The DICOMED D148S Color Slide System

a part of the
DICOMEDIA SLIDESYSTEM™
for the creation of
high resolution 35mm color slides
and business graphics

DICOMED®

The DICOMED D148S Color Slide System

The DICOMED D148S Color Slide System is a stand-alone high resolution color computer-output-to-film system. It is designed to produce high resolution, graphics arts quality 35mm slides. A comprehensive range of high fidelity, full spectrum color graphics can be produced by the D148S.

The D148S is the output portion of the DICOMEDIA SLIDESYSTEM, accepting input from DICOMED's D38 Design Station or other compatible graphics systems to create:

- **High Resolution 35mm Color Slides**
- **Business Graphics**
- **Simulation**
- **Animation**

The D48S Color Raster Recorder is a key element in the D148S System. As a stand-alone computer peripheral, it has earned a reputation as one of the world's leading color graphic film recorders. Combined with the power of the DEC PDP 11/34 computer and DICOMED's extensive system control software, it enables the D148S Color Slide System to stand alone at the forefront of computer graphics technology.

System Overview

The D148S Color Slide System is comprised of a DICOMED D48S Color Raster Recorder, a DEC PDP 11 computer and the DICOMEDIA II Production Software Package. The basic D48S is equipped with a 35mm color optical assembly, 35mm film transport, a PDP 11 computer with 128K words of memory, one 5 megabyte disk unit, a dual floppy disk unit and a computer terminal.

D48S Color Raster Recorder

Combining state of the art technology with DICOMED's years of experience in precision digital color film recording, the DICOMED D48S Color Raster Recorder is unsurpassed in versatility and speed. The D48S records raster information onto color as well as black and white film.

The CRT uses a wide spectral response phosphor, P48, with individual color intensity controls and specially designed color-corrected optics with a microprocessor controlled filter assembly. This combination provides the D48S with unmatched color recording quality. The achievable resolution is generally limited only by the color film emulsion. The color optical assembly may also be used to record onto black and white film.

Standard Features

Raster Mode

Raster images are plotted on a matrix of 4096 x 4096 addressable points at speeds of 166K-333K points per second. A 35mm slide (24mm x 36mm) uses 3200 points by 2138 points and takes an average of 90 seconds to produce depending on slide complexity.

Precision Intensity/Exposure Control

The D48S incorporates DICOMED's superior time modulation exposure system to provide 256 intensity levels. This feature, coupled with programmable exposure translation tables and film configuration control system, permits precise matching of input exposure values to film characteristics to achieve optimum density, color fidelity and repeatability on film.

Precision Optical Assemblies

A series of custom computer designed optical assemblies have been developed for the D48S to achieve optimum performance and interchangeability.

F300	**16mm Cine Format**	
	Film Size:	16mm perforated
	Image Size:	10.27mm x 10.27mm
	Resolution:	90 line pairs/mm (lpm)
F303	**35mm Cine Format**	
	Film Size:	35mm perforated
	Image Size:	24.9mm x 24.9mm
	Resolution:	65 lpm
F304*	**35mm Comic Format**	
	Film Size:	35mm perforated
	Image Size:	37.0mm x 37.0mm
	Resolution:	40 lpm
F307	**84mm Adapter Lens**	**for F303**
	Film Size:	4 x 5 cut film
	Image Size:	84.0mm x 84.0mm

*Standard assembly supplied with the D148S.

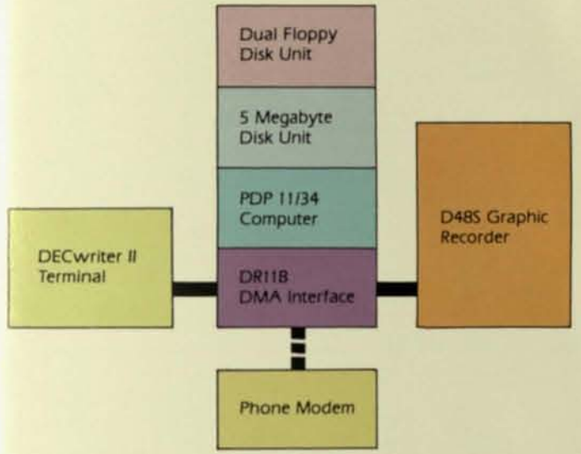
F227 35mm Film Transport

The F227 35mm perforated film transport is designed for 35mm perforated film only. Selectable pulldowns provide for either cine or comic format. The pulldown accuracy is ±0.0005 inch. The F227 may be used with the F304 optical assembly.

System Controller

A Digital Equipment Corporation PDP 11 computer is used as the D148S System controller. The D148S System Controller configuration is comprised of the following system components:

- PDP 11 computer with 128K, 16-bit words of MOS memory
- Dual Floppy Disk Unit
- A 5 megabyte Disk Unit
- DMA Interface
- DECwriter II Terminal
- RSX-11M Real Time Operating System Software



Through its UNIBUS system architecture, the PDP 11 control computer provides a highly flexible means of system expansion. System components such as graphic displays, printers, and additional film recorders may be readily added to the System. The magnetic tape controller and the disk subsystem provide for the easy addition of magnetic tape transports and disk drives, respectively.

