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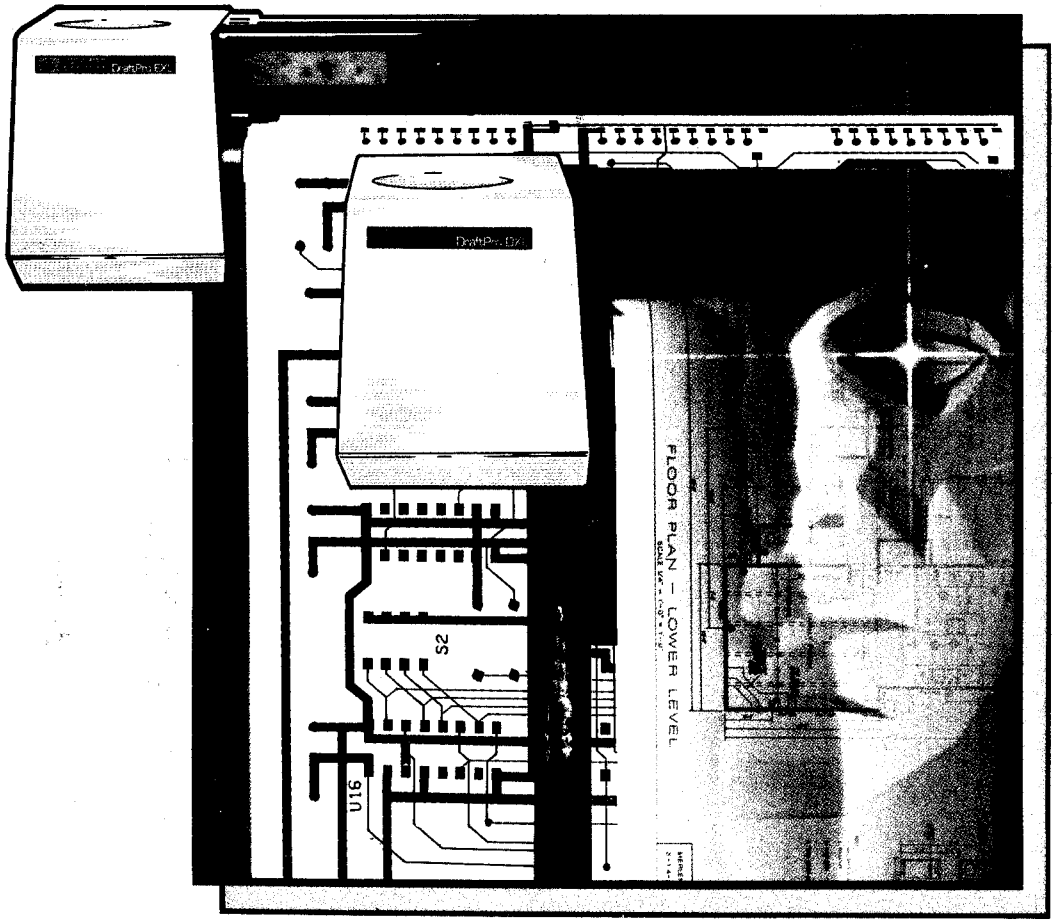
HEWLETT PACKARD

HP DraftPro DXL/EXL Plotters
User's Guide



HP DraftPro DXL/EXL User's Guide

Subject Index

A

B

C

D

E

G

H

I

M

P

R

S

X

Printing History

New editions are complete revisions of the manual. Change sheets, which may be issued between editions, contain additional information. The dates on the title page change only when a new edition is published. Minor corrections that do not affect the function of the product may be made at reprint without a change to the print date.

Many product updates and fixes do not require manual changes and, conversely, manual corrections may be done without accompanying product changes. Therefore, do not expect a one to one correspondence between product updates and manual revisions.

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Second edition	November 1988

One-Year On-Site Hardware Warranty

Hewlett-Packard warrants your graphics peripheral hardware product against defects in materials and workmanship for a period of one year from receipt by the end user. If HP receives notice of such defects during the warranty period, HP will either, at its option, repair or replace products which prove to be defective.

Should HP be unable to repair or replace the product within a reasonable amount of time, customer's alternative exclusive remedy shall be a refund of the purchase price upon return of the product.

Exclusions

The above warranty shall not apply to defects resulting from: improper or inadequate maintenance by customer; customer-supplied software or interfacing; unauthorized modification or misuse; operation outside of the environmental specifications for the product; or improper site preparation and maintenance.

Obtaining Warranty Service

To obtain warranty service, customer must contact a local Hewlett-Packard Sales and Support Office or an Authorized HP Personal Computer Dealer Repair Center and arrange for on-site repair of the product. Customer should retain proof of purchase for warranty service; there is no warranty registration card.

Warranty Limitations

HP makes no other warranty, either expressed or implied, with respect to this product. HP specifically disclaims the implied warranties of merchantability and fitness for a particular purpose. Some states or provinces do not allow limitations on the duration of an implied warranty, so the above limitation or exclusion may not apply to you. However, any implied warranty merchantability or fitness is limited to the one year duration of this written warranty.

This warranty gives you specific legal rights, and you may also have other rights which may vary from state to state, or province to province.

Obtaining Service During or After Warranty

During the Warranty Period

If your hardware should fail during the warranty period, follow the test procedures in the system manuals, then contact your local Hewlett-Packard Sales and Service Office or an Authorized HP Personal Computer Dealer Repair Center and arrange for on-site repair of the product.

Retain proof of purchase in order to obtain warranty service; there is no warranty registration card.

After the Warranty

If your hardware should fail after the warranty period, follow the test procedures in the system manuals, then contact an Authorized HP Personal Computer Dealer Repair Center or call our HP Sales and Service Office for details of the services available.

How to Use this Documentation

This *User's Guide* contains the information you need to set up your plotter, connect it to a computer, and create color graphics using a graphics software program. The manual is divided into two parts: Chapters 1 through 5 contain operating information, Chapters 6 through 8 contain interfacing information.

How to Use the User's Guide

You can use this manual without reading it cover-to-cover. Begin by reading Chapter 1. Once you understand the basics of operating the plotter, read the remaining chapters according to your needs and level of experience. The following chapter summaries will help you find the information you need.

Organization

Chapter 1 **Setting Up Your Plotter** gives you basic information you must know to use your plotter, such as identifying plotter parts and learning to load pens and paper. By the end of Chapter 1, you will be able to draw a demonstration plot.

Chapter 2 **Using the Plotter Controls** explains the function of each control-panel button and the enhanced plotting features.

Chapter 3 **Selecting Pens and Media** describes the pens and media recommended for your plotter and suggests pen and media combinations to fit your plotting needs.

Chapter 4 **Maintenance** contains thorough cleaning instructions for your plotter and drafting pens. Plotter disassembly instructions are also provided.

Chapter 5 **Troubleshooting** is a step-by-step guide to help you correct problems with your plotter, computer/software system setup, plot quality, or supplies.

Chapter 6 **Connecting Your Plotter to a Computer** provides general instructions for connecting your plotter and computer via an RS-232-C or HP-IB interface. This chapter explains how to identify your system configuration and set interface conditions using the rear-panel switches.

Chapter 7 **Computer/Plotter Interconnections** is a collection of step-by-step instructions for connecting your plotter to a variety of popular computers.

Chapter 8 **Using Software with Your Plotter** discusses how to use graphics software packages with your plotter and what you'll need to write your own graphics programs.

Appendix A **Technical Information** contains functional, physical, and environmental specifications for your plotter.

Appendix B **Plotting for Precision** offers suggestions on obtaining the most precise plot possible.

Appendix C **Accessories Available** lists the accessories you can purchase for your plotter and gives ordering information.

Appendix D **RS-232-C/CCITT V.24 Interface Information** gives a summary of interface specifications including pen allocations and cable schematics.

Appendix E **HP-IB (IEEE-488) Information** explains how to set address codes and how to implement normal or secondary command support.

Appendix F **Instruction Summary** lists all HP-GL and device-control instructions along with their uses and parameters. The appendix also includes default conditions, error numbers and their meanings, and the dimensions and plotter unit values for all media sizes.

Glossary Gives a definition for many of the terms found in this manual.

Manual Terms and Conventions

Before reading the rest of this manual, you should understand the type styles and number representation used in the text.

SMALL BOLDFACE TYPE	Denotes lights, buttons, or switches found on the plotter or actions produced by a combination of buttons. Also, denotes a single, nonprinting ASCII character (control code) to be sent to the plotter.
Numbers—12 345	Numbers are typed using SI (International System of Units) standards. Numbers with more than four digits are placed in groups of three—separated by a space instead of a comma—counting both to the left and right of the decimal point (e.g., 54 321.123 45).
RS-232-C	A serial interface. All references to RS-232-C interface in this manual apply equally to RS-232-C and CCITT V.24 interfaces. The term RS-232-C is used for simplicity.

A Note on Using Software

Software packages usually support, or "drive", a number of different peripheral devices. A plotter driver is that part of the software written specifically to drive a particular plotter. For best results, use your HP DraftPro DXL/EXL plotter with a software package that has an "HP DraftPro DXL", "HP DraftPro EXL", "HP 7575", or "HP 7576" plotter driver.

If an HP DraftPro DXL/EXL (or HP 7575/7576) driver is not listed for your software, check with your software dealer or manufacturer to see if an HP DraftPro DXL/EXL driver is or will be available. For specific directions on installing a driver, *refer to your software documentation*. You may need to key in answers to certain questions asked by the software, such as what type of interface you are using or which port on your computer is connected to the plotter.

If your software requires you to enter the actual plot size, refer to the end of Appendix F for that information.

If you are using the RS-232-C interface, *be sure the configuration, baud rate, and parity switch settings comply with the software's recommendations*. If the software documentation does not specify these settings, try using the setting recommended for your computer in Chapter 7. You may also need to initialize the computer's RS-232-C port. This may be done through the software, or else through the computer's operating system (if you are using a MS®-DOS system, refer to the MODE command). Refer to Appendix D for more information about RS-232-C interfacing.

If you are using an HP-IB interface, be sure the address switch settings match the one used by the software package. This is usually address 05, the address setting of the plotter when shipped. You may need to direct plotter output over the interface to the computer's HP-IB port and address. This may be done through the software, or else through the computer's operating system. Refer to Appendix E for more information about HP-IB interfacing.

Table of Contents

Chapter 6: Connecting Your Plotter to a Computer

Chapter 7: Computer/Plotter Interconnections

Appendix B: Plotting for Precision

Appendix C: Accessories Available

Appendix D: RS-232-C/CCITT V.24 Interface Information

Appendix E: HP-IB (IEEE-488) Information

Appendix F: Instruction Summary

1

Setting Up Your Plotter

This chapter shows you how to set up your HP DraftPro DXL/EXL plotter (HP 7575/7576), load pens and media, and run the built-in demonstration plot.

Initial Inspection

Carefully unpack and inspect the plotter and its accessories. Compare your accessories with those listed below.

- User's guide
- Help card
- Power cable
- Hardware kit for stand assembly
- Carousels for fiber-tip and drafting pens
- Grit wheel brush
- Assorted pens and media

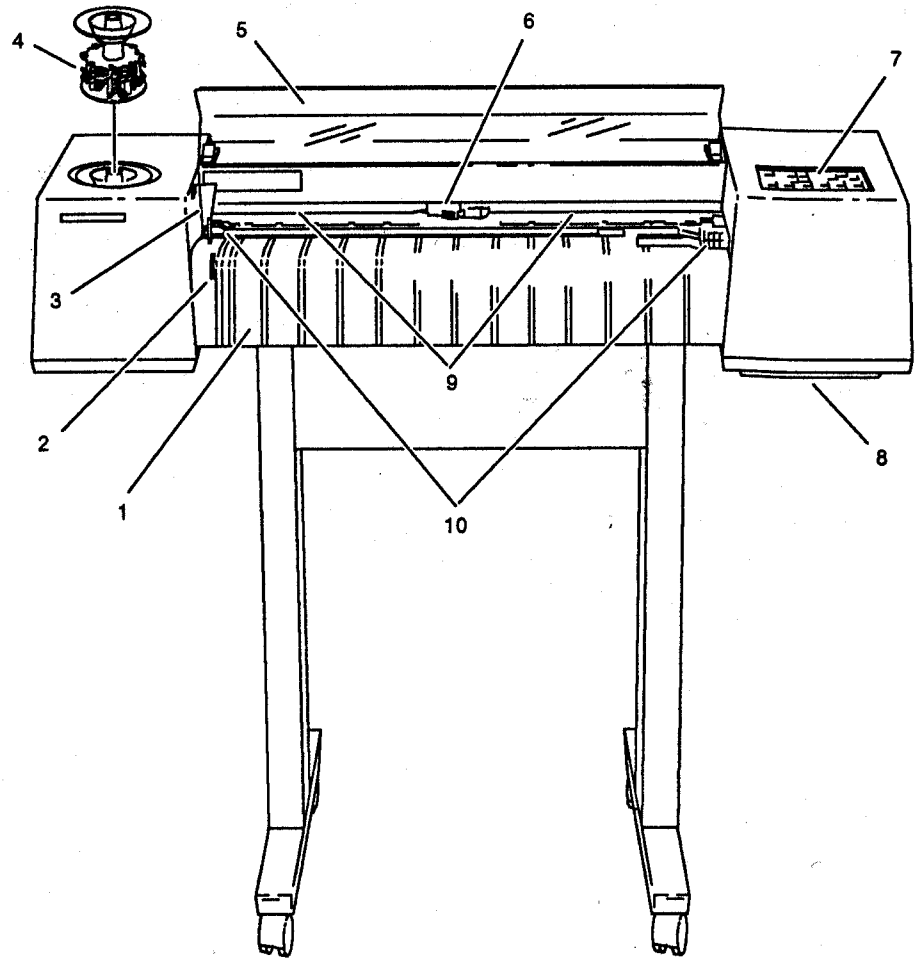
The plotter and its accessories were inspected before being shipped and should be in good working order. If you receive anything in damaged condition, notify the dealer or HP Sales and Support Office where you purchased the plotter, and file a claim with the carrier.

For information on ordering additional supplies, including interface cables and the *Programmer's Reference*, refer to Appendix C.

NOTE: An interface cable (required to connect the plotter to a computer) is *not* included with your plotter and must be purchased separately. Different computers require different cables. The interconnection instructions in Chapter 6 list the interface cable needed for those computers. If you want to make your own cable, refer to the pin allocations and cable schematics in Appendix D.■

Plotter Features (Front View)

Look at the front of your plotter and identify the features numbered in the following figure.



1. **Platen** — Provides a firm surface for plotting.

2. **Front Paper Guide** — Aligns plotting media correctly when used with the rear paper guide.

3. **Paper Loading Lever** — Lowers and raises the pinch wheels for loading and unloading plotting media.

4. **Pen Carousel** (removable) — Holds up to eight pens for multicolor plotting.

5. **Carriage Cover** — Prevents objects from blocking pen motion during plotting.

6. **Pen Holder** — Selects, moves, and puts away pens during plotting.

7. **Control Panel** — Contains the buttons used to manually control various plotter functions. (Button functions are described in Chapter 2.)

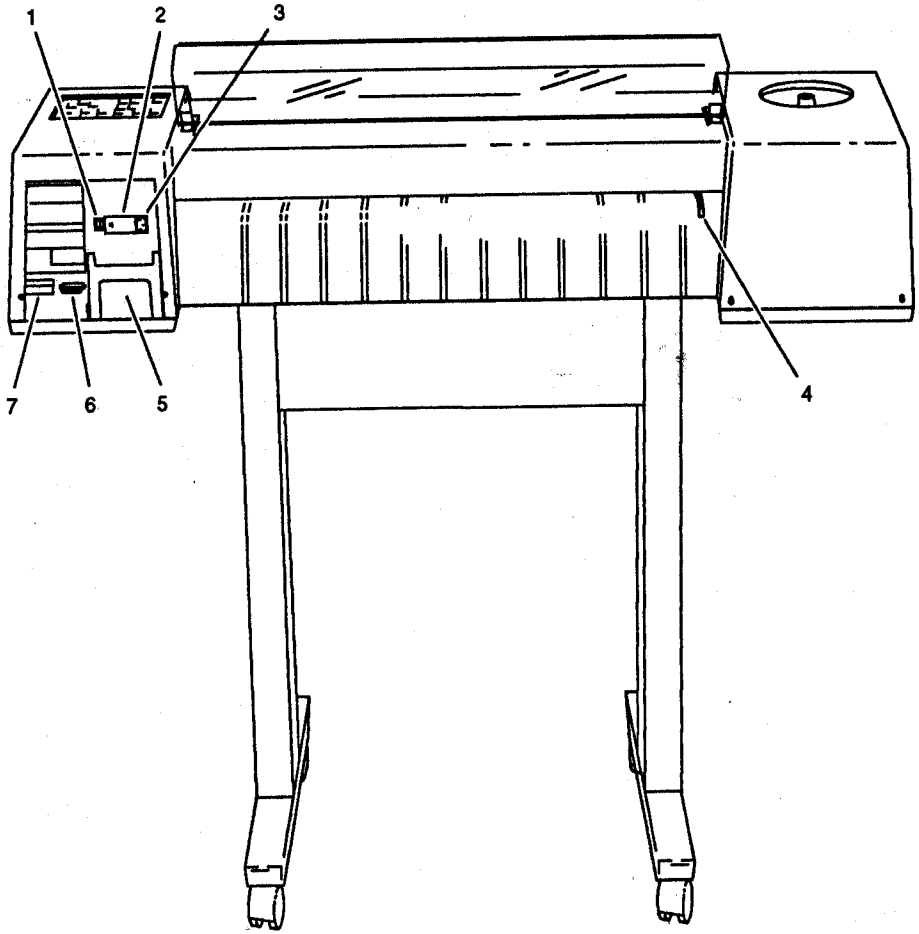
8. **Help Card** — Provides a quick reference for control-panel operations.

9. **Grit Wheels** — Move the media back and forth during plotting.

10. **Pinch Wheels** — Hold the media on the platen during plotting.

Plotter Features (Back View)

Look at the back of your plotter and identify the features numbered in the following figure.



1. **Power Switch** — Turns the plotter on and off.

2. **Voltage Box** — Contains the fuse and voltage selector. The current voltage selection appears in the window.

3. **Power Socket** — Accepts the plug from the power cable.

4. **Rear Paper Guide** — Aligns plotting media correctly, used with the front paper guide.

5. **Cartridge Connector** — Accepts the plotter's optional cartridges.

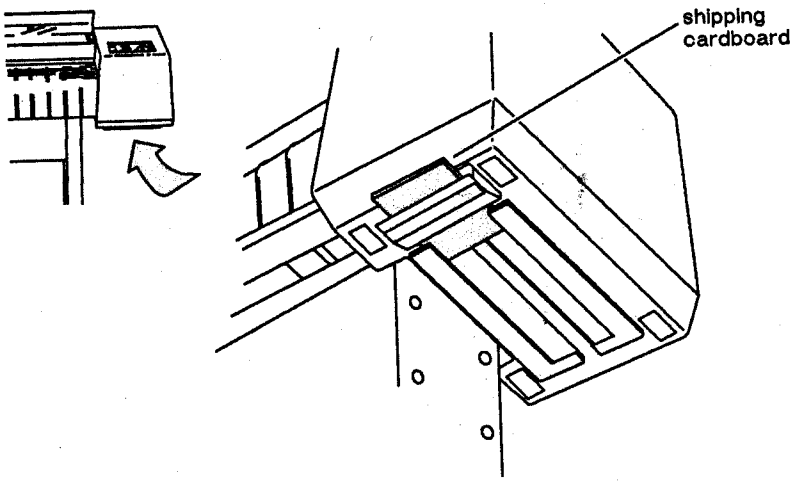
6. **RS-232-C Receptacle** — Accepts the RS-232-C interface cable connecting the plotter to a computer.

7. **Configuration and Enhanced Feature Switches** — Establish interfacing conditions when connecting the plotter to a computer and select the enhanced plotting features described in Chapter 2.

Installing the Help Card

The DraftPro DXL/EXL plotters come with a help card (refer to the illustration on the next page). The help card contains abbreviated instructions for using the control-panel buttons. Complete instructions are contained in this manual.

1. Before inserting the help card into the tray under the right side of the plotter, you must remove the piece of cardboard placed there for shipping. Pull the cardboard straight out to remove.



2. Holding the help card horizontally, insert it into the holding tray. Make sure the card slides *under* the guides that protrude from each side and push it all the way in. The tabs at the top end of the card will lock the card in place.

If You Want to . . .	Press
CLEAR the plotter Reset the plotter	C ● + C
VIEW a plot in progress Resume plotting after viewing	↓ ↓ again
ROTATE a plot Cancel a rotation	⟳ ⟳ again
Enter new **P1** point*	● + P1
Enter new **P2** point*	● + P2
Enter new **AXIS ALIGN** point*	● + ⌐
SELECT a **PEN** Return a pen	↕ ● + ↕
RAISE or **LOWER** a pen	↕
MOVE a pen Move a pen at high speed	◀ ◀ & ✥
Select a **PEN SPEED**	
refillable drafting pens on polyester film (15 cm/s) vellum (15 cm/s)	3
disposable drafting pens on polyester film (20 cm/s) vellum (20 cm/s) paper (20 cm/s)	4
fiber-tip pens on plotter paper (40 cm/s)	6

*See Chapter 2 of the User's Guide for more information.

For best results, use only Hewlett-Packard quality supplies.

Turning the Plotter On

Your plotter is shipped with the power cable and voltage setting appropriate for your area's power requirements. Compare the voltage setting displayed in the window of the voltage box to the setting listed for your area in *Power Specifications* in Appendix A. If the settings don't match, or if the wall plug on your power cable doesn't look familiar, contact your dealer or local HP Sales and Support Office.

WARNING

To avoid electrical shock, use the power cord with a properly grounded receptacle.

Connect the power and turn on the plotter as described in the following steps.

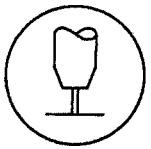
1. Insert the prongless (female) end of the power cable into the power socket on the back of the plotter.
2. Insert the wall power plug (male) into a grounded power outlet.
3. To turn the plotter on, press the **ON/OFF** switch. Pressing the end marked **I** turns the plotter on; pressing the end marked **O** turns the plotter off.

When the plotter is turned on, the green light on the control panel turns on. In addition, the plotter *initializes*, indicated by lights flashing on the control panel and movement of the pen holder and carousel. (Initialization simply means that certain standard conditions are established within the plotter.)

Loading Pens

Pens are loaded in stalls (numbered 1 through 8) on the pen carousel. Two carousels are supplied with your plotter—one for fiber-tip pens and one for disposable and refillable drafting pens. The following illustration shows how each carousel is labelled.

Fiber-tip Carousel



Drafting Carousel

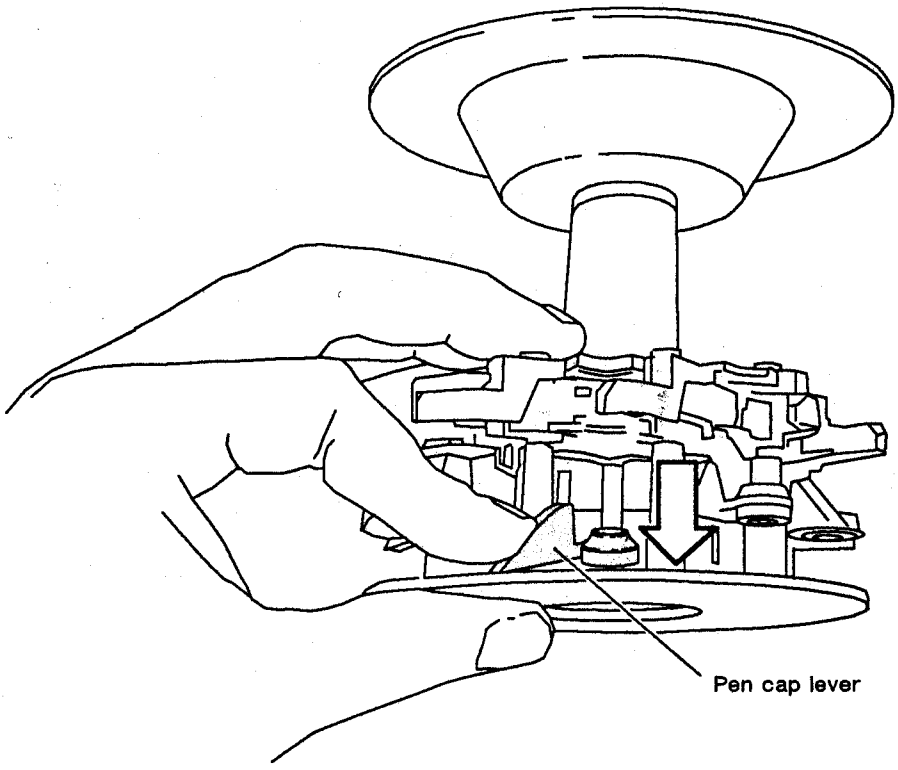
Always use the carousel corresponding to the pen type you are loading. The following instructions tell you how to load fiber-tip pens. While drafting pens are loaded into the carousel the same way, they do require special unpacking and assembly. Refer to the instructions that came with the pens.

1. Unpack the pens. The ink color for each pen matches the color of the markings on the top of the pen. The number on top of the pen specifies the pen's line width in tenths of millimetres.

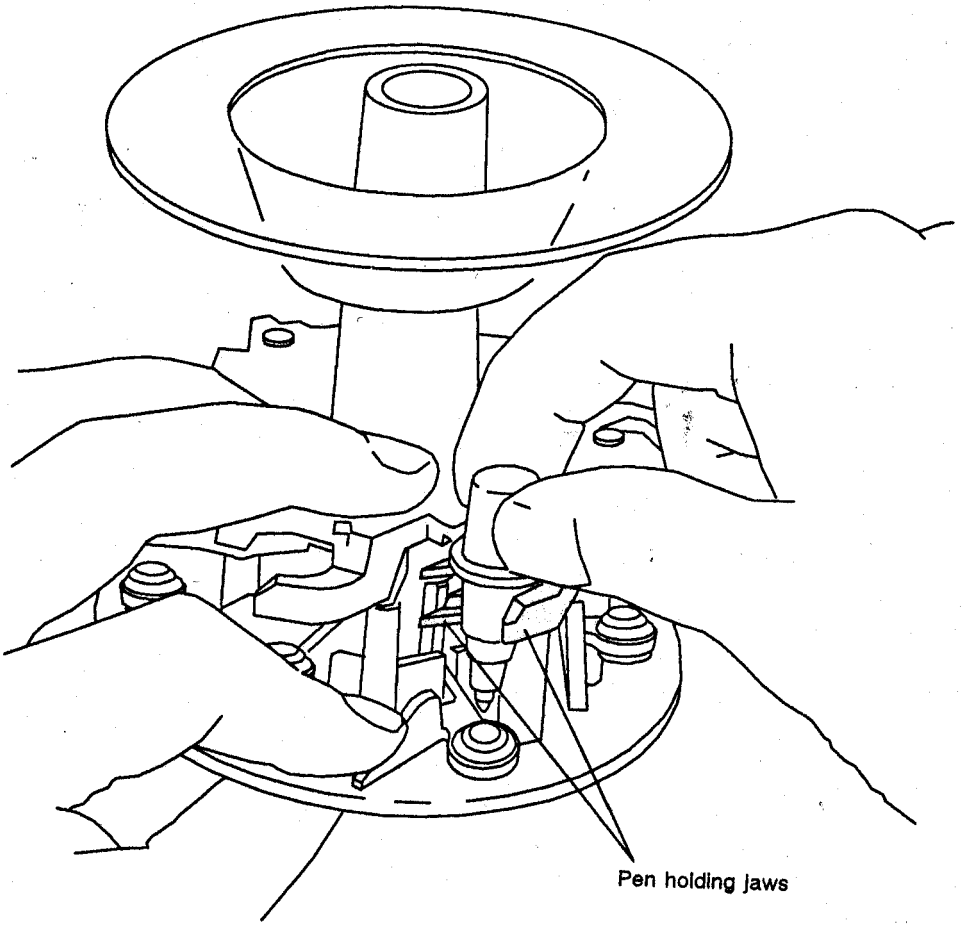
2. Remove the plastic pen caps from the pens. Save the caps for storing pens when they are not in use.

3. Hold the carousel with one hand and follow steps a through c.

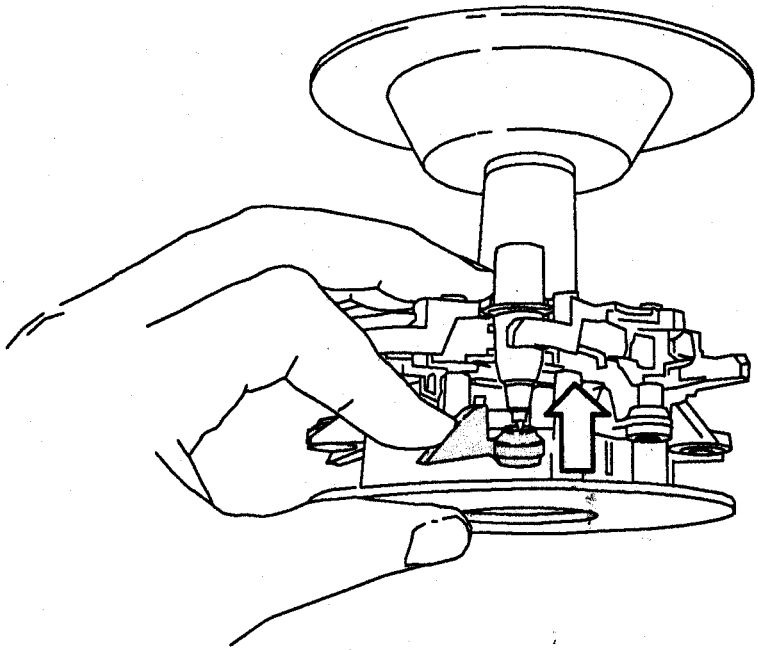
   a. Turn the carousel so that a numbered stall is facing you. Use your finger to push down the stall's pen cap lever.



b. With your other hand, slide the pen into the stall's pen-holding jaws. The collar on the pen should rest on *top* of the jaws.



c. Release the pen cap lever slowly, letting the rubber pen boot cover the pen tip to cap the pen.



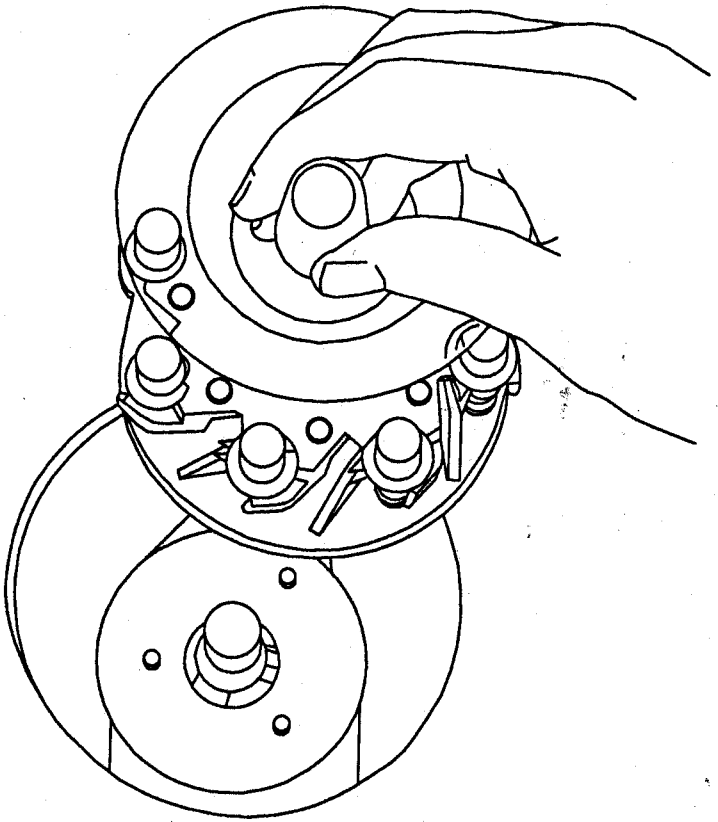
Repeat step 3 for each pen you want to load. The carousel does **not** need to be fully loaded for the plotter to work correctly.

To remove a pen, reverse the loading procedure. Although the plotter will automatically cap pens that are loaded in the carousel, pens will last longer if stored out of the carousel and recapped. For maximum pen life, remove fiber-tip pens when you will not be plotting for several days. Drafting pens should not be left in the carousel, and they require additional care, as explained in Chapter 4.

NOTE: When using a software package, note the pen color you place in each numbered stall so you can tell your software which pen you want to use for various parts of your plot.■

Inserting the Pen Carousel

The pen carousel fits on a rotating spindle located in the carousel well on the left side of the plotter. To insert the carousel, refer to the following illustration and description.



Lower the carousel onto the spindle. Three small posts, which fit into three holes in the base of the carousel, surround the spindle. If necessary, turn the carousel gently until it slips into place.

To remove the carousel, simply lift it straight up and out of the carousel well.

Loading Plotting Media

You can use single-sheet media in the following standard sizes:

- ANSI A, B, C, D, and E*
- Architectural A, B, C, D, and E*
- ISO A4, A3, A2, A1, and A0*
- ISO RA2, RA1, and RA0*
- ISO SRA2, ~~SRA1, and SRA0*~~ AND SRA1*

NOTE: The DraftPro DXL/EXL plotters cannot plot on 30 × 42 inch architectural size media.■

When you load media, the right edge must extend at least one-half inch (12.7 mm) over a grit wheel when the left edge of the medium is against both paper guides. Use the following table when loading media to determine whether to put the width or the length of the media along the platen.

Standard Media Size	Media Loading Direction
A ($8^1/_2$ × 11 in.) Architectural A (9 × 12 in.) A4 (210 × 297 mm)	media width or length along platen
B (11 × 17 in.) Architectural B (12 × 18) A3 (297 × 420 mm)	media width or length along platen
C (17 × 22 in.) Architectural C (18 × 24 in.) A2 (420 × 594 mm) RA2 (430 × 610 mm)	media width or length along platen
SRA2 (450 × 640 mm)	media *width* along platen only

(Table continues)

* Only the HP DraftPro EXL can use E-, A0-, RA0, and SRA0-size media.

Excuse Us, Please!

Please make the following corrections in your *HP DraftPro DXL/EXL Plotters User's Guide*. Delete the shaded text and add the underlined words.

Page 1-14

- ISO SRA2, SRA1, and SRA0* and SRA1*
- HP OA2, OA1, and OA0*

NOTE: The DraftPro DXL/EXL plotters cannot plot on 30 × 42 inch architectural media or ISO SRA0 media.■

Standard Media Size*	Media Loading Direction
A (8½ × 11 in.) Architectural A (9 × 12 in.) A4 (210 × 297 mm)	media width or length along platen
B (11 × 17 in.) Architectural B (12 × 18) A3 (297 × 420 mm)	media width or length along platen
C (17 × 22 in.) Architectural C (18 × 24 in.) A2 (420 × 594 mm) RA2 (430 × 610 mm) HP OA2 (480 × 625 mm)	media width or length along platen

* The DraftPro DXL/EXL plotters cannot plot on 30 x 42 in. architectural media or ISO SRA0 media.

(Table continues)

Loading

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- ANSI
- Archi
- ISO
- ISO
- ISO

NOTE:
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Page 1-15

Standard Media Size*	Media Loading Direction
SRA2 (450 × 640 mm)	media *width* along platen media length along platen DXL only
D (22 × 34 in.) Architectural D (24 × 36 in.)	media width or length along platen
A1 (594 × 841 mm) RA1 (610 × 860 mm) HP OA1 (625 × 900 mm)	media *width* along platen media length along platen EXL only
SRA1 (640 × 900 mm)	media width along platen DXL only media length along platen EXL only
E (34 × 44 in.) Architectural E (36 × 48 in.) A0 (841 × 1189 mm) RA0 (860 × 1220 mm) HP OA0 (900 × 1245 mm) SRA0 (900 × 1280 mm)	media length along platen EXL only

*The DraftPro DXL/EXL plotters cannot plot on 30 x 42 in. architectural media or ISO SRA0 media.

Page 3-4

Metric		
A4 (210 × 297 mm) A3 (297 × 420 mm) A2 (420 × 594 mm) A1 (594 × 841 mm) A0 (841 × 1189 mm)*	RA2 (430 × 610 mm) RA1 (610 × 860 mm) RA0 (860 × 1220 mm)*	SRA2 (450 × 640 mm) SRA1 (640 × 900 mm) SRA0 (900 × 1280 mm)**

*Only the HP DraftPro EXL can plot on this size media.
**The DraftPro DXL/EXL cannot plot on SRA0 media.

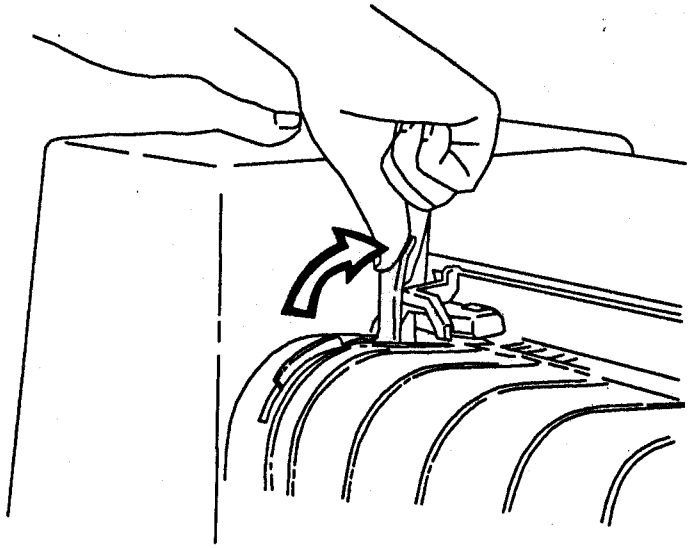
HP European Oversize
HP OA2 (480 × 625 mm) HP OA1 (625 × 900 mm) HP OA0 (900 × 1245 mm)*

*Only the HP DraftPro EXL can plot on this size media.

* On

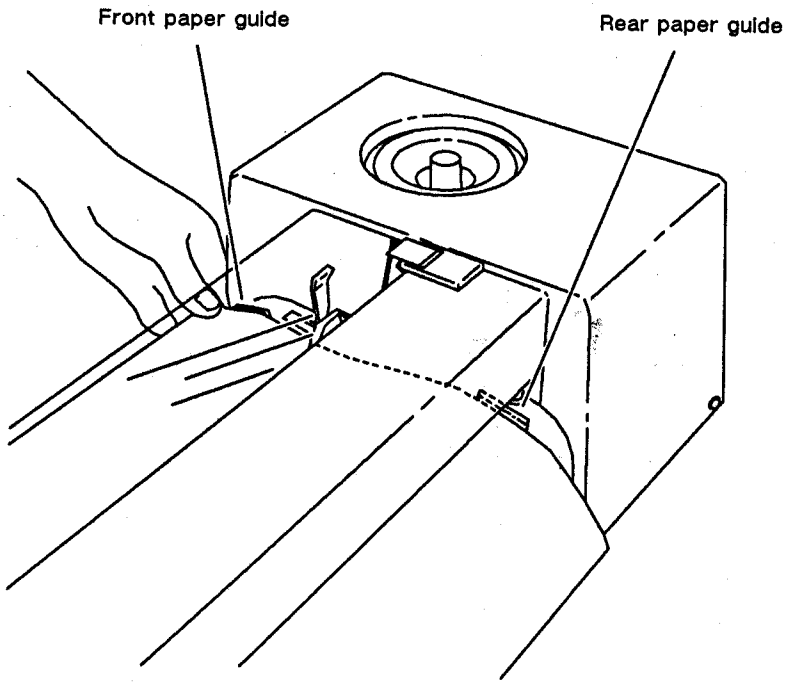
Standard Media Size	Media Loading Direction
D (22 × 34 in.) Architectural D (24 × 36 in.) A1 (594 × 841 mm) RA1 (610 × 860 mm)	media width or length along platen
SRA1 (640 × 900 mm)	media *length* along platen only
E (34 × 44 in.) Architectural E (36 × 48 in.) A0 (841 × 1189 mm) RA0 (860 × 1220 mm) ~~SRA0 (900 × 1280 mm)~~ HP DA0 (900 × 1245mm)	media *length* along platen only

1. With the plotter on, raise the carriage cover.
2. Raise the paper loading lever to raise the pinch wheels. Slide the right pinch wheel to the right side of the platen.

