use the printer with our "Word Processing System" software. See the software section of this catalog.

PRICES

(All printers are supplied with a 10-foot cable terminated in a DB-25P connector.)

Model 3779 Dot-Matrix Impact Printer; 12-inch platen; 60 ch/sec	\$1495
Model 3703 Dot-Matrix Impact Printer; 18-inch platen; 180 ch/sec	\$2995
Model 3355A Full-Letter Impact Printer; 55 ch/sec	\$3395

TECHNICAL SPECIFICATIONS

Model 3779 Dot-Matrix Printer

Format: 60 characters/sec; 12-inch platen; continuously-variable character pitch allows up to 132 ch/line;

General: tractor feed accommodates roll paper and forms.

Model 3703 Dot-Matrix Printer

Format: 180 characters/sec; 18-inch platen; 132 columns.

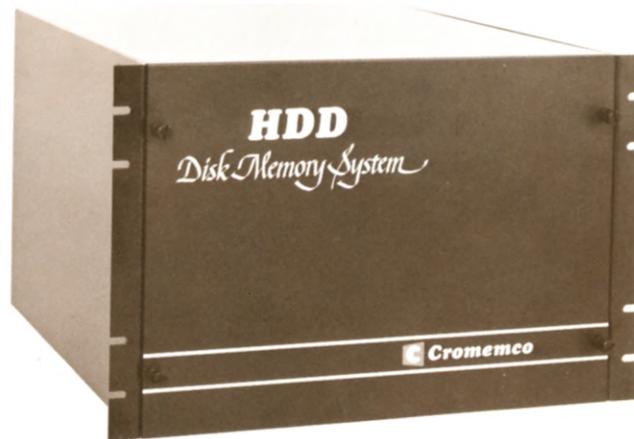
General: form feed, bi-directional printing and double buffering for high-speed performance; tractor fed accommodates roll paper and forms.

Model 3355A Full Letter Printer

Format: 55 characters/sec; 15-inch platen.

General: tractor feed and friction platen; quality impression suited to camera copy.

HDD Hard Disk Memory System



- One or two drives (11 or 22 megabytes of storage)
- Fast transfer rates

LARGE, FAST-TRANSFER STORAGE

The large storage capability of this advanced new hard disk drive provides 11 megabytes unformatted or more than 10 megabytes of formatted data for each drive.

In addition, this drive has a fast information transfer rate of 5.6 megabits/second when used with the Cromemco DMA controller (provided).

File transfers to and from the disk occur from 6 to 10 times faster than is commonly seen with floppy disk systems.

RELIABILITY

The rotating disks are housed in a sealed chamber so that air filtering is not required. Servo track following is used to achieve precise head positioning under temperature and humidity variations. Further, leveling of the unit is not normally required.



Combining the new Model HDD Disk Drive with the Cromemco System Two Computer gives you a fast, powerful system with a Z-80A microprocessor, two floppy disk drives, up to 512 kilobytes of RAM and up to 22 megabytes of hard disk storage. The HDD can also be used with the Cromemco System Three or for additional disk storage with the Cromemco Z2-H.

The low head tracking pressure of only 10 grams virtually eliminates a source of "head crashes" common with other disk drives.

SOFTWARE SUPPORT

With the HDD you receive a copy of our new extended CDOS operating system. With extended CDOS you have access to the full range of Cromemco software—software widely regarded to be the finest in the industry.

TECHNICAL SPECIFICATIONS Model HDD Hard Disk Drive

Storage capacity each drive: 11 megabytes (unformatted)
Data transfer rate: 5.6 megabits/sec.
Head positioner: linear actuator
Tracking mechanism: servo track following
Interface card: S-100 DMA interface
Rotational speed: 3600 RPM
Rotational latency: 8.3 msec
Number of data surfaces: 3 surfaces, sealed environment
Tracks per surface: 350
Head flying height: 19 microinches
Head tracking pressure: 10 grams
Average access time: 50 msec.
Power dissipation (each drive): 100 watts
Power requirements: 110/220 volts 50/60 cycle
Operating environment: 0-40°C; 10%-80% humidity (non-condensing)
Weight (w/one drive): 55 lbs (25 kg)
Weight (w/two drives): 88 lbs (40 kg)

PRICES

Price w/one drive (Model HDD-11): \$6,995
Price w/two drives (Model HDD-22): \$11,995

Mini Disk Drive



5" SINGLE DISK DRIVE

This 5-inch single disk drive gives you a large amount of disk storage (92 kilobytes on each diskette side) at a moderate price. Recording is done in a soft-sectored IBM format.

The drive can be used with our Z-2 Computer or any S-100 bus computer that uses our Z-80 CPU card.

The drive operates from our Model 4FDC Disk Controller.

SOFTWARE

Cromemco also offers advanced programs such as FORTRAN IV, RATFOR, 32K Structured BASIC, COBOL, 16K BASIC, and others on 5-inch disks.

PRICES

Model WFD Single 5" Disk Drive assembled \$495
See Section III for disk controller information.

SOFTWARE

Purchasers of Cromemco computers or drives may purchase software on 5" diskettes as shown in Section IV of this catalog.

8" Dual Disk Drive

— Now with quad-capacity for
1.2 megabyte storage on each
diskette



8" DUAL DISK DRIVE

Here is a convenient unit to use for cases where you want a large disk memory.

This Model PFD dual drive holds two 8-inch disks which will each hold 1.2 megabytes for a total of 2.4 megabytes for the unit.

Recording is done using a soft-sectored IBM format.

The drive can be used with our Z-2 Computer or any S-100 bus computer using our Z-80 CPU card.

The drive operates from our Model 16FDC Disk Controller.

The drive is complete with power supply and cables to connect to the interface on the Model 16FDC Controller.

The unit is supplied in the oiled wanut case shown here.

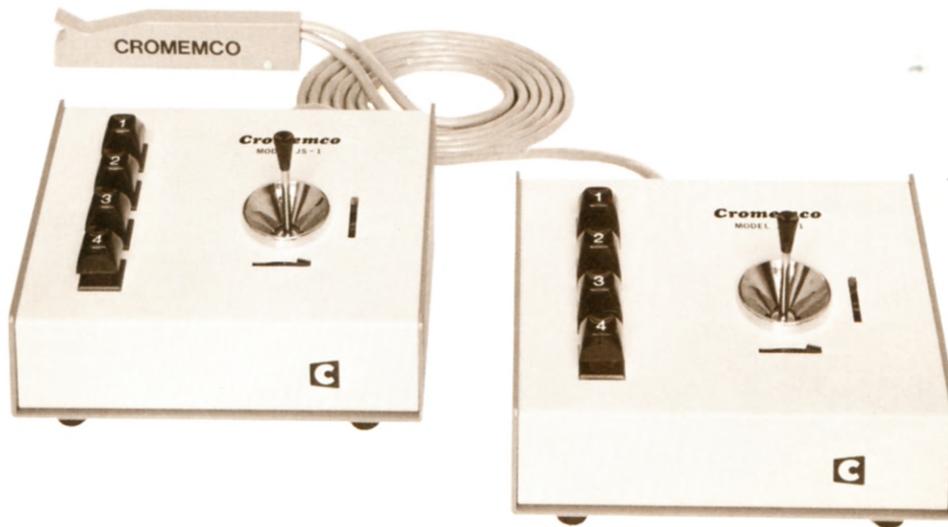
SOFTWARE

Software such as our FORTRAN IV and other programs is available on 8" diskettes. See Section IV of this catalog for details.

PRICES

Model PFD 8" Dual Disk Drive Assembled \$3295

Joystick console with speaker



EASY TO INPUT IT TO YOUR COMPUTER

You'll get a lot more use out of your computer with this new joystick.

But note that it is not just an ordinary joystick—it is a *console*. It has a 2-axis joystick *and* contains a *speaker* and *speaker amplifier*. You can have *sound* with your games or, say, warning sounds in other applications. Or have your computer talk to you.

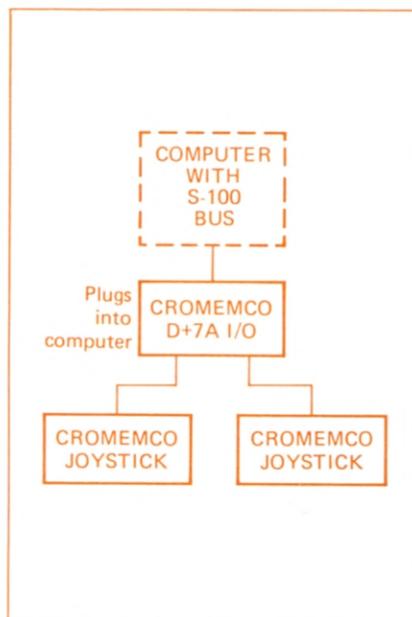
Gives you
sound, too



Four
pushbuttons



A third feature you get is *four pushbutton switches*. These give you even more possible uses such as selecting various colors on a color graphics terminal.



EASY TO COUPLE

To couple the new joystick to your computer, just use our D+7A™ I/O board (see page 30). It will couple not only one but two consoles. And you'll still have several analog channels left over (and one 8-bit output port).

The D+7A plugs into the Standard 100 (S-100) bus of your computer.

ORDER TODAY

Cromemco wishes you more use from your computer. Get this new joystick console and other Cromemco peripherals at your computer store.

PRICE

Joystick console assembled
(Model JS-1W) \$95

TECHNICAL SPECIFICATIONS JS-1 Joystick Console

JOYSTICK:

Degrees of freedom: 2 axes (X and Y), spring return to center.
X axis output voltage: ± 2 volts, center 0 volts.
Y axis output voltage: ± 2 volts, center 0 volts.

SWITCHES:

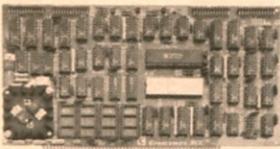
Number of switches: 4
Output switch depressed: 0 volts
Output switch open: +5 volts

AMPLIFIER/SPEAKER:

Input voltage range: -2.56 to $+2.54$ volts
Output: 47-ohm internal speaker

GENERAL INFORMATION

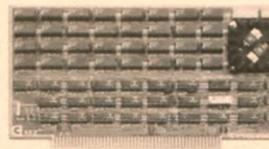
S-100 bus interface: use Cromemco D+7A I/O.
Power requirements: + 5 volts @ 50 mA
+ 18 volts @ 40 mA
- 18 volts @ 40 mA
Operating environment: 0-55°C



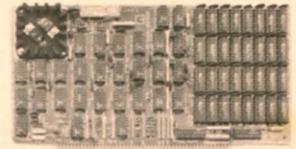
Z-80 Single Card Computer



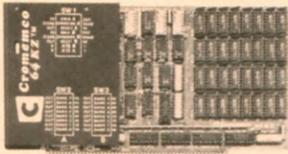
Z-80 CPU card



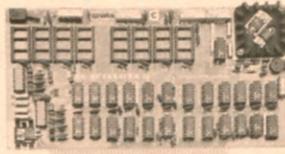
4K RAM card



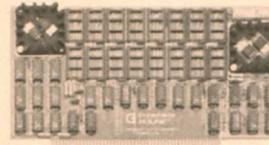
16K RAM card



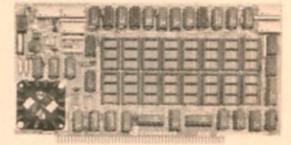
64K RAM card



8K BYTESAVER PROM card and programmer



16K PROM card



32K BYTESAVER PROM card and programmer

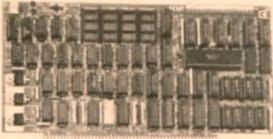
Section III

Computer Cards

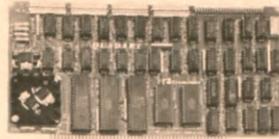
Our RAM memory cards can be greatly expanded using our Bank Select feature described in this section.

Cromemco-assembled cards are tested on automatic check-out equipment and thoroughly burned-in in temperature chambers.

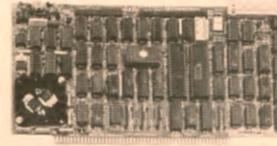
Cromemco offers a variety of computer cards including a Z-80-based single card computer, several memory cards including a fast 64-kilobyte memory, our extremely well-known BYTESAVER cards and several powerful interface cards.



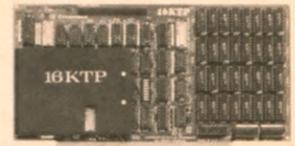
IOP processor



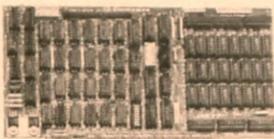
QUADART serial communications interface



16 FDC Disc controller



16K Two-port RAM card



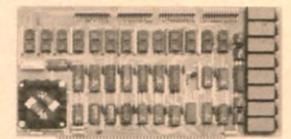
48K Two-port RAM card



Graphics interface



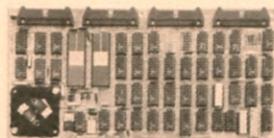
8-port parallel interface card



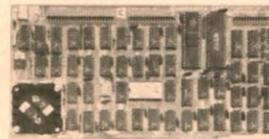
4-port isolated parallel interface card



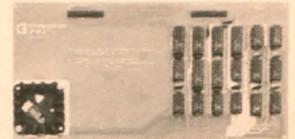
7-channel A/D and D/A card



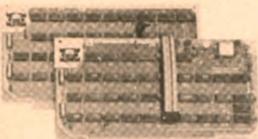
TU-ART I/O interface



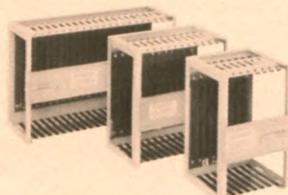
Disk Controller



Printer interface card



TV DAZZLER color graphics interface



Card Cages

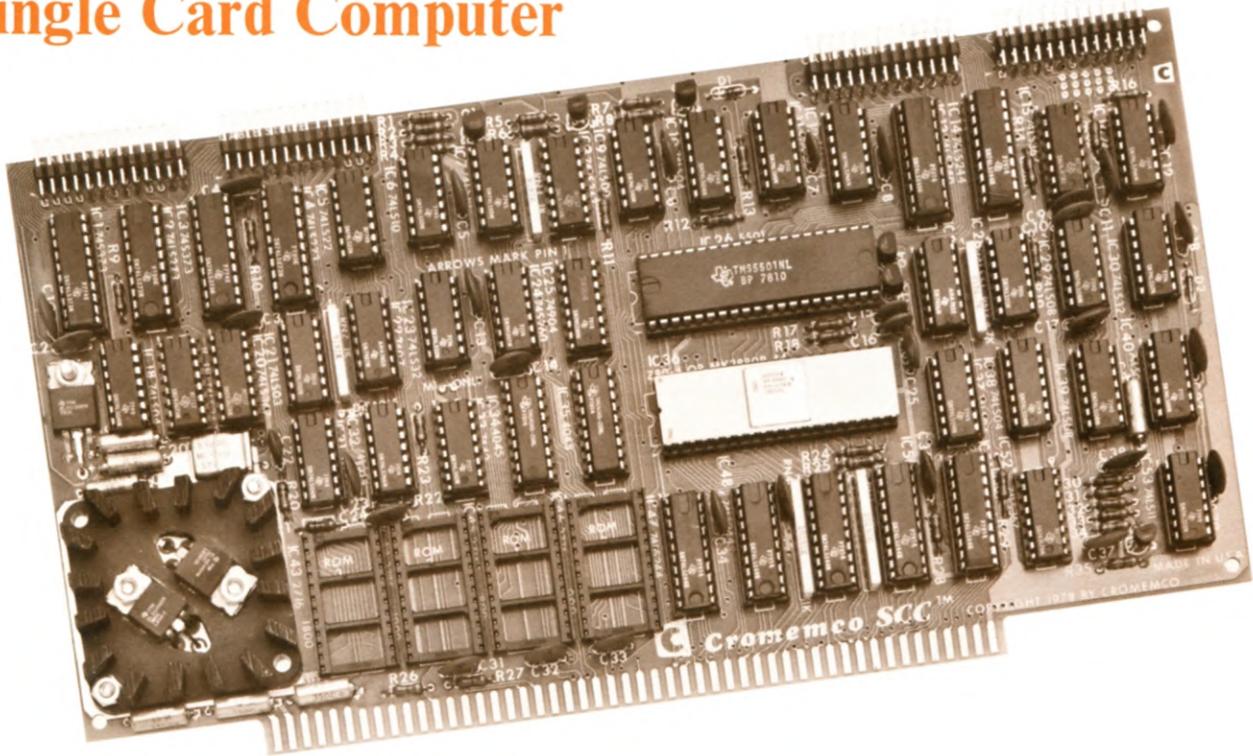


Wire Wrap card



Extender card

4 MHz Single Card Computer



A COMPLETE 4 MHz COMPUTER

With our new Single Card Computer, Cromemco brings the power of the Z-80 and the flexibility of the S-100 bus to the dedicated computer environment.

