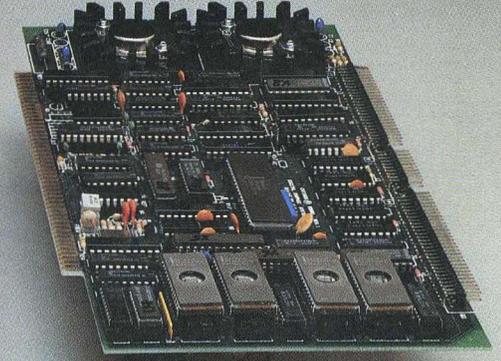
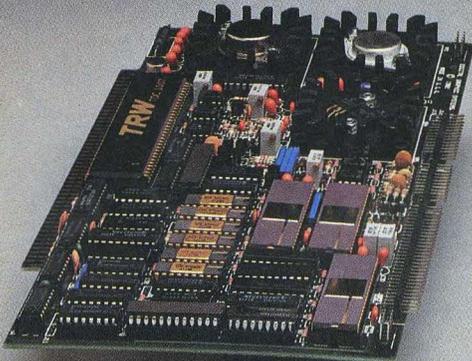
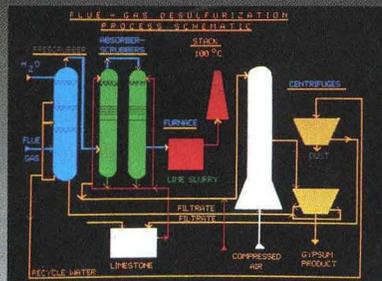
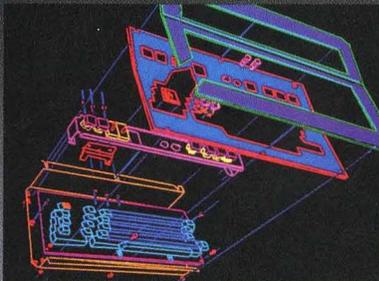


The Image Solution

The CAT 1600 Series lets you take full advantage of your color graphics potential.



Plug this powerful color video graphic system into your IEEE-696 bus and watch your computer open its eyes. Exercise your creativity developing new ways to study your world and discovering the flexibility of video imaging. Our real time frame grabber gives you instant availability of the image to be processed. The CAT 1600 is the creative link between machine, man and the world.

Resolution is the name of the game, and we've got it. Physically you're looking at 512 x 512 pixels up to 24 bits deep. And that's real color. Now, center on a pixel, any pixel, and roam the screen through an image space as large as 1K x 2K. Zoom in and explore a close-up of 32:1, not in the usual quantum leaps of integer zooms, but in smooth logarithmic steps of

1.1%. A smooth zoom...that's human engineering.

At the heart of the matter is a dedicated 8086 image processor. It blazes a 16 bit wide path through the various memories, lookup tables and image parameters as it executes high level commands from your host processor. Up to 48K of static RAM makes the image processor useful for downloading custom programs from the host.

When it came to adequate memory, we didn't forget. 768KB of dynamic memory gives you plenty of image. Our PROMs have a library of 64K organized into over 130 sophisticated graphics commands such as continuous live digitization, character and shape generation, global image manipulation and animation effects, to

relieve the host computer from low level primitives.

At your disposal is a palette of 16.7 million colors and 256 shades of gray. Quantized lines or free-hand sketching completes the picture. Use a variety of pen widths, brush strokes, even airbrush! Now imagine what you can do with a superb quality image captured in real time from a color video camera. Contact us for an eye opening demonstration: 935 Industrial Avenue, Palo Alto, CA 94303. 415/856-2500.



What You See Is What You Get.

CAT 1600 Series, Technical Specifications

Compatibility

Runs on any IEEE-696/S-100 bus.

Video Flash Digitizer

Models 11 and 31 feature a 256-level, 8-bit image digitizer to acquire monochrome images in real time (1/30 sec.). The Model 33 features *three* flash digitizers to capture real color RGB in real time. Each primary color is quantized to 256 levels (8 bits); the resulting pixel depth is 24 bits. The continuously digitized image appears as live video and can be frozen on any frame.

Video Standards

Video I/O conforms to RS-170A (525/60, U.S.) or CCIR (625/50). Gain, offset and sync are adjustable for video input and output signals. Four EIA timing signals are provided. The unit can generate its own sync (broadcast standard) or can be genlocked via PLL on the incoming video signal.

Image Resolution

Depending on the CAT 1600 model specified, images of $512 \times 512 \times 8$ bits can be configured up to three planes of $512 \times 512 \times 8$ or one plane of $512 \times 512 \times 24$.

Zoom

There are two zooms to select: coarse zoom, $1 \times$ to $16 \times$ in integer steps or fine zoom featuring 64 logarithmic steps, $1.00 \times$ to $1.98 \times$. Combined, they result in an exclusive *smooth zoom* with 320 evenly spaced steps of 1.1% from $1.00 \times$ to $31.68 \times$. The zooms operate in real time and can be centered on any pixel.

Scroll and Pan

In combination with any selected zoom ratio, the displayed image can be roamed in real time through larger images. Wraparound is software selectable. Pixel by pixel roam features a horizontal resolution of $\frac{1}{2}$ pixel and a vertical resolution of one raster line.

Image Processor

An 8086 dedicated image processor features a 16 bit data path and operates at 6.5 MHz. Typical compatible host processors are the Z80, 8086 and 68000. The image processor executes commands received from the host and bidirectionally transfers image data between the host and the CAT 1600 memories. Data transfer is optimized with the 68000 host which has direct memory-mapped access to all three image planes; the transfer rate is up to 3 million pixels per second.

Static RAM

16K or 48K bytes of general purpose RAM is provided for use by the image processor. The static RAM is useful when downloading custom programs from the host. Part of this RAM is assigned as a buffer for the color LUTs.

Image RAM

The two port dynamic image memory is either 256K or 768K. The first port is for video display and digitization. The second port is for direct access by the image processor or a 68000 host. A bit write protect mask is provided for both ports.

