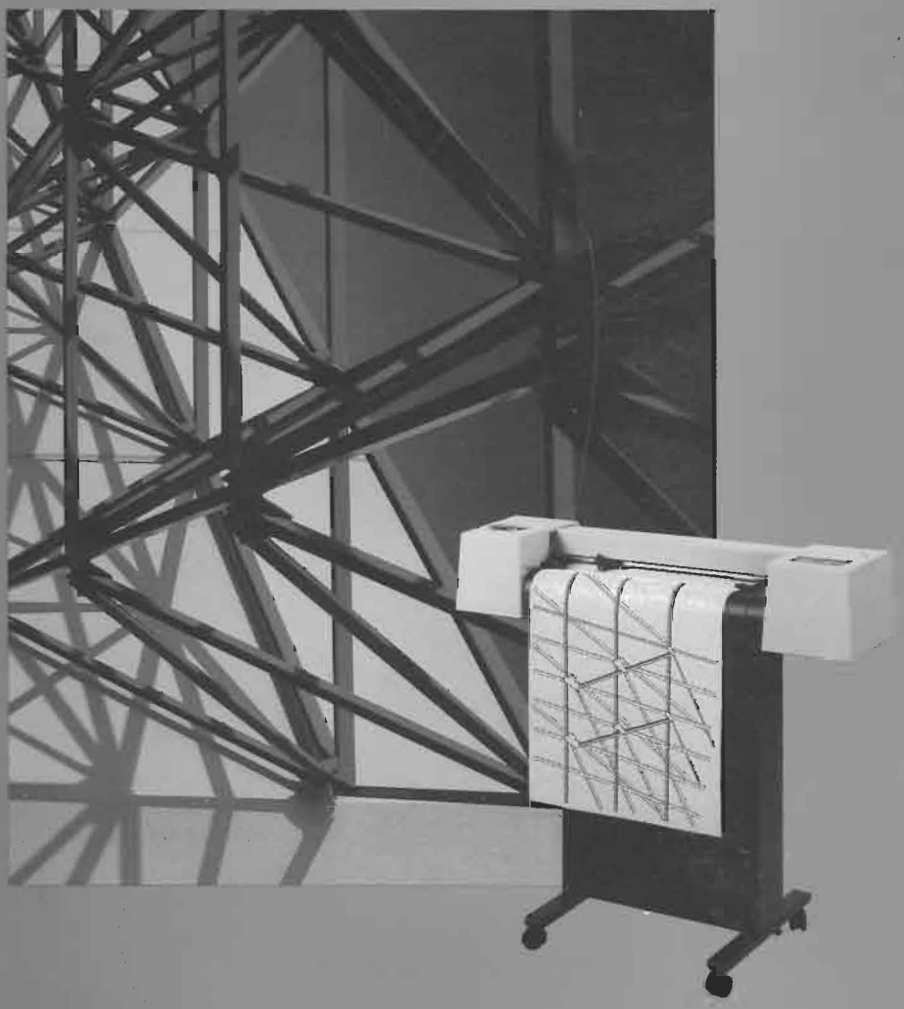
HEWLETT-PACKARD

# HP DraftPro Plotter
# USER'S GUIDE



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HEWLETT PACKARD

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# Warranty Statement

**90 Day On-Site Hardware Warranty**

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**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.

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**Obtaining Service During or after Warranty**

***During the Warranty Period***

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# 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.

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.

**Chapter 1** **Setting Up Your Plotter** gives you the 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 functions of each front-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 refillable 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 plotter specifications, detailed RS-232-C and HP-IB interfacing information, and cable schematics.

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

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

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# CHAPTER


# Setting Up Your Plotter

## What You'll Learn in This Chapter

This chapter shows you how to set up your plotter, load pens and paper, and run the built-in demonstration plot. Each of these tasks is very simple. Once you have followed the step-by-step instructions, you will probably not need them again.

## Initial Inspection

Your plotter and its accessories were inspected before the unit was shipped from the factory to ensure good operating order. Compare the accessories with those listed in the following table. If any are missing, contact your salesperson.

*Accessories Supplied*

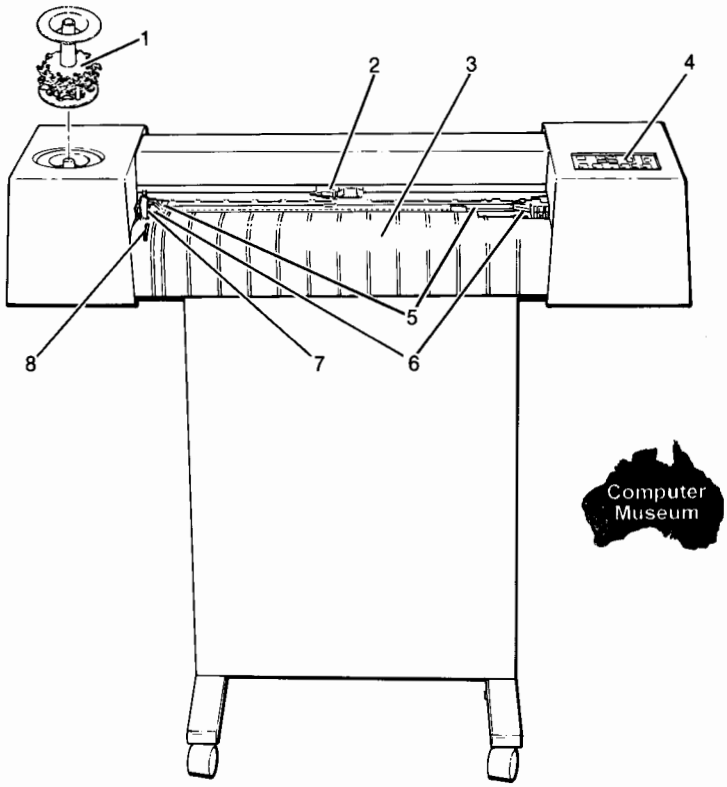
| Item | Quantity | Part Number |
|---|---|---|
| *User's Guide* | 1 | 07570-90002 |
| power cable | 1 | 8120-1751 |
| 8-pen fiber-tip carousel | 1 | 07570-60050 |
| 8-pen drafting carousel | 1 | 07570-60055 |
| plotter paper (5-sheet package, architectural D-size, 24 × 36 in.) | 1 | — |
| fiber-tip paper pens (5-color package, 0.3 mm tip width) | 1 | 17845P |
| grit wheel brush | 1 | 8710-1386 |

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.

