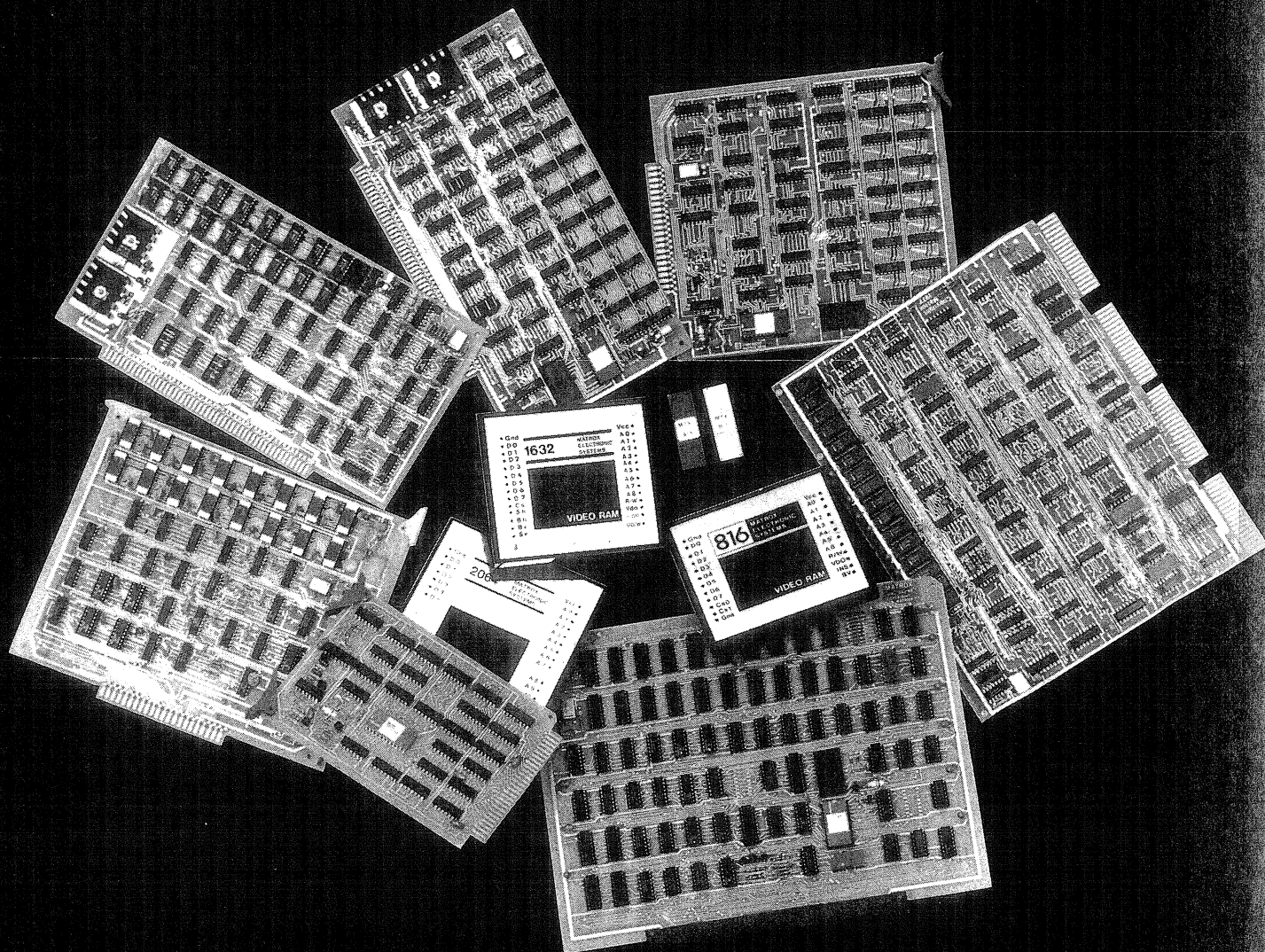


matrox

microprocessor displays



INTRODUCTION

Matrox Electronic Systems is a dynamic young electronics company. We have created a line of OEM display interface controllers that has grown along with the explosive microprocessor revolution. There are many companies specialized in data acquisition systems for microprocessors. Matrox is the only company specialized in display systems. We offer the most complete line of advanced CRT display controllers in the industry. The family of Matrox display controllers has been designed for maximum reliability, simplicity and lowest cost.

A majority of Matrox displays are designed for use with standard TV CRT monitors. Two main groups are alphanumeric and graphic video random access memories. A third type of display controller (the alpha chip) is designed for use with LED, fluorescent, gas discharge, incandescent etc. 5 X 7 dot matrix or multisegment type displays.

The controllers are available in different forms such as general purpose monolithic integrated circuits, plug-in modules or PC boards for any uP, plug-in boards for specific computer bus or uP or stand alone display systems.

Matrox offers numerous models which can be used in various combinations. A wide choice of display formats, character sets, TV standard, external/internal syncs, resolutions bus compatibility etc. allow the OEM user to build a display for any application at the lowest possible cost in the minimum of time.

For applications requiring special custom designs, Matrox has the capability to design and deliver prototype and production quantity display controllers according to customer specifications in a relatively short time.

OEM users have the option to manufacture their own display controllers under Matrox licence. After the user buys 200 units, Matrox will supply all schematics, artworks, specifications, and parts lists, for a flat one time charge. The OEM user can then use Matrox as a second source for his own production.

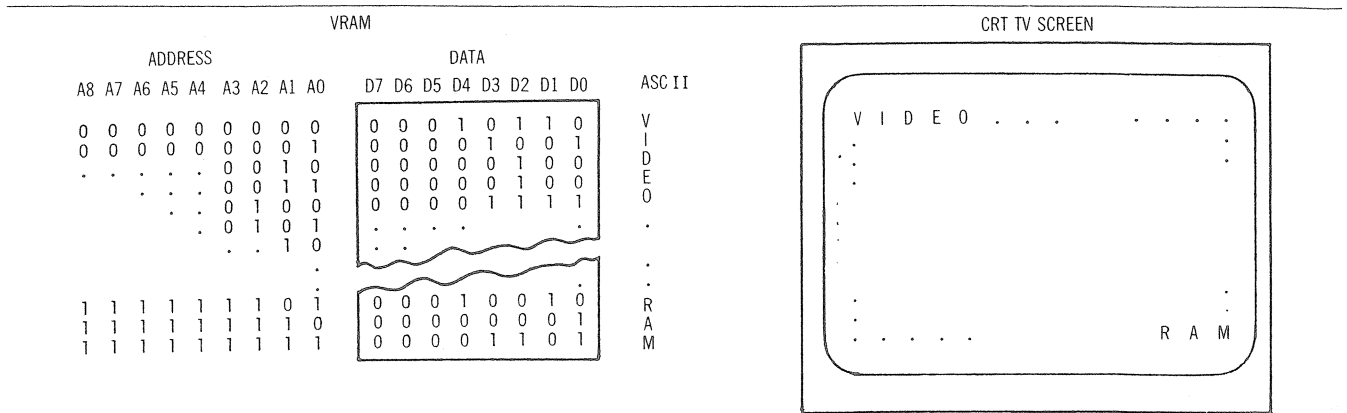
Matrox displays have been used in more than 10,000 installations in every imaginable application: from ground control displays for the Viking mission to Mars to hobby displays.

As an innovator in microcomputer displays, Matrox is fully committed to the design and manufacture of displays using the latest state of the art technology. We were the first to introduce VRAM concept to displays and we are the first to supply complete display controllers in a single chip.