This card was designed to get your application up and running fast. Naturally you get a 4 MHz operation. You also get up to 8K bytes of on-board 2716 PROM, and 1K byte of static RAM memory. Interfacing is a snap through the RS-232 (or 20 mA current loop) serial interface with programmable baud rates to 76,800 baud. This stand-alone card also gives you 24 bits of bidirectional parallel I/O, 5 programmable timers, vectored interrupts, and complete compatibility with all Cromemco cards.

Our Single Card is a complete computer. Only a power supply and your PROM software are required for operation. Yet the Single Card can be the core of an enormously expandable S-100 bus system since

you can add additional memory, I/O, or even floppy disk drives as your application requires.

MONITOR/3K BASIC

Our well-known Z-80 Monitor and our 3K Control BASIC are available in 2316 ROM for use in your Single Card Computer. With this two-ROM set you are ready to begin using a single Card right away — no other memory or I/O is required. The monitor has 12 commands to aid you in program development. Our Control BASIC has 36 commands/functions and can directly access I/O ports and memory locations as well as call machine language subroutines.

PRICES

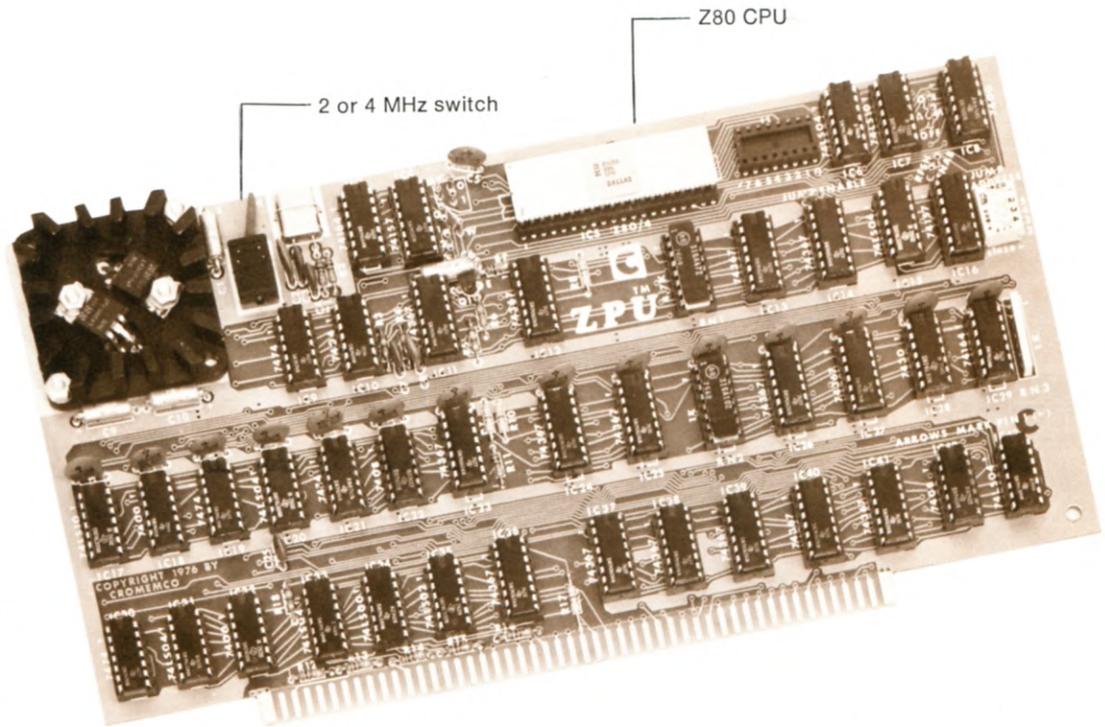
Single Card Computer assembled
(Model SCC) \$450.00
Monitor and Control BASIC
in two ROMs (Model MCB-216)..... \$90.00

TECHNICAL SPECIFICATIONS SCC Single Card Computer

Processor: 4 MHz Z-80
Instruction Set: 158 instructions including the 78 instructions of the 8080.
ROM Capacity: 8K Bytes located from address 0000 to 1FFF
ROM Type: Intel 2716 PROM or equivalent
RAM Capacity: 1K Bytes located from address 2000 to 23FF
RAM Type: 4045, Static
Serial I/O Ports:
I/O levels: RS-232 or 20 mA current loop
Baud rate: 110 to 76,800 (software selectable)
Parallel Ports:
Input Port: 24 bits bidirectional
Output Port: 24 bits bidirectional

Input Load: One TTL equivalent
Output Drive: 20 TTL loads
Interval Timers:
Number of timers: 5
Timer Range: 0-16.32 milliseconds (software selectable)
Timer resolution: 64 microseconds
Vectored Interrupts:
Number of restart locations (Z-80 mode): 65,536
General Information:
UART type: 5501
Bus: S-100
Power requirements: + 8 volts at 1.4 A
+18 volts at 70 mA
-18 volts at 25 mA
Operating environment: 0-55°C

4 MHz CPU card



- Uses special Z-80 microprocessor
- Fast—4 MHz clock rate
- Does not require front panel for operation

2-5X MORE THROUGHPUT

Here is by far the most powerful CPU card now available. (It is the heart of our computer systems.)

It uses the Z-80 chip — in fact, it uses a high-speed version of the Z-80 certified by its manufacturer for 4 MHz operation.

The Z-80 has all the advantages of the 8080 and 6800—and enormously more.

And Cromemco's new Z-80-CPU card does enormously more.

4 MHz CLOCK RATE

First, this CPU lets you choose either a 2 or 4 MHz crystal-controlled clock rate. Right away that means you can have twice the throughput. Cuts program running time in half. Then the instruction set of the Z-80 reduces software even more.

The 2 or 4 MHz clock rate is switch-selectable as shown in the above photo.

POWER-ON MEMORY JUMPS

Cromemco's CPU also has some neat design innovations of its own.

For example, you'll like the simplified operation you get because upon power turn-on the CPU will jump to any desired 4K boundary in memory. No switch flipping to go through to begin your program. So you can also use this CPU card in stand-alone systems — and it can be operated without need of a front panel.

80 ADDITIONAL INSTRUCTIONS

You've probably heard that the Z-80 with its 80 new additional instructions is by far the most powerful chip around. It's true.

That means with our CPU you will be able to devise much more powerful (as well as faster) software than before.

INCLUDES FREE SOFTWARE

The CPU comes with our powerful Z-80 monitor, complete documentation, source code, and paper tape object code. The monitor is also available in PROM (\$25) for use in our BYTE-SAVER or 16 KPR memory boards.

PRICE

Z-80-CPU assembled
(Model ZPU) \$395

TECHNICAL SPECIFICATIONS Z-80 Microprocessor Card

Processor: 4 MHz version of the Z-80.

Clock rate: 2/4 MHz (switch selectable)

Instruction set: 158 instructions including the 78 instructions of the 8080.

Power-on jump: jumper wire enabled.

Power-on jump locations: 16 locations switch selectable.

Wait State generation:

0-4 wait states jumper wire selectable.

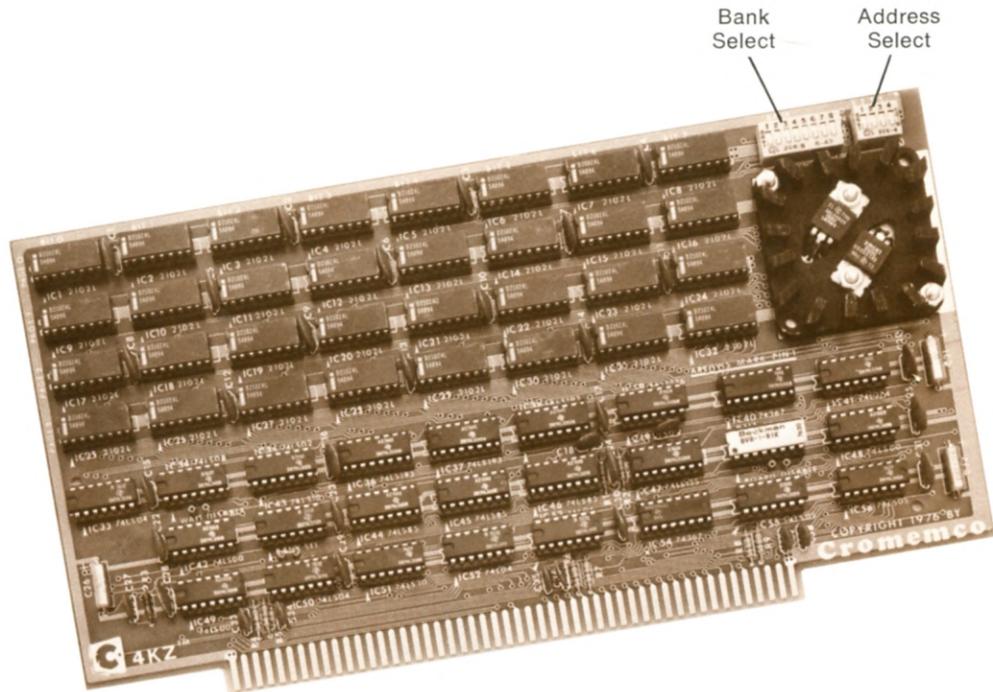
M1 Wait State: Jumper wire selectable.

BUS: S-100.

Power requirements: +8 volts @ 1.1 A.

Operating environment: 0-55°C.

4K RAM card with address anticipation and Bank Select



See information about
Memory Bank Select in
this section

- 4 MHz speed
- Memory Bank Select feature

As you would expect with a Cromemco product, our Model 4KZ gives you advanced performance at low cost.

It achieves its 4 MHz speed while using proven, reliable, low-power memory chips (21L02s) in a novel design involving address anticipation.

EXPANDABILITY

You get an unusual degree of expandability in the Model 4KZ — to 512 kilobytes if you'd like.

To achieve this, the 4KZ is arranged so you can organize memory into as many as 8 banks of 64K bytes each.

Then an 8-position switch on the card selects a given bank.

With memory expandability like that, Cromemco's CPU and RAM cards are the basic hardware for a broad range of jobs — even jobs that until now were only for large computers.

LOW PRICED

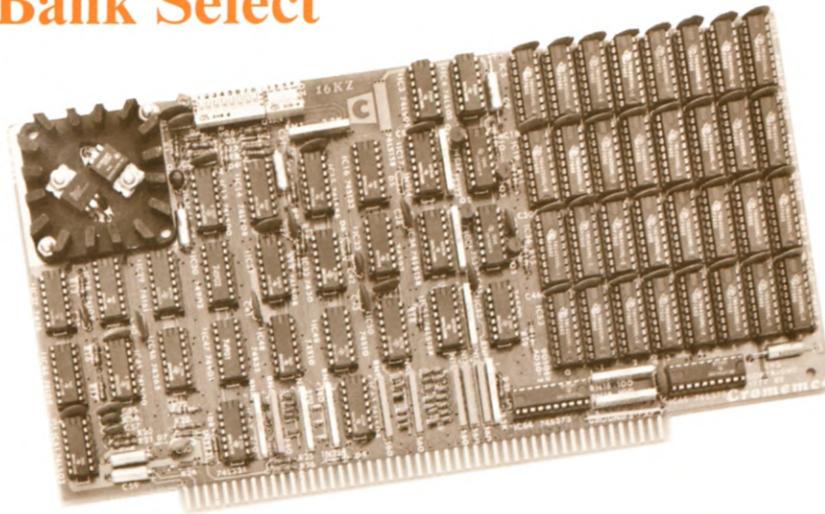
The Model 4KZ has the quality Cromemco is known for. Get it at your computer store.

4K Static RAM Memory assembled,
burned-in and tested (Model 4KZ) \$295

TECHNICAL SPECIFICATIONS Model 4KZ RAM Card

- Memory capacity:** 4K bytes.
- Memory type:** 21L02 RAM.
- Memory access time:** 450 nanoseconds
- Wait States at 2 MHz:** none required.
- Wait States at 4 MHz:** on non-sequential addresses only.
- BUS:** S-100.
- Power requirements:** +8 volts @ 0.8 A.
- Operating environment:** 0-55°C.

16K RAM card with Bank Select



- The fastest available
- No wait states required at either 2 or 4 MHz operation
- Offers expandability to a half megabyte with Bank Select
- Can be used for time-sharing
- Dynamic refresh fully transparent

FAST, EXPANDABLE

Not only is this the fastest 16K RAM card available but it is expandable to a half megabyte. It will operate at 4 MHz *with no wait states*.

TIME SHARING

One of the best examples of the power of the Bank-Select feature is that it will let you achieve a time-share system with minimum software overhead.

Each user (there can be up to 7) will be confined to his own bank of memory.

S-100 BUS COMPATIBILITY

This memory can be plugged into any S-100 bus computer. That includes the entire family of Cromemco computer systems.

START WITH THE BEST

Sooner or later you'll inevitably want larger memory. So start with Cromemco and be sure you'll have the expandability and high-speed performance you'll need.

PRICES

16K RAM Memory assembled, burned-in and tested (Model 16KZ) \$495

TECHNICAL SPECIFICATIONS Model 16KZ RAM Card

Memory capacity: 16K bytes.

Memory type: 4050-2 RAM.

Memory access time: 200 nanoseconds.

Wait States at 2 MHz: none required.

Wait States at 4 MHz: none required.

BUS: S-100.

Power requirements: + 8 volts @ 0.8 A
+ 18 volts @ 0.5 A
- 18 volts @ 10 mA

Operating environment: 0-55°C.

MEMORY BANK SELECT

Memory bank select is a feature incorporated on Cromemco memory boards that allows the expansion of memory-space beyond 64K bytes. With bank select, memory space may be organized into 8 banks of 64K bytes each for a total of one-half megabyte memory.