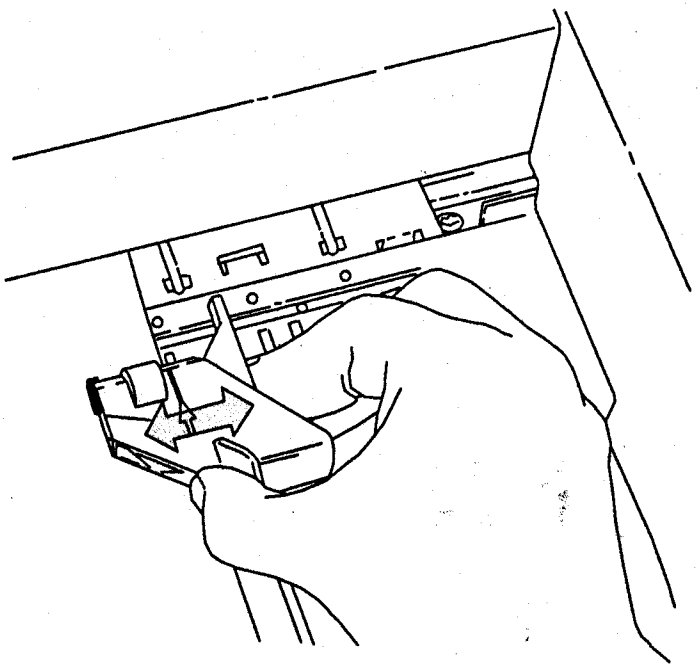


3. Slide a sheet of plotter paper over the platen and under the pinch wheels so the left edge of the paper is against *both the front and rear paper guides*. Check the alignment with the rear paper guide. (As you become experienced, you'll be able to tell by feel if the page is aligned with the rear paper guide.)

   Careful media alignment is critical for accurate plotting, especially with longer paper sizes.



4. Adjust the right pinch wheel so that the arrow next to the pinch wheel is aligned with the right edge of the paper.



5. Lower the paper loading lever to lower the pinch wheels—this holds the media in place.

   NOTE: Always raise the pinch wheels when you are not using the plotter. If left in the lowered position (lever lowered), the side of the pinch wheel that rests on the platen will temporarily flatten. As a result, media may slip, causing wobbly lines.■

6. Lower the carriage cover. The plotter determines the size of the media by moving both the pen holder and the media.

If the media is loaded incorrectly, the page may crumple when the plotter tries to determine the media size. In this case, the plotter's motor will turn off. If this happens, remove the media (including any torn scraps), turn the plotter off and then on again, and load a new sheet of media.

To unload paper, raise pinch wheels and remove the paper.

Drawing the Demonstration Plot

The demonstration plot checks most of the mechanical and electrical workings of your plotter. Although the demonstration plot can't check everything, it is a good way to see if your plotter is operating properly. Run this plot before connecting your plotter to a computer.

Although you can draw the demonstration plot on any media, it is recommended that you use plotter paper and fiber-tip paper pens the first time you run the demonstration plot. You can draw the plot on any size media.

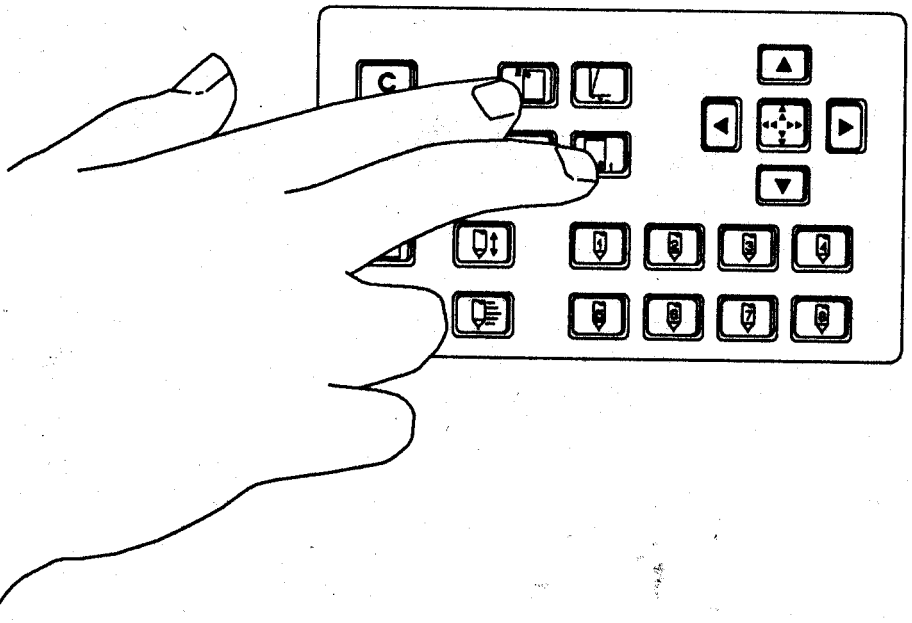
1. Load four fiber-tip pens in the fiber-tip pen carousel. The following pen colors are suggested.

Pen Stall Number	Pen Color
1	black
2	green
3	red
4	blue

   For large plots, use P.7 pens. For small plots, use P.3 pens.

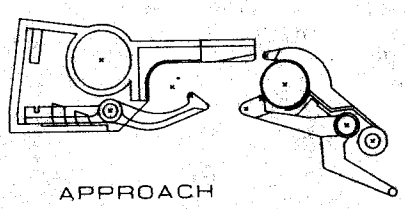
2. Load a sheet of plotter paper, following the steps provided earlier in this chapter.

3. To start the demonstration plot, simultaneously press the **P1** and **P2** buttons. Refer to the following illustration.

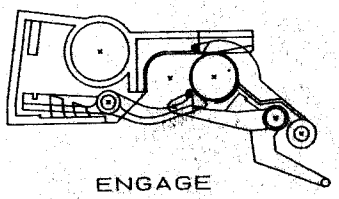


When the demonstration plot is complete, the plotter will move it forward so you can see the results. The finished plot should look like the plot shown on the following page; if not, refer to Chapter 5, *Troubleshooting*.

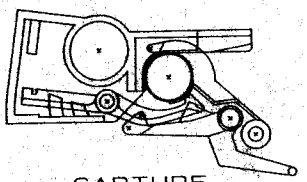
PEN PICK SEQUENCE



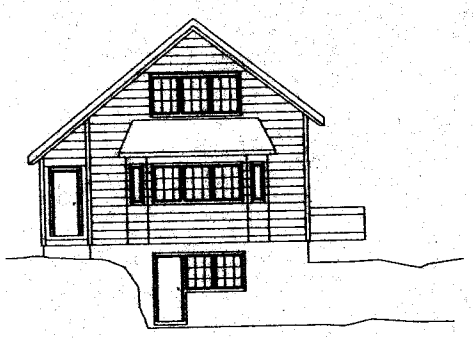
APPROACH



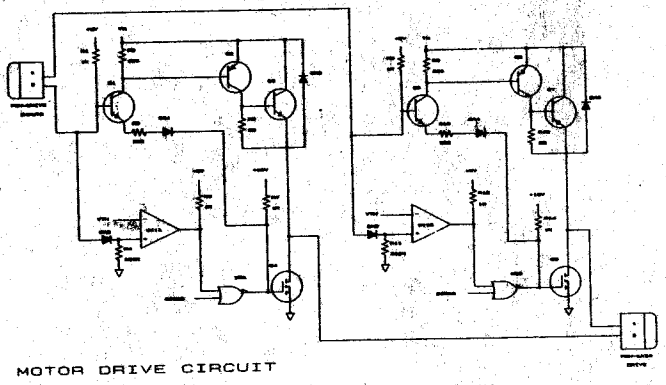
ENGAGE



CAPTURE



Media Size: A/A4 TO E/A0 and Architectural Sizes
Paper, vellum and polyester film
Fiber-tip and liquid-ink pens; 8 pen carousel
Resolution: 0.025mm
Velocity: 90 cm/s Acceleration: 2g



MOTOR DRIVE CIRCUIT

Drawn By: Hewlett-Packard DraftPro EXL
Approved by: Pen plotter users around the world

2

Using the Plotter Controls

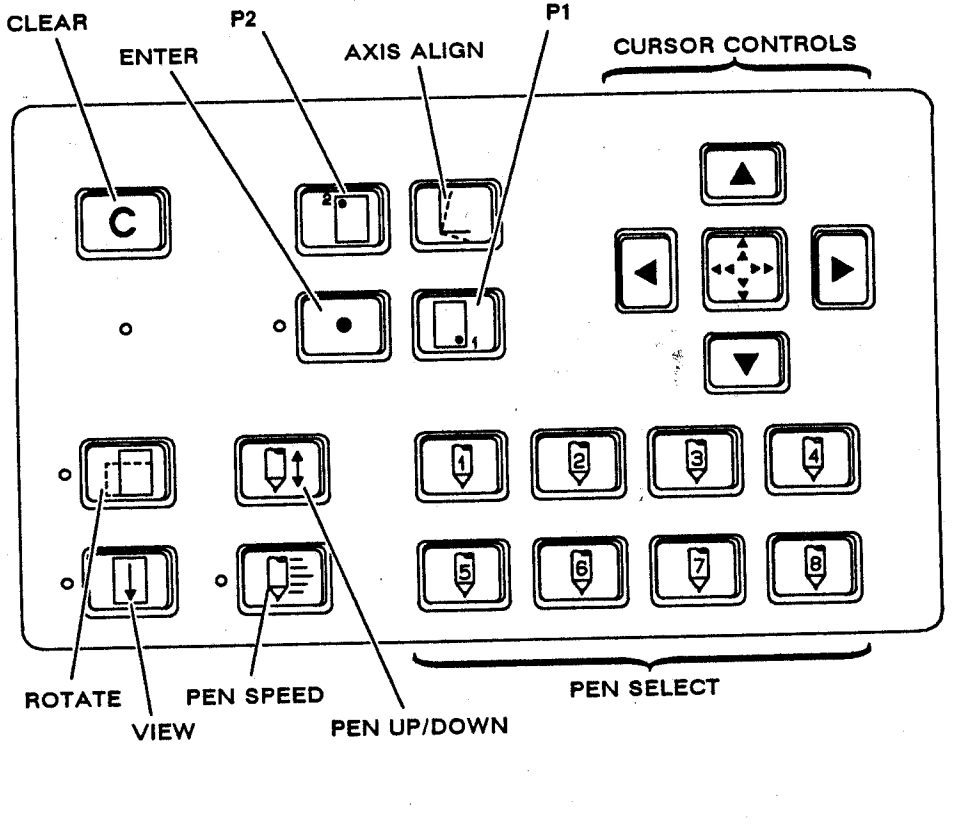
This chapter explains how to use the control-panel buttons and rear-panel switches to perform such tasks as:

- selecting and moving pens
- changing pen speed
- moving the scaling points P1 and P2
- aligning the plotter with gridded media
- rotating the plot
- clearing and resetting the plotter
- setting expanded plotting margins
- turning pen sort on

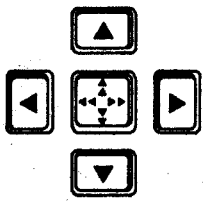
You should be aware that many of the functions described in this chapter can also be controlled through your software. If your software controls these plotter functions, it may override any selection that you make.

Using the Control-Panel Buttons

Use the control-panel buttons to manually control plotter functions. The control panel is shown below; a description of each button follows.



Control-Panel Buttons

Button	Name	Function
	**PEN SELECT**	Selects a pen from the carousel.
	**PEN UP/DOWN**	Raises and lowers the pen.
	**CURSOR CONTROLS**	Manually control the direction of the pen.
	**PEN SPEED**	Used with **PEN SELECT** buttons to change the pen speed.
	**VIEW**	Suspends plotting and moves the plot forward for viewing.
	**P1**	Moves to the **P1** point.
	**P2**	Moves to the **P2** point.
	**AXIS ALIGN**	Moves to the Axis Align point.
	**ROTATE**	Rotates the orientation of a plot by 90° counterclockwise.
	**ENTER**	Pressed with **PEN SELECT**, returns the pen to the carousel. Pressed with **P1** or **P2**, enters the pen position as the new **P1** or **P2**. Used with **AXIS ALIGN** to align axes. Pressed with **CLEAR**, resets the plotter.
	**CLEAR**	Cancels pending output and clears plotter buffers.

The following sections explain how to use the control-panel buttons. If you want to try using the buttons as you learn about them, turn on the plotter and load pens and a sheet of plotting media.

Selecting Pens 

Although software normally selects pens for you, you can also use the **PEN SELECT** buttons (numbered 1 through 8) to select pens. Pressing a numbered **PEN SELECT** button selects a pen from the corresponding stall in the carousel. If there is already a pen in the pen holder, it is returned to the carousel and the new pen is selected. After retrieving a pen, the pen holder will return to its previous location.

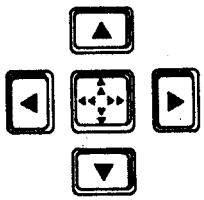
To return a pen to the carousel, press the **ENTER** button followed by any **PEN SELECT** button. The pen is returned to the carousel stall corresponding to the button pressed. If that stall is full, the pen is placed in the next lowest-numbered empty stall. If a pen is not in use for 15 seconds, the plotter automatically returns it to the carousel.

You can select a pen while a plot is in progress. Plotting is suspended until the new pen is picked, then the pen holder returns to its previous location and plotting resumes. (The pen change will not occur until the information currently in the plotter's buffer is plotted.)

The **PEN SELECT** buttons are also used when setting the pen speed, as explained in the section *Setting the Pen Speed*.

Raising and Lowering the Pen 

Use the **PEN UP/DOWN** button to raise and lower the pen manually. When the pen is up, you can move the pen without drawing on the plotting media; when the pen is down, you can use the **CURSOR CONTROLS** to draw.



Moving the Pen

Use the **CURSOR CONTROL** buttons to move the pen manually when positioning a digitizing sight or changing the scaling points. You can also use the cursor controls to draw manually.

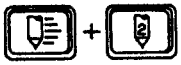
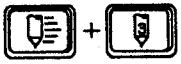
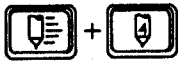
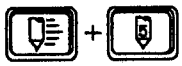
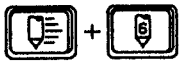
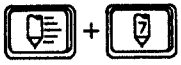
There are five **CURSOR CONTROL** buttons: four directional arrows and one speed button. Pressing any of the four arrow buttons moves the pen in the direction shown by the arrow. Simultaneously pressing any two adjacent arrow buttons moves the pen at a 45-degree angle between the two directions. The pen moves at low speed. Pressing the center speed button along with an arrow button moves the pen at maximum speed.

Setting the Pen Speed 

USE: Sets the optimum plotting speed for your plotting needs. Pen speed can also be set programmatically. If you are using a software package, your software documentation should tell you whether you need to set the pen speed from the control panel. If pen speed is not discussed, use the speeds recommended in this section.

DEFAULT: 40 cm/s

OPTIONS: Pen speeds of 5 centimetres per second through 80 centimetres per second. Pen speed applies to all pens. When used with the **PEN SPEED** button, each **PEN SELECT** button represents a pen speed.

Buttons Pressed	Corresponding Pen Speed, cm/s	Pen and Media Recommendation
	5	
	10	transparency pens on transparency film or glossy paper and fiber-tip paper pens on glossy paper
	15	refillable drafting pens on vellum or polyester film
	20	disposable drafting pens on plotter paper, vellum or film
	30	
	40	fiber-tip paper pens on plotter paper
	60	
	80	

EXPLANATION: To change the pen speed from the control panel, use the following steps.

1. Press the **PEN SPEED** button. The yellow light to the left of the button flashes.

2. Press the **PEN SELECT** button corresponding to the pen speed you want.

The **PEN SPEED** button stops flashing and the selected pen speed remains in effect until you set a new pen speed or reset the plotter. When you reset the plotter or turn the plotter off and on, the pen speed returns to its default setting, 40 cm/s. If you press the **PEN SPEED** button, then decide not to change the pen speed, press the button again. The yellow light stops flashing and the current speed remains in effect.

You can change the pen speed from the control panel while a plot is in progress. The **PEN SPEED** button affects only the plotting speed; it does not affect pen speed when using the **CURSOR CONTROL** buttons.

The default speed is satisfactory for fiber-tip pens on plotter paper. Use the suggested pen speed for other pen/media combinations. There are several other reasons why you may want to use a different pen speed: your software may require a pen speed other than the default; reduced pen speed can improve line quality; greater pen speed reduces plotting time when line quality isn't critical (e.g., draft plots).

NOTE: Actual plot throughput is determined by a combination of factors, including interface speed, acceleration, plot complexity, as well as pen speed. Doubling your pen speed will not double your throughput.■

Viewing a Plot in Progress 

USE: Use **VIEW** to temporarily halt a plot in progress without affecting the accuracy or completeness of the plot.

EXPLANATION: Press the **VIEW** button to view a plot in progress. After you press **VIEW**, the yellow light to the left of the button lights. The pen returns to the carousel and the plot moves so it is fully extended for your viewing. You can check the progress of your plot or remove the carousel and change pens.

Only the **VIEW** button is operational when the light is on; all other control-panel buttons may be pressed without effect.

To turn **VIEW** off, press the **VIEW** button again; the plotting media returns to its prior position and plotting resumes exactly where it was interrupted.

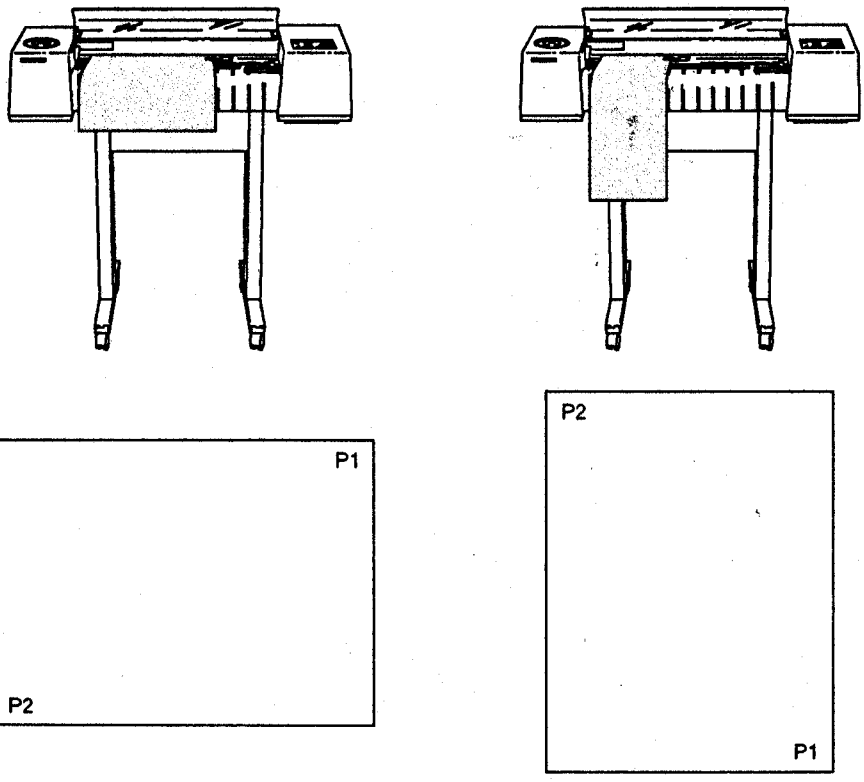
The **VIEW** light also serves as an error indicator. If an error occurs while plotting, the **VIEW** light blinks until the error is cleared. The software program may clear the error, or you can clear it by pressing **RESET** on the control panel or turning the plotter off then on. However, your plot may be fine, even if the light is blinking.

Before unloading a completed plot, use **VIEW** to raise the pen and move the plot forward. This simplifies unloading and prevents accidental pen marks on the media.

Repositioning P1 and P2

USE: P1 and P2 define plot boundaries. The P1 and P2 points determine the size and location of your plot when scaling. (Scaling is dividing the plotting area into units of measure convenient for your application. Refer to the *Programmer's Reference* for more information.)

EXPLANATION: Pressing **P1** or **P2** moves the pen to the location of the corresponding point. The following illustration shows the locations of P1 and P2 on horizontally and vertically loaded media.*



Horizontally Loaded Media *Vertically Loaded Media*

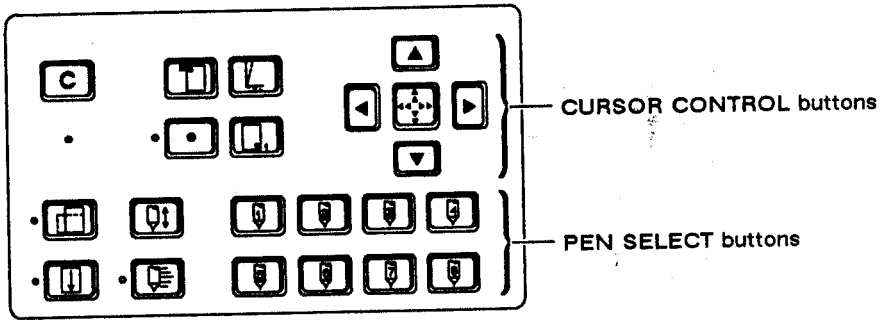
*Setting **ROTATE** or **EXPAND** on will affect the positions of P1 and P2. Refer to *Rotating a Plot* and *Expanding the Plotting Area* later in this chapter.

You will probably need to reposition P1 and P2 *only* when your software requires you to do so or when writing your own programs.

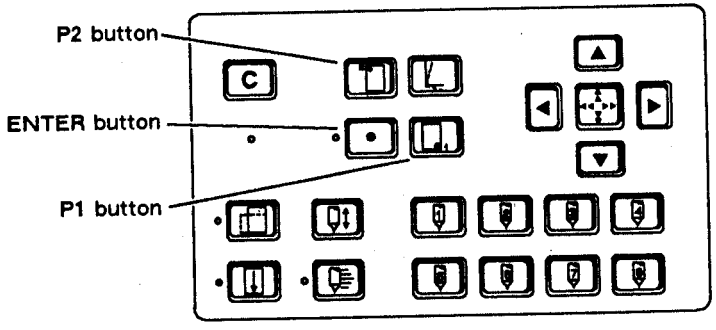
To change the location of P1 and P2, use the following steps and illustrations.

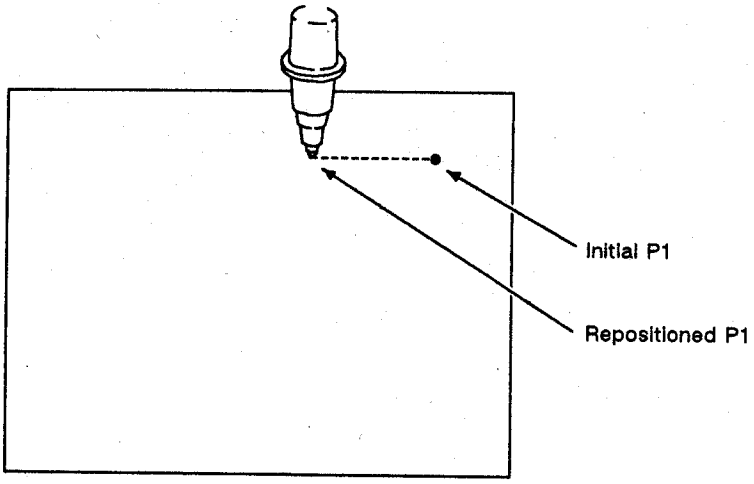
1. Press a **PEN SELECT** button to retrieve a pen from the carousel. (You must select a pen even though you will not be drawing with it.)

2. Use the **CURSOR CONTROL** buttons to move the pen to the desired P1 location.



3. Press the **ENTER** button, then press the **P1** button to store the new P1 location.





4. To locate P2, repeat steps 2 and 3 using the **P2** button instead of **P1**.

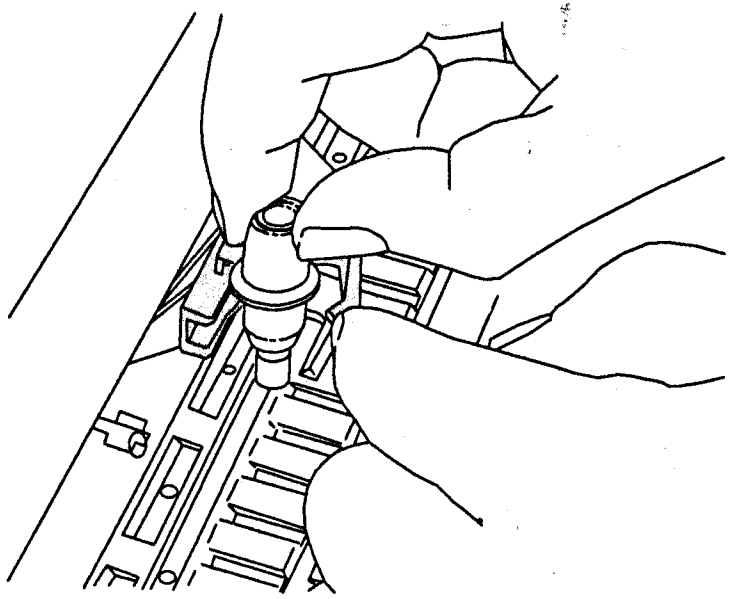
NOTE: Whenever you change the location of P1, P2 automatically changes location to maintain the same location relative to P1. To move P2 to a specific location, always set the location of P1 **before** setting P2.■

Aligning the Plotting Axes with Gridded Media

USE: Use **AXIS ALIGN** if you need to align grids on printed media with the physical axes of the plotter.

EXPLANATION: Use the following procedure to align grids on your media with the axes of the plotter. Although you can use a pen to make the alignment, a digitizing sight is more accurate and avoids pen marks on your media. (Refer to Appendix C for information on purchasing a digitizing sight.)

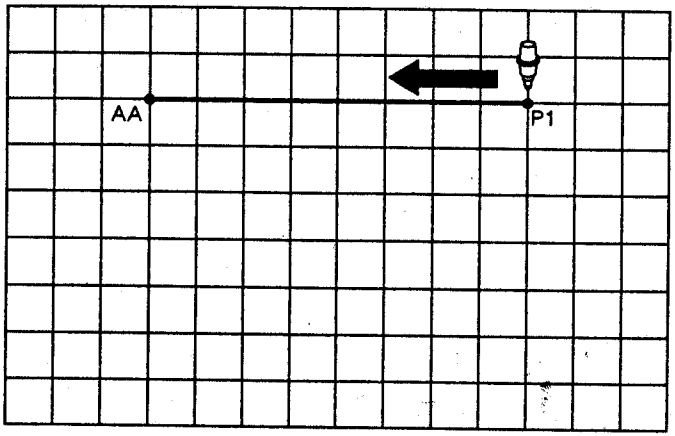
1. Load the preprinted media into the plotter.
2. Remove the protective cap and load the digitizing sight directly into the *pen holder*.



NOTE: To avoid smearing ink on the tip of the digitizing sight, do not load the digitizing sight into the carousel.■

3. Press **AXIS ALIGN** to locate the axis align point (AA). Note which grid lines are closest to the axis align point.
4. Press **P1** to move the sight to P1.

5. Press **PEN UP/DOWN** to lower the sight. Using the **CURSOR CONTROL** buttons, position the dot in the digitizing sight directly over the nearest grid line running from P1 to the axis align point. See the following illustration.



6. Press **ENTER** followed by **P1** to store the new location of P1.

7. Press **AXIS ALIGN** to move the sight to the axis align point. (The sight will move in the 'up' position.)

8. Press **PEN UP/DOWN** to lower the sight. Using the **CURSOR CONTROL** buttons, move the dot in the digitizing sight directly over the same grid line.

9. Press **ENTER** and **AXIS ALIGN** to store the new location of AA.

10. Press **P1** and look through the digitizing sight to verify that the dot tracks the grid line as the digitizing sight moves to P1.

NOTE: The angle between the edges of the media and the preprinted lines must be fewer than six degrees. If the angle is greater than six degrees, the alignment is rejected and the **ENTER** light continues to blink. Press **ENTER** to stop the light from blinking and try again.■

To return P1 and P2 to their default locations after using **AXIS ALIGN**, either turn the plotter off and then on again or load a new sheet of media and use **RESET**. Loading a new *size* of media will automatically return P1 and P2 to their default locations.

Rotating a Plot 

USE: Use the **ROTATE** button to turn the X- and Y-axes of your plot 90 degrees counterclockwise. If you are using a software package with your plotter, the rotation of plots may be controlled through the software, and you won't need to use the control-panel buttons for rotation. Check your software manual to determine how plot rotation is accomplished by the software.

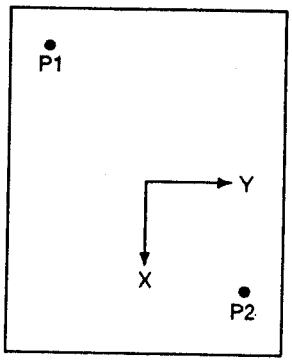
DEFAULT: OFF

OPTIONS: OFF, ON

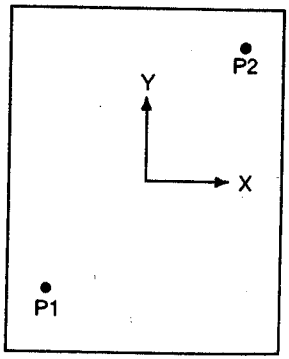
EXPLANATION: Use the following procedure to rotate your plot.

1. Press the **ROTATE** button. The yellow light to the left of the **ROTATE** button will light to show that plot rotation is on.
2. To turn plot rotation off, press the **ROTATE** button again. The light to the left of the button will go off.

Normally, the X-axis runs along the longest edge of the media. Pressing the **ROTATE** button turns the axes 90 degrees counterclockwise so that the Y-axis runs the length of the media.

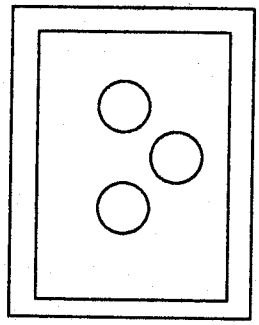


Rotate Off

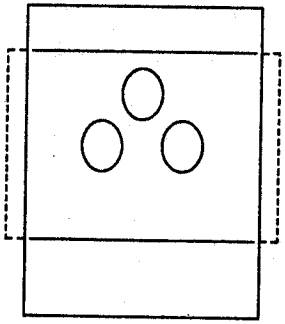


Rotate On

When you rotate a plot, the P1 and P2 points also rotate and move inward. Be aware that this may affect the proportions of your plot if your software uses scaling techniques. The circles in the following illustration show the effect of scaling when P1 and P2 are moved.

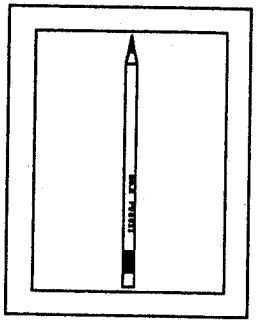


Original Plot

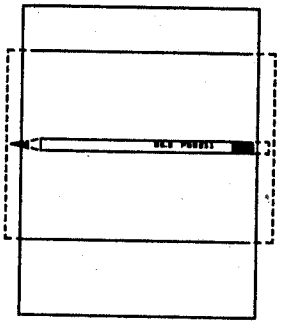


Rotated Plot

If your program does not use scaling techniques, your plot may not entirely fit on the page when rotated. This effect (called clipping) is shown with the pencil in the following illustration. Refer to the *Programmer's Reference* for more information on scaling.



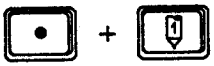
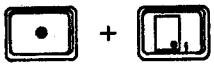
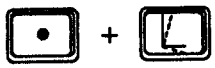
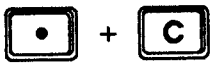
Original Plot



Rotated Plot

Using the Enter Button 

The **ENTER** button works in combination with other control-panel buttons. When you press **ENTER**, the yellow light to the left of the button flashes. The plotter responds to the next button pressed, and turns the light off. The following table lists the effects of the possible **ENTER** button combinations.

Buttons Pressed	Result
	Returns pen to carousel.
	Defines current pen location as P1.
	Defines current pen location as P2.
	Defines current pen location as AA*.
	Resets the plotter.

*AA refers to the axis align point.

Digitizing

If you are using a digitizing software package, complete these steps to digitize with the plotter. Refer to the *Programmer's Reference* to write your own digitizing programs.

1. Install your software package.
2. Load the digitizing sight into the pen holder (refer to *Aligning the Plotting Axis* earlier in this chapter).
3. When the light to the left of the **ENTER** button is lit but not blinking, use the **CURSOR CONTROLS** to position the dot in the digitizing sight directly over the point you want to digitize.
4. Press **ENTER** to send the point to the computer. Depending on your software's requirements, you may need to press a key such as RETURN on your computer's keyboard.

Choosing between Clear and Reset

You can use **CLEAR** or **RESET** to abort a plot and start over. However, they perform slightly different functions. Use the following table to help you decide between using clearing and resetting the plotter.

Clear	Reset
Cancels pending output from the plotter.	Clears the plotter, plus. . .
Clears plotting information in all buffers.	Reestablishes the plotter's initialization conditions.
	Erases errors.

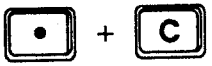
Clearing the Plotter's Buffer C

USE: Use **CLEAR** to stop a plot in progress and clear the plotter's buffer without canceling any changes (e.g., plot rotation) you made using the control-panel buttons.

EXPLANATION: Press the **CLEAR** button to clear the plotter.

Both **CLEAR** and **RESET** abort a plot in progress. If there is a plotting error (shown by the **VIEW** light blinking), use **CLEAR** if you want to abort the plot and check the cause of the error; use **RESET** if you just want to abort the plot and erase the error. Refer to *Using Reset to Start Over,* later in this chapter, for information on **RESET**.

CLEAR empties the plotter's buffer, stopping the plot in progress. However, to completely stop the plot, you must also stop your computer from sending more data.

Using Reset to Start Over 

USE: Use **RESET** to stop a plot in progress, clear the plotter's buffer, and reestablish the plotter's default conditions.

EXPLANATION: Use the following procedure to reset the plotter.

1. Press the **ENTER** button.
2. Then press the **CLEAR** button to reset the plotter.

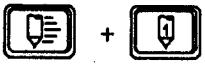
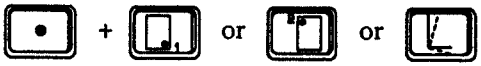
Resetting the plotter cancels any changes you made using the control-panel buttons: **PEN SPEED** resets to 40 cm/s, **ROTATE** turns off, and the P1, P2, and AA points return to their original locations. However, if you used **AXIS ALIGN** before plotting, your alignment is **not** cancelled.

Both **CLEAR** and **RESET** abort a plot in progress. If there is a plotting error (indicated by the **VIEW** light blinking), use **CLEAR** if you want to abort the plot and check the cause of the error; use **RESET** if you just want to abort the plot and erase the error.

NOTE: Data erased from the plotter's buffer will not be plotted; however, to completely terminate a plot, you must also stop your computer from sending more data.■

Summary of the Control-Panel Buttons

The following table summarizes the use of the control-panel buttons.

If You Want to...	Press...
select a pen	
return a pen	
raise or lower a pen	
move a pen	
move a pen at high speed	
select a pen speed	
view a plot in progress	
resume plotting after viewing	 again
send a pen to P1, P2, or AA	
reposition P1, P2, or AA	
rotate a plot	
cancel a rotation	
clear the plotter	
reset the plotter	
run the demonstration plot	

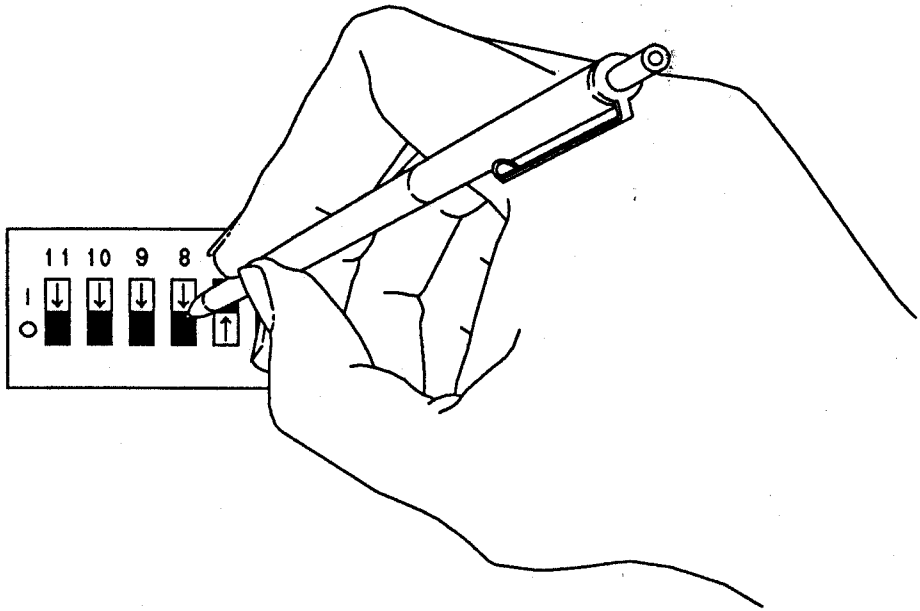
Selecting Enhanced Plotting Features

Your plotter has two enhanced plotting features, **EXPAND** and **PEN SORT**, which are selected using the rear-panel switches. (The rear-panel switches also set interface conditions, discussed in Chapter 6.)

Changing Rear-Panel Switch Settings

To change a switch setting, refer to the following steps and illustration.

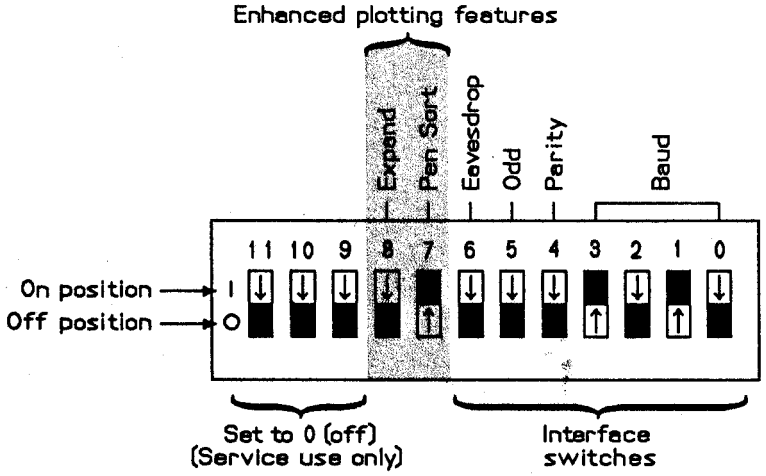
1. Turn off the plotter.
2. Push the switch to the desired position using a pencil or pen.



- The raised portion of the switch is shown in black.
- The arrow indicates the direction to push the switch.

3. Turn on the plotter. The new switch settings are now in effect.

NOTE: The plotter reads the settings of the switches *only* when you turn it on. Be sure to turn it off then on when you change switch settings.■



NOTE: Switches 9–11 are for the use of qualified service personnel only. Take care not to accidentally turn on one of these switches when setting other rear-panel switches.■

Expanding the Plotting Area

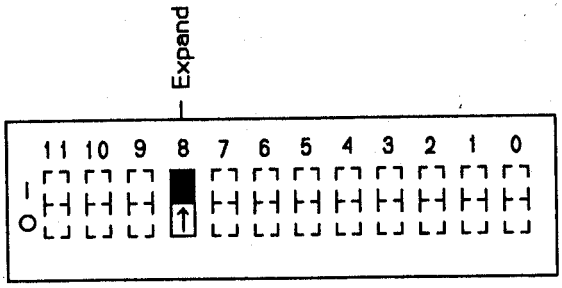
USE: Use **EXPAND** when you want to draw closer to the edges of your media. The **EXPAND** switch expands the plotting area by reducing the outer margins.

DEFAULT: OFF

OPTIONS: OFF, ON

EXPLANATION: Use the following procedure to increase the plotting area.

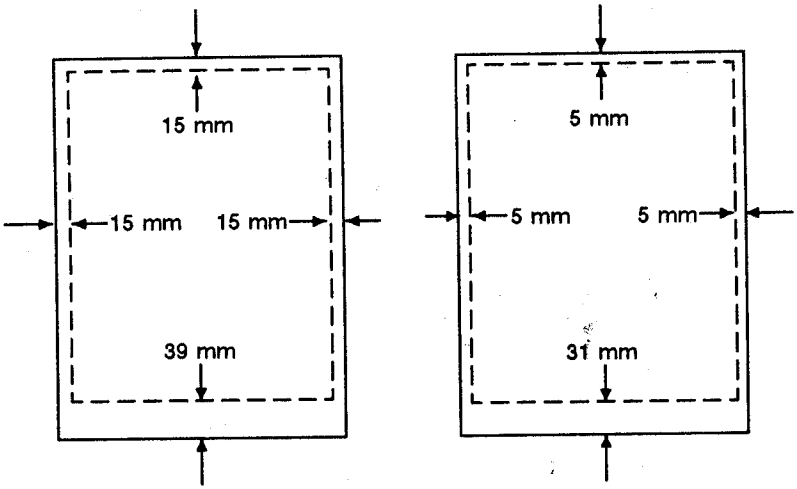
1. Turn off the plotter.
2. Use a pencil or pen to push the **EXPAND** switch to the on position.



