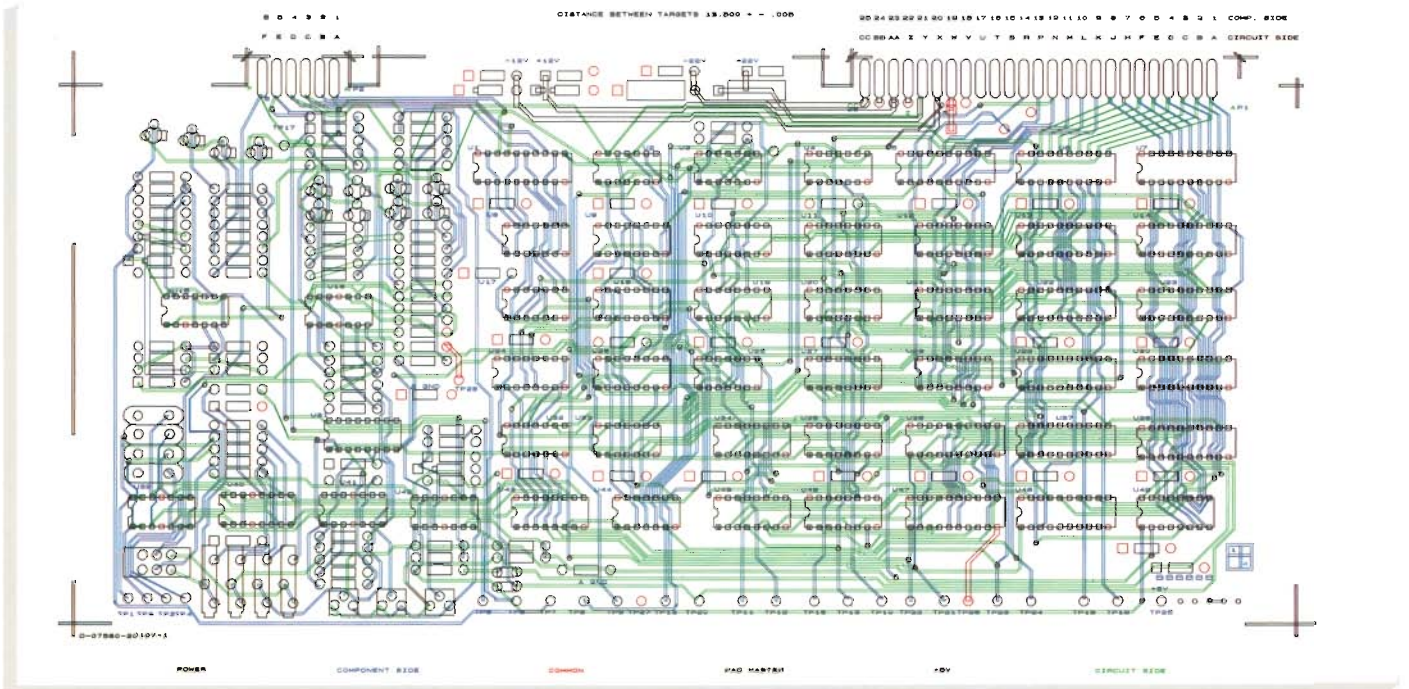


# The Hewlett-Packard Guide To

# GRAPHICS PLOTTERS



# How 8-pen plotting can add new dimensions to your hard copy graphics



## *Makes it easier to distinguish intricate patterns*

*Using multiple colors or line widths, data can be more easily differentiated, and analysis and decisions can be made faster. Circuit paths, for example, can be quickly followed and verified. Multiple data sets can be compared instantly.*