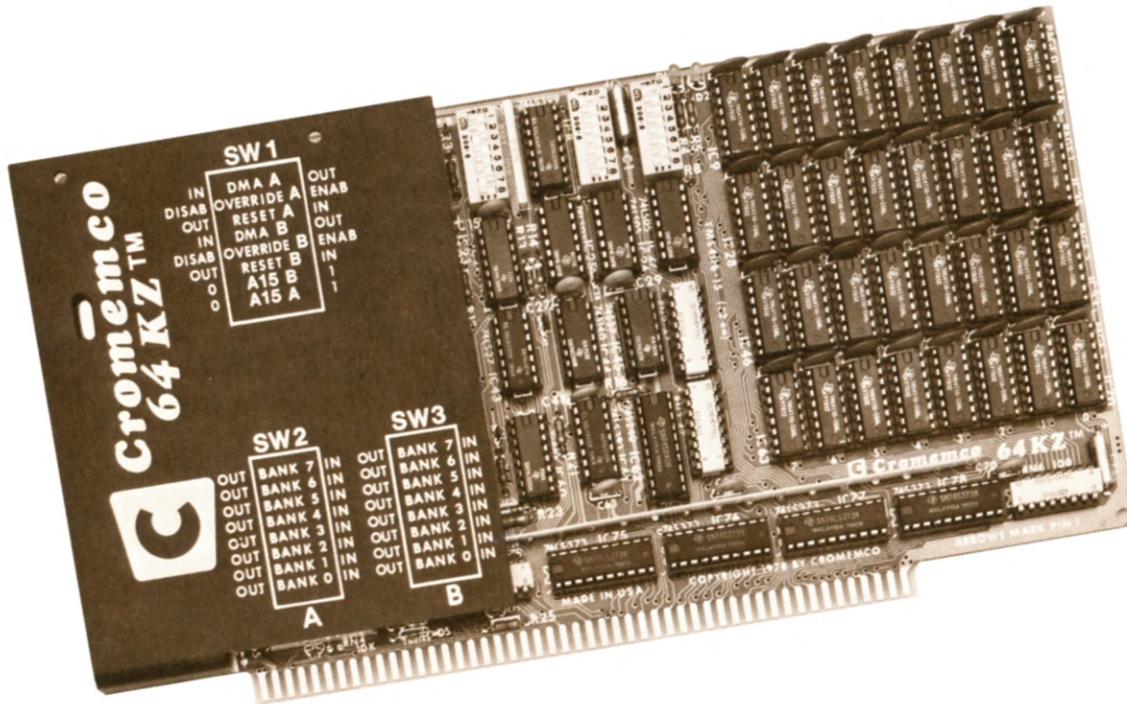
With bank select each memory board may reside in one or more of the 8 possible memory banks. An 8-position DIP switch on the board is used to select each of the banks in which the board resides.

The active bank or banks of memory are selected under software control. Output port 40H

is dedicated to this function. Each of the 8 bits of data of output port 40H is used to turn on or off the corresponding bank of memory. A "1" in the corresponding bit position will turn on the memory bank. A "0" will turn it off. All circuitry required to detect the output of port 40H is included on the memory card itself.

Bank select provides a convenient method by which to expand system memory space beyond 64K. Bank select also permits the implementation of time-sharing systems with a minimum of software overhead—up to 7 users can use the system simultaneously with each confined to his own bank of memory.

64K RAM card with Extended Bank Select



- Enormously expandable
- Guaranteed 4 MHz operation from 0-55°C
- Low power

This new 64-kilobyte RAM card is fast and tremendously expandable in keeping with Cromemco's objective of providing you with obsolescence insurance.

The Model 64KZ is organized as two 32K blocks of memory. Each block can be placed either in high-memory space (address 8000-FFFF) or low-memory space (address 0000-7FFF).

Each block can further be placed in any of 8 different memory banks. Address and bank assignment of each 32K block is switch selectable.

Another feature is that each 32K block can be independently switched to be selected or deselected after reset.

ENORMOUSLY EXPANDABLE

With our Bank Select feature you can expand memory space from 64K to 512K in eight banks.

Now with the Extended Bank Select feature in this new card you can expand to as much as 16 megabytes.

The 64KZ is fully tested to be compatible with all Cromemco products.

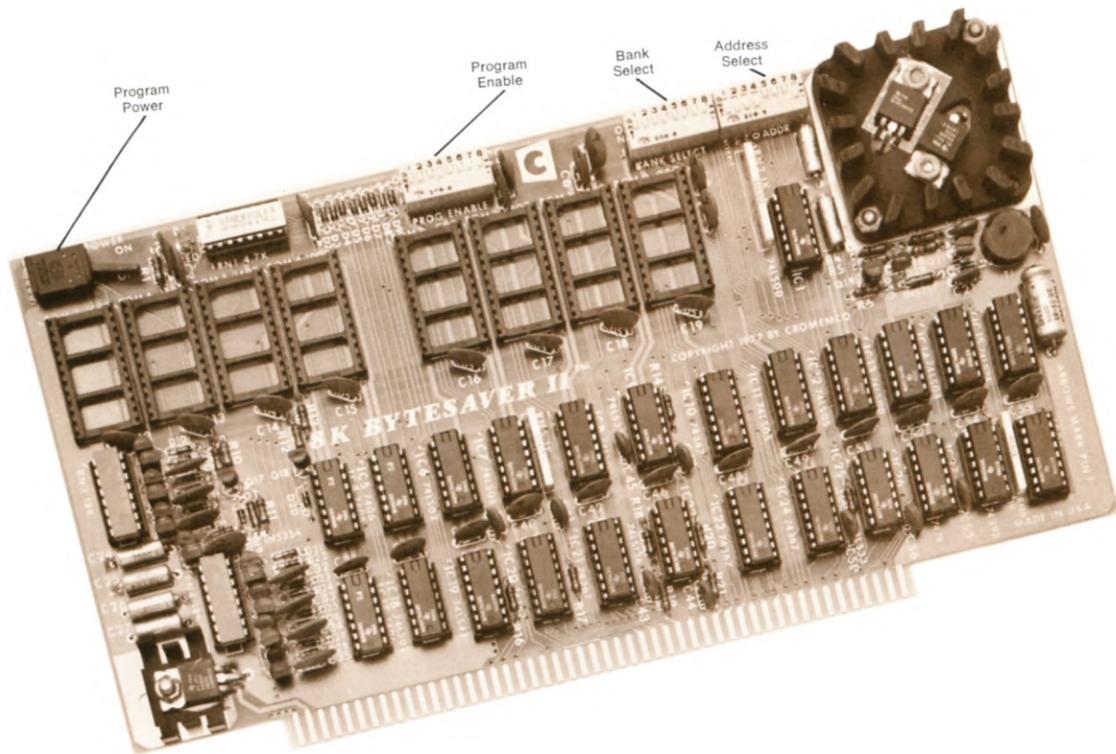
PRICE

64KZ High-Speed RAM Memory; factory assembled, burned in and tested
(Model 64KZ) \$1785

TECHNICAL SPECIFICATIONS Model 64KZ RAM Card

Memory capacity: 64K bytes.
Memory type: 4116
Memory access time: 150 nanoseconds.
Wait States at 2 MHz: none required
Wait States at 4 MHz: none required.
BUS: S-100.
Power requirements: + 8 volts @ 1.5 A
+ 18 volts @ 0.2 A
Operating environment: 0-55°C

8K BYTESAVER II memory board with 2708 PROM programmer



You're probably well acquainted with Cromemco's original BYTESAVER since it is the industry-standard PROM board on the S-100 bus.

Now this new BYTESAVER II gives you even more features. As with the original BYTESAVER, you get these two important features:

- (1) A simple, easy way to store your programs in 2708 programmable read only memory (PROMs).
- (2) A PROM board with the capacity for a full 8K bytes of PROM memory storage.

Here are the features the new BYTESAVER II gives you:

- (1) Convenient switch selection of board address.
- (2) Memory bank selection.
- (3) Fully buffered address lines.
- (4) Digitally timed programming pulses
- (5) Individual program enable switches for each of the eight PROM positions.

PROM PROGRAMMER

Many people are surprised to learn that in the BYTESAVER II you also have your own PROM programmer. But it's so.

And it can save you hundreds of dollars since you no longer need to buy one separately.

The built-in programmer is designed for the popular 2708 PROM. Each 2708 holds a full 1K bytes of memory. And the 2708 is UV erasable so that it can be used again and again. A 2708 PROM can be programmed in any of the 8 sockets on the BYTESAVER II. Individual program enable switches assure that PROMs not selected for programming cannot be accidentally programmed.

RESIDES IN MEMORY

Note that the BYTESAVER II card resides in 8K of memory. PROMs are programmed using conventional memory write instructions. To further simplify PROM programming, several Cromemco software packages contain special "Program" commands to transfer code from RAM memory into the BYTESAVER II PROM memory. These program commands are found in our Z-80 Monitor (ZM-108), Control BASIC (CB-308), ROS (ZA-808), and DEBUG in our disk assembler packages (FDA-S/L).

Once your program is written into BYTESAVER II PROMs, it's protected from power turn-offs, intentional or

accidental. And since the BYTESAVER II resides in memory, PROM resident programs can be directly executed from this card.

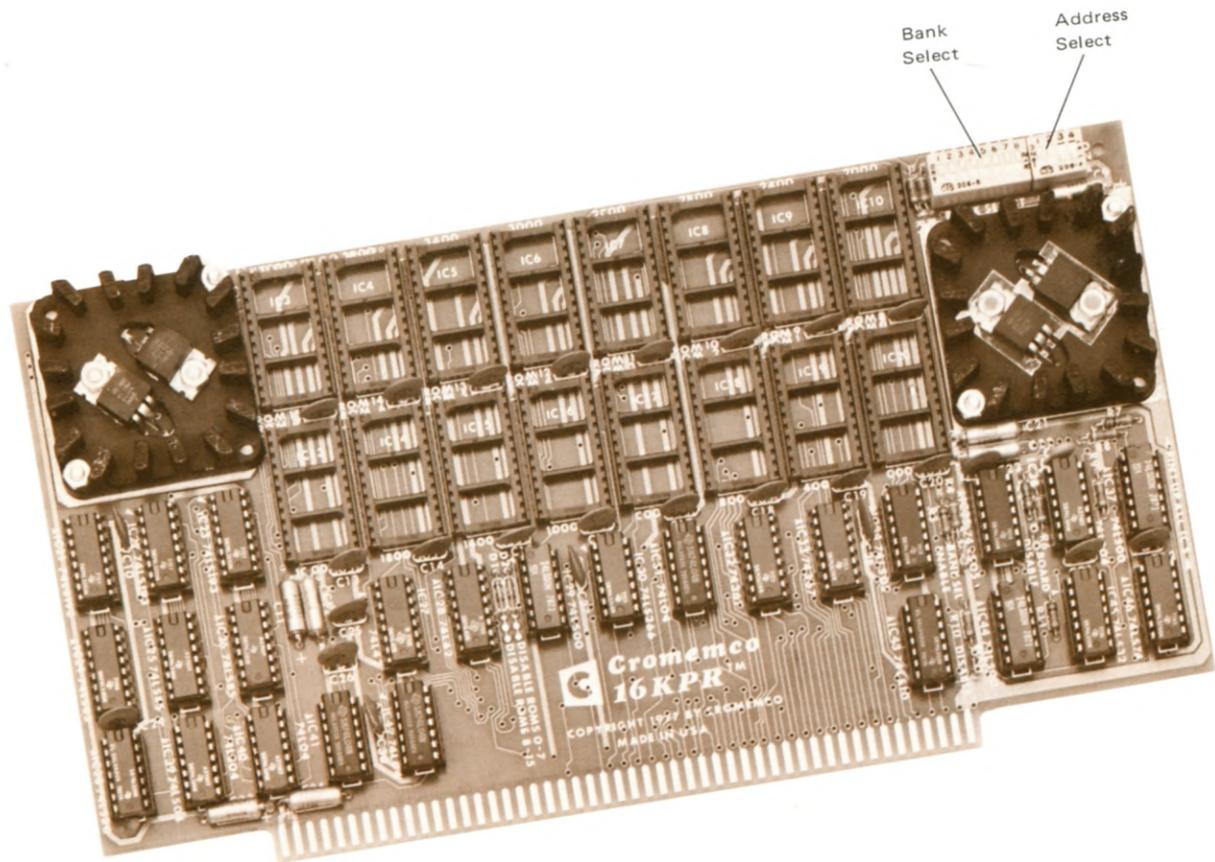
PRICE

BYTESAVER II assembled, burned in and tested (Model 8KBS) \$245

TECHNICAL SPECIFICATIONS BYTESAVER II Model 8KBS

- Memory capacity:** 8K bytes.
- Memory type:** 2708 PROM or equivalent.
- Memory access time:** 450 nano-seconds.
- Wait States at 2 MHz:** none required.
- Wait States at 4 MHz:** one per machine cycle.
- BUS:** S-100.
- Power requirements:**
 - + 8 volts @ 0.8 A
 - + 18 volts @ 0.4 A
 - 18 volts @ 0.2 A
- Operating environment:** 0-55°C

16K PROM card with address anticipation and Bank Select



HOLDS UP TO 16 HIGH-SPEED, ERASABLE 2708 PROMs

Here's what you need when you want the capability for a sizable PROM memory.

The 16KPR holds up to 16 type 2708 or equivalent PROMs. (You can program these with the BYTESAVER discussed on p. 27.)

BANK SELECT

And the 16KPR has our bank-select feature. That lets the board be part of large memory systems of up to 8 banks of 64K each. See additional information on p.25.

FAST

The 16KPR will operate with the fastest microcomputers because of its address anticipated fea-

ture. This means that there are no wait states required in the usual sequential addressing type of operation.

