AccessionIndex: TCD-SCSS-T.20141120.005
Accession Date: 20-Nov-2014
Accession By: Dr.Brian Coghlan
Object name: Ramtek 6200A
Vintage: c.1979
Synopsis: Rackmounted graphics display system. S/N: 960242.

**Description:**
An early rackmounted raster graphics display system, made by Ramtek Corporation, Sunnyvale, California, USA.

This is a first-generation raster graphics system, so much of the logic is hardwired, with numerous fast custom mask-programmed ROMs, including for text character generation. A four-slot 19” card cage has a proprietary Ramtek bus, with three boards for processor/comms, memory/video, and text/disk, and four side fans to carry away the considerable heat generated. The graphics memory (on the memory/video board) is separate from the text memory (on the text/disc board).

A Zilog Z80 microprocessor supports a Ramtek-proprietary graphics command set. Typically this would be issued by higher-level graphics software running on a host computer. The specification, including the command set, can be seen in the brochure at the end of this document.

In TCD Computer Science the host was the departmental VAX11/780 and the graphics commands were typically issued by the Core79 3-d graphics library written by Dr.Brian Coghlan, which itself was either called by the CUPID 3-d wire-frame modelling software or CIFED VLSI mask editor written by the same, or by the PADL 3-d solid modelling software from Georgetown University, USA.

| Accession Index | Object with Identification |
|---|---|
| TCD-SCSS-T.20141120.005.01 | Ramtek 6200A Rackmount Chassis.<br>S/N: 960242, Assy: 504207 02B, Made in USA, 1979 |
| TCD-SCSS-T.20141120.005.02 | Ramtek Processor/Communications board.<br>Includes:<br>1 x Zilog Z80-4 CPU<br>8 x NEC uPD4160 DRAM<br>3 x NEC D8251C<br>EA503770-2A PC2 ROM<br>EA503771-2B PC2 ROM<br>EA503772-2C PC1 ROM<br>EA503773-2D PC1 ROM<br>EA503774-2E PC1 ROM<br>EA503775-2F PC1 ROM<br>EA503776-2G PC1 ROM<br>EA503777-2H PC1 ROM<br>EA503778-3A PC2 ROM<br>EA503779-3B PC1 ROM<br>EA503780-3C PC1 ROM<br>EA503781-3D PC1 ROM<br>EA503782-3E PC1 ROM<br>EA503783-3F PC3 ROM<br>S/N: 801278, Assy: 503097 504190-01A |
| TCD-SCSS-T.20141120.005.03 | Ramtek Menory/Video board.<br>Includes:<br>96 x Motorola MCM4027AC4T DRAMs<br>S/N: 801221, Assy: 504192-01A |
| TCD-SCSS-T.20141120.005.04 | Ramtek Text/Disc board.<br>Includes:<br>Ramtek 504362 ROM Video Char. 00-1F<br>Ramtek 504363 ROM Video Char. 20-3F<br>Ramtek 504364 ROM Video Char. 40-5F<br>Ramtek 504365 ROM Video Char. 60-7F<br>32 x Fairchild F3542DC RAMs<br>S/N: 801429, Assy: 503104E, Jun 1979 |