The PDP 11 System may also be readily connected to host computer systems via a communications link.

System Software

In order to maximize system flexibility, DICOMEDIA Production Software and System Control has been developed to operate under the powerful Digital Equipment Corporation's RSX-11M Real Time Operating System. DICOMED's software is offered for use under the terms and conditions of DICOMED's software license and DEC's standard software license. The following software is provided with the D148S System:

- DEC RSX-11M Operating System
- DICOMED COM System Control
- DICOMED DICOMEDIA Production Software

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Specifications

Functional Performance

Recording Speed
The total time required to record an image on the D148S is dependent upon the number of points plotted and the execution of other related functions. Time requirements for these functions are stated as follows:

Point Exposure Time
The time required to position and expose any adjacent point ranges from a minimum of three microseconds to a maximum of six microseconds.

Random Position Time
The maximum time required to position the recording beam to any point on the plotting matrix is 100 microseconds.

Beam Flyback Time
The maximum time required to reposition the recording beam to the beginning of a new line in raster mode is 100 microseconds.

Geometrics

Trapezoiding
Trapezoiding is maintained within ±0.1% of the major axis.

Rectangularity
Rectangularity, the deviation of the major axis lengths, is maintained within ±0.1% of the major axis.

Orthogonality
The orthogonality of the horizontal and vertical axes is maintained within ±0.15%. Orthogonality is referenced to the major axis and expressed as a percentage of the matrix diagonal.

Linearity
Point spacing linearity is maintained within ±0.1% of the major axis. Linearity is evaluated for groups of points on the major axis by painting a test pattern on film which divides each of the major axes into segments.

Line Curvature
Pincushion distortion and/or line curvature is less than ±0.1% of the major axis. Pincushion distortion is defined as the maximum deviation of any raster line from the best fit straight line.

Spatial Repeatability
Stability of the deflection subsystem is measured in terms of spatial repeatability. This specification is defined as the deviation of any given point in time for subsequent scans. Spatial repeatability is maintained within ±0.02% of each major axis for successive images repeated during a 10-minute interval, and ±0.05% of each major axis over a 30-minute interval after the unit has been allowed to warm up for a minimum of one hour.

Photometrics

Exposure Range
The D148S is designed to operate with a variety of films. Films with speed as low as ASA 64 may be used.

Exposure Levels
256 levels.

Exposure Uniformity
The uniformity of exposure over the entire plotting array is specified in diffuse density (D) assuming a film gamma of unity. The maximum uniformity deviation is ±0.15D measured through a circular aperture 3 millimeters in diameter.

Spatial Resolution

Film Plane Resolution
Film plane resolution is a function of the optical assembly and the film. The following table summarizes the resolution in line pairs per millimeter which can be expected when using the various optical assemblies available for the D148S. Resolution numbers are referenced to black and white high resolution COM film.

Optical Assembly	Resolution (lpm)
F300 16mm (cine)	90
F303 35mm (cine)	65
F304 35mm (comic)	40

Environmental, Space & Power Requirements

The DICOMED D148S Color Slide System operates without degradation of performance within a temperature of 60-80 degrees Fahrenheit, a relative humidity environment of 45-55%, and an atmospheric pressure environment equivalent to 5,400 feet or less above mean sea level.

The physical space and power requirements for the three major components are described below.

D48S Color Raster Recorder

Floor Space (w x d): 51 x 24 inches (129 x 61 cm)
Height: 72 inches (183 cm)
Weight: 845 lbs. (384 Kg)
Power Requirement: 115 volts ±10%, single phase, 50-60 Hz, 20 amperes maximum

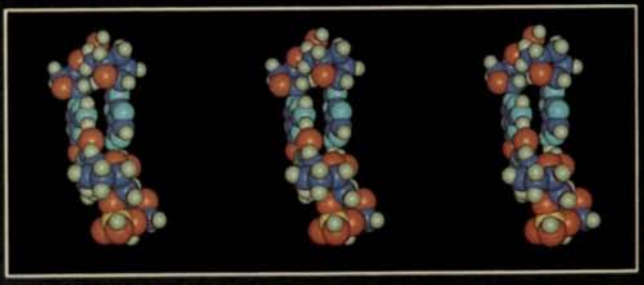
System Controller with Peripherals

Floor Space (w x d): 24 x 33 inches (61 x 84 cm)
Height: 72 inches (183 cm)
Weight: approximately 510 lbs. (232 Kg)
Power Requirement: 115 volts, ±10%, single phase, 50-60 Hz, 30 amperes maximum

DECwriter II

Floor Space (w x d): 28 x 25 inches (71 x 64 cm)
Weight: approximately 104 lbs. (47 Kg)

22805M



Welcome to DICOMED's world of color graphics.

The D148C Color Graphic COM System.

The DICOMED D148C Color Graphic COM System is a stand-alone computer-output-to-microfilm system with outstanding color graphics performance. It provides a unique optical system to produce high-fidelity color in a continuous spectrum.