Typical applications for Matrox OEM products include alphanumeric and graphics displays for sophisticated instruments and products such as scientific calculators, process control equipment, navigation equipment, medical instrumentation, industrial control, image processing, simulation, sophisticated video games, dumb or intelligent alphanumeric and/or graphics terminals, etc. The potential for application of Matrox display products is virtually unlimited.

ALPHANUMERIC VIDEO RAM'S

On the input side, an alphanumeric VRAM looks like a static random access memory and it can be directly connected to the address and data bus of a typical microprocessor system. The output is a video signal that produces a display of alphanumeric data on a TV monitor. Each character position on the screen is equivalent to a memory location. It can be written into and read out the same way as any other RAM in the microprocessor address space. The content of a video memory location determines the character to be displayed. Various display effects can be accomplished with the availability of the read/write feature. The full microprocessor instruction set including all memory reference instructions may be used for display data manipulation at full speed.

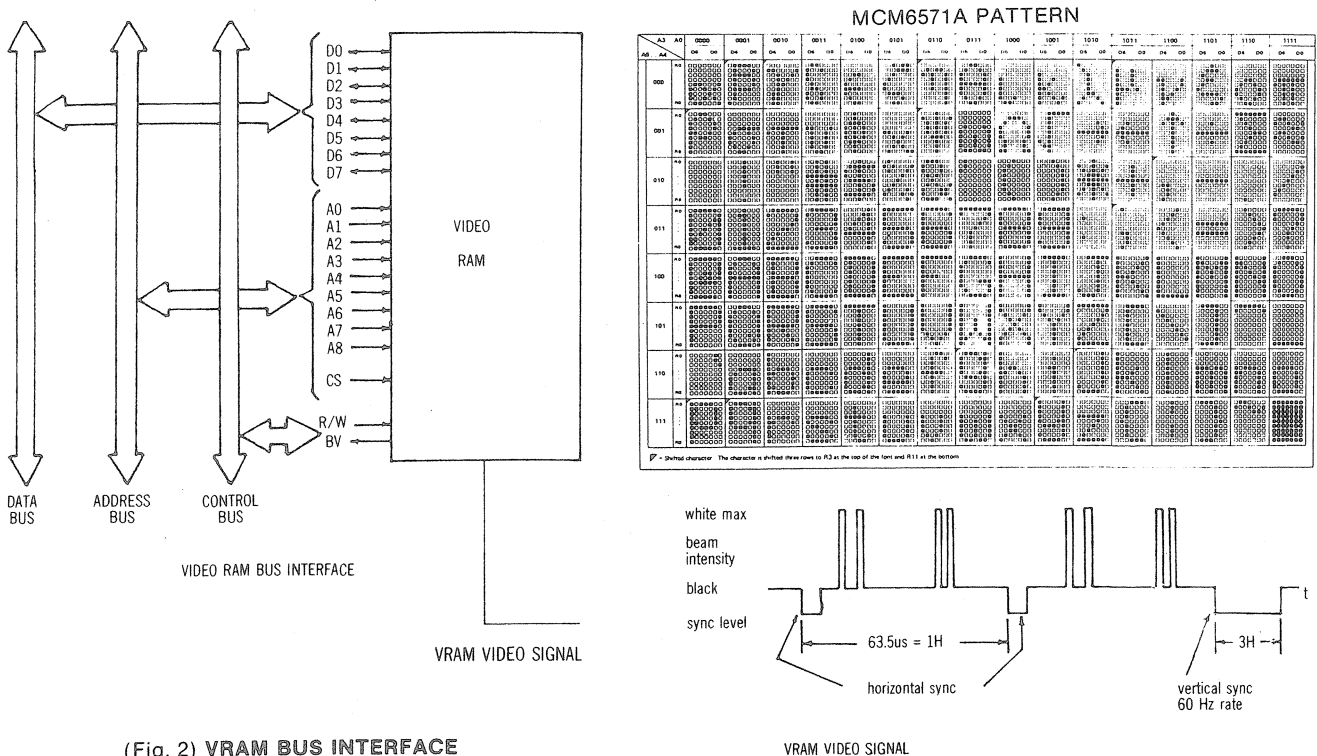


(Fig. 1) VRAM AND CRT ORGANIZATION

The VRAM bus interface shown in Figure 2 demonstrates the simplicity of interface to a typical bus system. Data, address and control lines can be connected without buffers. The CS (chip select) input is used to select the VRAM in microprocessor address space.

The CRT display is refreshed at a 60 Hz rate. However, there is no need for the CPU to refresh the VRAM; once written, a character is continuously displayed until a new character is rewritten into a location. This unique feature is a significant improvement over the commonly used DMA approach, since it requires no CPU time for refresh.

A VRAM produces a composite video signal which drives directly any standard TV monitor. A 75 ohm output impedance permits connection of a 75 ohm cable of up to 2,000 feet to drive up to 10 TV monitors.



(Fig. 2) VRAM BUS INTERFACE

MTX SERIES VRAM MODULES

The Matrox MTX series of VRAM TV CRT controller modules are designed for use in systems that require a display of alphanumeric data. The family is packaged in small self-contained modules to facilitate use as a component. It can be soldered or plugged in the user PCB. On the input side, an MTX VRAM looks like an ordinary 8 bit wide RAM and can be connected directly to the address and data bus of any bus organized system. MTX series VRAM modules are particularly suitable for use in microcomputer systems, due to their low cost, small size, modular packaging, single +5V power supply and ease of interface.

1. CRT DISPLAY CONTROLLERS (ALPHANUMERIC)

1.1 MODULES

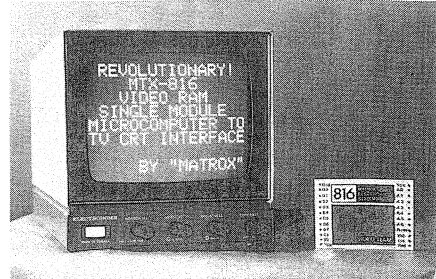
MTX-816

8X16 VIDEO RANDOM ACCESS MEMORY

The MTX-816 is a TV CRT controller designed for use in systems that require display of alphanumeric data. On the input side the device is directly connected to bus organized systems and looks like a 128x8 RAM. The output is a video signal which directly drives a TV monitor to provide an 8x16 field of 128 ASCII characters.

- organized as 128x8 RAM
- 8x16 display field
- no external refresh
- bidirectional data bus
- CMOS/TTL compatible
- access time 1 usec
- flicker free display
- single +5V power supply
- low power 800 mW
- ASCII font standard (5x7)
- standard video output
- drives up to 25 TV monitors
- remote display
- electronic intensity control

Price: \$179/single: \$149/100



Dimensions: 4" x 4.5" x .5" plug-in module

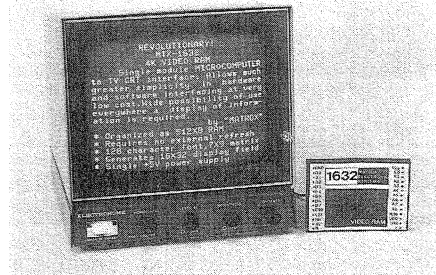
MTX-1632

16X32 VIDEO RANDOM ACCESS MEMORY

The MTX-1632 is a TV CRT controller designed for use in systems that require display of alphanumeric data. On the input side the device is directly connected to bus organized systems and looks like a 512x8 RAM. The output is a video signal which directly drives a TV monitor to provide a 16x32 field of 512 ASCII characters.