**NOTE:** An interface cable is required to connect the plotter to a computer and must be purchased separately. Different computers require different cables. Refer to Chapter 6 to determine which interface cable your computer requires. ■

# Plotter Features (Front View)

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

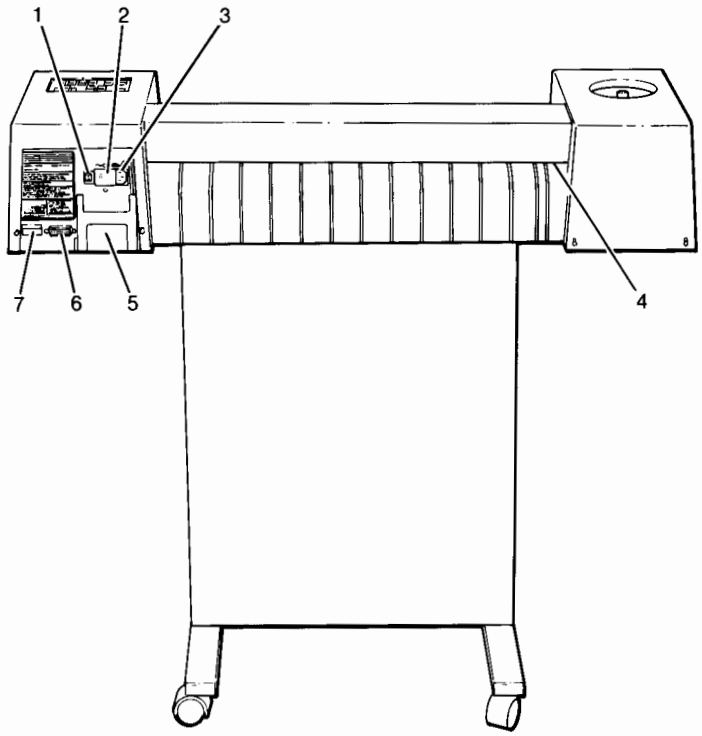



1. **Pen Carousel** (removable) — Holds up to eight pens for multicolor plotting.
2. **Pen Holder** — Selects, moves, and puts away pens during plotting.
3. **Platen** — Provides a smooth surface for plotting.

4. **Front Panel** — Contains the buttons used to manually control various plotter functions. (Button functions are described in Chapter 2.)
5. **Grit Wheels** — Move the plotting media back and forth during plotting.
6. **Pinch Wheels** — Hold the plotting media in place during plotting.
7. **Paper Loading Lever** — Lowers and raises the pinch wheels for loading and unloading plotting media.
8. **Front Paper Guide** — Aligns plotting media correctly, used with the rear paper guide.

# 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.
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 cartridge.

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.

## 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.

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**WARNING**

Use the plotter cable with a properly grounded receptacle to avoid electrical shock.

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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 front panel turns on. In addition, the plotter initializes, indicated by lights flashing on the front panel and movement of the pen holder and carousel. Initialization simply means that certain standard conditions are established within the plotter.

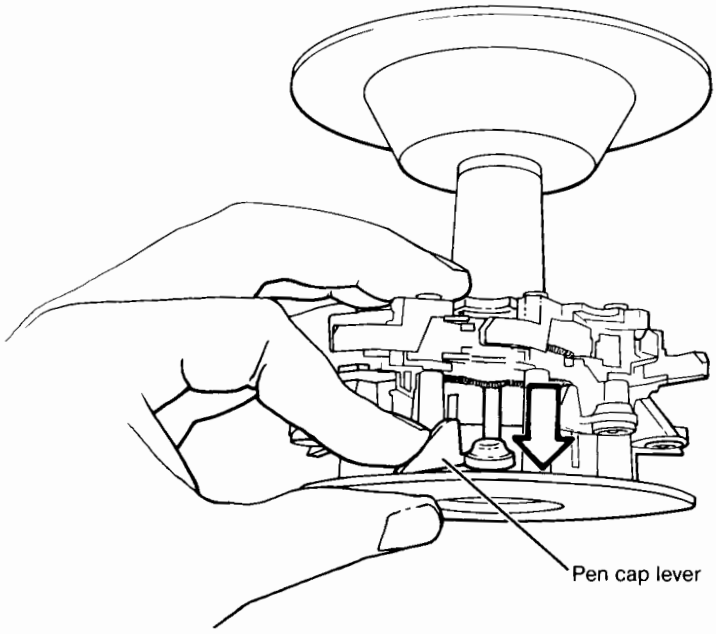
Press the **ON/OFF** switch a second time to turn the plotter and green indicator light off.

## Loading Pens

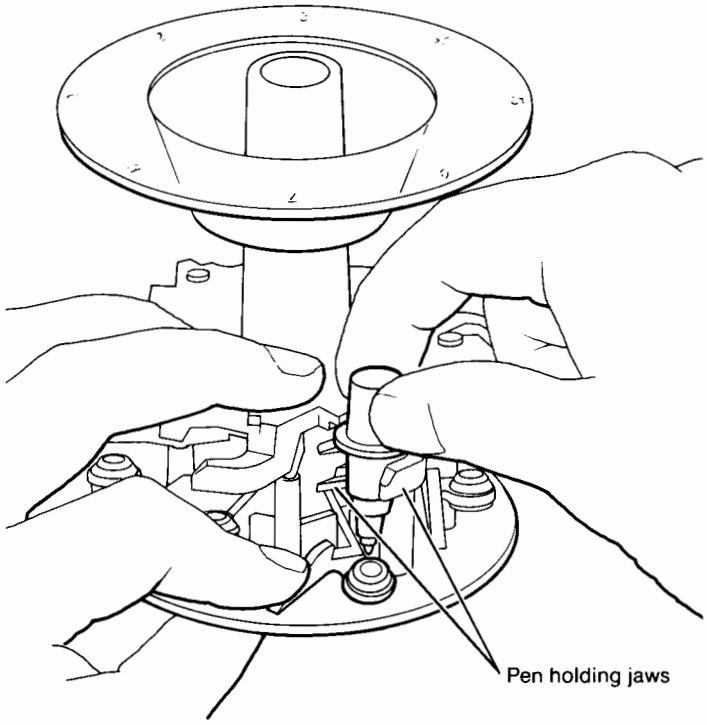
Pens are loaded in stalls (numbered 1 through 8) on the pen carousel. Two carousels are supplied with your plotter — one for fiber-tip pens, labeled ; one for disposable and refillable drafting pens, labeled . Always use the carousel corresponding to the pen type you are loading. The following instructions tell you how to load fiber-tip pens; drafting pens are loaded similarly.