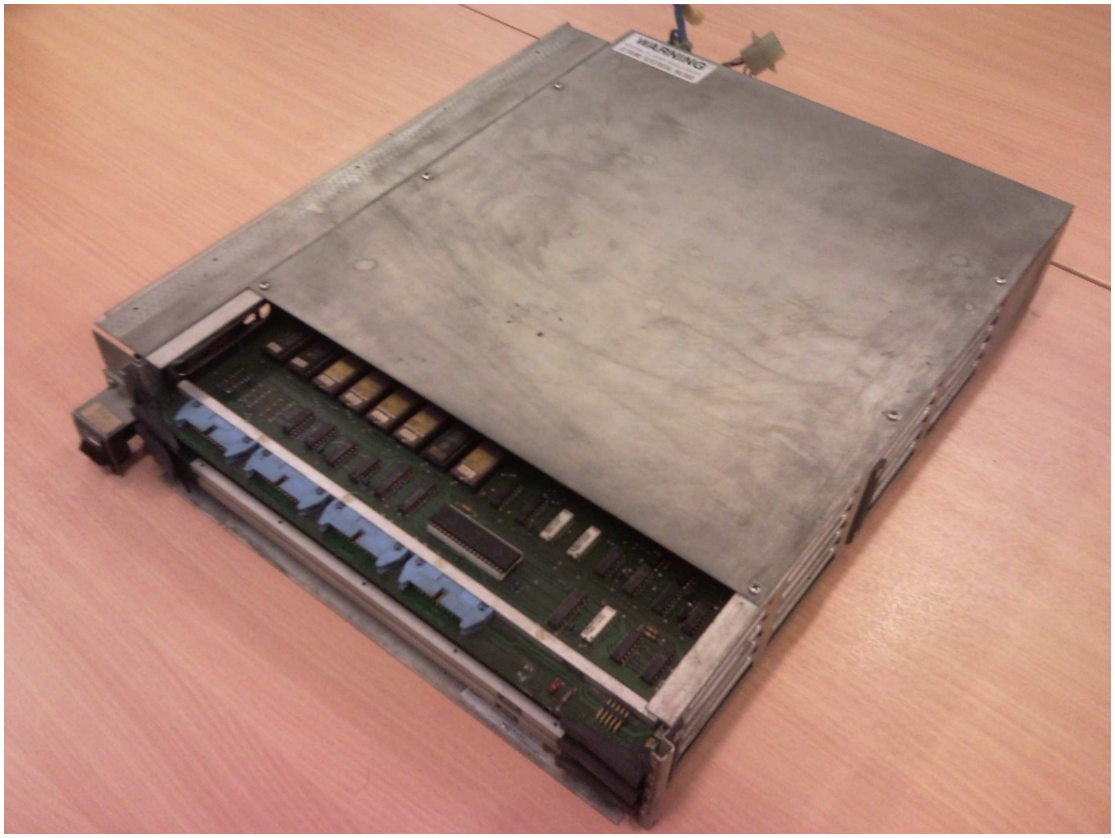


*Figure 1: Ramtek 6200A three-quarter view*


*Figure 2: Ramtek 6200A front view*


*Figure 3: Ramtek 6200A rear view*

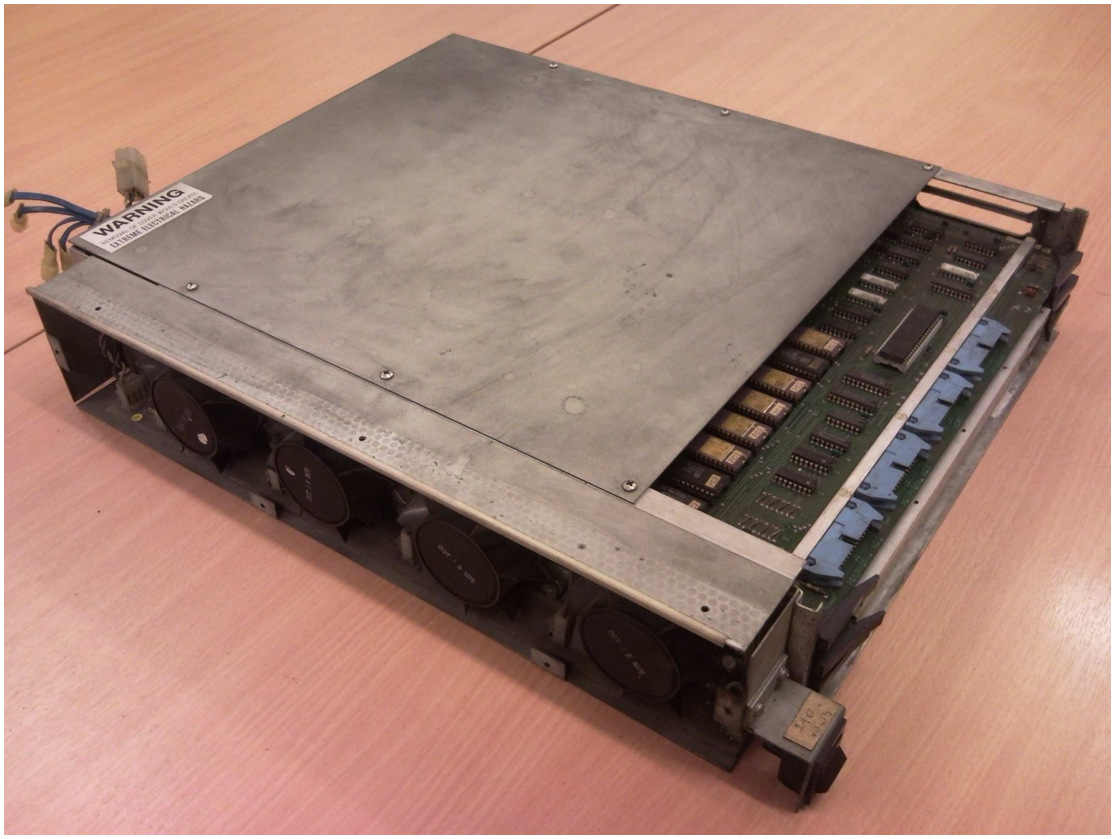



*Figure 4: Ramtek 6200A left side view*

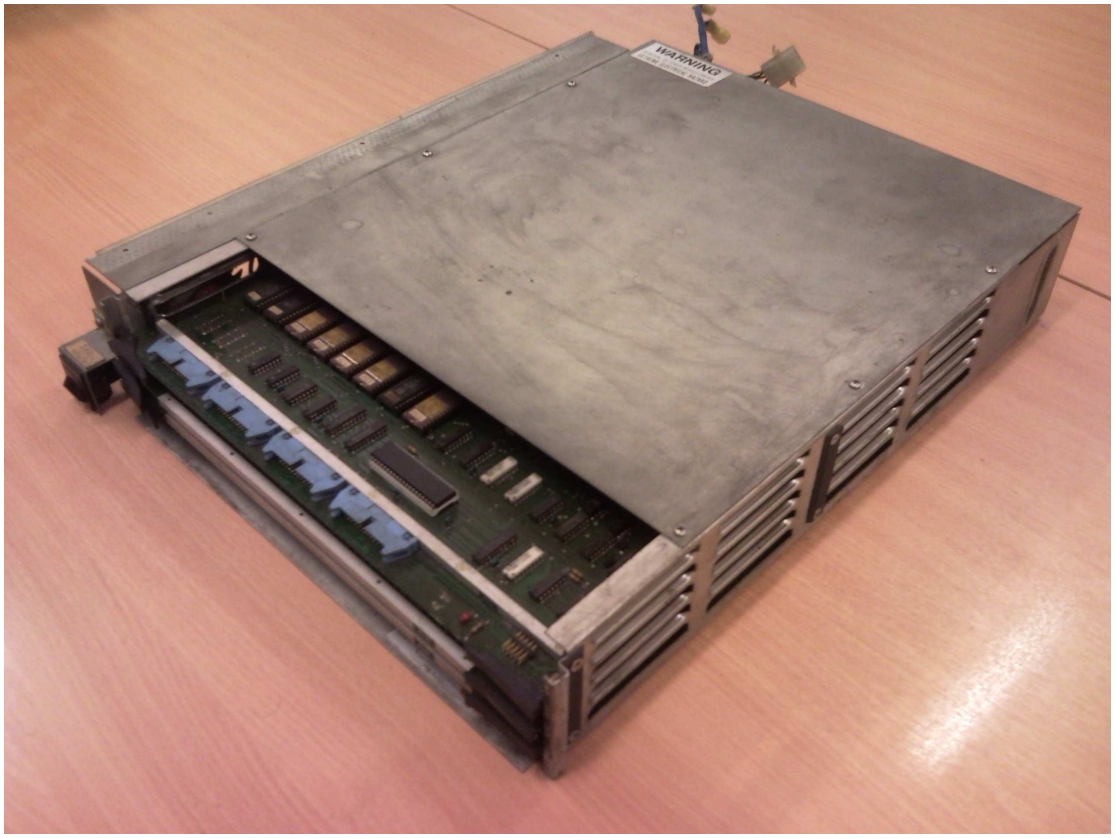



*Figure 5: Ramtek 6200A right side view*

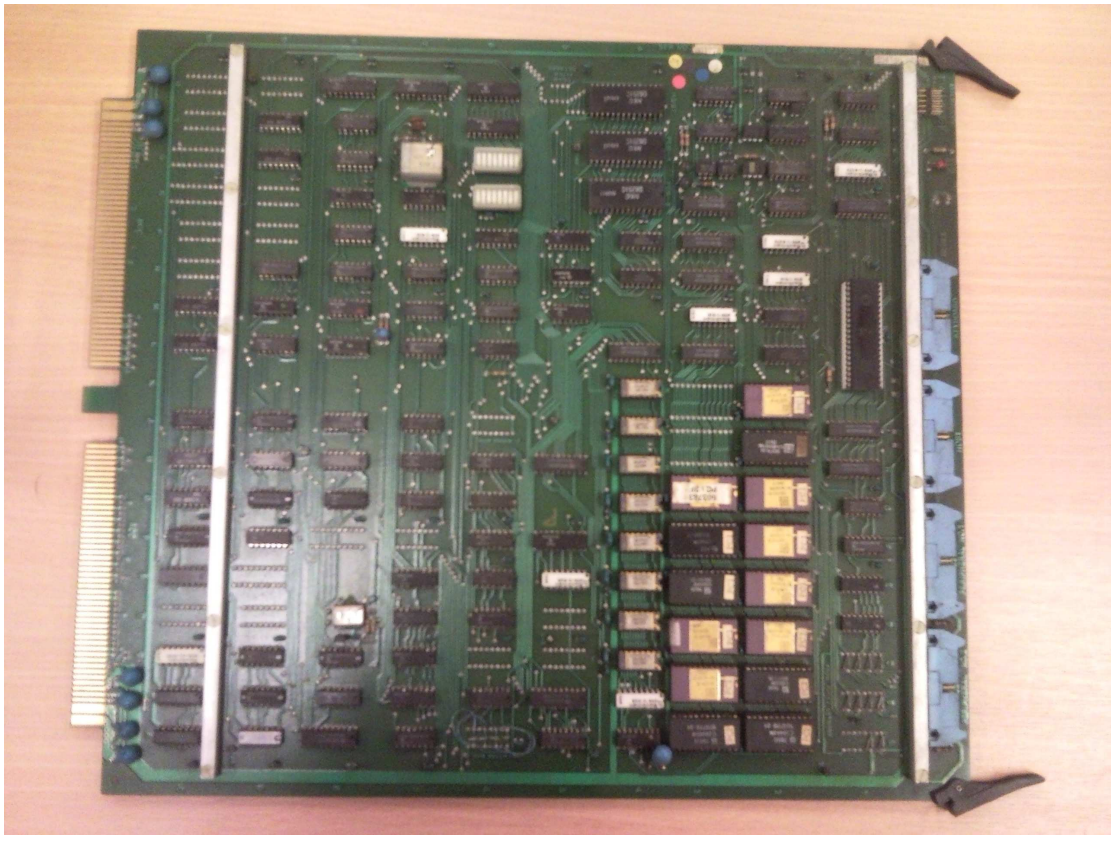


*Figure 6: Ramtek 6200A Processor/Communications board*

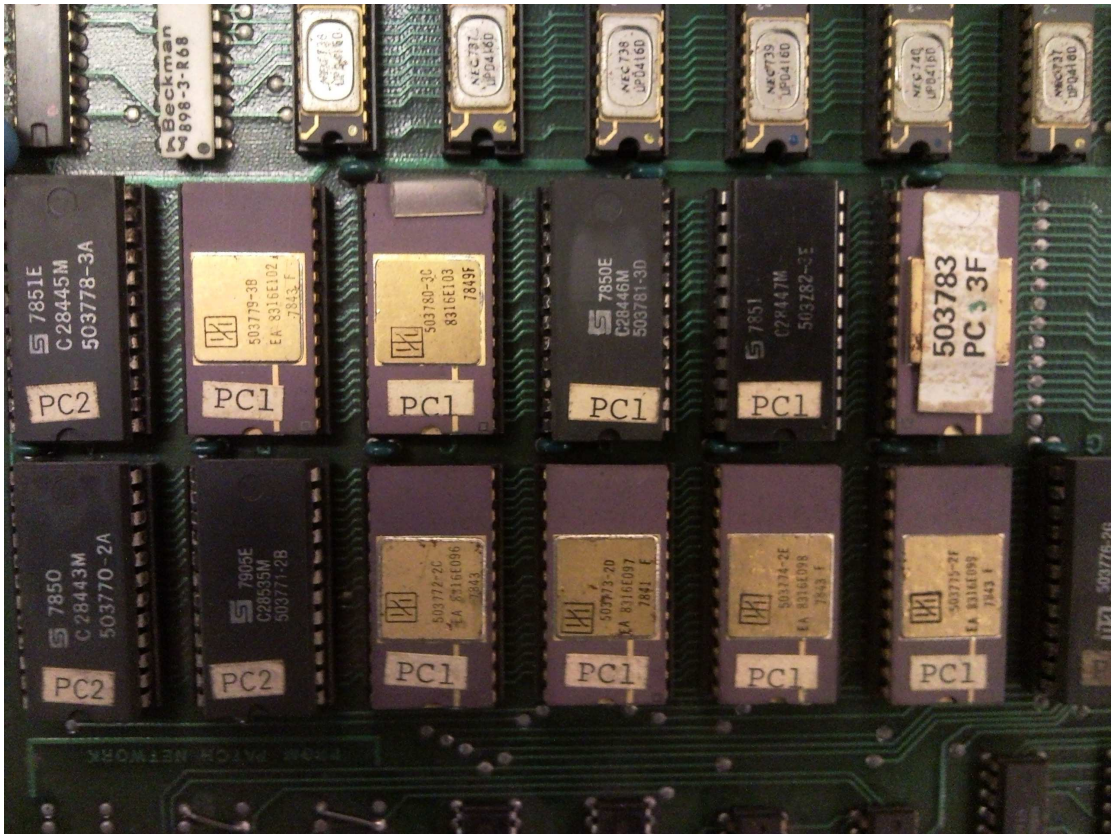



*Figure 7: Ramtek 6200A Processor/Communications board custom ROMs*

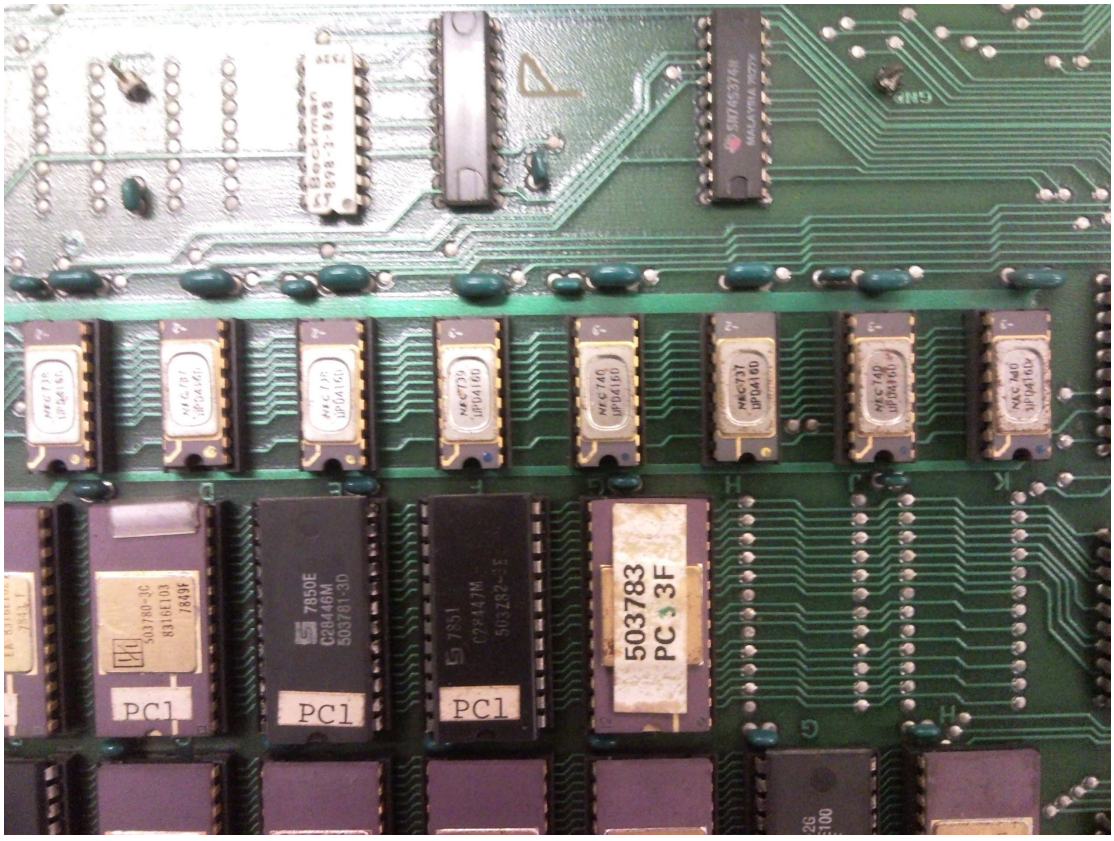



*Figure 8: Ramtek 6200A Processor/Communications board local DRAM memory*

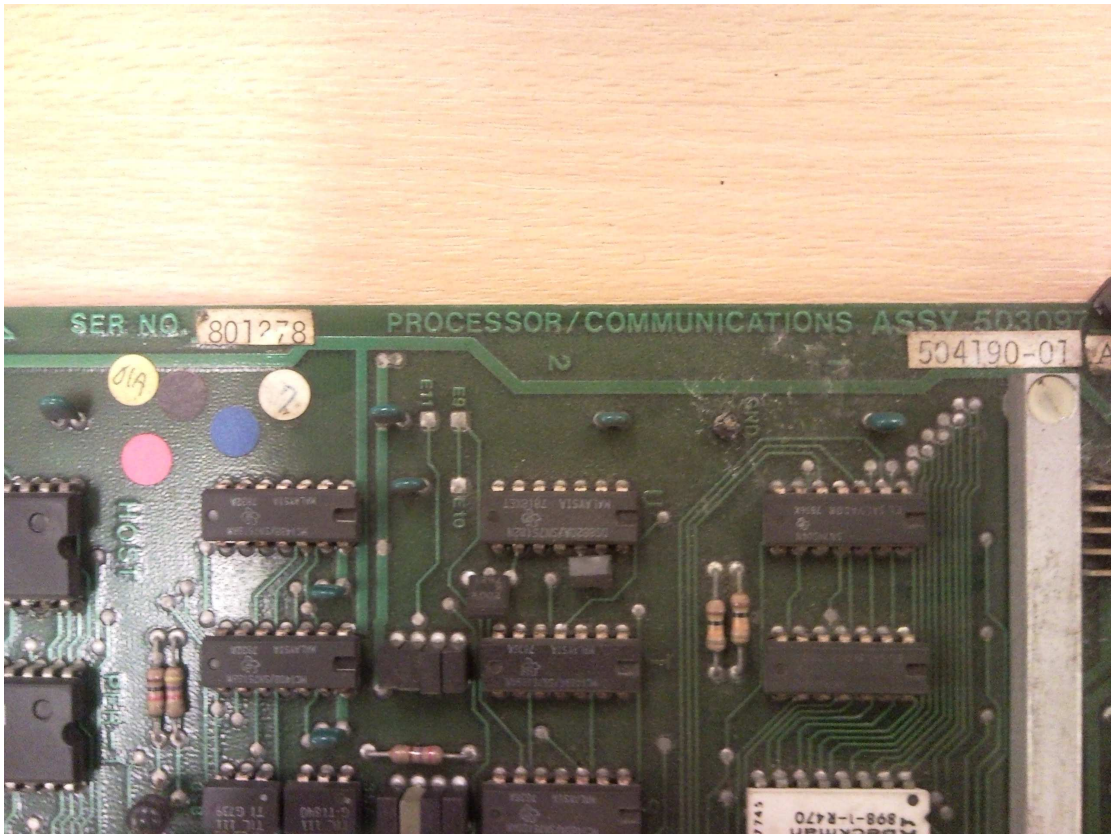



*Figure 9: Ramtek 6200A Processor/Communications board serial number 801278*

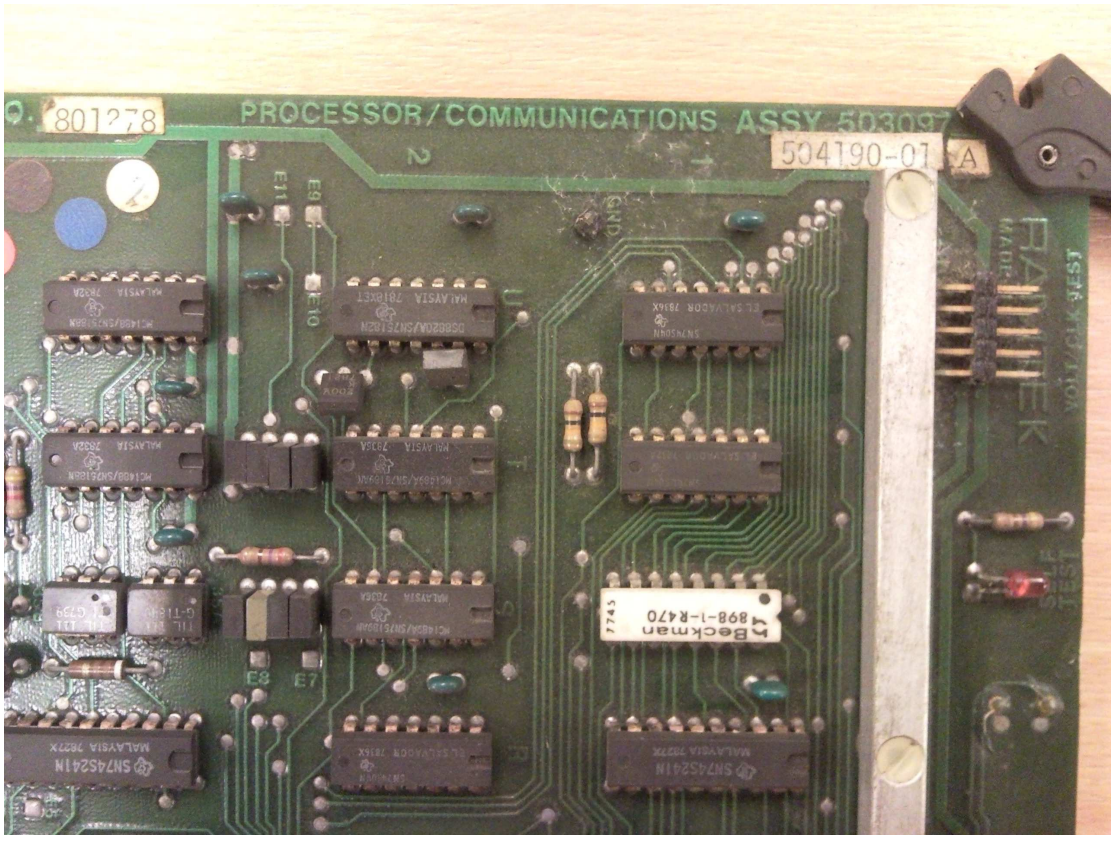



*Figure 10: Ramtek 6200A Processor/Communications board assy no. 504190-01A*

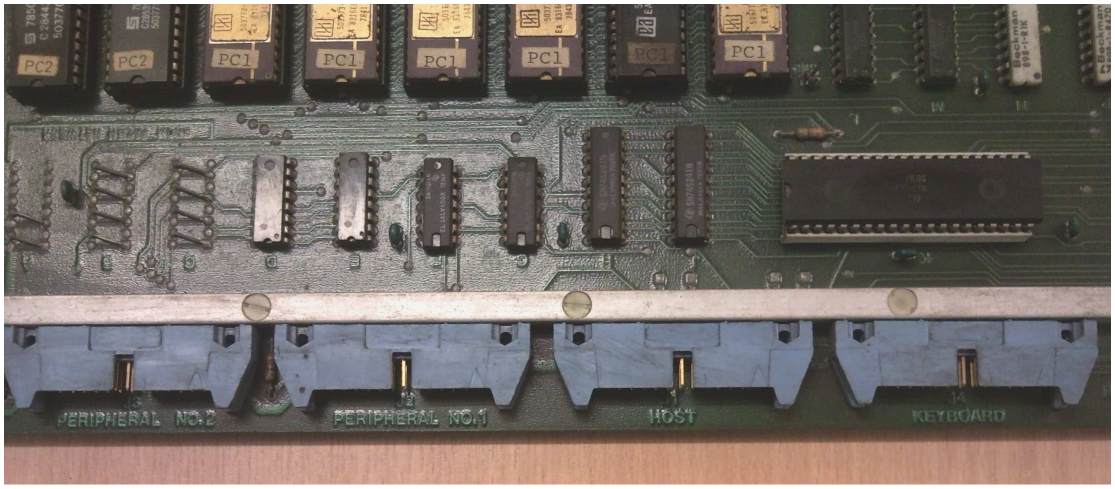



*Figure 11: Ramtek 6200A Processor/Communications board I/O ports*

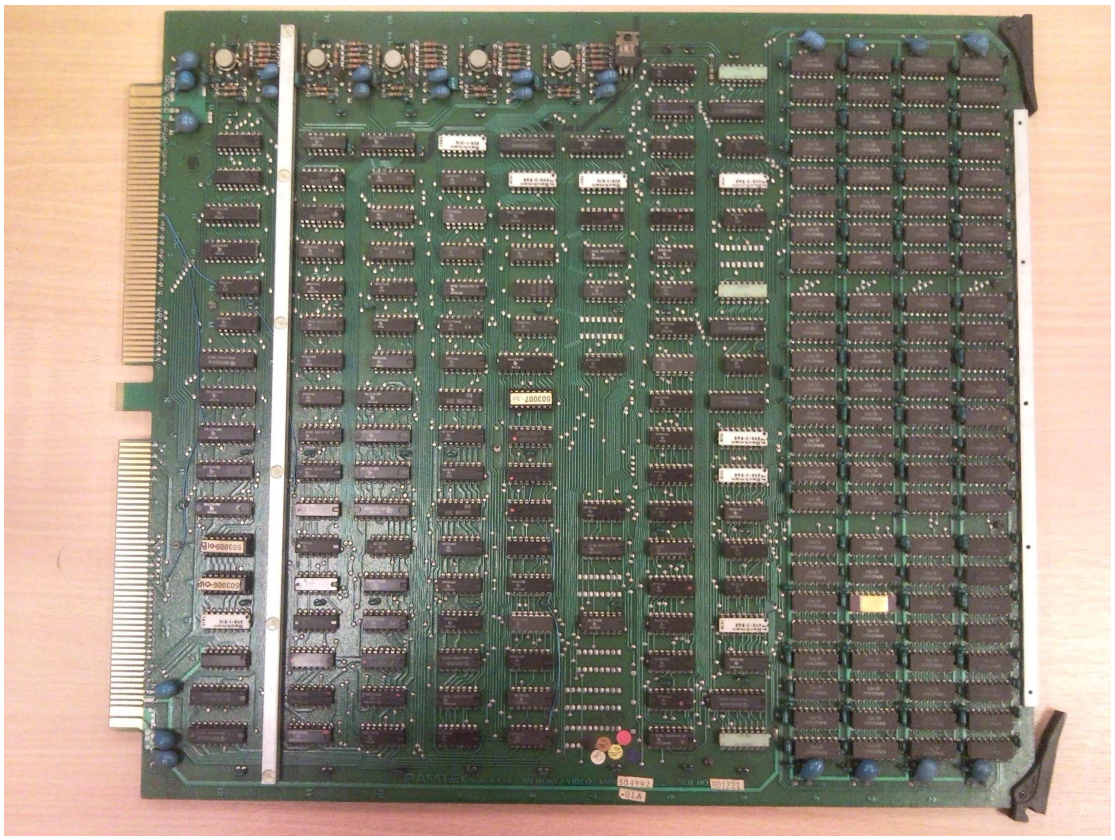


*Figure 12: Ramtek 6200A Memory/Video board*

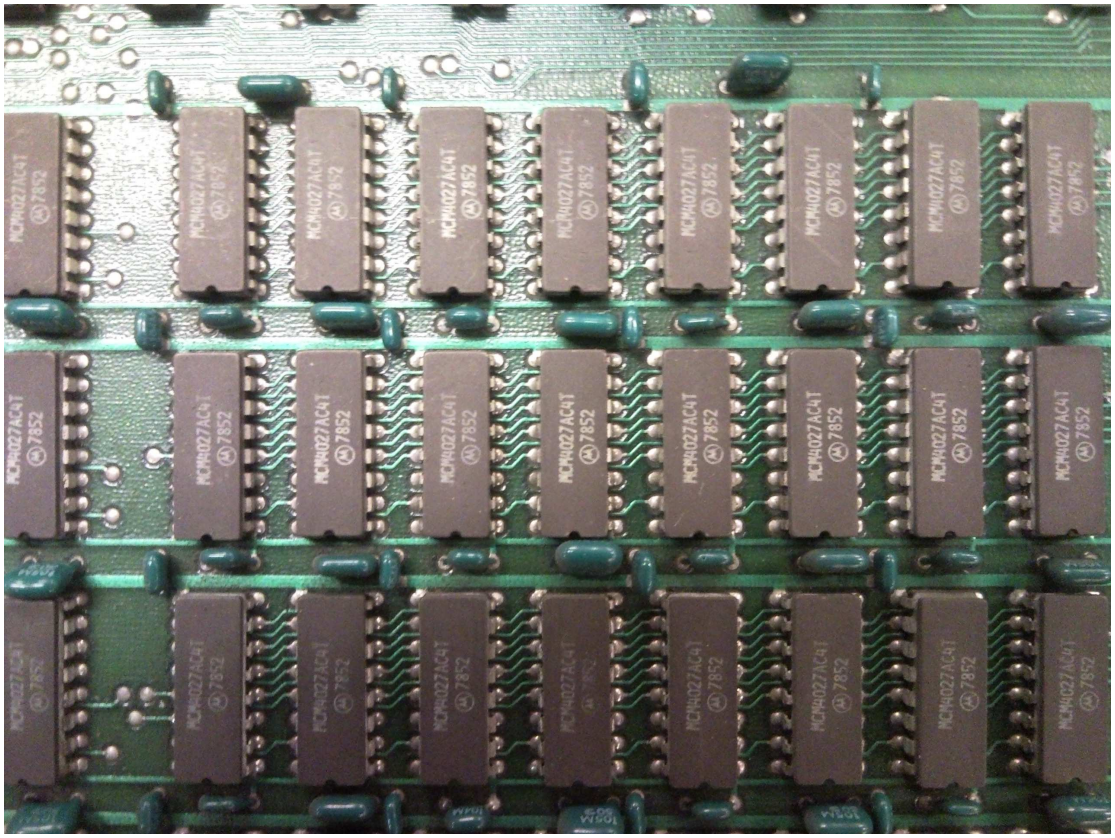