- organized as 512x8 RAM
- 16x32 display field
- no external refresh
- bidirectional data bus
- TTL compatible
- access time 550 ns
- flicker free display
- single +5V power supply
- low power
- ASCII font standard (7x9)
- standard video output
- drives up to 25 TV monitors
- character blinking
- electronic intensity control
- upper/lower case

Price: \$225/single: \$169/100



Dimensions: 4" x 4.5" x .5" plug-in module

MTX-1632SL

EXTERNALLY SYNCHRONIZED 16X32 VIDEO RANDOM ACCESS MEMORY

The MTX-1632SL is a TV CRT controller designed for use in systems that require display of alphanumeric data. On the input side the device is directly connected to bus organized systems and looks like a 512x8 RAM. The output is a video signal which directly drives a TV monitor to provide a 16x32 field of 512 ASCII characters. The device can be slave locked to an external source (TV sync. generator).

- external synchronization
- organized as 512x8 RAM
- 16x32 display field
- bidirectional data bus
- TTL compatible
- access time 550 ns
- broadcasting applications
- single +5V power supply
- ASCII font standard (7x9)
- standard video output
- drives up to 25 TV monitors
- character blinking
- upper/lower case

Price: \$225/single: \$169/100



Dimensions: 4" x 4.5" x .5" plug-in module

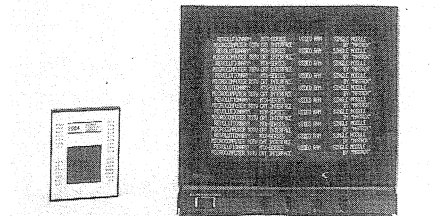
MTX-2064

20X64 VIDEO RANDOM ACCESS MEMORY

The MTX-2064 is a TV CRT controller designed for use in systems that require display of alphanumeric data. On the input side the device is directly connected to bus organized systems and looks like a 1280x8 RAM. The output is a video signal which directly drives a TV monitor to provide a 20x64 field of 1280 ASCII characters.

- organized as 1280x8 RAM
- 20x64 display field
- no external refresh
- bidirectional data bus
- TTL compatible
- access time 550 ns
- flicker free display
- single +5V power supply
- low power
- ASCII font standard (7x9)
- standard video output
- drives up to 25 TV monitors
- character blinking
- electronic intensity control
- upper/lower case

Price: \$295/single: \$190/100



Dimensions: 4.5" x 6" x .5" plug-in module

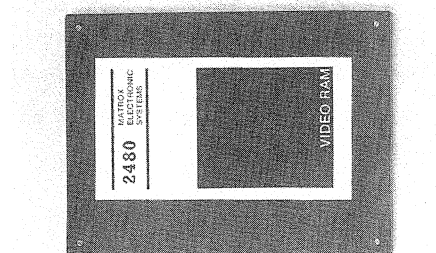
MMD-2480

24X80 VIDEO RANDOM ACCESS MEMORY

The MMD-2480 is a TV CRT controller designed for use in systems that require display of alphanumeric data. On the input side the device is directly connected to bus organized systems and looks like a 4Kx8 RAM. The output is a video signal which directly drives a TV monitor to provide a 24x80 field of 1920 ASCII characters.

- organized as 4Kx8 RAM
- 24x80 display field
- no external refresh
- bidirectional data bus
- TTL compatible
- access time 500 ns
- flicker free display
- single +5V power supply
- external sync. option
- ASCII font standard
- standard video output
- drives up to 25 TV monitors
- character blinking
- upper/lower case/graphics

Price: \$395/single: \$290/100



Dimensions: 4.5" x 6" x .5" plug-in module

PLUG-IN PC BOARDS

ALPHANUMERIC CONTROLLERS

A series of plug-in alphanumeric CRT controller PC boards for most industry standard buses is available. This OEM display controller plugs-in directly into the computer bus and provides a video signal which directly drives a CRT monitor. All interface electronics, refresh memory and TV scanning is built-in. Each board has a variety of options and features which can be user programmed by jumpers. Matrox video boards allow the system designer to add display to his system in the shortest possible time at a very low cost. Software packages are also available.

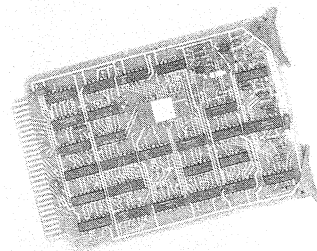
MTX-1664SL

EXTERNALLY SYNCHRONIZED 16X48 OR 16X64 VIDEO RANDOM ACCESS MEMORY

The MTX-1664SL is a TV CRT controller designed for use in systems that require display of alphanumeric data. On the input side the device is directly connected to bus organized systems and looks like a 1024x8 RAM. The output is a video signal which directly drives a TV monitor to provide a 16X64 field of 1K ASCII characters. The device can be slave locked to an external source (TV sync. generator).

- external synchronization
- organized as 1Kx8 RAM
- 16X64 display field or 16X48 display field
- bidirectional data bus
- TTL compatible
- access time 500 ns
- broadcasting applications
- single +5V power supply
- low power
- ASCII font standard (7x9)
- standard video output
- drives up to 25 TV monitors
- character blinking

Price: \$295/single: \$190/100



Dimensions: Prolog bus plug-in PCB; 4.5" x 6.5" PCB

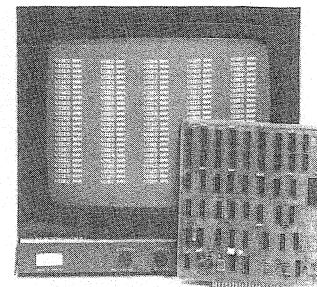
MTX-2480

24X80 VIDEO RANDOM ACCESS MEMORY

The MTX-2480 is a TV CRT controller designed for use in systems that require display of alphanumeric data. On the input side the device is directly connected to bus organized systems and looks like a 4096x9 RAM. The output is a video signal which directly drives a TV monitor to provide a 24x80 field of 1920 ASCII characters.

- organized as 4096x9 RAM
- 24x80 display field
- no external refresh
- bidirectional data bus
- TTL compatible
- access time 500 ns
- flicker free display
- single +5V power supply
- low power
- ASCII font standard
- standard video output
- half intensity
- character blinking
- inverse video

Price: \$395/single: \$290/100



Dimensions: 7" x 7.5" PCB/44 pin conn.

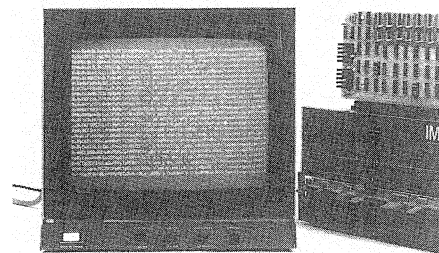
ALT-2480

24X80 VIDEO RANDOM ACCESS MEMORY (S-100 BUS)

The ALT-2480 is a TV CRT controller designed especially for the industry standard S-100 bus. It is used in systems that require a display of alphanumeric data. On the input side, the device is directly connected to an S-100 bus organized system and looks like a 4096x8 static RAM with an access time of 500 ns. The output is a video signal which directly drives a TV monitor to provide a 24x80 field of 1920 ASCII characters. A software package, MTX-ALPHA, is available for use with the ALT-2480 to emulate an intelligent terminal.