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 millimetres.
2. Remove the plastic pen caps from the pens. Save the caps for storing pens when they aren't in the carousel.
3. Hold the carousel with one hand as shown in the following illustration and follow steps a. through c.

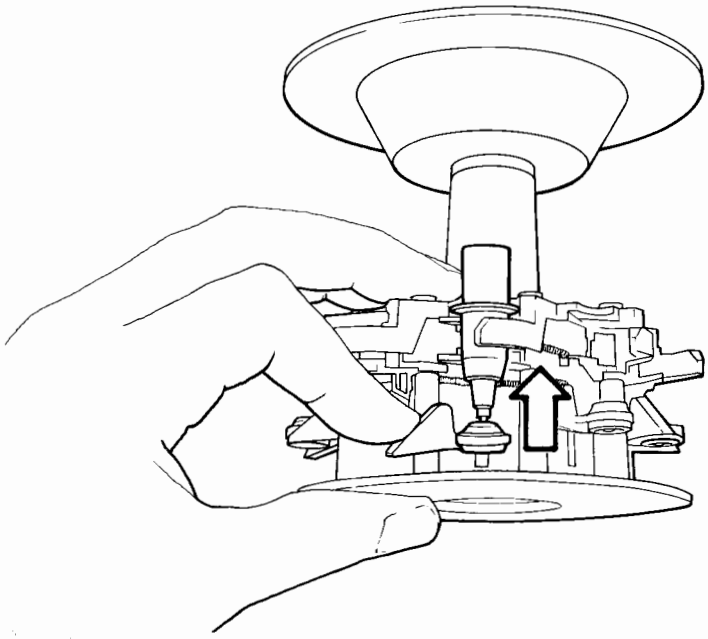
a. Turn the carousel so that a numbered stall is facing you. Use your index finger to push down the stall's pen cap lever.



b. With your other hand, pick up the pen you want in the stall. 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 cap cover the pen tip.

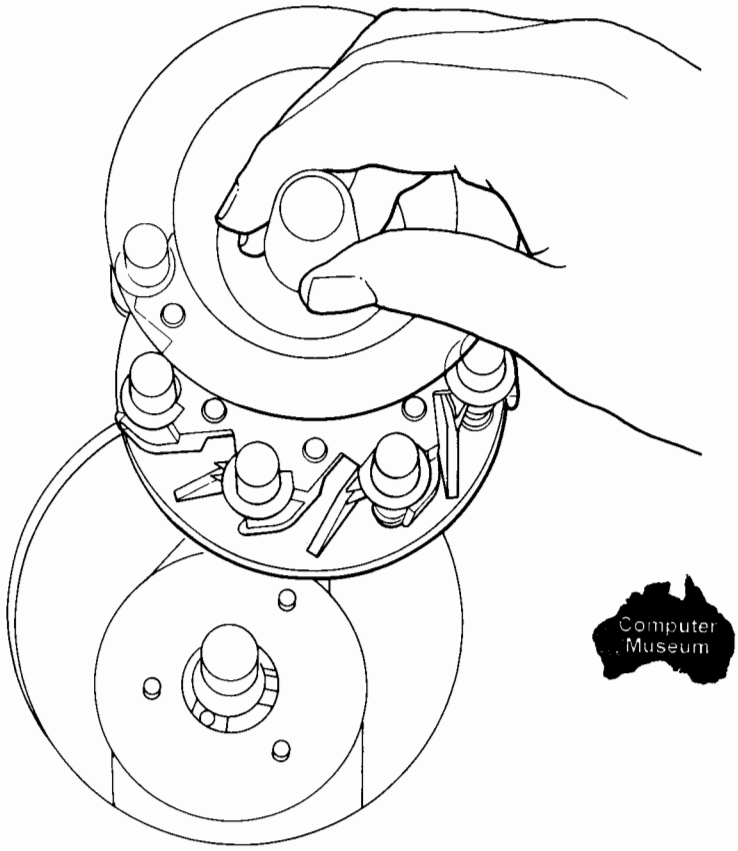


Repeat step 3 for each pen you want to load. To remove a pen, reverse the loading procedure. The carousel does not need to be fully loaded to work correctly.

**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.



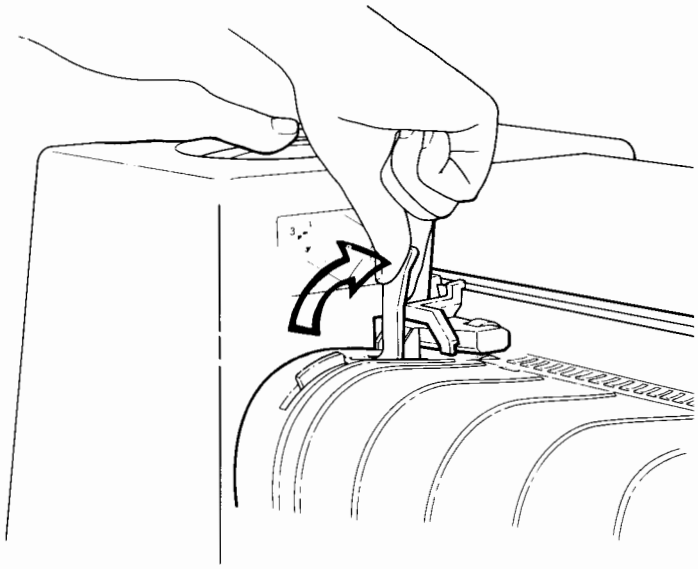

Lower the carousel onto the spindle. The spindle is surrounded by three small posts which fit into three holes in the base of the carousel. If necessary, turn the carousel gently until it slips into place.