3. Turn on the plotter. The new switch setting is now in effect.

NOTE: The plotter reads the settings of the switches *only* when you turn it on. Be sure to turn it off then on when you change switch settings.■

When **EXPAND** is on, the plotting area increases by reducing the outer margins of the page. The following illustration shows the difference in size between the standard and expanded plotting area. (All media sizes have the same margins.) Note that the wide margin is always on the front edge of the plotting media, even when a plot is rotated.



Standard plotting area Expanded plotting area

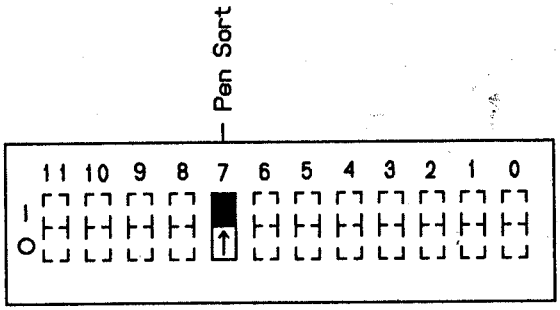
NOTE: Using reduced margins allows the plotter to draw under the pinch wheels. Fresh ink may smear when the pinch wheel rolls over it. If ink smears when **EXPAND** is on, move P1 and P2 in, away from the edges of the page, or reduce pen speed.■

Using Pen Sort to Increase Plotting Efficiency

USE: Use **PEN SORT** to save time when drawing complex, multicolored plots. **PEN SORT** reduces plotting time by limiting the number of times individual pens are picked.

EXPLANATION: Complete the following procedure to change the **PEN SORT** setting.

1. Turn off the plotter.
2. Use a pencil or pen to push the **PEN SORT** switch to the on position.



3. Turn on the plotter. The new switch setting is now in effect.

NOTE: The plotter reads the settings of the switches *only* when you turn it on. Be sure to turn it off then on when you change switch settings.■

When **PEN SORT** is on, the plotter sorts the pen instructions in the buffer and groups the instructions for each pen. Then the plotter draws your plot using one pen at a time. The plotter, for example, might draw all the green lines in your plot buffer, then all the blue lines, and so on.

When **PEN SORT** is off, the plotter draws the plot in the order that it receives the plotting instructions. For this reason, turn **PEN SORT** off when debugging programs you have written. Also, if ink smears when the plotter outlines shapes, try turning **PEN SORT** off.

PEN SORT can also be selected programmatically, refer to the *Programmer's Reference* (Part No. 07575-90001). Note that **PEN SORT** must be turned off the way it is turned on, for example, if you turn on **PEN SORT** using the rear-panel switch, you cannot use your software to turn it off.

PEN SORT has a companion feature that is in effect when pen sorting is on. If your plot program raises the pen and makes several moves before lowering the pen, the plotter keeps track of these moves without actually moving the pen.

3

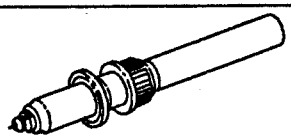
Selecting Pens and Media

This chapter describes the pens and media that can be used with your plotter and how to combine them with the proper pen speed for best results.

For the highest quality plots, use only Hewlett-Packard drafting supplies. Hewlett-Packard pens and media work together for optimal pen life, plot quality, and plotter performance. The chemical reaction between the pens and media is tested to ensure that fading and color changes are minimized. The smoothness of HP paper reduces abrasion on pen tips and produces a sharp, crisp ink line. For information on ordering supplies, refer to Appendix C, *Accessories Available*, or the *Supplies Catalog* shipped with your plotter.

Pens

Your plotter can use fiber-tip paper pens, transparency pens, disposable drafting pens, and refillable drafting pens. The following table illustrates each pen type and lists its characteristics.

Pen Type	Characteristics
Fiber-tip Paper 	Easy to use, economic. Even ink flow produces high-quality characters and opaque lines. Disposable.
Fiber-tip Transparency 	Excellent color and line quality on overhead transparency film.
Disposable Drafting* 	Very convenient, requires no refilling. Excellent quality. Available for polyester film and vellum/paper. Requires cleaning (refer to Chapter 4).
Refillable Drafting 	Highest drafting-quality pen. Long-lasting tungsten carbide points. Requires refilling and maintenance (refer to Chapter 4).

*Disposable drafting pens require a pen adapter (Part No. 5061-7578).

Fiber-tip pens will last 30 days stored in the carousel. However, if you do not plan to plot for several days, remove the pens from the carousel and cap them to lengthen pen life.

Remove drafting pens and cap them immediately after use to prevent drying and clogging. Clean drafting pens after use, as explained in *Maintaining Refillable Drafting Pens* and *Caring for Disposable Drafting Pens* in Chapter 4.

Because of the air vents in drafting pens, ink dries as quickly in the drafting pen as it does on the plotting media. In dry climates and at high altitudes, you can expect ink to dry out more rapidly than in humid environments. (Note that many office environments are quite dry.) The following are the maximum times that ink can remain in a drafting pen in an average environment.

- 20 seconds if the pen is uncapped and not in use.
- One day if the pen is in a drafting pen carousel.
- One week if the pen is properly capped and stored in a pen tip up vertical position.

Media

You can use plotter paper, glossy paper, transparency film, vellum, and double-matte polyester film with your plotter. The following table describes each of these plotting media.

Media Type	Characteristics
Plotter Paper	Smooth surface, clear line definition. Easy to handle, good for everyday use. Inexpensive.
Glossy Paper	Highest quality plotter paper. Heavy-weight, glossy finish for presentation-quality plots. Moderately expensive.
Transparency Film	High-grade, clear plotting medium for presentations or overlays using an overhead projector.
Vellum	Surface coated for smoothness and ink receptivity. Also treated for strength and transparency. Stores well. Diazo reproducible. Moderately expensive.
Double-matte Polyester Film*	Finely coated and translucent. Good for high-accuracy applications and archive storage. Dimensionally stable. Expensive.

* Use film of standard, 3-mil thickness for best results.

The plotter can use single-sheet media in the standard sizes listed below.

English	Architectural**
A (8½ × 11 in.)	A (9 × 12 in.)
B (11 × 17 in.)	B (12 × 18 in.)
C (17 × 22 in.)	C (18 × 24 in.)
D (22 × 34 in.)	D (24 × 36 in.)
E (34 × 44 in.)*	E (36 × 48 in.)*

* Only the HP DraftPro EXL can plot on this size media.

** The DraftPro DXL/EXL cannot plot on 30 X 42 in. architectural media.

Metric		
A4 (210 × 297 mm)		
A3 (297 × 420 mm)		
A2 (420 × 594 mm)	RA2 (430 × 610 mm)	SRA2 (450 × 640 mm)
A1 (594 × 841 mm)	RA1 (610 × 860 mm)	SRA1 (640 × 900 mm)
A0 (841 × 1189 mm)*	RA0 (860 × 1220 mm)*	SRA0 (900 × 1280 mm)*

* Only the HP DraftPro EXL can plot on this size media.

Operating Considerations

Take the following precautions when working with plotter paper, glossy paper, transparency film, vellum, or polyester film.

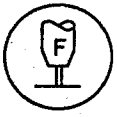
- Handle media by the edges. Oil from fingerprints can prevent ink from adhering to media.
- Plotting media, particularly paper, can be affected by changes in temperature and humidity. Plotting distortions occur if the media shrinks or stretches. Stabilize your media by removing a sheet from the package and exposing it to air near the plotter for at least 15 minutes before using it. (This is not necessary for media from an open package that has been exposed to the plotter's environment for several days.)
- Disposable drafting pens can be affected by changes in temperature. To prevent leaking: avoid placing the plotter near windows or heating/air conditioning vents and store pens in an area that maintains a relatively constant temperature.
- Use media with square corners to allow the pinch wheels to grip and move the media correctly.
- Periodically clean the tips of disposable and refillable drafting pens to remove lint.

Combining Pens and Media

Use the following table to select the types of pens and media that work best together. The recommended plotting speed is listed for each combination.

Fiber-tip Pens 	**Plotter Paper:** Excellent quality for drawings. Good for solidly-filled areas. **Transparency Film:** *Not recommended.* **Glossy Paper:** Excellent quality for business graphics, reports, and presentations. (Pen Speed: 10 cm/s) **Vellum:** *Not recommended.* **Polyester Film:** *Not recommended.* **Pen Speed:** 40 cm/s
Transparency Pens 	**Plotter Paper:** *Not recommended.* **Transparency Film:** Excellent for overlays or overhead projection at meetings and presentations. **Glossy Paper:** Excellent quality for business graphics, reports, and presentations. **Vellum:** *Not recommended.* **Polyester Film:** *Not recommended.* **Pen Speed:** 10 cm/s

(Table continues)

Disposable Drafting Pens **Vellum/Paper** 	**Plotter Paper:** Good for preliminary drawings. **Transparency Film:** *Not recommended.* **Glossy Paper:** *Not recommended.* **Vellum:** Excellent quality for final drawings. Use for diazo reproductions at fast developing speed. **Polyester Film:** *Not recommended.* **Pen Speed:** 20 cm/s
Disposable Drafting Pens **Polyester Film** 	**Plotter Paper:** *Not recommended.* **Transparency Film:** *Not recommended.* **Glossy Paper:** *Not recommended.* **Vellum:** *Not recommended.* **Polyester Film:** Convenient. Excellent quality for high accuracy. Excellent for final, archive drawings. **Pen Speed:** 20 cm/s
Refillable Drafting Pens 	**Plotter Paper:** *Not recommended.* **Transparency Film:** *Not recommended.* **Glossy Paper:** *Not recommended.* **Vellum:** Excellent quality for final drawings. Use for diazo reproductions at fast developing speed. **Polyester Film:** Excellent quality for high accuracy. Excellent for final, archive drawings. **Pen Speed:** 15 cm/s

Selecting the Proper Pen Speed 

The previous table lists the recommended pen speed for each pen and media combination. However, each pen type can write effectively within the following ranges.

Pen Type	Speed Range, cm/s
fiber-tip paper	5 to 80
fiber-tip transparency	5 to 15
disposable drafting	10 to 30
refillable drafting	5 to 15

You may vary the pen speed within each range according to your plotting needs. If you want one plot of the highest possible quality, set the pen speed in the low end of the range. If you need many plots drawn quickly, set pen speed in the high end of the range.

Refer to the Help Card or *Setting the Pen Speed* in Chapter 2 for the button combinations to generate each pen speed.

4

Maintenance

This chapter explains the maintenance required for the plotter and for disposable and refillable drafting pens. For your reference, instructions are included for disassembling the plotter.

Cleaning the Plotter

Plotter maintenance is limited to a thorough cleaning—all other maintenance must be performed by qualified service personnel. Periodically cleaning the carousels will remove ink that can accumulate on the rubber pen caps. Cleaning the grit wheels will help ensure accuracy while plotting. When cleaning the plotter, use the following instructions.

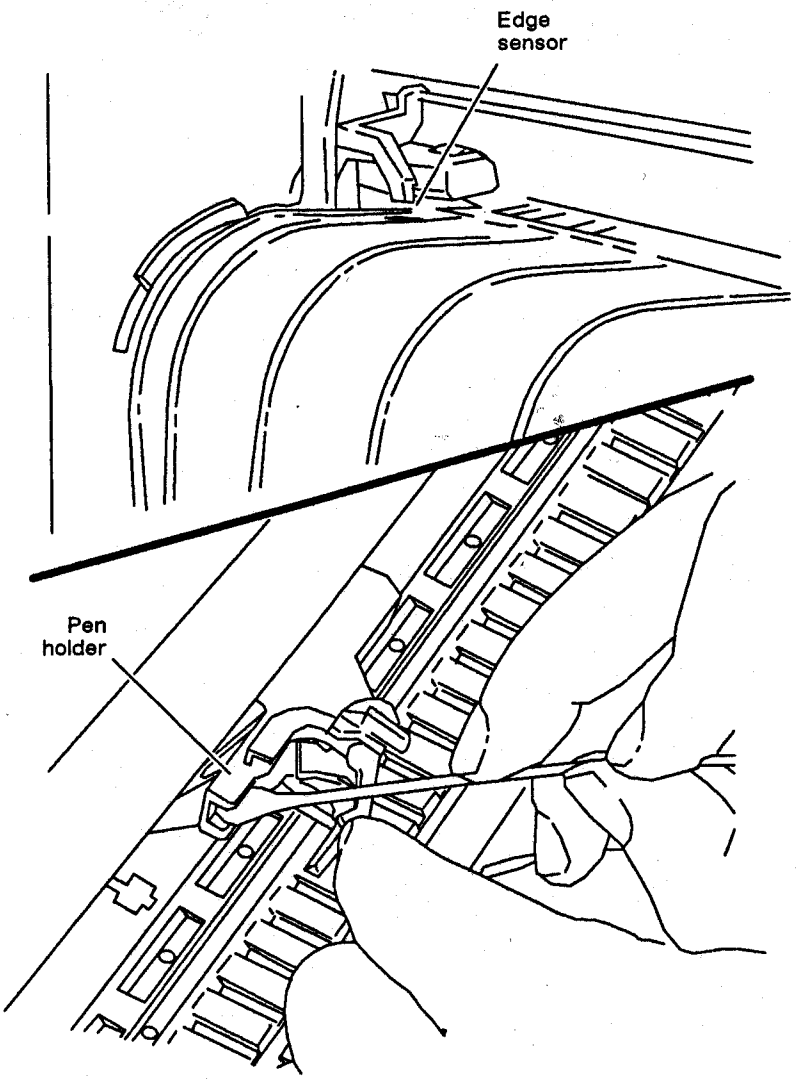
WARNING

To prevent electrical shock, unplug the plotter before cleaning. Do not allow water to run inside the plotter.

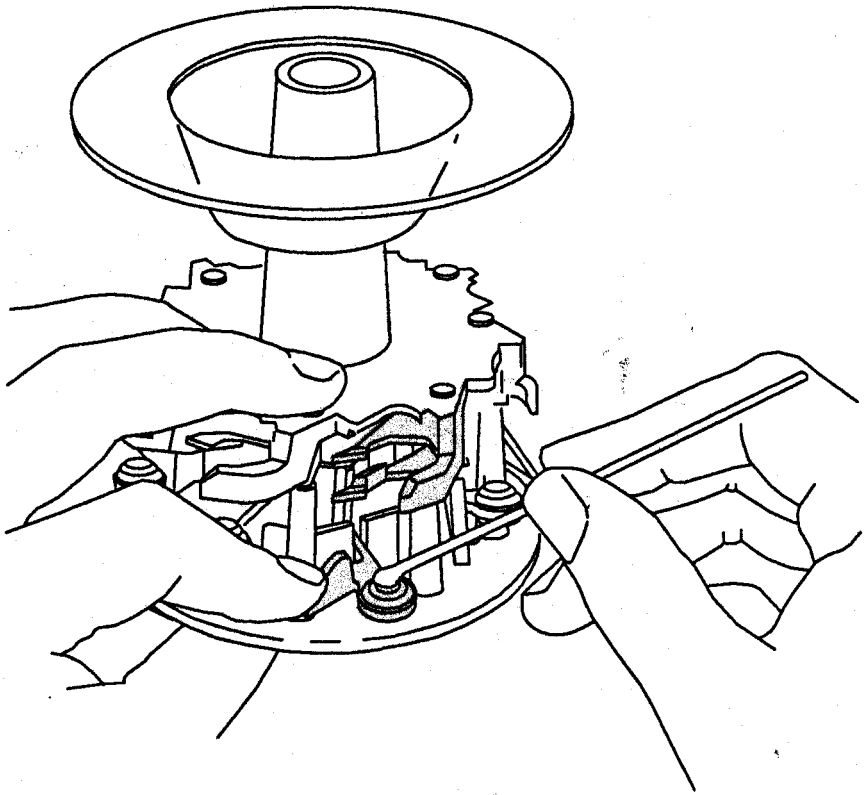
---

1. Wipe the plotter surface with a damp sponge or soft cloth. If necessary, clean with a 50-50 solution of isopropyl alcohol and water. Wipe with water to rinse off any residue and dry with a soft, lint-free cloth. *Do not use abrasive cleaners, cleaning solvents or strong detergents.*

2. Use a cotton swab to wipe accumulated dust and lint from the surface of the edge sensor and the inside ridges of the pen holder. Refer to the following illustration.



3. Remove the pen carousel from the plotter and remove any pens. Clean the carousel's black rubber pen boots (as shown below) using a cotton swab moistened with alcohol or pen cleaning solution. Allow the carousel to dry thoroughly before inserting pens. Replace any cracked or damaged pen boots.

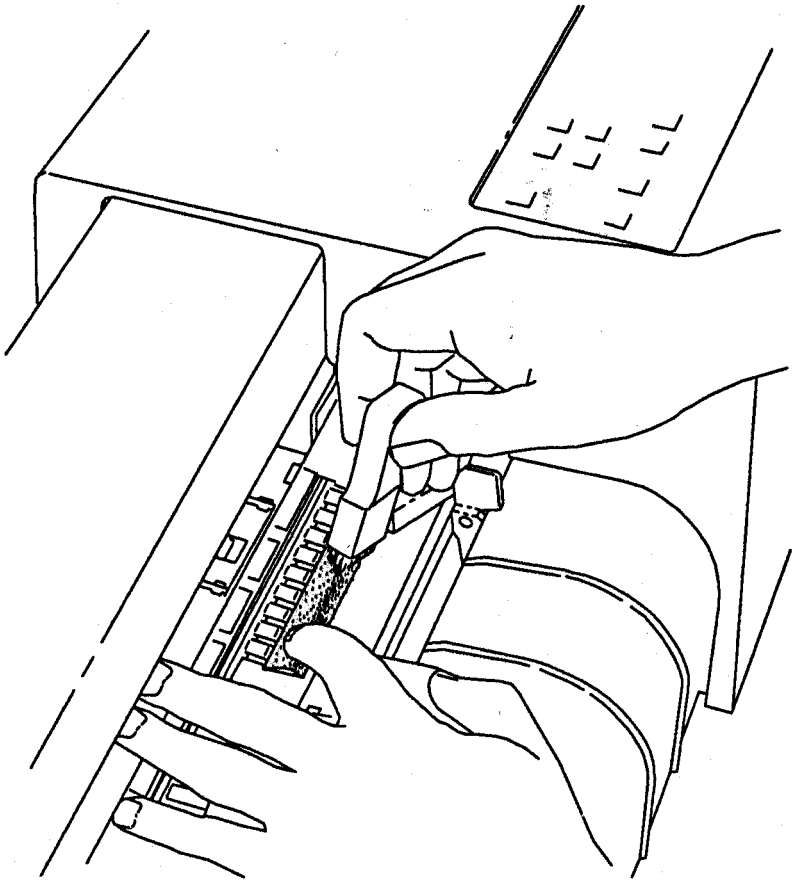


4. To maintain plotter accuracy, use the following steps to clean the grit wheels.

   a. Turn the plotter off and raise the carriage cover.

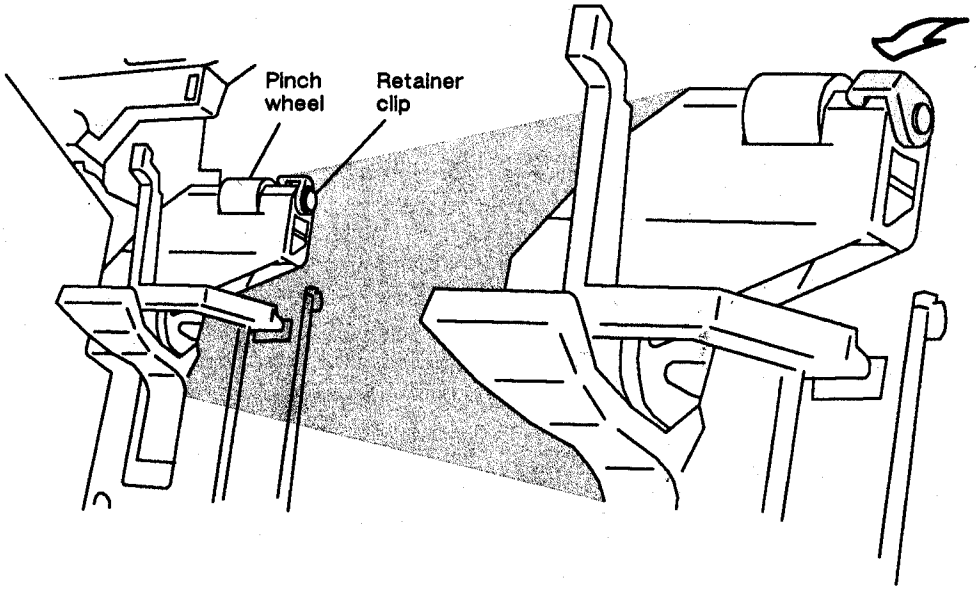
   b. Raise the pinch wheels and slide the right pinch wheel so it is not over the grit wheel surface.

   c. To rotate the grit wheel, move it with your finger. Use the grit wheel brush supplied with your plotter to remove dust from the grit surface as you manually rotate the grit wheel.

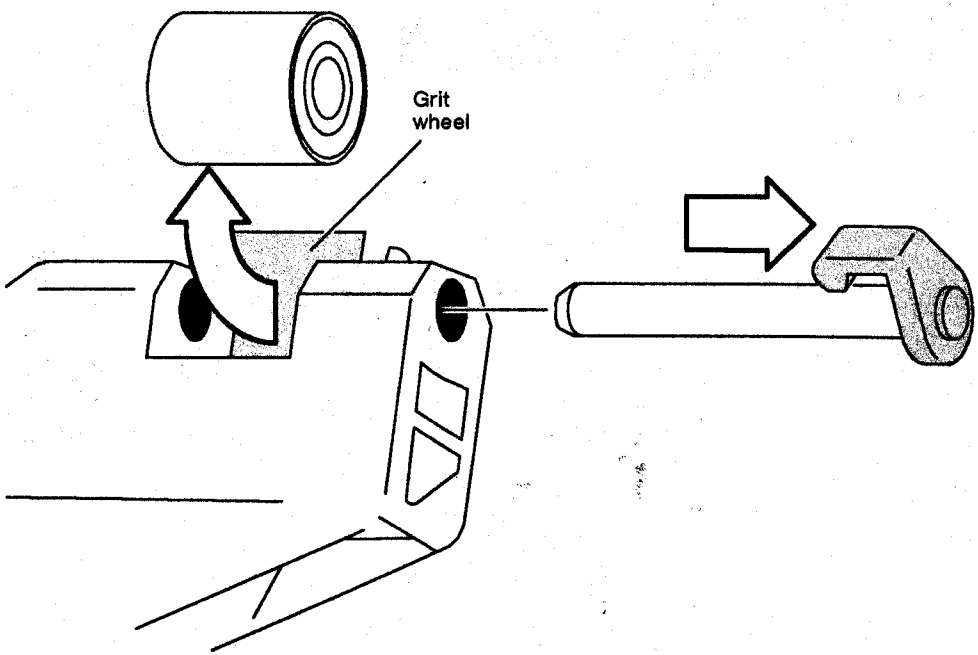


d. After cleaning the visible grit wheels, you must also clean the small grit wheel under the left pinch wheel. To clean this grit wheel, first remove the left pinch wheel using the following instructions.

(1) Turn the retaining clip so that it is over the flat area.



(2) Pull the retaining clip to the right to remove it, then remove the left pinch wheel.



(3) Clean the small grit wheel using the same technique as the large ones.

(4) Place the pinch wheel back in its slot and insert the retaining clip rod. You may need to wiggle the rod to make it go through the hole in the pinch wheel.

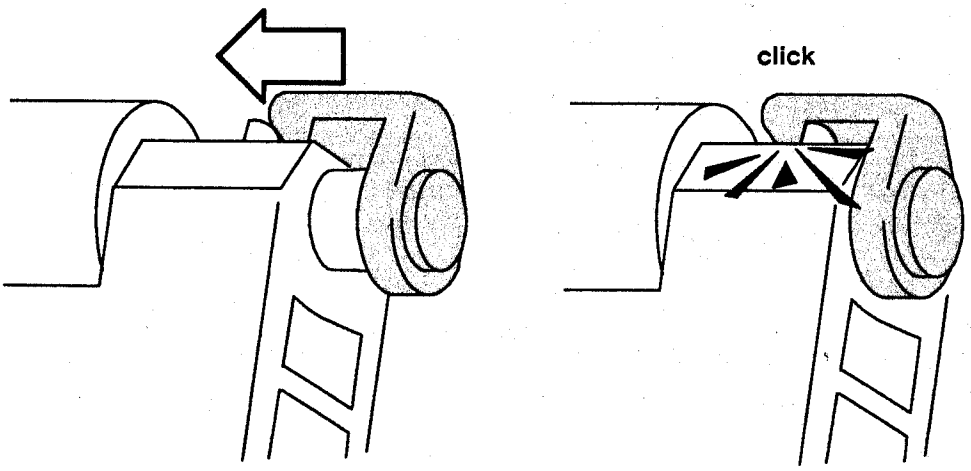
CAUTION

Carefully latch the pinch wheel. Improperly latching the pinch wheel could cause it to come out while you are plotting.

---

(5) Turn the retaining clip so that it is horizontal.

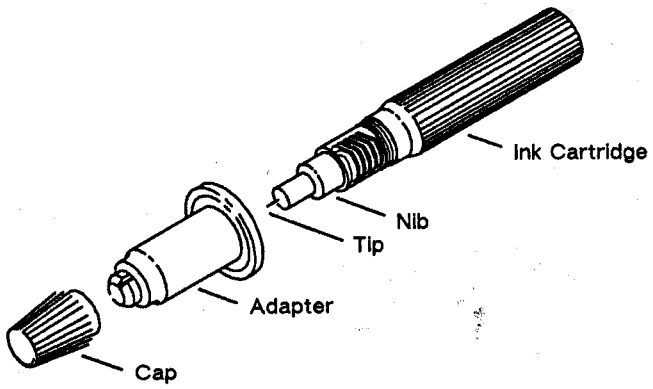
Push until you hear a click. The retaining clip *must* snap over the catch in order to securely hold the pinch wheel.



Caring for Disposable Drafting Pens

We want you to get the best results from your plotter. When using disposable drafting pens, you should be aware of

The following illustration shows the parts of a disposable drafting pen.



There are several things you can do to get the most from your disposable drafting pens.

- Make sure the pen adapters are screwed on securely.
- Take the pens out of the carousel after use and *cap* them.
- Store the pens vertically with the tips *up*.
- Clean the pens on a regular basis.
- Occasionally clean the pen boots in the drafting carousel and replace them if they are damaged.
- Avoid placing the plotter near windows or heating/air conditioning vents.
- Keep pens stored in an area that maintains a relatively constant temperature.

Clogging

Occasionally, disposable drafting pens will clog, especially if you are using them on paper that is highly fibrous. If your disposable drafting pens clog, clean them using the procedure described in the section, *Cleaning Your Disposable Drafting Pens*, later in this chapter. If clogging is a frequent problem, try the following steps.

- Change your media to one that is less fibrous.
- Reduce your pen speed, particularly if you are using a lower quality media (e.g., plotter paper).

Cleaning Your Disposable Drafting Pens

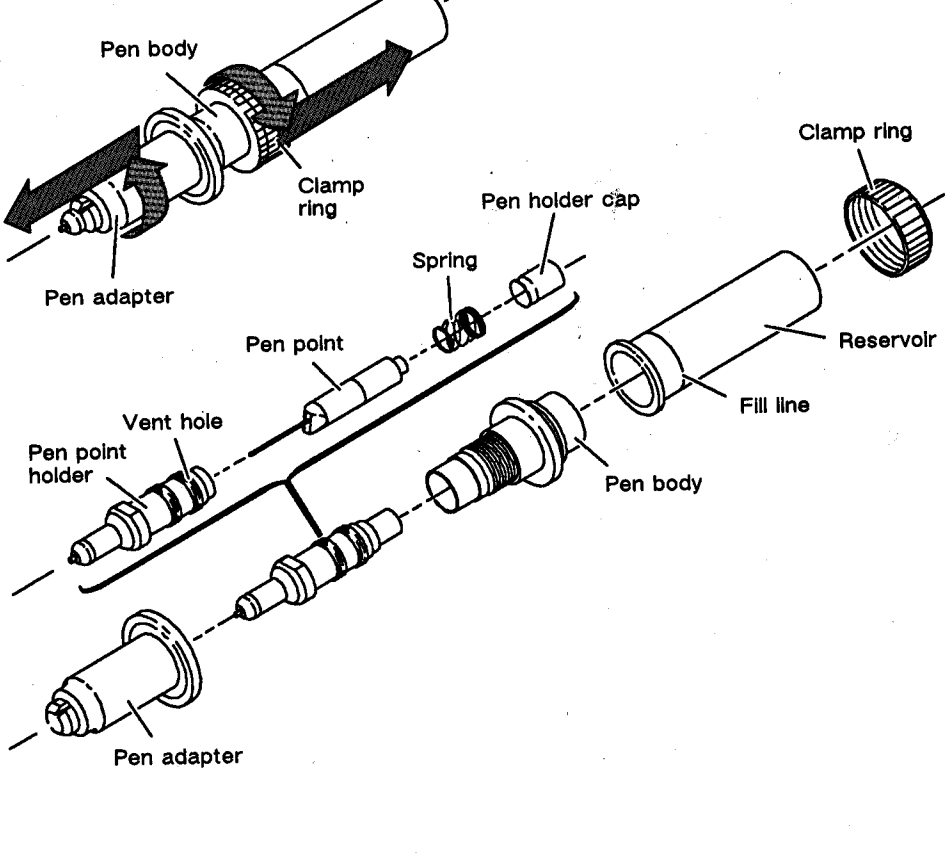
Clean your disposable drafting pens on a regular basis. Follow these procedures to clean your disposable drafting pens.

1. Remove the pen cap.
2. Tap the end of the cartridge on a firm surface.
3. Holding the tip down, shake the pen 3 to 5 times and test by hand on some scrap media.
4. Immediately cap or load the pen into the drafting pen carousel.

Maintaining Refillable Drafting Pens

For good line quality, clean your drafting pens after each plotting session. Maintaining your drafting pens will improve their reliability. Complete the following steps to disassemble, clean, and reassemble an HP drafting pen. If a sink is available, use it.

1. Unscrew each part to disassemble the pen. Refer to the following illustration. **Take care not to bend the pen point.**



2. Thoroughly clean all parts under warm running water. A toothbrush and a very small bottle brush are helpful.

3. Dry all parts thoroughly with a tissue, inside and outside.

4. Holding the pen point holder, cover the vent hole with your finger and blow firmly into the wide end. Repeat as necessary to remove all water.

5. Reassemble the pen as follows.

   a. **Gently lower** the pen point into the pen point holder.

   b. Place the spring in the pen holder cap and press the cap onto the top of the pen holder.

   c. Screw the pen point holder into the pen body.

   d. Screw the pen adapter onto the pen body.

   e. Replace the reservoir on the pen body.

   f. Slip the clamp ring over the reservoir to the pen body and screw in place.

Filling the Drafting Pen with Ink

Use the following instructions to fill a pen with ink.

1. Unscrew the clamp ring and remove the reservoir from the pen body.

2. Hold the ink reservoir upright and add ink to the fill line. Don't overfill.

3. Gently insert the large end of the pen body into the open end of the reservoir. Replace the clamp ring.

CAUTION

Do not shake the pen to start ink flow. Shaking the pen can force ink into the air vents and prevent ink flow.

4. Hold the pen point down and rap the top sharply on the underside of a table. Alternatively, hold the pen point down and firmly tap the top of the ink reservoir to start the flow of ink to the pen tip.
5. Moisten the point and draw with the pen until ink appears.
6. Immediately cap or load the pen into the drafting pen carousel.

Assembling and Disassembling the Plotter

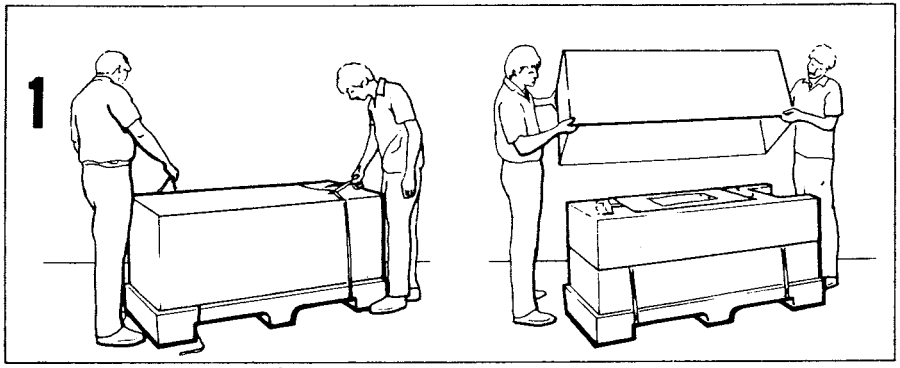
Refer to the illustrations on the following pages should you not have the unpacking instructions for your plotter, or if you need to disassemble and move your plotter.

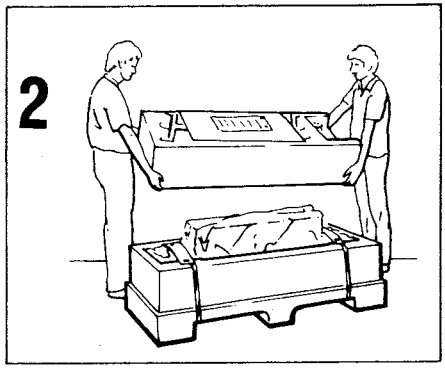
CAUTION

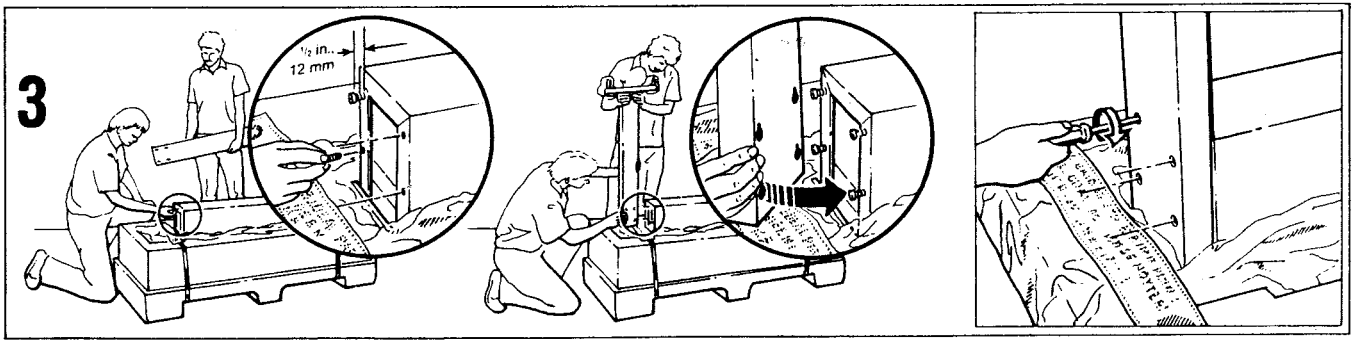
Pack your plotter in the packaging material and box designed for it. Other materials will not adequately protect the plotter during shipment.

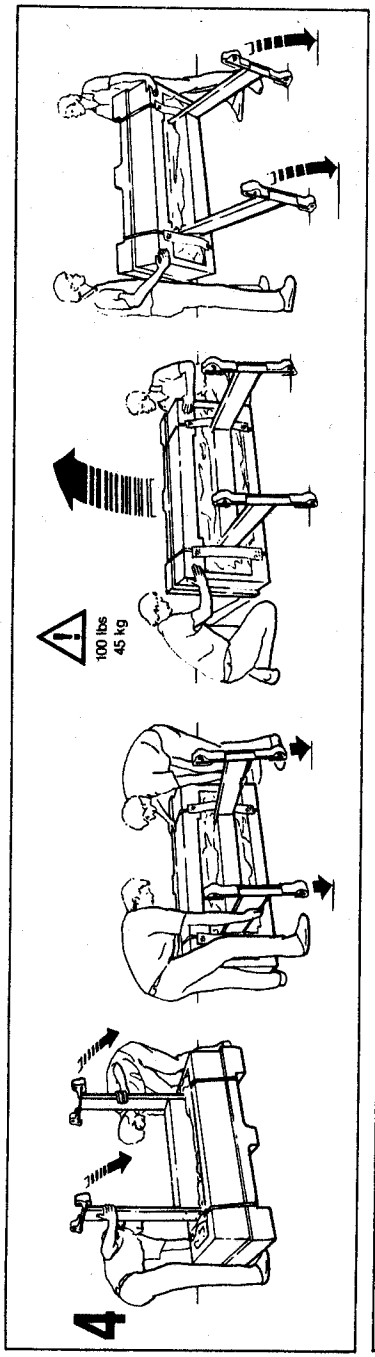
If you are going to disassemble and move your plotter, you should package it in the packaging material box in which you received it. If you no longer have these materials, you can order them. Refer to Appendix C for part numbers and ordering information.

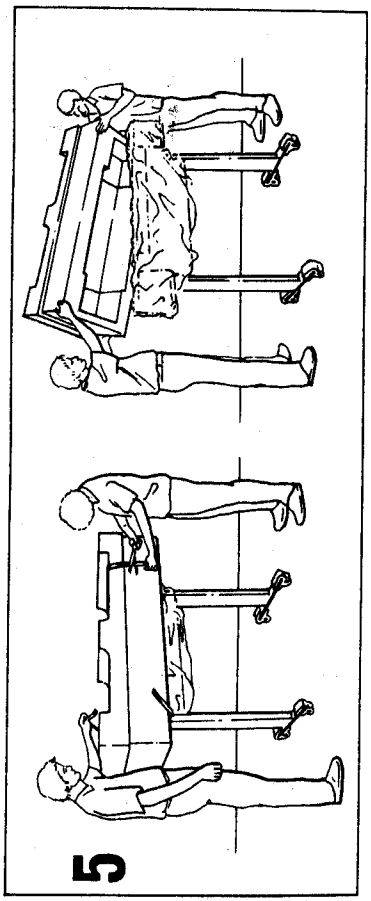
IMPORTANT! READ THESE UNPACKING INSTRUCTIONS!
WICHTIG! DIESE AUSPACK-ANLEITUNGEN LESEN!
IMPORTANTE! LEGGERE QUESTE ISTRUZIONI PRIMA DI APRIRE!
¡IMPORTANTE! ¡LEA LAS SIGUIENTES INSTRUCCIONES DE DESEMPACADO!
IMPORTANT ! LIRE CES CONSIGNES DE DEBALLAGE !
注意！パッケージの開け方の説明を読んでください！

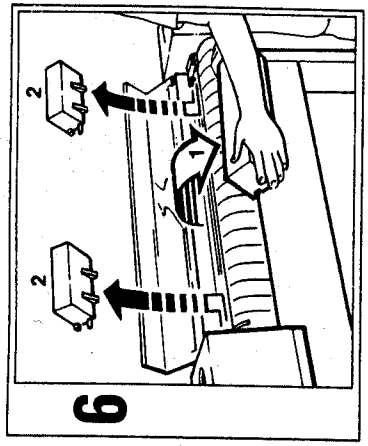







100 lbs
45 kg
4


5


2
1
2
6

7 STABILIZE PLOTTER WITH THIS PROCEDURE.

DEN PLOTTER MIT DIESEM VERFAHREN STABILISIEREN.

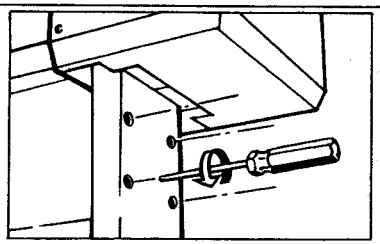
STABILIZZARE IL PLOTTER NEL MODO SEGUENTE.

PARA ESTABILIZAR LA TRAZADORA, HAGA LO SIGUIENTE:

STABILISER LE TRACEUR DE CETTE FAÇON.

この手順でプロッタを安定させる。

a



Loosen all bolts one complete turn.

Alle Bolzen um eine ganze Umdrehung lockern.

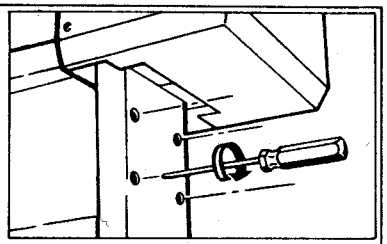
Allentare tutti i bulloni di un giro completo.

Afloje todos los pernos una vuelta completa.

Desserrer tous les boulons d'un tour complet.

全部のボトルを1回転ずつ回してゆるめる。

b



After all bolts have been loosened, retighten all bolts.

Nachdem alle Bolzen gelockert wurden, alle wieder anziehen.

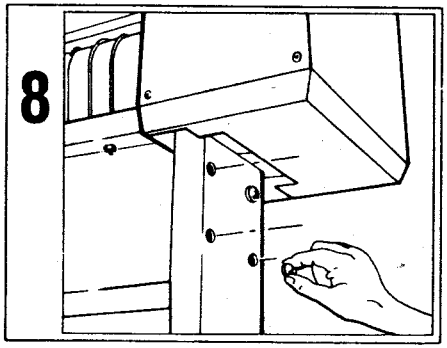
Dopo aver allentato i bulloni, serrarli nuovamente tutti.