- organized as 4096x8 RAM
- 24x80 display field
- no external refresh
- bidirectional data bus
- TTL compatible
- access time 500 ns
- flicker free display
- standard video output
- single +5V power supply
- low power
- ASCII font 5x7 or 7x9
- option of lower case characters
- character blinking
- inverse video
- drives up to 10 TV monitors
- can combine with the ALT-256 to produce a combined alphanumeric and graphic display

Price: \$295/single: \$265/100



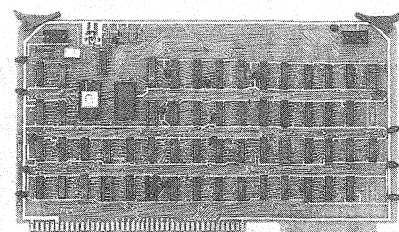
Standard S-100 bus size (5.3" x 10")

MSBC-2480 24X80 VIDEO RANDOM ACCESS MEMORY (SBC-80)

The MSBC-2480 is a TV CRT controller designed especially for the industry standard Intel SBC-80 bus. It is used in systems that require a display of alphanumeric data. On the input side, the device is directly connected to an SBC-80 bus organized system and looks like a 4096x8 static RAM with an access time of 500 ns. The output is a composite video signal which directly drives a TV monitor to provide a 24x80 field of 1920 ASCII characters. A software package, MTX-ALPHA, is available for use with the MSBC-2480 to emulate intelligent terminals (Lear Siegler ADM-3A and DEC DECSCOPE VT-52).

- plugs directly in SBC-80 bus
- 32 lines x 80 characters
- upper/lower case, graphics
- memory mapped (VRAM)
- built-in refresh memory
- user programmable character generator (2716 EPROM)
- external/internal sync
- looks like 4Kx8 RAM
- built-in ASCII keyboard interface
- normal/inverse/blink
- drives TV monitor directly
- software control
- single +5V power supply, .9A
- hardware scroll
- 500 nsec access time
- can be combined with MSBC-512x512 graphics

Price: \$495/single: \$350/100



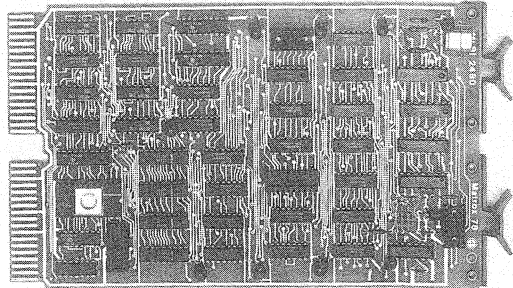
Standard SBC-80 size card (6.75" x 12")

MLSI-2480 24X80 VIDEO RANDOM ACCESS MEMORY (LSI-11 BUS)

The MLSI-2480 provides an alphanumeric video interface between an LSI-11 bus microcomputer and a TV monitor. It outputs the industry standard 24 line by 80 character display which is invaluable for professional applications such as an intelligent CRT terminal and word processor. The MLSI-2480 is compatible with the MLSI-512 graphics interface board, permitting a powerful combined alphanumeric/graphics display.

- plugs directly in LSI-11 bus
- 24 lines X 80 characters
- upper/lower case/graphics
- byte mapped (4K X 8)
- built-in R/W refresh memory
- user programmable character generator (2716 EPROM)
- full software control
- external/internal sync
- normal/inverse control
- drives TV monitor directly
- dual size
- 500 nsec access time
- can be combined with MLSI-512 X 512 graphics

Price: \$495/single; \$350/100 Standard Dual LSI-11 card

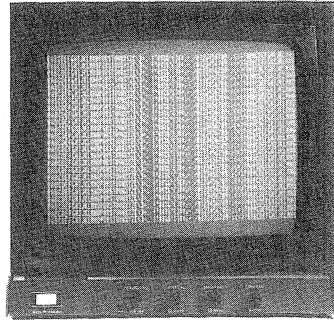


MDC-2480 24X80 VIDEO RANDOM ACCESS MEMORY (PDP-11 BUS)

The MDC-2480 provides an alphanumeric video interface between a PDP-11 bus microcomputer and a TV monitor. It outputs the industry standard 24 line X 80 character display which is invaluable for professional applications such as an intelligent CRT terminal and word processor. The MDC-2480 is compatible with the MDC-512 graphics alphanumeric/graphics display.

- plugs directly in PDP-11 bus
- 24 lines X 80 characters
- upper/lower case/graphics
- byte mapped (4K X 8)
- built-in R/W refresh memory
- user programmable character generator (2716 EPROM)
- full software control
- external/internal sync
- normal/inverse control
- drives TV monitor directly
- quad size
- 500 nsec access time
- single +5V, .9A
- can be combined with MDC-512 X 512 graphics

Price: \$495/single; \$350/100 Standard Quad PDP-11 card



GRAPHICS CRT CONTROLLERS

Each graphic VRAM has several registers of varying length. The registers are used to store parameters of the currently addressed dot such as X-Y coordinates, color or intensity, as well as commands such as clear display, scroll, vector plot, etc. A memory mapped I/O technique is used to address registers. This means that each register looks to the CPU like a RAM location. This feature allows extremely simple hardware and software interfacing since the graphic display can be interfaced to the CPU as a 4 or 8 location x 8 or 16 bit wide RAM. The use of an X-Y addressing scheme permits addressing up to 262,000 on board refresh memory bits using only two computer memory locations.

All Matrox graphic video RAM's are designed such that multiple units can be combined for color/grey scale applications. The Matrox graphic VRAM's are divided into two main subgroups: the 256 family and the 512 family. The 256 family is designed for lowest cost with a 256 x 256 dot matrix resolution. The 512 family incorporates a revolutionary variable resolution feature which permits user selection of 256 x 256; 256 x 512; 512 x 512; and 256 x 1025 dot matrix displays. The design is available for a number of popular buses.

2. CRT DISPLAY CONTROLLERS (GRAPHICS)

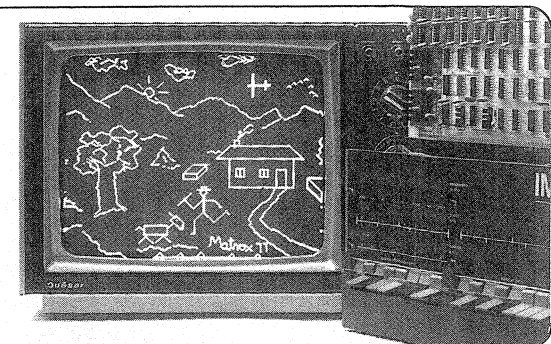
ALT-256 256X256 GRAPHIC DISPLAY CONTROLLER (S-100 BUS)

The ALT-256, directly plug compatible with the S-100 bus contains all interface electronics, a TV sync generator and its own 65,536 X 1 bit refresh memory. It outputs a composite video which can be connected to any TV monitor or the video portion of a TV set. The unit produces a high resolution 256 X 256 dot raster. The ALT-256 can combine with the ALT-2480 to produce a powerful combined alphanumeric/graphics display.

A software package, MTX-GRAPH, is available for use with the ALT-256.