The D148C is ideally suited for the following applications:

- Scientific Graphic Plotting
- Business Graphics (Vector or Raster)
- Simulation
- Animation
- Graphic Publications
- Engineering Graphics
- Alphanumeric COM (16mm; 24X, 42X, and 48X)

The D48C Graphic Recorder is a key element in the D148C System. As a stand-alone computer peripheral, it has earned a reputation as the world's leading color graphic COM recorder. Combined with the power of the DEC PDP 11/34 computer and DICOMED'S extensive system control software, the D148C Color Graphic COM System stands alone at the forefront of computer graphics technology.

SYSTEM OVERVIEW

The D148C Graphic COM System is comprised of a DICOMED D48C Graphic Recorder equipped with various optical assemblies and film transports, which is connected to the system controller consisting of a DEC PDP 11/34 computer with 80K words of MOS memory, dual 5 megabyte disk units and a 9 or 7 track magnetic tape unit. Although generally used in an off-line mode of operation, the system may be connected, via a communications link, to a host computer for on-line operation.

A second D48C (or D48B COM Recorder) may be added to the system controller for dual recorder operation. (NOTE: In the dual system configuration, the D48 recorders do not record simultaneously.)

D48C COLOR GRAPHIC RECORDER

Combining state of the art technology with DICOMED's years of experience in precision digital color film recording, the DICOMED D48C Graphic Recorder is unsurpassed in versatility and speed. The D48C records graphic, alphanumeric, and raster information onto color as well as black and white film when the appropriate optical assemblies are used.

The CRT uses a wide spectral response phosphor, P48, with individual color intensity controls and specially designed color-corrected optics with a matched seven-color, microprocessor-controlled filter assembly (red, blue, green, yellow, magenta, cyan, and neutral). This combination provides the D48C with unmatched color recording quality . . . the achievable resolution is generally limited only by the color film emulsion. The color optical assemblies may also be used to record onto black and white film by selecting the neutral filter.

Standard features

Vector Mode

Absolute and relative vectors are plotted at an addressability of 32,768 x 32,768 with an internal precision of 65,536 x 65,536. The unsurpassed vector plotting speed of the D48C is achieved through DICOMED's unique length-dependent digital vector generator. DICOMED's unique multiple line width technique provides optimum control of line thickness and intensity while maintaining edge sharpness.

Raster Mode

Raster images are plotted on a matrix of 4096 x 4096 addressable points at speeds of 100K-250K points per second. Element (pixel) size and spacing are fully programmable.

Precision Intensity/Exposure Control

The D48C incorporates DICOMED's superior time modulation exposure system to provide 256 intensity levels in both vector and raster modes. This feature, coupled with programmable exposure translation tables and film configu control system, permits pre matching of input exposure va to film characteristics to achi optimum density on film.

B350 Programmable Hardware Character Generator (Optional)

The B350 Hardware Characte Generator is a high speed stroke type generator which takes advantage of the latest microproce technology. Loadable RAM memories permit fonts to be changed in less than 50 milliseconds. A complete range of character styles from simple character sets for A/N COM to complex graphic arts quality, may be loaded into the character generator's memory. While the speed of character gene ation is a function of font complexity and film type, rates in excess o 30,000 characters per second ca be achieved in A/N COM applica tions. Multiple character sizes and four orientations are standard fea tures. Since the memory of the B350 Character Generator is modularly expandable, it is possible to store and access more than one font, thus making it simple to intermix fonts on the same frame. The B350 is supplied with 8K, 16 bit words of memory and a basic font of 196 characters. The B350 memory is expandable by adding the B351A Memory Expansion Module (24K, 16 bit words).

B352 Storage Tube Display Monitor (Optional)

The B352 Storage Tube Display Monitor provides the operator with a visual display of the information which is being recorded onto film. It may also be used to "preview" data prior to committing it to film. It is also helpful in forms design. The B352 mounts into the B354 Auxiliary Cabinet. This option is field installable and may be purchased at any time.

B353 Camera Exchange Mechanism

In operational situations requiring interchanging film transports and optical assemblies, DICOMED recommends the addition of the B353 Camera Exchange Mechanism to the D48. The B353 facilitates the movement of heavy optical assemblies and film transports, some of which weigh as much as 50 pounds, into and out of the D48. Depending on the personnel operating the system, the B353 may be required to satisfy OSHA regulations. The B353 is mounted on and becomes an integral part of the D48. B355 Storage Carts are also available.

B354 Auxiliary Cabinet

The B354 Auxiliary Cabinet attaches to the D48 cabinet and houses the controller, vacuum pump, and humidity control for the F225 Microfiche Film Transport and F230 Film Transport as well as the controller for the F218 Film Transport. The B352 Storage Tube Display Monitor also mounts at eye level in the B354. The B354 is a required option for the B352, F225, and F218.

Precision Optical Assemblies

A series of custom computer designed optical assemblies have been developed for the D48C to achieve optimum performance and interchangeability.