Una vez aflojados todos los pernos, apriételos de nuevo.

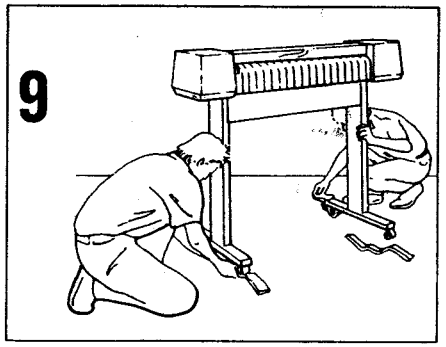
Une fois tous les boulons desserrés, les resserrer de nouveau.

全部のボトルをゆるめたら、
それを再び締めなおす。

8



9



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5

Troubleshooting

This chapter helps you correct some of the most common problems that can occur in the day-to-day operation of the plotter. The chapter is divided into the sections listed below; turn to the section that addresses your problem.

Having the Plotter Serviced

Follow the instructions in the appropriate section to help determine if the plotter needs servicing. Before having your plotter serviced, use this chapter to make certain the malfunction is in your plotter and not the result of an interface problem or a malfunction in your computer or software.

If a repair is needed, contact the Hewlett-Packard dealer or HP Sales and Support Office where you purchased the plotter for complete service information.

Plotter Operation Problems

Use this section if the plotter does not turn on or operate as you would expect.

Plotter Does Not Turn On

Take the following steps.

1. Check the following.

   - The voltage box displays the correct voltage for your area's power requirements, as listed in Appendix A.
   - The power cord is properly plugged into an electrical outlet that you *know* works.
   - The power cord is properly plugged into the plotter's power socket.

2. Turn the plotter on by pressing the **ON/OFF** switch. Did the control-panel green light turn on?

   No — Have the plotter and power cord serviced.

   Yes — Try using your plotter again.

All Control-Panel Lights Flash Simultaneously

If all the control-panel lights flash simultaneously and the control-panel buttons do not respond, take the following steps.

1. Turn off the plotter.
2. Look at the rear-panel dip switches.

   Are switches 9, 10, and 11 set to 0 (off)?

   No — Set all three switches to 0. Turn on the plotter. If the problem persists, have your plotter serviced.

   Yes — Have your plotter serviced.

Plotter Does Not Load Media Properly

If the plotter crumples or tears media during loading, take the following steps.

1. Load a sheet of plotting paper into the plotter. Be sure the left edge is against **both** front and rear paper guides, and the arrow on the right pinch wheel is aligned with the right edge of the paper.

   Lower the paper loading lever. Do the pinch wheels lower?

   No — Have the plotter serviced.

   Yes — Go to step 2.

2. Does the paper move back and forth?

   No — Remove the paper and check the following.

   - Is there enough clear space around the plotter for the paper to move freely?
   - Are there any obstructions, such as jammed paper, around the pinch wheels or pen holder?
   - Remove any obstructions and try loading paper again. If the problem persists, go to step 3.

   Yes — Go to step 4.

3. Turn the plotter off. Rotate the grit wheel with your hand. Look for and remove any foreign matter.

   Does the grit wheel turn freely?

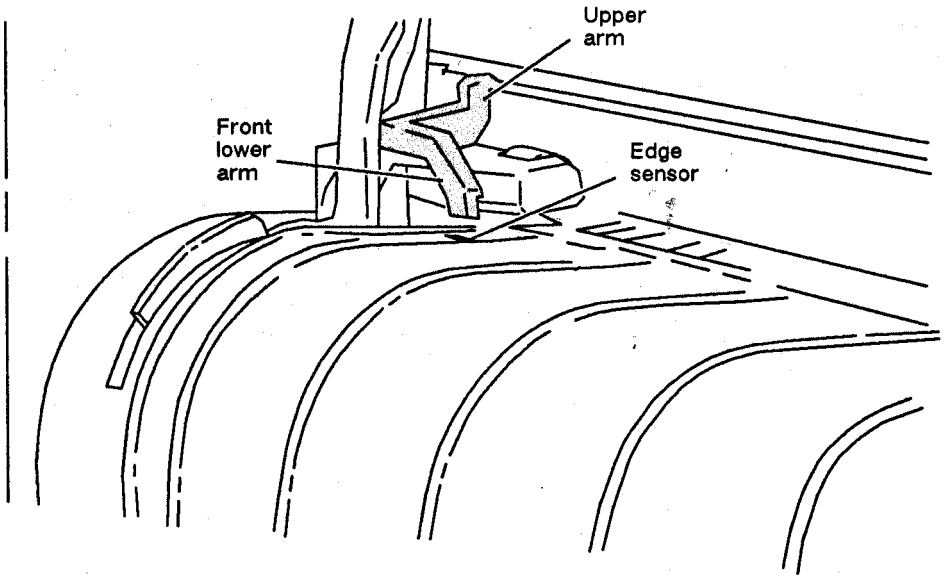
   No — Have your plotter serviced.

   Yes — Go to step 4.

4. Does the paper fall out of the plotter?

No — Try loading paper again. Check that your sheet is not warped or curled, particularly the edges.

Yes — Look for and remove any obstructions from the front and rear edge sensors. (The rear edge sensor is located on the left rear of the platen.) Try loading paper again. If the problem persists, refer to the following illustration and instructions.



Gently press the upper arm to the right. The lower arm should drop into the edge sensor, and the upper arm should spring back when released. If not, have your plotter serviced.

Pens Are Not Picked From or Returned to Pen Carousel

If any of the pens cannot be picked from or returned to their pen stalls, take the following steps.

1. Turn the plotter off and raise the carriage cover. Grasping the pen holder, gently slide it from one side of the plotter to the other. The drive belt that the pen holder is attached to should move freely with the pen holder. Remove any obvious obstructions.

   Does the pen holder and drive belt move freely?

   No — Have the plotter serviced.

   Yes — Go to step 2.

2. Lightly press the pen holder to see if it moves down toward the surface of the paper. When you release the pen holder, it should spring back.

   Does the pen holder move down toward the paper surface and spring back when released?

   No — Have the plotter serviced.

   Yes — Go to step 3.

3. Check that the spring-loaded jaws of the pen holder move freely outward. When you release the jaw of the pen holder, it should spring back in place.

   Does the jaw of the pen holder spring back when released?

   No — Have your plotter serviced.

   Yes — Go to step 4.

4. Remove the pen carousel. Check the pen stalls for damage. The spring-loaded jaws of each pen stall should move inward freely and spring back when released. The rubber pen-capping mechanism of each pen stall should move downward freely and spring back when released. Remove any obvious obstructions.

   Do the jaws and pen-capping mechanism of each pen stall move freely?

   No — Replace the carousel.

   Yes — Go to step 5.

5. Turn the plotter on and load a sheet of paper in the plotter. Load the carousel with eight pens. Press **SELECT PEN** button **1**. Your plotter should pick the pen from stall 1 of the carousel.

   Use the **SELECT PEN** buttons to select the other pens from the carousel. The plotter should return the current pen, then pick the next pen. Repeat this procedure for all eight pens.

   Were all pens picked and returned properly?

   No — Have the plotter serviced.

   Yes — Try using the plotter again.

Control-Panel Buttons Do Not Work

If one or more buttons on the control-panel are working improperly, take the following steps.

1. Check the rear-panel switches. Are any of the switches 9–11 set to I (on)?

   No — Go to step 2.

   Yes — Turn the plotter off. Turn off switches 9–11. Try using your plotter again.

2. Turn the plotter on and load a sheet of plotting paper. Do the control-panel yellow lights blink then turn off?

   No — Follow the instructions in the previous section, *Plotter Does Not Load Media Properly*. Turn the plotter off then on again. If lights remain on again, note which lights remained on and have the plotter serviced.

   Yes — Go to step 3.

3. Press the **VIEW**, **PEN SPEED**, and **ROTATE** buttons twice each. Does the light next to each button turn on then off?

   No — Have your plotter serviced.

   Yes — Go to step 4.

4. Press the **ENTER** button. (Be sure **VIEW** is off.)

   Does the light next to it blink?

   No — Have your plotter serviced.

   Yes — Go to step 5.

5. Press the **CLEAR** button. Do all the yellow lights go off?

   No — Have your plotter serviced.

   Yes — Go to step 6.

6. Press each **PEN SELECT** button in turn. Is each pen picked from the carousel and returned properly?

   No — Remove the carousel and check that all pens are loaded correctly. Return the carousel to the plotter, seating it properly.

   If the problem persists, follow the instructions in the previous section, *Pens are Not Picked From or Returned to the Carousel*.

   Yes — Go to step 7.

7. Select a pen and check the following.

   - Press the **P1**, **P2**, and **AXIS ALIGN** buttons. The pen should move to a different corner each time.
   - Press the **PEN UP/DOWN** button. The pen should move up and down.
   - Use the **CURSOR CONTROLS** to draw. The pen should move in the direction of the arrow pressed, and move faster when the center button is pressed with the arrow.

   Does the plotter respond correctly to each button?

   No — Have the plotter serviced.

   Yes — All buttons appear to function properly. Try using your plotter again.

Demonstration Plot Does Not Complete

If the demonstration plot does not run or complete properly, reread the section, *Drawing the Plotter's Demonstration Plot* in Chapter 1. If the problem persists, take the following steps.

1. Follow the instructions in the section, *Plotter Does Not Load Media Properly*. Check for obstructions that may be interfering with proper operation.

   Run the demonstration plot again. Does it complete now?

   No — Go step to 2.

   Yes — Try using your plotter again.

2. Follow the instructions in the section, *Pens Are Not Picked From or Returned to the Carousel*. Check for damage that may prevent proper operation.

   Run the demonstration plot again. Does it complete now?

   No — Have the plotter serviced.

   Yes — Try using your plotter again.

Plots Are Garbled When Using a Buffer Cartridge

If the plotter produces garbled plots when a buffer cartridge is installed, make sure your plotter and computer are communicating successfully. Run the interconnection test program, as described in Chapter 6. If the test program does **not** work, following the instructions in the section, *Plotter/Computer Communication Problems*.

Are you sending a series of plot files to the plotter?

No — Have the plotter serviced.

Yes — Since the DraftPro DXL/EXL plotters are manual sheet feed plotters, they cannot automatically plot a series of plot files on separate sheets of media. If you want to send more than one plot file to the plotter to be plotted on separate sheets of media, you must include an NR (not ready) instruction at the end of *each* plot file. (Refer to the NR instruction in Appendix F and *The One- and Two-Megabyte Extended Buffer Cartridges* in Appendix C.)

Verify that your software supports sending a series of plot files to the DraftPro DXL/EXL.

Plotter/Computer Communication Problems

Follow the instructions in this section if your problem seems to be an interfacing or communications problem. Take your time and follow each step carefully. To find the problem, you must verify that the individual pieces of your system are working properly.

1. Verify that your plotter is working. Check the following.

   - Plotter should turn on and the green light should come on. If it does not, follow the instructions in the section, *Plotter Does Not Turn On.*
   - Control-panel buttons should operate properly. If they do not, follow the instructions in the section, *Control-Panel Buttons Do Not Work.*
   - The plotter should draw the demonstration plot correctly. If it does not, follow the instructions in the section, *Demonstration Plot Does Not Complete.*

2. Verify that your computer system works properly. Disconnect the plotter and run a simple test program (or software package) using your computer. If you are using a computer and a terminal, they should both work together.

   Is your computer system working properly?

   No — The problem is in your computer system. Refer to your system documentation. Do not connect your plotter to the system until the problem is solved.

   Yes — Go to step 3.

3. Connect the plotter to your computer system according to the instructions in Chapter 6.

   Does the interconnection test program run correctly?

   No — Reread the instructions in Chapter 6. Make sure you have followed the instructions and that you have keyed in the interconnection program *exactly* as shown. Make sure your interface settings (RS-232-C or HP-IB) are set correctly. Verify that you are using the correct interface cable and that it is securely fastened to both the computer and plotter.

   Correct any problems and rerun the program. If the problem persists, have your interface cable checked. If your computer has an interface card, you should also have it checked.

   Yes — Your plotter and computer are communicating correctly. Try using the plotter.

4. Is your plotter in an eavesdrop configuration, connected between a computer and a terminal?

   No — If the problem persists, follow the instructions in the section, *Software Problems*.

   Yes — Go to step 5.

5. Are you using a hardwire handshake?

   No — Go to step 6.

   Yes — Select another type of handshake. (The hardwire handshake cannot be used in an eavesdrop configuration.) Consult your system documentation for the recommended handshake.

6. Turn the plotter off. Make sure the rear-panel **EAVESDROP** switch is in the **ON** (set to I) position. Turn on the plotter.

   Can you run a simple program from the terminal, such as listing a file to the screen?

   No — Go to step 7.

   Yes — Go to step 8.

7. Unplug the computer and terminal cables from the plotter's Y-cable. Plug the cable from the terminal into the cable from the computer.

   Can you run the simple program now?

   No — The problem is in your computer system. Refer to your system documentation. Do not connect the plotter to your system until the problem is resolved.

   Yes — Go to step 8.

8. Connect the terminal and computer cables into the plotter's Y-cable, without adding additional cables. Make sure the plotter's rear-panel **EAVESDROP** switch is on and the **BAUD** and **PARITY** switches are set correctly for your system. Turn the plotter on.

   Can you run the simple program now?

   No — Check your Y-cable for damage. Try using a different Y-cable, if available.

   Yes — Go to step 9.

9. Refer to the interconnection test program in Chapter 6. Check that you have keyed in the program **exactly** as shown. Make sure there is an ESC.Y (Plotter On) instruction before the first write line, and an ESC.Z (Plotter Off) instruction before the STOP and END lines.

   Does the interconnection test program run now?

   No — Do not add software to your system until communication between your plotter and computer is verified by running this program successfully. Consult your systems manager or engineer for assistance.

   Yes — Try running your plot again. If the problem persists, refer to the following section, *Software Problems*.

Software Problems

Before adding software to your list of concerns, make sure your plotter and computer are communicating successfully. Run the interconnection test program, as described in Chapter 6. If the test program does **not** work, follow the instructions in the previous section, *Plotter/Computer Communication Problems*. Do not add software to your system until this program runs.

1. Are you using a software package?

   No — Go to step 2.

   Yes — Go to step 3.

2. Is the **VIEW** light blinking?

   No — If the program does not work correctly, refer to the plotter's *Programmer's Reference* and check your program instructions. The HP-GL instructions OA, OC, and OH are useful for debugging a program. (Be sure **PEN SORT** is off before debugging.)

   If you are using an RS-232-C interface, pay particular attention to the device-control instructions—they are the instructions that establish RS-232-C conditions. Always make sure you have included any communication statements (such as OPEN) required by your computer.

   Correct any problems and rerun the program. If the problem persists, follow the instructions in the section, *Plot Location Problems,* earlier in this chapter.

   Yes — If the plot does not plot correctly, refer to the *Programmer's Reference,* OE and ESC.E instructions, to identify the error. Try running the program again.

3. Verify that the software works with your computer and plotter. Does your software documentation say that it will work with your computer and plotter?

   No — Contact the software vendor.

   Yes — Go to step 4.

4. Verify that you have correctly set the plotter's interface conditions to match the requirements of your software. If your software recommends specific settings, use them.

   Did you find a problem with the settings?

   No — Try running the software again. If the problem persists, go to step 5.

   Yes — Turn the plotter off, correct the settings, then turn the plotter on again. Try running the software with your plotter again.

5. Does your software documentation recommend using a different cable than the one recommended in Chapter 7 for your specific computer?

   No — Go to step 6.

   Yes — Turn the plotter and computer off and replace your cable with the recommended cable. Turn your equipment back on and try running the software with the plotter again. If the problem persists, go to step 6.

6. Is there a sample plot file provided by the software vendor?

   No — Consult your software documentation for a tutorial example. If this does not help you, consult the software vendor.

   Yes — Go to step 7.

7. Reset the plotter, then send the sample plot file to the plotter. Does it work?

   No — Contact the software vendor.

   Yes — Go to step 8.

8. Is the VIEW light blinking?

   No — Try running your plot again. If the problem persists, contact the software vendor.

   Yes — Try running your plot again. If your plot is drawn correctly, you may choose to ignore the VIEW light. If you want to identify the error, refer to the *Programmer's Reference*. Consult your software documentation or vendor to determine what caused the error.

Plot Location Problems

Use this section if the plotter works but your plots are not oriented the way you would like or if only part of your plot is drawn on the page.

Plot is Not Oriented Correctly

1. The control-panel settings of **ROTATE**, **P1**, and/or **P2** may have been changed from their default values. Check the settings of each of these items or use **RESET** to return them to their default settings.

2. Is the paper loaded correctly against the front and rear paper guides? Is the arrow on the right pinch wheel aligned with the right edge of the paper.

   No — Load a new sheet of paper, carefully aligning the left edge with both paper guides. Try running your plot again.

   Yes — Go to step 2.

3. Are you using a software package?

   No — Go to step 4.

   Yes — If your software allows you to select a paper size, make sure you have selected the correct size for the paper you are using. Run the program again.

   If the problem persists, it may be that the software is not designed to work with the plotter. Check your software documentation, software vendor, or manufacturer.

4. If you are writing your own program, does your program include an HP-GL SC or IP instruction?

   No — Check that you have specified the correct X,Y coordinates in your program. Turn **PEN SORT** off before debugging a program.

   Correct any program errors and rerun the program. If the problem persists, go to step 5.

   Yes — Your problem may be related to scaling. Refer to the explanation of the SC and IP instructions in the plotter's *Programmer's Reference.*

5. If you are writing your own program, does your program include an HP-GL RO instruction?

   No — Use the **ROTATE** button to set the desired plot orientation.

   Yes — Refer to the explanation of the RO instruction in the *Programmer's Reference.*

Plot is Incomplete

Remove the carousel and check for missing or damaged pens. Replace any worn or dried-out pens. If you are plotting with refillable or disposable drafting pens, make sure the pen adapters are screwed tightly to the pen body.

1. Does the paper move back and forth during plotting?

   No — Look for and remove any obstructions. If the problem persists, follow the instructions in the section, *Plotter Does Not Load Paper.*

   Yes — Go to step 2.

2. Is the plot missing ink in small, fingerprint-sized areas?

   No — Go to step 3.

   Yes — The oil from fingerprints interferes with ink adhesion. Handle your plotting media by the edges, particularly double-matte polyester film. Load a new sheet of plotting media and try running your program again.

3. Are you writing your own programs?

   No — If you are using a software package, go to step 5.

   Yes — Go to step 4.

4. Is the **VIEW** light blinking?

   No — Refer to the *Programmer's Reference* and check your program instructions. The HP-GL OA, OC, and OH instructions are useful for debugging a program. (Be sure **PEN SORT** is off before debugging.) Correct any program errors and rerun the program.

   Yes — There is an error in your program. Refer to the *Programmer's Reference* and the OE and ESC.E instructions to identify the error and determine the cause. (If the cause is buffer overflow, consult the *Programmer's Reference* on establishing the proper handshake protocol used by your computer.)

5. Does your software recommend a cable other than the one you are using?

   No — Verify that you are using the cable recommended in Chapter 7 for your computer/plotter interconnection, then follow the interconnection instructions and rerun the interconnection test program.

   Check your cable for damage. Replace the cable, if necessary. If the problem persists, follow the instructions in the previous section, *Plot is Not Oriented Correctly.*

   Yes — Use the cable recommended by your software documentation.

   If the problem persists, follow the instructions in the previous section, *Plot is Not Oriented Correctly.*

Plot Quality Problems

Use this section if you are not satisfied with the line quality of your plots. As a first step, check to make sure that you are using a correct pen and media combination, as recommended in Chapter 3. The quality of the supplies you use will affect final plot quality.

In addition, keep in mind that changes in humidity or temperature during the course of a plot can cause media to stretch or shrink, affecting plot quality. Always let media acclimate to your plotter's environment for 15 minutes prior to plotting.

1. Is this an infrequent problem?

   No — Go to step 2.

   Yes — If the plotter is bumped while plotting, it can jar the pen, causing a misregistered line. Run the program again. If the problem persists, go to step 2.

2. Is paper movement restricted?

   No — Go to step 3.

   Yes — Move the plotter to an open area, where paper movement will not be obstructed. Run the program again. If the problem persists, go to step 3.

3. Are lines of uneven quality?

   No — Go to step 4.

   Yes — Remove your carousel and examine the pens. Replace any damaged or dried-out pens. Run the program again. If the problem persists, go to step 4.

4. Are lines of uneven widths or smeared?

   No — Go to step 5.

   Yes — Reducing pen speed can improve line quality. Use the control-panel **PEN SPEED** button (or the programming instruction, VS) to lower your pen speed. Run the program again. If the problem persists, go to step 5.

5. When filled areas are edged, are the outlines smeared?

   No — Go to step 6.

   YES — Turn the plotter off and turn the rear-panel **PEN SORT** switch off. Turn the plotter on and run the program again. If the problem persists, go to step 6.

6. Are the **outer** lines of your plot smeared?

   No — Go to step 7.

   Yes — If you have set **EXPAND** on, the plotter's pinch wheels may be rolling over the wet ink. To resolve this without turning **EXPAND** off, you can:

   - Reduce the pen speed using the control-panel **PEN SPEED** buttons or the programming instruction, VS, so the ink has time to dry before the plot moves under the pinch wheels.
   - If you are writing your own program, change the order in which lines are drawn so the ink has time to dry before the plot moves under the pinch wheels.
   - Move P1 and P2 away from the edges of the page using the control-panel **P1** and **P2** buttons or the programming instruction, IP.

   If you do not need to plot to the outer edges of the page, turn off the rear-panel **EXPAND** switch. (Turn the plotter off then on again before rerunning your program.)

7. Are shapes not closed properly or line ending points not matched correctly?

   No — Go to step 8.

   Yes — In a dry environment, static electricity can build up between the plotter's platen and the plotting media. Wipe the platen with a slightly dampened cloth or with an antistatic agent.

   Try running your plot again. If the problem persists, have your plotter serviced.

8. Does the ink flake off the plotting media?

   No — Go to step 9.

   Yes — If you have treated the media with a cleaning powder or other compound, the ink may be adhering to this powder. Load a new sheet of plotting media and run your plot again.

9. Are you using Hewlett-Packard media and pens?

   No — HP media and pens are designed to work together with your plotter to produce sharp, clear lines. Use HP supplies for the highest quality plots.

   Yes — If you have completed the preceding steps and are still not satisfied with the line quality produced by your plotter, refer to Chapter 3, *Selecting Pens and Media*. Make sure that you are using a recommended pen and media combination, quality supplies, and are following correct maintenance procedures for your plotter and drafting pens.

Supplies Problems

Use this section if pens are not lasting as long as you would expect, or if media tears during plotting.

Pens Dry in the Carousel

Note that in dry climates and in high altitudes, you can expect ink to dry out more rapidly than in humid environments. In a dry environment, you must take extra care to cap pens.

1. Do you recap your pens after use?

   No — If pens remain in the carousel over long periods of time, they tend to dry out.

   - Remove fiber-tip paper pens from the carousel and replace the caps if you will not be using the plotter over a period of several days.
   - Remove refillable drafting pens if you will not be using them in the next 8 hours. Store drafting pens vertically with the pen tips up.
   - Remove disposable drafting pens if you won't be using them right away. Store drafting pens vertically with the pen tips up.

   Yes — Go to step 2.

2. Remove the pen carousel and examine the rubber pen boots. Are any of the pen boots in the pen stalls damaged or loose?

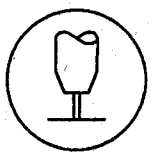
   No — Go to step 3.

   Yes — Press loose pen boots into place. If any pen boots are damaged or missing, replace them with new boots.

3. Are you using drafting pens (refillable or disposable)?

No — Make sure the pens you are using have not been stored longer than their shelf life.

Yes — Read the sections, *Caring for Disposable Drafting Pens* and *Maintaining Refillable Drafting Pens*, in Chapter 4. Follow maintenance instructions carefully. Make sure you are using the drafting pen carousel. It has the larger pen boots that stick up and is labeled as shown below.



Media Tears During Plotting

1. Are you using a recommended pen and media combination?

   No — Refer to the section, *Combining Pens and Media*, in Chapter 3.

   Yes — Go to step 2.

2. Check the surface of your media. Are the edges of your media curled?

   No — Go to step 3.

   Yes — Load the media with the curled edges down. Try running your plot again.

3. Remove the carousel and examine the pens. Are any pen tips damaged?

   No — Go to step 4.

   Yes — Replace any damaged pens.

4. Is your plot drawn with many closely-spaced lines?

   No — Make sure you are using high quality media. If you are using double-matte polyester film, check that it is the recommended thickness, 3-mil.

   Yes — Use a tougher plotting media, such as double-matte polyester film, or change plotting conditions to allow ink time to dry before more lines are drawn (e.g., slow the pen speed).

6

Connecting Your Plotter to a Computer

This chapter deals with generic configurations and interface conditions. This chapter outlines the steps necessary to establish communication between a computer and the plotter. It describes the different ways equipment can be connected and discusses RS-232-C and HP-IB interface conditions. (To use the HP-IB interface, you must purchase and install an HP-IB interface cartridge.)

Before You Begin

If you find your computer in the following list, go directly to Chapter 7 and follow the interconnection instructions for your computer.

Personal Computers (Compatible)
- HP Vectra/Vectra ES/12
- HP Vectra RS/20
- IBM PC/PC-XT/AT
- IBM PS/2

Apple IIe
Apple Macintosh
Apple Macintosh Plus/SE/II
DEC VAX
HP 3000 Computer
HP 9000, Series 200 Technical Computer
HP 9000, Series 300 Technical Computer

If your computer isn't listed, and it supports an RS-232-C or an HP-IB interface, follow the interface instructions in this chapter, depending on which interface you are using. Additional technical RS-232-C and HP-IB interface information is contained in Appendices D and E. Additionally, you can contact your HP Sales and Support Office to see if there is a *Set-Up Instruction* available for your particular computer.

Setting Up an RS-232-C Interconnection

Use this section to help you establish RS-232-C communication between the plotter and your computer. RS-232-C is also known as *serial* interfacing.

The following steps outline the process to connect the plotter to your computer.

- identify system configuration
- connect the equipment
- set serial interface conditions
- verify communication

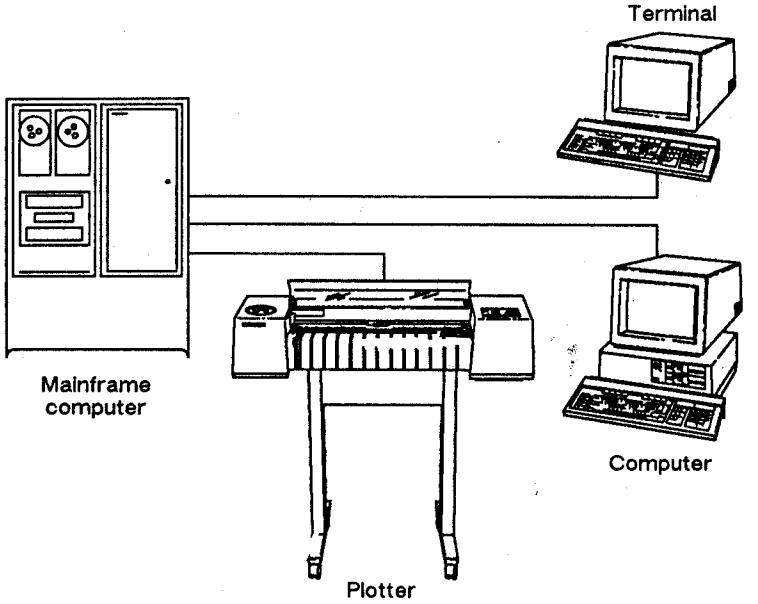
For RS-232-C pin allocations, cable schematics, and additional technical information, refer to Appendix D. For additional information about interfacing and handshaking, the RS-232-C Interfacing and Handshaking Guide, Application Note 6 (Part No. (11)5953-9770) is available through HP Sales and Support Offices.

Identifying Your System Configuration

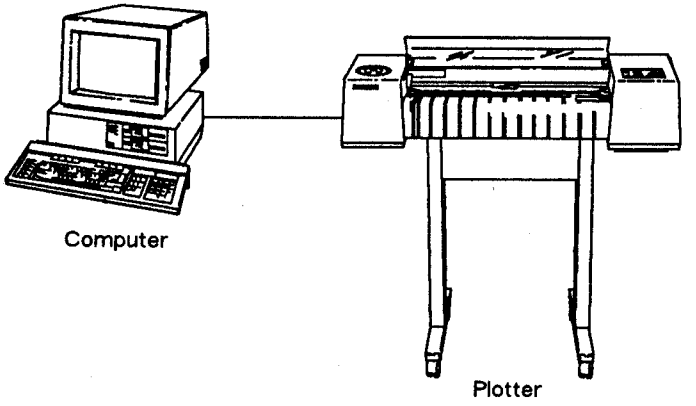
The term "system configuration" refers to the way the plotter is connected to the computer and other equipment. The plotter can be operated in a standalone or eavesdrop configuration. Read the following descriptions to identify your configuration, then read the section called *Connecting the Equipment* to learn how to connect the plotter to your computer.

Standalone Configuration

In a standalone configuration, the plotter is connected to the computer via a separate (not shared) interface cable. The following illustrations show this arrangement for mainframe computers and for personal computers or "smart" (programmable) terminals.



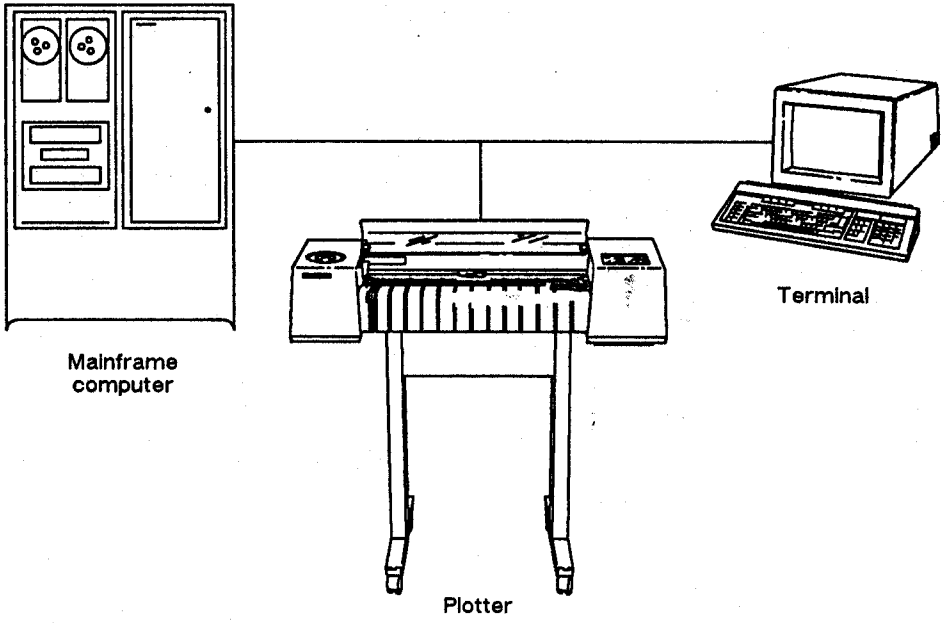
Standalone Configuration with Mainframe



Standalone Configuration with Personal Computer

Eavesdrop Configuration

In an eavesdrop configuration, the plotter is connected between a mainframe computer and a terminal. All communications between the mainframe computer and the terminal actually pass through the plotter. An RS-232-C Y-cable (Part No. 17455A) is required to connect both the mainframe and terminal to the plotter.



Eavesdrop Configuration

Connecting the Equipment

Once you have decided how to configure your equipment, connect the plotter to your computer.

With the plotter, your computer, and all of its components turned off, connect one end of the RS-232-C cable to the computer's RS-232-C port. (To select an RS-232-C cable appropriate for your computer, refer to Appendix C.) Connect the other end of the cable to the plotter's RS-232-C port. Tighten the screws on both ends of the cable and turn your equipment on.

NOTE: In some cases, you may need to install an RS-232-C (serial) interface card in the computer. If this is the case, your computer documentation should provide details.■

Determining RS-232-C Interface Conditions

After correctly connecting your plotter and computer, set the plotter's rear-panel RS-232-C interface switches to tell it which configuration you are using. Additionally, you must set the plotter's switches to match your computer's baud rate and parity. *To work together, your plotter and computer must use the same settings.*

Check your system's documentation to find what baud rate and parity your computer uses. Write your computer's requirements in the "Computer Requirement" column of the following table. This should help you determine if you need to change plotter settings. If you are using a software package, you may need to change settings according to the requirements of the software package.

RS-232-C Interface Condition Checklist

Condition	Plotter's Factory-Set Default	Computer Requirement
baud rate	9600	_____
parity	off*	_____
odd or even	even*	_____

*You can set parity to odd, even, mark and space. The factory-set default is space parity (no parity).

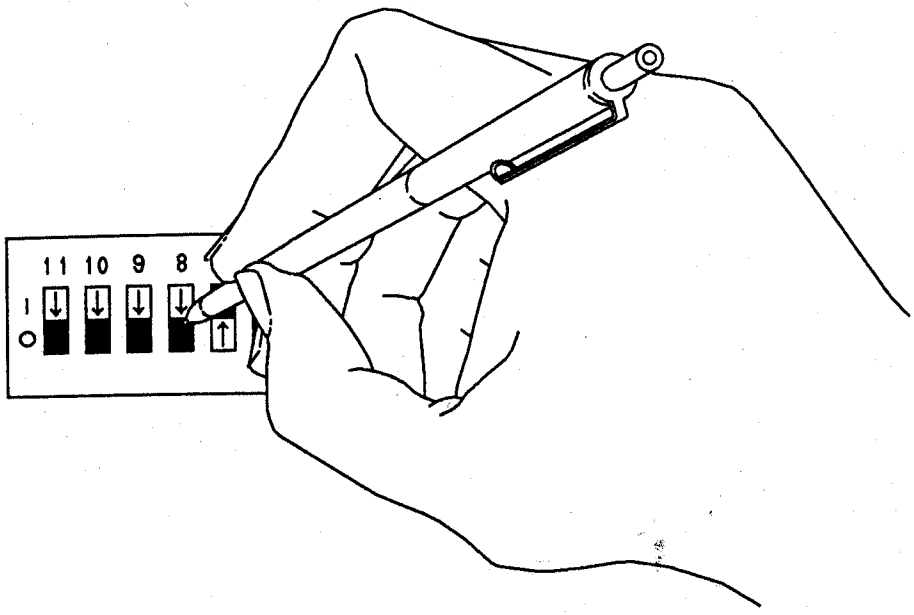
The following section explains how to use the plotter's rear-panel switches to set your plotter's interface conditions.

Setting the RS-232-C Interface Switches

The next four sections describe how to use the switches to change your plotter's settings for configuration, baud rate, and parity. Once you set your plotter's switches correctly, you will not need to reset them unless you change your computer/plotter system so that is requires a different configuration.

To change a switch setting, refer to the following steps and illustration.

1. Turn off the plotter.
2. Push the switch to the desired position using a pencil or pen.



- The raised portion of the switch is shown in black.
- The arrow indicates the direction to push the switch.

3. Turn on the plotter. The new switch settings are now in effect.

NOTE: The plotter reads the settings of the switches *only* when you turn it on. Be sure to turn it off then on when you change switch settings.■

The rear-panel switches are described individually in the following sections.

Setting Eavesdrop or Standalone Configuration

USE: Use the **EAVESDROP** switch (number 6) to tell the plotter what dataflow you are using.

DEFAULT: Standalone

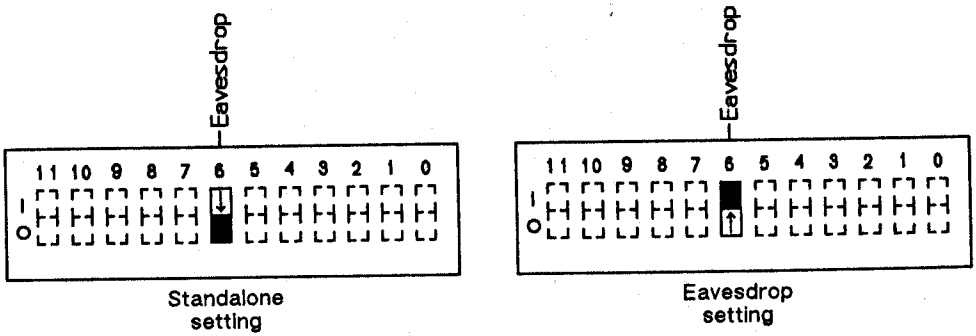
OPTIONS: Standalone, Eavesdrop

EXPLANATION: Complete the following steps to set the dataflow.

1. Turn off the plotter.
2. Use a pen or pencil to push switch 6 to the desired position.

   Setting switch 6 *off* establishes standalone configuration.

   Setting switch 6 *on* establishes eavesdrop configuration.



3. If you need to set other switches, go on to those sections. Otherwise, turn on the plotter. The new switch settings are now in effect.

Setting the Baud Rate

USE: Use the four **BAUD RATE** switches (numbers 3, 2, 1, and 0) to select the baud rate.

DEFAULT: 9600

OPTIONS:

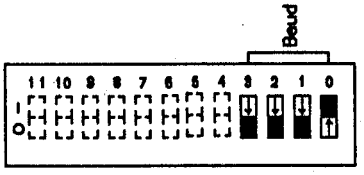
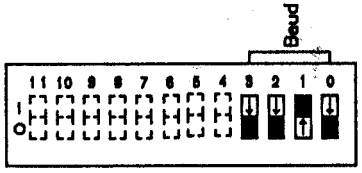
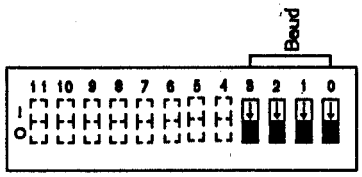
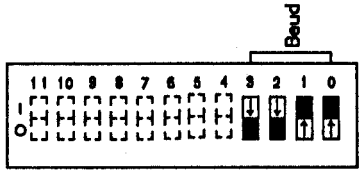
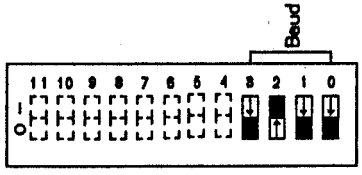
Baud Rate Settings
75
110
150
200
300
600
1200
2400
4800
9600

EXPLANATION: Complete the following steps to set the baud rate.

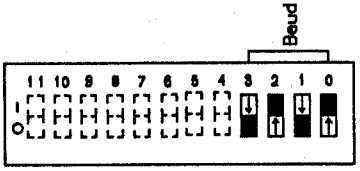
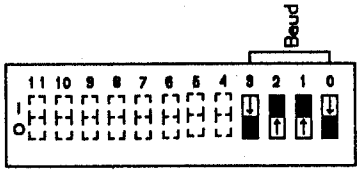
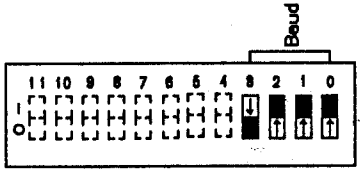
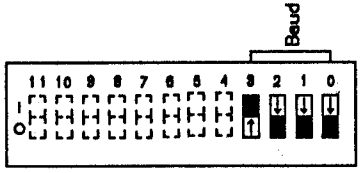
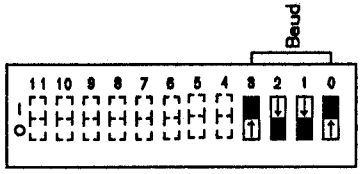
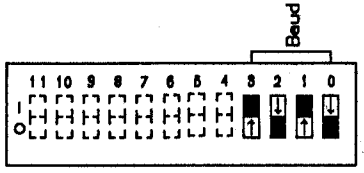
1. Turn off the plotter.

2. Push switches 3, 2, 1, and 0 to the desired position using a pen or pencil.

   The combined settings of the four **BAUD RATE** switches set the baud rate and stop bits. Your computer and plotter do not have to use the same number of stop bits. The following table shows how to set the switches for the available baud rates.

Baud Rate	Switch Settings	Stop Bits
75		2
110		2
150		2
150		1
200		1

(Table continues)

Baud Rate	Switch Settings	Stop Bits
300		1
600		1
1200		1
2400		1
4800		1
9600		1

3. If you need to set other switches, go on to those sections. Otherwise, turn on the plotter. The new switch settings are now in effect.

Setting the Parity

USE: Use the **PARITY** switch (number 4) and the **ODD** switch (number 5) to turn parity checking on or off.

DEFAULT: Space (Off, parity bit 0)

OPTIONS: Space (0), Mark (1), Odd, Even

EXPLANATION: Complete the following steps to set parity.