HOST PROCESSOR ADDRESS SPACE	16 bit; Z80, 8085 20 bit; 8086, 8088	24 bit; 68000
ADDRESSING WINDOW SIZE	8KB standard	1MB
RANDOM PIXEL ACCESS TIME	10 μ S	.6 μ S
OPTIMUM PIXEL TRANSFER TIME	1.5 μ S	.3 μ S

With the 68000 host, an entire 512×512 image plane transfers in less than 0.1 second.

Firmware PROMs

On-board PROMs feature an extensive 32KB/64KB library for the over 130 graphic imaging commands provided on the CAT 1600s.

Color Lookup Tables

The palettes of colors used for display are defined by software in four sets of buffered, high speed 256×24 bit tables (3K bytes total). The LUTs control the display colors by assigning the brightness of each primary color output for each of the 256 or 16.7 million possible pixel values. The contents of these tables is programmable and is automatically updated at the frame rate.

Applications

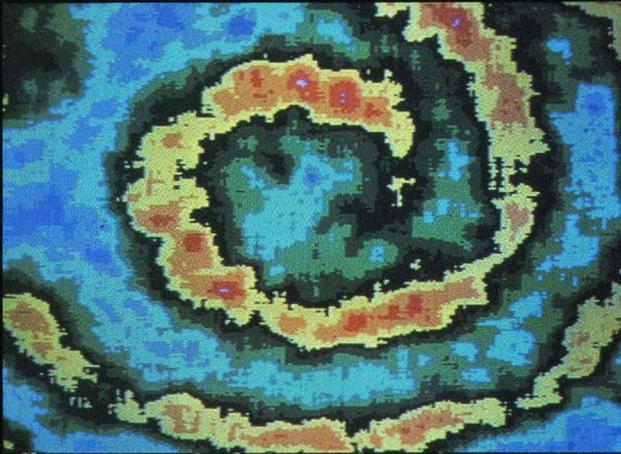
- Image analysis for research and industry
 - Time lapse, motion studies
 - Satellite, LANDSAT
 - Medical
- Teleconferencing
- Video special effects
- Graphic design: charts, graphs, illustration, etc.
- CAD/CAM

Selection Chart

	Model 11	Model 31	Model 33
Image memory size	256K	768K	768K
Static memory size	16K	48K	48K
No. of circuit boards	3	5	7
Pixel size (bits)	8	8	24
No. of frame grabbers	1, B/W	1, B/W	3, RGB
Grabber resolution	8 bit	8 bit	3×8 bit
No. of 512×512 images	1, 8 bit	3, 8 bit	1, 24 bit
No. of simult. colors	256	256	256K
Supply currents:	+ 8V 8A	13A	18A
(typical values) +16V	.2A	.2A	.6A
-16V	.8A	.8A	2.4A



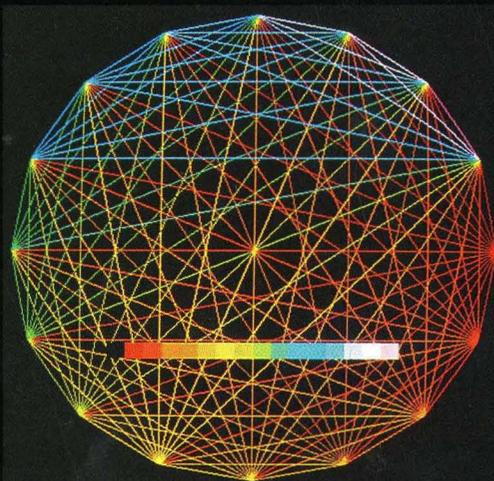
935 Industrial Avenue • Palo Alto, CA 94303 • 415/856-2500



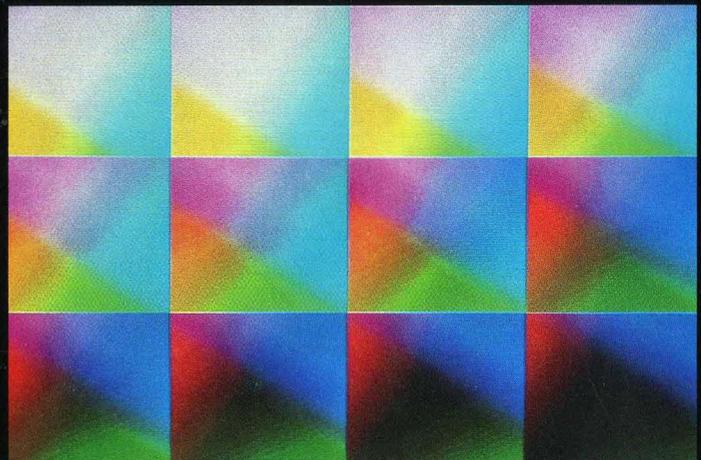
242x256 4-bit pixels, CAT-100, 16 pseudo-colors.
Digitized microscopic cell, 4-bit FRAME GRABBER.



484x512 4-bit pixels, CAT-400, 16 pseudo-colors.
Digitized monochrome X ray, 4-bit FRAME GRABBER.



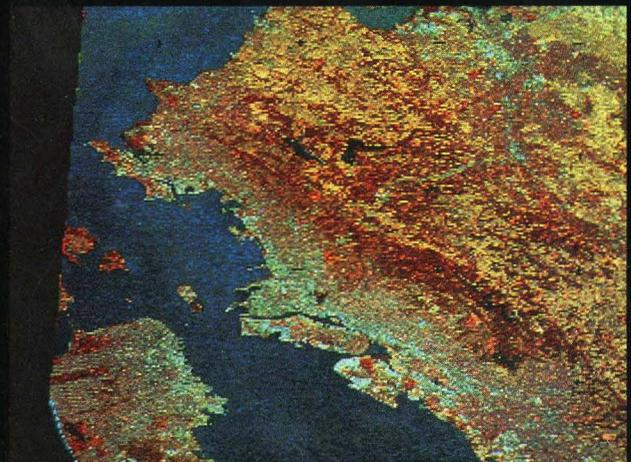
484x512 4-bit pixels, CAT-400, 16 colors
Computer generated image and color spectrum



242x256 16-bit pixels, CAT-400, 64K colors.
Computer generated color spectrum.



242x256 24-bit pixels, CAT-800, 64K colors.
Digitized real color image, 8-bit FRAME GRABBER.
Computer generated lettering and color spectrum.