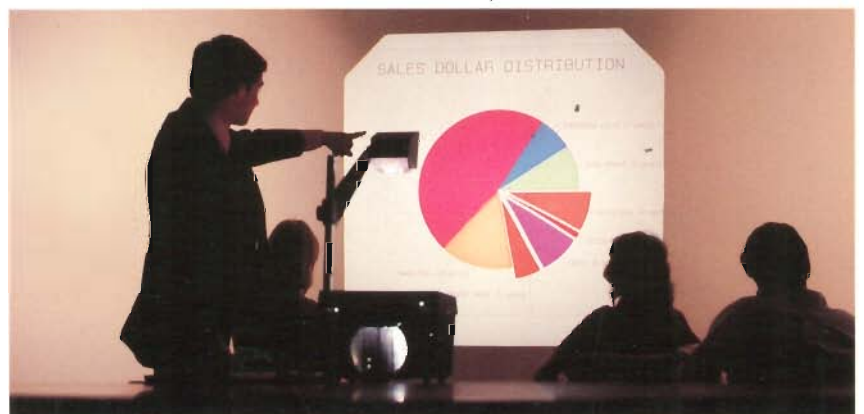
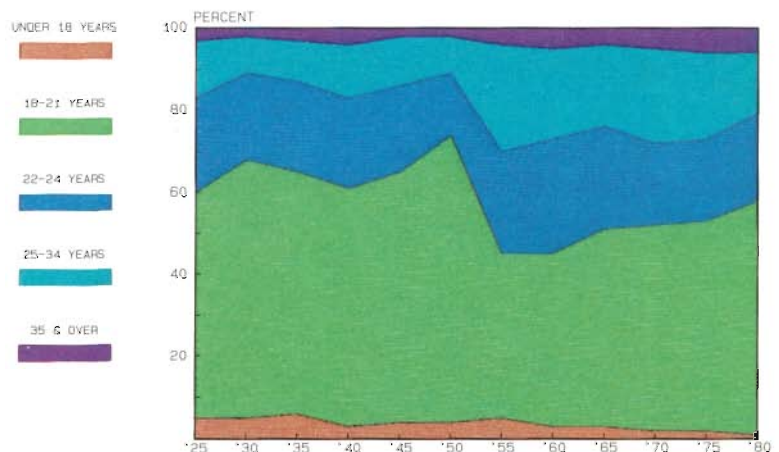
## *Helps interpret complex relationships*

*Color and line width variations make data relationships clearer than ever before. From topography and structural features to sales analysis, HP's new 8-pen plotting dramatically increases the impact and understandability of your graphic data.*

## *Contributes contrast and extra color for more dramatic presentations*

*For almost any application, 8-pen plotting can deliver bolder, more professional, and more meaningful presentations. Most Hewlett-Packard pen plotters also produce vivid multicolor transparencies for overhead projection.*

ENROLLMENT TRENDS BY AGE  
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**[www.hpmuseum.net](http://www.hpmuseum.net)**

**For research and education purposes only.**

# And how these valuable Hewlett-Packard features make it easy to use

## Choose from HP's 10 colors and two line widths

For paper plotting, you can load and use any eight of HP's 10 ink colors. For transparencies, choose from seven vivid colors. Fiber-tip pens for both paper and transparencies come in two widths: a regular tip for grids, tick marks and small labels; and a wide tip for bold titles, heavy lines, and filled-in areas. HP's 7580 Drafting Plotter also allows you to use roller-ball pens and standard liquid-ink drafting pens. With liquid-ink pens you can choose from an even wider variety of pen tip widths and colors.

## Programmable pen selection

To make 8-color plotting even easier, all our multi-pen plotters change pens automatically under program control, so no operator intervention is necessary. On receipt of program commands, the plotter automatically selects the desired pen from its pen stable or carousel, draws the plot section, returns that pen, and selects the next one. All HP multi-pen plotters also feature manual pen selection at the push of a button. For low-cost applications, our 7225 plotter allows manual pen changes for plotting in up to 10 colors and 2 line widths.

## Easy to change pens for overhead transparencies

HP supplies an Overhead Transparency Kit with all necessary film and pens for convenient production of colorful overhead transparencies. Even better, we've taken the trouble out of pen changing. Our 8-pen plotters let you change pen colors and widths quickly. The plotters also feature programmable pen velocity control to allow you to reduce pen speed for producing the highest quality overhead transparencies.

## Intelligent pen control insures superb quality and longer pen life

To produce their extraordinarily high quality graphics, HP 8-pen plotters provide precise pen control movement through the use of sophisticated electronic circuitry. As pens descend, their motion is automatically damped to preserve pen tip life and sharpness. When a pen is returned to its stable or carousel, it is automatically covered with an airtight cap. This means that your pens stay fresh and last longer. Even the

liquid-ink pens used on our 7580 Drafting Plotter write without repriming and won't dry out for up to several days.

## Simple interfacing and powerful HP software for practically any application

All of our 8-pen plotters provide either an HP-IB (IEEE 488-1978) or an RS-232C (CCITT V.24) interface, so they connect with Hewlett-Packard computers or those of most other manufacturers. Most models use simple yet powerful HP-GL (Hewlett-Packard Graphics Language) mnemonic commands. The 7221 series plotters use a compacted binary command language for efficient communications at slower data rates such as over telephone lines.