PRICES

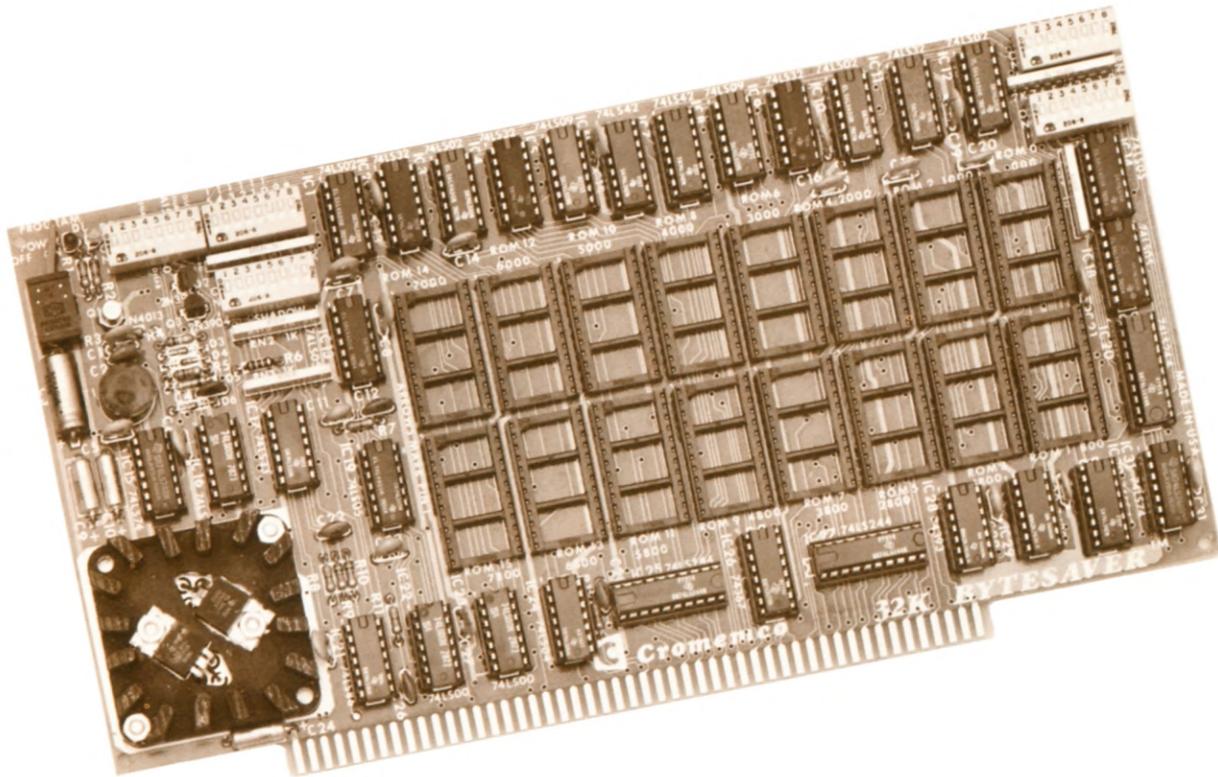
16K PROM card assembled, burned in,
and tested (Model 16KPR) \$245

TECHNICAL SPECIFICATIONS Model 16KPR PROM Card

Memory capacity: 16K bytes.
Memory type: 2708 PROM or equivalent.
Memory access time: 450 nanoseconds.
Wait States at 2 MHz: none required.
Wait States at 4 MHz: on non-sequential addresses only.
BUS: S-100.
Power requirements: + 8 volts @ 0.4 A
+ 18 volts @ 0.8 A
- 18 volts @ 0.5 A
Operating environment: 0-55°C

See information about
Memory Bank Select in
this section

32K BYTESAVER® memory board with 2716 PROM programmer



32K BYTESAVER® PROGRAMS THE NEW, HIGH DENSITY 2716 PROM

Many customers have asked for a card that has the ease of use and high flexibility of our popular BYTESAVER® 2708 PROM card but one that could use the new 2716 2-kilobyte PROM.

Now Cromemco's 32K BYTESAVER® card gives you a full 32-kilobyte capacity of non-volatile storage for those ROM-intensive applications.

You also get the convenience of an on-board 2716 programmer.

The new 32K BYTESAVER® holds up to 16 of the 2716 PROMs. Switches are provided to: (1) protect and un-protect PROMs individually or in groups for programming (2) shadow ROM socket pairs (allows external RAM to overlap portions of ROM address space) (3) select card address, and (4) control the powerful Bank-Select and DMA IN-OUT features.

NO SPECIAL SOFTWARE NEEDED

A simple, one-time write of the desired data into an erased PROM with the on-board programmer

turned on is all that is required to store information quickly and permanently.

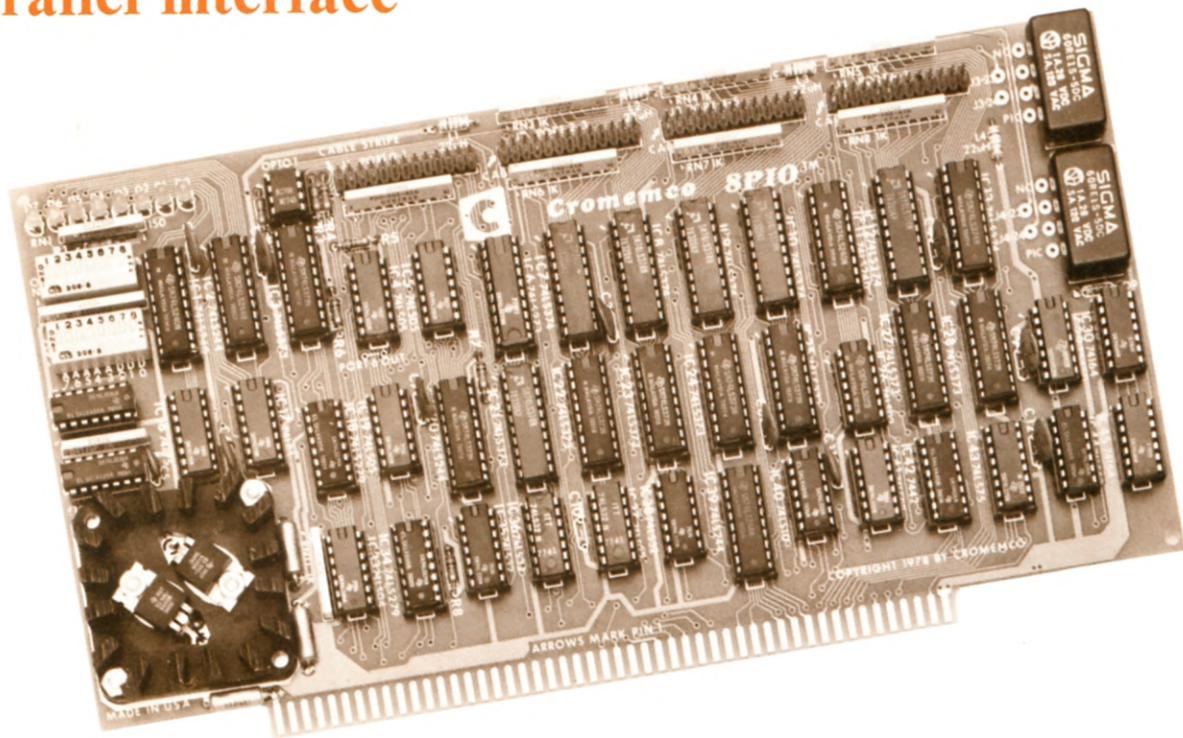
PRICE

32K BYTESAVER® PROM card assembled,
burned in and tested (Model 32KBS) \$295

TECHNICAL SPECIFICATIONS 32K BYTESAVER® PROM Card Model 32KBS

Memory capacity: 32K bytes.
Memory type: Intel 2716 PROM or equivalent.
Memory access time: 450 nanoseconds.
Wait States at 2 MHz: none required.
Wait States at 4 MHz: one per machine cycle.
BUS: S-100.
Power requirements: +8 volts @ 2.1 A, max.
Operating environment: 0-55°C.

8 Port I/O Multi-channel microcomputer parallel interface



SIMPLIFIED PARALLEL INTERFACING

Parallel interfacing was never easier than with the Cromemco 8PI/O Parallel Interface Card.

You get 8 bidirectional 8-bit I/O ports that can be used either singly or coupled together to form longer word lengths.

For convenience, input and output status flags for handshake purposes are grouped together on one port and may be accessed with one input or output statement.

Strobe pulses can be issued after each 8-bit transfer or may be delayed until the proper word length has been formed.

Other features include 8 sense switches and 8 LEDs on the highest selected I/O port on the card, and 2 bits of opto-isolated input and 2 bits of relay-driven output.

The 8 I/O ports may be located on any 8-port I/O boundary.

PRICE

8PI/O assembled (Model 8PIO) \$295

TECHNICAL SPECIFICATIONS

Model 8PI/O

8-Channel Parallel Interface

Parallel I/O Ports:

Number of bidirectional ports: 8

I/O port width: 8 bits wide.

Input load: 4 TTL loads.

Output drive: 4 TTL loads.

Input strobes: latched.

Output strobes:

Delay: 1 μ sec after new data valid.

Width: 1.5 μ sec; negative true.

1 strobe pulse per port.

Opto-Isolator input:

Number of Opto inputs: 2 bits,

TTL level inputs.

Relay Outputs:

Number of relay outputs: 2 bits.

Contact voltage: 28 V AC or DC.

Contact current: 1 amp.

Contact type: SPDT.

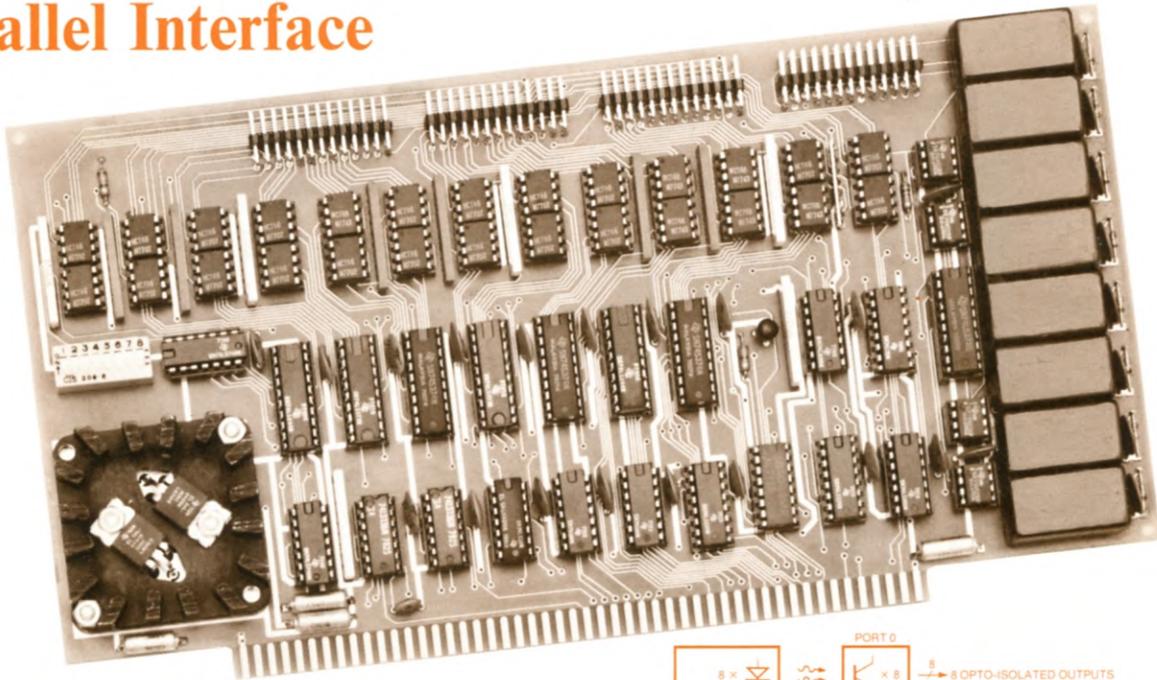
General information:

BUS: S-100.

Power requirements: +8 volts @ 1.5 A

Operating environment: 0-55°C.

4 Port I/O Isolated Parallel Interface



- Complete electrical isolation
- Eliminates ground loop problems

Now your interfacing can be achieved with complete electrical isolation from your microcomputer.

Electrical isolation means that problems with ground noise and ground loops can be completely eliminated in your instrumentation, communications, or process control systems.

Electrical isolation also means that potentially damaging transients can be safely isolated from your computer system.

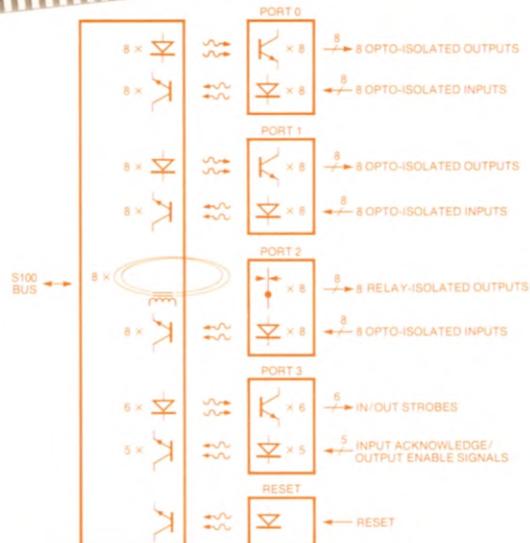
The new Cromemco 4PIO parallel interface card includes:

- 24 opto-isolated input channels
- 16 opto-isolated output channels
- 8 relay-isolated output channels
- 11 opto-isolated strobe/handshake lines
- 1 opto-isolated reset line

The 4PIO services these isolated I/O channels through four parallel, 8-bit I/O ports. The addresses of these I/O ports are switch selectable (in blocks of four) by means of a switch located conveniently on the 4PIO interface card.

ISOLATED CONNECTOR PINS

The isolated I/O channels of the 4PIO are brought to four connectors on the top edge of the card. NO PIN ON ANY OF THESE CONNECTORS IS DIRECTLY CONNECTED TO THE COMPUTER



CROMEMCO 4PIO INTERFACE. NOTE THAT ALL I/O LINES ARE EITHER OPTICALLY OR MAGNETICALLY ISOLATED FROM THE COMPUTER CIRCUITRY.

Cromemco 4PIO interface. Note that all lines are either optically or magnetically isolated from the computer circuitry.

CIRCUITRY. Every active pin is electrically isolated either by means of an opto-isolator or relay.

Cables are available in two convenient lengths to couple from these top connectors to a standard DB-25S socket. Cable model CBL-2 is 62 cm in length and can be used in our Z-2 computer. Cable model CBL-3 is 110 cm in length for use in our System Three computer.

Like all Cromemco cards, the 4PIO is designed to meet the most demanding standards of industrial performance.