242x256 24-bit pixels, CAT-800, 64K pseudo-colors.
LANDSAT infrared image of San Francisco Bay Area.

These unretouched photographs were all taken from a DIGITAL GRAPHIC SYSTEMS 13" high resolution RGB color monitor. These examples illustrate a few of the many ap-

plications where a CAT series imaging system is an essential element, from biological research to LANDSAT image processing.



THE NEW 1600 SERIES: SMART, POWERFUL, STATE OF THE ART

DIGITAL GRAPHIC SYSTEMS, Inc. is now delivering the 1600 Series, a new generation of high resolution, full color graphic imaging systems with dedicated 16 bit microprocessor, for acquiring, generating and displaying broadcast standard video images. This new series further extends a concept pioneered by DIGITAL GRAPHIC SYSTEMS in 1977: a compact unit with a large image memory, a video display section and a flash digitizer sharing a common control and timing logic section.

The 1600 Series is the most advanced and powerful graphic imaging system available today in its category. It is intelligent, fast, reliable and uncompromising with its advanced design concepts and its extensive use of programmable logic. In a compact physical format, it has processing power and capabilities only available until now on more expensive systems. It also features novel functions that are unique in the industry.

The 1600 Series is available in three classes of products: CAT 1600 graphic image controller boards, CBX 1600 graphic imaging peripherals, and TKS 1600 standalone graphic imaging computers. The CAT boards are an integral part of the CBX and TKS models.

FEATURES

CAT 1600s are multiboard frame buffers compatible with any standard IEEE 696 host processor. They feature a dedicated 8086 display processor, supported on board with up to 48K of fast static RAM and 64K of PROM. The dual port image memory provides for up to three 512x512x8 bit images or one 512x512x24 bit real color image. It can be accessed at any time, either by the display processor or by the host processor, for software image generation or software analysis of the digitized images.

A number of high performance features, like real time color video frame flash digitizing, buffered multiple color lookup tables, pixel by pixel scroll and pan, real time logarithmic zoom, and over 130 powerful graphics commands in PROM, are unique in the industry and differentiate the 1600 Series from other imaging systems.

The continuous flash digitizer captures live video images and stores them in digital

form. Setting a new industry standard, the CAT 1600-33, with three flash color digitizers, can grab a 24 bit, broadcast quality color image from an RGB camera. Other broadcast features include three separate composite video outputs, adjustable signal parameters, four video timing signals, and genlock on incoming video or composite sync.

The palettes of colors used for display are defined in four video lookup tables that can be updated at the frame rate. Automatic animation effects are supported in firmware.

The display window can be scrolled, panned and zoomed in real time through 1Kx2K images with zoom ratios from 1.00 through 31.68 in 320 dynamically selectable steps of 1.1%. This fast hardware produces a specific class of special effects for animation and human engineered image analysis, which would not be otherwise possible with the coarse (integer) zoom commonly available in the industry.

The firmware is sophisticated enough to relieve the host processor from lower level tasks, which speeds development work and increases overall system performance. An extensive library of sophisticated graphic imaging functions, callable as simple and easy to use commands, is standard with all three models of the 1600 Series.

BENEFITS

CAT 1600s are extremely versatile and can be used for acquiring, processing and displaying data in a wide variety of applications, like image analysis for research and industry, teleconferencing, TV special effects, and graphic design. Speed is one of the most remarkable features of the 1600 Series. The dedicated display processor fully utilizes its 16 bit number crunching capability. It unburdens the host processor and has access to a large amount of on board RAM to independently perform a large variety of image processing tasks. The image RAM and the digital video I/O paths are 32 bit wide, for optimum speed. Extended roaming and smooth zooming are implemented in hardware and operate in real time. CAT 1600s are fully compatible with all 8-bit and 16-bit IEEE 696 host processors, and 68000-based hosts have direct memory mapped access to all three image planes.

A family of high performance, high resolution, full color graphic imaging systems with dedicated 16 bit microprocessor, for acquiring, generating and displaying broadcast standard images.

The 1600 Series is available in three classes of products: CAT graphic image controller boards, CBX graphic imaging peripherals, and TKS standalone graphic imaging computers. The CAT boards are an integral part of the CBX and TKS models, and they will be described first.

1. CAT 1600 IMAGE CONTROLLER BOARDS

OUTSTANDING FEATURES

- Twoport 256K or 768K image memory
- Image resolution 512x512x24 or 512x512x8
- Real time 256 level or RGB color flash digitizer
- Broadcast standard video inputs and outputs
- Programmable genlock on external video or sync
- Extremely flexible display color look up tables
- Pixel by pixel scroll and pan
- Exclusive smooth zoom / extended roam hardware
- Bit plane write protect mask
- Dedicated 6.5MHz, 16 bit 8086 display processor
- Extensive 64K byte graphics firmware library