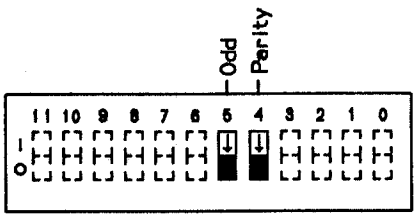
1. Turn off the plotter.
2. Push switches 5 and 4 to the desired positions using a pen or pencil.

   Setting switch 5 *off* and 4 *off* sets parity to Space (bit 8 transmitted as 0).

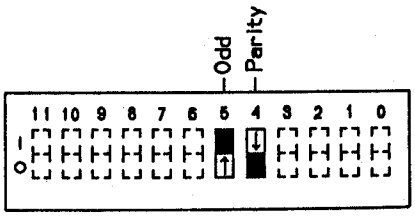
   Setting switch 5 *on* and 4 *off* sets parity to Mark (bit 8 transmitted as 1).

   Setting switch 5 *off* and 4 *on* sets parity to Even.

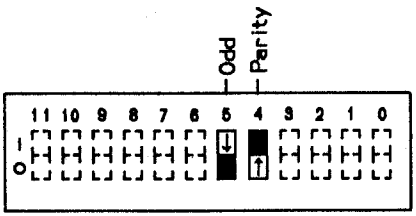
   Setting switch 5 *on* and 4 *on* sets parity to Odd.



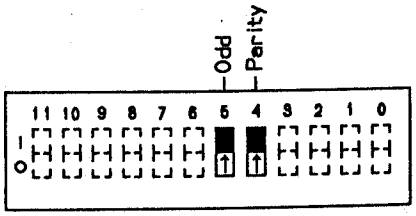
Space



Mark



Even



Odd

3. Turn on the plotter. The new switch settings are now in effect.

NOTE: If your software uses 8-bit character sets (e.g., ISO sets), it will require NO parity as the 8th bit must be available for data.■

Verifying Communication

Load pens and media. Then, use the appropriate read and write statements for your computer language to send the following HP-GL strings to the plotter. This program instructs the plotter to print 7575A PLOTTER OK (or 7576A PLOTTER OK, depending on the plotter's model number). If the program runs successfully, it means that the plotter and your computer are communicating.

```
Open serial port
Write     "IN;OI;"
Read      ID$
Write     "SP1;PA500,500;"
Write     "LB"+ID$+" PLOTTER OK"+E$X"
Write     "PA0,0;SP0;"
End
```

NOTE: E_X represents the ASCII character **ETX** (decimal code 3).

The following example shows the same program with GW™-BASIC read and write statements. The first line of the program establishes interface conditions, and may vary based on your computer's requirements. If you are not sure how your computer reads data, check your computer documentation. For further examples of read and write statements for various computers, refer to the sample programs in Chapter 7.

```
10 OPEN "COM1:9600,N,8,1,RS,CS65535,DS,CD" AS #1
20 PRINT #1, "IN;OI;"
30 INPUT #1, ID$
40 PRINT #1, "SP1;PA500,500;"
50 PRINT #1, "LB"+ID$+" PLOTTER OK"+CHR$(3)
60 PRINT #1, "PA0,0;SP0;"
70 END
```

NOTE: THE BASIC *CHR$(3)* string function in line 50 sends the decimal code (3) for the ASCII character **ETX**. Check your computer documentation for the proper string function to use.■

Setting Up an HP-IB (IEEE-488) Interconnection

If you have purchased either of the available HP-IB Interface Cartridges (HP-IB only, Part No. 17570A; HP-IB with Kanji, Part No. 17571A), you have the option of using the HP-IB interface.

The Hewlett-Packard Interface Bus (HP-IB) is an interface system consisting of one or more HP-IB cables linking computers and peripheral devices. The HP-IB is a parallel interface, also known as IEEE-488.

The following steps outline the process used to connect the plotter to your computer. For more detailed information about how the HP-IB interface works, refer to Appendix E.

1. **Connect the equipment.** Install the HP-IB interface cartridge according to the instructions provided with the cartridge. With your computer and plotter turned off, connect one end of the HP-IB cable to the plotter's HP-IB port (connector). Connect the other end of the cable to your computer's HP-IB port. Tighten the screws on both ends of the cable.

2. **If you need a plotter address other than 05.** Use the plotter's rear-panel HP-IB interface switches to select an address. Selecting an address is discussed in the next section.

3. **Verify communication.** Load pens and media. Then, use the appropriate read and write statements for your computer language to run the following interconnection test program. The program instructs the plotter to print 7575A PLOTTER OK (or 7576A PLOTTER OK, depending on the plotter's model number).

```
Write     "IN;OI;"
Read      ID$
Write     "SP1;PA500,500;"
Write     "LB"+ID$+" PLOTTER OK[Ex]"
Write     "PA0,0;SP0;"
```

NOTE: E_x represents the ASCII character **ETX** (decimal code 3).■

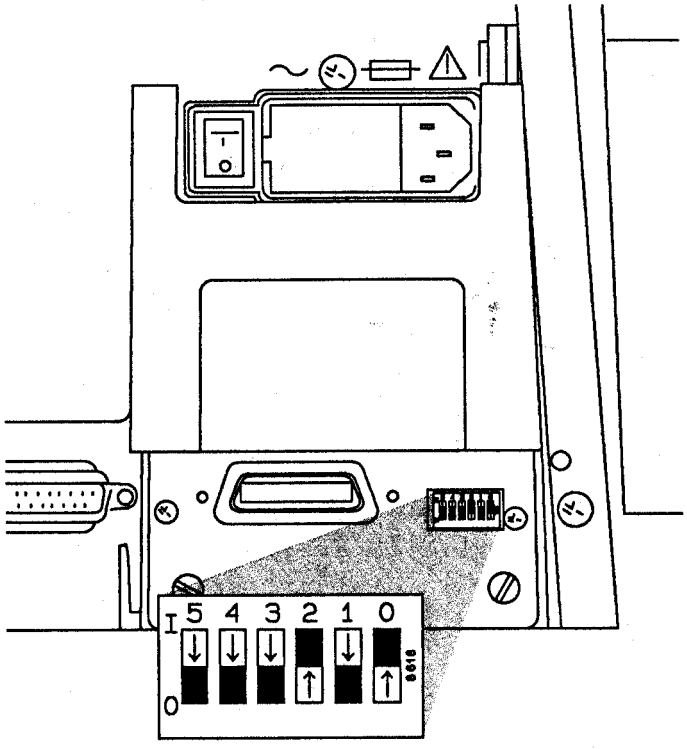
The following example shows the same program, with HP BASIC read and write statements included. The first line of the program establishes interface conditions, and may vary based on your computer's requirements. If you are not sure how your computer reads data, check your computer documentation. For further examples of read and write statements for various computers, refer to the sample programs in Chapter 7.

```
10 OUTPUT 705; "IN;OI;"
20 ENTER 705; ID$
30 OUTPUT 705; "SP1;PA500,500;"
40 OUTPUT 705; "LB"+ID$+" PLOTTER OK"+CHR$(3)
50 OUTPUT 705; "PA0,0;SP0;"
60 END
```

NOTE: THE BASIC *CHR$(3)* string function in line 40 sends the decimal code (3) for the ASCII character **ETX**. Check your computer documentation for the proper string function to use.■

Selecting an HP-IB Address

If you are using more than one peripheral with your computer, each must have a separate HP-IB address. The rear-panel HP-IB interface switches are located on the back of the HP-IB cartridge. Refer to the following illustration.



Most systems use address 05 for plotters—this is the cartridge's default address setting. To use an address other than 05, refer to the table of HP-IB address settings in Appendix E.

NOTE: Switch number 5 must remain set to 0 (off) unless you are using Secondary Command Support (SCS). Refer to Appendix E for more information on SCS.■

If you select listen-only (address 31), the plotter listens to all data transmitted on the interface. This mode is useful in a system that has no controller but, instead, has a dedicated talker (such as a magnetic tape driver or other mass storage unit) transmitting information to the plotter. Refer to Appendix E for more information about listen-only mode.

If your computer system uses languages such as BASIC, FORTRAN, or COBAL, with high-level input/output (I/O) statements, the addressing procedure is taken care of by the computer's internal operating system—all you need to do is select an address.

If, however, your computer uses low-level I/O statements, you must directly control the addressing. If your computer system fits this description, refer to *HP-IB Addressing Protocol*, in Appendix E, for details.

7

Computer/Plotter Interconnections

This chapter contains specific instructions for connecting your plotter to the following computers. If your computer is not in this list, refer to Chapter 6.

- Personal Computers (Compatible)
  - HP Vectra/Vectra ES/12
  - HP Vectra RS/20
  - IBM PC/PC-XT/AT
  - IBM PS/2
- Apple IIe
- Apple Macintosh
- Apple Macintosh Plus/SE/II
- DEC VAX
- HP 3000 Computer
- HP 9000, Series 200 Technical Computer
- HP 9000, Series 300 Technical Computer

Refer to Appendix C for cable ordering information. If you want to make your own cable, Appendix D contains RS-232-C pin allocations and cable schematics for Hewlett-Packard cables.

Using the Interconnection Instructions

The following instructions are designed to help you get your plotter and computer connected and communicating as soon as possible. Be aware that the listed computer and plotter equipment includes the *minimum* necessary to establish communication.

Please verify that your computer and plotter work individually before attempting to connect them.

If you'll be using graphics software, check your software documentation (or software supplier) for specific computer hardware and memory requirements. When you install your software, you may have to "configure" the software. After your computer and plotter are communicating, refer to Chapter 8 for information on configuring your software.

Setting the Serial Interface Switches

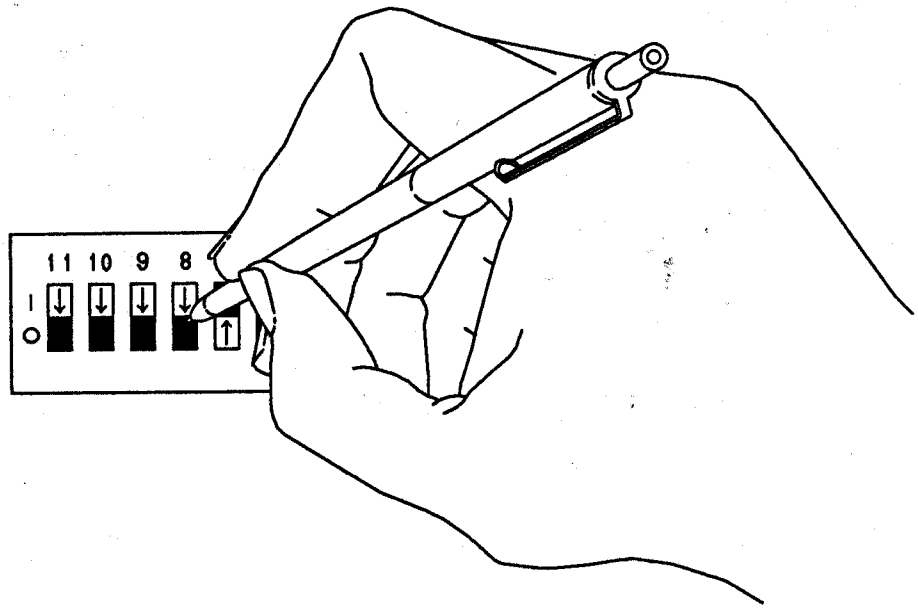
The following section describes how to use the plotter's rear-panel interface switches to set serial interface conditions. If you are using a plotter with an RS-232-C interface, this information will help you connect the plotter to your computer. If you are using an HP-IB interface, skip this section and go directly to your computer's instructions.

The following section tells you *how* change the settings; for a full description of each option, refer to Chapter 6.

Changing Rear-Panel Switch Settings

To change a switch setting, refer to the following steps and illustration.

1. Turn off the plotter.
2. Push the switch to the desired position using a pencil or pen.



- The raised portion of the switch is shown in black.
- The arrow indicates the direction to push the switch.

3. Turn on the plotter. The new switch settings are now in effect.

NOTE: The plotter reads the settings of the switches *only* when you turn it on. Be sure to turn it off then on when you change switch settings.■

Personal Computers
(Compatibles using RS-232-C Interface)

These instructions tell you how to connect your HP DraftPro DXL/EXL plotter to the following compatible computers.

- HP Vectra/ES/12 Personal Computers
- HP Vectra RS/20
- IBM PC/PC-XT/AT Computer
- IBM PS/2

Computer	Cable
HP Vectra, ES/12, or RS/20 with HP 24540A or HP 24541A card using the 9-pin connector	HP 24542G
with HP 24541A card using the 25-pin connector	HP 17255M or HP 13242G
IBM PC and PC-XT	HP 17255D
IBM AT	HP 24542G
IBM PS/2 using a 25-pin connector	HP 17255D
using a 9-pin connector	HP 24542G

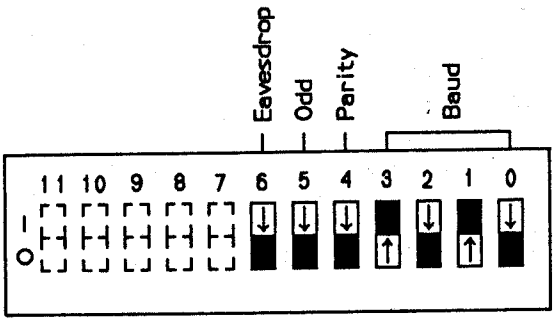
Interconnection Instructions

1. Turn off your plotter and computer equipment.

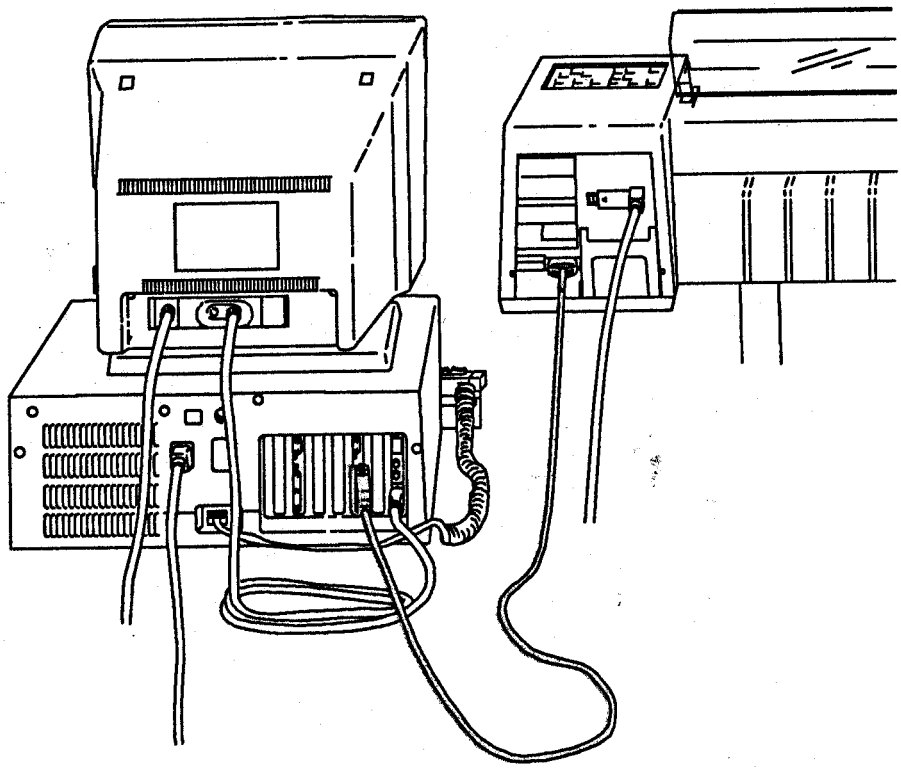
2. If necessary, install the serial interface card. (Refer to your computer documentation for details.) If you have already installed a serial card, go to step 3.

   NOTE: If you have more than one serial port installed, you will need to know whether you're connecting the plotter to COM1 or COM2 (most software will not run on COM3). You will need this information for testing communications and for configuring your software. If you are using COM2, be sure to substitute COM2 for COM1 in the instructions.■

3. Set the plotter's rear-panel switches to 9600 baud rate and parity checking off. Refer to the following illustration.



4. Connect the plotter to the computer. The following illustration shows an HP Vectra PC.



The plotter has a 25-pin connector. If you have a 25-pin connector on the serial card on your computer, you can use either the HP 17255M or 13242G cable, attaching one end to the computer and the other to the plotter. If you have a 9-pin connector on the serial card on your computer, you can use the HP 24542G cable, attaching the 9-pin connector to the computer and the 25-pin connector to the plotter.

Testing Communications without BASIC

To test the computer/plotter interface without using BASIC, turn on your computer and plotter, load pens and paper, then follow these steps.

1. At the DOS prompt, type the following (substitute COM2 for COM1, if necessary) and press **ENTER**.

   ```
   MODE COM1:9600,N,8,1,P
   ```

   This sets the RS-232-C port for 9600 baud, no parity, 8 data bits, one stop bit, and continuous error checking.

2. Type the following (substitute COM2 for COM1 if necessary) and press **ENTER**.

   ```
   ECHO IN;SP1;PA0,0;PD0,1500,1500,1500,0,0;SP0>COM1
   ```

   The plotter should select pen #1, draw a triangle on the page, and return the pen to the carousel.

Running the Test Program

To test the computer/plotter interface, turn on your computer and plotter, and load pens and paper.

1. At the DOS prompt, type the following (substitute COM2 for COM1, if necessary) and press **ENTER**.

   ```
   MODE COM1:9600,N,8,1,P
   ```

   This sets the RS-232-C port for 9600 baud, no parity, 8 data bits, one stop bit, and continuous error checking.

2. Enter and run the following BASIC program (substitute COM2 for COM1, if necessary). (If you need help entering and running the program, refer to your computer documentation.)

   ```
   10 OPEN "COM1:9600,N,8,1,RS,CS65535,DS,CD" AS #1
   20 PRINT #1, "IN;OI;"
   30 INPUT #1, ID$
   40 PRINT #1, "SP1;PA500,500;"
   50 PRINT #1, "LB"+ID$+" PLOTTER OK"+CHR$(3)
   60 PRINT #1, "PA0,0;SP0;"
   70 END
   ```

Your plotter selects pen #1 and prints 7575A PLOTTER OK (or 7576A PLOTTER OK, depending on the plotter's model number).

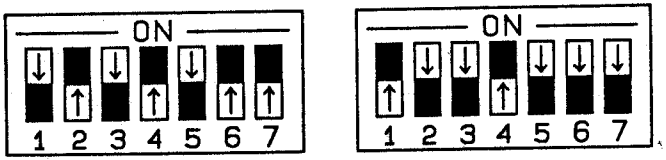
Apple IIe Computer
(RS-232-C Interface)

Computer Equipment	Plotter Equipment
Apple IIe computer Apple disk drive & Apple IIe controller Apple Monitor /// or equivalent Apple Super Serial Card	HP DraftPro DXL/EXL RS-232-C cable, male-to-male (HP 17355M)

Interconnection Instructions

1. Turn off your plotter and computer equipment.
2. Install the Apple Super Serial Card as follows (refer to your computer documentation for details).

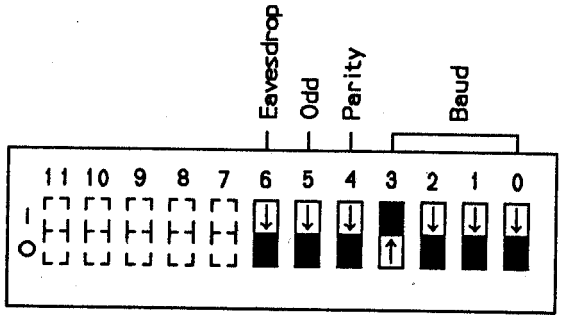
   a. Set the two banks of switches on the serial card to match the illustration below.



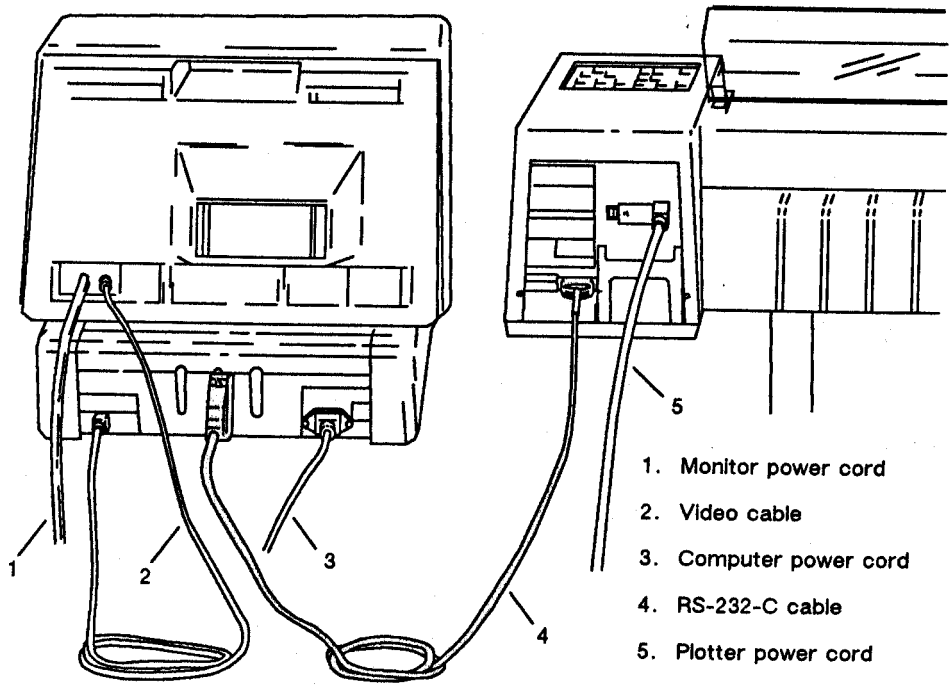
SW1 SW2

   b. With your computer unplugged, install the serial card in slot #2 of the computer. Make sure that the arrow on the card's jumper block is pointing toward the word "TERMINAL".

3. Set the plotter's rear-panel switches to 2400 baud rate and parity checking off. Refer to the following illustration. You are not limited to a 2400 baud rate, but the plotter's baud rate and the baud rate on your serial card must match.



4. Connect the plotter to the computer using the RS-232-C cable. Either end of the cable can be connected to the plotter or the connector on the installed serial card (port #2). Refer to the following illustration.



Running the Test Program

To test the computer/plotter interface, turn on your computer and plotter, load pens and paper, then enter and run the following BASIC program. (If you need help entering and running the program, refer to your computer documentation.)

```
10 PR#2 : IN#2
20 PRINT CHR$(27) + ".M50;63;13;13:"
30 PRINT "IN;OI;"
40 INPUT ID$
50 PRINT "SP1;PA500,500;"
60 PRINT "LB";ID$;" PLOTTER OK";CHR$(3)
70 PRINT "PA0,0;SP0;"
80 PR#0 : IN#0
90 END
```

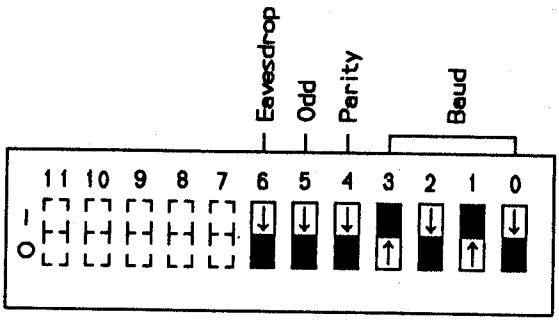
Your plotter selects pen #1 and prints 7575A PLOTTER OK (or 7576A PLOTTER OK, depending on the plotter's model number).

Apple Macintosh Computer
(RS-232-C Interface)

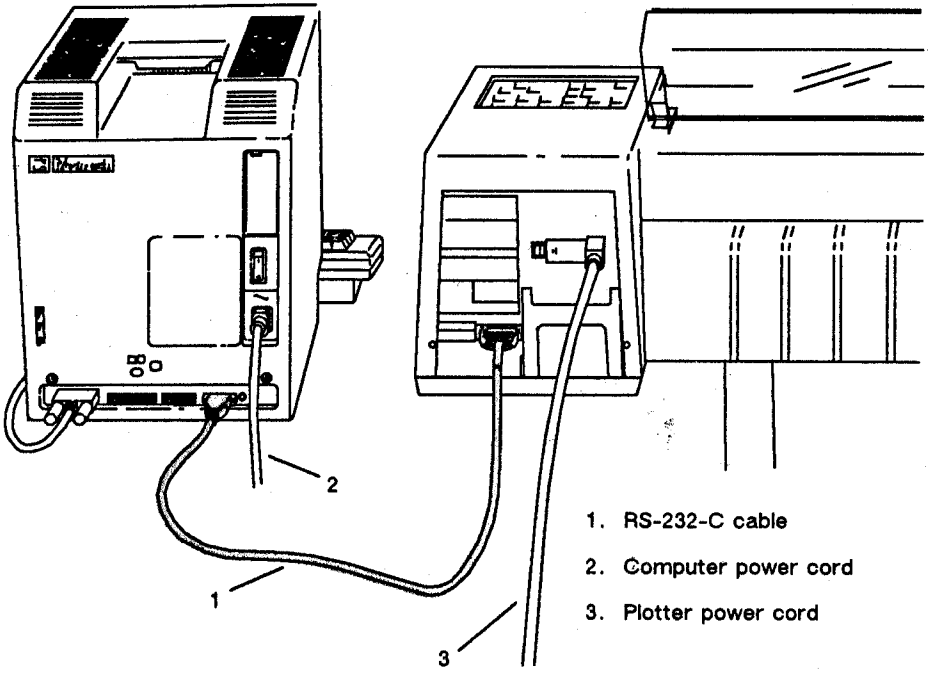
Computer Equipment	Plotter Equipment
Apple Macintosh computer	HP DraftPro DXL/EXL RS-232-C cable, 9-pin male to 25-pin male (HP 92219M)

Interconnection Instructions

1. Turn off your plotter and computer equipment.
2. Set the plotter's rear-panel switches to 9600 baud rate and parity checking off. Refer to the following illustration.



3. Connect the plotter to the computer using the RS-232-C cable. The small end of the cable connects to the computer's modem port. Refer to the following illustration.



Running the Test Program

To test the computer/plotter interface, turn on your computer and plotter, load pens and paper, then enter and run the following BASIC (Microsoft BASIC 2.0 or higher) program. (If you need help entering and running the program, refer to your computer documentation.)

```
10 OPEN "COM1:9600,N,8,1,RS,CS65535,DS,CD" AS #1
20 PRINT #1, "IN;OI;"
30 INPUT #1, ID$
40 PRINT #1, "SP1;PA500,500;"
50 PRINT #1, "LB";ID$;" PLOTTER OK";CHR$(3)
60 PRINT #1, "PA0,0;SP0;"
70 END
```

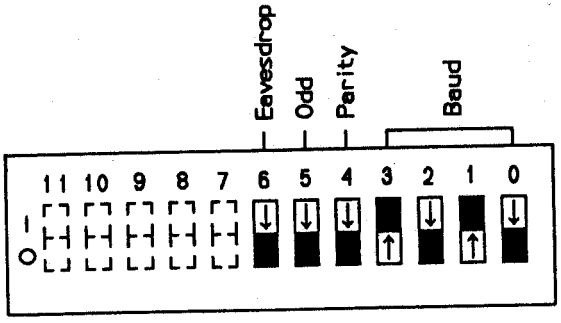
Your plotter selects pen #1 and prints 7575A PLOTTER OK (or 7576A PLOTTER OK, depending on the plotter's model number).

Apple Macintosh Plus/SE/II Computers
(RS-232-C Interface)

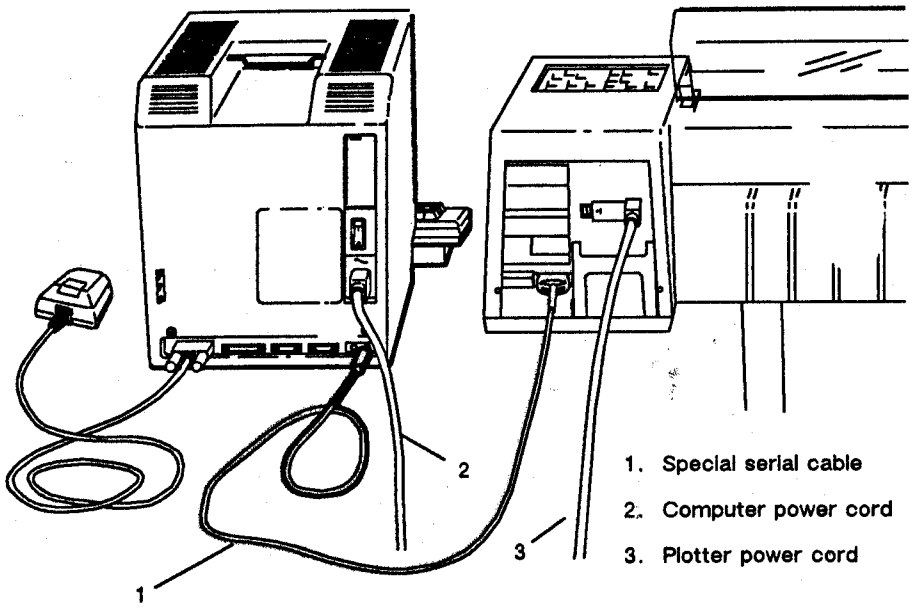
Computer Equipment	Plotter Equipment
Apple Macintosh Plus/SE/II Microsoft BASIC 2.0 or higher	HP DraftPro DXL/EXL RS-232-C cable, 8-pin mini din male to 25-pin male (HP 17302A)

Interconnection Instructions

1. Turn off your plotter and computer equipment.
2. Set the plotter's rear-panel switches to 9600 baud rate and parity checking off. Refer to the following illustration.



3. Connect the plotter to the computer using the RS-232-C cable. The round end of the cable attaches to the computer's modem port and the other end to the plotter. Refer to the following illustration. (This illustration is of a Macintosh Plus; the Macintosh II and SE are similar.)



Running the Test Program

To test the computer/plotter interface, turn on your computer and plotter, load pens and paper, then enter and run the following BASIC (Microsoft BASIC 2.0 or higher) program. (If you need help entering and running the program, refer to your computer documentation.)

```
10 OPEN "COM1:9600,N,8,1,RS,CS65535,DS,CD" AS #1
20 PRINT #1, "IN;OI;"
30 INPUT #1, ID$
40 PRINT #1, "SP1;PA500,500;"
50 PRINT #1, "LB";ID$;" PLOTTER OK";CHR$(3)
60 PRINT #1, "PA0,0;SP0;"
70 END
```

Your plotter selects pen #1 and prints 7575A PLOTTER OK (or 7576A PLOTTER OK, depending on the plotter's model number).

DEC VAX Computer
(RS-232-C Interface)

Computer Equipment	Plotter Equipment
DEC VAX computer null modem cable (DEC Part No. BC22D or BC03M)*	HP DraftPro DXL/EXL RS-232-C Y-cable (HP 17455A) (eavesdrop) RS-232-C cable (HP 17355M) (standalone)

* The RS-232-C cable listed connects the computer to the plotter. You need another cable to connect the terminal to the plotter. The part number of this second cable depends on the model number of your terminal.

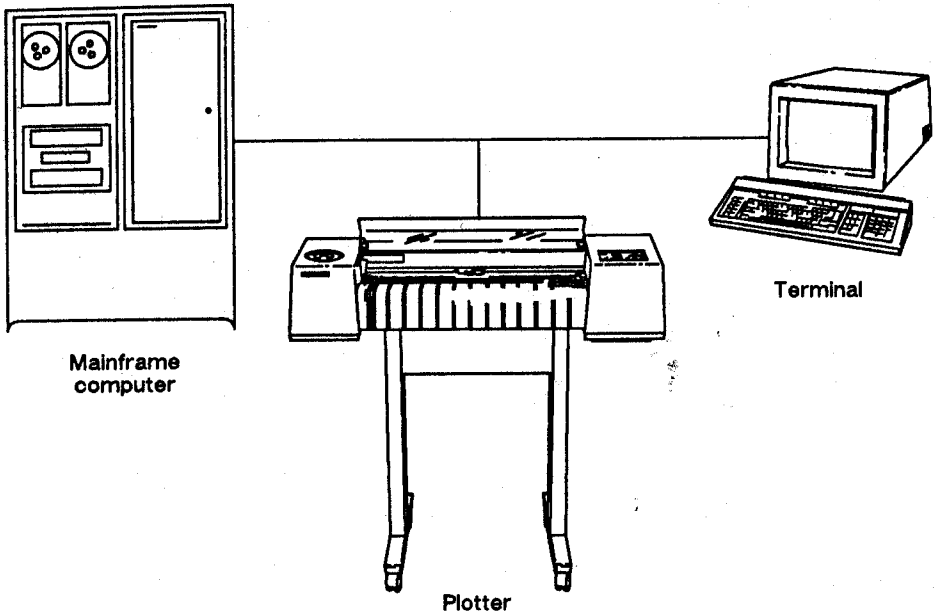
Interconnection Instructions

Use the following instructions to connect your plotter.

1. Turn off your plotter and terminal.
2. **EAVESDROP:** Turn on the plotter's rear-panel **EAVESDROP** switch. Set switches 0–5 to match the computer's baud rate and parity. (Refer to *Setting the RS-232-C Interface Switches* in Chapter 6.) If your terminal is communicating successfully with the computer, try setting the plotter to the same baud rate and parity as the terminal.

   STANDALONE: Turn off the plotter's rear-panel **EAVESDROP** switch. Set switches 0–5 to match the computer's baud rate and parity. (Refer to *Setting the RS-232-C Interface Switches* in Chapter 6.)

3. **EAVESDROP:** Connect the Y-cable to the back of the plotter. Connect the male end of the Y-cable to the female end of the computer's null modem cable; connect the female end of the Y-cable to the male end of the terminal's cable. Refer to the following illustration.



STANDALONE: Use the RS-232-C cable to connect the plotter to the computer's null modem cable.

Running the Test Program

To test the computer/plotter interface, turn on your computer and plotter, load pens and paper, then enter and run the FORTRAN program on the next page. (If you need help entering and running the program, refer to your computer documentation.)

```
            PROGRAM INTERCONNECT
            CHARACTER*5 ID
            INTEGER ESCAPE, ETX
            ESCAPE=27
            ETX=3
            WRITE(6,10) ESCAPE,ESCAPE
10          FORMAT ('+',A1,'.Y',A1,'.P1:IN;SP1;')
            WRITE(6,20)
20          FORMAT('+','PA500,500;OI;')
            READ(6,30) ID
30          FORMAT (A5)
            WRITE(6,40) ID,ETX
40          FORMAT('+','LB',A5,' PLOTTER OK ',A1)
            WRITE(6,50) ESCAPE
50          FORMAT('+','PA0,0;SP0;',A1,'.Z')
            STOP
            END
```

NOTE: This program establishes an Xon-Xoff handshake with predefined values. If the program does not run on your system, refer to Appendix F (instructions ESC.I, ESC.N, and ESC.P) or the plotter's *Programmer's Reference* (Part No. 07575-90001).■

Your plotter selects pen #1 and prints 7575A PLOTTER OK (or 7576A PLOTTER OK, depending on the plotter's model number).

HP 3000 Computer
(RS-232-C Interface)

Computer Equipment	Plotter Equipment
HP 3000 computer	HP DraftPro DXL/EXL
RS-232-C cable HP 17355D*	RS-232-C Y-cable (HP 17455A)

*The RS-232-C cable listed connects the plotter to the computer's ATC or ADCC interface. (The ATP interface requires the adapter cable HP 30152A.) You need another cable to connect the terminal to the plotter. The part number of this second cable depends on the model number of your terminal.

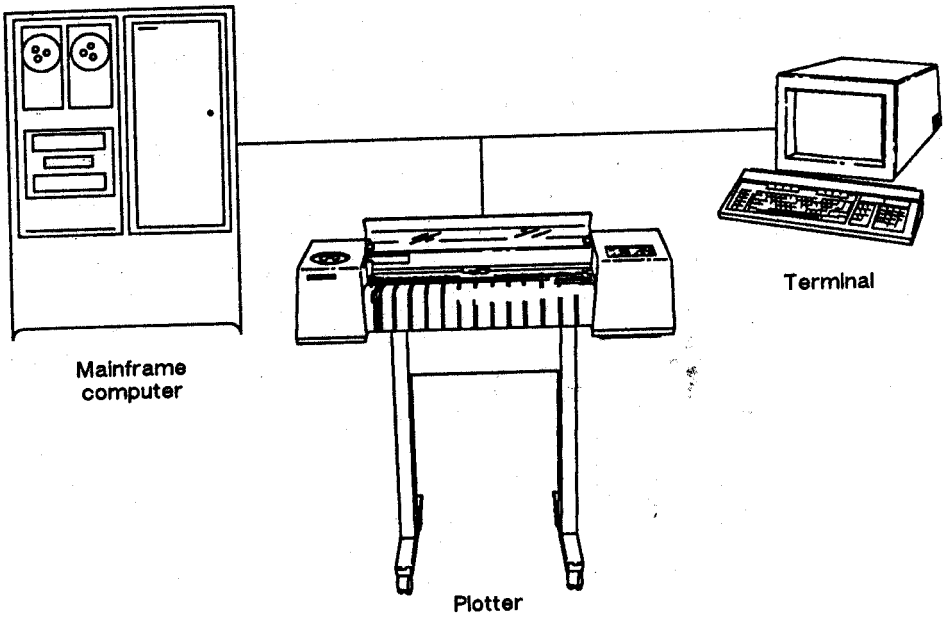
Interconnection Instructions

Use the following instructions to connect your plotter in an **eavesdrop** configuration. (The same instructions apply for a stand-alone configuration, with the following changes: use RS-232-C cable HP 17355M for the ATC or ADCC interface; and turn **EAVESDROP** off. The ATP interface also requires the adapter cable HP 30152A.)

1. Turn off your plotter and terminal.

2. Turn on the plotter's rear-panel **EAVESDROP** switch. Set switches 0–5 to match the computer's baud rate and parity. (Refer to *Setting the RS-232-C Interface Switches* in Chapter 6.) If your terminal is communicating successfully with the computer, try setting the plotter to the same baud rate and parity as the terminal.

3. Connect the Y-cable to the back of the plotter. Connect the male end of the Y-cable to the female end of the computer's cable; connect the female end of the Y-cable to the male end of the terminal's cable. Refer to the following illustration.



Running the Test Program

To test the computer/plotter interface, turn on your computer and plotter, load pens and paper, then enter and run the following FORTRAN program. (If you need help entering and running the program, refer to your computer documentation.)

```
      PROGRAM INTERCONNECT
      CHARACTER*5 ID
      INTEGER ESCAPE, ETX
      ESCAPE=27
      ETX=3
      WRITE(6,10) ESCAPE,ESCAPE
10    FORMAT(%320C,1R1,".Y",1R1,".P2:IN;SP1;")
      WRITE(6,20)
20    FORMAT(%320C,"PA500,500;OI;")
      READ(5,30) ID
30    FORMAT(A5)
      WRITE(6,40) ID,ETX
40    FORMAT(%320C,"LB",A5," PLOTTER OK",1R1)
      WRITE(6,50) ESCAPE
50    FORMAT(%320C,"PA0,0;SP0;",1R1,".Z")
      STOP
      END
```

NOTE: This program establishes an ENQ/ACK handshake with predefined values. If the program does not run on your system, refer to Appendix F (instructions ESC.I, ESC.H, and ESC.P) or the plotter's *Programmer's Reference* (Part No. 07575-90001).■

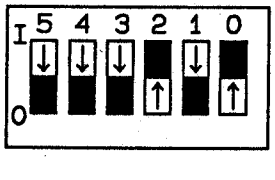
Your plotter selects pen #1 and prints 7575A PLOTTER OK (or 7576A PLOTTER OK, depending on your plotter's model number).