- 256 X 256 dot raster
- each dot individually addressed
- refresh memory (64K X 1) built-in
- single instruction erase
- 3.4 us max/dot write time
- external/internal sync
- multiple boards stackable for color/grey scale applications
- powerful X-Y addressing
- American/European TV standard
- can be combined with ALT-2480
- low cost

Price: \$395/single \$355/100 Standard S-100 bus size

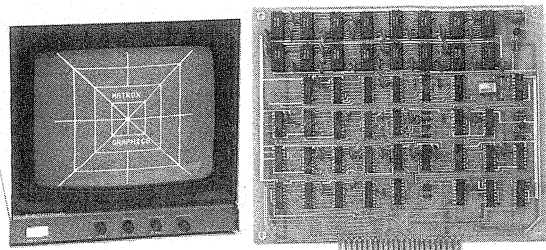


MTX-256 256X256 GRAPHIC DISPLAY CONTROLLER (GENERAL PURPOSE)

The MTX-256*2 is a unique modular graphics system designed for direct interfacing with any mini or microcomputer bus. On the input side, the device looks like a 4 location X 8 bit static random access memory. The output is a composite video signal which directly drives commercial TV monitors to provide a 256 X 256 dot raster. Multiple boards can be used for color/grey scale applications. External/internal sync capability is provided. The graphics can be mixed with an alphanumeric VRAM (such as the MTX-1632SL or the MTX-2480, etc.) to obtain full alphanumeric/graphics capability.

- 256 X 256 dot raster
- directly interfaces to any microprocessor
- drives a standard TV monitor
- expansion to color/grey scale
- modular form
- individually addressed dots
- 3.6 usec cycle time/dot
- vector/point plot
- no external refresh
- erase screen capability
- graphics/alphanumeric
- flicker free display
- remote display
- American/European TV standard
- TTL compatible
- +5V, +12V power supply
- low power 5W
- low cost

Price: \$595/single \$495/100 8.5" X 7", 44 pin dual connector

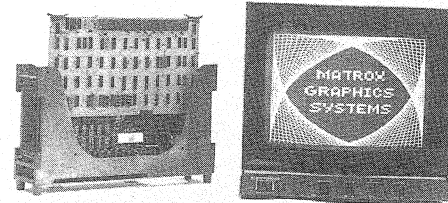


MSBC-512 VARIABLE RESOLUTION GRAPHICS CONTROLLER (SBC-80 BUS)

The MSBC-512 incorporates the revolutionary concept of variable resolution graphics on a single card. The MSBC-512 is directly plug-in compatible with the industry standard Intel SBC-80 bus. The same card can be user programmed to produce a dot matrix of 256 X 256; 256 X 512; 512 X 512; or 256 X 1024 points by using 4K, 8K, or 16K plug-in compatible dynamic memories.

- variable resolutions
- multiple cards stackable for color/grey scale applications
- single command erase
- vertical scroll built-in
- external/internal sync
- can be combined with the alphanumeric MSBC-2480
- display memory read/write
- each dot individually addressed
- 1.4 usec max/dot access time
- X-Y addressing
- American/European standard
- software package available

Price: \$1395/single; \$1150/100 512 x 512; 256 x 1024, \$895/single; \$659/100 256 x 256, \$1095/single; \$850/100 256 x 512



Standard SBC-80 size board (12" x 6.75")

MLSI-512 VARIABLE RESOLUTION GRAPHICS CONTROLLER (LSI-11 BUS)

The MLSI-512 incorporates the revolutionary concept of variable resolution graphics on a single card. The MLSI-512 is directly plug-in compatible with the industry standard LSI-11 bus. The same card can be user programmed to produce a dot matrix of 256 X 256; 256 X 512; 512 X 512; or 256 X 1024 points by using 4K, 8K or 16K plug-in compatible dynamic memories.

- variable resolutions
- multiple cards stackable for color/grey scale applications
- single command erase
- vertical scroll built-in
- external/internal sync
- can be combined with the alphanumeric MLSI-2480
- display memory read/write
- each dot individually addressed
- 1.4 usec max/dot access time
- X-Y addressing
- American/European standard
- software package available

Price: \$1395/single; \$1150/100 512 x 512; 256 x 1024, \$895/single; \$650/100 256 x 256, \$1095/single; \$850/100 256 x 512



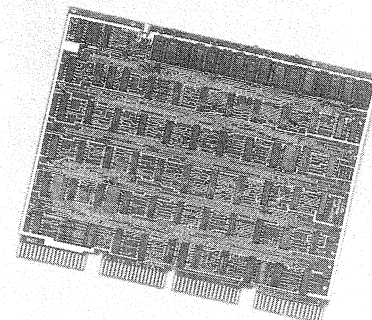
Standard LSI-11 size board (quad) (8.5" x 10.45")

MDC-512 VARIABLE RESOLUTION GRAPHICS CONTROLLER (PDP-11 BUS)

The MDC-512 incorporates the revolutionary concept of variable resolution graphics on a single card. The MDC-512 is directly plug-in compatible with the industry standard DEC PDP-11 bus. The same card can be user programmed to produce a dot matrix of 256 X 256; 256 X 512; 512 X 512; or 256 X 1024 points by using 4K, 8K or 16K plug-in compatible dynamic memories.

- variable resolutions
- multiple cards stackable for color/grey scale applications
- single command erase
- vertical scroll built-in
- external/internal sync
- can be combined with the alphanumeric MDC-2480
- display memory read/write
- each dot individually addressed
- 1.4 usec max/dot access time
- X-Y addressing
- American/European standard
- software package available

Price: \$1395/single; \$1150/100 512 x 512; 256 x 1024, \$895/single; \$650/100 256 x 256, \$1095/single; \$850/100 256 x 512



Standard PDP-11 size board (quad) (8.5" x 10.45")

RGB-256 SINGLE BOARD 256 X 256 X 4 COLOR CONTROLLER (SBC-80 OR GENERAL PURPOSE)

The RGB-256 is a single board graphic controller which displays a 256 X 256 raster with 4 bits/pixel. All refresh memory is built-in. The board can be used for a variety of graphic systems such as a 256 X 256, 16 level grey or a 16 color display. Each dot is individually addressed and it can be read or written into in less than 1.2 usec/dot.

- 256 X 256 X 4 raster
- 16 level color (RGB)
- composite color output
- 16 level grey scale
- composite grey scale output
- American/European standard
- external/internal sync
- expansion for multiple boards for more bits/pixel
- can be combined with optional frame grabber card for frame grabbing applications
- plugs directly into an SBC-80 type computer
- can be used with any uP
- single instruction clear
- broadcast application
- image processing

Price: \$1595/single; \$1250/100 256 x 256 x 4, \$995/single; \$680/100 256 x 256 x 1



Stretched SBC-80 board (8" x 12")

CRT DISPLAY CONTROLLERS (ALPHA AND GRAPH) COMBINED

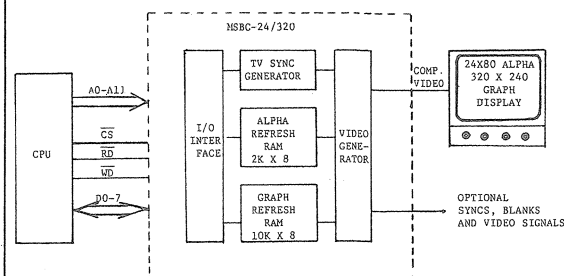
MSBC-24/320 SINGLE BOARD 24 X 80 ALPHANUMERIC AND 320 X 240 GRAPHIC DISPLAY

The MSBC-24/320 is an SBC-80 bus compatible VRAM that integrates an alphanumeric and graphic display on the same printed circuit board. The alphanumeric section outputs a full 24 lines X 80 column text display. The graphic portion generates a dot raster of 240 X 320 dots. The graphic and alphanumeric displays are aligned and scaled to occupy the same screen area. On the input side, the card looks like a 4096 X 8 static read/write RAM with an access time of 500 ns. By being a part of the memory, the full power of the processor is available for display manipulations. Each alphanumeric character position on the screen corresponds to a unique memory location, whereas, graphic data is addressed as 8-bit wide segments. The board can easily be interfaced to any micro or mini computer.