DESCRIPTION

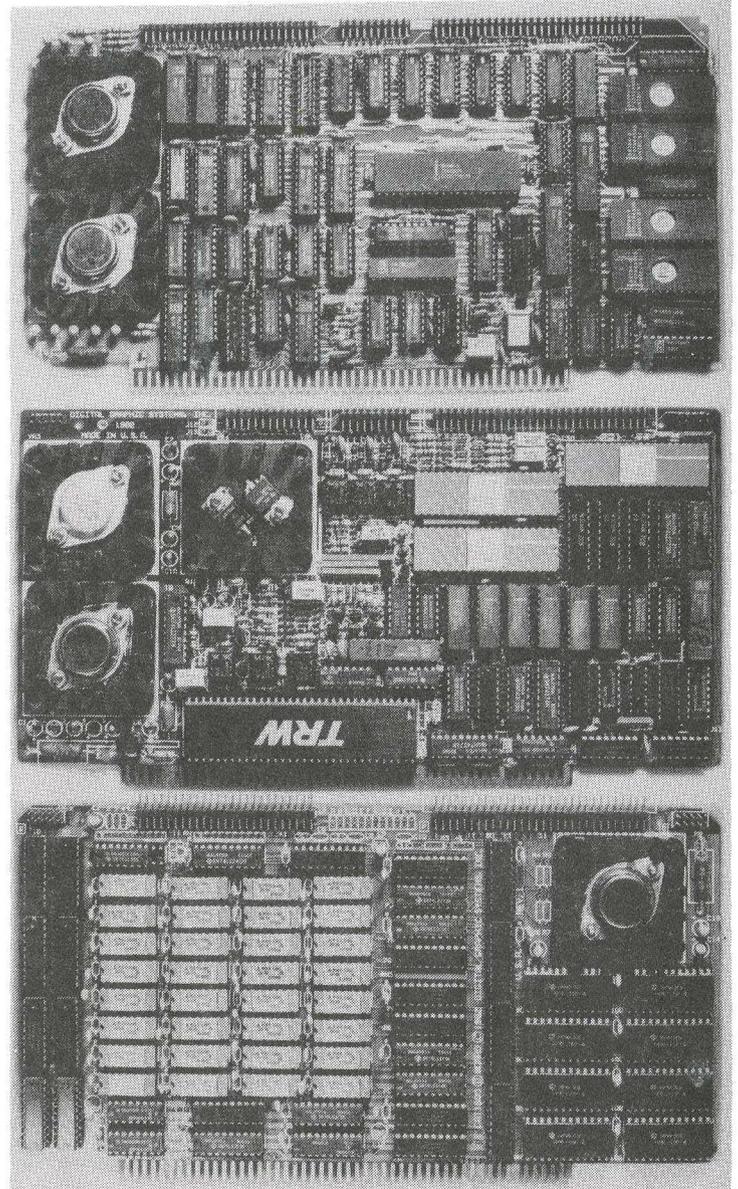
CAT 1600's are sets of boards designed to plug directly into the motherboard of a standard S-100 IEEE 696 host processor. In a compact physical format, they contain a large image memory and all the circuitry necessary to digitize black and white or RGB color video signals in real time; to store and process the digital image data; to make the data accessible to the host processor; and to display the digital image on a video screen in gray levels or in full resolution RGB color.

The CAT 1600 series consists of Models 11, 31 and 33. Common functional characteristics are outlined below, and differences between the three models are described in the selection chart.

FUNCTIONAL CHARACTERISTICS

Resolution. Maximum resolution for display or digitization is either 512x512x24 RGB real color, or 512x512x8 monochrome/RGB pseudo color, with a zoom ratio of 1. With higher zoom ratios (up to 31.68), the resolution can be made as low as 16x16, including 320 intermediate steps, independently along X and Y. In all cases the display window can be roamed around through images as large as 1Kx2K.

Display Processor. All three models feature a dedicated 16 bit 8086, operating at 6.5MHz. It executes the high level commands received from the host, updates the video look up tables and various display parameters at the frame rate, and monitors programmed data I/O with the host.



CAT 1600-11: circuit boards A, V and D.

The on-board 8086 is supported by **four distinct memory types:**

Image RAM. Organized as either one or three 256K-byte image planes, it stores the pixels as single bytes of data. It has two separate ports, one for video access, and the other for direct access by the display processor.

Firmware EPROM. Holds up to 64K bytes of command driven software, featuring over 130 powerful graphic imaging primitives.

Static RAM. 16K or 48K bytes of scratch pad and live operating RAM for the display 8086. It is also useful to download custom programs from the host. Part of it acts as a buffer for the LUT's.

Color Video Lookup Tables (LUT's). The palettes of colors used for display are defined by software in four sets of buffered, high speed 256x24 tables (3K bytes total). They control the display colors and gamma correction by assigning the brightness of each primary color output for each of the 256 or 16.7 million possible pixel values. The contents of these tables is fully programmable and is dynamically updated at the frame rate. Automatic animation effects are supported in firmware.

Video Input/Output

Flash Digitizer. Full resolution and real color video frames are acquired in 1/30 second (real time) via one or three state-of-the-art flash converters which digitize the frames either one by one or continuously, under software control. The 8-bit bytes produced by the frame grabbers represent primary color brightnesses of the analyzed pixels, stored as consecutive bytes into the image RAM through the video port.

Image Display. To display an image, the pixel bytes are read out of the image RAM through the video port and are routed, serially in time, to the color LUT's which utilizes them as addresses. The LUT's translate pixel data values into the desired luminances (0-255) for each primary color. The video output generator provides three channels of D/A output (RGB or monochrome) and conforms the signals to the selected video standard, with correct blanking, pedestal and composite sync.

Video Sync Sources. The sync source (Internal/External) is software selectable. Internal sync is derived from the master crystal oscillator. External sync is used by the PLL (Phase Locked Loop circuit, which tracks the frequency and phase characteristics of the external video signal), and is either produced by the sync stripper from the input composite video signal, or separately fed into the CAT 1600 on the External Sync input line. Black burst is an acceptable sync input signal.

Video Standards. Video input and output signals exactly conform to applicable sections of either RS-170A (525/60, U.S.) or CCIR (625/50, European) standard, for each monochrome primary color.

Roam and Zoom

Scroll and Pan. Under software control the display window can be roamed around through larger images, regardless of the current zoom ratio. Vertical scroll is with single raster line precision, horizontal pan with half-pixel precision. Image wrap-around can be independently enabled along X and Y.

Smooth Zoom. The real time smooth zoom circuit, unique in the industry, can be set dynamically to any of **320 logarithmic steps of 1% between 1.00 and 31.68**, independently along X and Y. It pro-

duces interesting special effects for animation and human engineered image analysis, which would not be otherwise possible with the coarse integer zoom commonly available in the industry.

Interface

Host Compatibility. The CAT 1600 series is fully compatible with the entire spectrum of existing IEEE 696 host processors: it accomodates 16, 20 or 24 bits of address, and 8 or 16 bits of data. The host can directly operate on the dual port image RAM at any time, or RAM operations may be shared between the host and the display 8086. There is a choice of two addressing schemes from the host: I/O mapped, or memory mapped through an addressing window in host address space.