*Figure 13: Ramtek 6200A Memory/Video board DRAM graphics memory*

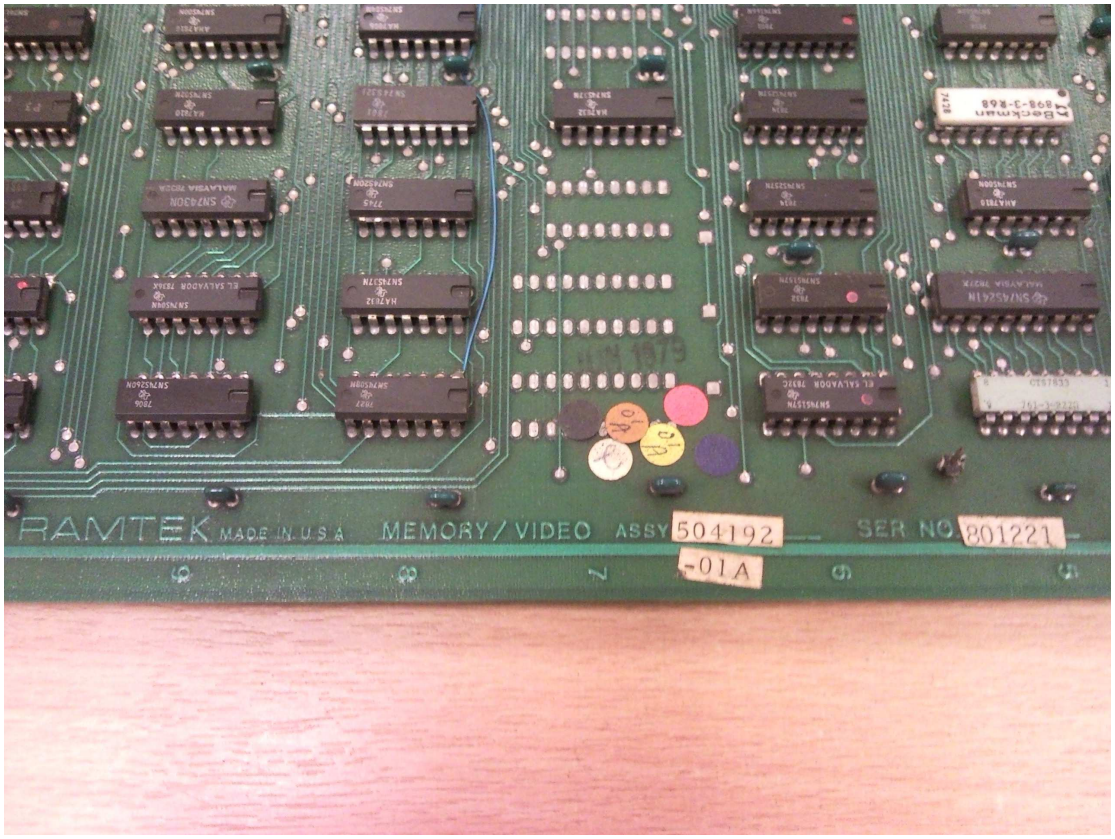



*Figure 14: Ramtek 6200A Memory/Video board serial number 801221*

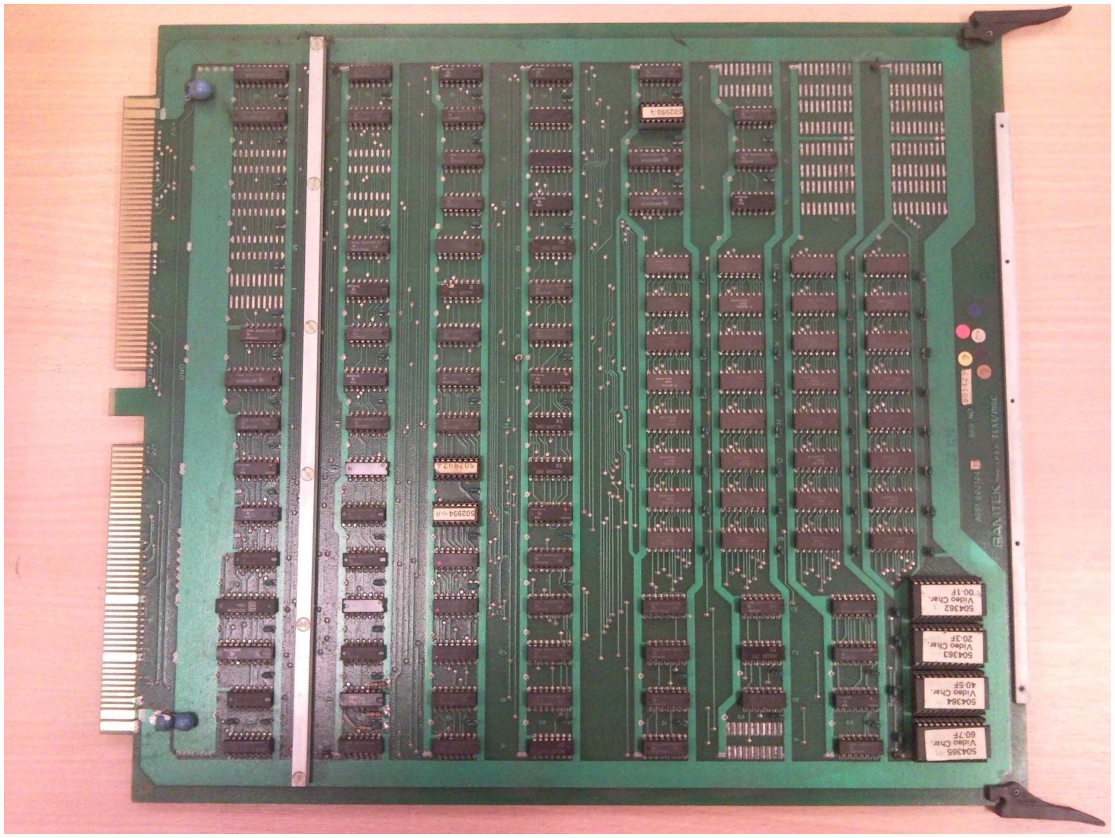


*Figure 15: Ramtek 6200A Text/Disc board*

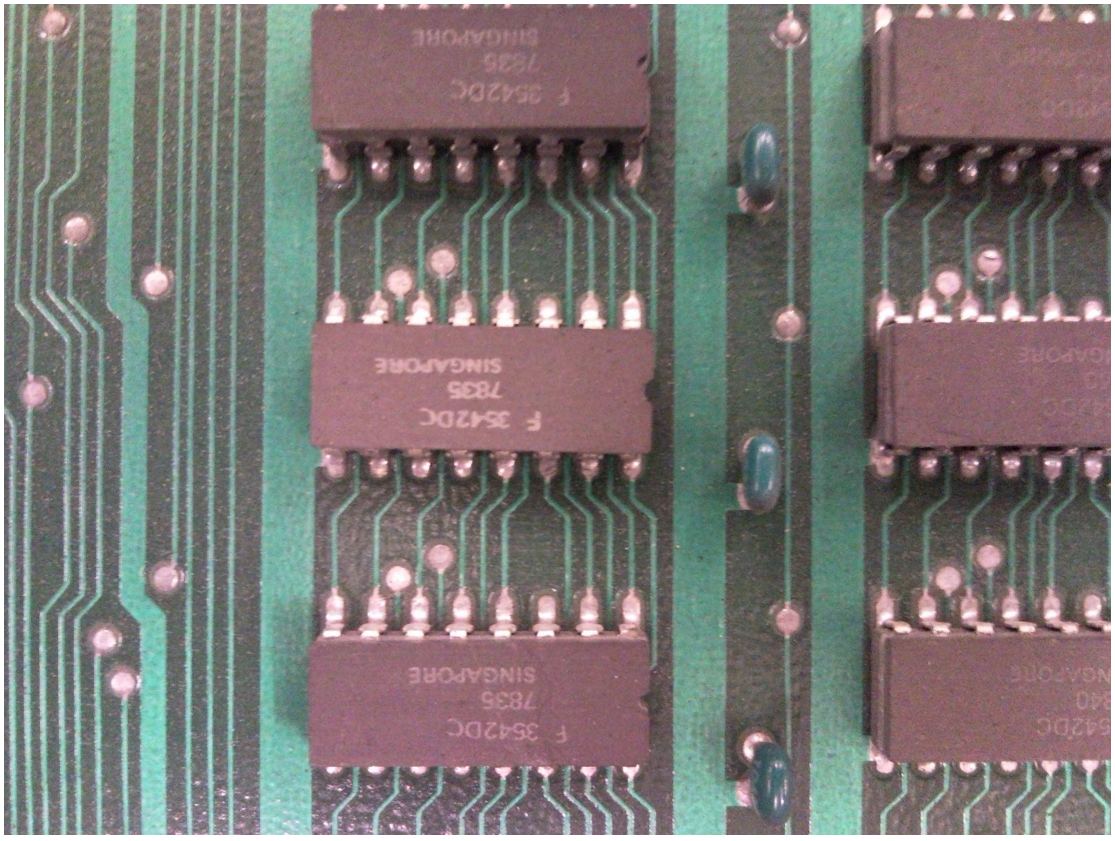



*Figure 16: Ramtek 6200A Text/Disc board text memory*

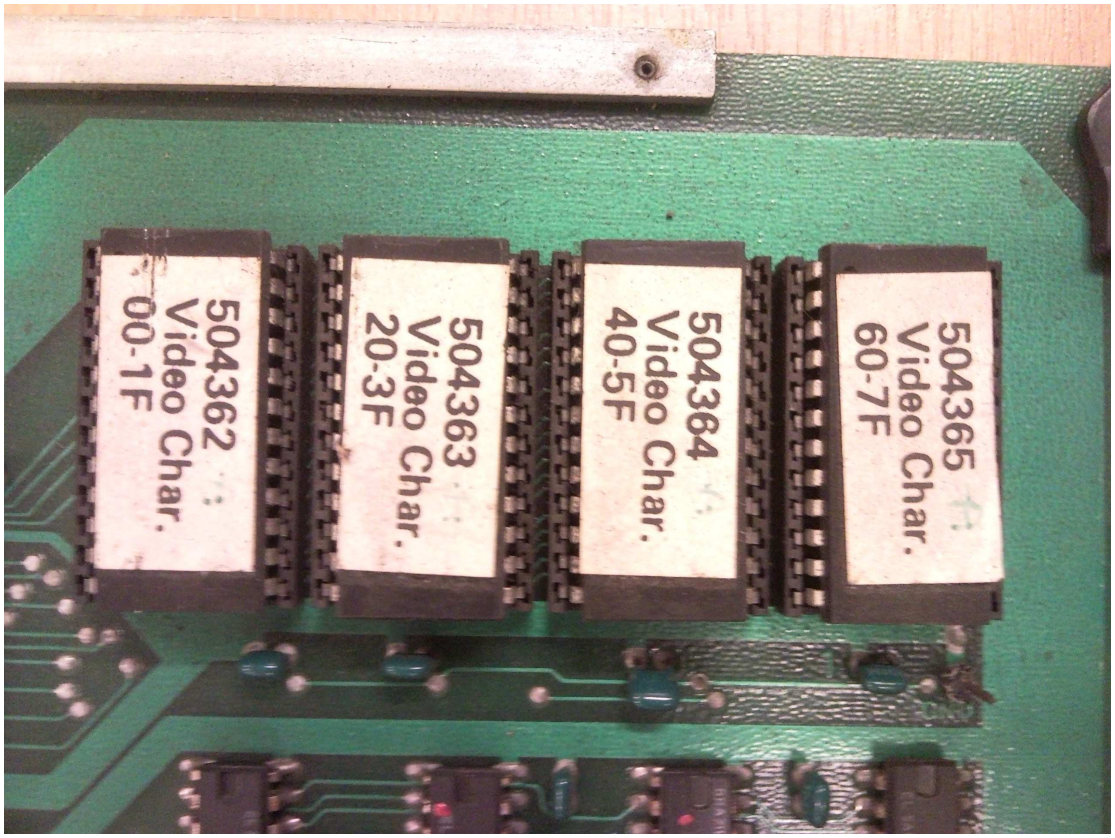



*Figure 17: Ramtek 6200A Text/Disc board text character ROMs*

*Figure 18: Ramtek 6200A Text/Disc board serial number 801429*

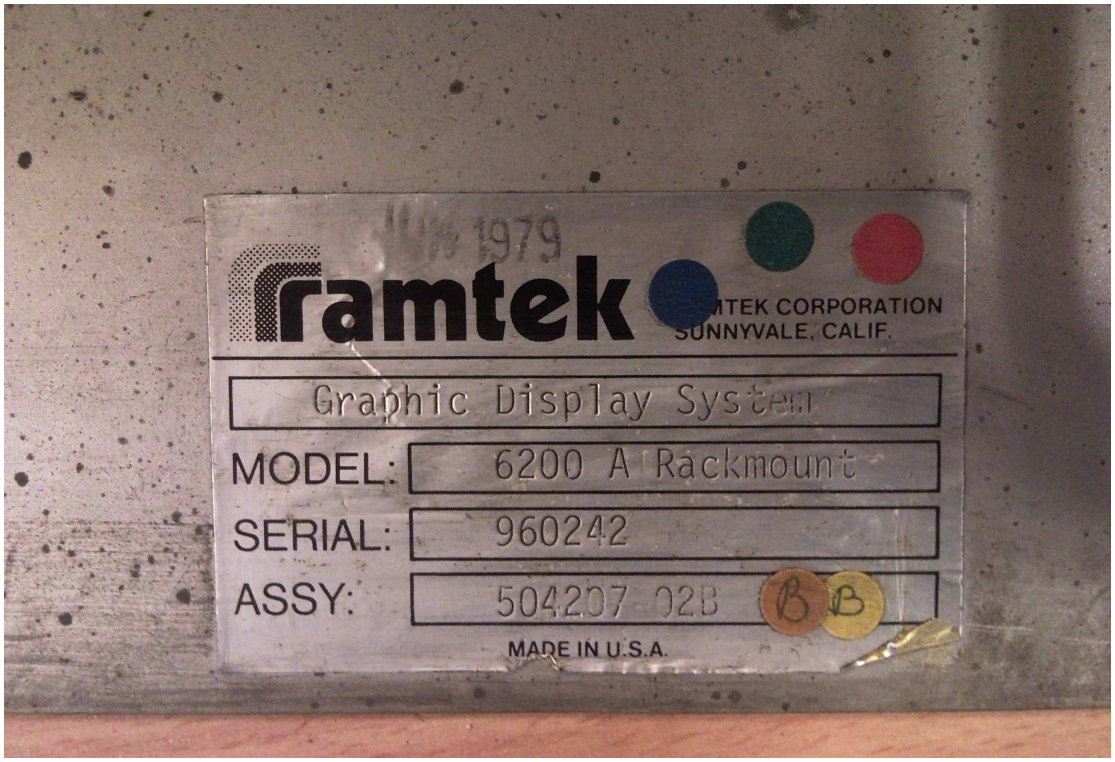



*Figure 19: Ramtek 6200A manufacturing label*
*Model: 6200A Rackmount, S/N: 960242, Assy: 504207 02B, Made in USA, 1979.*

# Ramtek 6000 Series Data Sheet

## 6200A Colorgraphic Computer Terminal

- **Fully integrated Colorgraphics capability**
- **High resolution color display**
- **Powerful Colorgraphic Programming Language**
- **State-of-the-Art Raster Scan Technology**
- **Modular, Microprocessor-Controlled Architecture**
- **Teletype™ ASR-37 compatible (RS-232C and full ASCII)**
- **Independent Color Alphanumeric and Graphic Displays**