F300 16mm: Cine Format (used with F218)
Film Size: 16mm perforated
Image Size: 10.27mm x 10.27mm
Resolution: 90 line pairs per millimeter (lpm)

F303 35mm: Cine Format (used with F218)
Film Size: 35mm perforated
Image Size: 24.9mm x 24.9mm
Resolution: 65 lpm

F304 35mm: Comic Format (used with F218 or F227)
Film Size: 35mm perforated
Image Size: 37.0mm x 37.0mm
Resolution: 40 lpm

F305 70mm: (used with F211A)
Image Size: 56.9mm x 56.9mm

F307 84mm Adapter Lens for F303
Film Size: 4 x 5 inch cut film
Image Size: 84.0mm x 84.0mm

F308 16mm (used with F218)
Film Size: 16mm non-perforated
Image Size: 14.8mm x 14.8mm
Resolution: 100 lpm

F309 35mm: Aperture Card Format (used with F218)
Film Size: 35mm non-perforated
Image Size: 37.0mm x 37.0mm
Resolution: 55 lpm

F310 24X Microfiche Format (or 16mm) used with F225
Film Size: 105mm (or 16mm)
Image Size: Reference NMA standard MS 2-1978
Resolution: 100 lpm

F311 42X/48X Microfiche Format (used with F225)
Film Size: 105mm
Image Size: Reference NMA standard MS 2-1978
Resolution: 140 lpm

F312 35mm: Aperture Card Format (used with F225)
Film Size: 35mm non-perforated
Image Size: 37.0mm x 37.0mm
Resolution: 55 lpm

Film Transports

F218 Programmable Pulldown Film Transport

A precision 16/35mm Film Transport with a pulldown accuracy of ±0.0008 inch is provided for 16mm and 35mm applications. Equipped with a programmable pulldown feature, this transport accommodates 16mm cine, 35mm cine, and 35mm comic applications as well as 35mm aperture card format on perforated and non-perforated film. The pulldown accuracy of this transport when using non-perforated film is ±0.0015 inch.

F225 Microfiche Transport

The universal F225 105mm Microfiche Transport is designed to accept 16mm, 35mm, or 105mm non-perforated film. This flexibility, when combined with the F310, F311, and F312 optical assemblies, permits a single transport to be used to record on 16mm, 35mm, and 105mm at 24X, 42X, or 48X. Only a few minutes are required to change from one format to another. No adjustments or focusing are required. The F225 is equipped with a vacuum system to hold film flat and a humidity control to minimize static flashes on film.

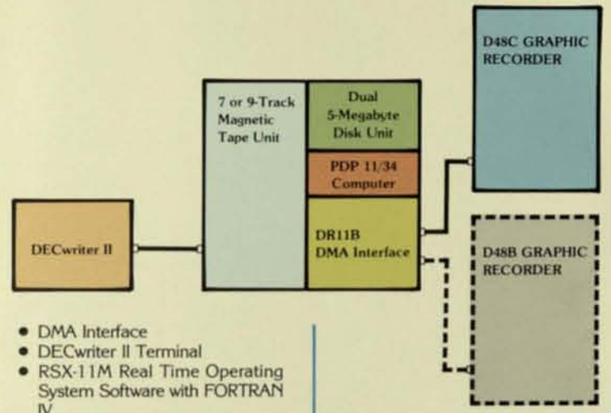
F227 35mm Film Transport

The F227 35mm perforated film transport is designed for 35mm perforated film only. Selectable pulldowns provide for either cine or comic format. The pulldown accuracy is ±0.0005 inch. The F227 may be used with the F304 optical assembly.

SYSTEM CONTROLLER

A Digital Equipment Corporation PDP 11/34 computer is used as the D148C System controller. The D148C System controller configuration is comprised of the following system components:

- PDP 11/34 computer with 80K 16 bit words of MOS memory
- 9 Track 1600 bpi/800 bpi; 45 ips Magnetic Tape Unit (7 track optionally available)
- Dual 5 megabyte disk units



- DMA Interface
- DECwriter II Terminal
- RSX-11M Real Time Operating System Software with FORTRAN IV

Through its UNIBUS system architecture, the PDP 11/34 control computer provides a highly flexible means of system expansion. System components such as graphic displays, printers, and additional film recorders may be readily added to the System. The magnetic tape controller and the disk subsystem provide for the easy addition of magnetic tape transports and disk drives, respectively.

The PDP 11/34 system may also be readily connected to host computer systems via a communications link, thus eliminating magnetic tape handling.

SYSTEM SOFTWARE

In order to maximize system flexibility, DICOMED's Graphic COM software has been developed to operate under the powerful DEC RSX-11M Real Time Operating System. Operating system programs including utility programs, assemblers, and compilers, which are available from DEC, as well as the DICOMED Graphic COM software are offered for use under a license fee basis.