PRICES

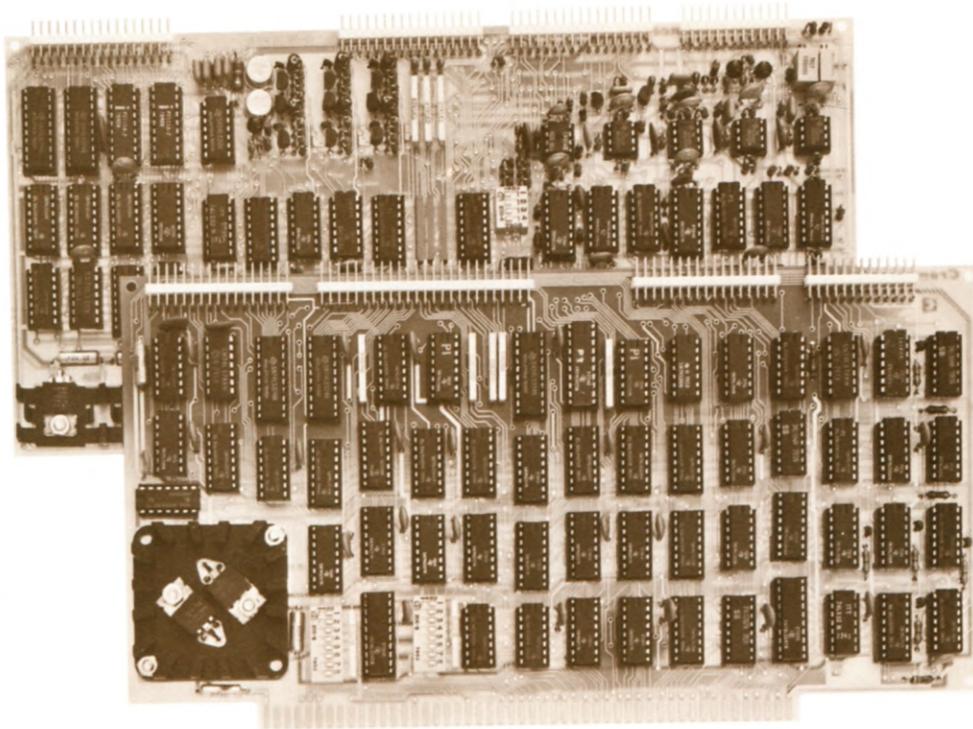
4PIO assembled, burned-in and tested
(Model 4PIO) \$395

CABLES

CBL-2 (62 cm long) \$15
CBL-3 (110 cm long) \$15

TECHNICAL SPECIFICATIONS Model 4PIO Isolated Parallel Interface	
Parallel I/O ports: Number of bidirectional ports: 4 I/O port width: 8 bits wide Number of opto-isolated input ports: 3 Number of opto-isolated output ports: 2 Number of relay-isolated output ports: 1	Opto-isolated I/O: Number of opto-isolators: 52 Opto-isolator type: MCT66 Signal levels: TTL
I/O strobe signals and reset: Number of I/O strobe bits: 11 Strobe signal isolation: opto-isolated Reset line: opto-isolated	Relay outputs: Number of relay outputs: 8 Contact type: SPDT Contact voltage: 28 V AC or DC Contact current: 1 A
General information: BUS: S-100 Power requirements: +8 volts @ 2.3 A Operating environment: 0-55°C	

Model SDI Color Graphics Interface

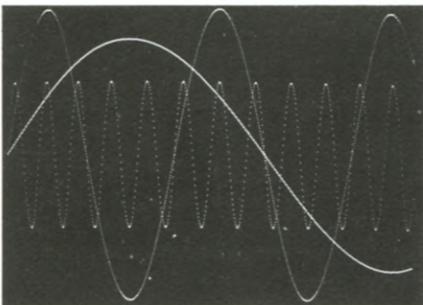


Here's a graphics interface that gives you high resolution, simplicity and an enormous range of color choices unmatched in the industry.

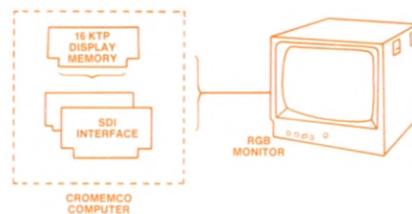
The new Cromemco Model SDI Color Graphics interface is a fully-integrated way to display the memory content of Cromemco computer systems in beautiful and meaningful color choices. Use of color and the high resolution of the image facilitate reading the display by researchers in the field. To simplify examination or discussion, various parts of the scan can be displayed in any of a wide range of colors — 4096 to be specific.

The interface consists of two circuit cards that plug directly into any Cromemco computer. No alteration of the computer is required. All necessary outputs to the monitor are provided by the interface.

The display device is typically an RGB Monitor, used in the industry or available from Cromemco (Model RGB-19).



Very high resolution provided by the new color graphics interface is apparent in this plot of sinusoids.



HIGH RESOLUTION

The new SDI interface can be used to display images with up to 756 x 484-point resolution. As discussed later, this resolution is at least the equal of a high-quality broadcast-TV picture.

COLOR OR B/W

The new interface can be used to display an image in either color or black-and-white — or in both simultaneously.

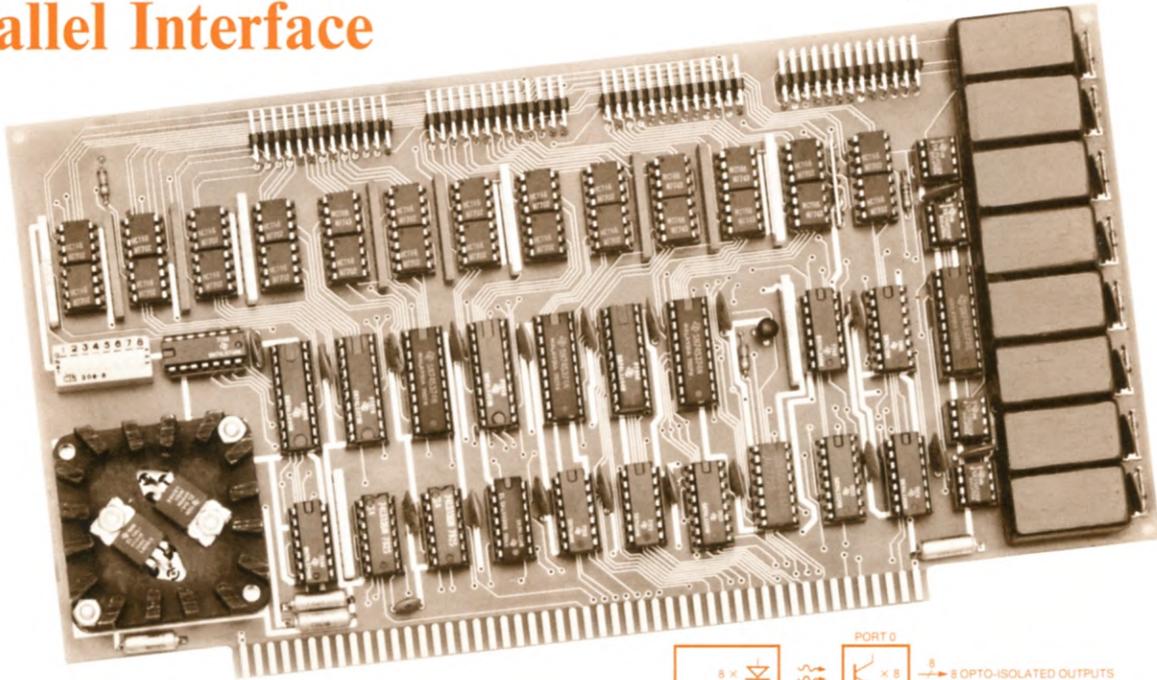
In color any 16 colors from a palette of 4096 colors can be used in the picture. In black-and-white any 16 shades of gray can be used.

HOW THE SDI MAPS

The SDI uses direct memory access to display the content of a display memory. Each pixel of the display may be mapped either from one nybble (4 bits) or one bit of the display memory. The mapping mode (nybble or bit) is software-selectable — in fact, part of a picture may be displayed in one mode and part in the other.

The display memory may consist of either a 12K or 48K memory.

4 Port I/O Isolated Parallel Interface



- Complete electrical isolation
- Eliminates ground loop problems

Now your interfacing can be achieved with complete electrical isolation from your microcomputer.

Electrical isolation means that problems with ground noise and ground loops can be completely eliminated in your instrumentation, communications, or process control systems.

Electrical isolation also means that potentially damaging transients can be safely isolated from your computer system.

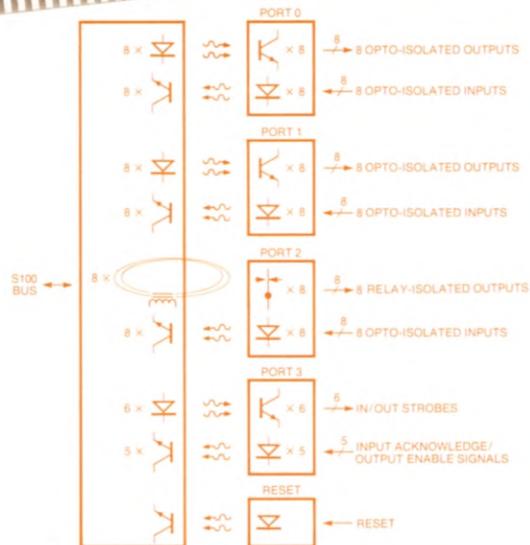
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- 24 opto-isolated input channels
- 16 opto-isolated output channels
- 8 relay-isolated output channels
- 11 opto-isolated strobe/handshake lines
- 1 opto-isolated reset line

The 4PIO services these isolated I/O channels through four parallel, 8-bit I/O ports. The addresses of these I/O ports are switch selectable (in blocks of four) by means of a switch located conveniently on the 4PIO interface card.

ISOLATED CONNECTOR PINS

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Cromemco 4PIO interface. Note that all lines are either optically or magnetically isolated from the computer circuitry.

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PRICES

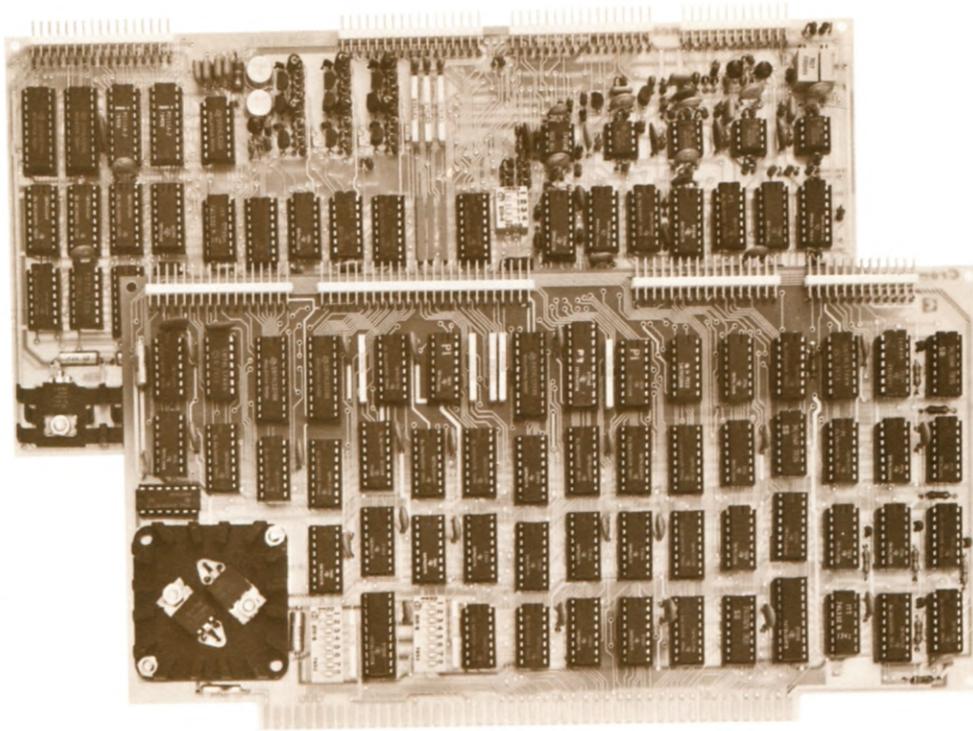
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Model SDI Color Graphics Interface

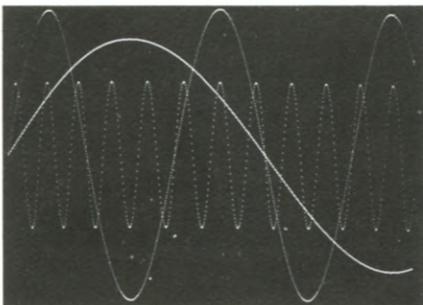


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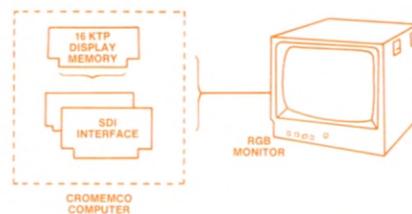
The new Cromemco Model SDI Color Graphics interface is a fully-integrated way to display the memory content of Cromemco computer systems in beautiful and meaningful color choices. Use of color and the high resolution of the image facilitate reading the display by researchers in the field. To simplify examination or discussion, various parts of the scan can be displayed in any of a wide range of colors — 4096 to be specific.

The interface consists of two circuit cards that plug directly into any Cromemco computer. No alteration of the computer is required. All necessary outputs to the monitor are provided by the interface.

The display device is typically an RGB Monitor, used in the industry or available from Cromemco (Model RGB-19).



Very high resolution provided by the new color graphics interface is apparent in this plot of sinusoids.



HIGH RESOLUTION

The new SDI interface can be used to display images with up to 756 x 484-point resolution. As discussed later, this resolution is at least the equal of a high-quality broadcast-TV picture.

COLOR OR B/W

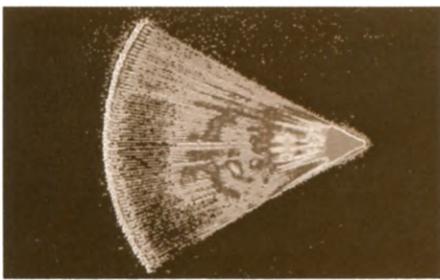
The new interface can be used to display an image in either color or black-and-white — or in both simultaneously.

In color any 16 colors from a palette of 4096 colors can be used in the picture. In black-and-white any 16 shades of gray can be used.

HOW THE SDI MAPS

The SDI uses direct memory access to display the content of a display memory. Each pixel of the display may be mapped either from one nybble (4 bits) or one bit of the display memory. The mapping mode (nybble or bit) is software-selectable — in fact, part of a picture may be displayed in one mode and part in the other.

The display memory may consist of either a 12K or 48K memory.



Display of cross section of human heart imaged by a 2.25 MHz ultrasonic sector scan through body's intracostal space. The image is displayed using the new SDI interface on an RGB Monitor. This medical application involving the new interface was done at Stanford University.

The combination of mapping modes and memory result in four basic modes of operation as shown below.

MODEL SDI RESOLUTION (HORIZONTAL x VERTICAL) IN EACH OF FOUR MODES OF OPERATION.

	Display Memory Size	
	12K	48K
Nybble-Mapped	189 x 121	378 x 242
Bit-Mapped	378 x 242	756 x 484

SDI OUTPUTS

The Model SDI provides three separate analog output signals to drive the Red, Green, and Blue guns of a high-quality RGB monitor. The three separate outputs, rather than one composite output, are used to preserve the full resolution of the picture.



In nybble mapped operations each 4-bit nybble can select one of 4096 colors as determined by a mapping RAM. The contents of the mapping RAM can be changed dynamically, under software control, by issuing OUTPUT instructions to the SDI.

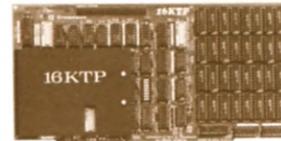
TV COMPATIBILITY

The Model SDI also provides all signals required to serve as input to a colorizer or color modulator in a TV broadcast studio.



RGB MONITOR

New Cromemco RGB (red/green/blue) Color Monitor is specially adapted for use with SDI Interface. Photos shown herein are from this monitor.



DISPLAY MEMORY

A new 16K two-port memory card has been developed for use with the SDI. Three of these memories thus hold a full 48K picture. Picture information is accessible by the SDI through a connector on the top of the memory cards. The cards plug directly into the Cromemco computer. See Section III of this catalog.

The computer resident memory may also be used as the display memory, although at the expense of mapping speed. This reduction occurs because the CPU must suspend operation when the SDI accesses the resident memory. The result is approximately 55% CPU utilization for a 12K-memory picture and 6% utilization for a 48K-memory picture.

Use of the special two-port memory, however, assures 75% to 100% CPU utilization, depending on the application software.

In its high-resolution mode, the SDI* displays a picture having a 756 x 484-pixel resolution. This format corresponds to and is compatible with NTSC TV systems practice in that 484 lines are normally displayed in a nominal 525-line system. The 756 points in the horizontal direction give a resolution equal or better than that of the vertical direction.