- **Interactive Graphic Input Option**
- **Hardcopy Interface**

The Ramtek 6200A is a sophisticated, interactive computer terminal which provides the computer user with high resolution, raster scan Colorgraphics. The Ramtek 6000 Series provides to the computer graphics marketplace a highly-modular and flexible graphics terminal which gives you full color output from your computer. Ramtek gives you high resolution, cost-effective Colorgraphics today.

The 6200A Colorgraphic Computer Terminal integrates the latest in raster scan graphics and microprocessor technology with an interpretive graphics programming language to provide a comprehensive Colorgraphics terminal. The Colorgraphic Programming Language is a powerful set of user-oriented commands that are easy to learn and easy to use. This offers graphics users an efficient way to add color to their existing graphics applications. It allows non-graphics users an effective way to move immediately to Colorgraphics.

The 6200A has full color graphic and alphanumerics capabilities. The independent graphic and alphanumeric random access memories (RAM) may be viewed either together or separately This provides maximum flexibility to the user.

The bright, flicker-free color display may be easily viewed in typical ambient light conditions. And, in addition, Colorgraphics maximizes the utility of the information displayed.

Teletype compatibility allows the user immediate access to his computer system. The 6200A has several options available to increase the graphics utility of the terminal in the computer graphics movement.

### DISPLAY

Type: High Resolution RGB Monitor, P22 Phosphor
Non-Interlaced Raster Scan (Repeat Field)
60 Hz Refresh Rate

Size: CRT 330mm (13″) Diagonal
Visible Raster—255mm (10″) x 191mm (7.5″) Y
51 Pixels/in. x 34 Pixels/in. Y
4:3 Aspect Ratio


### GRAPHICS

Origin: 0,0 Lower Left Corner
Displayable Pixels: 512 (X) by 256 (Y), 1.5:1 Rectilinear
Vector Speed (max): HORIZ 20 μs/Pixel
VERT 66 μs/Pixel
ANGLE 112 μs/Pixel
Text Characters: 128 Displayable ASCII Characters
7 x 10 Character Cell
5 x 7 Character Matrix
Vector Type: Solid (Patterned Vectors/Fill Optional)
Cursor: Blinking—Crosshair
Blink Mode: Defined Graphic Entity Hardware (Optional)