Data Transfer. The dual port image RAM can be accessed at any time from the IEEE 696 host for software image generation, or analysis of the digitized images. For hosts with 16 or 20 bits of address (Z80, 8085, 8086), window size is 2Kbytes and pixel access times are 10uS random, 1.5uS optimum. Hosts with a 24 bit address (68000) have simultaneous **memory mapped access** to all three image planes; window size is 1Mbyte, pixel access times are 0.6uS random, and 0.3uS in the **Direct Image Access (DIA)** mode. Data transfer speed to and from host is an impressive **3 million bytes per second**, and a full image plane (512x512x8) can be transferred in less than 0.1 second.

Programming

Firmware. An extensive library of sophisticated graphic imaging functions is implemented in firmware and provides a complete and easy to use instruction set for the graphics programmer. The firmware routines are designed for high speed response as well as ease of use by the host processor. They promote character and shape generation, global image manipulation, and animation effects using lookup tables and multiple images. An important new feature is the user-created library of objects and memory partitions for animation, image processing, or just fast and simple image generation. Custom routines can be downloaded from the host to the 1600's static RAM for execution by the display processor. These routines may reference functions in firmware also. The powerful attributes permit simple control of complicated drawing tasks. Complex I/O and co-processor operations are simplified into fast register accesses, and internal transformation of coordinates greatly speeds up image access and control.

Software. A test package (DEMO 1600) is available for either CP/M** or UNIX*** operating systems. Well documented with practical examples, the test package demonstrates a variety of uses of the CAT 1600 Series instruction set.

OPTIONS

- E 50Hz CCIR standard television specifications
- G1 Single frame grabber, 256 levels (8 bits)
- G3 Triple frame grabber for RGB color, Model 33 only

1600 SERIES, SELECTION CHART

	Model 11	Model 31	Model 33
Image memory size	256K	768K	768K
Static memory size	16K	48K	48K
No. of circuit boards	3	5	7
Pixel size (bits)	8	8	24
No. of frame grabbers	1, B/W	1, B/W	3, RGB
Grabber resolution	8 bit	8 bit	3x8 bit
No. of 512x512 images	1, 8 bit	3, 8 bit	1, 24 bit
No. of simult. colors	256	256	256K
Supply currents:	+ 8V	8A	13A
(typical values)	+16V	.2A	.6A
	-16V	.8A	2.4A

SHORT FORM SPECIFICATIONS

- **Image RAM:** dual port with cycle stealing. Accessible by host at any time, no visual interference. Data transfer time 300nS/pixel.
- **IEEE 696** 16/8 bit host processor interface.
- **64K firmware EPROM**, with over 130 commands.
- **Display LUT's:** 4 sets, buffered, programmable.
- **Video I/O:** six standard 75ohm lines, one input/output pair for each primary color (R,G,B)
- **Each input is separately digitized** to 256 levels in 1/30 second at 10 megasamples/second.
- **External Genlock:** accepts Comp. Video, Comp. Sync or Black Burst. Supplies four EIA signals: Sync, Blanking, Hor.Drive, Vert.Drive.
- **EIA RS-170A** or **CCIR** exact monochrome video specifications for each primary color.
- **Operating modes:** Display, Digitize, Flood.
- **Roam:** Horizontal pan resolution, 1/2 pixel; Vertical scroll resolution, 1 raster line.
- **Zoom:** Coarse zoom, any integer, 1-16; Fine zoom, any of 64 log. steps, 1.00-1.98; Resulting **Smooth Zoom**, 1.00-31.68 in 320 evenly spaced steps of 1%. Real time operation.

2. CBX 1600 GRAPHIC IMAGING PERIPHERALS

For applications where the host processor is not IEEE 696, the CBX 1600 series offers the same high performance specifications as the CAT 1600 series, with the additional benefit of an almost universal interface. The CBX 1600 series consists of Models 11, 31 and 33. Each CBX 1600 model number corresponds to the featured CAT 1600 model number; please refer to the CAT 1600 specifications.

The CBX 1600 is a small 12 slot mainframe with a CAT 1600, two contrast adjustment control knobs for optimizing the balance of the flash digitizer input signal, an independent power supply, and a general purpose 16/8 bit parallel interface card. Plug compatible parallel interfaces are available for DEC PDP-11* and LSI-11*; they come with standard DEC DMA modules which simply plug into the DEC host processor mainframe.

3. TKS1600 STANDALONE IMAGING COMPUTERS

All of the CAT 1600 Series models can be configured as complete standalone systems. There is a choice of three basic host processors:

1. 8085/88 CPU, STANDARD SYSTEM, CP/M80** and CP/M 86**.
2. 8086/87 CPU, STANDARD SYSTEM, CP/M 86**.
3. 68000 CPU, DUAL SYSTEM, UNIX*** operating system for state of the art computer graphics and high speed image processing.

STANDARD SYSTEM consists of cabinet, power supply, 20 slot S-100 backplane, 64KB system RAM, serial I/O, floppy disk controller with two 8" DSSD drives (2.4MB total capacity), and ADDS VIEWPOINT 24x80 character terminal with detachable keyboard and multiple functions.

DUAL SYSTEM consists of a 68000 single user (multi-user available) UNIX*** based hard disk system with cabinet, power supply, 20 slot IEEE 696 S-100 backplane, 512KB memory, hard disk controller with 20MB hard disk, floppy disk controller with 1MB floppy drive, real time non volatile clock, serial I/O, and ADDS 24x80 character terminal with detachable keyboard and multiple functions.

The TKS 1600 is a complete, general purpose computer that is totally integrated with the CAT 1600 system. In addition to the image generation, animation and image processing, the TKS is capable of data processing (accounting, financial), reporting, and word processing. It also has many other business, scientific, and experimental applications.

All of the above TKS systems are available with suffixes -11, -31 and -33, according to the featured CAT 1600 models. There is a full line of accessories such as video cameras, high resolution color monitors and digitizer pads.

A family of full color graphic imaging systems with frame grabber for acquiring, generating and displaying high resolution video images.

The 100 Series is available in three classes of products: CAT graphic image controller boards, CBX graphic imaging peripherals, and TKS standalone graphic imaging computers. The CAT boards are an integral part of the CBX and TKS models, and they will be described first.

