

# DECgraphic-11

## GT46 Stand-Alone Graphics System



- Self Contained System
- Full PDP-11 Family Features
- Choice of Operating Systems
- A DECgraphic-11 Family Member

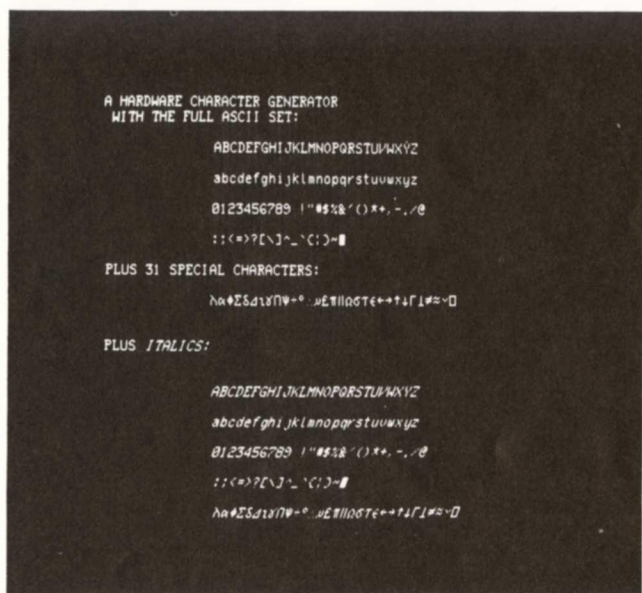
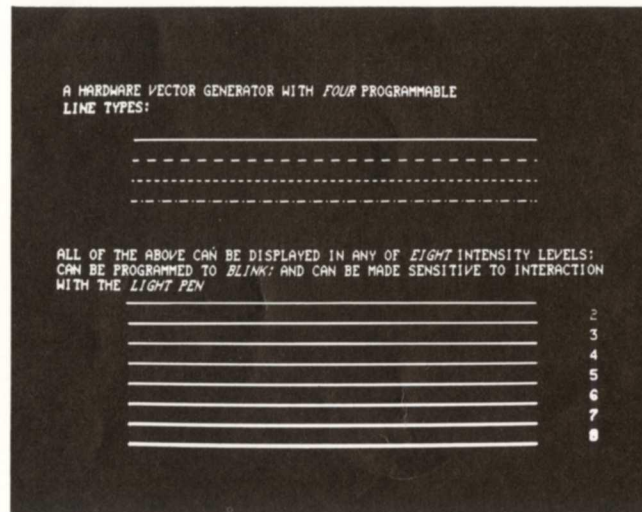
- Refresh Display with Light Pen
- Wide Range of Peripherals
- Graphics Support Routines
- Single Source, World Wide Support

## THE DECGRAPHIC-11 GT46

The GT46 is a self-contained member of the DECgraphic-11 family of interactive graphics display systems.

The GT46 provides the user with rapid generation and dynamic changes of graphical information through the autonomous refresh capabilities of its display processor. On-line interaction with the user's application is readily achieved by a convenient hand-held light pen or optional 16-button function key pad.

The economical GT46 combines the power and versatility of the PDP-11T34 disk-based computer system with the graphical facilities of the VT11 display subsystem. It is thus ideally suited for a broad range of applications, from real-time data acquisition and display to simulation studies and computer aided design. It is fully supported by a comprehensive set of FORTRAN callable sub-routines in RT-11 and RSX-11M environments.



## FEATURES

### • Self-Contained System

A complete disk-based computer system with full hardware and software graphics support. Suitable for many applications in the basic configuration.

### • PDP-11 Family Features

PDP-11/34 includes an integral Memory Management Unit, Extended Instruction Set, and is expandable to 124K words of memory.

### • Choice of Operating Systems

RT-11 for real-time fast response. RSX-11M for multi-task operation.

### • A DECgraphic-11 Family Member

Being a member of the DECgraphic-11 series of interactive graphics systems means that application software written for the GT46 can be easily transferred to run on other DECgraphic-11 configurations. The integrated family approach brings the benefits of commonality in training, operating, programming, and documentation. Other DECgraphic-11 family members include graphics terminal systems, as well as high performance graphic systems using the upward compatible VS60 display subsystem.