Color PROM: Primary Color Table—8 Colors
White, Red, Green, Blue, Magenta, Cyan, Yellow, Black
Alternate Color Table
One Black and Seven White

### ALPHANUMERICS

Origin (Home): Upper Left Corner
Format: 72 Columns by 25 lines, 1800 Total Characters
Font: 96 Displayable ASCII Characters
7 x 10 Character Cell
5 x 7 Character Matrix
On-The-Fly Character Generation
Cursor: Underline with Selectable Blink
Color PROM: Green (Default)
Primary Color Table—8 Colors
White, Red, Green, Blue, Magenta, Cyan, Yellow, Black
Alternate Color Table
One Black and Seven White
Display Modes: Reverse Background, Blink, and Underline
Edit Mode: Overstrike Replaces With Last Character and Color

### KEYBOARD

Detachable, 51cm (2 ft.) Cable Standard
Alphanumeric Group—61 Keys
User Function Group—12 Keys
Terminal Control Group—16 Keys
Cursor Control Group—12 Keys
Data Communication Control Group—5 Switches
Parity Switch: Odd, Even, or No Parity
Communication Mode Switch: Full Duplex and Local Echo
TTY Mode Switch: On—64 Character ASCII or
Off—Full ASCII
Local/Remote Switch
Speed Switch: 110, 300 or Selectable (1200 Baud Default)
Auto Repeat, N-Key Rollover