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

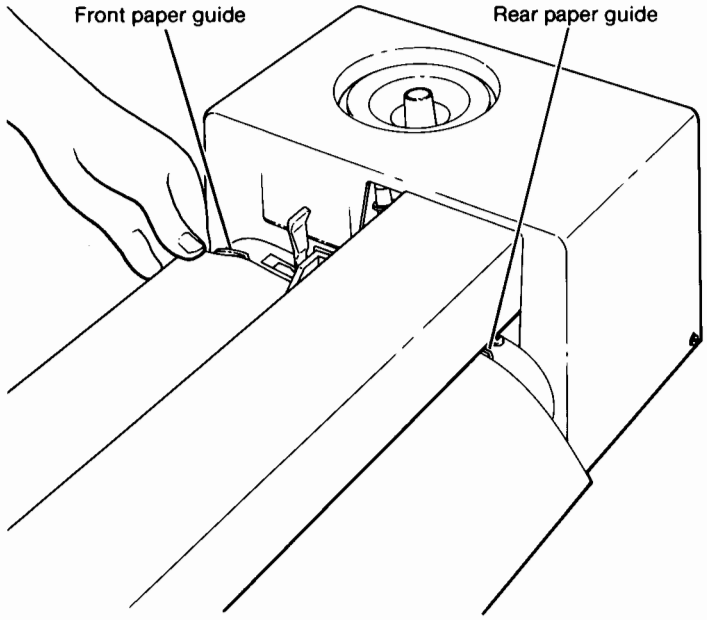
## Loading Plotting Media

Loading plotting media is a simple task and one that you'll do often. Use the following instructions to load a sheet of plotter paper. These instructions also apply to loading vellum and double-matte polyester film.

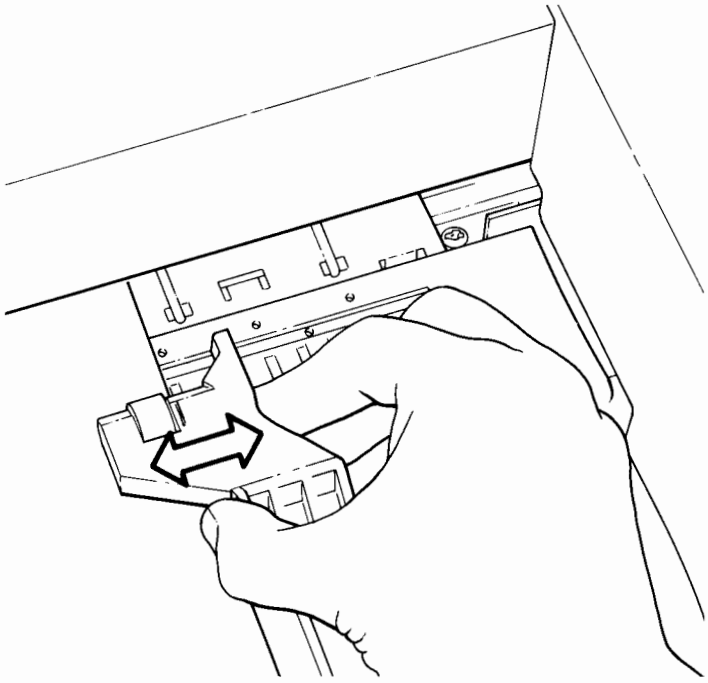
1. With the plotter on, raise the paper loading lever to raise the pinch wheels.



2. Slide a sheet of plotter paper over the platen and under the pinch wheels so that the left edge of the paper is against **both the front and rear paper stops.**



3. Adjust the right-hand pinch wheel so that the line on the top of the pinch wheel is aligned with the right edge of the paper. (Always make this adjustment with the pinch wheels raised.)



4. Lower the paper loading lever to lower the pinch wheels. The plotter moves the paper back and forth twice in preparation for plotting.

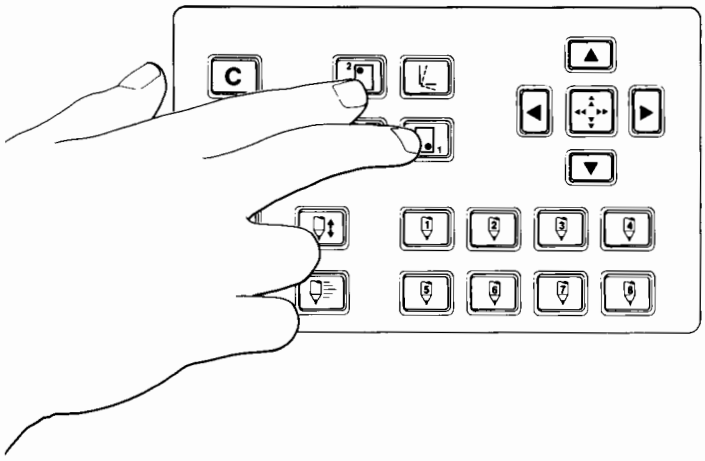
To unload paper, raise pinch wheels and remove the paper.

**NOTE:** The plotter's motor turns off if the pen holder is obstructed, for example, by your hand or crumpled media. This safety feature protects you from harm and your plotter from damage. Front-panel lights flash when the motor turns off — simply turn the plotter off then on again to clear the lights, and continue using the plotter. ■

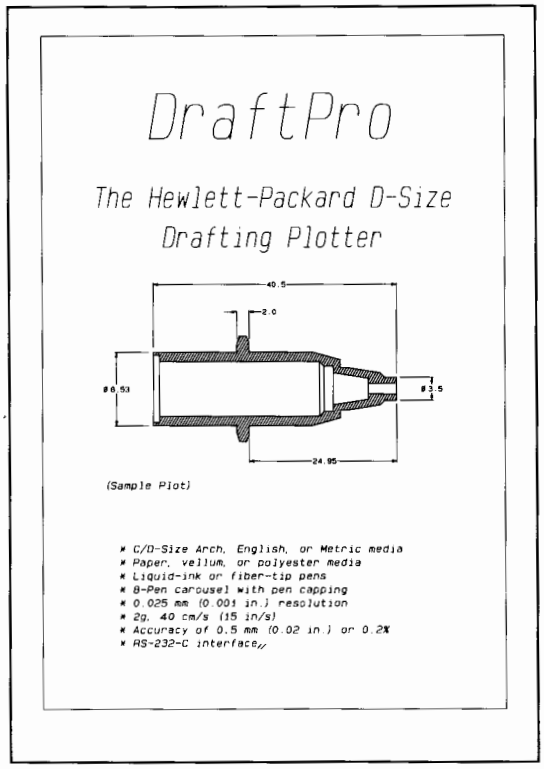
# Performing the Plotter's Demonstration Plot

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.

Before running the plot, make sure pens, carousel, and a sheet of paper have been loaded properly. Turn the plotter on. To start the demonstration plot, simultaneously press the **P1** and **P2** buttons. Refer to the following illustration.