The horizontal resolution itself far exceeds that of conventional TV displays which have relatively limited bandwidth.

The result of the above approach is that the high-resolution picture displayed using the SDI interface is at least equal in resolution to a 525-line color TV picture.

TECHNICAL SPECIFICATIONS

Model SDI Color Graphics Interface

- Mapping modes:** Bit or nybble; software selected.
- Resolution:** 756 x 484 pixels maximum using 48K display memory. 12K display memory may also be used at lower resolution; see text.
- Color:** Any 16 of 4096 colors or any 16 shades of gray may be displayed.
- Outputs:** Three analog outputs for R.G.B. monitor.
- Recommended Display Memory:** Cromemco 16KTP two-port memory.
- Sync signal:** Composite Sync signal is switch-selectable. Separate RS-170 Sync signal available.
- System Bus:** Industry Standard S-100.
- Operating Environment:** 0-55°C.
- Price:** \$595.

Model 48 KTP Two-Port Memory

- Memory Capacity:** 16K bytes
- Bus:** Industry Standard S-100
- Operating Environment:** 0-55°C
- Price:** \$1785

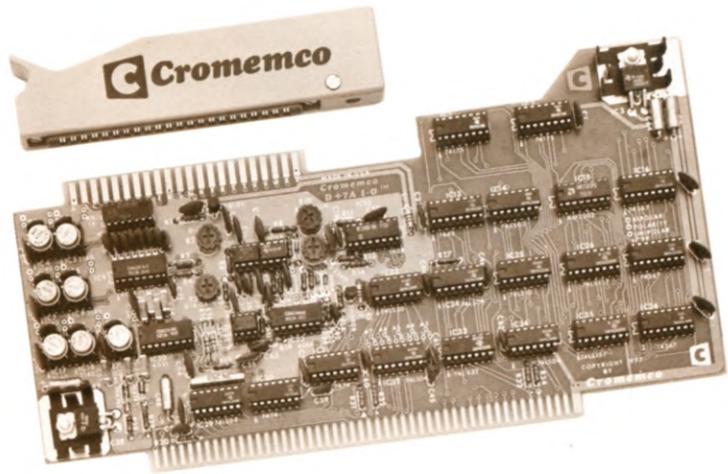
Cromemco Model RGB-19 Color Monitor

- Max. effective screen size:** 396 mm x 297 mm.
- Technology:** All solid state except for CRT.
- CRT:** 19" shadow mask, delta gun.
- Video signal output:** RGB 0.3 - 2.0 v., 75 ohm. Fully compatible with Cromemco model SDI interface outputs.
- Video amplifier bandwidth:** 50 Hz to 15 MHz ± 3 db.
- Power requirements:** 100, 110, 120, 220, or 240 volts; 50/60 Hz.
- Power consumption:** 250 VA.
- Dimensions:** 444 mm x 482 mm x 545 mm.
- Weight:** 45 kg.
- Operating environment:** -5° to 40°C.
- Price:** \$6995.

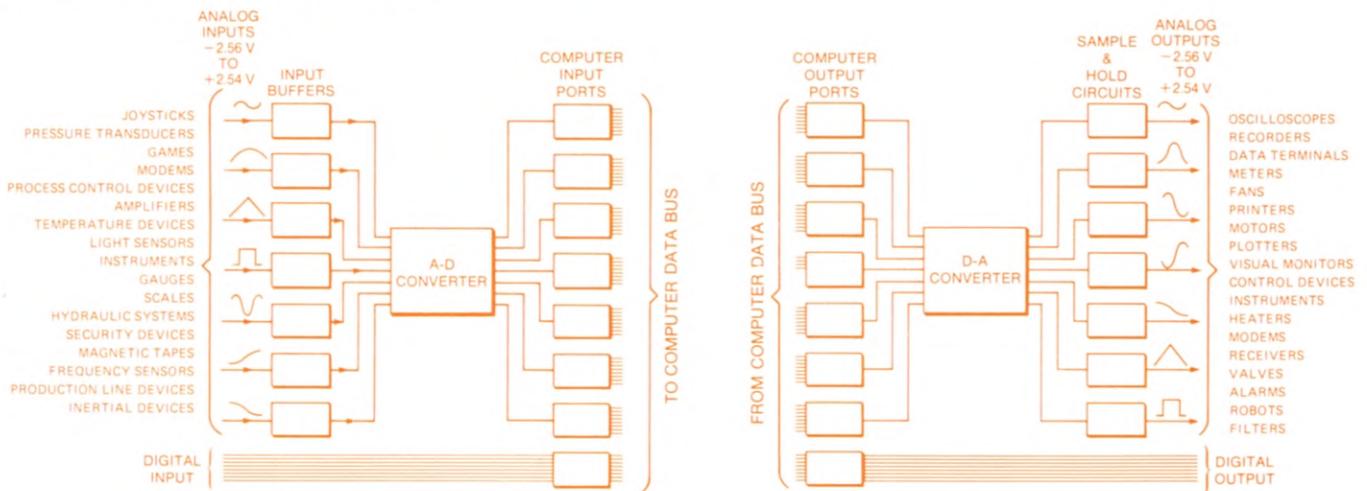
Cromemco RGB-13 Color Monitor (Similar to RGB-19 but with 13" picture tube)

- Price:** \$2995
- Model 16KTP Two-Port Memory**
- Memory Capacity:** 16K bytes
- Bus:** Industry standard S-100
- Operating environment:** 0-55°C
- Price:** \$795

D+7A I/O™ Multi-channel microcomputer analog interface



See p. 20 for special joystick console with audio output. Use with this analog I/O.



Now you have a way to get analog information into and out of your microcomputer. It's an easy, fast, and unbelievably inexpensive way.

It's Cromemco's new D+7A® high-performance I/O module which gives you:

- 7 channels of 8-bit analog-to-digital conversions (to input analog data to the computer)
- 7 channels of digital-to-analog conversion (to output computer data in analog form)
- an 8-bit parallel I/O port to input and output data in digital form.
- a fast conversion time of 5.5 microseconds.

A MULTITUDE OF USES

The D+7A makes it easy to use your computer for the jobs you want it to do — such as process control, digital filtering, games, oscilloscope graphics, speech recognition, speech and music synthesis.

The D+7A lets you input and output analog data with all sorts of devices: joysticks, ham radio gear, measurement instruments, machine tools, transducers, control systems, motors, recorders, and plotters, to name just a few.

NO FURTHER SOFTWARE NEEDED

The D+7A I/O plugs directly into the Cromemco microcomputers. Analog signal range is from -2.56 to +2.54 volts (20-millivolt increments) on both input and output sides.

Simple "Input" and "Output" instructions initiate A/D conversion and read in or out the ensuing 8 bits of data. No further software is re-

quired. During conversion the D+7A holds down the computer "Ready" line.

LOW-PRICED

D+7A I/O assembled, burned-in and tested
(Model D+7A-W) \$245
Each D+7A includes a connector to connect to the 8 input and 8 output ports.

TECHNICAL SPECIFICATIONS D+7A A/D & D/A Interface

Analog input ports:

Number of input ports: 7
Input voltage range: -2.56 to +2.54 volts

Input bias current: 2 microamps max.

Input impedance: 20 Megohms || .001 μ F, 1 KHz sample rate.
2 Megohms || .001 μ F, 10 kHz sample rate.

Resolution: 8 bits.
Conversion time: 5.5 microseconds.

Accuracy: ± 20 millivolts.

Analog Output Ports:

Number of output ports: 7
Output voltage range: -2.56 to +2.54 volts

Output impedance: 0.25 ohm.

Maximum load current: 1.5 mA

Resolution: 8 bits

Conversion time: 5.5 microseconds

Accuracy: ± 20 millivolts

Drift rate: Less than 10 mV/sec at 25°C

Parallel I/O Port:

Input port: 8 bits.

Output port: 8 bits.

Input load: one TTL equivalent.

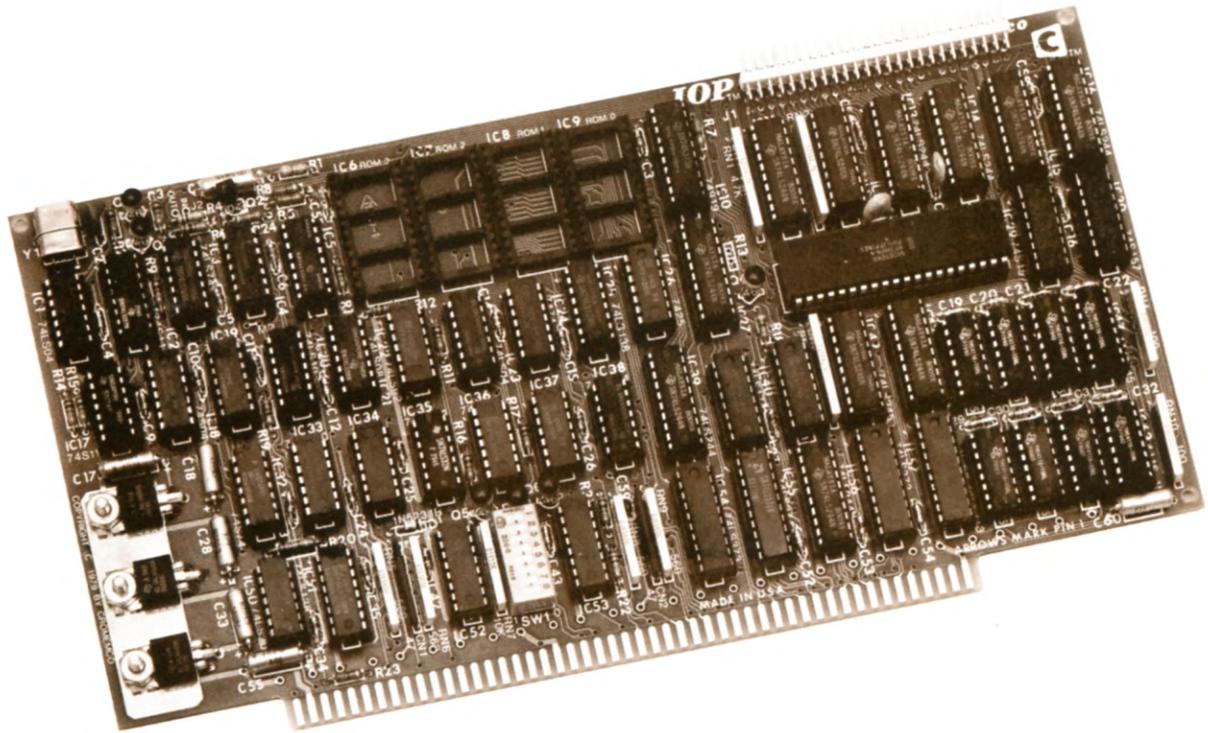
Output drive: 10 TTL loads.

General Information:

BUS: S-100.

Power requirements: + 8 volts @ 0.4 A, +18 volts @ 30 mA, -18 volts @ 60 mA

I/O Processor



MULTI-PROCESSOR CAPABILITY

With this new I/O Processor you can now have multi-processor capability in your S-100-bus system.

The new Model IOP is a true single-card computer — one that has a fast Z-80A processor, 16K bytes of RAM, and up to 16K bytes of PROM capacity.

The IOP interfaces to the S-100 host processor by means of simple “input” and “output” instructions.

SATELLITE PROCESSOR

The IOP can be used either alone or with other IOP cards as a satellite processor on the S-100 bus.

Or the IOP can process I/O channels and interface to other devices such as the Cromemco Quad-art through the C-bus connector on the top edge of the card.

The IOP is an advanced development that brings a new dimension of computer architecture to Cromemco computer systems.

PRICE

I/O Processor (Model IOP) assembled,
burned in and tested \$695

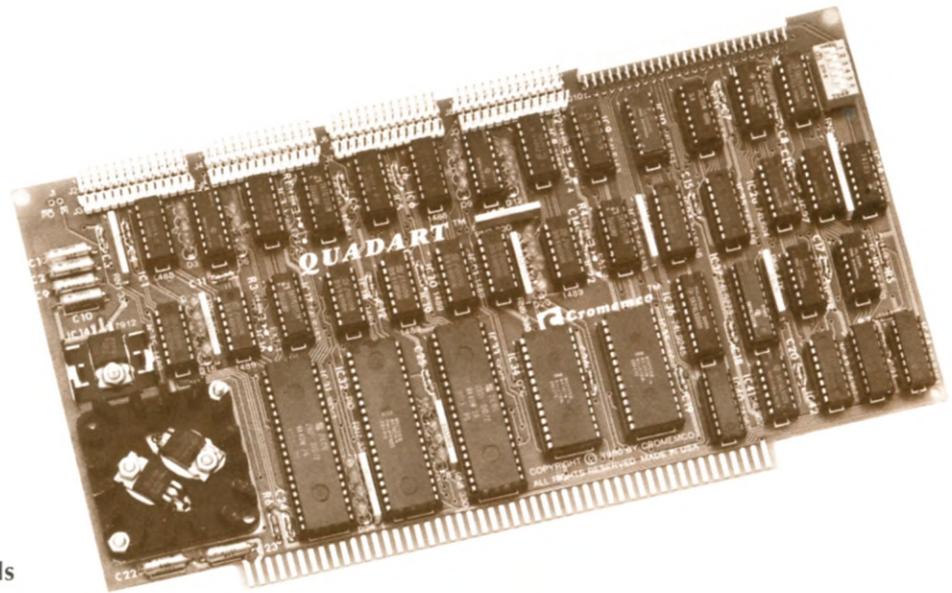
TECHNICAL SPECIFICATIONS

Model IOP I/O Processor

Processor: 4 MHz Z-80A
Instruction Set: 158 instructions including the 78 instructions of the 8080
ROM Capacity: 16K bytes positioned starting on any 2K boundary (selectable by bipolar PROM).
ROM Type: Intel 2716, 2732 or equivalent
RAM Capacity: 16K bytes positioned starting on any 2K boundary (selectable by bipolar PROM)
Standard address configuration:
PROM—0000 to 1FFFH
RAM—4000H to 7FFFH

RAM Type: 4116
Host Interface: S-100 bus input-output ports
Peripheral Interface: C-bus
M1 Wait state generation: 0-1 wait states jumper wire selectable
Power requirements: + 8 volts @ 1.5A
+ 18 volts @ 100 mA
- 18 volts @ 30 mA
Operating environment: 0-55°C

Quadart



Supporting Serial Protocols

- Asynchronous
- Synchronous Bit (e.g., SDLC)
- Synchronous Byte (e.g., Bisync)

SIMULTANEOUSLY INTERFACES UP TO FOUR SERIAL CHANNELS

In this versatile new QUADART serial communications interface card you get the power to satisfy virtually any high-speed data communications application.

You get four independent serial channels, each supporting Asynchronous, Synchronous Byte mode (e.g., Bisync), and Synchronous Bit mode (e.g., SDLC) protocols with complete handshaking for modems. Serial protocol is software-selectable for each channel.

Our unique loopback feature gives you the capability to connect data from any channel to any other channel, data from any modem to any other modem, or the capability for any modem/channel combination to be used for diagnostics and selftest.

Baud rates for each may be software-selected from 0 to 300K baud (asynchronous to 19,200 baud).