HP 9000 Series 200 Technical Computer
(HP-IB Interface)

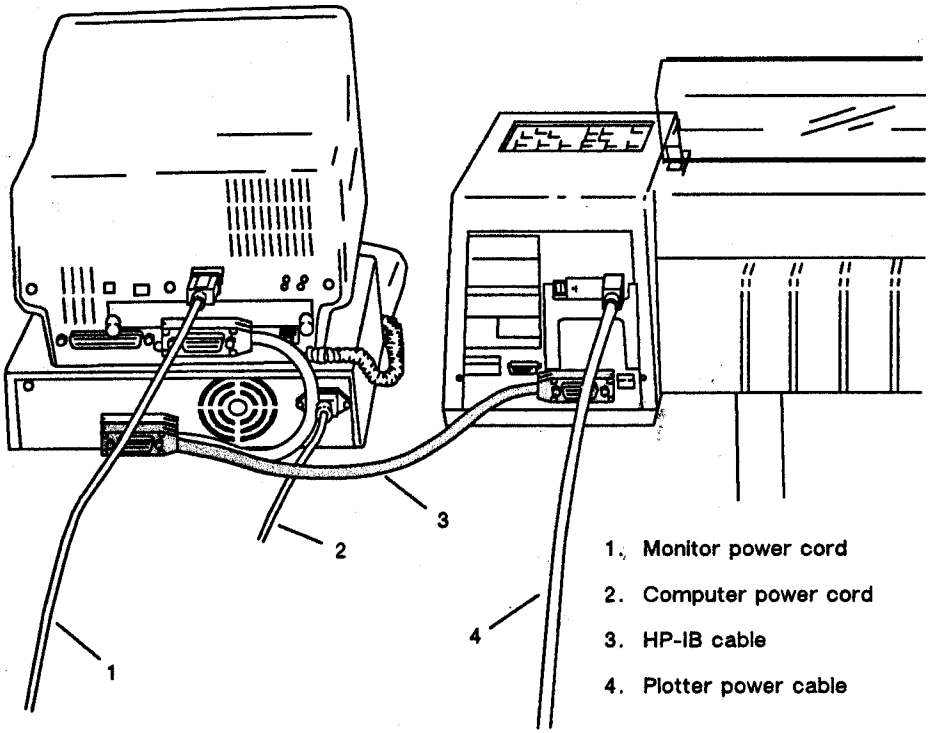
Computer Equipment	Plotter Equipment
HP Model 216, 226, or 236 computer	HP DraftPro DXL/EXL HP-IB interface cartridge (HP 17570A or 17571A) HP-IB cable (HP 10833A, B, C, or D)

Interconnection Instructions

1. Turn off your plotter and computer equipment.
2. Install the HP-IB interface cartridge according to the instructions provided with the cartridge.
3. Set the plotter's rear-panel HP-IB switches to address 05, as shown in the following illustration.



4. Connect the plotter to the computer using the HP-IB cable. Either end of the cable can be connected to the plotter or computer. The following illustration shows an HP Model 216 connected to the plotter.



Running the Test Program

To test the computer/plotter interface, turn on your computer and plotter, load pens and paper, then enter and run the following BASIC program. (If you need help entering and running the program, refer to your computer documentation.)

```
10 OUTPUT 705 ;"IN;OI;"
20 ENTER 705 ; Id$
30 OUTPUT 705 ;"SP1;PA500,500;"
40 OUTPUT 705 ;"LB"&Id$&" PLOTTER OK"&CHR$(3)
50 OUTPUT 705 ;"PA0,0;SP0;"
60 END
```

Your plotter selects pen #1 and prints 7575A PLOTTER OK (or 7576A PLOTTER OK, depending on the plotter's model number).

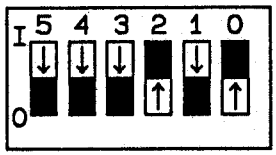
HP 9000 Series 300 Technical Computer
(HP-IB Interface)

Computer Equipment	Plotter Equipment
HP Model 310 or 320, with keyboard, video board, monitor, mass storage, and operating system.	HP DraftPro DXL/EXL HP-IB interface cartridge (HP 17570A or 17571A) HP-IB cable (HP 10833A, B, C, or D)

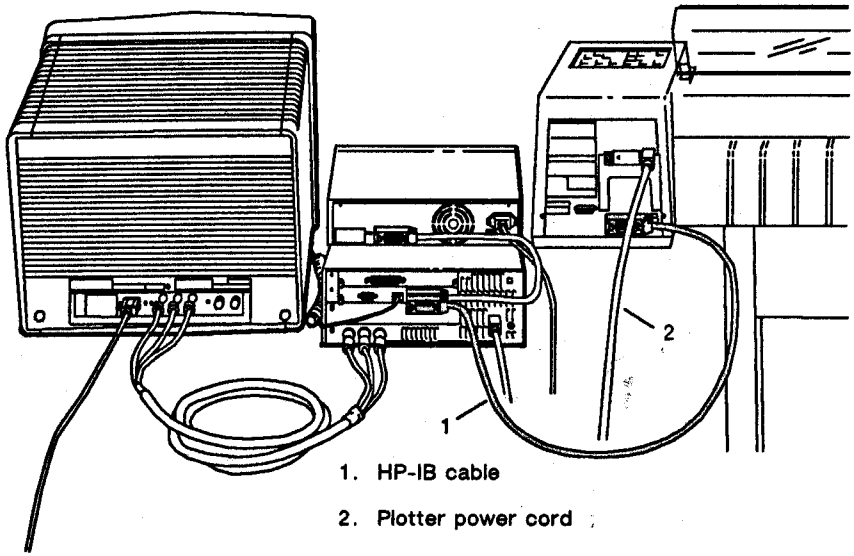
Interconnection Instructions

Turn off your plotter and computer equipment.

Set the plotter's rear-panel HP-IB switches to address 05. Refer to the following illustration.



3. Connect the plotter to the computer using the HP-IB cable. Either end of the cable can be connected to the plotter or computer. The following illustration shows an HP Model 320 connected to the plotter.



1. HP-IB cable
2. Plotter power cord

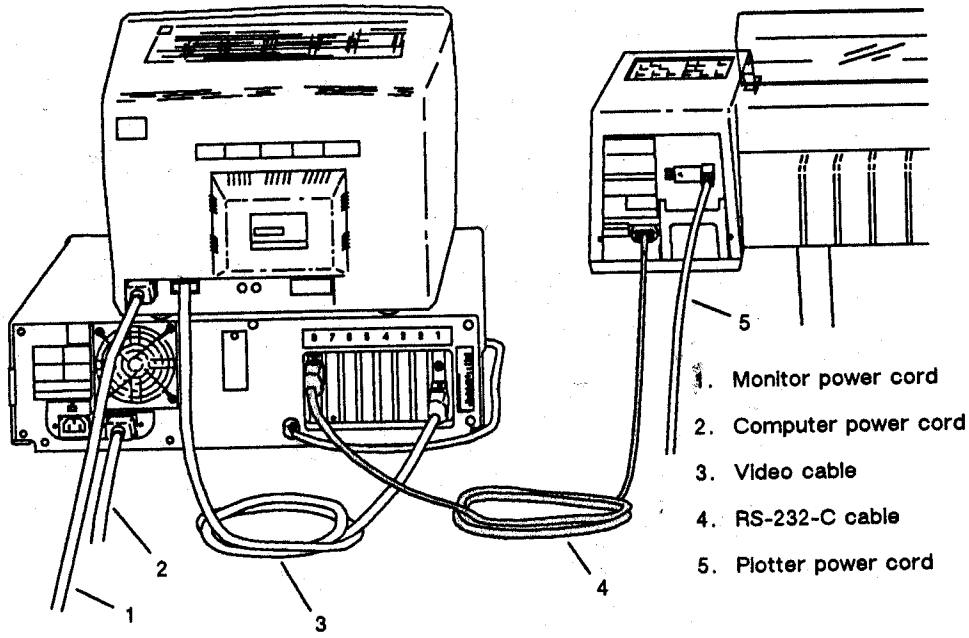
Running the Test Program

To test the computer/plotter interface, turn on your computer and plotter, load pens and media, then enter and run the following program. (If you need help entering and running the program, refer to your computer documentation.)

```
10 OUTPUT 705 ;"IN;OI;"
20 ENTER 705 ; Id$
30 OUTPUT 705 ;"SP1;PA500,500;"
40 OUTPUT 705 ;"LB"&Id$&" PLOTTER OK"&CHR$(3)
50 OUTPUT 705 ;"PA0,0;SP0;"
60 END
```

Your plotter selects pen #1 and prints 7575A PLOTTER OK (or 7576A PLOTTER OK, depending on the plotter's model number).

4. Connect the plotter to the computer using the special RS-232-C cable. The small, 9-pin connector connects to the 9-pin serial port on the back of the IBM AT. Refer to the following illustration.



Testing Communications without BASIC

To test the computer/plotter interface without using BASIC, turn on your computer and plotter, load pens and paper, then follow these steps.

1. At the DOS prompt, type the following (substitute COM2 for COM1 if necessary) and press **ENTER**.

```
MODE COM1:9600,N,8,1,P
```

This sets the RS-232-C port for 9600 baud, no parity, 8 data bits, one stop bit, and continuous error checking.

2. Type the following (substitute COM2 for COM1 if necessary) and press **ENTER**.

```
ECHO IN;SP1;PA0,0;PD0,1500,1500,1500,0,0;SP0>COM1
```

The plotter should select pen one, draw a triangle on the page, and return the pen to the carousel.

Running the Test Program

To test the computer/plotter interface, turn on your computer and plotter, and load pens and paper.

1. At the DOS prompt, type the following (substitute COM2 for COM1 if necessary) and press **ENTER**.

```
MODE COM1:9600,N,8,1,P
```

This sets the RS-232-C port for 9600 baud, no parity, 8 data bits, one stop bit, and continuous error checking.

2. Enter and run the following BASIC program (substitute COM2 for COM1 if necessary). (If you need help entering and running the program, refer to your computer documentation.)

```
10 OPEN "COM1:9600,N,8,1,RS,CS65535,DS,CD" AS #1
20 PRINT #1, "IN;OI;"
30 INPUT #1, ID$
40 PRINT #1, "SP1;PA500,500;"
50 PRINT #1, "LB"+ID$+" PLOTTER OK"+CHR$(3)
60 PRINT #1, "PA0,0;SP0;"
70 END
```

Your plotter selects pen #1 and prints 7575A PLOTTER OK (or 7576A PLOTTER OK, depending on the plotter's model number).

IBM Personal Computer (PC and PC-XT)
(RS-232-C Interface)

Computer Equipment	Plotter Equipment
IBM system unit graphics monitor (color or b&w) IBM color/graphics adapter diskette drive and adapter Asynchronous Communications Adapter (standard on the PC-XT)	HP DraftPro DXL/EXL RS-232-C cable, male-to-female (HP 17255D or equivalent)

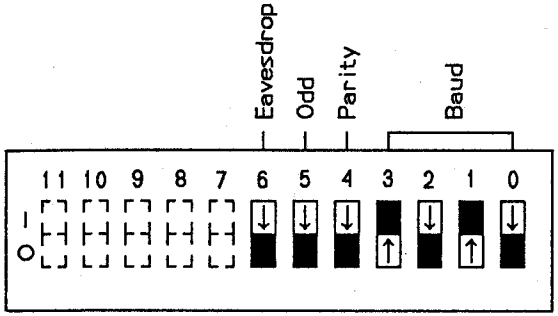
Interconnection Instructions

1. Turn off your plotter and computer equipment.

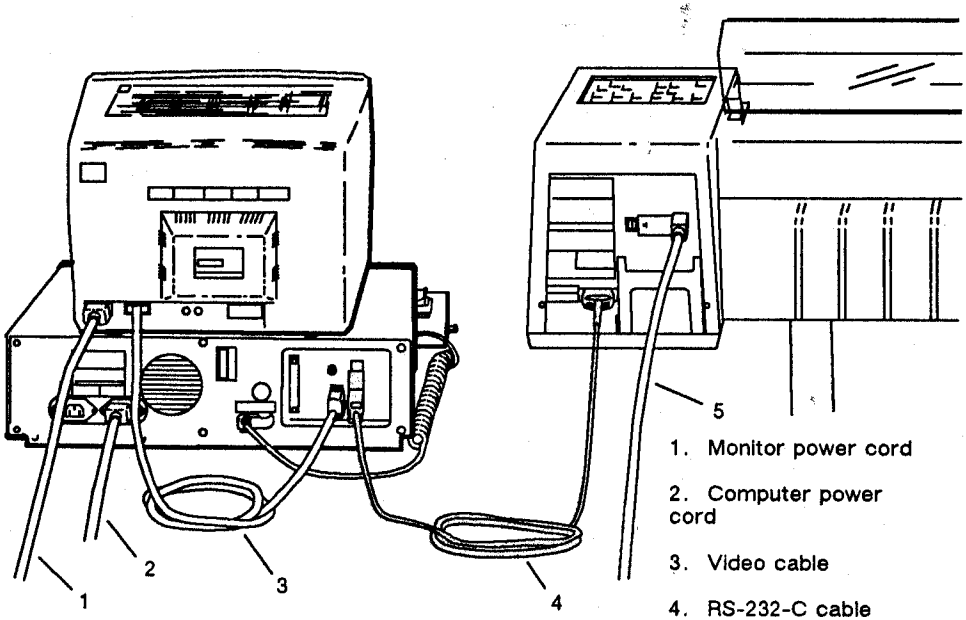
2. Install the Asynchronous Communications Adapter (RS-232-C serial card) in your IBM PC (refer to your IBM documentation for instructions on installation). If you are using an IBM PC-XT or have already installed the serial card, go on to step 3.

   NOTE: If you have two Asynchronous Communications Adapters installed in your computer, one of the adapters must be set for COM1 and the other for COM2. (Refer to your computer documentation for details.) The interconnection instructions listed here assume you are connecting your plotter to the COM1 adapter. If you are using COM2, be sure to substitute COM2 for COM1 in the instructions.■

3. Set the plotter's rear-panel switches to 9600 baud rate and parity checking off. Refer to the following illustration.



4. Connect the plotter to the computer using the RS-232-C cable. Connect the female end of the cable to the IBM Asynchronous Communications Adapter. Refer to the following illustration.



1. Monitor power cord
2. Computer power cord
3. Video cable
4. RS-232-C cable
5. Plotter power cord

Testing Communications without BASIC

To test the computer/plotter interface without using BASIC, turn on your computer and plotter, load pens and paper, then follow these steps.

1. At the DOS prompt, type the following (substitute COM2 for COM1 if necessary) and press **ENTER**.

   ```
   MODE COM1:9600,N,8,1,P
   ```

   This sets the RS-232-C port for 9600 baud, no parity, 8 data bits, one stop bit, and continuous error checking.

2. Type the following (substitute COM2 for COM1 if necessary) and press **ENTER**.

   ```
   ECHO IN;SP1;PA0,0;PD0,1500,1500,1500,0,0;SP0>COM1
   ```

   The plotter should select pen one, draw a triangle on the page, and return the pen to the carousel.

Running the Test Program

To test the computer/plotter interface, turn on your computer and plotter, and load pens and paper.

1. At the DOS prompt, type the following (substitute COM2 for COM1 if necessary) and press **ENTER**.

   ```
   MODE COM1:9600,N,8,1,P
   ```

   This sets the RS-232-C port for 9600 baud, no parity, 8 data bits, one stop bit, and continuous error checking.

2. Enter and run the following BASIC program (substitute COM2 for COM1 if necessary). (If you need help entering and running the program, refer to your computer documentation.)

```
10 OPEN "COM1:9600,N,8,1,RS,CS65535,DS,CD" AS #1
20 PRINT #1, "IN;OI;"
30 INPUT #1, ID$
40 PRINT #1, "SP1;PA500,500;"
50 PRINT #1, "LB"+ID$+" PLOTTER OK"+CHR$(3)
60 PRINT #1, "PA0,0;SP0;"
70 END
```

Your plotter selects pen #1 and prints 7575A PLOTTER OK (or 7576A PLOTTER OK, depending on the plotter's model number).

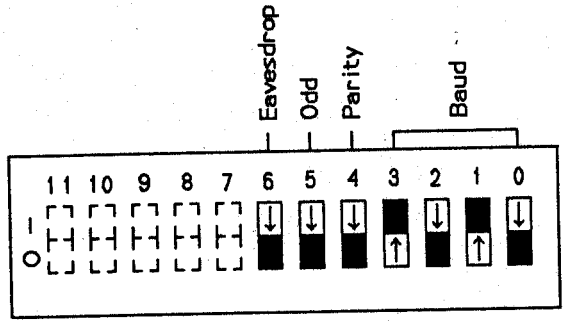
IBM PS/2 Computer
(RS-232-C Interface)

Computer Equipment	Plotter Equipment
IBM PS/2 with disc drive graphics monitor (color or b&w)	HP DraftPro DXL/EXL RS-232-C cable, male-to-female (HP 17255D or equivalent)*

* If you have an additional asynchronous communication adapter with the 9-pin connector, use the HP 24542G or equivalent.

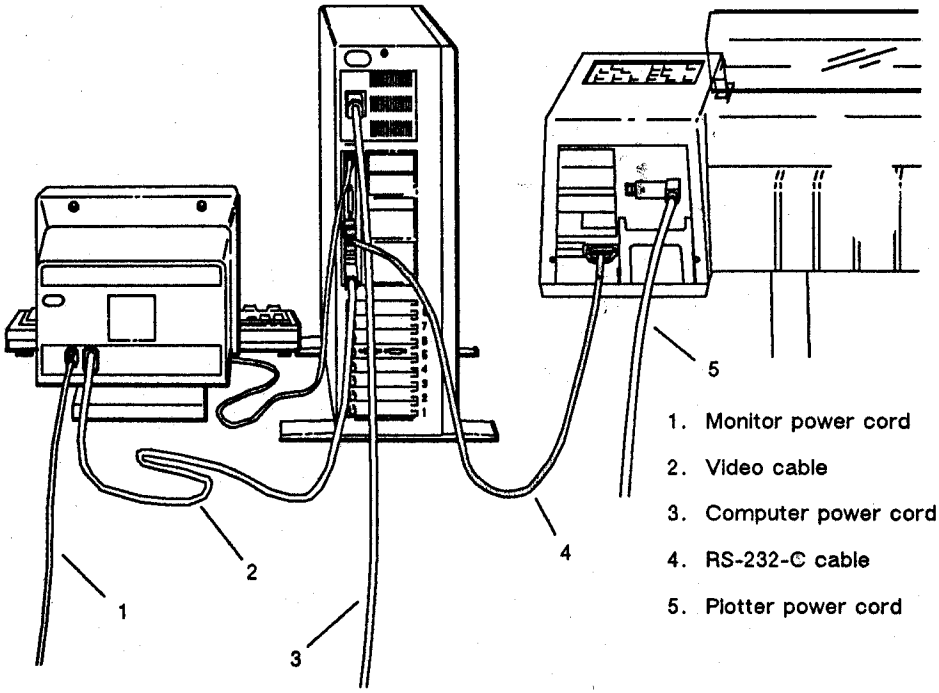
Interconnection Instructions

1. Turn off your plotter and computer equipment.
2. Set the plotter's rear-panel switches to 9600 baud rate and parity checking off. Refer to the following illustration.



4. Connect the plotter to the computer using the RS-232-C cable. Connect the female end of the cable to the IBM Asynchronous Communications Adapter. Refer to the following illustration.

NOTE: If you have two Asynchronous Communications Adapters installed in your computer, one of the adapters must be set for COM1 and the other for COM2. (Refer to your computer documentation for details.) The interconnection instructions listed here assume you are connecting your plotter to the COM1 adapter. If you are using COM2, be sure to substitute COM2 for COM1 in the instructions.■



1. Monitor power cord
2. Video cable
3. Computer power cord
4. RS-232-C cable
5. Plotter power cord

Testing Communications without BASIC

To test the computer/plotter interface without using BASIC, turn on your computer and plotter, load pens and paper, then follow these steps.

1. At the DOS prompt, type the following (substitute COM2 for COM1 if necessary) and press **ENTER**.

   ```
   MODE COM1:9600,N,8,1,P
   ```

   This sets the RS-232-C port for 9600 baud, no parity, 8 data bits, one stop bit, and continuous error checking.

2. Type the following (substitute COM2 for COM1 if necessary) and press **ENTER**.

   ```
   ECHO IN;SP1;PA0,0;PD0,1500,1500,1500,0,0;SP0>COM1
   ```

   The plotter should select pen one, draw a triangle on the page, and return the pen to the carousel.

Running the Test Program

To test the computer/plotter interface, turn on your computer and plotter, and load pens and paper.

1. At the DOS prompt, type the following (substitute COM2 for COM1 if necessary) and press **ENTER**.

   ```
   MODE COM1:9600,N,8,1,P
   ```

   This sets the RS-232-C port for 9600 baud, no parity, 8 data bits, one stop bit, and continuous error checking.

2. Enter and run the following BASIC program (substitute COM2 for COM1 if necessary). (If you need help entering and running the program, refer to your computer documentation.)

```
10 OPEN "COM1:9600,N,8,1,RS,CS65535,DS,CD" AS #1
20 PRINT #1, "IN;OI;"
30 INPUT #1, ID$
40 PRINT #1, "SP1;PA500,500;"
50 PRINT #1, "LB"+ID$+" PLOTTER OK"+CHR$(3)
60 PRINT #1, "PA0,0;SP0;"
70 END
```

Your plotter selects pen #1 and prints 7575A PLOTTER OK (or 7576A PLOTTER OK, depending on the plotter's model number).

8

Using Software with Your Plotter

This chapter provides important information on using graphics software packages or programs to create color graphics on your plotter. Be sure to read it before attempting to use your graphics software package.

Before You Begin

Before using a software package, check the following.

- Is your plotter in good working condition? If the demo plot runs, it is a good indication that the plotter is working correctly.
- Is your computer system working correctly?
- Are your plotter and computer communicating effectively? If the test program (described in Chapter 6 and 7) runs, communication is established.
- Does your software package support your plotter and computer? (Your software documentation should tell you this.)

When you are sure the components of your computer system are working properly, and that communication has been established between the computer and plotter, you are ready to use your software package.

Using Graphics Software Packages

Many software packages require you to configure the software so that it knows what type of plotter you are using, how the plotter interface switches are set, and where the plotter is attached to your computer. This configuration is usually done by typing or selecting answers on your computer in response to questions asked by the software. If your software asks you configuration questions, answer them carefully to avoid computer/plotter communication problems. Read your software documentation when installing and configuring the software to avoid potential problems.

If your software documentation recommends specific plotter settings, use them—even if they differ from the settings recommended for your computer in Chapter 7. If your software lists possible choices *without* making a recommendation, use the settings recommended in Chapter 7.

Using the Extended Buffer Cartridges

Since the DraftPro DXL/EXL plotters are manual sheet feed plotters, they cannot automatically plot a series of plot files on separate sheets of media. If you want to send a series of plot files to the plotter and you want them plotted on separate sheets, your software package must include an NR (not ready) instruction at the end of each file. Verify that your software package supports this feature before sending a series of plot files to the buffer.

If your software package supports sending a series of plot files to the plotter for the DraftPro DXL/EXL, the control-panel VIEW light will turn on and plotting will stop at the end of each file. When you load a new sheet of media, the plotter will resume plotting.

For RS-232-C (Serial) Interface Users . . .

If your software or software documentation recommends specific plotter settings, use the plotter's rear-panel RS-232-C interface switches to select and store the recommended settings, as explained in Chapter 6. Following is a summary of the kind of information your software package may ask for.

Plotter Configuration Options

Switch	Options
EAVESDROP	standalone or eavesdrop
BAUD	75, 110, 150, 200, 300, 600, 1200, 2400, 4800, or 9600
PARITY	on or off
ODD	odd or even

If your software doesn't require any configuring, or if no plotter settings are suggested in your software documentation, try setting the interface switches as advised in Chapter 6. **Be certain your software configuration matches the plotter's settings.**

NOTE: If an error is shown by the VIEW light flashing and the plotter won't plot, check the plotter's baud rate and parity settings.■

For HP-IB (Parallel) Interface Users . . .

If you are using the HP-IB interface cartridge with the plotter, the plotter's address setting must match the HP-IB address used by the graphics software package. If your software requires configuring, select an HP-IB address of 05 and be certain your plotter's address is set to 05. If you need to use an address other than 05, use the HP-IB interface switches as explained in Chapter 6.

Writing Your Own Graphics Programs

If you want to write your own graphics programs using the HP-GL programming language, you can purchase an extensive programming document, the *HP DraftPro DXL/EXL Programmer's Reference*, from Hewlett-Packard. Refer to Appendix C for ordering information.

Although most graphics software packages allow you to specify the labels you need for your graphs, there may be occasions when you would like to add additional labels or graphics, for example, a company logo. The *Programmer's Reference* explains how you can write your own graphics programs that will add labels or graphics to software-generated graphs.

A

Technical Information

This appendix contains the functional, physical, and environmental specifications for your plotter.

Functional Specifications

Number of Pens	8
Pen Types	fiber-tip paper pens, fiber-tip transparency pens, disposable drafting pens, refillable drafting pens
Media Sizes	8.5 × 11 in. (ANSI A) 210 × 297 mm (ISO A4) 11 × 17 in. (ANSI B) 297 420 mm (ISO A3) 17 × 22 in. (ANSI C) 420 × 594 mm (ISO A2) 430 × 610 mm (ISO RA2) 450 × 640 mm (ISO SRA2) 480 × 625 mm (HP OA2) 22 × 34 in. (ANSI D) 594 × 841 mm (ISO A1) 610 × 860 mm (ISO RA1) 640 × 900 mm (ISO SRA1) 625 × 900 mm (HP OA1) 34 × 44 in. (ANSI E)* 841 × 1189 mm (ISO A0)* 860 × 1220 mm (ISO RA0)* ~~900 × 1280 (ISO SRA0)~~ 900 × 1245mm (HPOA0)*

* Only the HP DraftPro EXL can use E-, A0-, RA0-, or ~~SRA0~~ HPOA0-size media.

** THE DRAFTPRO CANNOT PLOT ON SRA0 MEDIA

(Table continues)

Functional Specifications

Media Sizes *(Continued)*	9 × 12 in. (Architectural A)** 12 × 18 in. (Architectural B)** 18 × 24 in. (Architectural C)** 24 × 36 in. (Architectural D)** 36 × 48 in. (Architectural E)* **
Media Types	plotter paper, glossy paper, transparency film, vellum, double-matte polyester film
Margins **Normal Mode** **Expanded Mode**	 15 mm (0.59 in.) on three edges, 39 mm (1.5 in.) on the fourth 5 mm (0.2 in.) on three edges, 31 mm (1.2 in.) on the fourth
Pen Speed	maximum: 80 cm/s (32 ips) control panel selectable: 5 to 80 cm/s programmable: 1 to 80 cm/s in 1 cm/s increments
Acceleration	approximately 2 g
Resolution **Addressable** **Mechanical**	 0.025 mm (0.001 in.) 0.0127 mm (0.0005 in.)
Buffer Size	31 900 bytes (shared between I/O, polygon, and pen sort buffers) optional 1 and 2 megabyte expandable buffers available as accessories (for use with RS-232-C interface only)

* Only the HP DraftPro EXL can use E-size media.

** The DraftPro DXL/EXL plotters cannot plot on 30 X 42 in. architectural media.

Physical Specifications

DraftPro DXL

Size	
Height	1105 mm (43.5 in.)
Width	1145 mm (45.0 in.)
Depth	570 mm (22.5 in.)
Weight	34 kg (76 lbs)

DraftPro EXL

Size	
Height	1210 mm (47.5 in.)
Width	1450 mm (57.0 in.)
Depth	620 mm (24.5 in.)
Weight	41 kg (91 lbs)

Environmental Specifications

Operating Temperature	0°C to 55°C (32°F to 131°F)
Nonoperating Temperature	-40°C to 75°C (-40°F to 167°F)
Relative Humidity	5% to 95% (in 0°C to 40°C)

Power Specifications

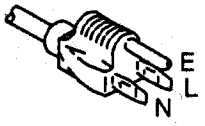
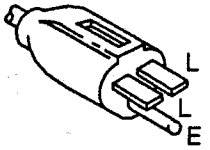
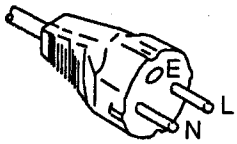
Requirements

Source	100, 120, 220, 240 V~
Frequency	47.5–66 Hz
Consumption	less than 85 W maximum

Power Options

The power cable supplied with your plotter should match the plug requirement for your area. However, power cables with different plugs (international options) are available and are shown in the following table. If you wish to use a different power cable, contact your local Hewlett-Packard dealer or Sales and Support Office.

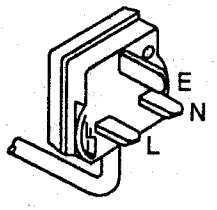
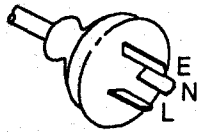
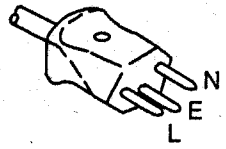
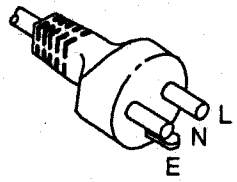
Power Options

AC Plug Type*	AC Voltage	Country	HP Part Number (Option Number)
 NEMA 5-15P	100 or 120 V	Canada Japan Mexico Philippines Taiwan United States	8120-1378 (903)
 NEMA 6-15P	220 or 240 V	United States	8120-0698 (904)
 CEE 7-VII	220 or 240 V	East and West Europe Egypt Saudia Arabia	8120-1689 (902)

* L = Line or Active Conductor (also called "live" or "hot")
N = Neutral or Identified Conductor
E = Earth or Ground

(*Table Continues*)

Power Options (Continued)

AC Plug Type*	AC Voltage	Country	HP Part Number (Option Number)
 BS 1363A	220 or 240 V	United Kingdom	8120-1351 (900)
 ASC112	220 or 240 V	Austria New Zealand	8120-1369 (901)
 SEV 1011	220 or 240 V	Switzerland	8120-2104 (906)
 DHCK-107	220 or 240 V	Denmark	8120-2956 (912)

*L = Line or Active Conductor (also called "live" or "hot")
N = Neutral or Identified Conductor
E = Earth or Ground

B

Plotting for Precision

What You'll Learn in This Appendix

Precision counts when you need parallel lines, exact spacing between two points or lines, exact alignment between figures, or when measurements will be taken directly from your plot. This appendix explains your plotter's capacity for precision and offers suggestions for achieving the most exact plots possible.

How Precise is Your Plotter?

Your plotter's precision is measured in three ways: accuracy, repeatability, and resolution. The following definitions clarify the meaning of each of these terms.

- **Accuracy** specifies how exactly the plotter can position one endpoint with respect to another endpoint.
- **Repeatability** measures how closely the plotter returns a pen to a previously plotted point.
- **Resolution** has two components: **mechanical resolution** is the smallest mechanical move the plotter can make; **addressable resolution** is the smallest move you can specify programmatically.

The following table lists your plotter's precision measurements.

Accuracy*	0.2% of the move length or 0.5 mm (0.02 in.), whichever is greater
Repeatability*	
For the same pen	0.1 mm (0.004 in.)
For pen to pen	0.2 mm (0.008 in.)
Mechanical Resolution	0.0127 mm (0.0005 in.)
Addressable Resolution	0.0254 mm (0.001 in.)

* On 3-mil double-matte polyester film at 10–30°C and 20% to 80% relative humidity.

When the Plot Must be Precise

The following conditions are necessary to achieve the specifications discussed in the preceding section.

1. **Use Hewlett-Packard 3-mil double-matte polyester film** for precise grit wheel movement and dimension stability.

   - Hewlett-Packard warrants the plotter's specifications when using HP supplies.
   - Media thickness affects the distance the sheet moves with each rotation of the grit wheel. Film thicker than 3-mil increases the distance so lines are longer than specified. Thinner film has the opposite effect.
   - A double-matte surface prevents static build-up between the plotter's platen and the media.
   - Polyester film is dimensionally stable.

2. **Keep the room temperature between 10° and 30°C (50° and 86°F) and 20% to 80% relative humidity during plotting.** All media can stretch or shrink slightly due to changes in temperature and humidity.

3. **Use the same pen for the entire plot.** Keep the pen in the pen holder (don't return it to the carousel) until the plot is completed. This ensures the same pen orientation throughout the plot.

4. **Operate the plotter on a flat surface.**

Here are two final suggestions for drawing the most precise plot possible.

- Closely spaced lines are most accurate when drawn in the same direction; for example, left to right each time rather than back and forth.

- When making overlays, use the same plotter to plot the entire set. Also use the same media for all overlays, and plot at similar room temperatures.

Measurements of Inaccuracy

Each of the preceding recommendations prevents a source of inaccuracy. Not following a recommendation introduces a certain amount of error into your plot. These amounts are listed in the following table.

Source of Error	Magnitude of Error	Effect on a 1016 mm Line
Using paper instead of polyester film	Changes up to ±1% in paper-axis and up to ±1% in pen-axis	±10.16 mm (paper-axis) ±10.16 mm (pen-axis)
Using film thicker or thinner than 3-mil	0.021% of a paper-axis move per Δ mil	±0.212 mm (paper-axis)
Plotting on film at one temperature and measuring at a different temperature	0.017 mm/m/°C	0.0172 mm/°C
Plotting on film at one humidity and measuring at a different humidity	0.006 mm/m/%RH	0.006 mm/%RH
Using more than one pen, or reselecting a pen	±0.2 mm/pen (independent of move length)	±0.2 mm
Making overlays with more than one plotter	±0.4% of move length or ±1.0 mm whichever is greater	±2.03 mm

C

Accessories Available

This appendix lists the accessories available for your plotter and tells you how to order supplies and accessories. Descriptions of the *Programmer's Reference* and the optional HP-IB and buffer cartridges are included.

Plotter Accessories

The following items are available and can be purchased using the appropriate part number. For information on available pen and media supplies, refer to the *Supplies Catalog* shipped with your plotter.

Item	HP Part Number
HP DraftPro DXL/EXL Programmer's Reference	07575-90001
HP DraftPro DXL/EXL User's Guide	
English	07575-90002
German	07575-90004
French	07575-90005
Spanish	07575-90006
Italian	07575-90007
Japanese	07575-90008
HP-IB interface cartridge	17570A
HP-IB interface cartridge with Kanji	17571A
1 MB extended buffer cartridge*	17573A
2 MB extended buffer cartridge*	17574A
HP DraftPro DXL dust cover	92259Q
HP DraftPro EXL dust cover	92259P

* The buffer cartridges can only be used with the RS-232-C interface.

(Table continues)

Item	HP Part Number
HP DraftPro DXL packaging material kit	07575-60131
HP DraftPro EXL packaging material kit	07576-60141
power cable	see Appendix A
RS-232-C cable, 25-pin to 25-pin (for use with IBM PC and PC-XT	17255D (1.5 m)
RS-232-C cable, 25-pin to 25-pin (for use with HP Touchscreen and HP Vectra PC)	17255M (1.5 m) or 13242G (5 m)
RS-232-C cable (for use with HP 3000 in eavesdrop configuration)	17355D (3 m)
RS-232-C cable (for use with Apple IIe and DEC VAX in standalone configuration)	17355M (3 m)
RS-232-C Y-cable (for use with DEC VAX and HP 3000 in eavesdrop configuration)	17455A
RS-232-C cable, 9-pin to 25-pin (for use with HP Vectra PC and IBM AT)	24542G (3 m)
RS-232-C adapter cable (for use with HP 3000 in standalone configuration)	30152 (5 m)
RS-232-C cable (for use with Apple Macintosh)	92219M (1.5 m)
RS-232-C cable (for use with Apple Macintosh Plus/SE/II)*	17302A (1.5 m)
HP-IB cable (IEEE 488), RFI shielded (for use with HP 9000 Series 200 and Series 300)	10833A (1 m), B (2 m), or C (3 m)**
fiber-tip pen carousel	07570-60050
drafting pen carousel	07570-60055
replacement pen boots for fiber-tip pen carousels for drafting pen carousels	 5062-0096 5062-0097

* You do *not* need a peripheral adapter cable if you use the HP 17302A.

** The HP 31389 and HP 45529 cables are equivalent to the HP 10833.

(Table continues)

Item	HP Part Number
grit wheel brush	5062-1515
adapter and pen cap assemblies	5061-7578
standard digitizing sight	09872-60066
slanted digitizing sight	07585-60191

The Programmer's Reference

The *HP DraftPro DXL/EXL Programmer's Reference* available for your plotter contains complete explanations and examples of the plotter's graphic and interfacing instructions. The *Programmer's Reference* is a valuable tool for writing your own programs using HP-GL instructions.

The Optional Cartridges

You can purchase any of four cartridges to customize the features of your DraftPro DXL/EXL to your needs. Note that since the plotter has only one cartridge slot, you can install only one of these cartridges at a time.

The HP-IB Cartridge and theHP-IB Cartridge with Kanji

The HP-IB interface cartridge (HP 17570A) allows you to use the Hewlett-Packard Interface Bus (including Secondary Command Support) with your plotter. HP-IB provides for compatibility between all devices adhering to the ANSI/IEEE-488 (1978) standard. Refer to Appendix E for more information on the HP-IB interface.

The HP-IB interface cartridge with Kanji (HP 17571A) provides the Kanji character set in addition to the HP-IB interface. Refer to the *Programmer's Reference* for more information on the Kanji character set. While you must purchase the HP-IB interface to get the Kanji character set, you can access the character set through the RS-232-C interface.

The One- and Two-Megabyte Extended Buffer Cartridges

Because your computer can send data to the plotter faster than the plotter can plot it, your computer is frequently unavailable for use while the plotter is plotting. The one- and two-megabyte extended buffer cartridges allow your computer to send large amounts of data to the buffer to await plotting, thus freeing your computer for other tasks.

The time savings you will realize will depend on the type of computer or workstation being used, the complexity of your drawing, and whether or not your computer's operating system supports multitasking. For a 32-bit (80386 based) personal computer without multitasking (e.g., HP Vectra RS Personal Computer and IBM PS/2 Model 70), you can expect to save 50 to 70 percent of the time your computer is usually busy while the plotter is drawing.

However, since the DraftPro DXL/EXL plotters are manual sheet feed plotters, they cannot automatically plot a series of plot files on separate sheets of media. If you want to use the buffer to allow you to send a series of plot files, you must include an NR (not ready) instruction (refer to Appendix F or the *Programmer's Reference*) at the end of each file. At the end of each plot, the **VIEW** light will turn on and plotting will stop. Plotting will resume when you load a new sheet of media.

How to Order Supplies and Accessories

You can order plotter supplies and accessories in any of these three ways:

1. Call your local authorized HP dealer.
2. Contact your local HP Sales and Support Office.
3. In the United States, use HP's Direct Order telephone service. The telephone number is provided in the *Supplies Catalog* included with your plotter.

For a complete list of Hewlett-Packard supplies and accessories, order the *Computer User's Catalog* (Part No. 5953-2450). You can obtain one by asking at your local HP Sales and Support Office.

D

RS-232-C/CCITT V.24 Interface Information

The RS-232-C interface is a standard serial interface compatible with many computers and terminals. This appendix provides a summary of RS-232-C interface specifications including pin allocations and cable schematics.

RS-232-C Pin Allocations

The plotter interfaces to the RS-232-C communications lines through a standard 25-pin female connector. Connector pin allocations are identified and described in the following table.

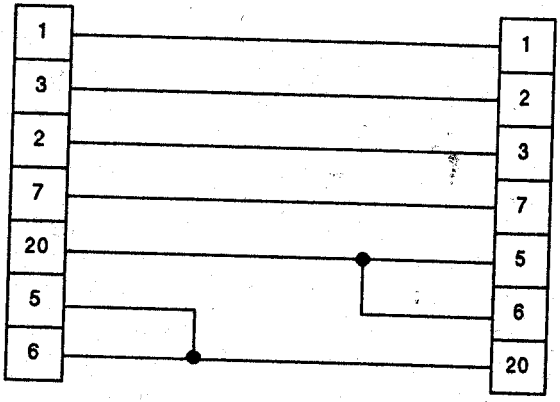
Wire/Signal Name	Pin #	RS-232-C	CCITT V.24
Protective Ground	1	AA	101
Transmitted Data	2	BA	103
Received Data	3	BB	104
Request to Send	4	CA	105
Clear to Send	5	CB	106
Data Set Ready	6	CC	107
Signal Ground	7	AB	102
Data Carrier Detect	8	CF	109
Secondary Transmit Data*	14	SBA	118
Secondary Receive Data*	16	SBB	119
Data Terminal Ready	20	CD	108.2

* Pins 14 and 16 are wired only in the Y-cable (Part No. HP 17455A) used in eavesdrop configurations.

RS-232-C Cable Schematics

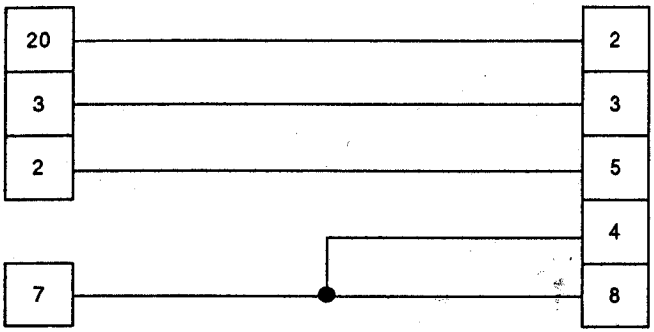
The following cable schematics are for Hewlett-Packard cables.

HP Part Number	Connector Type (25-pin)	
	Plotter End	Computer End
17255D	male	female
17255M or 13242G*	male	male

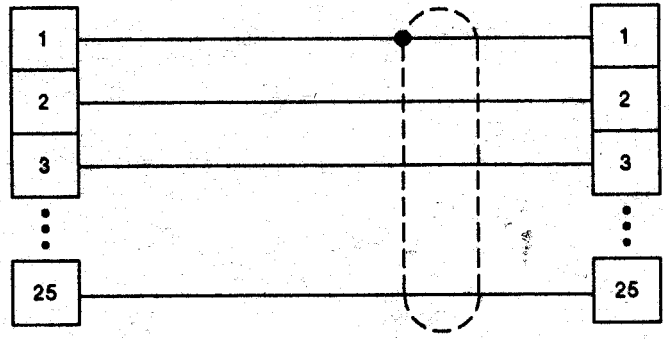


* Symmetrical; either end may be connected to the plotter. Other pins are connected in the 13242G but do not affect plotter operation.