To make plot generation as effortless as possible, HP supports its plotters with two software packages. HP's ISPP (Industry Standard Plotting Package) supports the plotters that have the HP-GL instruction set. It is specifically designed to allow simple adaptation of existing application programs to use HP plotters as well as for the first-time graphics user. HP-PLOT/21 supports the 7221 series of plotters with over 70 high level user-callable subroutines. Both packages are written in ANSI-standard FORTRAN and operate on a wide variety of ASCII-based computer systems. For HP computers, desktop computers, and intelligent terminals, a wide range of Hewlett-Packard graphics software application programs and programmer utilities are available for almost any business or technical need.



*Produce 8-pen color plots automatically using Hewlett-Packard's 7580 or 7220, 7221 and 9872 series plotters.*

# Hewlett-Packard 7225

High quality graphics at a low budget price

Now the professional look of multicolor plotting is available in a desktop unit ideal for limited budgets. The 7225 delivers clean, sharp, publication quality images in minutes—for analysis of financial, engineering, marketing, and production data, and many other applications. Addressable resolution of 0.032mm (0.0013 in.) insures smooth lines, sharp angles and smooth, round circles. The 7225 produces plots, graphs and representations on conventional 210 x 297mm (or 8.5 x 11 in.) media.

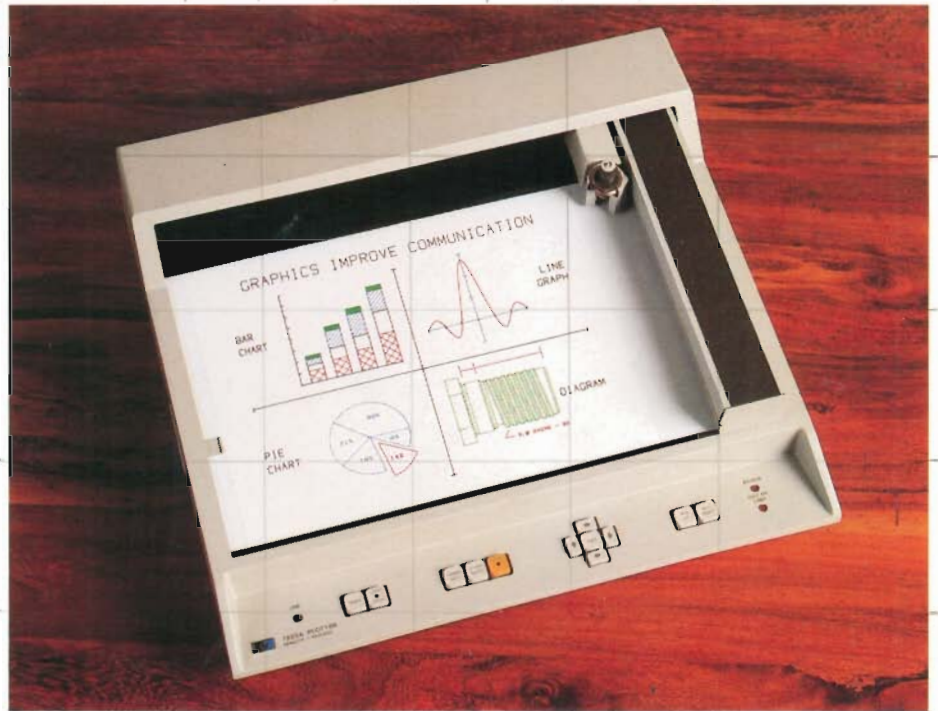


*The 7225 offers five Personality Modules for quick adaptability to a variety of user environments.*

To produce multicolor graphics, programs can be made to pause for manual pen changing. The 7225 can also produce transparencies for overhead projection.

## Five Personality Modules for interfacing to your system

To allow the 7225 to be used with a wide variety of computer systems—today and in the future—HP supplies five Personality Modules for easy interfacing. These intelligent modules simply plug into the 7225 and adapt it to the requirements of BCD or Binary parallel, RS-232C serial, or HP-IB interfacing environments. Most modules also provide character sets, vector and line type generation, window plotting, point digitizing, and other instruction and scaling capabilities appropriate to the user system. The benefit of this on-board graphics intelligence is a significant reduction in the burden on your CPU.