The programs resident within the graphic COM system operate under the system monitor. The control programs are written primarily in FORTRAN source language, but include some selected routines encoded in lower level language as necessary to meet system throughput requirements. A modular concept has been employed in the development of the DICOMED Graphic COM software. Starting with the basic control programs which provide the basic job control, D48C Recorder control, and character control, various program modules may be licensed to perform such functions as A/N COM generation, software character generation, and emulation of other plotting devices, including SC4020, CalComp 925, III FR80, CalComp 1675, Gerber, and many others.

DICOMED's microfiche software package properly formats alphanumeric and graphic information onto microfiche at 24X, 42X, and 48X in accordance with NMA standards (NMA MS 2-1978 or ANSI PH 5.18-1978).

The D148C System Line Printer software package permits the creation of microfiche images from standard host computer print tapes. Features include high speed titling and indexing, utilizing various data extraction routines. Standard packages are available for IBM, CDC, and UNIVAC printer formats.

DICOMED Corporation

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12SP148C/Printed In U.S.A.

SPECIFICATIONS

Functional Performance

Recording Speed:

The total time required to record an image on the D48 is dependent upon the number of points plotted and the execution of other related functions. Time requirements for these functions are stated as follows:

Point Exposure Time:

The time required to position and expose any adjacent point ranges from a minimum of four microseconds to a maximum of nine microseconds.

Random Position Time:

The maximum time required to position the recording beam to any point on the plotting matrix is 100 microseconds.

Beam Flyback Time:

The maximum time required to reposition the recording beam to the beginning of a new line in raster mode is 100 microseconds.

When in the SHORT END OF LINE DELAY (SED) mode, the beam positioning delay time is approximately 15 microseconds.

Vector Generation Time:

The time required to generate a vector in the D48 increases in a nearly linear relationship with the vector length.

The time to draw a minimum length vector (single point) is 15 microseconds. The time to draw a full-screen vector at maximum intensity is 45 milliseconds.

Geometrics

Trapezoiding

Trapezoiding is maintained within ±0.1% of the major axis.

Rectangularity

Rectangularity, the deviation of the major axis lengths, is maintained within ±0.1% of the major axis.

Orthogonality

The orthogonality of the horizontal and vertical axes is maintained within ±0.15%. Orthogonality is referenced to the major axis and expressed as a percentage of the matrix diagonal.

Linearity

Point spacing linearity is maintained within ±0.1% of the major axes. Linearity is evaluated for groups of points on the major axis by painting a test pattern on film which divides each of the major axes into segments.

Line Curvature

Pincushion distortion and/or line curvature is less than ±0.1% of the major axis. Pincushion distortion is defined as the maximum deviation of any raster line from the best fit straight line.

Spatial Repeatability

Stability of the deflection subsystem is measured in terms of spatial repeatability. This specification is defined as the deviation of any given point in time for subsequent scans. Spatial repeatability is maintained within ±0.02% of each major axis for successive images repeated during a 10-minute interval, and ±0.05% of each major axis over a 30-minute interval after the unit has been allowed to warm up for a minimum of one hour.

Photometrics

Exposure Range:

The D48C is designed to operate with a variety of high-resolution films such as DatagraphiX E or Kodak Dacomatic E.

Exposure Levels: 256 levels.

Exposure Uniformity:

The uniformity of exposure over the entire plotting array is specified in diffuse density (D) assuming a film gamma of unity. The maximum uniformity deviation is ±0.15D measured through a circular aperture 3 millimeters in diameter.

Spatial Resolution

Film Plane Resolution:

Film plane resolution is a function of the optical assembly and the film. The following table summarizes the resolution in line pairs per millimeter which can be expected when using the various optical assemblies available for the D48. Resolution numbers are referenced to black and white film, such as DatagraphiX E or equivalent.

Optical Assembly	Resolution (lpm)
F300 16mm color (cine)	90
F303 35mm color (cine)	65
F304 35mm color (comic)	40
F308 16mm black and white	100
F309 35mm black and white (aperture)	55
F310 24X black and white	100
F311 42X/48X black and white	140
F312 35mm black and white (aperture)	55

Environmental, Space, and Power Requirements

The DICOMED Graphic COM System operates without degradation of performance within a temperature environment of 60-80 degrees Fahrenheit, a relative humidity environment of 45-55%, and an atmospheric pressure environment equivalent to 5,400 feet or less above mean sea level.

The physical space and power requirements for the three major components are described below.

D48 Graphic Recorder:

Floor space (w x d):
51 x 24 inches (129 x 61 cm)

With B354 Auxiliary Cabinet:
74 x 24 inches (188 x 61 cm)

Height: 72 inches (183 cm)

Weight: 500 lbs. (228 Kg)

Power Requirements:
115 volts ±10%, single phase,
50-60 Hz, 20 amperes maximum*

Processor with peripherals in two-rack cabinet assembly:

Floor space (w x d):
44 x 30 inches (112 x 76 cm)

Height: 72 inches (183 cm)

Weight:
approximately 1200 lbs. (546 Kg)