### • Refresh Display with Light Pen

The GT46 incorporates the VT11 display subsystem. Since this is a refresh display subsystem, the GT46 graphics user derives the following benefits:

- Good picture contrast.
- Rapid picture generation and modification.
- Direct memory access without CPU overhead.

Closely coupled graphical interaction is then easily achieved with:

- Solid state light pen (standard)
- 16 push-button unit (optional)

### • Wide Range of Peripherals

The GT46 can be used with any UNIBUS peripheral. Particularly useful in graphics environments are:

- Graphic Plotters, Electrostatic Printer/Plotter
- Real-Time A/D Interface

### • Graphics Support Routines

For application programs written in FORTRAN, the GT46 user can use DECgraphic-11 FORTRAN Support routines:

Compatible with other DECgraphic-11 systems. Available under RT-11 or RSX-11M.

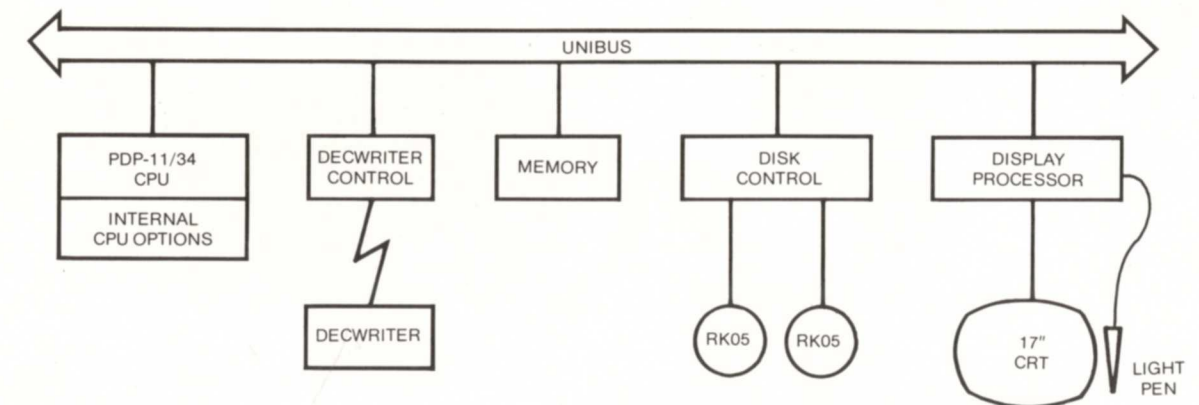
FORTRAN callable subroutines:

- Picture Generation
- Picture Modification
- Interaction & Light Pen Tracking
- Utility Routines

### • Single Source, World-Wide Support

The GT46 is the only interactive graphics system in its price range where the user can call upon a single supplier for his requirements—computer and graphics hardware; computer and graphics software; installation, training, and maintenance. No need to involve more than one supplier to meet a graphics requirement—and when that supplier is DIGITAL, it means ongoing dependable support from specialists in our 250 offices throughout the world.

## GT46 SYSTEM CONFIGURATION



### The GT46 Consists Of:

- PDP-11/34 Central Processor incorporating
  - Integer multiply/divide (EIS—Extended Instruction Set)
  - Memory Management Unit
  - Hardware Bootstrap Loader (M9301-YB)
- Programmer's console (KY11-LB)
- Graphics Display Processor with 17" (43cm) CRT Monitor and Light Pen (VT11-A)
- Console DECwriter (LA36)
- Serial Line Interface for LA36/Real-Time Clock (DL11-WA)
- 32K words (64K bytes) MOS or Core memory
- Two 1.2M word cartridge disk drives (RK05) and control (RK11)
- Table for CRT (H970-FA)
- Tall cabinet (72", 183cm) (H960-DH)

### SOFTWARE

The successful implementation of any graphics application hinges on the effectiveness of the applications program in its working environment. A major stepping stone to success is the provision of a comprehensive package of graphics functional routines. Such a package allows the user to carry out complex real-time graphical manipulation and interaction in a simple and straightforward manner. The software optionally available with the GT46 provides these facilities.