1. CAT 100 thru '800 IMAGE CONTROLLER BOARDS

OUTSTANDING FEATURES

- Twoport image memory, 32K thru 256K
- Image resolution up to 512x512x8 and 256x256x24
- High resolution 256 level flash digitizer
- Standard video format 525/60 or 625/50
- External video synchronization possible
- Extremely flexible display color look up tables
- Line by line scrolling

DESCRIPTION

Models CAT 100 thru '800 are multi-board digital frame buffers with image memory sizes from 32K to 256K bytes. They are designed to plug directly into the motherboard of S-100 host processors. In a compact physical format, they contain a large image memory and all the circuitry necessary to digitize black and white or RGB color video signals in real time, to store the digital image data and make it accessible to the host processor, and to display the digital image on a video screen in gray levels or in full resolution RGB color.

The CAT 100 series consist of Models 100, 200, 300, 400, 600 and 800. Their common functional characteristics are outlined below, and the differences between the models are described in the selection chart.

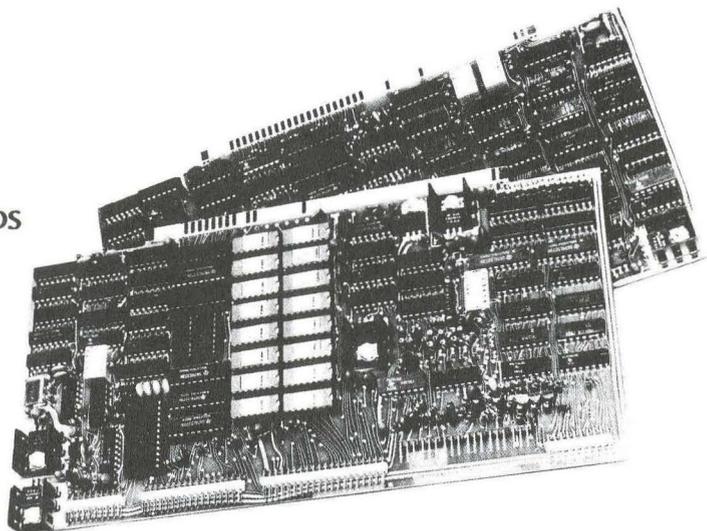
FUNCTIONAL CHARACTERISTICS

Resolution. Maximum resolution for display or digitization is either 256x256x24 RGB real color, or 512x512x8 monochrome/RGB pseudo color. Formats, pixel resolutions and all other parameters are software selectable.

Memory

Image RAM. Holds a "frozen" graphic image in digital form and makes it available to the host for processing. Storage format varies according to selected resolution. The Image RAM has two separate ports, one for video access, and the other for direct access by the display processor.

Color Video Lookup Tables (LUT's). The palettes of colors used for display are defined by software in four sets of high speed 256x24 tables (3K bytes total). They control the display colors and gamma



CAT 100 Boards

correction by assigning the brightness of each primary color output for each of the 256 or 16.7 million possible pixel values. The contents of these tables is programmable and it can be changed dynamically to produce animation and other effects.

Video Input/Output

Flash Digitizer. The video flash digitizer, or Frame Grabber, captures live video images and stores them in digital form. There are two types of digitizers available for the CAT 100 Series. Type A produces 4 bits of data which represent 16 gray levels. Type G produces 16 bits of data (256 levels). Full resolution monochrome video frames are acquired one at a time, in 1/30 second (real time), under software control. The data produced by the frame grabber represent brightnesses of the analyzed pixels, stored into the image RAM through the video port.

Image Display. The video display generates high resolution images in gray levels or RGB colors. To display an image, the pixel bytes are read out of the image RAM through the video port and are routed, serially in time, to the color LUT's which utilizes them as addresses. The LUT's translate pixel data values into the desired luminances (0-255) for each primary color. The video output generator provides three channels of D/A output (RGB or monochrome) and conforms the signals to the selected videostandard.

Video Sync Sources. The sync source (Internal/External) is software selectable. Internal sync is derived from the master crystal oscillator. External sync is either produced by the sync stripper from the input composite video signal, or separately fed into the CAT (on request).

100 SERIES SELECTION CHART

	CAT-100	CAT-200	CAT-300	CAT-400	CAT-600	CAT-800
Image memory size (bytes)	32K	64K	96K	128K	192K	256K
Software selectable pixel size (bits)	1,2,4	2,4,8	3,6,12	4,8,16	6,12,24	8,16,24
TYPICAL FORMATS						
High resolution						
484X512 pixels						
Number of bits per pixel	1	2	3	4	6	8
Number of gray levels	2	4	8	16	64	256
Number of colors [option]	2	4[Y]	8[Y]	16[Y]	64[Y]	256[Y]
Medium resolution						
484X256 or 242X512 pixels						
Number of bits per pixel	2	4	6	8	12	16
Number of gray levels	4	16	64	256	256	256
Number of colors [option]	4[X]	16[Y]	64[Y]	256[Y]	4K[Z]	64K[Z]
Low resolution						
242 x 256 pixels						
Number of bits per pixel	4	8	12	16	24	24
Number of gray levels	16	256	256	256	256	256
Number of colors [option]	16[X]	256[Y]	4K[Z]	64K[Z]	64K[Z]	64K[Z]
FRAME GRABBERS						
4 bit option						
	A	A	A	A	A	A
8 bit option						
		G	G	G	G	G
PHOTO TRIGGER option						
	F	F	F	F	F	F
KEYING option						
	K					
LIGHTPEN option						
	L	L	L	L	L	L
SPECIAL FORMATS option						
	P	P	P	P		
COLOR MAPPING OPTIONS						
	no	yes	yes	yes	yes	yes
Pixel size (bits, max.):						
standard	4	8	8	8	8	8
option Y (input to maps)		8	8	8	8	8
option Z (input to maps)			12	16	24	24
Map output width (bits):						
standard		8	8	8	8	8
option Y		24	24	24	24	24
option Z			24	24	24	24
Color map size (bytes):						
standard		1K	1K	1K	1K	1K
option Y or option Z		3K	3K	3K	3K	3K
Number of colors in palette to choose from	16 (no map)	16.7 million	16.7 million	16.7 million	16.7 million	16.7 million
RGB color option	X	Y	Y or Z	Y or Z	Y or Z	Y or Z
NTSC comp. color option	C					
Number of circuit boards	2	4	4	4	5	6
Number of status registers	3	3	3	3	3	3
Number of control registers	5	8	8	8	8	8
POWER FROM S-100 BUS (typical current)						
+8V	2.2A	3.7A	3.8A	3.9A	4.3A	4.7A
+16V	.5A	.9A	1.3A	1.7A	2.5A	3.3A
-16V	.2A	.4A	.5A	.6A	.8A	1.0A

Video Standards. Video input and output signals conform to applicable sections of either RS-170A (525/60, U.S.) or CCIR (625/50, European) standard, for each monochrome primary color.