When the demonstration plot is completed, the plotter slides it forward so you can view the results. Your plot should appear as shown in the following illustration; if not, refer to Chapter 5, *Troubleshooting.*



# Notes

# CHAPTER 2

CHAPTER 2

# Using the Plotter Controls

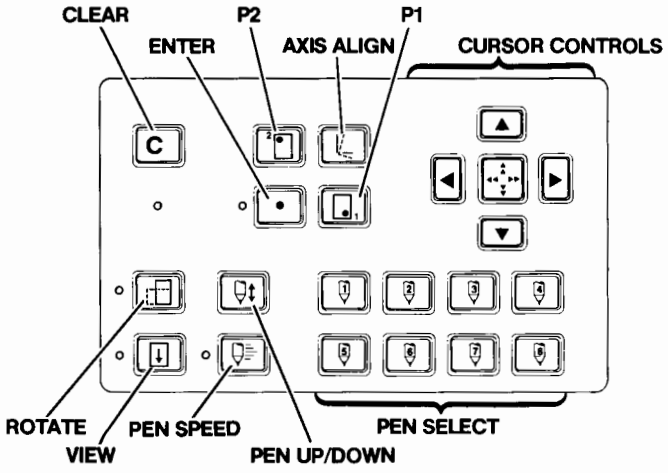


## What You'll Learn in This Chapter

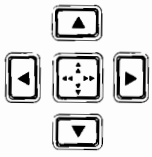
This chapter explains how to use each of the front-panel buttons and select enhanced plotting features using the rear-panel switches.

## Using the Front-Panel Buttons

The front-panel buttons are used to manually control plotter functions. The front panel is shown below; a table describing each button follows.



*Front-Panel Buttons*

| Symbol | 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** | Locates the P1 point. |
|  | **P2** | Locates the P2 point. |
|  | **AXIS ALIGN** | Locates the Axis Align point. |
|  | **ROTATE** | Rotates the orientation of a plot by 90°. |
|  | **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 front-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 

Use the **PEN SELECT** buttons to manually select pens. The numbers on the buttons correspond to the carousel stall numbers (labeled 1 through 8). Press the appropriate button to select the pen you want from the carousel. If there is currently a pen in the pen holder, it is returned to the carousel and the new pen is selected.

To manually 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 lowest-numbered empty stall. If a pen is not in use for 15 seconds, the plotter automatically returns it to the carousel.

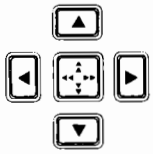
You can select a pen while a plot is in progress. Plotting is suspended until the new pen is picked, then the pen holder returns to its previous position and plotting resumes.

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 indicated by the arrow. The pen moves at low speed. Pressing the center speed button along with an arrow button moves the pen at high speed.

Simultaneously pressing any two adjacent arrow buttons moves the pen at a 45-degree angle between the two directions. For example, pressing the both the right arrow and down arrow buttons moves the pen to the lower right.

## Setting the Pen Speed

Use the **PEN SPEED** button with the **PEN SELECT** buttons to set the proper plotting speed for your pen and media combination. Pen speed can also be set programmatically. If you are using a software package, your documentation should tell you whether you need to set the pen speed from the front panel. If pen speed is not discussed, use the speeds recommended in this section.

Your plotter has eight plotting speeds, from 5 to 40 centimetres per second (cm/s). When used with the **PEN SPEED** button, each **PEN SELECT** button represents a pen speed — multiply the number on the button by 5 for the corresponding pen speed. To change the pen speed from the front 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, refer to the following table.

| Buttons Pressed | Corresponding Pen Speed, cm/s | Pen and Media Recommendation |
|---|---|---|
| + 1 | 5 | |
| + 2 | 10 | |
| + 3 | 15 | refillable drafting pens on vellum or polyester film |
| + 4 | 20 | disposable drafting pens on plotter paper or vellum |
| + 5 | 25 | |
| + 6 | 30 | |
| + 7 | 35 | |
| + 8 | 40 | fiber-tip paper pens on plotter paper |

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 front 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.



## Viewing a Plot in Progress 

Use the **VIEW** button to check the quality of a plot in progress. Pressing the **VIEW** button suspends plotting and moves the plotting media forward for your viewing. 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.

If you want to abort a plot after viewing it, first turn **VIEW** off (if it is on). Next press the break key (or equivalent) on your computer, then press the **CLEAR** button on the plotter. For more information on aborting plots in progress, see *Clearing and Resetting the Plotter* later in this chapter.

When **VIEW** is on, the yellow light to the left of the button is lit. Only the **VIEW** button is operational when the light is on; all other front-panel buttons may be pressed without effect.

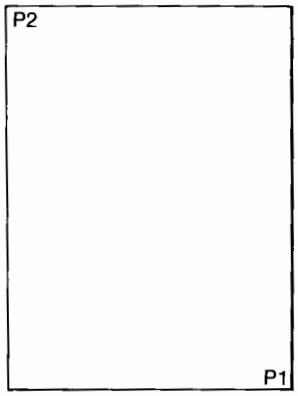
The **VIEW** light also serves as an error indicator. If an error occurs while plotting, the **VIEW** light blinks until the error is investigated or the plotter is reset. However, your plot may be fine, even if the light is blinking.

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

## Repositioning P1 and P2

P1 and P2 are points used to determine the size and location of your plot when scaling. (Scaling is dividing the plotting area into units convenient for your application.) You probably don't need to reposition P1 and P2 unless your software requires you to do so or when writing your own programs. Your software package will tell you if you need to use the **P1** and **P2** buttons. The following illustration shows the initial locations of P1 and P2 on C- and D-sized media.

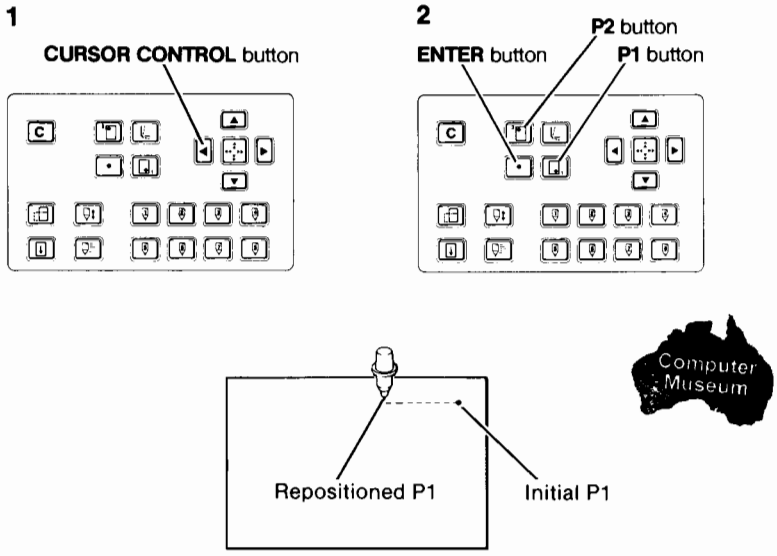

C-size




D-size

Pressing **P1** or **P2** moves the pen to the location of the corresponding point. To change the location of P1 and P2, use the following steps and illustration.