- alphanumeric and graphic display on a single board
- 24 lines X 80 columns alphanumeric
- 320 X 240 dot raster graphics
- normal/inverse; on/off video control
- single +5V power supply
- 2716 EPROM character generator
- external/internal sync
- SBC-80 plug-in or general purpose
- refresh 12K X 8 static RAM built-in (read/write, 500 ns)
- American/European standard non-interlaced
- upper/lower case

Price: \$1395/single; \$1150/100

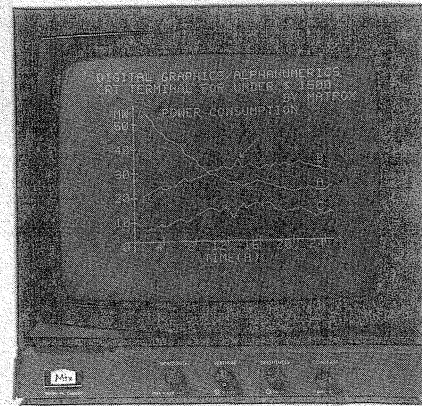
SINGLE BOARD 24 X 80 ALPHANUMERIC AND 320 X 240 GRAPHIC DISPLAY



Stretched SBC-80 card size (8" x 12")

COMBINED ALPHA/GRAPH BOARDS

In addition to using single board alpha/graph combination (MSBC-24/320), the unique Matrox design allows for any combination of graphic and alphanumeric controllers. Since each VRAM has a built-in TV sync generator which can be either externally or internally synchronised, video combination can be generated by selecting one of the controllers as a master and synchronising the rest to the master. Typical combinations are the ALT-2480 and ALT-256; the MTX-2480 and MTX-256; the MSBC-2480 and MSBC-512; the MLSI-2480 and MLSI-512; etc. Module VRAMs can also be synchronised to graphics boards if required.



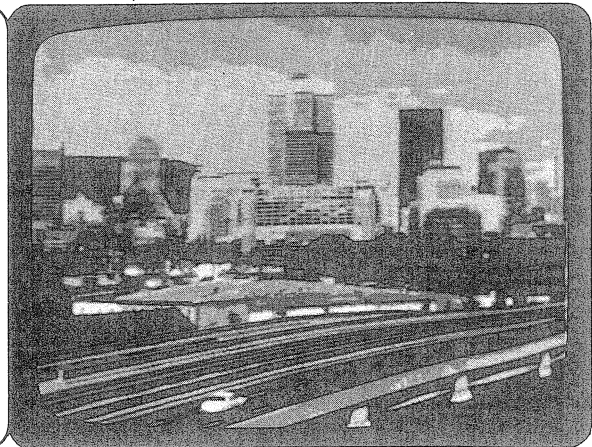
COLOR CRT CONTROLLERS

COMBINED BOARDS

The simplest graphic color system can be obtained by producing three separate video signals which then directly drive the red, green and blue guns of a color monitor. Up to a maximum of 24 graphic cards can be used in a master slave configuration to generate the red, blue and green inputs for the RGB monitor. The master card will supply three signals to all slaves: Dot clock, horizontal and vertical reset. Each card generates one bit of video information which can be used to produce a grey scale or color video signal. Typical graphic cards which can be used in this configuration include the ALT-256, MTX-256, MSBC-512, MLSI-512 and the MDC-512.

Outputs of these boards can be combined via a D/A converter for each color to obtain 2ⁿ colors (N-number of boards). Additional RGB encoder circuits can be built to obtain composite color video if required.

The single board RGB-256 provides 4 bits per card, and can be used if 16 colors are required.



SINGLE CHIP DISPLAY/KEYBOARD CONTROLLERS

Matrox has introduced the first two chips in its single chip I/O controller family. They are alphanumeric display/keyboard controllers and are intended to drive a wide variety of the displays presently available on the market in either 5 X 7 dot matrix (MTX-A1) or 7, 14, 16 segment (MTX-B1) configurations (LED, Liquid X-tals, flourescent, incandescent, gas discharge, etc.).

The controllers are monolithic NMOS, LSI circuits packaged in a standard 40 pin DIP. They have a single +5V power supply and interface directly to any uP through an 8 bit bi-directional bus.

The I/O controller provides all timing and refresh signals for driving up to 32 character displays. An ASCII character generator ROM (64 X 5 X 7 -MTX-A1 and 64 X 16 -MTX-B1) is built-in as well as 32 X 8 refresh RAM. The keyboard portion provides all the scanning signals, debounce and decoding for any keyboard with up to 64 keys (X-Y or common pole).

Many intelligent commands such as clear display, shift left/right, cursor control, blink, read/write, etc., are featured. Display parameters such as refresh rate, display length, etc., are user programmable.

Typical applications are uP controlled instruments, equipment, POS terminals, electronic scales.

The Matrox single chip I/O controller represents a breakthrough in display technology by providing a complete intelligent alphanumeric display and keyboard controller in a single LSI chip.

Complete assembled OEM displays are also available. They consist of single chip controller, LED displays, all driving and interface electronics and mounting hardware and filter on a small PCB. (8" X 3.25").

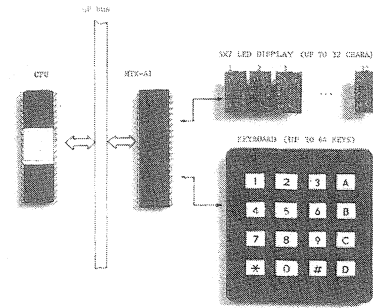
MTX-A1

ALPHANUMERIC (DOT) DISPLAY/KEYBOARD CONTROLLER

The MTX-A1 is a general purpose programmable alphanumeric display and keyboard interface device for use with any 8-bit microprocessor such as the 8080A, 6800, etc. The display portion provides all timing and refresh signals to drive up to 32 popular 5X7 dot matrix LED displays. The keyboard portion provides all scanning signals and debounces and decodes any keyboard with up to 64 keys. The single chip controller interfaces directly to the uP via the uP data bus. Many intelligent commands for display and keyboard manipulation are incorporated.

- Single chip controller
- drives up to 32 5X7 LED
- 64 ASCII character set
- character generator ROM (64X5X7) built-in
- refresh 32 X 8 RAM built-in
- no external refresh required
- self-test built-in
- scans up to 64 keys
- interface to any uP directly
- all parameters programmable
- single +5V, 60 mA
- low power
- many intelligent commands

Price: \$49/single; \$39/100, \$12/10K



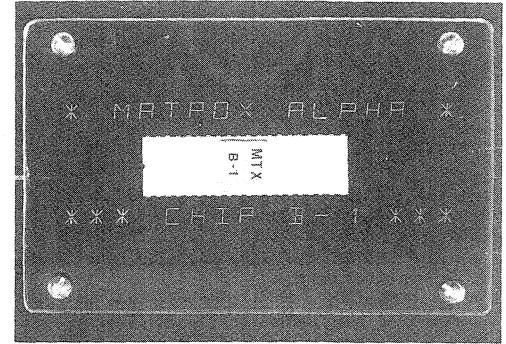
MTX-B1

ALPHANUMERIC (SEGMENT) DISPLAY/KEYBOARD CONTROLLER

The MTX-B1 is a general purpose programmable alphanumeric display and keyboard interface device for use with any 8-bit microprocessor such as the 8080A, 6800, etc. The display portion provides all timing and refresh signals to drive up to 32 popular segment (from 7 to 16) displays. The keyboard portion provides all scanning signals and debounces and decodes any keyboard with up to 64 keys. The single chip controller interfaces directly to the uP via the uP data bus. Many intelligent commands for display and keyboard manipulation are incorporated.