Host Compatibility. The CAT 100 Series is compatible with all 8 bit S-100 host processors. The host can directly operate on the dual port image RAM at any time, through an addressing window in host address space.

Data Transfer. The dual port image RAM can be accessed at any time from the S-100 host for software image generation, or analysis of the digitized images. The addressing window can be selected or deselected under software control.

Lightpen. A high resolution lightpen can be connected directly to the CAT, and the interaction provides 18 bits of coordinates resolving one pixel in the 484x512 format.

Software. DGS offers a set of graphic routines for the CAT 100 Series. The package includes primitives that facilitate image generation and analysis, graphic text formatting, and management of the CAT hardware. Written in Z-80 assembly language and optimized for swift execution, the coding designates an 8K window in the S-100 address space to access the CAT image buffer. The graphic module is CP/M compatible, relocatable, occupies 6K, and is designed for ease of linkage to a high level host language like Fortran, Basic or Pascal.

SHORT FORM SPECIFICATIONS

- **Image RAM:** dual port with cycle stealing. Accessible by host at any time, no visual interference. Data transfer time 1.5uS/pixel.
- **Interface:** for 8 bit S-100 host processors.
- **Display LUT's:** 4 sets, programmable.
- **Video I/O:** standard 75 ohm lines.
- **The video input is digitized** to either 256 or 16 levels in 1/30 second at either 5 or 10 Mspl/S.
- **External Sync:** accepts Comp. Video or Sync.
- **EIA RS-170 or CCIR** monochrome video specifications for each primary color.
- **Operating modes:** Display, Digitize. Vertical scroll resolution, one raster line.

OPTIONS

Option A: 4 bit Frame Grabber. Reduces every picture element (pixel) of a video frame to a 4-bit number measuring its brightness, in 1/60 or 1/30 of a second, and stores all the resulting data into the image RAM. Option A includes a **contouring circuit** which is a software-selectable alternate digitizing circuit and performs a hardware pseudo-edge extraction by comparing the input video signal with two analog thresholds. Option A also enables the CAT to extract sync from and to genlock onto an external, monochrome, composite video signal.

Option C: Composite Color Output. Available for CAT 100 only, this option generates a standard composite color video signal.

Option E: European TV Standard. Provides a standard 625/50 CCIR video signal.

Option F: Photographic Trigger Input. Synchronizes the display of a single video frame with the shutter of a photographic camera.

Option G: 8 bit Frame Grabber. Provides high quality 256 level flash converter, utilizes TRW circuit. Available for Models CAT 200 thru '800. Option G also enables the CAT to extract sync from and to genlock onto an external, monochrome, composite video signal.

Option L: Lightpen. One of the most useful interactive features for graphic and image process-

ing. The high performance lightpen provided is the most precise unit now available. It allows the user to take full advantage of the CAT's 482x512 high resolution format.

Option P: Special Formats. Provides all "rectangular" and "condensed" formats listed in the specs, such as 454x576, 227x1182, 227x576, 227x288, 408x640, 204x1280, 204x640, and 204x320. When any of these formats is selected, part of the display remains blank at the bottom of the screen.

Option X: RGB Output. For CAT 100 only.

Option Y: RGB Output. For CAT 200 thru '800. Offers an 8-bit maximum pixel size, three 1Kx8 color maps, and 256 simultaneous RGB colors selectable from a palette of 16.7 million colors.

Option Z: RGB Output. For CAT 300 thru '800. Offers 12, 16 and 24-bit pixel sizes, three 1Kx8 color maps, and up to 64K simultaneous RGB colors selectable from a palette of 16.7 million colors.

2. CBX 100 thru '800 COLOR GRAPHIC IMAGING PERIPHERALS

For applications where the host processor is not S-100, the CBX 100 series offers the same graphic performance specifications as the CAT 100 series, with the additional benefits of a dedicated Z-80A display processor, 8K of graphic primitives firmware in PROM, and an almost universal interface. The CBX 100 series consists of Models 100, 200, 400 and 800. Each CBX model number corresponds to the featured CAT model number; please refer to the CAT 100 Series specifications.

A CBX is a small 12 slot mainframe with a CAT 100, '200, '400 or '800, two contrast adjustment control knobs for optimizing the balance of the flash digitizer input signal, a Z80A processor with specialized firmware in PROM, an independent power supply, and a general purpose 8 bit parallel interface. Plug compatible parallel interfaces are available for DEC PDP-11* and LSI-11*; they come with standard DEC modules which simply plug into the DEC host processor mainframe.

3. TKS 200, '400 and '800 STANDALONE IMAGING COMPUTER SYSTEMS

The models CAT 200, '400 and '800 can be configured as complete standalone systems, with a 6MHz Z80A processor, 2.4Mbytes of 8" DSDD capacity and CP/M operating system.

The TKS is a complete, general purpose computer that is totally integrated with our company's CAT system. In addition to the image generation, animation and image processing, the TKS is capable of data processing (accounting, financial), reporting, and word processing. It also has many other business, scientific, and experimental applications.