1. Use the **CURSOR CONTROL** buttons to move the pen to the desired P1 point.
2. Press the **ENTER** button, then press the **P1** button to enter the new P1.




3. To position P2, repeat steps 1 and 2 using the **P2** button instead of **P1**.

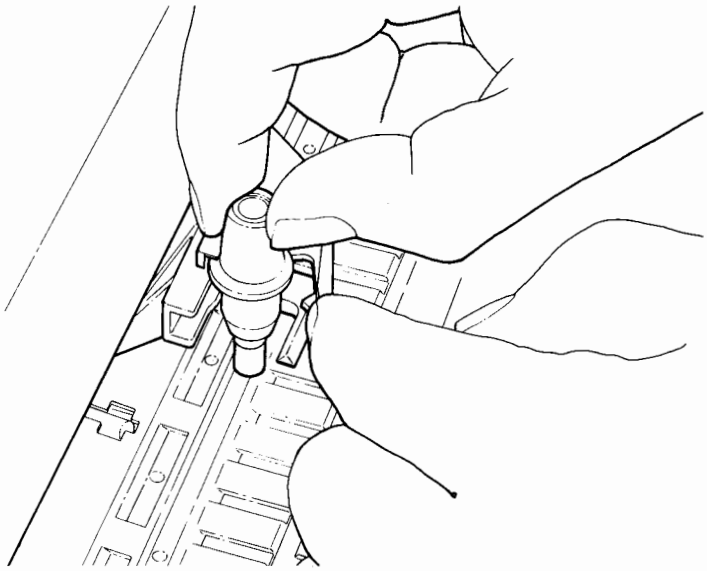
**NOTE:** Whenever you change the position of P1, P2 automatically changes its position to reflect the same proportions. To position P2 to a specific location, always set the position of P1 **before** setting P2. ■

## Aligning the Plotting Axes

If you are using media with preprinted lines or grids, use **AXIS ALIGN** when the grids are not aligned with the edges of the media. **AXIS ALIGN** enables you to match the plotting axes to the preprinted grids.

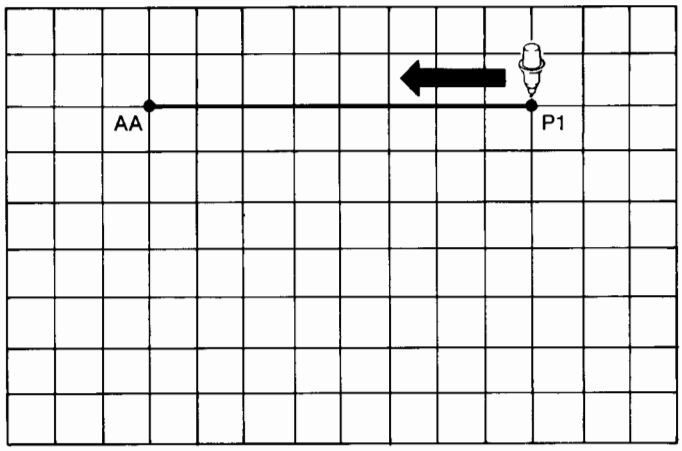
The following steps describe how to use **AXIS ALIGN**. You can use a pen to make the alignment, but using a digitizing sight is more accurate and avoids pen marks on your media. Refer to Appendix C for information on purchasing a digitizing sight.

1. Load the preprinted media into the plotter.
2. Load the digitizing sight into the pen holder as shown in the following illustration.



3. Press **AXIS ALIGN** to locate the axis align point (AA).
4. Press **P1** to move the pen 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 end of a grid line running from P1 to AA. See the following illustration.



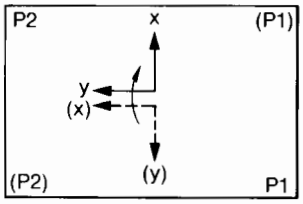

6. Press **ENTER** followed by **P1** to store the new location of P1.
7. Press **AXIS ALIGN** to move the pen to the axis align point.
8. Using the **CURSOR CONTROL** buttons, position the dot in the digitizing sight directly over the other end of the same grid line.
9. Press **ENTER** and **AXIS ALIGN** 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 less than six degrees. If the angle is greater, the alignment is rejected and the **ENTER** light continues to blink. ■

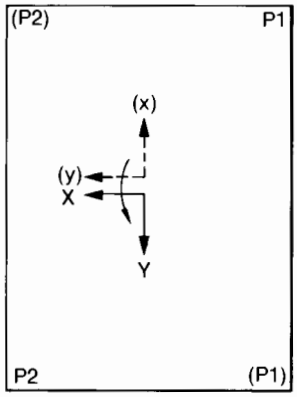
## Rotating a Plot

Use the **ROTATE** button to turn the axes of your plot 90 degrees. 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 front-panel buttons for rotation. Check your software manual to determine how plot rotation is accomplished by the software.

Normally, the X-axis runs the length of both C- and D-size media. Pressing the **ROTATE** button rotates the axes 90 degrees so that the Y-axis runs the length of both media sizes, as shown in the following illustration. The yellow light to the left of the **ROTATE** button is lit when plot rotation is in effect.

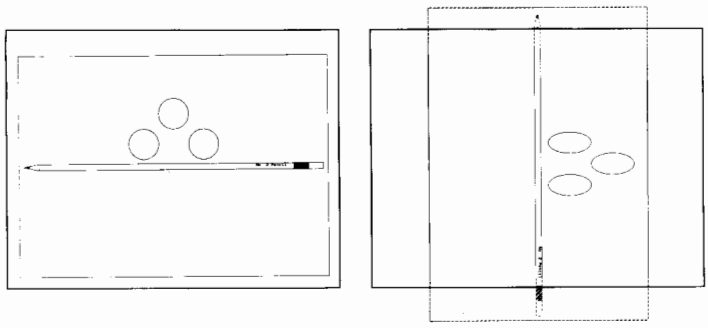



C-size




D-size

Rotation can affect your plot in two ways depending on whether the plot is drawn using scaling. When you rotate a plot, the P1 and P2 points also rotate and move inward to ensure that your plot fits on the page. When drawing a scaled plot, be aware that the proportions of your plot may be affected by the new P1 and P2 locations, as shown by the circles in the following illustration.