Power requirements:
115 volts, ±10%, single phase,
50-60 Hz, 30 amperes maximum*

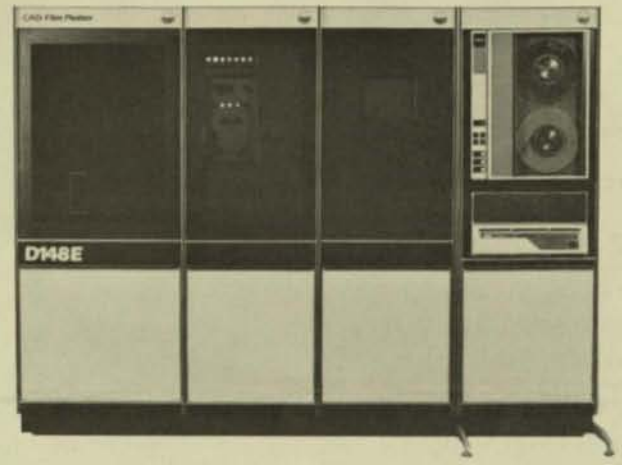
DECwriter II:

Floor space (w x d):
28 x 25 inches (71 x 64 cm)

Weight:
approximately 75 pounds (34 Kg)

***Note:** The B356 Power Adapter Unit is available for converting 240 VAC/50 Hz power to 115 VAC/50 Hz.

The DICOMED D148E CAD Film Plotter



for high resolution, precision COM output for CAD systems

The DICOMED D148E CAD Film Plotter is the most cost-effective unit yet developed for offering CAD users the time and cost saving benefits of COM output. The D148E is designed for one specific need: to take properly formatted data from any CAD system and output it as high resolution, precision black and white 35mm microfilm.

The system's speed and ease of operation give the D148E maximum productivity advantages over other COM systems and conventional output devices.

As production requirements dictate, a simple factory upgrade can provide the system with 16mm and 105mm capabilities.

The D148E is designed for the following applications:

- Computer Aided Design
- Graphic COM
- Scientific Graphic Plotting
- Animation

System Overview

The D148E CAD Film Plotter consists of a DICOMED D48E Graphic Recorder, a DEC PDP 11 computer and DICOMED high-performance software.

D48E Graphic Recorder

The D48E is a specially configured graphic recorder for ultra-high resolution black and white recording applications. The CRT uses a sharply peaked spectral response P-11 phosphor, along with custom computer-designed optics, to achieve the highest quality output possible. The D48E is unsurpassed in versatility and performance.

Vector Mode

Absolute and relative vectors are plotted at an addressability of 32,768 x 32,768, with an internal precision of 65,536 x 65,536.

Precision Intensity/Exposure Control

The D48E incorporates DICOMED's superior time modulation exposure system to provide 256 intensity levels. This feature, combined with programmable exposure translation tables and film configuration control system, permits input exposure values and film characteristics to be precisely matched to achieve optimum density on film.

Precision Optical Assembly

L313C — 35mm: Aperture Card Format. Film Size — 35mm non-perforated. Image Size — 27.9 x 36.4mm (NMA MS 2-1976). Resolution — 80 line pairs per millimeter.

Film Transport

F333 — accommodates 35mm comic or aperture card format on non-perforated film.

System Controller

The system controller consists of a Digital Equipment Corporation PDP 11 computer with 128K, 16-bit words of MOS memory; 9 track 1600bpi/800bpi, 45 ips Magnetic Tape Unit; 20 megabytes of fixed disk storage and 512 kilobytes of removable floppy storage; DMA interface; CRT Console Terminal; and RSX-11M Real Time Operating System Software with FORTRAN IV.

- Graphic displays, printers and additional film recorders may be easily added to the system.
- A second D48E (or D48C Color COM Recorder) may be added to the system controller for dual recorder operation. (Note: In the dual system configuration, the D48 recorders do not record simultaneously.)

System Software

DICOMED software is offered for use under the terms and conditions of DICOMED's software license and DEC's standard software license.

- DICOMED Graphic COM software provides basic job control, D48E Recorder control and character control.
- Program modules may be licensed to perform such functions as software character generation and emulation of other plotting devices, including: SC4020, CalComp 925, III FR80, CalComp 1675, Gerber and many others.
- Operates under the DEC RSX-11M Real Time Operating System, which includes: 1) utility programs, 2) assemblers, and 3) compilers (available from DEC).

The DICOMED D148E CAD Film Plotter

Functional Performance

The DICOMED D148E CAD Film Plotter operates without degradation of performance within a temperature range of 60-80 degrees Fahrenheit, a relative humidity environment of 45-55%, and an atmospheric pressure environment equivalent to 5,400 feet or less above mean sea level.

Recording Speed

Recording speed is dependent upon the number of points plotted and the execution of other related functions. Time requirements for these functions are as follows:

Point Exposure Time — 4 microseconds (minimum) to 9 microseconds (maximum)

Random Position Time — 100 microseconds

Beam Flyback Time — 100 microseconds in raster mode. In SED mode, delay time is approximately 15 microseconds.

Vector Generation Time — 15 microseconds to draw a point. 90 milliseconds to draw a full-screen vector at maximum intensity.