HP Part Number	Connector Type	
	Plotter End	Computer End
17302A	male (25-pin)	male (8-pin mini din)

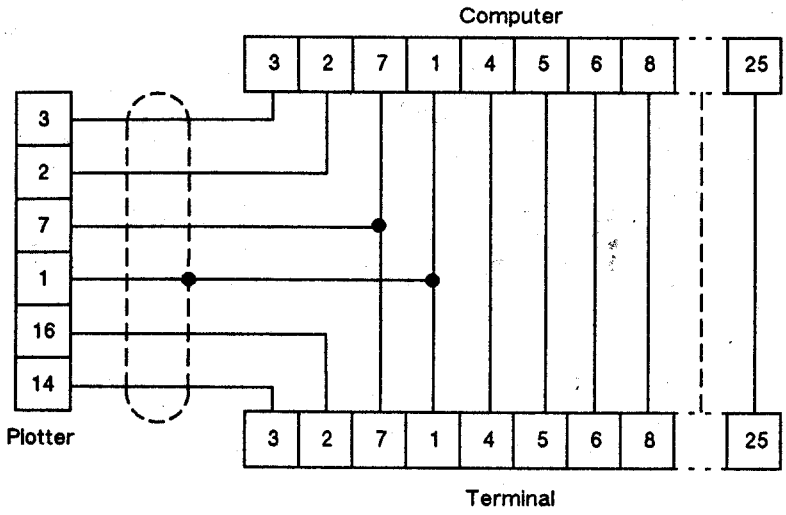


HP Part Number	Connector Type (25-pin)	
	Plotter End	Computer End
17355D 17355M *	male male	female male



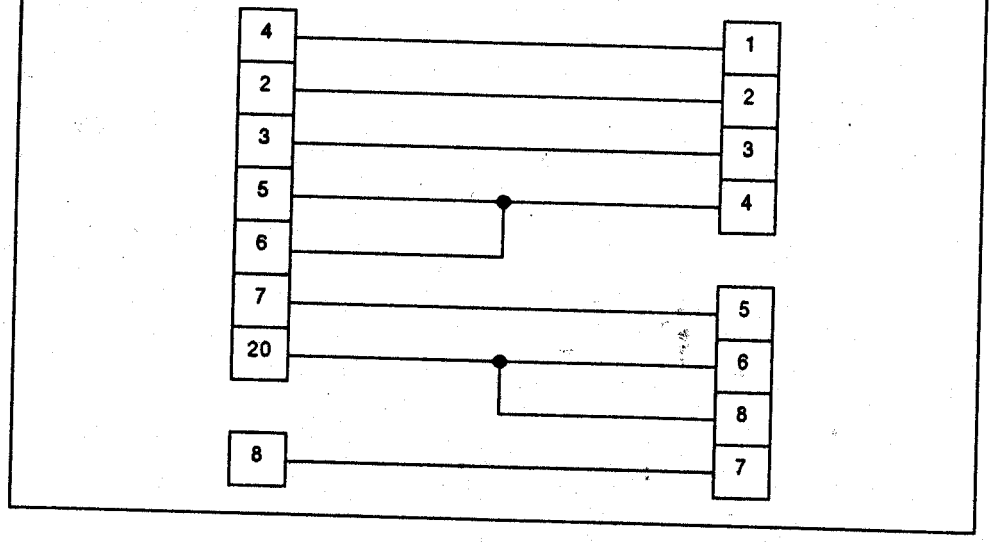
* Symmetrical; either end may be connected to the plotter.

HP Part Number	Connector Type (25-pin)	
	Plotter End	Computer End
17455A	male	male (computer) female (terminal)

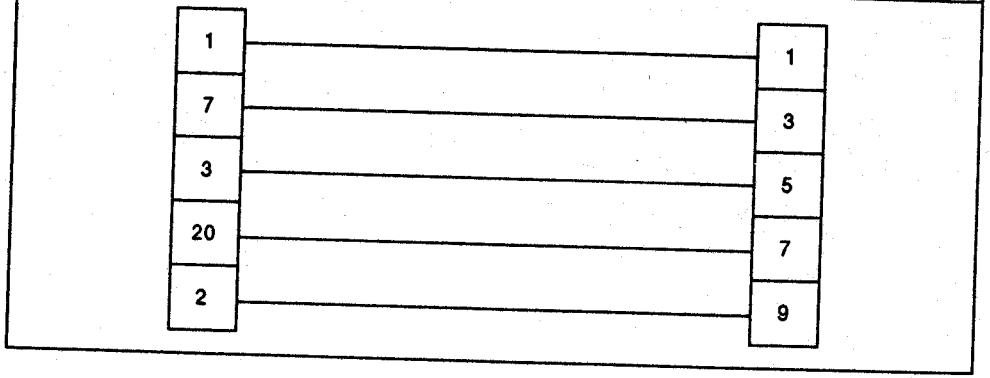


(pins 4, 5, 6, and 8 through 25 are directly connected between the computer and terminal connectors)

HP Part Number	Connector Type	
	Plotter End	Computer End
24542G	male (25-pin)	female (9-pin)



HP Part Number	Connector Type	
	Plotter End	Computer End
92219M	male (25-pin)	male (9-pin)



E

HP-IB (IEEE-488) Information

The Hewlett-Packard Interface Bus (HP-IB) provides for compatibility between all devices adhering to the ANSI/IEEE-488 (1978) standard. This appendix explains how to set the plotter's switches for the address code and how to implement normal or secondary command support.

Addressing the Plotter

The HP-IB uses an addressing technique to ensure that each device on the bus (interconnected by HP-IB cables) receives only the data intended for it. Using this addressing technique, devices can be instructed to talk (send) or listen (receive). More than one device can listen at the same time, but only one device at a time can be designated as the talker.

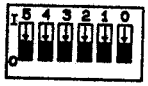
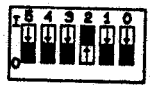
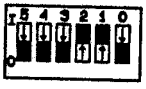
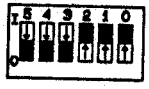
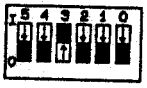
There are basically two modes of addressing the plotter: addressable and listen-only. In addressable mode, the plotter can function as a talker or as a listener, depending on the commands it receives from the computer. In listen-only mode, the plotter hears all activity on the bus but cannot talk.

Addressable Mode

The addressing technique on HP desktop computers requires assigning a "select code" to the HP-IB interface, and an "address code" to the plotter. The plotter is set to an address of 05 at the factory. Using the rear-panel switches, you can set your plotter to any one of 31 different HP-IB addresses, ranging from 0 through 30, or listen-only mode (described in the following section). Each HP-IB interface can have as many as 15 devices connected to it, each set to different specific address codes.

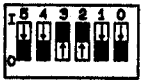
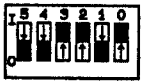
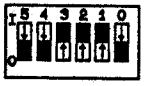
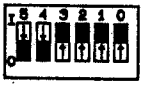
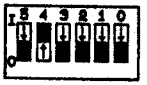
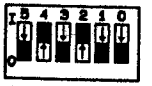
NOTE: When using your plotter with an HP desktop computer, do not use address 21; it is reserved for the desktop computer's address.■

HP-IB Address Settings

Address Codes		Address Settings	Address Characters	
Decimal	Octal		Listen	Talk
0	0		SP	@
1	1		!	A
2	2		"	B
3	3		#	C
4	4		$	D
5	5		%	E ← Factory default
6	6		&	F
7	7		'	G
8	10		(	H
9	11		)	I

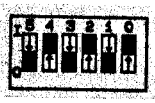
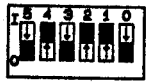
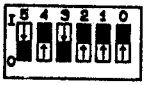
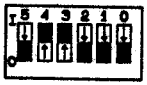
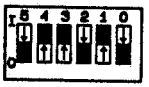
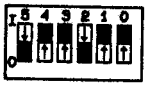
(Table continues)

HP-IB Address Settings

Address Codes		Address Settings	Address Characters	
Decimal	Octal		Listen	Talk
10	12		*	J
11	13		+	K
12	14		,	L
13	15		-	M
14	16		.	N
15	17		/	O
16	20		0	P
17	21		1	Q
18	22		2	R
19	23		3	S
20	24		4	T

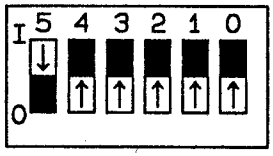
(Table continues)

HP-IB Address Settings

Address Codes		Address Settings	Address Characters		
Decimal	Octal		Listen	Talk	
21	25		5	U	← Reserved for HP desktop computer
22	26		6	V	
23	27		7	W	
24	30		8	X	
25	31		9	Y	
26	32		:	Z	
27	33		;	[	
28	34		<	\	
29	35		=	]	
30	36		>	^	
31	37		?	_	← Sets listen-only mode

Listen-Only Mode

To activate listen-only mode, set the rear-panel HP-IB switches 0–4 to the **ON** position as shown in the following illustration. In listen-only mode, the plotter does not have an address, but listens to all data transmitted on the bus. The plotter cannot then be placed in a talker-active state.



Listen-Only Setting

Listen-only mode is useful in a system that has no controller but has a dedicated talker (such as a tape drive or other mass storage unit) transmitting information to the plotter.

Notes on Addressing Protocol

Some computer systems can use high-level languages (such as BASIC, FORTRAN, Pascal, and COBOL) with high-level input/output (I/O) statements. In this case, the addressing procedure (unlisten, talk, listen) is taken care of by the computer's internal operating system and need not be of concern to you. With these high-level I/O statements, you may not be able to control some of the other bus functions.

Some computers must use low-level I/O statements to address devices on the HP-IB bus. If your computer uses such statements, you'll need to direct the talking, listening, and unlistening activities as described in the following section. In order to communicate effectively with the plotter, it is important that you understand the HP-IB addressing protocol of your computer. Therefore, you may wish to review this aspect of your computer.

Controlling Addressing Sequences

One of the first things you must consider when **directly** controlling the HP-IB is addressing. Following is a typical addressing sequence.

<Unlisten Command> <Talk Address> <Listen Addresses>

This sequence is made up of three major parts which serve the following purposes.

1. The unlisten command is the universal bus command with a character code of ?. It unaddresses all listeners. After the unlisten command is transmitted, no active listeners remain on the bus.

2. The talk address designates the device that is to talk. A new talk address automatically unaddresses the previous talker.

3. The listen addresses designate one or more devices that are to listen. A listen address adds the designated device as listener along with the other addressed listeners.

This addressing sequence simply directs who is to talk to whom. The commands (unlisten, talk, listen) are implemented by putting data on the bus and setting the proper control line true. The unlisten command (?) plays a vital role in this sequence. It is important that a device receives only the data intended for it.

When a new talk address is transmitted in the addressing sequence, the previous talker is unaddressed. Therefore, only the new talker can send data on the bus and you do not need to use an untalk command in the same manner as the unlisten command.

To tell a computer at address 21 to talk and a plotter at address 05 to listen, the controller (usually the computer) sets the proper control line true and sends the following sequence over the data lines.

?U%

where ? — Tells all devices on the bus to unlisten;
U — Designates the device at address 21 as the talker;
% — Designates the device at address 05 as the listener.

Refer to the preceding section, *Addressable Mode*, for a table of ASCII characters and their decimal and octal equivalent values.

HP-IB Interface Functions

The interface functions provide the physical capability to communicate via the HP-IB. The HP-IB interface on the HP-IB interface cartridge (Part No. 17570A) conforms to ANSI/IEEE-488-1978 specifications. The following table lists the functions implemented on your plotter.

Mnemonic	Interface Function Name
SH1	Source Handshake
AH1	Acceptor Handshake
T6	Talker
L3	Listener
SR1	Service Request
RL0	No Remote Local
PP0,1,2*	Parallel Poll
DC1	Device Clear
DT0	No Device Trigger
C0	No Controller

*PP0 is implemented if the plotter is in listen-only mode; PP2 is implemented if the plotter's address is less than 8; PP1 is implemented otherwise.

Secondary Command Support

Your system must support secondary commands in order for the plotter to function in this mode. Secondary command support extends the capabilities of standard HP-IB protocol. Implementation of secondary commands avoids HP-IB lock-up in a multiuser environment.

When this protocol is selected, listen-only mode and the service request are automatically disabled. The plotter can be identified with addresses 0 through 7.

Secondary commands have a two-byte structure to carry their more detailed instructions. The plotter functions as Extended Talker or Extended Listener. The first byte is always a primary talk or listen command, which sets up the second byte as a more specific talk or listen instruction.

The plotter supports five secondary commands, three talk and two listen.

Secondary Talk Commands

Device Specified Jump (DSJ) X1110000

When the plotter receives the primary talk command followed by a secondary DSJ command, it responds with one byte of data with the EOI line asserted. The decimal value of the byte is zero, one, or two.

Decimal Value of Response Byte	Plotter Status
0	Ready to receive
1	Ready to send
2	Status change (power cycled or not ready)

I/O Status X1101110

The I/O status is a means by which the controller checks the current plotter status. When the plotter receives the primary talk command followed by a secondary I/O status command, it responds with one byte of data with the EOI line asserted. Set bits in the byte have the following meaning.

Bit	Bit Value When Set	Plotter Status
0	1	Power cycled
1	—	Undefined
2	4	View or not ready state
3–4	—	Undefined
5	32	Ready to send data
6	64	Ready to receive data
7	128	On-line

Output Data X1100000

The output data command tells the plotter to send the data stored in the output buffer in bursts of 16 bytes (or less).

Unrecognized Secondary Talk Commands

When the plotter receives a secondary talk command it does not recognize, it responds by sending a null byte (00000000) with the EOI line asserted.

Secondary Listen Commands

Device Clear X1110000

This performs the same function as a DCL and has no effect on the plotter. Device clear is followed by a required parity byte used by other devices, which the plotter ignores.

Enter Data X1100000

This command tells the plotter that bytes following the command contain data to be plotted. The plotter should receive data bursts that are 16 bytes (or less) in length.

Unrecognized Secondary Listen Commands

When the plotter receives a secondary listen command it does not recognize, it acknowledges the command as valid. It then reads and ignores all incoming data bytes until it receives an Unlisten command or a data byte with the EOI line asserted.

Identify Command Sequence

This command is used by the controller to identify devices on the bus and determine their characteristics. When the plotter receives a primary untalk command followed by a secondary identify command specifying the plotter's address in the lowest 3 bits, it responds with two data bytes. The first byte tells the controller that the device is a plotter. The second byte tells the controller that the plotter is an HP DraftPro DXL or EXL plotter. The response bytes are shown below.

Byte 1	(plotter)	00100010	(22 hex)
Byte 2	(HP DraftPro DXL designator)	00011101	(1D hex)
	(HP DraftPro EXL designator)	00011110	(1E hex)

F

Instruction Summary

This appendix is divided into two sections. The first section lists each HP-GL instruction in alphabetic order of the instruction's mnemonic. Also included are tables of default conditions, HP-GL errors, and device-control errors.

The second section of this appendix lists each device-control instruction in alphabetic order of the escape sequence.

Syntax and parameter ranges are provided for each HP-GL and device-control instruction. The format notation 'current units' indicates that the format is integer if scaling is off and real if scaling is on.

HP-GL Instructions

The following list of HP-GL instructions includes the use, syntax, and parameter range for each instruction. The semicolon is included as the terminator for all HP-GL instructions. (However, a semicolon or the next mnemonic are each valid terminators. In an HP-IB configuration, a line feed character is also a valid terminator.) The terminator sent by the plotter at the end of an output response is **CR LF** in an HP-IB configuration and **CR**, or as set by an ESC.M instruction, in an RS-232-C/CCITT V.24 configuration.

AA, Arc Absolute

USE: Draws an arc, using absolute coordinates, that starts at the current pen location and uses the specified center point.

SYNTAX: AA *X,Y,arc angle(,chord tolerance)*;

Parameter	Format	Range	Default
X,Y coordinates	current units	-32 768 to 32 767*	none
arc angle	real	-360 to 360 degrees**	none
chord tolerance chord angle†	real	0.1 to 180 degrees**	5 degrees
chord deviation	current units	-32 768 to 32 767*	5 degrees††

* If scaling is on, the range is -8 388 608.9999 to 8 388 607.9999. The plotter converts user units to plotter units before plotting. If the converted number is not within the plotter unit range, the plotter generates an error 3 (number out of range) and ignores the instruction.

** Practical range; allowable range is -32 768.9999 to 32 767.9999.

† Chord angle is the default interpretation of chord tolerance.

†† If no deviation distance is specified, the chord tolerance defaults to a chord *angle* of 5 degrees.

AP, Automatic Pen Operations

USE: Controls automatic pen operations such as returning a pen to the carousel if it has been in the holder without drawing for 15 seconds (to prevent the pen from drying out).

SYNTAX: AP *n*; or AP;

Parameter	Format	Range	Default
n	integer	0 to 31	7*

* This is the default value when the rear-panel pen sort switch is off. If the rear-panel pen sort switch is on, the default range is 24 to 31, and the default value is 31. When the rear-panel pen sort switch is on, any number less than 24 is changed to 24.

AR, Arc Relative

USE: Draws an arc, using relative coordinates, that starts at the current pen location and uses the specified center point.

SYNTAX: AR *X,Y,arc angle(,chord tolerance)*;

Parameter	Format	Range	Default
X,Y increments	current units	−32 768 to 32 767*	none
arc angle	real	−360 to 360 degrees**	none
chord tolerance chord angle†	real	0.1 to 180 degrees**	5 degrees
chord deviation	current units	−32 768 to 32 767*	5 degrees††

* If scaling is on, the range is −8 388 608.9999 to 8 388 607.9999. The plotter converts user units to plotter units before plotting. If the converted number is not within the plotter unit range, the plotter generates an error 3 (number out of range) and ignores the instruction.

** Practical range; allowable range is −32 768.9999 to 32 767.9999.

† Chord angle is the default interpretation of chord tolerance.

†† If no deviation distance is specified, the chord tolerance defaults to a chord *angle* of 5 degrees.

CA, Designate Alternate Character Set

USE: Designates a character set as the alternate character set to use in labeling instructions. Use this instruction to provide an additional character set that you can easily access in a program.

SYNTAX: CA *set*; or CA;

Parameter	Format	Range	Default
set	integer	0–9, 30–39, 61, 99, 100 & 101*	0

* Sets 100 and 101 (the Kanji character set) are available as an option on the HP-IB cartridge only. Refer to Appendix D of the *Programmer's Reference* for more information on using Kanji.

CI, Circle

USE: Draws a circle using the specified radius and chord tolerance. If you want a filled circle, refer to the WG or PM instruction.

SYNTAX: CI *radius(,chord tolerance)*;

Parameter	Format	Range	Default
radius	current units	-32 768 to 32 767*	none
chord tolerance chord angle†	real	0.1 to 180 degrees**	5 degrees
chord deviation	current units	-32 768 to 32 767*	5 degrees††

* If scaling is on, the range is -8 388 608.9999 to 8 388 607.9999. The plotter converts user units to plotter units before plotting. If the converted number is not within the plotter unit range, the plotter generates an error 3 (number out of range) and ignores the instruction.

** Practical range; allowable range is -32 768.9999 to 32 767.9999.

† Chord angle is the default interpretation of chord tolerance.

†† If no deviation distance is specified, the chord tolerance defaults to a chord *angle* of 5 degrees.

CM, Character Selection Mode

USE: Specifies mode of character set selection and usage. Read *Choosing Other Character Selection Modes* earlier in this chapter to determine if you need this instruction.

SYNTAX: CM *switch mode(,fallback mode)*; or CM;

Parameter	Format	Range	Default
switch mode	integer	0 to 3	0
fallback mode	integer	0 or 1	0

CP, Character Plot

USE: Moves the pen the specified number of character plot cells from the current pen location (e.g., to indent or center a label).

SYNTAX: CP *spaces,lines*; or CP;

Parameter	Format	Range	Default
spaces	real	-32 768.9999 to 32 767.9999	none
lines	real	-32 768.9999 to 32 767.9999	none

CS, Designate Standard Character Set

USE: Designates a character set as the standard character set for labeling instructions. Use this instruction to change the default ANSI ASCII English set to one containing the characters you will most use for labeling. This instruction is particularly useful if you plot most of your labels in a language other than English.

SYNTAX: CS *set*; or CS;

Parameter	Format	Range	Default
set	integer	0–9, 30–39, 61, 99, 100 & 101*	0

* Sets 100 and 101 (the Kanji character set) are available as an option on the HP-IB cartridge only.

CT, Chord Tolerance

USE: Determines whether the chord tolerance parameter of CI, AA, AR, EW, and WG instructions is interpreted as a chord angle in degrees or as a deviation distance in current units.

SYNTAX: CT *n*; or CT;

Parameter	Format	Range	Default
n	integer	0 to 1	0 (chord angle)

DC, Digitize Clear

USE: Terminates digitize mode. For example, if you are using an interrupt routine in a digitizing program to branch to another plotting function, use DC to clear the digitize mode immediately after branching.

SYNTAX: DC;

DF, Default

USE: Sets certain graphics functions to their predefined default settings. Use this instruction to return the plotter to a known state while maintaining the current rotation and location of P1 and P2. When DF is used at the beginning of a program, unwanted graphics parameters such as character size, slant, or scaling are not inherited from another program. You can find a list of the default values set by both DF and IN at the end of this appendix.

SYNTAX: DF;

DI, Direction Absolute

USE: Specifies the direction in which labels are drawn, independent of P1 and P2 settings. Use this instruction to change labeling direction when you are labeling curves in line charts, schematic drawings, blueprints, and survey boundaries.

SYNTAX: DI *run,rise*; or DI;

Parameter	Format	Range	Default
run (or cos θ)	real	-32 768.9999 to 32 767.9999	1
rise (or cos θ)	real	-32 768.9999 to 32 767.9999	0

DP, Digitize Point

USE: Places the plotter in digitize mode, turning on the control-panel **ENTER** light. Use the OD instruction to obtain the coordinates of a point on a plot.

SYNTAX: DP;

DR, Direction Relative

USE: Specifies the direction in which labels are drawn, relative to the scaling points P1 and P2. *Label direction changes when P1 and P2 change so that labels maintain the same relationship to the plotted data.* Use DI if you want label direction to be independent of P1 and P2.

SYNTAX: DR *run,rise*; or DR;

Parameter	Format	Range	Default
run	real	-32 768.9999 to 32 767.9999	1% of P2X -P1X
rise	real	-32 768.9999 to 32 767.9999	0% of P2Y -P1Y

DS, Designate Character Set into Slot

USE: Designates up to four character sets to be immediately available for plotting. Used with ISO character sets and modes.

SYNTAX: DS *slot,set*; or DS;

Parameter	Format	Range	Default
slot	integer	0 to 1 (HP modes) 0 to 3 (ISO modes)	0
set	integer	0–9, 30–39, 61, 99, 100 & 101	0

DT, Define Label Terminator

USE: Specifies the character for use as the label terminator. Use this instruction to define a new label terminator if your computer cannot use the default label terminator (**ETX**, decimal code 3).

SYNTAX: DT *label terminator*;

Parameter	Format	Range	Default
label terminator	label	any character except **NUL**, **ENQ**, **LF**, **ESC**, and ; (decimal codes 0, 5, 10, 27, and 59, respectively)	**ETX** (decimal code 3)

DV, Direction Vertical

USE: Specifies vertical mode as the direction for subsequent labels. Use this instruction to 'stack' horizontal characters in a column. This is especially useful when using the Kanji character set (refer to Appendix D in the *Programmer's Reference* for more information on using Kanji).

SYNTAX: DV *n*; or DV;

Parameter	Format	Range	Default
n	integer	0 or 1	0 (horizontal)

EA, Edge Rectangle Absolute

USE: Defines and outlines a rectangle using absolute coordinates. Use the EA instruction to create rectangles for chart legends, floor plans, flow diagrams, schematics, or to frame any drawing.

SYNTAX: EA *X,Y*;

Parameter	Format	Range	Default
X,Y coordinates	current units	-32 768 to 32 767*	none

* If scaling is on, the range is -8 388 608.9999 to 8 388 607.9999. The plotter converts user units to plotter units before plotting. If the converted number is not within the plotter unit range, the plotter generates an error 3 (number out of range) and ignores the instruction.

EP, Edge Polygon

USE: Outlines the polygon now stored in the polygon buffer. Use this instruction to edge polygons that you defined in polygon mode and with the rectangle and wedge instructions (RA, RR, and WG).

SYNTAX: EP;

ER, Edge Rectangle Relative

USE: Defines and outlines a rectangle using relative coordinates. Use ER to create rectangles for chart legends, floor plans, flow diagrams, schematics, or to frame any drawing.

SYNTAX: ER *X,Y*;

Parameter	Format	Range	Default
X,Y increments	current units	-32 768 to 32 767*	none

* If scaling is on, the range is -8 388 608.9999 to 8 388 607.9999. The plotter converts user units to plotter units before plotting. If the converted number is not within the plotter unit range, the plotter generates an error 3 (number out of range) and ignores the instruction.

ES, Extra Space

USE: Adjusts space between characters and lines of labels without affecting character size.

SYNTAX: ES *spaces(,lines)*; or ES;

Parameter	Format	Range	Default
spaces	real	-.05 to 1* character plot cells	0
lines	real	-.05 to 2* character plot cells	0

* Practical range; allowable range is -32 768.9999 to 32 767.9999.

EW, Edge Wedge

USE: Outlines any wedge. Use these instructions to produce sectors of a pie chart. (You can fill a wedge using the WG, Wedge Fill, instruction.)

SYNTAX: EW *radius,start angle,sweep angle,(,chord tolerance)*;

Parameter	Format	Range	Default
radius	current units	-32 768 to 32 767*	none
start angle	real	-360 to 360 degrees**	none
sweep angle	real	-360 to 360 degrees**	none
chord tolerance chord angle†	real	0.1 to 180 degrees**	5 degrees
chord deviation	current units	-32 768 to 32 767*	5 degrees††

* If scaling is on, the range is -8 388 608.9999 to 8 388 607.9999. The plotter converts user units to plotter units before plotting. If the converted number is not within the plotter unit range, the plotter generates an error 3 (number out of range) and ignores the instruction.

** Practical range; allowable range is -32 768.9999 to 32 767.9999.

† Chord angle is the default interpretation of chord tolerance.

†† If no deviation distance is specified, the chord tolerance defaults to a chord *angle* of 5 degrees.

FP, Fill Polygon

USE: Fills the polygon now in the polygon buffer. Use FP to fill polygons defined in polygon mode and by the edge rectangle and wedge instructions (EA, ER, and EW).

SYNTAX: FP;

FT, Fill Type

USE: Selects the shading pattern for filling polygons, rectangles, or wedges. Use this instruction to enhance charts with solid fill, parallel lines (hatching), or cross-hatching patterns.

SYNTAX: FT *type(,spacing (,angle))*; or FT;

Parameter	Format	Range	Default
type	integer	1 to 4*	1
spacing	current units	0 to 32 767**	depends on type
angle	real	0 to 90 degrees**	0

* Practical range; actual range is 1 to 6 for compatibility with other HP plotters. This plotter uses the default fill type for values of 5 and 6.

** Practical range; actual range is -32 768.9999 to 32 767.9999.

GM, Graphics Memory

USE: Allocates memory to two of the three buffers in the configurable graphics memory.

SYNTAX: GM *(polygon buffer)(,reserved buffer)(,reserved buffer) (,reserved buffer)(,pen sort buffer)*; or GM;

Parameter	Format	Range	Default
polygon buffer	integer	0 to 31 887 bytes	1024 bytes
reserved*	integer	0	0
reserved*	integer	0	0
reserved*	integer	0	0
pen sort buffer	integer	12 to 31 889 bytes	29 852 bytes

* The plotter does not have these buffers and ignores any values in these positions. These parameter positions provide compatibility with other HP plotters.

IM, Input Mask

USE: Controls which HP-GL errors are reported. If you are using an HP-IB interface, you can also use IM to control the conditions that cause an HP-IB service request or a positive response to a parallel poll.

SYNTAX: IM *E-mask value(,S-mask value(,P-mask value))*; or IM;

Parameter	Format	Range	Default
E-mask value	integer	0 to 255	223
S-mask value	integer	0 to 255	0
P-mask value	integer	0 to 255	0

IN, Initialize

USE: Resets most plotter conditions to their default settings. Use this instruction to return the plotter to a known state and to cancel settings that may have been changed by a previous program. You can find a list of the default values set by both DF and IN at the end of this appendix.

SYNTAX: IN;

IP, Input P1 and P2

USE: Establishes new or default locations for the scaling points P1 and P2. P1 and P2 are used by the scaling instruction (SC) to establish user-unit scaling. The IP instruction is often used to ensure that a plot is always the same size, regardless of where P1 and P2 might have been set from the front panel or the size of media loaded in the plotter. You can also use this instruction in advanced techniques such as plotting mirror images, enlarging/reducing plots, and enlarging/reducing relative character size or direction (refer to Chapter 10 in the *Programmer's Reference*).

SYNTAX: IP *P1X,P1Y(,P2X,P2Y)*; or IP;

Parameter	Format	Range	Default
X,Y coordinates	integer	–32 678 to 32 767 plotter units	depends on media size*

* Refer to the table of plotter unit ranges for various media sizes at the end of this appendix.

IV, Invoke Character Slot

USE: Invokes a character set slot into either the right or left half of the in-use code table. Primarily used with ISO modes of character selection.

SYNTAX: IV *(slot,(left))*; or IV;

Parameter	Format	Range	Default
slot	integer	0 to 1 (HP modes) 0 to 3 (ISO modes)	0
left	integer	0 to 1	0

IW, Input Window

USE: Defines a rectangular area, or window, that establishes soft-clip limits. Subsequent programmed pen motion is restricted to this area. Use this instruction when you want to be sure that the plot falls within a specific plotting area.

SYNTAX: IW *X1,Y1,X2,Y2*; or IW;

Parameter	Format	Range	Default
X1,Y1,X2,Y2	integer current units*	-32 768 to 32 767**	current hard-clip limits

* Regardless of scaling, the IW parameters must be integer. They will be interpreted as current units.

* If scaling is on, the range is -8 388 608 to 8 388 607. The plotter converts user units to plotter units before plotting. If the converted number is not within the plotter unit range, the plotter generates an error 3 (number out of range) and ignores the instruction.

LB, Label

USE: Plots text using the current character set. Use this instruction to annotate drawings or create text-only charts.

SYNTAX: LB c...c CHR$(3)

(where CHR$(3) is the ASCII character **ETX** (CTRL-C) or the label terminator you defined using the DT instruction)

Parameter	Format	Range	Default
c ... c	label	any ASCII character	none

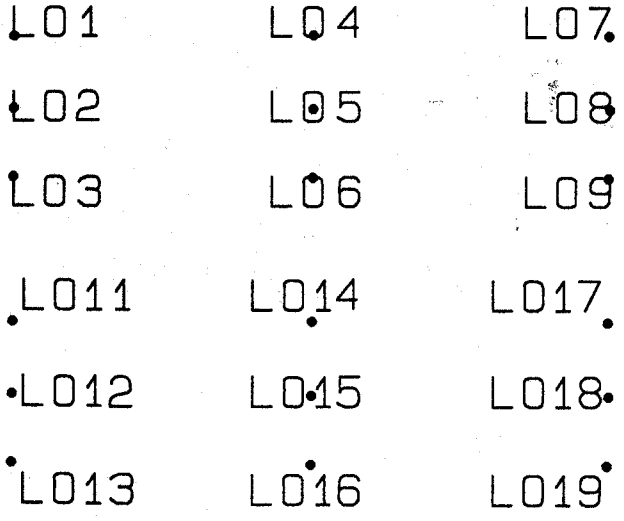
LO, Label Origin

USE: Positions labels relative to current pen location. Use LO to center, left justify, or right justify labels. The label can be drawn above or below the current pen location and can also be offset by an amount equal to $^1/_2$ the character's width and height.

SYNTAX: LO *position number*;

Parameter	Format	Range	Default
position number	integer	1 to 9 or 11 to 19	1

The label origins for each position number are shown in the following figure.



LT, Line Type

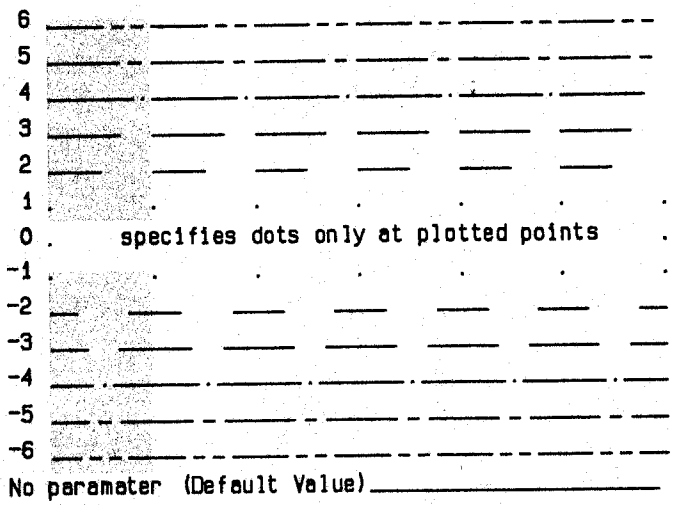
USE: Specifies the line pattern to use when drawing lines and nonsolid fill types. Use LT to emphasize or de-emphasize plotted lines and shapes.

SYNTAX: LT *pattern number(,pattern length)*; or LT;

Parameter	Format	Range	Default
pattern number	integer	-6 to 6	no parameter solid line
pattern length	real	0 to 100* percentage	4% of the distance between P1 and P2

* Practical range; if scaling is on, the range is -8 388 608.9999 to 8 388 607.9999. The plotter converts user units to plotter units before plotting. If the converted number is not within the plotter unit range, the plotter generates an error 3 (number out of range) and ignores the instruction.

The line types for each pattern number are shown in the following figure.



NR, Not Ready

USE: Programmatically simulates pressing the control-panel VIEW button. However, you cannot take the plotter out of the VIEW state with the NR instruction. You must use the control-panel button or load a new sheet of media.

Since the DraftPro DXL and EXL are manual sheet feed plotters, they cannot automatically plot a series of plot files on separate sheets of media. If you are using an extended buffer cartridge on your plotter and you want to send a series of plot files to the plotter, you must include an NR instruction at the end of each file. The NR instruction causes plotting to stop and the control-panel VIEW light to turn on. Loading a new sheet of media will cause the plotter to resume plotting.

SYNTAX: NR;

OA, Output Actual Pen Status

USE: Outputs the current pen location (in plotter units) and up/down position. You can use this information to position a label or figure, to determine the parameters of some desired window, or to determine the pen's current location if it has been moved using control-panel cursor buttons.

NOTE: When in digitize mode, use the OD (Output Digitized Point) instruction to determine the above information.■

SYNTAX: OA;

RESPONSE: X, Y, pen status

Components	Format	Range
X, Y coordinates	integer	-32 678 to 32 767*
pen status	integer	0 (up) or 1 (down)

* Limited to the current hard-clip limits.

OC, Output Commanded Pen Status

USE: Outputs the location (X,Y coordinates) and up/down position of the last commanded pen move. Use this instruction to position a label or determine the parameters of an instruction that tried to move the pen beyond the limits of some window. You can also use this instruction when you want to know the pen's location in user units.

SYNTAX: OC;

RESPONSE: X, Y, pen status

Components	Format	Range
X, Y coordinates	current units	-32 678 to 32 767*
pen status	integer	0 (up) or 1 (down)

* If scaling is on, the range is -8 388 608.9999 to 8 388 607.9999.
Limited to the current hard-clip limits.

OD, Output Digitized Point and Pen Status

USE: Outputs the X,Y coordinates and up/down pen position associated with the last digitized point. Use this instruction after the DP instruction to return the coordinates of the digitized point to your computer.

SYNTAX: OD;

RESPONSE: X, Y, pen status

Components	Format	Range
X, Y coordinates	current units	-32 678 to 32 767*
pen status	integer	0 (up) or 1 (down)

* If scaling is on, the range is -8 388 608 to 8 388 607. The plotter converts user units to plotter units before plotting. If the converted number is not within the plotter unit range, the plotter generates an error 3 (number out of range) and ignores the instruction.
Limited to the current hard-clip limits.

OE, Output Error

USE: Outputs a number corresponding to the type of HP-GL error (if any) received by the plotter after the most recent IN instruction, control-panel reset, or OE instruction. Use this instruction for debugging programs. You can find a list of HP-GL error numbers and their meanings at the end of this appendix.

SYNTAX: OE;

RESPONSE: error number

Component	Format	Range
error number	integer	0 to 7

OF, Output Factors

USE: Outputs the number of plotter units per millimetre in each axis. This instruction lets you use the plotter with software that needs to know the size of a plotter unit.

SYNTAX: OF;

RESPONSE: 40, 40

Component	Format	Range
40, 40	integer	none

OH, Output Hard-Clip Limits

USE: Outputs the X,Y coordinates (in plotter units) of the current hard-clip limits (lower-left corner (LL) and upper-right corner (UR)). Use this instruction to determine the plotter unit dimensions of the area in which plotting can occur.

SYNTAX: OH;

RESPONSE: XLL, YLL, XUR, YUR

Components	Format	Range
XLL, YLL, XUR, YUR	integer	-32 678 to 32 767

OI, Output Identification

USE: Outputs the plotter's identifying model number. This information is useful in a remote operating configuration (where several plotters are connected to the computer) to determine which plotter model is on-line, or when software needs the plotter's model number.

SYNTAX: OI;

RESPONSE: model number

Component	Format	Range
model number	character string	7575A or 7576A

OO, Output Options

USE: Outputs eight option parameters showing the features implemented on the plotter. Some software packages use this feature to determine which plotter capabilities exist.

SYNTAX: OO;

RESPONSE: n,n,n,n,n,n,n,n

Parameter	Response	Format	Range
none	c, 1, 0, 0, 1, 1, 0, 1	integer	0 or 1

OP, Output P1 and P2

USE: Outputs the X,Y coordinates (in plotter units) of the current scaling points P1 and P2. Use this instruction to determine the numeric coordinates of P1 and P2 when they have been set manually, and to help compute the number of plotter units per user unit when scaling is on. This instruction can also be used with the input window (IW) instruction to programmatically set the window to P1 and P2.

SYNTAX: OP;

RESPONSE: P1X, P1Y, P2X, P2Y

Components	Format	Range
P1X, P1Y, P2X, P2Y	integer	-32 678 to 32 767*

* Except that P2 tracks P1 and may be outside this range.

OS, Output Status

USE: Outputs the decimal value of the status byte. Use this instruction in debugging operations and in digitizing applications.

SYNTAX: OS;

RESPONSE: status number

Components	Format	Range
status number	integer	0 to 255

OT, Output Carousel Type

USE: Increases compatibility with other plotters. This plotter cannot distinguish what type of pen carousel is present.

SYNTAX: OT;

RESPONSE: −1, 255

Components	Format	Range
−1, 255	integer	none

OW, Output Window

USE: Outputs the X,Y coordinates of the lower-left (LL) and upper-right (UR) corners of the window area in which plotting can occur. This instruction is especially useful when the window area (defined by IW) extends beyond the hard-clip limits.

SYNTAX: OW;

RESPONSE: XLL, YLL, XUR, YUR

Components	Format	Range
XLL, YLL, XUR, YUR	integer* current units	−32 678 to 32 767**

* Regardless of scaling, the plotter reports in integers.
** If scaling is on, the range is −8 388 608 to 8 388 607. Limited to the current hard-clip limits.

PA, Plot Absolute

USE: Establishes absolute plotting mode and moves the pen to specified absolute coordinates using the current pen position.

SYNTAX: PA *X,Y(,...)*; or PA;

Parameter	Format	Range	Default
X,Y coordinates	current units	-32 768 to 32 767*	none

* If scaling is on, the range is -8 388 608.9999 to 8 388 607.9999. The plotter converts user units to plotter units before plotting. If the converted number is not within the plotter unit range, the plotter generates an error 3 (number out of range) and ignores the instruction.

PD, Pen Down

USE: Lowers the pen onto the writing surface for drawing.

SYNTAX: PD *X,Y(,...)*; or PD;

Parameter	Format	Range	Default
X,Y coordinates	current units	-32 768 to 32 767*	none

* If scaling is on, the range is -8 388 608.9999 to 8 388 607.9999. The plotter converts user units to plotter units before plotting. If the converted number is not within the plotter unit range, the plotter generates an error 3 (number out of range) and ignores the instruction.

PE, Encoded Polyline

USE: Incorporates the plot absolute, plot relative, pen down, pen up, and select pen (PA, PR, PD, PU, and SP) instructions and allows you to reduce the size of your file by representing vectors in base 64 or base 32. Using the PE instruction can quadruple your transmission throughput.