- single chip controller
- drives up to 32 displays
- 7 to 16 segment displays
- LED, plasma, fluorescent, gas discharge, incandescent, etc.
- common anode/cathode
- alphanumeric 16 segment character generator built-in
- refresh 32X8 RAM built-in
- dual scan mode
- doubles duty cycle
- scans up to 64 keys
- interfaces to any uP directly
- all parameters programmable
- single +5V, 60 mA

Price: \$49/single; \$39/100, \$12/10K



COMPLETE LED DISPLAYS

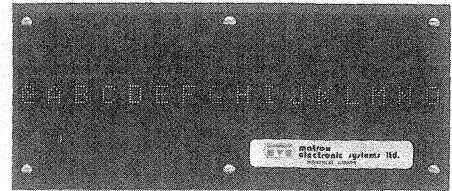
MTX-A2

COMPLETE OEM 16 CHARACTER ALPHANUMERIC DISPLAY (5X7 LED)

The MTX-A2 is a complete ready to use 16 character alphanumeric display for OEM. It contains all drivers, an MTX-A1 display controller and 16 alphanumeric .35" LED displays. All data signals are brought to a 44 pin connector.

- complete 16 character display
- expansion to 32 characters
- interfaces directly to any uP
- MTX-A1 single chip controller
- mounting hardware/red filter included
- \$180 without LEDS/\$280 with LEDS
- single +5V, 800 mA power supply
- variable intensity
- scans up to 64 keys
- all solid state
- 22 intelligent commands

Price: \$280/single; \$230/100

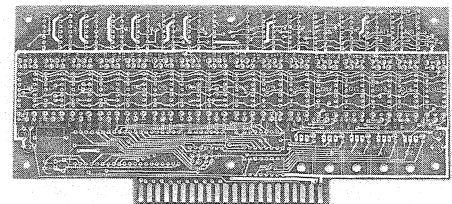


Dimensions: 8" X 3.25" PCB

MTX-A2 EXD

The MTX-A2 EXD is a blank PC board which can be used for various applications. By plugging in 16 LEDS and shift registers, the MTX-A2 EXD can be used to expand the MTX-A2 to a 32 digit display (the MTX-A1 and the display drivers from the MTX-A2 will drive the additional LEDS). For applications requiring large characters (up to 3"), the user can plug in the MTX-A1 chip and the display drivers and build his own large 5 X 7 alpha LED display using discrete LEDS.

Prices: Blank PCB only. \$28/single, LEDS & SHR \$200, MTX-A1 & drivers \$95



Dimensions: 8" X 3.25" PCB

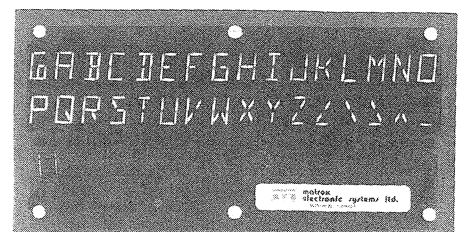
MTX-B2

COMPLETE OEM 32 CHARACTER ALPHANUMERIC DISPLAY (14 SEG)

The MTX-B2 is a complete ready to use 32 character alphanumeric display using large .5", 14 segment LEDS. All drivers, LEDS and the MTX-B1 controller are included. The maximum number of characters is 32 organised in 2 lines of 16 each. However, any display format from 1 to 32 can be used by plugging in the required number of LEDS and initializing the MTX-B2 chip. Keyboard scan signals are brought out on the connector for keyboard scanning.

- complete 32 character display
- interfaces directly to uP
- MTX-B1 single chip controller
- mounting hardware/filter included
- 2 lines X 16 characters
- modular 1 to 32 character display
- single +5V power supply
- user adjusted brightness
- scans up to 64 keys
- large .5 inch LEDS (MTX-14SD)
- all solid state
- 22 intelligent commands

Prices: MTX-B2 (32) [with 32 LEDS] \$380/single; \$285/100
MTX-B2 (16) [with 16 LEDS] \$280/single; \$195/100



Dimensions: 8" X 3.75"

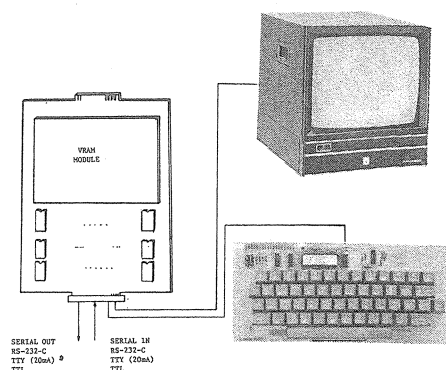
ACCESSORIES

SI-ABCD SERIAL INTERFACE ADAPTER BOARD

Serial interface adapter board (SI) allows the user to build a variety of low cost terminals with standard serial interface. By adding an ASCII keyboard, TV monitor and any of Matrox VRAM modules or boards, a versatile low cost CRT terminal with different screen formats can be built.

- serial interface (user selectable) RS-232-C; TTY (20mA, 60mA); TTL
- user selectable baud rate: 110, 150, 300, 600, 1200, 2400, 4800, 9600
- works with any Matrox video RAM; MTX-816, -1632, -1632SL, -1648/64SL, -2064, -2480
- accepts ASCII keyboard inputs (8 bits and strobe)
- drives directly TV monitors, composite video, or separate video and syncs
- all video and baud rate signals X-tal controlled
- accepts CR (carriage return); LF (line feed) and clear screen commands
- external clear screen command
- synchronised VRAM writing; no flicker during VRAM write
- can be used as serial write only terminal (no keyboard)

Price: \$120/single; \$98/100



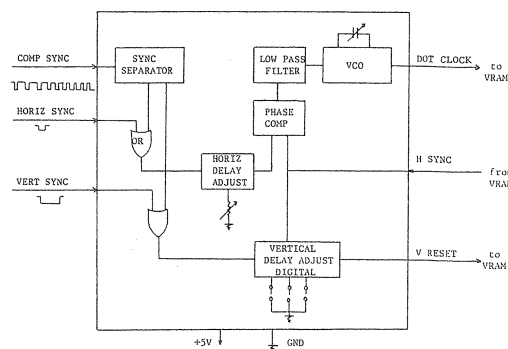
Dimensions: 7" X 9" including VRAM

PLL-01 EXTERNAL SYNC PHASE LOCK LOOP MODULE FOR VRAMS

The PLL-01 is a 2.5" X 3" plug in module intended for use with the alphanumeric and graphic VRAMs requiring external sync capabilities. This module allows the user to synchronise any VRAM to a TV camera, master sync generator, etc., for various applications requiring video mixing.

The module requires a single +5V power supply and interfaces directly to the VRAM. (the VRAM is operating in the slave mode). The PLL-01 will accept either composite or separate syncs. The user can adjust the horizontal and vertical delay. This allows the user to position the VRAM video picture relative to the external syncs.