Geometrics

Trapezoiding — maintained within ±0.1% of the major axis.

Rectangularity — maintained within ±0.1% of the major axis.

Orthogonality — maintained within ±0.15% of the horizontal and vertical axes. Orthogonality is referenced to the major axis and expressed as a percentage of the matrix diagonal.

Linearity — point spacing linearity is maintained within ±0.1% of the major axes.

Line Curvature — pincushion distortion and/or line curvature is less than ±0.1% of the major axis.

Spatial Repeatability — spatial repeatability is maintained within ±0.02% of each major axis for successive images repeated during a 10-minute interval, and ±0.05% of each major axis over a 30-minute interval after the unit has been allowed to warm up for a minimum of one hour.

Photometrics

Exposure Range — operates with a variety of high resolution films, such as DatagraphiX E, Kodak Dacomatic E or G, etc.

Exposure Levels — 256 levels.

Exposure Uniformity — The maximum uniformity deviation is ±0.15D measured through a circular aperture 3 millimeters in diameter.

Space and Power Requirements

D48E Graphic Recorder

Floor space (w x d): 51 x 24 inches (129 x 61 cm). With B354 Auxiliary Cabinet: 74 x 24 inches (188 x 61 cm).

Height: 72 inches (183 cm).

Weight: 500 lbs. (228 Kg).

Power Requirements*: 115 volts ± 10%, single phase, 50-60 Hz, 20 amperes maximum.

Processor with Peripherals in Two-Rack Cabinet Assembly

Floor space (w x d): 44 x 30 inches (112 x 76 cm).

Height: 72 inches (183 cm).

Weight: approximately 1200 lbs. (546 Kg).

Power Requirements*: 115 volts ± 10%, single phase, 50-60 Hz, 30 amperes maximum.

*The B356 Power Adapter Unit is available for converting 240 volts/50HZ power to 115 volts/50 HZ.

DICOMED Corporation
9700 Newton Avenue South
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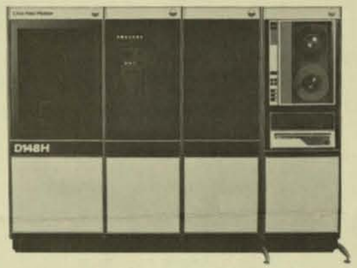
The DICOMED D148H CAD Film Plotter

with enhanced geometrics



for COM applications requiring extremely precise geometrics

The DICOMED D148H CAD Film Plotter provides the same extremely high resolution output as DICOMED's other COM systems, but also features specially designed geometrics. The system is ideal for extremely demanding applications such as mapping, PC board schematics, or 35mm images which must be blown back to E size (33" x 44"). The D148H offers an accuracy unsurpassed in the industry.

With the D148H's enhanced precision geometrics:

- Lines are straight across the CRT.
- Circles are real circles.
- Polygons are mathematically correct.
- Parallel lines are true across the CRT.
- Horizontal and vertical axes are straight, and of the same length.
- Geometric sizes and locations are consistent and precise.

System Overview

The D148H CAD Film Plotter consists of a DICOMED D48H Graphic Recorder, a DEC PDP 11 computer and DICOMED high-performance software.

D48H Graphic Recorder

The D48H is a specially configured graphic recorder for ultra-high resolution black and white recording applications. The CRT uses a sharply peaked spectral response P-11 phosphor, along with custom computer-designed optics, to achieve the highest quality output possible. The D48H is unsurpassed in versatility and performance.

Vector Mode

Absolute and relative vectors are plotted at an addressability of 32,768 x 32,768, with an internal precision of 65,536 x 65,536.

Raster Mode

Raster images are plotted on a matrix of 4096 x 4096 addressable points at speeds of 100K-250K points per second. Element (pixel) size and spacing are fully programmable.

Precision Intensity/Exposure Control

The D48H incorporates DICOMED's superior time modulation exposure system to provide 256 intensity levels in both vector and raster modes. This feature, combined with programmable exposure translation tables and film configuration control system, permits input exposure values and film characteristics to be precisely matched to achieve optimum density on film.

B350 Programmable Hardware Character Generator (Optional)

The B350 has loadable RAM memories that permit fonts to be changed in less than 50 milliseconds. It offers four orientations and multiple character sizes, and in alphanumeric COM applications can generate over 30,000 characters per second. The B350 is supplied with 8K, 16-bit words of memory and a basic font of 196 characters. The B350 memory is expandable by adding the B351 Memory Expansion Modules (8K, 16-bit words) for a maximum of 32K words.

Precision Optical Assemblies

A series of optical assemblies has been developed for the D48H to achieve optimum performance and interchangeability.

L313 — 35mm: Aperture Card Format. Film Size — 35mm non-perforated. Image Size — 27.9 x 36.4mm (NMA MS 2-1976). Resolution — 80 line pairs per millimeter.

L314 — 24X Microfiche or 16mm Formats (used with F225). Film Size — 105mm (or 16mm). Image Size — reference NMA standard MS 2-1978. Resolution — 110 line pairs per millimeter.