SYNTAX: PE *((flag)(value)X,Y...(flag)value)X,Y);*

NOTE: *Do not use commas* with this instruction; parameter values are self-terminating. Also, you *must* use a semi-colon to terminate PE.■

Parameter	Format	Range	Default
flag	character	':', '<', '>','=', or '7'	none
value	character	flag dependent	none
X,Y coordinates	integer	-32 768 to 32 767*	none

* If scaling is on, PE has an extended range of -8 388 608 to 8 388 607 plotter units. If the current pen location goes out of this range, the plotter ignores plotting instructions until it receives an absolute PA or PE coordinate within the extended range.

The plotter converts user units to plotter units before plotting. If the converted number is not within the plotter unit range, the plotter generates an error 3 (number out of range) and ignores the instruction.

PM, Polygon Mode

USE: Enters polygon mode for defining shapes such as block letters, logos, surface charts, or any unique or intricate area, and exits for subsequent filling and/or edging. Fill polygons using the fill polygon (FP) instruction and/or outline them using the edge polygon (EP) instruction.

SYNTAX: PM *n*; or PM;

Parameter	Format	Range	Default
n	integer	0, 1, and 2	0

PR, Plot Relative

USE: Establishes relative plotting mode and moves the pen to specified points, each successive move relative to the current pen location.

SYNTAX: PR *X,Y(,...)*; or PR;

Parameter	Format	Range	Default
X,Y increments	current units	−8 388 608.9999 to 8 388 607.9999*	none

* In relative plotting, whether or not scaling is on, the plotter accepts this parameter range. It then converts user units to plotter units before plotting. If the converted number is not within the plotter unit range (−32 768 to 32 767), the plotter generates an error 3 (number out of range) and ignores the instruction.

PT, Pen Thickness

USE: Determines the spacing between the parallel lines in solid fill patterns according to the pen tip thickness.

SYNTAX: PT *pen thickness*; or PT;

Parameter	Format	Range	Default
pen thickness	real	0.1 to 5.0 millimetres	0.3 millimetres

PU, Pen Up

USE: Raises the pen from the plotting surface. Use this instruction to move the pen to the beginning of the next line without drawing stray lines.

SYNTAX: PU *X,Y(,...)*; or PU;

Parameter	Format	Range	Default
X,Y coordinates	current units	−32 768 to 32 767*	none

* If scaling is on, the range is −8 388 608.9999 to 8 388 607.9999. The plotter converts user units to plotter units before plotting. If the converted number is not within the plotter unit range, the plotter generates an error 3 (number out of range) and ignores the instruction.

RA, Fill Rectangle Absolute

USE: Fills a rectangular area defined by absolute coordinates. Use this instruction to fill rectangles required by chart legends, logos, and other plots. To outline a rectangle using absolute coordinates, use the EA instruction.

SYNTAX: RA *X,Y*;

Parameter	Format	Range	Default
X,Y coordinates	current units	-32 768 to 32 767*	none

* If scaling is on, the range is -8 388 608.9999 to 8 388 607.9999. The plotter converts user units to plotter units before plotting. If the converted number is not within the plotter unit range, the plotter generates an error 3 (number out of range) and ignores the instruction. Refer to *Units of Measure and Scaling* in Chapter 2.

RO, Rotate Coordinate System

USE: Rotates the plotter's coordinate system 90 degrees about the plotter-unit coordinate origin. This instruction allows you to orient your plot vertically or horizontally.

SYNTAX: RO *n*; or RO;

Parameter	Format	Range	Default
n	integer	0 or 90 degrees	0 degrees

RR, Fill Relative Rectangle

USE: Fills a rectangular area defined using relative coordinates. Use this instruction to fill rectangles required by chart legends, logos, and other plots. To outline a rectangle using relative coordinates, use the ER instruction.

SYNTAX: RR *X,Y*;

Parameter	Format	Range	Default
X,Y increments	current units	-32 768 to 32 767*	none

* If scaling is on, the range is -8 388 608.9999 to 8 388 607.9999. The plotter converts user units to plotter units before plotting. If the converted number is not within the plotter unit range, the plotter generates an error 3 (number out of range) and ignores the instruction.

SA, Select Alternate Character Set

USE: Selects the alternate character set (already designated by the CA instruction) for subsequent labeling. Use this instruction to shift from the standard set to the designated alternate set.

SYNTAX: SA;

SC, Scale

USE: Establishes a user-unit coordinate system by mapping user-defined coordinate values onto the scaling points P1 and P2. Thus, you can plot in units convenient to your application. For a discussion of the basic concept of scaling, refer to *Scaling* in Chapter 3 of the *Programmer's Reference*.

SYNTAX: SC *Xmin,Xmax,Ymin,Ymax*; or SC;

Parameter	Format	Range	Default
Xmin, Xmax, Ymin, Ymax	integer	–8 388 608 to 8 388 607*	none

* The plotter converts user units to plotter units before plotting. If the converted number is not within the plotter unit range (–32 768 to 32 767), the plotter generates an error 3 (number out of range) and ignores the instruction.

SG, Select Pen Group

USE: Selects a specified pen for plotting, or returns the current pen to the carousel. This instruction provides partial compatibility with other plotters and works the same as the select pen (SP) instruction.

SYNTAX: SG *pen number*;

Parameter	Format	Range	Default
pen number	integer	0 to 8	none

SI, Absolute Character Size

USE: Specifies the size of labeling characters in centimetres. Use this instruction to establish character sizing that is not dependent on the settings of P1 and P2.

SYNTAX: SI *width, height*; or SI;

Parameter	Format	Range	Default
width	real	−110 to 110*	0.285 cm
height	real	−110 to 110*	0.375 cm

* Parameter cannot equal zero (0).
Practical range; allowable range is −32 768.9999 to 32 767.9999.

SL, Slant Character

USE: Specifies the slant at which label characters are drawn. Use this instruction to create slanted text for emphasis, or to reestablish upright labeling after an SL instruction with parameters has been in effect.

SYNTAX: SL *tangent*; or SL;

Parameter	Format	Range	Default
tangent	real	−3.5 to 3.5*	0 (no slant)

* Practical range; allowable range is −32 768.9999 to 32 767.9999.

SM, Symbol Mode

USE: Draws the specified symbol at each X,Y coordinate with PA, PD, PE, PR, and PU instructions. Use SM to create scattergrams, show points on geometric drawings, and differentiate data points on multiline graphs.

Note that a second character allows access to Kanji characters in symbol mode. Refer to Appendix D for details concerning accessing Kanji characters.

SYNTAX: SM *character(character)*; or SM;

Parameter	Format	Range	Default
character	label	most printing characters (decimal codes 33–58 and 60–126)*	none

* Decimal code 59 (the semicolon) is an HP-GL terminator and cannot be used as a symbol in any character set. Use it only to cancel symbol mode (e.g., SM;). You can also terminate symbol mode by sending any of the ASCII control characters (decimal codes 0–32).

SP, Select Pen

USE: Loads specified pen into the pen holder. Use the SP instruction to change pen colors or widths during a plot. At the end of every program, use SP to return the pen to the carousel.

SYNTAX: SP *pen number*; or SP;

Parameter	Format	Range	Default
pen number	integer	0 to 8	0

SR, Relative Character Size

USE: Specifies the relative size of characters as a percentage of the distance between scaling points P1 and P2. Use this instruction to establish relative character sizes so that if the P1/P2 distance changes, the character sizes adjust to occupy the same relative amount of space.

SYNTAX: SR *width,height*; or SR;

Parameter	Format	Range	Default
width	real	-100 to 100 percent* of P2X - P1X	0.285 cm
height	real	-100 to 100 percent* of P2X - P1X	0.375 cm

* Parameter cannot be zero (0).
Practical range; allowable range is -32 768.9999 to 32 767.9999.

SS, Select Standard Character Set

USE: Selects the standard set (already designated by the CS, Designate Standard Character Set, instruction) for subsequent labeling. Use this instruction to shift from the alternate set to the designated standard set.

SYNTAX: SS;

TL, Tick Length

USE: Specifies the length of the tick marks produced by the tick instructions (XT and YT). Use this instruction to adjust both the positive and negative portions of tick marks, and to establish a tick length for drawing grids.

SYNTAX: TL *positive tick(,negative tick)*; or TL;

Parameter	Format	Range	Default
positive tick length	real	−100 to 100 percentage*	0.5% of |P2X −P1X| and |P2Y −P1Y|
negative tick length	real	−100 to 100 percentage*	0.5% of |P2X −P1X| and |P2Y −P1Y|

* Practical range; allowable range is −32 768.9999 to 32 767.9999.

UC, User-defined Character

USE: Draws characters of your own design. Use this instruction to create characters or symbols not included in the plotter's character sets or to draw logos.

SYNTAX: UC *(pen control,)X-increment,Y-increment(, . . .)(,pen control)(, . . .)*; or UC;

Parameter	Format	Range	Default
pen control	integer	−9999 to −32 768* = pen up +9999 to +32 768* = pen down	pen up
X-, Y-increments	integer	−9998 to 9998	none

* Practical range; actual range is −32 768 to 32 767.

VS, Velocity Select

USE: Specifies pen speed. Use the instruction to optimize line quality and pen life for each pen and media combination. Increase line quality and create a slightly thicker line on any media by slowing the pen speed.

SYNTAX: VS *pen velocity(,pen number)*; or VS;

Parameter	Format	Range	Default
pen velocity	integer	1 to 80	40 cm/s
pen number	integer	1 to 8	all pens

WG, Wedge Fill

USE: Defines and fills any sector of a circle. Use this instruction with different fill types, line types, and pen thicknesses to produce individualized wedges.

SYNTAX: WG *radius,start angle,sweep angle(,chord tolerance)*;

Parameter	Format	Range	Default
radius	current units	−32 768 to 32 767*	none
start angle	real	−360 to 360 degrees**	none
sweep angle	real	−360 to 360 degrees**	none
chord tolerance chord angle†	real	0.1 to 180 degrees**	5 degrees
chord deviation	current units	−32 768 to 32 767*	5 degrees††

* If scaling is on, the range is −8 388 608.0000 to 8 388 607.9999. The plotter converts user units to plotter units before plotting. If the converted number is not within the plotter unit range, the plotter generates an error 3 (number out of range) and ignores the instruction.

** Practical range; allowable range is −32 768.9999 to 32 767.9999.

† Chord angle is the default interpretation of chord tolerance.

†† If no deviation distance is specified, the chord tolerance defaults to a chord *angle* of 5 degrees.

XT, X-Tick

USES: Draws a vertical (parallel to the Y-axis) tick at the current pen location. Use this instruction to draw vertical tick marks on axes, grid lines, or lines centered on or starting at the current pen location.

SYNTAX: XT;

YT, Y-Tick

USE: Draws a horizontal (parallel to the X-axis) tick at the current pen location. Use this instruction to draw horizontal tick marks on axes, grid lines, or lines centered on or starting with the current pen location.

SYNTAX: YT;

Device-Control Instructions

All device-control instructions are valid for RS-232-C and HP-IB configurations except where noted. The following list of device-control instructions includes the use, syntax, parameter range (if any), and response for each instruction. Unlike HP-GL instructions, device-control instructions that do not have parameters require no terminator. However, device-control instructions that have parameters require a *colon* (:) as a terminator, whether or not you use any parameters. The terminator sent by the plotter at the end of an output response is **CR LF** in an HP-IB configuration and **CR**, or as set by an ESC.M instruction, in an RS-232-C/CCITT V.24 configuration.

ESC.@, Set Plotter Configuration

USE: *For RS-232-C users*, this instruction sets an effective logical I/O buffer size and controls hardwire handshake, communications protocol, monitor modes 1 and 2, and block I/O error checking.

For HP-IB users, sets an effective logical I/O buffer size. Use the instruction to enlarge the logical I/O buffer.

SYNTAX: **ESC.@** *(logical I/O buffer size);(I/O conditions)*:

Parameter	Format	Range	Default
logical I/O buffer size	integer	1 to 31 888 bytes	1024 bytes
I/O conditions	integer	0 to 31*	3

* This is the practical range. The actual range the plotter accepts is 0 to 32 767. We recommend that you restrict your values to the practical range specified.

ESC.A, Output Identification

USE: Outputs the plotter's model number.

SYNTAX: **ESC.A**

RESPONSE: model number, firmware revision level

Components	Format	Range
model number	character string	7575A or 7576A
firmware revision level	integer	001 to 999

ESC.B, Output Buffer Space

USE: Outputs the plotter's currently available logical I/O buffer space.

SYNTAX: ESC.B

RESPONSE: available logical I/O buffer space

Components	Format	Range
available logical I/O buffer space	integer	1 to 31 888

ESC.E, Output Extended Error

USE: *For RS-232-C users*, this instruction outputs any RS-232-C related I/O error and turns off the control-panel error light (unless an HP-GL error has also occurred). Use this instruction when debugging a program to determine which errors have occurred. Additionally, when used in conjunction with the ESC.@ instruction, you can perform block I/O error checking. You can find a list of device-control error numbers and their meanings at the end of this appendix.

For HP-IB users, this instruction outputs a number defining a device-control error and turns off the control-panel error light (unless an HP-GL error has also occurred). Use the instruction to determine what type of device-control instruction error has occurred (if any). You can find a list of device-control error numbers and their meanings at the end of this appendix.

SYNTAX: ESC.E

RESPONSE: error number

Components	Format	Range
error number	integer	0, 10 to 18

ESC.H, Set Handshake Mode 1

USE: Configures the plotter for enquire/acknowledge handshake when the computer requires the parameters of ESC.M and ESC.N be used during the handshaking sequence.

Use the ESC.H instruction in systems where the output trigger character, echo terminator, and output terminator must be used with the enquire and acknowledge exchange in addition to being used with plotter output responses.

SYNTAX: **ESC.H** *(data block size);(enquiry character);(acknowledgment string)*: or **ESC.H:**

Parameter	Format	Range	Default
data block size	integer	0 to 31 888 bytes*	80 bytes
enquiry character	ASCII value	0 to 26, 28 to 126**	0 (no character)
acknowledgment string	ASCII value	0 to 126	0 (no character)

* This is the practical range. The actual range the plotter will accept is 0 to 32 767.

** Printable characters (ASCII codes 32 to 126) should be avoided as they are required to send the HP-GL instructions. The recommended characters are those with codes 1-26 and 28-31

ESC.I, Set Handshake Mode 2 (Operating System)

USE: Configures the plotter for either the Xon-Xoff or Enquire/Acknowledge handshakes when the computer does not expect the parameters of the ESC.M and ESC.N instructions to be used during the handshaking sequence. This is often true when the handshake protocol is part of the computer's operating system.

SYNTAX: Depends on the handshake being configured.

Xon-Xoff: ESC.I *(Xoff threshold level);(omitted);(Xon trigger character(s))*:

Parameter	Format	Range	Default
Xoff threshold level	integer	*	80 bytes
omitted parameter			
Xon trigger character(s)	ASCII value	decimal codes 0 to 126**	0 (no character)

* The practical range is one byte less than the logical I/O buffer size. The actual range the plotter will accept is 0 to 32 767; however, any value greater than the logical buffer size is changed to one byte less than the logical I/O buffer size.

** You can enter up to 10 character codes for the Xon trigger characters.

Enquire/Acknowledge: ESC.I *(data block size);(enquiry character); (acknowledgment string)*:

Parameter	Format	Range	Default
data block size	integer	0 to 31 888 bytes*	80 bytes
enquiry character	ASCII value	0 to 26, 28 to 126**	0 (no character)
acknowledgment string	ASCII value	decimal codes 0 to 126†	0 (no character)

* This is the practical range. The actual range the plotter will accept is 0 to 32 767, however, any value greater than the practical range is changed to one byte less than the logical I/O buffer size.

** Printable characters (ASCII codes 32 to 126) should be avoided as they are required to send the HP-GL instructions. The recommended characters are those with codes 1-26 and 28-31

† You can enter up to 10 ASCII character codes for the acknowledgment string.

ESC.J, Abort Device-Control

USE: Aborts any device-control instruction that may be partially decoded or executed. Use this instruction in an initialization sequence when you first access the plotter.

SYNTAX: ESC.J

ESC.K, Abort Graphics

USE: Aborts any partially decoded HP-GL instruction and discards remaining instructions in the input and pen sort buffers. Use this instruction as part of an initialization sequence when starting a new program or to terminate plotting of HP-GL instructions in the buffer.

SYNTAX: ESC.K

ESC.L, Output Buffer Size When Empty

USE: Outputs the size (in bytes) of the logical input buffer. The response is not transmitted by the plotter until the buffer is empty.

SYNTAX: ESC.L

RESPONSE: logical I/O buffer size

Components	Format	Range
logical input buffer size	integer	1 to 31 888

ESC.M, Set Output Mode

USE: Establishes parameters for the plotter's communication format. Use the instruction to establish a turnaround delay, an output trigger character, an echo terminator, and an output initiator character. Also use it to change the output terminator from its default value, ASCII decimal code 13 (carriage return).

SYNTAX: **ESC.M** *(turnaround delay);(output trigger character); (echo terminator);(output terminator(,output terminator)); (output initiator character)*:

Parameter	Format	Range	Default
turnaround delay	integer	0 to 32 767 milliseconds	0
output trigger character	ASCII value	character codes 0 to 4, 6 to 26, and 28 to 126	0 (no character)
echo terminator	ASCII value	character codes 0 to 4, 6 to 26, and 28 to 126	0 (no character)
output terminator	ASCII value	one or two character codes 0 to 4, 6 to 26, and 28 to 126	13 (carriage return)
output initiator	ASCII value	character codes 0 to 126	0 (no character)

ESC.N, Set Extended Output and Handshake Mode

USE: Establishes parameters for the plotter's communication format. Use this instruction to specify an intercharacter delay in all handshake modes and either the immediate response string for enquire/acknowledge handshake or the Xoff trigger character(s) for the Xon-Xoff handshake.

SYNTAX: ESC.N *(intercharacter delay);(handshake dependent parameter)*:

Parameter	Format	Range	Default
intercharacter delay	integer	0 to 32 767 milliseconds	0
handshake dependent parameter For Xon-Xoff: Xoff trigger character(s)	ASCII value	characters 0 to 126*	0 (no character)
For Enquire/Acknowledge: immediate response string	ASCII value	characters 0 to 126*	0 (no character)

* You can enter up to 10 ASCII codes (separated by semicolons) for either the Xoff trigger characters or the Enquire/Acknowledge immediate response string.

ESC.O, Output Extended Status

USE: Outputs the plotter's extended status. Use this instruction to obtain information about the current operating status of the plotter.

SYNTAX: ESC.O

RESPONSE: operating status

Components	Format	Range
operating status	integer	0 to 314

ESC.P, Set Handshake Mode

USE: Sets one of four standard handshakes.

SYNTAX: ESC.P *n*: or ESC.P:

Parameter	Format	Range	Default
n	integer	0 (none) 1 (Xon-Xoff) 2 (ENQ-ACK) 3 (hardwire)	3

ESC.Q, Set Monitor Mode

USE: Enables or disables either monitor mode 1 (parse) or monitor mode 2 (receive). Use this instruction as a debugging aid in program development. This instruction is valid only when the rear-panel **Eavesdrop** switch is on and you are using an RS-232-C interface (refer to the Appendix E for more information).

SYNTAX: ESC.Q *n*:

Parameter	Format	Range	Default
n	integer	0 (none) 1 (parse) 2 (receive)	0

ESC.R, Reset

USE: Resets certain I/O conditions to power-up default states. Use this instruction to establish known conditions when starting a new plot.

SYNTAX: ESC.R

ESC.S, Output Configurable Memory Size

USE: Outputs the total memory size of user-definable RAM, or the memory space available in one of its three buffers: the physical I/O buffer, pen sort buffer, or polygon buffer. Use this instruction to determine how much memory is now allocated to each buffer or to confirm the allocation performed by GM, ESC.T, or ESC.R.

SYNTAX: ESC.S *n*:

Parameter	Format	Range	Default
n	integer	0 (total configurable memory) 1 (physical I/O buffer) 2 (polygon buffer) 3 (not used) 4 (not used) 5 (not used) 6 (pen sort buffer)	0

RESPONSE: total configurable memory *or*
physical I/O buffer *or*
polygon buffer *or*
pen sort buffer

Components	Format	Range
total configurable memory	integer	31 900 bytes
physical I/O buffer	integer	1 to 31 888 bytes
polygon buffer	integer	0 to 31 887 bytes
not used	integer	0
not used	integer	0
not used	integer	0
pen sort buffer	integer	12 to 31 899 bytes

ESC.T, Allocate Configurable Memory

USE: Allocates memory in user-definable RAM, which consists of three buffers: the physical I/O buffer, polygon buffer, and pen sort buffer. Use this instruction to change the sizes of these buffers as needed.

SYNTAX: ESC.T *(physical I/O buffer);(polygon buffer);0;0; 0;(pen sort buffer)*:

Parameter	Format	Range	Default
physical I/O buffer size	integer	1 to 31 888 bytes	1024 bytes
polygon buffer size	integer	0 to 31 887 bytes	1024 bytes
reserved			0 bytes
reserved			0 bytes
reserved			0 bytes
pen sort buffer size	integer	12 to 31 899 bytes	29 852 bytes

ESC.Y or ESC.(, Plotter On

USE: Enables the plotter to accept data and interpret it as graphics or device-control instructions. Use this instruction in Eavesdrop (RS-232-C interface only) to establish programmed-on operation.

SYNTAX: ESC.Y or ESC.(

ESC.Z or ESC.), Plotter Off

USE: Disables the plotter so that it accepts only a plotter-on instruction. Use this instruction in Eavesdrop (RS-232-C interface only) to establish programmed-off operation.

SYNTAX: ESC.) or ESC.Z

Conditions Established by the Default (DF) Instruction

Function	Equivalent Instruction	Default Condition
Pen Control	AP;	Lifts or stores a motionless pen after 15 seconds. Selects a pen only when it is required to draw. Pen sort is disabled. If previously enabled, the plotter executes the buffer before proceeding.*
Alternate Character Set	CA;	ANSI ASCII English (Character set 0).
Character Selection Mode	CM;	HP 7-bit mode.
Standard Character Set	CS;	ANSI ASCII English.
Chord Tolerance	CT;	Chord angle of 5 degrees.
Digitize Clear	DC;	Terminates digitize mode and turns off front-panel **ENTER** light.
Direction Absolute	DI1,0;	Horizontal characters.
Label Terminator	DT;	**ETX**, ASCII decimal code 3.
Direction Vertical	DV;	Off (set to horizontal).
Extra Space	ES0,0;	No extra character space.
Fill Type	FT;	Type 1, solid bidirectional fill. Spacing is 1% of P1/P2 X-axis distance. Angle is at zero degrees.
Input Mask	IM233,0,0;	Recognizes all defined errors.
Input Window	IW;	Set to hard-clip limits.

*Valid only when rear-panel pen sort switch is off.

(Table continues)

Function	Equivalent Instruction	Default Condition
Label Origin	LO1;	Standard labeling starting at current location.
Line Type	LT;	Solid line (pattern length is 4% of P1/P2 diagonal distance.
Plotting Mode	PA;	Absolute.
Polygon Mode	PM0;PM2;	Polygon buffer cleared.
Pen Thickness	PT;	0.3 mm.
Scaling	SC;	User-unit scaling off.
Character Size Absolute	SI;	Absolute size: Width = 0.285 cm Height = 0.375 cm
Character Slant	SL;	No slant.
Symbol Mode	SM;	Off.
Character Set	SS;	Standard character set selected.
Tick length	TL;	Positive and negative tick marks are 5% of |P2X - P1X| and |P2Y - P1Y|.

In addition, the DF instruction updates the carriage-return point for labeling instructions to the current pen location.

Conditions Established by the Initialize (IN) Instruction

The IN instruction sets the plotter to the same conditions as the DF instruction, with the following *additional* conditions.

- Raises the pen.
- Sets P1, P2, and the axis-align point 600 plotter units within the current hard-clip limits (unless **EXPAND** is on, then it is 200 plotter units).

  When you establish a new axis align point, the plotter establishes new hard-clip limits. To subsequently send IN sets P1, P2, and the axis align point 600 plotter units within the *new* hard-clip limits (unless **EXPAND** is on, then it is 200 plotter units).
- Sets bit position 3 of the status byte to 1 (to indicate the plotter has been initialized).
- Clears any HP-GL error and I/O error conditions.

The IN instruction does not affect the pen speed, rotation, or buffer sizes.

Error Numbers and Their Meanings

Use the OE instruction to output HP-GL error numbers.

HP-GL Errors	
Error Number	**Meaning**
0	No error
1	Instruction not recognized
2	Wrong number of parameters
3	Out of range number, or illegal character
4	Not used
5	Unknown character set
6	Position overflow (not reported with default E-mask value)
7	Buffer overflow for polygons
8	Not used

Use the ESC.E instruction to output device-control errors.

Device-Control Errors	
Error No.	**Meaning**
10	Output instruction received while another output instruction is executing. The original instruction will continue normally; the second instruction received will be ignored.
11	Invalid byte received after first two characters, ESC., in a device-control instruction.
12	Invalid byte received while parsing a device control instruction. The parameter containing the invalid byte and all following parameters are defaulted.
13	Parameter out of range.
14	Too many parameters received. Additional parameters beyond the proper number are ignored; parsing of the instruction ends when a colon (normal exit) or the first byte of another instruction is received (abnormal exit).
15	A framing error, parity error, or overrun error has been detected.
16	The input buffer has overflowed. As a result, one or more bytes of data have been lost, and therefore, an HP-GL error will probably occur.
17	Baud rate mismatch or full-duplex data communication is selected and conditions for data transmission are not met, i.e., cabling is configured for three-wire communications.
18	I/O error of indeterminate cause.

Media Sizes: Dimensions and Plotter Unit Values

Normal Plot Size
(EXPAND: OFF)

Paper Size	Default Scaling Points P1	Default Scaling Points P2	Hard-Clip Plotting Range		Maximum Plotting Area (X and Y)
	P1X,P1Y	P2X,P2Y	X-axis	Y-axis	
A (vertical)	-3908,-3118	3908,3118	±4508	±3718	225.4 X 185.9 mm (8.87 X 7.32 in.)
A (horizontal)	-2638,-4388	2638,4388	±3238	±4988	161.9 X 249.4 mm (6.37 X 9.82 in.)
B (vertical)	-6956,-4388	6956,4388	±7556	±4988	377.8 X 249.4 mm (14.87 X 9.82 in.)
B (horizontal)	-3908,-7436	3908,7436	±4508	±8036	225.4 X 401.8 mm (8.87 X 15.82 in.)
C (vertical)	-9496,-7436	9496,7436	±10 096	±8036	504.8 X 401.8 mm (19.87 X 15.82 in.)
C (horizontal)	-6956,-9976	6956,9976	±7556	±10 576	377.8 X 528.8 mm (14.87 X 20.82 in.)
D (vertical)	-15 592,-9976	15 592,9976	±16192	±10 576	809.6 X 528.8 mm (31.87 X 20.82 in.)
D (horizontal)	-9496,-16 072	9496,16 072	±10 096	±16 672	504.8 X 833.6 mm (19.87 X 32.82 in.)
E (vertical)	-20 672,-16 072	20 672,16 072	±21 272	±16 672	1063.6 X 833.6 mm (41.87 X 32.82 in.)
A4 (vertical)	-4260,-3000	4260,3000	±4860	±3600	243.0 X 180.0 mm (9.57 X 7.09 in.)
A4 (horizontal)	-2520,-4740	2520,4740	±3120	±5340	156.0 X 267.0 mm (6.14 X 10.51 in.)
A3 (vertical)	-6720,-4740	6720,4740	±7320	±5340	366.0 X 267.0 mm (14.41 X 10.51 in.)
A3 (horizontal)	-4260,-7200	4260,7200	±4860	±7800	243.0 X 390.0 mm (9.57 X 15.35 in.)
A2 (vertical)	-10 200,-7200	10 200,7200	±10 800	±7800	540.0 X 390.0 mm (21.26 X 15.35 in.)
A2 (horizontal)	-6720,-10 680	6720,10 680	±7320	±11 280	366.0 X 564.0 mm (14.41 X 22.20 in.)
A1 (vertical)	-15 120,-10 680	15 120,10 680	±15 720	±11 280	786.0 X 564.0 mm (30.94 X 22.20 in.)
A1 (horizontal)	-10 200,-15 600	10 200,15 600	±10 800	±16 200	540.0 X 810.0 mm (21.26 X 31.89 in.)
A0 (vertical)	-22 080,-15 600	22 080,15 600	±22 680	±16 200	1134.0 X 810 mm (44.65 X 31.89 in.)

(Table continues)

Normal Plot Size
(EXPAND: OFF)

Paper Size	Default Scaling Points P1	Default Scaling Points P2	Hard-Clip Plotting Range		Maximum Plotting Area (X and Y)
	P1X,P1Y	P2X,P2Y	X-axis	Y-axis	
Architectural A (vertical)	-4416,-3372	4416,3372	±5016	±3972	250.8 X 198.6 mm (9.87 X 7.82 in.)
Architectural A (horizontal)	-2892,-4896	2892,4896	±3492	±5496	174.6 X 274.8 mm (6.87 X 10.82 in.)
Architectural B (vertical)	-7464,-4896	7464,4896	±8064	±5496	403.2 X 274.8 mm (15.87 X 10.82 in.)
Architectural B (horizontal)	-4416,-7944	4416,7944	±5016	±8544	250.8 X 427.2 mm (9.87 X 16.82 in.)
Architectural C (vertical)	-10 512,-7944	10 512,7944	±11 112	±8544	555.6 X 427.2 mm (21.87 X 16.82 in.)
Architectural C (horizontal)	-7464,-10 992	7464,10 992	±8064	±11 592	403.2 X 579.6 mm (15.87 X 22.82 in.)
Architectural D (vertical)	-16 608,-10 992	16 608,10 992	±17 208	±11 592	860.4 X 579.6 mm (33.87 X 22.82 in.)
Architectural D (horizontal)	-10 512,-17 088	10 512,17 088	±11 112	±17 688	555.6 X 884.4 mm (21.87 X 34.82 in.)
Architectural E (vertical)	-22 704,-17 088	22 704,17 088	±23 304	±17 688	1165.2 X 884.4 mm (45.87 X 34.82 in.)
RA2 (vertical)	-10 520,-7400	10 520,7400	±11 120	±8000	556.0 X 400.0 mm (21.89 X 15.75 in.)
RA2 (horizontal)	-6920,-11 000	6920,11 000	±7520	±11 600	376.0 X 580.0 mm (14.80 X 22.83 in.)
RA1 (vertical)	-15 520,-11 000	15 520,11 000	±16 120	±11 600	806.0 X 580.0 mm (31.73 X 22.83 in.)
RA1 (horizontal)	-10 520,-16 000	10 520,16 000	±11 120	±16 600	556.0 X 830.0 mm (21.89 X 32.68 in.)
RA0 (vertical)	-22 720,-16 000	22 720,16 000	±23 230	±16 600	1166.0 X 830.0 mm (45.91 X 32.68 in.)
SRA2 (vertical)	-11 120,-7800	11 120,7800	±11 720	±8400	586.0 X 420.0 mm (23.07 X 16.54 in.)
SRA1 (horizontal)	-11 120,-16 800	11 120,16 800	±11 720	±17 400	586.0 X 870.0 mm (23.07 X 34.25 in.)
SRA0 (vertical)	-23 920,-16 800	23 920,16 800	±24 520	±17 400	1226.0 X 870.0 mm (48.27 X 34.25 in.)

Normal Plot Size
(EXPAND: ON)

Paper Size	Default Scaling Points P1	Default Scaling Points P2	Hard-Clip Plotting Range		Maximum Plotting Area (X and Y)
	P1X,P1Y	P2X,P2Y	X-axis	Y-axis	
A (vertical)	-4268,-3518	4268,3518	±4868	±4118	243.4 X 205.9 mm (9.58 X 8.11 in.)
A (horizontal)	-2998,-4788	2998,4788	±3598	±5388	179.9 X 269.4 mm (7.08 X 10.61 in.)
B (vertical)	-7316,-4788	7316,4788	±7916	±5388	395.8 X 269.4 mm (15.58 X 10.61 in.)
B (horizontal)	-4268,-7836	4268,7836	±4868	±8436	243.4 X 421.8 mm (9.58 X 16.61 in.)
C (vertical)	-9856,-7836	9856,7836	±10 456	±8436	522.8 X 421.8 mm (20.58 X 16.61 in.)
C (horizontal)	-7316,-10 376	7316,10 376	±7916	±10 976	395.8 X 548.8 mm (15.58 X 21.61 in.)
D (vertical)	-15 952,-10 376	15 952,10 376	±16 552	±10 976	827.6 X 548.8 mm (32.58 X 21.61 in.)
D (horizontal)	-9856,-16 472	9856,16 472	±10 456	±17 072	522.8 X 853.6 mm (20.58 X 33.61 in.)
E (vertical)	-21 032,-16 472	21 032,16 472	±21 632	±17 072	1081.6 X 853.6 mm (42.58 X 33.61 in.)
A4 (vertical)	-4620,-3400	4620,3400	±5220	±4000	261.0 X 200.0 mm (10.28 X 7.87 in.)
A4 (horizontal)	-2880,-5140	2880,5140	±3480	±5740	174.0 X 287.0 mm (6.85 X 11.30 in.)
A3 (vertical)	-7080,-5140	7080,5140	±7680	±5740	384.0 X 287.0 mm (15.12 X 11.30 in.)
A3 (horizontal)	-4620,-7600	4620,7600	±5220	±8200	261.0 X 410.0 mm (10.28 X 16.14 in.)
A2 (vertical)	-10 560,-7600	10 560,7600	±11 160	±8200	558.0 X 410.0 mm (21.97 X 16.14 in.)
A2 (horizontal)	-7080,-11 080	7080,11 080	±7680	±11 680	384.0 X 584.0 mm (15.12 X 22.99 in.)
A1 (vertical)	-15 480,-11 080	15 480,11 080	±16 080	±11 680	804.0 X 584.0 mm (31.65 X 22.99 in.)
A1 (horizontal)	-10 560,-16 000	10 560,16 000	±11 160	±16 600	558.0 X 830.0 mm (21.97 X 32.68 in.)
A0 (vertical)	-22 440,-16 000	22 440,16 000	±23 040	±16 600	1152.0 X 830.0 mm (45.35 X 32.68 in.)

(Table continues)

Normal Plot Size
(EXPAND: ON)

Paper Size	Default Scaling Points P1	Default Scaling Points P2	Hard-Clip Plotting Range		Maximum Plotting Area (X and Y)
	P1X,P1Y	P2X,P2Y	X-axis	Y-axis	
Architectural A (vertical)	-4776,-3772	4776,3772	±5376	±4372	268.8 X 218.6 mm (10.58 X 8.61 in.)
Architectural A (horizontal)	-3252,-5296	3252,5296	±3852	±5896	192.6 X 294.8 mm (7.58 X 11.61 in.)
Architectural B (vertical)	-7824,-5296	7824,5296	±8424	±5896	421.2 X 294.8 mm (16.58 X 11.61 in.)
Architectural B (horizontal)	-4776,-8344	4776,8344	±5376	±8944	268.8 X 447.2 mm (10.58 X 17.61 in.)
Architectural C (vertical)	-10 872,-8344	10 872,8344	±11 472	±8944	573.6 X 447.2 mm (22.58 X 17.61 in.)
Architectural C (horizontal)	-7824,-11 392	7824,11 392	±8424	±11 992	421.2 X 599.6 mm (16.58 X 23.61 in.)
Architectural D (vertical)	-16 968,-11 392	16 968,11 392	±17 568	±11 992	878.4 X 599.6 mm (34.58 X 23.61 in.)
Architectural D (horizontal)	-10 872,-17 488	10 872,17 488	±11 472	±18 088	573.6 X 904.4 mm (22.58 X 35.61 in.)
Architectural E (vertical)	-23 064,-17 488	23 064,17 488	±23 664	±18 088	1183.2 X 904.4 mm (46.58 X 35.61 in.)
RA2 (vertical)	-10 880,-7800	10 880,7800	±11 480	±8400	574.0 X 420.0 mm (22.60 X 16.54 in.)
RA2 (horizontal)	-7280,-11 400	7280,11 400	±7880	±12 000	394.0 X 600.0 mm (15.51 X 23.62 in.)
RA1 (vertical)	-15 880,-11 400	15 880,11 400	±16 480	±12 000	824.0 X 600.0 mm (32.44 X 23.62 in.)
RA1 (horizontal)	-10 880,-16 400	10 880,16 400	±11 480	±17 000	574.0 X 850.0 mm (22.60 X 33.46 in.)
RA0 (vertical)	-23 080,-16 400	23 080,16 400	±23 680	±17 000	1184.0 X 850.0 mm (46.61 X 33.46 in.)
SRA2 (vertical)	-11 480,-8200	11 480,8200	±12 080	±8800	604.0 X 440.0 mm (23.78 X 17.32 in.)
SRA1 (horizontal)	-11 480,-17 200	11 480,17 200	±12 080	±17 800	604.0 X 890.0 mm (23.78 X 35.04 in.)
SRA0 (vertical)	-24 280,-17 200	24 280,17 200	±24 880	±17 800	1244.0 X 890.0 mm (48.98 X 35.04 in.)

Glossary

ASCII Control Character — A nonprinting ASCII character (decimal codes 0–32 and 127) that starts, modifies, or stops a device function. Control functions affect data processing, transmission, or interpretation.

Acceleration — The rate at which a pen reaches its maximum velocity. Acceleration is measured in centimetres per second per second.

Address — The address specifies the plotter's location on the HP-IB (IEEE-488) interface cable (bus).

BASIC — Beginner's All-purpose Symbolic Instruction Code; a programming language which uses common English words.

Baud Rate — For an RS-232-C interface, the data transmission rate between a computer and a peripheral (bits per second).

Buffer — A part or parts of computer or device memory where data is held until it can be processed. Usually refers to a memory area reserved for I/O operations.

Bus — Short for HP-IB (IEEE-488) interface.

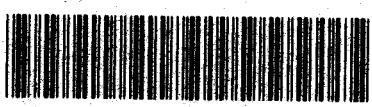
Communication — Data exchange between two or more devices.

Configuration — The way in which computer equipment is set up and interconnected to operate as a system.

Data Communication	The exchange of data between devices.
Debug	To find and correct mistakes in a computer program.
Default	A value or condition that is assumed if no other value or condition is specified.
Digitize	The process of converting a physical location defined by X,Y coordinates into digital information a computer understands.
Eavesdrop (RS-232-C only)	A functional state in which the plotter is physically connected between a computer and a terminal.
Handshake	RS-232-C communication between a computer and the plotter about the availability of I/O buffer space. A handshake ensures correct and complete data transfer.
Hewlett-Packard Graphics Language (HP-GL)	The graphics instruction set that Hewlett-Packard plotters understand.
HP-IB	Short for Hewlett-Packard Interface Bus. Hewlett-Packard's version of IEEE Standard 488-1978 for interfacing programmable devices (e.g., computers, plotters, and printers).
IEEE 488-1978	A parallel interface standard established by the Institute of Electrical and Electronics Engineers.
Initialize	To set plotter conditions to known default values.
Interface	Anything (a cable for example) used to join components of a computer system so they function in a compatible and coordinated fashion. Standards which allow systems to connect with each other; i.e., RS-232-C, HP-IB.

Interface Cable	The data transmission cable used to connect a peripheral device to a computer. Most devices require an RS-232-C, HP-IB (IEEE 488-1978), or Centronics interface cable.
I/O Error	A data transmission error between a computer and peripheral. Examples of I/O errors are mismatched interface conditions, such as baud rate and parity.
Literal String	When using BASIC, any sequence of letters, numbers, and symbols enclosed by quotation marks. The plotter can only accept literal strings or a specific set of ASCII control characters.
Operating System	The computer software or firmware that controls the execution of programs.
P1	A scaling point the plotter uses that generally specifies the location of a plot's lower-left corner.
P2	A scaling point the plotter uses that generally specifies the location of a plot's upper-right corner.
Parallel Interface	An interface type in which a separate line is used for each data bit in a byte or word and all bits are transferred simultaneously.
Parity	An error-checking method for information transfer between a computer and a peripheral device. Parity is used to check the accuracy of binary data.
Peripheral (device)	A device separate from, but used with, a computer. For example, a disc drive, printer, or plotter.
RS-232-C Interface	A serial interface standardized by the Electronic Industries Association Standard RS-232-C.

Repeatability	A measure of how closely a device can return a pen to the previously plotted point.
Resolution	A measure of image sharpness expressed as a number of lines per unit length. When referring to plotters, addressable resolution means the smallest move the plotter can make programmatically.
Scaling	Dividing the plotting area into units convenient for your application.
Scaling Points	Points assigned the user-unit values specified in the scale (SC) instruction. These points, also known as P1 and P2, define opposite corners of a rectangular area.
Serial Interface (RS-232-C interface)	A serial interface uses a single data line to transfer data bits sequentially between devices.
Standalone Configuration (RS-232-C only)	In a standalone configuration, the plotter is connected to the computer via a separate (not a shared) cable.



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