### Capabilities at a glance

Ideal for smaller graphics systems and cost-sensitive applications.

**Pens:** Single pen (plotting in up to 10 colors and 2 widths with manual pen changing).

**Speed:** To 250 mm/s (10 ips) on each axis.  
To 350 mm/s (14 ips) on 45° angle.

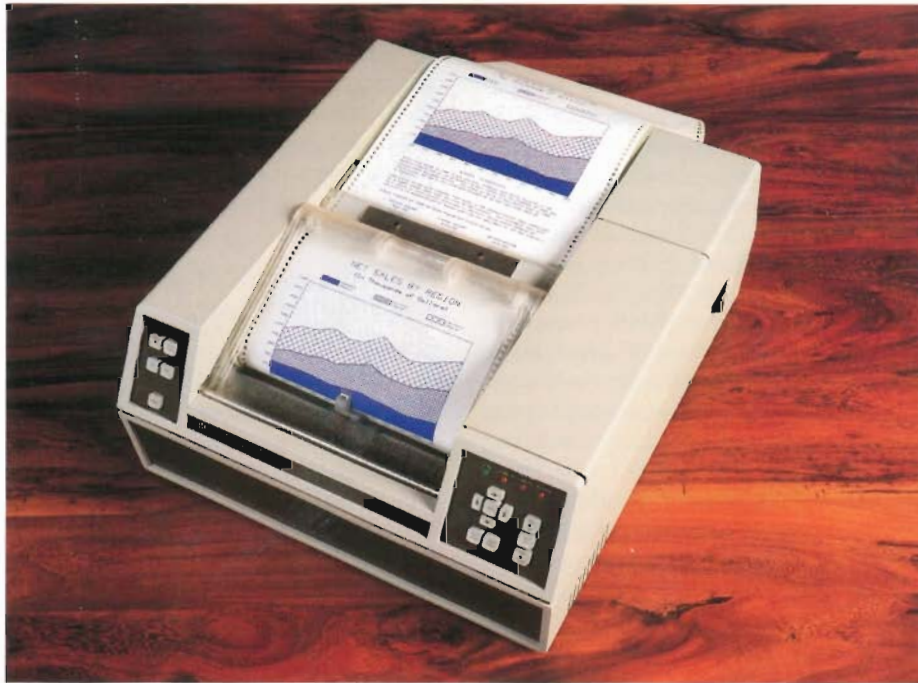
**Media:** Sheet sizes to 210 x 297mm (or 8.5 x 11 in.). Paper or transparency film.

**Interfaces:** Plug-in modules for General Purpose I/O, HP-IB (IEEE 488-1978), BCD or Binary parallel data transfer, and RS-232C (CCITT V.24).

For a sample plot and more information on the 7225, mail postage-paid card enclosed.

# Hewlett-Packard 7240/7245

Thermal plotter/printers that are perfect for unattended and long-axis plotting



Our 7240 and 7245 offer an efficient combination of high contrast graphics, sharp text, and fast operation. Best of all, they can produce continuous long-axis plots up to 5 meters (or 16 feet) long, as well as drawn character annotation and extensive dot-matrix text printing—all unattended, and in a remote location, if need be. These plotter/printers are quiet enough for office operation, yet rugged enough for the laboratory environment.

## Extensive command sets simplify plot and text generation

Both the 7240 and 7245 give you over 50 plotting commands and over 40 printing function commands. These HP-GL command sets mean fast, easy access to a wide range of plot and text possibilities. Arcs, circles, and axes, for example, can be generated with single commands. Choose from nine resident dot-matrix and five drawn character sets. Print in four directions, rotate axes,

or draw characters in any size, slant or direction. The 7245 can even produce a dot-for-dot hard copy from an HP graphics terminal image.

## Remote or local operation

We designed our 7240 for users of remote systems with a modem or for users of hardwired connection to computers with an RS-232C interface. Our 7245, on the other hand, serves computers, desktop computers, and micro-computer systems with an HP-IB (IEEE 488-1978) interface.



*Bidirectional plotting up to 5 meters long in the office, lab, or remote locations*

## Capabilities at a glance

For systems requiring high quality plotting with extensive text, long-axis capability, and fast, unattended operation.