Price: \$48/single; \$38/100

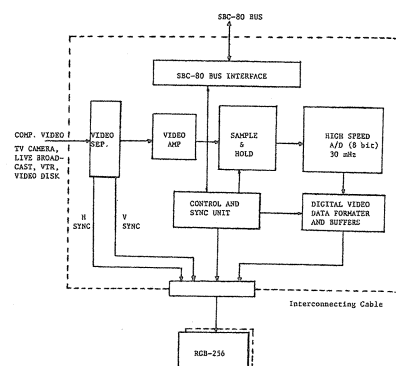


Dimensions: 2.5" X 3"

FG-01

The FG-01 is a frame grabber card used in combination with the RBG-256 single board CRT controller. The grabber plugs into the INTEL SBC-80 bus and allows the CPU to grab a single frame of a standard TV signal. The board contains a high speed 8 bit A/D converter, and all logic required to interface with the RBG-256 card.

- grabs single TV frame
- CPU grab control
- American/European standard
- 4 bit/8 bit grey scale
- lowest cost complete video system
- broadcast quality
- can be used with any computer
- wide range of application

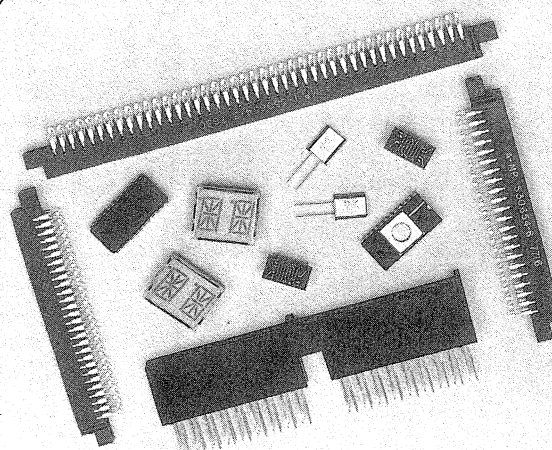


Dimensions: 6.75" X 12"

HARDWARE ACCESSORIES

MBC-01	Blank prototype board (SBC-80 or general purpose)	\$68	\$54
MTX-305	5X7 LED display (TIL-305 equivalent)	\$ 7.5	\$ 6.5
MTX-14SD	Dual (2 digit) 14 seg. alphanumeric LED display	\$ 9.5	\$ 7.8
VCB-75	75 Ohm coax video cable (price/foot)	\$ 1.5	
X-tal	X-tal (for different TV standards)	\$10	
CHG	Character generator (alpha. CRT controllers)	\$20	
MS-BAR	Socket bars for alphanumeric modules	\$ 4	
CON-44	44-pin connector (530654-6)	\$ 5	
CON-50	50-pin connector (MP-0100-25-DP-1)	\$ 6	
CON-56	56-pin connector (530664-6)	\$ 6	
CON-86	86-pin connector (1-530654-3) for SBC-80 boards	\$ 9	
CON-DEC	DEC connector (for LSI-11 and PDP-11 boards) (H8030)	\$15	

Price reference: First price per every 1 — Second price per every 100



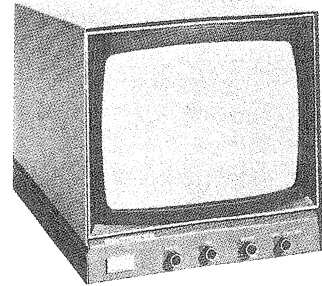
CRT MONITORS

MCRT-9, MCRT-14/MCRT-14G

The MCRT-9 and MCRT-14 are 9" and 14" (black/white; P4 phosphor) solid state video monitors which have been built to international standards as established by the communications and computer industries. The MCRT-14G is similar to the MCRT-14 except that it has green phosphor (P39). These high quality monitors can be used with any of the Matrox CRT controllers.

- internal/external sync capability
- A/B video input selection
- VTR time constant switching
- pilot lamp/tally lamp
- 75 Ohm termination switch (A&B)
- UL/CSA approved
- switchable power supply 110/220V Hi Lo line 90-132V
- 15 MHz bandwidth to optimize resolution
- wide dynamic range
- excellent black level clamping and hum suppression
- EHT regulation
- up front primary and most secondary controls
- AC cord winder
- universal AC interlock
- attractive styling

Price: MCRT-9 \$420 MCRT-14 \$525, MCRT-14G \$580

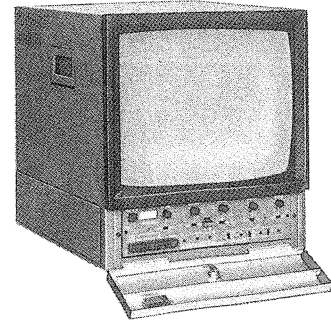


MCRT-CC19/RGB/PAL/SECAM

The MCRT-19 is a 19" high quality color TV monitor with a 6 MHz color bandwidth. It can be used with any Matrox CRT controller, in systems requiring color graphics.

- RGB/NTSC/PAL/SECAM convertibility through optional plug-in circuit boards
- signal processing circuitry located on front accessible plug-in circuit boards.
- DC coupled operating controls permitting final user to remote any or all primary functions.
- excellent tracking of all three channels throughout the operating range.
- active convergence circuitry provides full raster convergence
- excellent black level stability through high level back porch clamp.
- a multiple clamping arrangement provides hum rejection in series mode
- the power supply design allows asynchronous operation.
- maintenance of full resolution at brightness levels by the use of the Negative Guardband picture tube.
- optional luminance comb filter provides full luminance response avoiding the bandwidth limitations associated with conventional passive subcarrier traps. As a second function, this comb filter reduces luminance cross color interference in the chroma display.
- each model offers reduced scan

Price: \$3950



SOFTWARE AND DOCUMENTATION

MTX-ALPHA SOFTWARE PACKAGE

The MTX-ALPHA software package, for use with any 2480, provides the user with the full flexibility of a software based intelligent terminal. The software package is written in 8080 assembly language. The program occupies approximately 3K of memory. The package will fully emulate the popular Lear Siegler Inc. ADM-3A and Digital Equipment Corp. DECSCOPE VT-52 interactive display terminals. Line at a time and text block input modes are available to provide the powerful text preparation features of an intelligent terminal. The package includes a detailed manual, a listing with comments and paper tape (object).

Price: \$28

MTX-GGRAPH SOFTWARE PACKAGE

The MTX-GGRAPH software package is designed for use with any 256 graphics display. The package is configured as a series of callable sub-routines and occupies a 1K block of memory. Some features included in MTX-GGRAPH are point plot and line vector graphics, variable size alphanumeric character generation, animation synchronisation and an option for color graphics. The package includes a detailed manual, a listing with comments and an object paper tape.

Price: \$28

MANUALS

Manuals including schematics for various products are available. The price is \$10 each if bought separately. Free if bought with product.

CUSTOM DESIGN

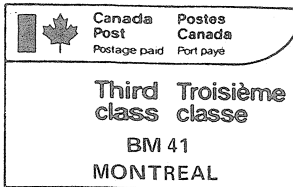
Custom CRT display controllers can be designed according to customer specifications. Examples of custom orders would be different screen formats, special size PCB's, VRAM, additional features, modifications of standard designs, system integration, custom character generators, etc. Send a request for quotation for your particular needs and we will be pleased to suggest solutions and quote prices and delivery. For larger OEM requirements, Matrox can licence the user to make his own VRAM. Matrox will supply all schematics, specifications and custom made integrated circuits, where required for production, for a flat one time charge.



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