### TERMINAL INPUT/OUTPUT

Data Communications:
Serial Asynchronous—EIA Standard RS 232C and CCITT/V24
Data Rate:
External Switch Selectable:
110, 300 and Selectable (1200 Baud Default)
Internal DIP Switch Selectable:
50, 110, 134.5, 150, 300, 600, 1200, 1800, 2400, 4800 or 9600 Baud
Operation above 1200 baud may require nulls or handshake protocol to insure proper terminal operation.
Peripheral Port 1 (PER 1): DCE, RS 232C, Bit Serial Differential
Peripheral Port 2 (PER 2): DCE, RS 232C, Bit Serial TTL
Video Outputs (BNC):
R, G, B — Graphic and/or Alphanumeric, RS 170 Compatible Voltage Levels
B/W — Alphanumeric Only
Hardcopy — A/N and/or Graphic

**TERMINAL CONTROL SOFTWARE (TCS)** TCS Release 2.0 firmware is included.

COLORGRAPHIC COMMAND SUMMARY

| MNEMONIC | INSTRUCTION | MNEMONIC | INSTRUCTION |
|---|---|---|---|
| ALARM | SOUND AUDIBLE ALARM | SBG | SELECT BACKGROUND COLOR |
| ALPHA | SELECT ALPHA EXECUTION STATE | SBL | SET BLINK |
| BARX | DRAW HORIZONTAL BAR CHART | SBU | SET BLINKING UNDERSCORE |
| BARY | DRAW VERTICAL BAR CHART | SCOP | SET CURRENT OPERATING POINT |
| BOX | DRAW RECTANGLE AND FILL | SCOPX | SET COP X COMPONENT |
| CAC | CLEAR ALTERNATE COLORS | SCOPY | SET COP Y COMPONENT |
| CAD | CLEAR ADDITIVE WRITE | CUR | SET CURSOR ADDRESS |
| CBL | CLEAR BLINK | SCURX | SET CURSOR X COMPONENT |
| CBU | CLEAR BLINKING UNDERSCORE | SCURY | SET CURSOR Y COMPONENT |
| CDH | CLEAR DOUBLE HEIGHT | SDH | SET DOUBLE HEIGHT |
| CDW | CLEAR DOUBLE WIDTH | SDW | SET DOUBLE WIDTH |
| CGLOFF | TURN INTERPRETER OFF | SWIN | SET WINDOW |
| CGLON | TURN INTERPRETER ON | TCOM | SET TERMINAL COMMUNICATION PARAMETERS |
| CHANGE | CHANGE CHARACTER CONTROL CODES | SFG | SET FOREGROUND COLOR |
| CIRCLE | DRAW CIRCLE | SFH | SET FONT HEIGHT |
| CONICE | DRAW CONIC TO END POINT | SFW | SET FONT WIDTH |
| CONICP | DRAW CONIC PARTIAL | SHS | SET HORIZONTAL SPACING |
| CRB | CLEAR REVERSE BACKGROUND | SHTAB | SET HORIZONTAL TAB |
| CVA | CLEAR VISIBLE ALPHA | SI | SET INDEX REGISTER |
| CVC | CLEAR VISIBLE CURSOR | SIX | SET INDEX X COMPONENT |
| CVU | CLEAR VISIBLE UNDERSCORE | SIY | SET INDEX Y COMPONENT |
| DOT | WRITE GRAPHIC ELEMENTS | SPBL | SET PLOT BASELINE |
| ERASE | ERASE REFRESH MEMORY | SPS | SET PLOT SPACING |
| EWIN | ERASE WINDOW | SPW | SET PLOT WIDTH |
| FILL | FILL CONVEX POLYGON | SRB | SET REVERSE BACKGROUND |
| GRAPH | SELECT GRAPHIC EXECUTION STATE | SSC | SELECT SUBCHANNELS |
| HOME | HOME CURSOR | SVA | SET VISIBLE ALPHA |
| HSCR | HORIZONTAL SCROLL | SVC | SET VISIBLE CURSOR |
| INIT | INITIALIZE INTERPRETER | SVS | SET VERTICAL SPACING |
| LED | SET KEYBOARD LED'S STATE | SVSC | SELECT VISIBLE SUBCHANNELS |
| LINE | DRAW LINKED VECTORS | SVTAB | SET VERTICAL TABS |
| LPF | LOAD PROGRAMMABLE FONT | SVU | SET VISIBLE UNDERSCORE |
| PLOTX | DRAW HORIZONTAL PLOT | TEXT | WRITE TEXT |
| PLOTY | DRAW VERTICAL PLOT | TTY | SET TTY WINDOW |
| PTEXT | WRITE PROPORTIONAL TEXT | TTYOFF | TTY EMULATOR OFF |
| RASTER | WRITE RASTER DATA | TTYON | TTY EMULATOR ON |
| RCUR | REPORT CURSOR POSITION | VALPHA | VIEW ALPHANUMERIC REFRESH SYSTEM |
| RECT | DRAW UNFILLED RECTANGLE(S) | VBOTH | VIEW BOTH REFRESH SYSTEMS |
| RESET | RESET INTERPRETER | VGRAPH | VIEW GRAPHIC REFRESH SYSTEM |
| RLINE | DRAW RADIAL VECTORS | VSCR | VERTICAL SCROLL |
| SAC | SELECT ALTERNATE COLORS | VTEXT | WRITE VARIABLE TEXT |
| SAD | SET ADDITIVE WRITE | | |
| SBC | SET BLINKING CURSOR | | |

## PHYSICAL SPECIFICATIONS

Table-Top Configuration

Weight: Terminal 60.0 kg (130 lbs.)
Keyboard 3.2 kg (7 lbs.)
Total Shpg. 80.0 kg (175 lbs.)

Dimensions:
Terminal—483mm H (19") x 533mm W (21") x 838mm (33")
Keyboard—318mm H (12.5") x 533mm (21") x 318mm D (12.5")

Power Requirements:
Input Voltage—108-130 VAC at 47 to 66 Hz
Power Consumption—550W (max)
Fusing—15 Amps (fast blow)

## ENVIRONMENTAL SPECIFICATIONS

Temperature, Free Space Ambient
Non-Operating—20° to 65°C (4° to 149°F)
Operating—5° to 40°C (41° to 104°F)
Relative Humidity: 20-80% (non-condensing)

## PRODUCT SUPPORT

Warranty: 90 days parts and labor

Installation: Terminal installation can be performed by the owner/user. Refer to reference manual supplied with unit for detailed instructions. Installation can be provided upon request and at the prevailing rates by Ramtek.

Documentation Supplied:
6000 Series Installation & Adjustment Procedure
6000 Series Programming Manual
6000 Series Theory of Operations, Vol. I

## OPTIONS

6002 SELECT Baud Rate
SELECT baud rate position may factory pre-set to baud rate other than standard 1200 baud (default) position.

6003 Host Interface Option
Current Loop or Differential operation may be selected instead of standard TTL.

6801 Scratchpad Memory Extension
12K bytes of RAM may be added to existing 4K bytes of RAM for a total of 16K bytes of Scratchpad RAM space.

6804 Interactive Joystick
Includes 4' cable

6805 Special Graphics Color PROM
A custom PROM may be ordered which will have colors selected from the 6000 Series Color Chart. Specify special colors on Selection Chart and include with order.

6811 Graphic Blink Overlay
An overlay which allows the user to "blink" graphic entities on the display. This option does preclude the normal use of the alternate color PROM.