VECTORED INTERRUPTS

The QUADART also supports the powerful

internally-prioritized vectored interrupt structure of the Z-80 microprocessor which has become a trademark of Cromemco interface cards.

INTERVAL TIMERS

You have real-time clocking capability with four interval timers each having periods as small as 4.00 microseconds. Up to three timers can be cascaded to provide a 1.000-second time interval.

The software-selectable time range of each timer is 0-16.384 milliseconds.

C-BUS

The control for the QUADART is from the C-Bus provided by Cromemco's powerful I/O processor computer, Model IOP. The IOP interfaces between your S-100 bus and the C-bus and can support up to four QUADARTS with full interrupt capability.

PRICE

QUADART Serial Communications Interface (Model QDRT) fully assembled, burned-in and tested\$595

TECHNICAL SPECIFICATIONS

Model QDRT

QUADART Serial Communications Interface

Serial Channels:

Serial Protocols:

- Asynchronous Byte
- Synchronous Byte (Bisync)
- Synchronous Bit (SDLC)
- Modem handshaking

Number of channels: 4

Diagnostics: Channel-to-channel diagnostic loopback capability (input/output channels software selectable)

Asynchronous Baud Range: 0 to 19,200 baud (software selectable)

Synchronous Baud Range: 0 to 300K baud (software selectable)

Interval Timers:

Number of timers: 4

Timer Range: 0-16.384 msec (cascadable to 1.0 sec, software selectable)

Timer resolution: 4.0 microseconds

Vectored Interrupts:

Number of restart locations (Z-80 mode): 65,536

Prioritization of serial channels and timers:

Internally prioritized

Prioritization for multiple QUADARTS:

daisy-chaining

General Information:

Serial channel type: Z80-SIO/2

Parallel channel type: Z80-PIO

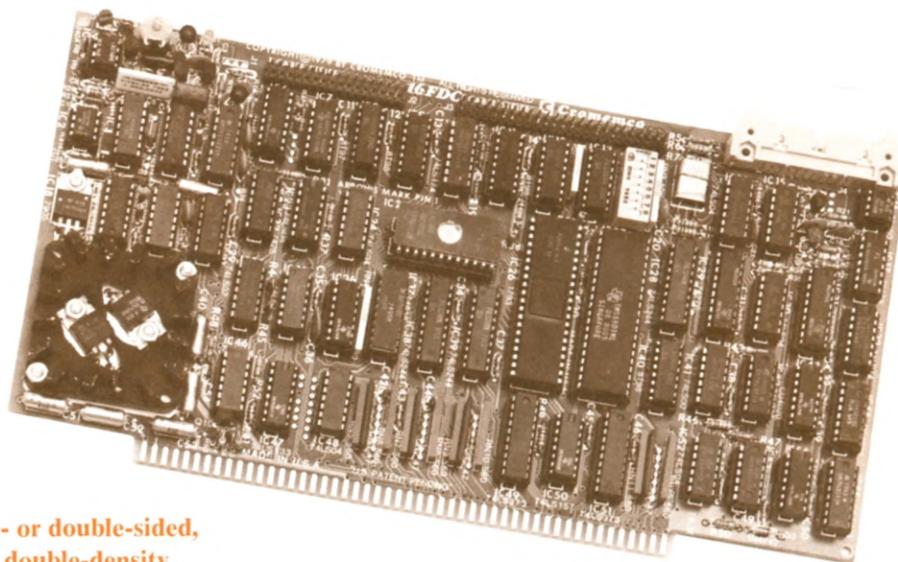
Timer type: Z80-CTC

Interface: C-Bus

Power requirements: + 8 volts @ 1.5A
+ 18 volts @ 100 mA
- 18 volts @ 100 mA

Operating environment: 0-55°C

16FDC Quad-Capacity Disk Controller



**For single- or double-sided,
single- or double-density,
5" or 8" disk drives**

This new disk controller enables you to have the largest storage capacity per disk size in the industry.

Specifically, it works with 390K bytes on a 5" diskette or 1216K bytes (1.2 megabytes) on an 8" diskette.

Such a large storage capacity has been achieved by using double-sided double-density (i.e., quad capacity) formats on each size disk drive.

The new 16FDC also supports an RS-232 interface capable of up to 76,800 baud operation. This interface is commonly used to connect a crt terminal to your system.

SYSTEM DIAGNOSTICS

A special feature of the 16FDC is that it is pro-

vided with a ROM-resident program called RDOS-II. This not only provides for system monitor and bootstrap operation but also has a complete set of system diagnostics for system maintenance and trouble shooting.

STANDARD IN CROMEMCO SYSTEMS

The new 16FDC is now used in all Cromemco floppy-disk-based systems and is designed to replace the older Model 4FDC controller in most applications.

PRICE

Disk Controller and I/O Interface (Model 16FDC) assembled, burned in and tested . . . \$595

TECHNICAL SPECIFICATIONS Model 16FDC Disk Controller and I/O Interface

Disk controller:

- Maximum number of 5" drives: 4
- Maximum number of 8" drives: 4
- Bootstrap/monitor firmware: 4K byte ROM monitor/boot/diagnostic
- Controller circuitry: MOS LSI

Serial I/O Port:

- I/O levels: RS-232 or 20 mA current loop
- Low Baud Range: 110-9600 baud (software selectable)
- High Baud Range: 880-76,800 baud (software selectable)

Diskette Format:

- Size: 5" or 8"
- Sides: single or double
- Density: single (FM) or double (MFM) (software selectable)
- Data recovery: analog phase-lock loop, U.S. Pat. Pending

Formatted disk capacity:

	5"	8"
Single sided-single density	83K	243K
Single sided-double density	190K	600K
Double sided-single density	173K	594K
Double sided-double density	390K	1216K

Interval Timers:

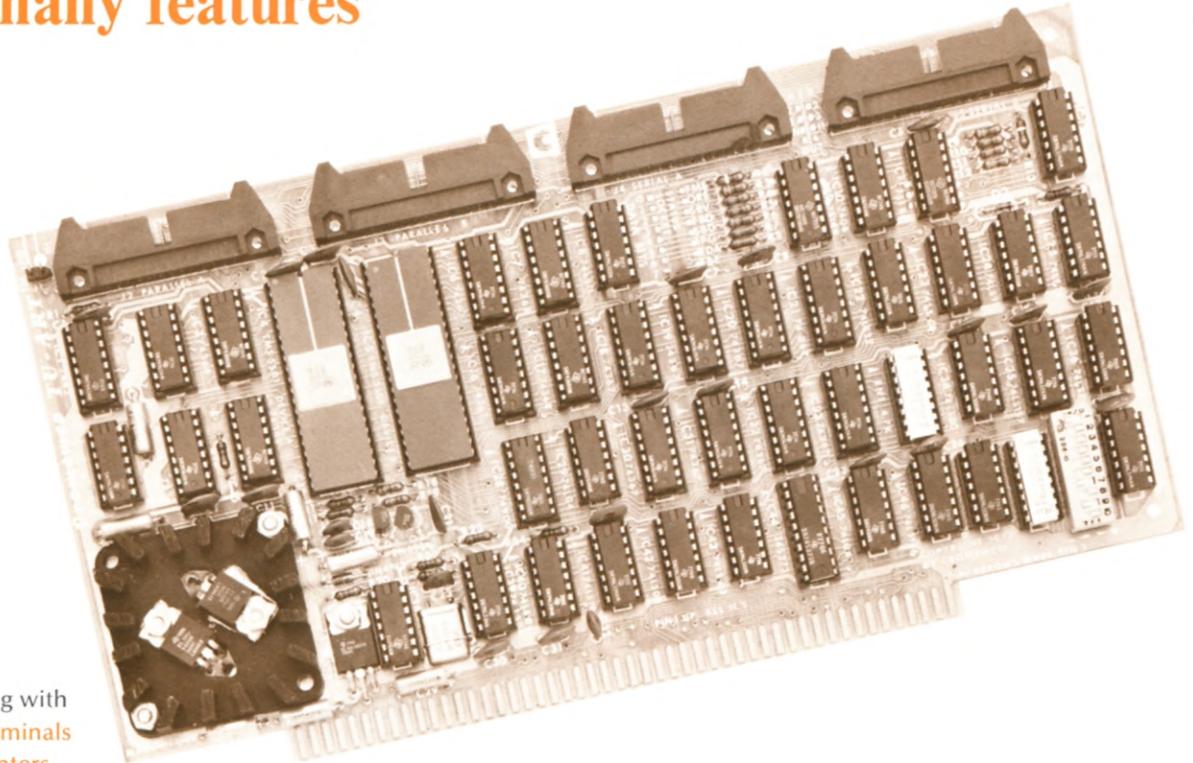
- Number of timers: 5
- Timer Range: 0-16.32 msec (software selectable)
- Timer resolution: 64 microseconds

General Information:

- Bus: S-100
- Disk controller type: 1793-B02
- UART type: 5501
- ROM type: 2332
- Power requirements: + 8 volts @ 1.5A
+ 18 volts @ 100 mA
- 18 volts @ 100 mA

Operating environment: 0-55°C

TU-ART digital interface with many features



For interfacing with

- CRT terminals
- line printers
- modems
- other devices

FAST — SOFTWARE SELECTABLE BAUD RATES UP TO 76,800 BAUD

Here's a very convenient interface to let you couple not to one but to two terminals or other devices. So we call it a TU-ART.

It has two serial I/O ports, two 8-bit parallel I/O ports, and 10 independent, programmable interval timers.

Baud rates are software-selectable from 110 to 76,800 baud.

VECTORED INTERRUPTS

Yet another special convenience of the TU-ART is its vectored prioritized interrupts. Is able to support powerful vectored interrupt structure of the Z-80 microprocessor.

INTERVAL TIMERS

The 10 interval timers, since they have real-time clock capability, offer a very wide range of control possibilities.

Each timer range is from 0 - 16.32 milliseconds and is software selectable.

PRICES

TU-ART assembled, burned-in and tested
(Model TRT) \$295

CABLE

CBL-2 for Z2 computers; 62 cm long \$15
CBL-3 for System Three computer;
110 cm long \$15

TECHNICAL SPECIFICATIONS Model TRT TU-ART Digital Interface

Serial I/O ports:

Number of ports: 2.

I/O levels: RS-232 or 20 mA current loop.

Low baud range: 100-9600 baud (software selectable).

High baud range: 880-76,800 baud (software selectable).

Parallel I/O ports:

Number of ports: 2.

Input ports: 8 bits.

Output ports: 8 bits.

Input load: one TTL equivalent.

Output drive: 20 TTL loads.

Interval timers:

Number of timers: 10.

Timer range: 0-16.32 msec (software selectable).

Timer resolution: 64 microseconds.

Vectored interrupts:

Number of restart locations (8080 mode): 8.

Number of restart locations (Z-80 mode): 65,536.

Prioritization of TU-ART ports: internally prioritized

Prioritization for multiple TU-ARTs: daisy-chaining

General Information

UART type: 5501.

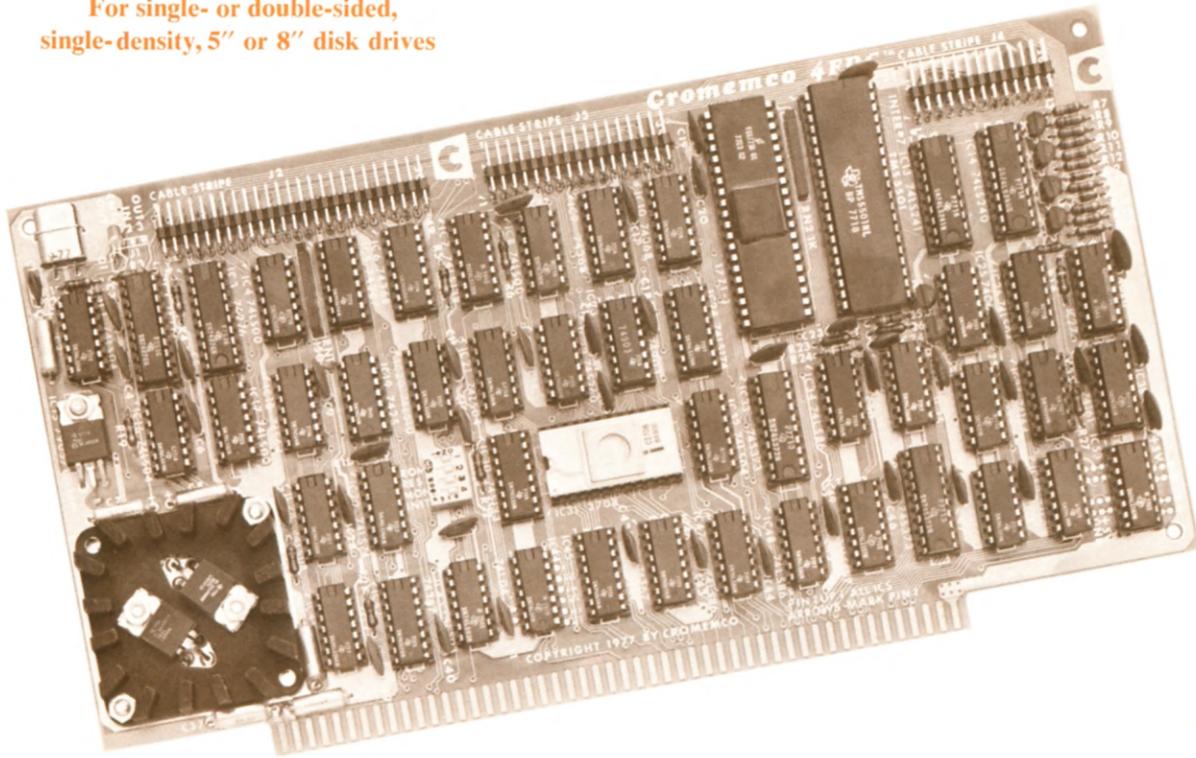
BUS: S-100.

Power requirements: + 8 volts @ 1.0 A
+ 18 volts @ 80 mA
- 18 volts @ 40 mA

Operating environment: 0-55°C.

4FDC Disk Controller

For single- or double-sided,
single-density, 5" or 8" disk drives



DISK CONTROLLER

- Many functions on one card
- Includes disk bootstrap monitor
- RS-232 interface

SIMULTANEOUSLY INTERFACES UP TO FOUR DISK DRIVES

This card is not only a disk controller but also an I/O interface.

Placing many functions on this one card is possible because we have taken the step of using LSI circuitry.

The card is capable of simultaneously interfacing up to three 5" drives or four 8" drives.

Its interface provisions include an RS-232 serial interface with a baud range up to 76,800 baud.

The bootstrap monitor is contained in a 1K 2308 ROM.

PRICE

Disk Controller card assembled, burned-in
and tested (Model 4FDC)..... \$495

TECHNICAL SPECIFICATIONS

Model 4FDC

Disk Controller and I/O Interface

Disk controller:

Maximum number of 5" drives: 3

Maximum number of 8" drives: 4

Bootstrap/monitor firmware: 1K byte PROM

Controller circuitry: MOS LSI

Serial I/O port:

I/O levels: RS-232 or 20 mA current loop

Low baud range: 110-9600 baud (software selectable)

High baud range: 880-76,800 baud (software selectable)

Parallel port:

Input port: 8 bits

Output port: 8 bits

Input load: one TTL equivalent

Output drive: 20 TTL loads

Interval timers:

Number of timers: 5

Timer range: 0-16.32 msec (software selectable).