At the operating system level, the user has a choice of two highly versatile PDP-11 operating systems: RT-11, a foreground/background monitor for dedicated applications needing fast response, or RSX-11M where graphics use can be carried out simultaneously with other tasks. Both of these operating systems provide a wide range of program utilities—editors, file management, debugging aids—for efficient program development and operation.

For the graphics facilities, a comprehensive set of software functions is provided under FOCAL/RT-11 and BASIC/RT. Even more extensive facilities are provided for FORTRAN users under both RT-11 and RSX-11M. These FORTRAN callable subroutines—DECgraphic-11 FORTRAN Support—are also applicable to extended versions of the GT46, which could include remotely coupled GT43 or GT62 display terminals.

### EXPANSION SPACE:

|              |                                                                                    |
|--------------|------------------------------------------------------------------------------------|
| Core Version | 1 System Unit (SU)                                                                 |
| MOS Version  | 1 SU, 2 Hex SPC Slots, 1 Quad SPC Slot, plus additional panel space in the cabinet |

### OPTIONS:

|       |                                    |
|-------|------------------------------------|
| LK11: | 16 Push Button Box                 |
| LV11: | Electrostatic Line Printer/Plotter |
| Plus, | full range of PDP-11 peripherals   |

### ORDERING INFORMATION

Option designations in brackets are for 230V/50Hz:

|                  |                   |
|------------------|-------------------|
| 32K Core System: | GT46-CA (GT46-CB) |
| 32K MOS System:  | GT46-MA (GT46-MB) |

NOTE: Core version is slightly faster and the memory is non-volatile. The MOS version has more expansion space.

Software Ordering Information:

RT-11 Software License: QJ003-AE with either FOCAL (QJ922-AE), BASIC (QJ830-AE), or FORTRAN (QJ980-AE).

RSX-11M Software License: QJ620-AE (includes FORTRAN), plus Graphics Extensions (QJ641-AE).

### SYSTEM SPECIFICATIONS

#### CRT Monitor

|                            |                                                                |
|----------------------------|----------------------------------------------------------------|
| Screen Size:               | 17" (43cm) diagonal                                            |
| Image Area:                | 9¼" X 9¼" (23.5cm x 23.5cm)                                    |
| Phosphor Type (standard):  | P39 with IR doping                                             |
| Deflection Type:           | Electromagnetic                                                |
| Beam Spot Size:            | Less than .02" (.5mm)                                          |
| Discrete Intensity Levels: | 8                                                              |
| Brightness:                | 30 foot lamberts (measured using a shrinking raster technique) |

Contrast Ratio:

10:1

#### Display Processor

|               |                                            |
|---------------|--------------------------------------------|
| Type:         | Direct Memory Access (NPR)                 |
| Instructions: | Set Graphic Modes<br>Load Status Registers |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                             |                                      |                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------|-------------------------------------------------------------|
| Instructions:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | No-Op<br>Jump                                                               | Information Available to Programmer: | DPC location; absolute X,Y coordinates of light pen detect. |
| Main Viewing Area:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1024 X 1024 rasters                                                         |                                      |                                                             |
| Image Definition Area:                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 8192 X 8192 rasters                                                         |                                      |                                                             |
| Hardware Parameter:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Blink                                                                       |                                      |                                                             |
| Refresh Rate:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Line Frequency or Unsynchronized (programmable)                             |                                      |                                                             |
| Scissoring:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Hardware                                                                    |                                      |                                                             |
| Interrupts:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Light Pen<br>Time Out<br>Display STOP Interrupt                             |                                      |                                                             |
| Physical:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1 System Unit<br>20' (6.1m) Cable<br>1 Bus Load                             |                                      |                                                             |
| <b>Vector Generator</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                             |                                      |                                                             |
| Line Types:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Solid, long dash, short dash, dot dash                                      |                                      |                                                             |
| Modes:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Relative<br>Relative Short ( $\pm 32$ )<br>Incremental Stroke               |                                      |                                                             |
| Technique:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                             |                                      |                                                             |
| Drawing Speeds:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                             |                                      |                                                             |
| Character                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 26 $\mu$ sec                                                                |                                      |                                                             |
| Vectors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 18 $\mu$ sec for $\frac{1}{2}$ " vector<br>200 $\mu$ sec full screen vector |                                      |                                                             |
| Absolute Point                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 20 $\mu$ sec                                                                |                                      |                                                             |
| Relative Point                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 18 $\mu$ sec for $\frac{1}{2}$ " increment                                  |                                      |                                                             |
| <b>Character Generator</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                             |                                      |                                                             |
| Code:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ASCII                                                                       |                                      |                                                             |
| Character Set:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Full 96 ASCII Set (upper and lower case) plus 31 special symbols            |                                      |                                                             |
| Modes:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Normal, Italics                                                             |                                      |                                                             |
| Rows/Screen:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 31 (42 optional)                                                            |                                      |                                                             |
| Columns/Row:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 72 (80 optional)                                                            |                                      |                                                             |
| Drawing Speed:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 25 $\mu$ sec/character                                                      |                                      |                                                             |
| <b>Other Modes</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                             |                                      |                                                             |
| Absolute X,Y points                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                             |                                      |                                                             |
| Relative X,Y points                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                             |                                      |                                                             |
| X and Y graph plot modes                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                             |                                      |                                                             |
| <b>Interaction</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                             |                                      |                                                             |
| Light Pen:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Programmable sensitivity for any graphic element                            |                                      |                                                             |
| <b>CPU-PDP-11/34</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                             |                                      |                                                             |
| <ul style="list-style-type: none"> <li>• Single and double operand instructions</li> <li>• Hardware implemented multiply and divide instructions</li> <li>• 16-bit word (two 8-bit bytes)</li> <li>• Parity detection on each 8-bit byte</li> <li>• Memory addressing to 124K words</li> <li>• Asynchronous operation</li> <li>• 8 internal general purpose registers</li> <li>• Automatic Priority Interrupt</li> <li>• Vectored interrupts</li> <li>• Power Fail and Automatic Restart</li> </ul> |                                                                             |                                      |                                                             |
| <b>Memory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                             |                                      |                                                             |
| <b>MOS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                             |                                      |                                                             |
| The basic unit of MOS memory, MS11-JP, contains 16K words of parity MOS memory. Each 16K words of MOS requires 1 hex mounting space. Cycle time 0.775 microsecond; access time 0.635 microsecond.                                                                                                                                                                                                                                                                                                   |                                                                             |                                      |                                                             |
| <b>Core</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                             |                                      |                                                             |
| The basic unit of Core memory, MM11-DP, contains 16K words of parity core memory. Each 16K words of core memory requires 2 hex mounting spaces. Cycle time 1.0 microsecond; access time 0.510 microsecond.                                                                                                                                                                                                                                                                                          |                                                                             |                                      |                                                             |
| <b>Disks</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                             |                                      |                                                             |
| Two 1.2M word cartridge disk drives and control                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                             |                                      |                                                             |
| Storage medium:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Disk cartridge                                                              |                                      |                                                             |
| Capacity/cartridge:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1,228,800 words                                                             |                                      |                                                             |
| Data transfer rate:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 11.1 $\mu$ sec/word                                                         |                                      |                                                             |
| <b>Physical Dimensions:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                             |                                      |                                                             |
| Cabinet:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 72" (183cm) H X 21" (53.3cm) W X 30" (76.2cm) D                             |                                      |                                                             |
| CRT:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 15" (38.1cm) H X 21.5" (54.6 cm) W X 27" (68.6cm) D                         |                                      |                                                             |
| Table:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 30" (76.2cm) H X 48" (121.9cm) W X 29" (73.7cm) D                           |                                      |                                                             |
| Weight of GT46:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 940 lbs. (includes cabinet, LA36, table and CRT)                            |                                      |                                                             |



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