**Writing system:** Thermal with choice of blue or black paper.

**Speed:** Pen off—To 513 mm/s (20.2 ips) on each axis.

To 725 mm/s (28.6 ips) at 45° angle

Pen on—To 256 mm/s (10.1 ips) on each axis.

To 363 mm/s (14.3 ips) at 45° angle.

**Media:** Roll paper, thermally sensitive, with choice of black or blue image. Rolls have removable sprocket perforations at the edges and are available in either unperforated rolls measuring 210mm x 61m (or 8.5 in. x 200 ft.) or rolls perforated into 210 x 297mm (or 8.5 x 11 in.) pages.

**Interfaces:** RS-232C (CCITT V.24) for 7240 and HP-IB (IEEE 488-1978) for 7245.

For a sample plot and more information on the 7240 and 7245, mail postage-paid card enclosed.

# How to choose the graphics plotter that suits your needs and applications

## What paper size do you need?

Obviously, your plotter should be able to produce plots in a presentation format appropriate to your specific application. Most plotters accommodate only a limited number of paper sizes and media types, so this will be a critical specification. Two of the most common size standards are those of the American National Standards Institute (ANSI) and the International Standards Organization (ISO). Measurements for these sizes are indicated in the accompanying chart. Remember that transparency sheets are normally 216 x 267mm (8.5 x 10.5 in.). To allow our customers to match their requirements as precisely as possible, Hewlett-Packard plotters accommodate a wide range of media sizes. Choices range from our 7225, for plotting on media up to standard A/A4 sheets; or our 7220/7221/9872 Series, which handle sheet sizes up to B/A3; or our large-format 7580 plotter, which plots on sheets from A/A4 up to D/A1. Our 7240/7245 plotters will even produce plots with axes up to 5 meters long.

ISO	DIMENSIONS MILLIMETERS	ANSI	DIMENSIONS IN INCHES
A4	210 x 297	A	8½ x 11
A3	297 x 420	B	11 x 17
A2	420 x 594	C	17 x 22
A1	594 x 841	D	22 x 34
A0	841 x 1189	E	34 x 44

## How many colors are necessary?

Color lends professional quality and a new dimension of clarity to most graphic presentations. In general, the more complex your data relationships or the more difficult it is to differentiate, the more useful and productive multicolor plotting will be in your application. And of course, color can add impact to any graphics presentation, especially overhead transparencies.

Today Hewlett-Packard offers eight plotters that can produce multicolor, multi-line width graphics, and seven of these may be programmed for automatic pen selection. Our 7220, 7221, and 9872 Series can produce plots using any eight of ten paper media colors available

in two widths, or any of seven transparency colors, also in two widths. The 7580 offers an even wider variety of color and line widths using liquid-ink drafting pens. Our low-cost 7225 plotter permits multicolor plotting with manual pen changing.

## How do resolution and repeatability affect graphic quality?

Essentially, the resolution of a plotter is limited to the smallest size move its pen can make. The better the resolution, the smoother lines and arcs and characters will look. There are 2 distinct types of resolution specified for plotters. The first, addressable resolution, refers to the smallest line segment that a user can command the plotter to draw. The second, mechanical resolution, is the smallest line segment that the plotter can draw as defined by the limits of its mechanical design. In some plotters, addressable resolution equals mechanical resolution. In others, like HP's 7580, addressable resolution is 0.025mm (0.001 in.) while mechanical resolution is a much finer 0.003mm (0.00012 in.) — equivalent to about 1/50 the width of a human hair!

Repeatability, or the ability of the plotter to return to a given point, is also critical to plot quality. The more accurately the plotter can find a given point again, the more exactly lines will meet and the better circles will close. Repeatability is affected by both the mechanical operation of the plotter and the uniformity and concentricity of the pens used. HP plotters feature excellent repeatability, the result of the precise mechanical design of the plotters combined with the exacting specifications to which all Hewlett-Packard pens are designed, built, and tested.

## Which interface for your system?

Most computers today require an interface based either on the RS-232C (CCITT V.24) or the HP-IB (IEEE 488-1978) standards. That's the reason all HP plotters are designed with these common interfaces. Hewlett-Packard also offers the 7225 with individual Personality Modules that match a variety of computer interface environments.