6901 Subroutines Firmware

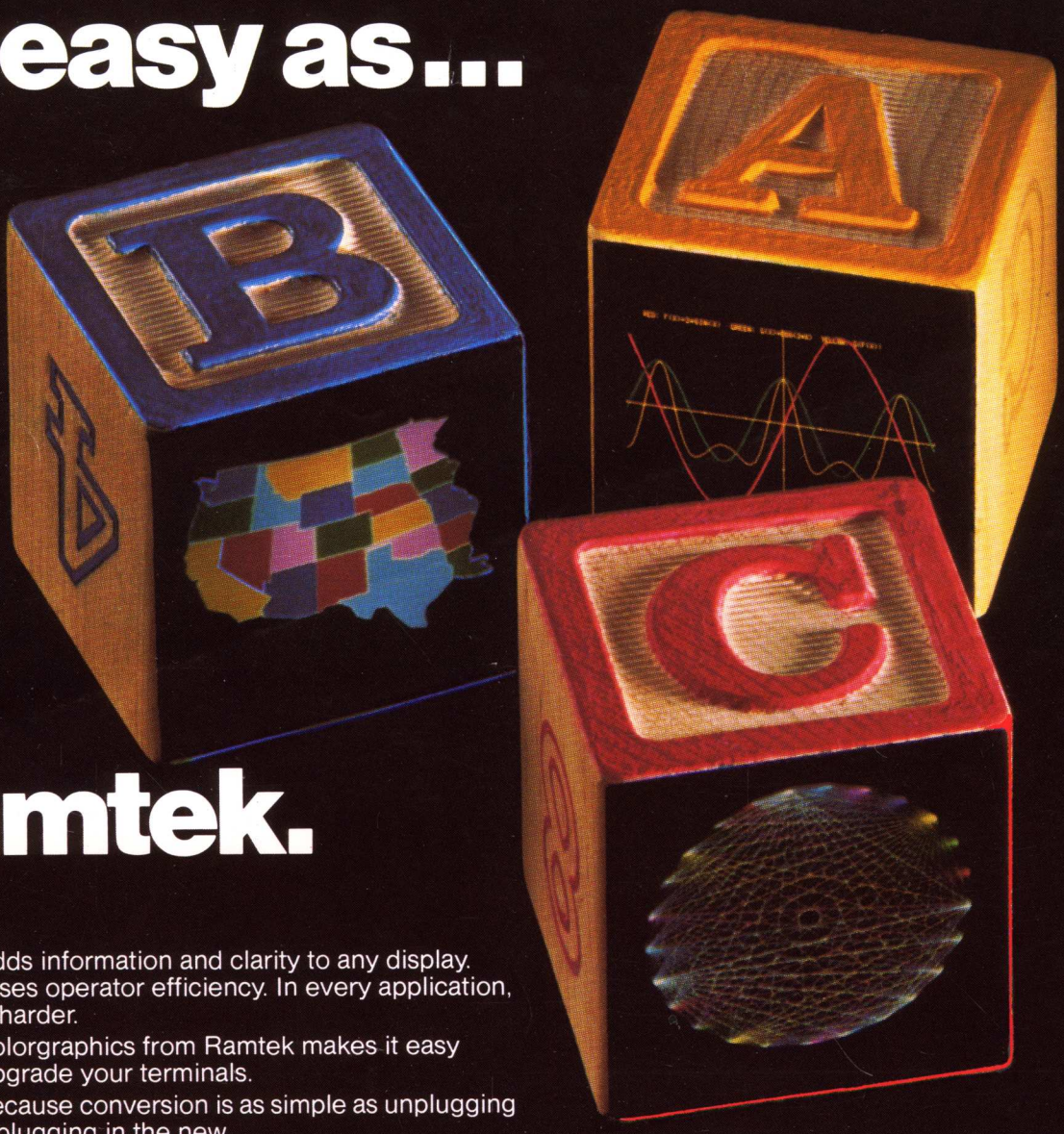
| | |
|---|---|
| CALL | Invoke A Subroutine |
| DEL | Delete Subroutines Line Numbers |
| FKEY | Assign A Function Key To A Subroutine |
| GOTO | Transfer Control Within Subroutine |
| RET | Return From A Subroutine |
| SEND | Formatted Output From Terminal |

6902 Patterned Vectors/Fill Firmware

| | |
|---|---|
| LPL | Load Patterned Line |
| PLINE | Patterned Line |
| PFILL | Patterned Fill |

ramtek
**Our Experience Shows**
585 North Mary Avenue
Sunnyvale, California 94086
(408) 735-8400

# No one can let you plug in to Colorgraphics as easy as...




# Ramtek.

Color adds information and clarity to any display. Color increases operator efficiency. In every application, color works harder.

Now, Colorgraphics from Ramtek makes it easy for you to upgrade your terminals.

Easy, because conversion is as simple as unplugging the old and plugging in the new.

Easy, because writing programs is so uncomplicated you can be displaying your first colorgraphics in half-an-hour.

Easy, because Colorgraphics is the only complete family of raster scan colorgraphics terminals.

Easy, too, because stand-alone colorgraphics terminals let you develop your color software without costly CPU overhead.

Finding out more is just as easy. Call your nearest Ramtek Office. Or, write: Ramtek, 585 N. Mary Ave., Sunnyvale, CA 94086.

**The complete terminal family is ready to plug in.** A. The 6110, our lowest-priced true colorgraphics terminal. B. The 6200A, more capabilities per dollar than any comparable terminal. C. The 6310, the highest resolution raster scan color terminal made.

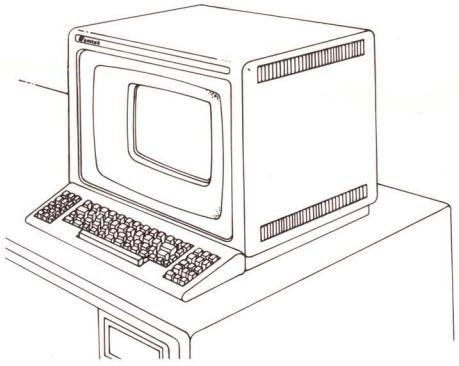
ramtek

**Our experience shows**

REGIONAL OFFICES: Sunnyvale, California (408) 735-8400 · Newport Beach, California (714) 979-5351 · Dallas, Texas (214) 422-2200 · Huntsville, Alabama (205) 837-7000 · Cleveland, Ohio (216) 464-4053 · Washington, D.C. (703) 960-3550 · Boston, Massachusetts (617) 862-7720 · West Germany (0611) 595980.

# The Colorgraphics computer terminal family is the beginning of a new era in computer graphics.

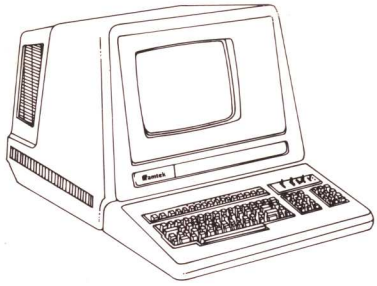
**"If you are looking for true color graphics, there is no lower priced way to make the switch from monochrome or black-and-white than the new 6110 Colorgraphics."**



## The 6110 Colorgraphics

- 320 x 240 x 3 graphics matrix.
- Medium resolution 13" color monitor.
- 72 x 25 alphanumerics format.
- TV compatible format.
- Eight graphics colors.
- Pedestal configuration.
- Ideal for educational, business and process control applications.

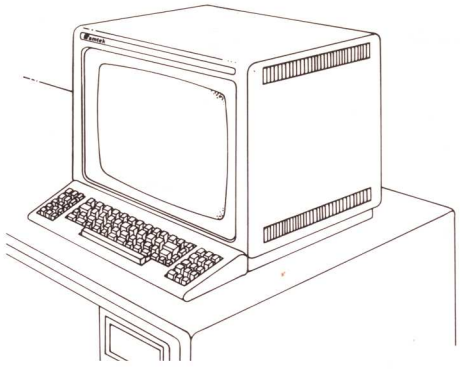
**"The user who is looking for a versatile, general-purpose graphics terminal will soon discover that the 6200A Colorgraphics offers more features for the money than anything else around."**



## The 6200A Colorgraphics

- 512 x 256 x 3 graphics matrix.
- High resolution 13" color monitor.
- 72 x 25 alphanumerics format.
- Eight selectable colors.
- Desktop or rack mount configuration.
- Ideal for general computer graphics applications.

**"The critical fact about the Colorgraphics 6310 is performance. With an 800 x 600 displayable matrix it is simply the highest resolution raster scan color terminal on the market today."**



## The 6310 Colorgraphics.

- 800 x 600 x 3 graphics matrix.
- Ultra-high resolution 19" color monitor.
- 72 x 24 alphanumerics format.
- User programmable colors.
- Color zoom/pan over the full 1024 x 1024 memory.
- Pedestal configuration.
- Ideal for high resolution computer graphics applications such as scientific research and computer aided design.

### Color does more for you

1. You can display more information on the screen at one time.
2. You get another dimension for data display.
3. You react faster to changes in data.
4. You have many more choices when coding graphics and alphanumerics.
5. It's less boring for the user; efficiency increases.

### Two terminals in one

Dual architecture gives you separate memories for graphics and alphanumerics. Each terminal can function as either a teletype or a graphics terminal or both simultaneously. Increases your flexibility in how you can assign work stations and the kinds of tasks that can be performed at each.

### TTY compatible

The family is RS 232 and CCITT (V 24) compatible. A serial asynchronous communications interface minimizes host interface problems.

### Total compatibility

The Colorgraphics family is upward and downward compatible in software, options and peripherals. There is no wasted effort, wasted money or retraining required to shift from one model to the next.

### They stand alone

Powerful terminal-resident firmware provides an easy-to-use interpreter. You can develop your Colorgraphics software off-line, without costly host computer overhead.

## From Ramtek, Who Else?

Ramtek has been the innovator in raster scan color imaging and graphics technology from the first. Nobody knows more about it. Nobody gives you more ways to take advantage of its potential—at an affordable price.

**Ramtek**

**Our Experience Shows**

585 N. Mary Ave., Sunnyvale, CA 94086
(408) 735-8400

### You get true Raster Scan Colorgraphics

Every plot point is addressable. In a character graphic system the entire character cell must be one color. With raster scan, each pixel (picture element) can be a different color. It adds versatility and effectively increases color resolution.

### Easy to program

Ramtek's Colorgraphics programming language is an extremely high-order language. Commands are brief and intuitive. Complex graphics operations, such as drawing a circle require only a single command. Operator training time is reduced to a minimum.

### Easy on the user

60Hz, non-interlaced repeat field operation makes the display flicker-free. Operators can look at the display for longer periods without fatigue. The bright, easy-to-read display permits use in a wide range of lighting conditions.