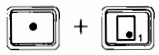
Original Plot Rotated Plot



Without scaling, a plot that fills the length of the paper does not entirely fit when rotated. Refer to the pencil in the previous illustration. If you are using software, your plots may be automatically scaled for you. If not, you need to change your program to reduce the size of your plot so that it fits when rotated.

## Using the Enter Button 

The **ENTER** button works in combination with other front-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 position as P1. |
|  | Defines current pen position as P2. |
|  | Defines current pen position as AA. |
|  | Resets the plotter. |

You can use the **ENTER** button to enter points when digitizing. When the yellow light to the left of the button is lit but not blinking, the plotter is in digitizing mode. A programming instruction is necessary to set the plotter in digitizing mode. Check your software documentation to determine if your software supports this feature.

## Clearing and Resetting the Plotter C

Use **CLEAR** and **RESET** to start over. Press the **CLEAR** button to clear the plotter; press the **ENTER** button followed by the **CLEAR** button to reset the plotter. The following table describes the effects of clearing and resetting the plotter.

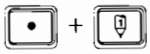
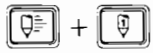
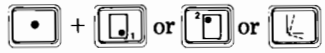
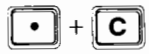
| Clear | Reset |
|---|---|
| Cancels pending output from the plotter.<br><br>Clears plotting information in all buffers. | Clears the plotter, plus . . .<br><br>Reestablished the plotter's initialization conditions.<br><br>Erases errors. |

**NOTE:** Resetting the plotter cancels any changes you made using the front-panel buttons: **PEN SPEED** resets to high, **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.

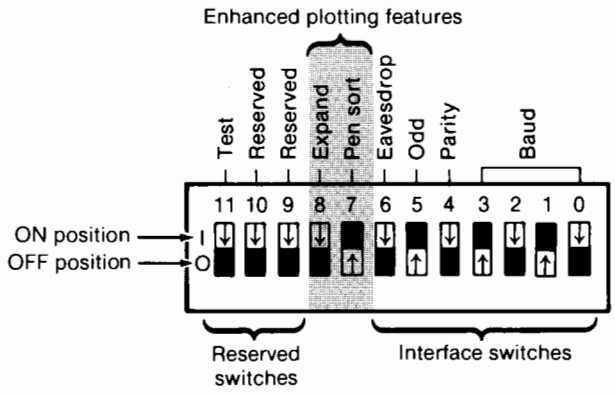
## Summary of the Front-Panel Buttons

The following table summarizes how to use the front-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 |  again |
| 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**, described in the next sections. The following illustration shows the rear-panel switches used to select these features. (The switches also set interface conditions, discussed in Chapter 6.)

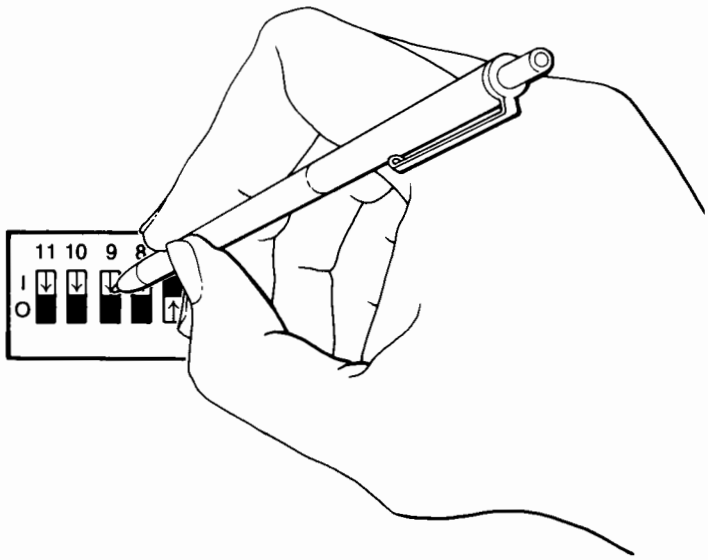



**NOTE:** Switches 9–11 are for the use of qualified service personnel only. Take care not to accidentally turn on one of these switches when setting other rear-panel switches. ■

Computer Museum

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

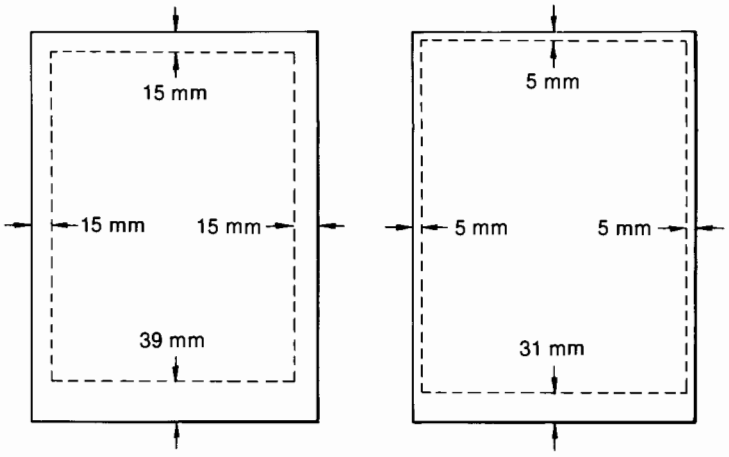
1. Turn off the plotter.
2. Use a pencil or pen to push the switch to the desired position.
3. Turn on the plotter. The new switch settings are now in effect.




## Expanding the Plotting Area

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

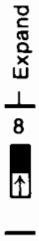
The following illustration shows the difference in size between standard and reduced margins. Standard and reduced margins are the same on both C- and D-size media. Note that the wide margin is always on the front edge of both sizes of plotting media, even when a plot is rotated.




Standard plotting area  Expanded plotting area



To select reduced margins, set the **EXPAND** switch as shown in the following figure.