### What software is available?

Hewlett-Packard's Industry Standard Plotting Package (ISPP) provides software support both for customers who have existing application programs and for new graphics users without application software. If you are already generating graphics on an existing system, in most cases, ISPP can make it easy and inexpensive to adapt your programs for use with HP plotters. New graphics customers can use ISPP's 22 subroutines to perform a wide range of common plot and annotation functions automatically. Hewlett-Packard also supplies HP-PLOT/21 software, with its 77 FORTRAN subroutines, for the binary language 7221 plotter. HP computer systems provide a wide range of Hewlett-Packard graphics software for all these plotters as well.

### How important is the plotter's command language?

Plotter operation is controlled by simple commands which are transmitted from a computer program to the plotter where those commands are interpreted by the plotter's internal microprocessor. The higher the level of the command language, the more functions it can provide. Hewlett-Packard's Graphics Language, HP-GL, is an efficient, high level command language which is both easy to understand and simple to use. HP-GL employs 2-letter codes that are mnemonic abbreviations for the functions performed. For example, the command sequence

PA x,y

moves the pen (Plot Absolute) to the point equal to the values of x and y supplied. The command

SP8

Selects Pen from pen stable or position 8. If you don't wish to use PLOT/21 or ISPP or other available software, then HP-GL will help you create your own, more application-specific software. HP-GL also helps to reduce the cost of program development because HP-GL programs are comparatively easy to write and debug.

### What is the value of a "smart" plotter?

Specific functions of plot generation,

such as arcs, vectors, dashed lines, and character sets, may be implemented either by your system's host CPU or by intelligence within the plotter itself. In order to free your system's CPU for more general data management, HP plotters have built-in microprocessor intelligence which handles these typical functions. On HP plotters, many of these tasks can be performed with one or two commands. This on-board intelligence also simplifies your programming task if you're generating your own specialized software.

### Which plotters are best for OEM's

In general, OEM customers consider these key features in a plotter line: Price/performance, a selection of compatible products, ease-of-interfacing, reliability, availability, and service support. Today, OEMs can choose price and performance options from five compatible HP plotter models. Our OEM family — the 7220C, 7220T, 7240A, 7225B and 7580A — all share the same RS-232C interface and the powerful HP-GL command language. For an environment requiring RS-232C interface and low baud rate remote data communications, HP's 7221 Series gives OEMs two models, both supported by our HP-PLOT/21 software.

By selecting an HP plotter, OEMs can offer customers a family of hard copy graphics products with an impressive range of features. A good measure of the confidence manufacturers have in HP plotters is the fact that thousands are already operating in OEM systems worldwide.

### What to ask about service.

Find out where the nearest service center is located. Ask what service plans are available and what the average service response time is. Find out how many sales and service centers the company has nationally and internationally, especially if your plotters may be used in far-flung installations. Then remember that every Hewlett-Packard plotter is backed by a rigorous performance warranty, and sales/service centers in over 70 countries worldwide.

## Glossary of most often used hard copy graphics terms

**Accuracy** — the difference between the commanded length of a line and the actual length of a line drawn by the plotter.

**Addressable resolution** — the smallest line segment that the user can command the plotter to draw.

**ANSI** — American National Standards Institute, an organization that specifies a wide variety of standards, including plotting media sizes, electronic media, and programming languages, such as FORTRAN and COBOL.

**Hard copy** — any computer output on a permanent, storable medium, such as plotter paper.

**High level language** — a computer language which effectively compacts many small steps and commands understood by the computer into simple commands that are more like spoken language.

**HP-IB** — Hewlett-Packard Interface Bus; this is HP's implementation of IEEE 488-1978 instrumentation interface standard.




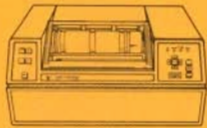
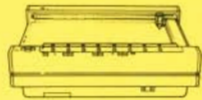

**HP-GL** — Hewlett-Packard Graphics Language. A high level mnemonic command language that makes it easier to write programs for most HP plotters.

**Mechanical resolution** — the smallest distance to which the pen movement is controlled when drawing a line or curve. (Mechanical resolution can be finer than addressable resolution, as in the 7580A.)