L315 — 42X/48X Microfiche Format (used with F225). Film Size — 105mm. Image Size — reference NMA standard MS 2-1978. Resolution — 150 line pairs per millimeter.

L316 — 35mm: Cine Format (used with F227). Film Size — 35mm, perforated. Image Size — 24.89 x 24.89 mm. Resolution — 80 line pairs per millimeter.

Spatial Resolution

Film Plane Resolution varies according to optical assembly (see above).

Film Transports

The **F225** Microfiche Transport accepts 16mm, 35mm or 105mm non-perforated film. Vacuum pulldown holds film flat, and humidity control minimizes static flashes on film. With L313, L314 and L315 optical assemblies, a single transport can be used to record on 16mm, 35mm and 105mm film at 24X, 42X or 48X.

The **F333** 35mm Film Transport accommodates comic or aperture card format on non-perforated film.

The DICOMED D148H CAD Film Plotter

System Controller

The system controller consists of a Digital Equipment Corporation PDP 11 computer with 128K, 16-bit words of MOS memory; 9 track 1600bpi/800bpi, 45 ips Magnetic Tape Unit; dual 5 megabyte disk units; DMA interface; CRT Console Terminal; and RSX-11M Real Time Operating System Software with FORTRAN IV.

- Graphic displays, printers and additional film recorders may be easily added to the system.
- PDP 11 system may also be connected to host computer systems via a communications link for on-line operation, to eliminate magnetic tape handling.
- A second D48H (or D48C Color COM Recorder) may be added to the system controller for dual recorder operation. (Note: In the dual system configuration, the D48 recorders do not record simultaneously.)

System Software:

DICOMED software is offered for use under the terms and conditions of DICOMED's software license and DEC's standard software license.

- DICOMED Graphic COM software provides basic job control, D48H Recorder control and character control.
- Program modules may be licensed to perform such functions as alphanumeric COM generation, software character generation and emulation of other plotting devices, including: SC4020, CalComp 925, III FR80, CalComp 1675, Gerber and many others.
- DICOMED microfiche software formats alphanumeric and graphic information at 24X, 42X and 48X, in accordance with NMA standards (NMA MS 2-1978 or ANSI PH 5.18-1978).
- Operates under the DEC RSX-11M Real Time Operating System, which includes: 1) utility programs, 2) assemblers, and 3) compilers (available from DEC).

D148H System Line Printer Software Package allows:

- Creation of microfiche images from standard host computer print tapes.
- High speed titling and indexing, using several data extraction routines.
- Standard packages for IBM, CDC and UNIVAC printer formats.

Functional Performance

The DICOMED D148H CAD Film Plotter with enhanced geometrics operates without degradation of performance within a temperature range of 60-80 degrees Fahrenheit, a relative humidity environment of 45-55%, and an atmospheric pressure environment equivalent to 5,400 feet or less above mean sea level.

Recording Speed

Recording speed is dependent upon the number of points plotted and the execution of other related functions. Time requirements for these functions are as follows:

Point Exposure Time — 4 microseconds (minimum) to 9 microseconds (maximum)

Random Position Time — 100 microseconds

Beam Flyback Time — 100 microseconds in raster mode. In SED mode, delay time is approximately 15 microseconds.

Vector Generation Time — 15 microseconds to draw a point. 90 milliseconds to draw a full-screen vector at maximum intensity.

Geometrics

Trapezoiding — maintained within ±0.05% of the major axis.

Rectangularity — maintained within ±0.05% of the major axis.

Orthogonality — maintained within ±0.1% of the horizontal and vertical axes. Orthogonality is referenced to the major axis and expressed as a percentage of the matrix diagonal.

Linearity — point spacing linearity is maintained within ±0.05% of the major axes.

Line Curvature — pincushion distortion and/or line curvature is less than ±0.05% of the major axis.

Spatial Repeatability — spatial repeatability is maintained within ±0.02% of each major axis for successive images repeated during a 10-minute interval, and ±0.05% of each major axis over a 30-minute interval after the unit has been allowed to warm up for a minimum of one hour.

Photometrics

Exposure Range — operates with a variety of high resolution films, such as DatagraphiX E, Kodak Dacomatic E or G, etc.

Exposure Levels — 256 levels.

Exposure Uniformity — The maximum uniformity deviation is ±0.15D measured through a circular aperture 3 millimeters in diameter.

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Height: 72 inches (183 cm).

Weight: 500 lbs. (228 Kg).

Power Requirements*: 115 volts ± 10%, single phase, 50-60 Hz, 20 amperes maximum.

Processor with Peripherals in Two-Rack Cabinet Assembly

Floor space (w x d): 44 x 30 inches (112 x 76 cm).

Height: 72 inches (183 cm).

Weight: approximately 1200 lbs. (546 Kg).

Power Requirements*: 115 volts ± 10%, single phase, 50-60 Hz, 30 amperes maximum.

DECwriter II

Floor space (w x d): 28 x 25 inches (71 x 64 cm).

Weight: approximately 75 lbs. (34 Kg).

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