Timer resolution: 64 microseconds

General Information:

Disk controller type: 1771-1

UART type: 5501

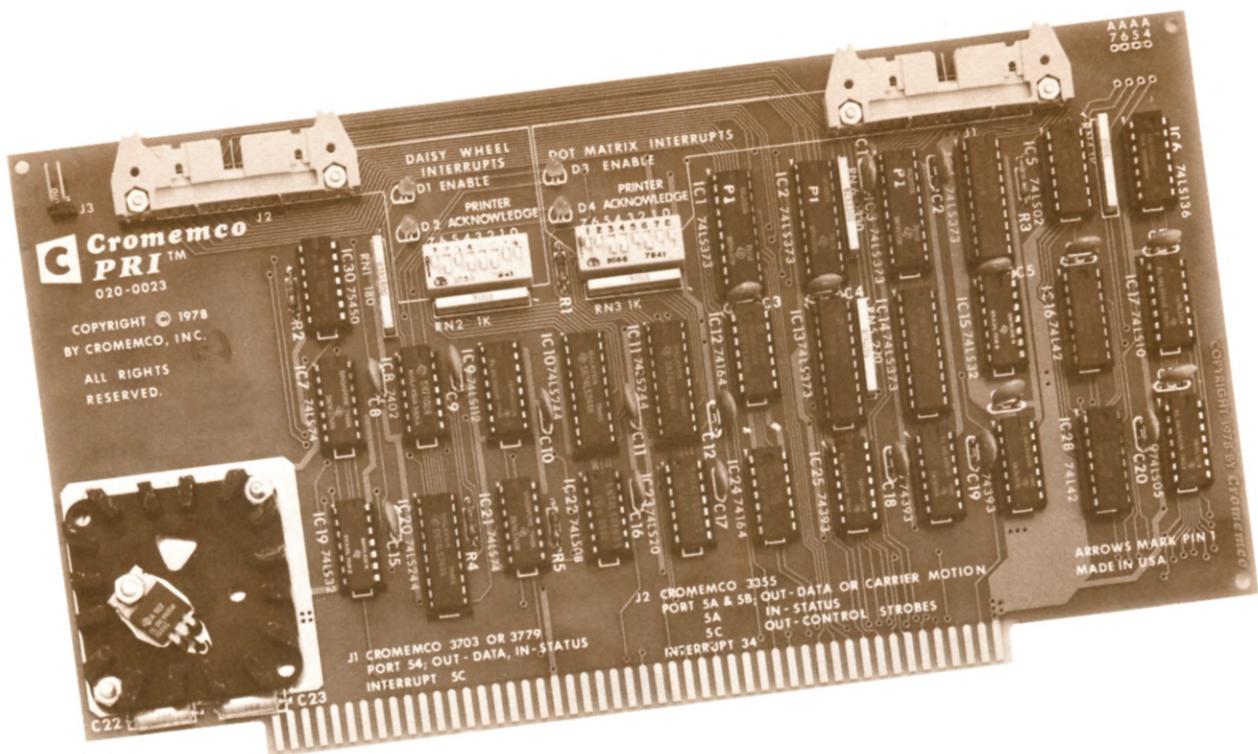
ROM type: 2308

BUS: S-100 (one slot only)

Power requirements: + 8 volts @ 1.0 A
+ 18 volts @ 100 mA
- 18 volts @ 100 mA

Operating environment: 0-55°C

Printer Interface



- Use with all Cromemco printers

A VERSATILE CARD WITH TWO INTERFACES ON ONE CARD

With this new interface card, it's easy for you to interface either dot-matrix or full letter printers to your computer system.

To be suited to these printers, this card is designed with two actual interfaces. One uses the "Centronix parallel" convention and interfaces the Cromemco Models 3779 or 3703 dot-matrix printers.

The card's second interface interfaces the Cromemco Model 3355A Full-Letter printer.

This second interface has built-in ribbon-lift and ribbon-lowering circuitry to free the software overhead normally required for this function.

NOTE TO CROMEMCO SYSTEM TWO AND SYSTEM THREE PURCHASERS:

The Model PRI interface card described here is now supplied as standard equipment in your system.

You need not purchase this card separately unless you are adding additional printers to your system.

See Cromemco printers in Section II

Each of the two interfaces has an individual cable connection on the top edge of the card.

The Cromemco PRI card now also includes full interrupt capability for use in multi-user systems.

PRICES

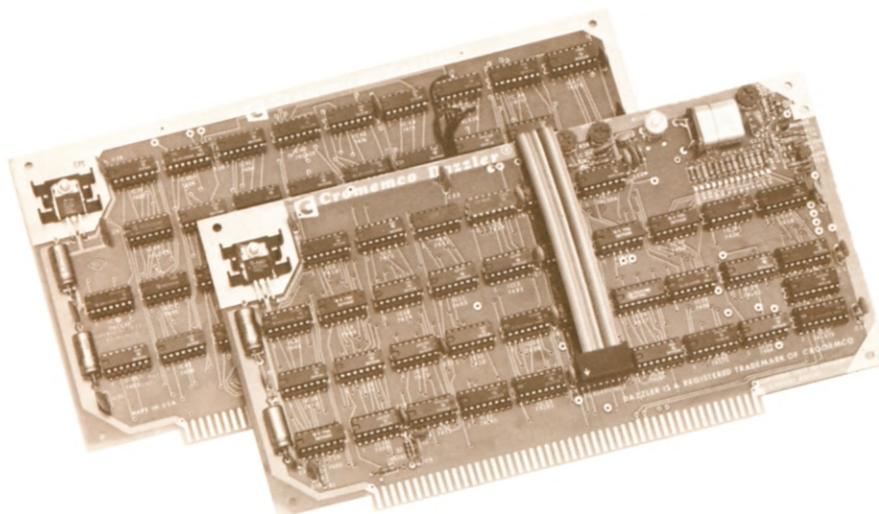
- Printer Interface Card assembled, burned-in and tested (Model PRI) \$195
- Cables for PRI interface: 25-conductor ribbon cable connects from top card connector to DB-25S socket. Lengths as follows:
 - Cable 62 cm in length for use in Cromemco System Two computers (Model CBL-2) \$15
 - Cable 110 cm in length for use in Cromemco System Three computer (Model CBL-3) \$15

TECHNICAL SPECIFICATIONS

Model PRI Printer Interface

Output port addresses: 54, 5A, 5B, 5C
Input port addresses: 54, 5A
Alternate port addresses: Optional DIP switch
Software support: Cromemco CDOS
BUS: S-100
Power requirements: +8 volts @ 1.0A
Operating environment: 0-55°C

TV Dazzler



ALPHANUMERICS PLUS ACTION, AND GRAPHICS

The Dazzler® maps your computer memory content onto your color TV screen in full color.

That doesn't mean just that you see alphanumeric in color. You can display any information in memory. And do so in color.

The Dazzler® consists of two circuit boards that plug directly into your Cromemco Computer Systems.

NEEDS ONLY 2K MEMORY

Technically, the Dazzler® scans your computer memory using direct-memory access (DMA). It formats each memory bit into a point on the TV screen to give a 128 x 128-element picture. Only a 2K-byte computer memory is required (only 512 bytes for a 32 x 32 picture). The quality of the pictures is evident in the photos.

The Dazzler® output is a video signal that goes directly to the TV video amp or to the antenna terminal through an inexpensive commercially-available device.

PRICE

TV Dazzler assembled, burned-in and tested (Model CGI)..... \$350

DAZZLER GAMES

A set of over a dozen games you can play with the Dazzler. Available on either 5" or 8" diskettes. Each diskette includes CHESS, SPACE WAR, 4D TIC-TAC-TOE, TANK WAR, DAZZLE-MATION, CHASE, TRACK, DAZZLE-DOODLE, GOTCHA, LIFE, KALEIDOSCOPE, DOG-FIGHT, MAGENTA MARTINI, and AMBUSH.

PRICES

Dazzler Games on 5" diskette (Model FDG-S) .. \$95
Dazzler Games on 8" diskette (Model FDG-L) .. \$95

DAZZLER GRAPHICS

A program to use the Dazzler to display graphs, graphics and alphanumeric displays in color on a TV set. Available on either 5" or 8" diskettes.

PRICES

Dazzler Graphics on 5" diskette (Model DGR-S) \$95
Dazzler Graphics on 8" diskette (Model DGR-L) \$95

TECHNICAL SPECIFICATIONS

Model CGI TV Dazzler

Display format: 128 x 128, 64 x 64, or 32 x 32 (software selectable).

Colors available (color mode): Red, green, blue, cyan, magenta, yellow, white, black.

Gray-scale available (B&W mode): 16 intensities.

System memory required: 2K bytes (512 bytes for low resolution mode).

Memory access: DMA.

DMA rate: 1 megabyte/second.

Video output: composite video TV signal.

BUS: S-100 (two slots required).

Power requirements: + 8 volts @ 1.4 A
- 18 volts @ 50 mA

Operating environment: 0-55°C

Card Cages



Model CC-21

Model CC-12

Model CC-8

8-, 12-, OR 21-SLOT VERSIONS

Ideal for your OEM or Home-brew system requirements, these S-100 bus card cages are built with the quality you've come to expect from Cromemco.

The card cages themselves are of sturdy steel construction and include a rugged retaining bar to insure that cards cannot be shaken from their sockets.

The back planes include a full set of edge connectors which are wave-soldered in place on our exclusive shielded mother board that we call the Blitz Bus.

Available in an 8-, 12-, or 21-slot version.

CARD CAGE BUYER'S GUIDE					
Model	Dimensions (Inches)			Number of Slots	Price
	H	W	L		
CC-8	6 ⁵ / ₈	10 ⁷ / ₈	7	8	\$ 195
CC-12	6 ⁵ / ₈	10 ⁷ / ₈	10 ¹ / ₄	12	\$ 245
CC-21	6 ⁵ / ₈	10 ⁷ / ₈	16 ³ / ₄	21	\$ 395

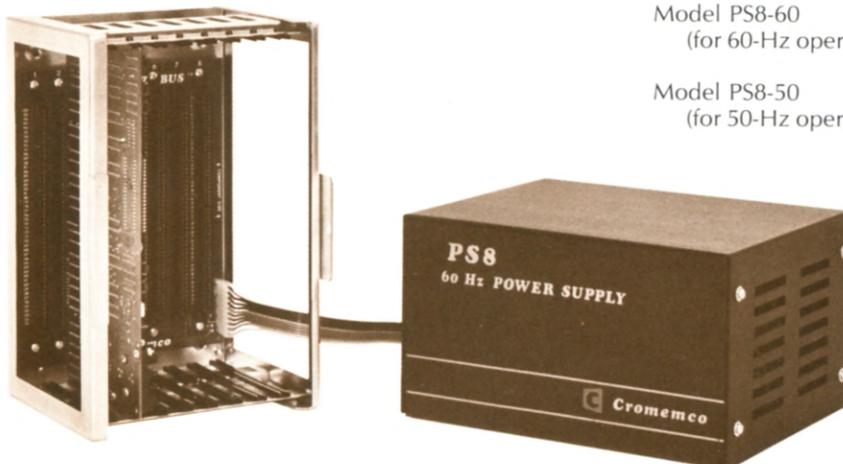
PS-8 Power Supply

A convenient power supply to use with our Model CC-8 card cage. Then plug in the circuit cards of your choice.

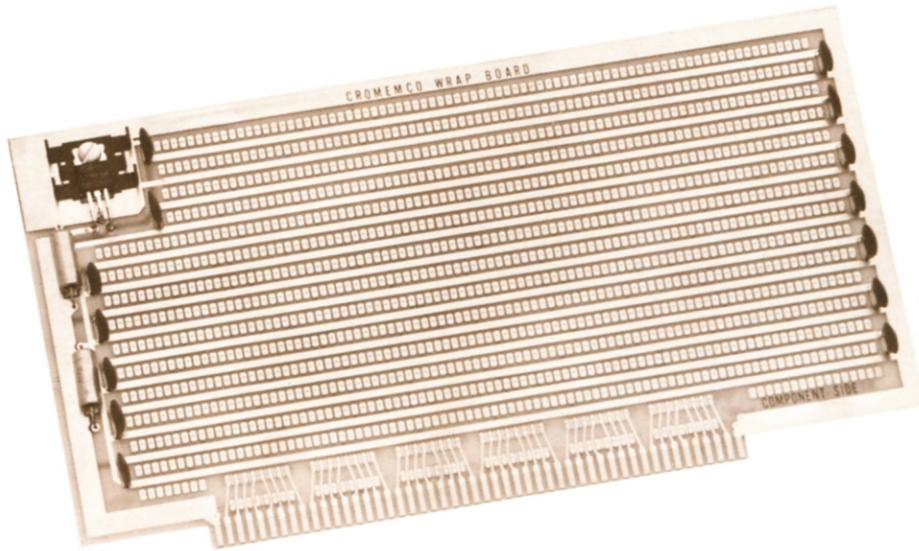
PRICES

Model PS8-60
(for 60-Hz operation)\$295

Model PS8-50
(for 50-Hz operation)\$295



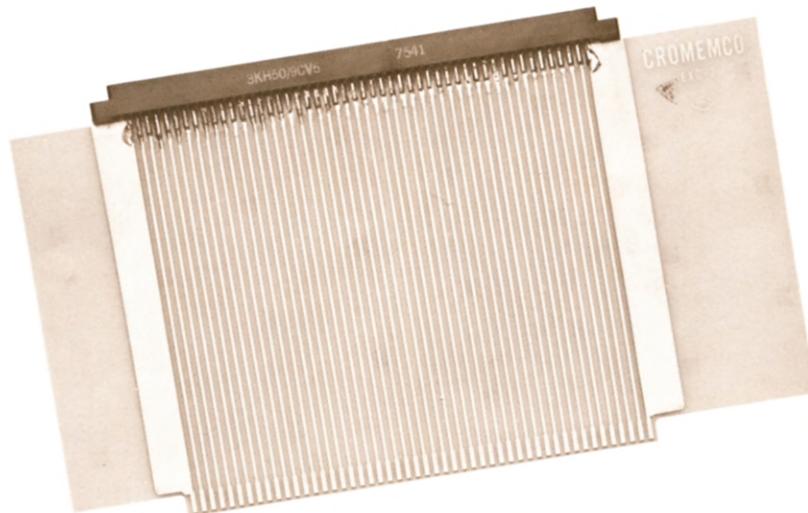
Wire wrap Extender cards



Wire Wrap Card

A high-quality wire wrap board for building your own cards for your computer. Will hold over 70 integrated circuits. A 5-volt power supply is included on the board. Uses tantalum decoupling capacitors and disk ceramic bypass capacitors. Edge contacts are gold-plated for long, trouble-free life.

	PRICE
Wire Wrap Board assembled (Model WWB) \$45



Extender Card

The card you need when experimenting with or troubleshooting your computer. Extends computer boards above case for easy connection of voltmeter, logic probe, or oscilloscope. Compatible with all S-100 boards. Edge contacts are gold plated for long, trouble-free life.

Connector is included (photo).

	PRICE
Extender Card assembled (Model EXC)	... \$45