**Repeatability** — the ability of a plotter to return to precisely the same point each time it is commanded to do so.



# Use this chart to find the Hewlett-Packard graphics plotter that's right for you

	PLOTTER	GENERAL DESCRIPTION	PEN CAPABILITY	MEDIA SIZES
<p><b>HP's OEM Family</b></p> <p>These plotters offer OEMs optimum flexibility in choosing price and performance, plus a common interface, a common command language, and software support.</p>	<p>7580A</p> 	<p>High speed, high resolution 8-pen plotter for large-format, D/A 1-size plotting. Excellent price/performance advantages.</p>	<p>Programmable 8-pen plotting. Liquid-ink, roller-ball and fiber-tip pens.</p>	<p>Maximum: 622 x 1190mm (24.5 x 46.85 in.) Minimum: 203 x 267mm (8 x 10.5 in.)</p>
	<p>7220C/7220T</p> 	<p>Compact table-top 8-pen plotter with optional automatic paper advance.</p>	<p>Programmable 8-pen color plotting.</p>	<p>Maximum: 297 x 420 mm (or 11 x 17 in.) No minimum</p>
	<p>7225B</p> 	<p>High quality plotting for budget-sensitive applications.</p>	<p>Single pen (up to 10 color plotting with manual changing).</p>	<p>Maximum: 210 x 297mm (or 8.5 x 11 in.) No minimum</p>
	<p>7240A/7245B</p> 	<p>Thermal vector printer/plotter with high speed text generation and long axis capabilities; well suited for remote applications.</p>	<p>Single color (choice of black or blue thermal paper).</p>	<p>Roll format, perforated at edges. Available in continuous unperforated rolls measuring 210mm x 61m (or 8.5 in. x 200 ft.) or rolls perforated into 210 x 297mm (or 8.5 x 11 in.) sheets.</p>
	<p>7221C/7221T</p> 	<p>Compact table-top 8-pen plotter with automatic paper advance option; designed for use in lower data rate communications environments.</p>	<p>Programmable 8-pen plotting.</p>	<p>Maximum: 297 x 420mm (or 11 x 17 in.) No minimum</p>
	<p>9872C/9872T</p> 	<p>Compact table-top 8-pen plotter with automatic paper advance option for systems with HP-IB interface.</p>	<p>Programmable 8-pen plotting.</p>	<p>Maximum: 297 x 420mm (or 11 x 17 in.) No minimum</p>

*500/bars*

MEDIA	INTERFACE	COMMAND LANGUAGE	SOFTWARE SUPPORT	SPECIAL FEATURES
Chart paper. Vellum. Double matte polyester film.	RS-232C (CCITT V.24). HP-IB (IEEE 488-1978) (specified as options).	HP-GL	HP-ISPP (for most ASCII-based computer systems). HP software also available for a variety of HP computers, desktop computers, and intelligent terminals.	Precision micro-grip drive control for high performance at minimal cost.
Chart paper. Transparency film. Roll paper (T models only).	RS-232C (CCITT V.24)	HP-GL	HP-ISPP (for most ASCII-based computer systems). HP software also available for a variety of HP computers, desktop computers and intelligent terminals.	RS-232C interface and HP-GL command language. "T" units have automatic paper advance and page stacking capability for unattended operation.
Chart paper. Transparency film.	RS-232C (CCITT V.24) (Personality Modules 17603, 17604), HP-IB (IEEE 488-1978) (Personality Module 17601). GP-IO (Personality Module 17600). BCD (Personality Module 17602).	HP-GL with Personality Modules 17601, 17603, 17604	HP-ISPP (for most ASCII-based computer systems). HP software also available for a variety of HP computers, desktop computers and intelligent terminals.	User-changeable Personality Modules provide flexible I/O for interfacing to a variety of current and future systems.
Black or blue-trace thermal sensitive paper.	RS-232C (CCITT V.24) (7240A). HP-IB (IEEE 488-1978) (7245B).	HP-GL	HP-ISPP (for most ASCII-based computer systems). HP software also available for a variety of HP computers, desktop computers and intelligent terminals.	7240A and 7245B provide bidirectional plotting up to 5 meters long.
Chart paper. Transparency film. Roll paper (T models only).	RS-232C (CCITT V.24)	Compacted binary code	HP-PLOT/21 (for most ASCII-based computer systems). HP software also available for a variety of HP computers and desktop computers.	RS-232C interface with compacted binary command language optimized for remote data communications environments where transmission efficiency is critical. "T" units have automatic paper advance and page stacking capability for unattended operation.
Chart paper. Transparency film. Roll Paper (T models only).	HP-IB (IEEE 488-1978)	HP-GL	Provided for a variety of HP computers, desktop computers and intelligent terminals.	HP-IB interface with HP-GL command language. "T" units have automatic paper advance and page stacking capability for unattended operation.

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