<u>CAT SERIES BOARDS</u>	<u>BASE PRICE</u>	<u>AVAILABLE OPTIONS</u>
CAT 100	\$1,975	A, C, E, F, K, L, P, X
CAT 200	3,850	A, E, F, G.0, L; P, Y
CAT 300	4,350	A, E, F, G.0, L, P, Y, Z
CAT 400	4,750	A, E, F, G.0, L, P, Y, Z
CAT 600	5,950	A, E, F, G.0, L, Y, Z
CAT 800	7,250	A, E, F, G.0, L, Y, Z
CAT 1600-11	8,250	E, G.1
CAT 1600-31	14,245	E, G.1
CAT 1600-33	17,945	E, G.3

CBX SERIES GRAPHIC IMAGING PERIPHERALS (including basic CAT system)

CBX 100	\$3,875	A, C, E, F, K, L, X
CBX 200	5,695	A, E, F, G.0, L, Y
CBX 400	6,575	A, E, F, G.0, L, Y, Z
CBX 800	8,875	A, E, F, G.0, L, Y, Z
CBX 1600-11	10,995	E, G.1
CBX 1600-31	15,995	E, G.1
CBX 1600-33	20,945	E, G.3

TKS SERIES STANDALONE GRAPHIC IMAGING COMPUTER SYSTEMS (not including CAT)

TKS Z80/6MHz	\$6,995	Basic mainframe, 64K RAM, dual DSDD drives, terminal, CP/M 80** and DGS software; for CAT 400 thru '800 + Available Options + Accessories
TKS 8085/88	7,995	Basic mainframe, 64K RAM, dual DSDD drives, terminal, CP/M 80**, CP/M 86** and DGS software; for CAT 1600-11, 31, or 33 + Available Options + Accessories
TKS 8086/87	8,495	Basic mainframe, 64K RAM, dual DSDD drives, terminal, CP/M 86** and DEMO 1600 software; for CAT 1600-11, 31, or 33 + Available Options + Accessories
TKS 68000	20,000	Basic Mainframe, 512K RAM, 20MB Hard Disk and DSDD drive, terminal, UNIX*** and DEMO 1600 software; for CAT 1600-11, 31, or 33 + Avail. Options + Accessories

OPTIONS for above

A	\$575	16-level frame grabber, contouring circuit and Int./Ext. sync for CAT/CBX/TKS 100 thru '800
C	250	Composite color video output for CAT/CBX 100
E	525	50Hz, 625 line CCIR European television standard
F	150	Photographic trigger control input for CAT/CBX/TKS 100 thru '800
G.0	2,095	8 bit, 256 level frame grabber (flash digitizer) for CAT/CBX/TKS 200 thru '800
G.1	1,750	8 bit, 256 level frame grabber (flash digitizer) for CAT/CBX/TKS 1600-11 or 1600-31
G.3	4,995	8 bit, 256 level, triple frame grabber (flash digitizer) for CAT/CBX/TKS 1600-33
K	395	Allows CAT/CBX 100 to overlay a B/W digital image on an incoming B/W or color video signal
L	575	Lightpen circuit and high resolution lightpen, for CAT/CBX/TKS 100 thru '800
P	350	Special formats: 454x576 and 408x640, for CAT 100 thru 400
X	150	RGB color output for CAT/CBX 100, 1 bit/primary color
Y	425	RGB color output for CAT/CBX/TKS 200 thru '800, 8 bit/primary color, 8 bit pixel max.
Z	725	RGB color output for CAT/CBX/TKS 300 thru '800, 8 bit/primary color, 24 bit pixel max.

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All software packages on 8" CP/M** diskettes, Z80 object code

DGS 100	\$200	CAT 100 graphics utility package
DGS 200	225	CAT 200 graphics utility package
DGS 300	250	CAT 300 graphics utility package
DGS 400	275	CAT 400 graphics utility package
DGS 600	325	CAT 600 graphics utility package
DGS 800	375	CAT 800 graphics utility package
DEMO 100-800	75	Object only for CAT 100 thru '800, specify I/O address needed
Updates of the above	50	
DEMO 1600	75	CAT 1600 test package available for CP/M** or UNIX***
ACCUCHART 100	360	Software for use with CAT 100 to produce charts & graphs
CGS 400	595	Powerful interpretive graphic programming language patterned after Siggraph Core, for graphic development with CAT 400
GRAPHMASTER II/400	375	Business graphics application package written using CGS 400 for use with CAT 400
EZ-ART 400	750	CAT 400 interactive graphic arts production and image editing package, use with Bit Pad
EZ-ART 800	1,500	CAT 800 interactive graphic arts production and image editing package, use with Bit Pad

ACCESSORIES

M13RGB	\$2,165	High resolution 13" Mitsubishi RGB monitor, LP phosphor
M19RGB	3,165	High resolution 19" Mitsubishi RGB monitor, LP phosphor
HM13RGB.....	2,165	Medium resolution 13" Hitachi RGB monitor, LP phosphor
HR13RGB.....	2,650	High resolution 13" Hitachi RGB monitor, LP phosphor
HR19RGB.....	3,165	High resolution 19" Hitachi RGB monitor, LP phosphor
Black and white monitors		CALL FOR DETAILS
RCA2011	380	RCA 16mm vidicon TV camera with lens
RCA1005	855	RCA high resolution, 25mm vidicon TV camera without lens
COHU	2,375	COHU high resolution, 25mm vidicon TV camera, model 2810B-200, without lens, without genlock
COHU-G	2,575	Same as above, but with genlock
Newvicon or Ultricon for TV cameras		CALL FOR DETAILS
CF25B	96	25mm F1.4 lens for above TV cameras
CF50A	116	50mm F1.2 lens
Zoom & special lenses for TV cameras		CALL FOR DETAILS
Encoder	2,500	Lenco NTSC Color Encoder Model PCE-462
DEC 11	1,395	Interface card (Q bus or Unibus) + interface cable for CBX to be used with LSI-11* or PDP-11*
DEC 11/DMA		CALL FOR DETAILS
CBX-3	75	CBX Parallel interface cable
C3RGB	75	Set of three RGB cables for RGB Monitor
CSYNC	50	Set of camera sync cables
B-1	1,200	Bit Pad 11x11 with power supply and stylus (RS232 Format)
B-1C	120	RS-232 Data Cable (10 ft.)
CW	1,350	Computer controlled dichroic color separation filter, available for CBX and TKS only

MANUALS CAT 100--\$20, CAT 200 thru 1600--\$30, CBX--\$30
 (Please specify which CAT model you are interested in purchasing when ordering to ensure that you receive the appropriate manual).

* DEC, PDP-11 and LSI-11 are trademarks of Digital Equipment Corp.; ** CP/M is a trademark of Digital Research Corp.; *** UNIX is a trademark of Bell Labs.