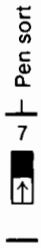

**NOTE:** Using reduced margins allows the plotter to draw under the right-hand pinch wheel. Fresh ink may smear when the pinch wheel rolls over it. ■

## Using Pen Sort

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.

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, 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. (Turn **PEN SORT** off when debugging programs.)

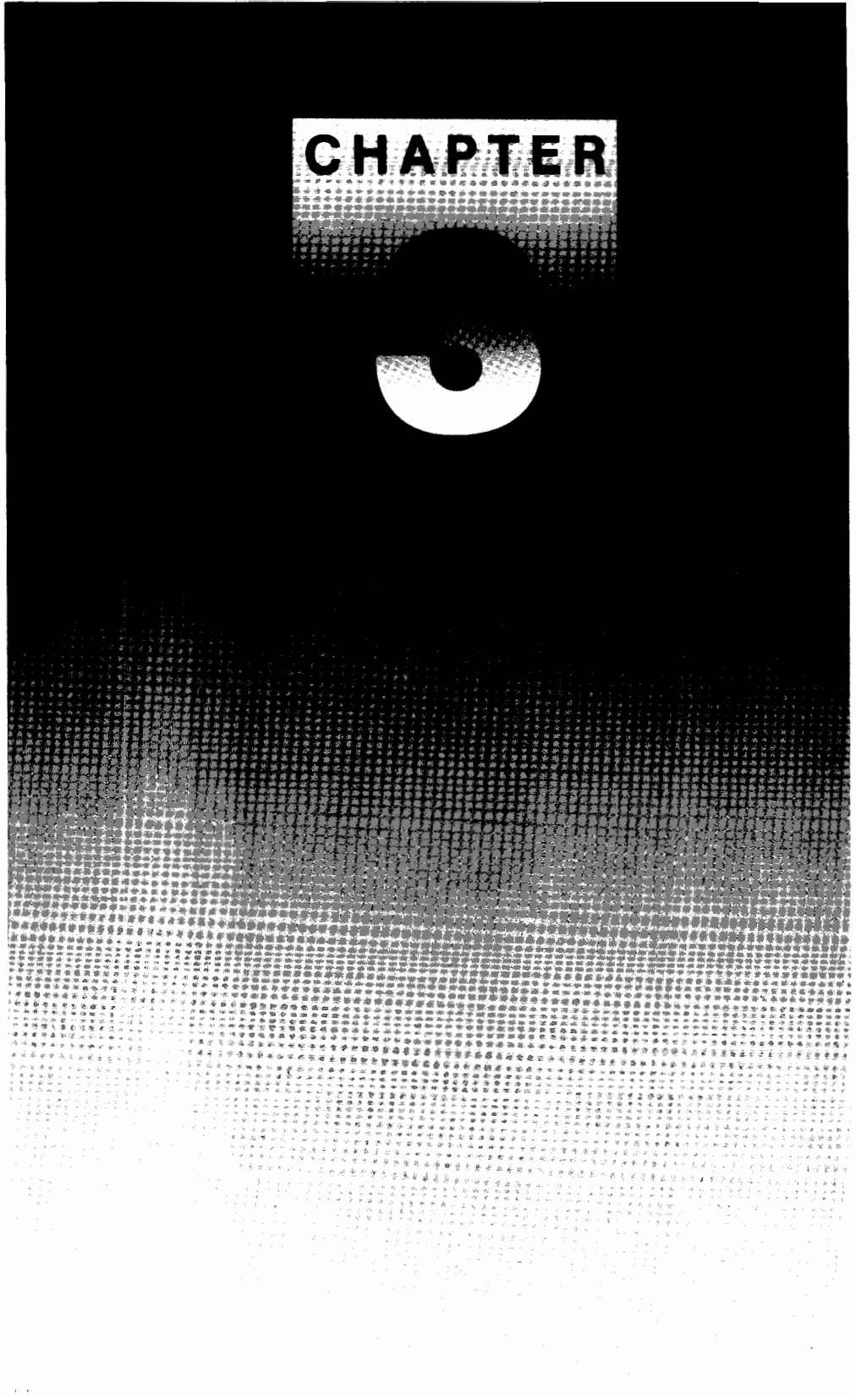
To select pen sorting, set the **PEN SORT** switch as shown in the following figure.




**PEN SORT** can also be selected programmatically, refer to the *Programmer's Reference* (Part No. 07570-90001). 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.

# Notes


CHAPTER
3

CHAPTER 3

# Selecting Pens and Media

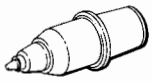
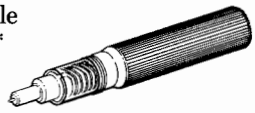
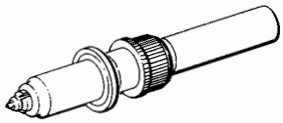
## What You'll Learn in This Chapter

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 *Drafting Supplies Catalog*.

# Pens

Your plotter can use fiber-tip paper 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. |
| disposable drafting*  | Very convenient, requires no cleaning or refilling. Excellent quality. |
| refillable drafting  | Highest drafting-quality pen. Long-lasting tungsten carbide points. Requires refilling and maintenance. |

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



Fiber-tip paper pens will last at least 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 ensure a longer pen life.

Remove drafting pens and cap them immediately after use to prevent drying and clogging. Refillable drafting pens require cleaning after use, as explained in *Maintaining Refillable Drafting Pens* in Chapter 4. Remember that ink dries as quickly in the drafting pen as it does on the plotting media. Here 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 horizontal position.

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# Media

You can use plotter paper, 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. |
| vellum | Surface coated for smoothness and ink receptivity. Also treated for strength and transparency. Stores well. Moderately expensive. |
| double-matte polyester film* | Finely coated and translucent. Good for high-accuracy applications and archive storage. Dimensionally stable. Expensive. |

*Film of standard thickness, 3-mil, is recommended for best results.

Each of these media is available in the following sizes.

| English | Architectural | Metric |
|---|---|---|
| C (17 × 22 in.) | C (18 × 24 in.) | A2 (420 × 590 mm) |
| D (22 × 34 in.) | D (24 × 36 in.) | A1 (594 × 841 mm) |

Handle your plotting media by the edges when preparing final plots. Oil from fingerprints can prevent ink from adhering to the medium.

Plotting media, particularly paper, can be affected by changes in temperature and humidity. Plotting distortions will occur if the medium 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.)

Media with rounded corners are not recommended for use with your plotter. Square corners are necessary for the pinch wheels to grip and move the media accurately.

# 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.

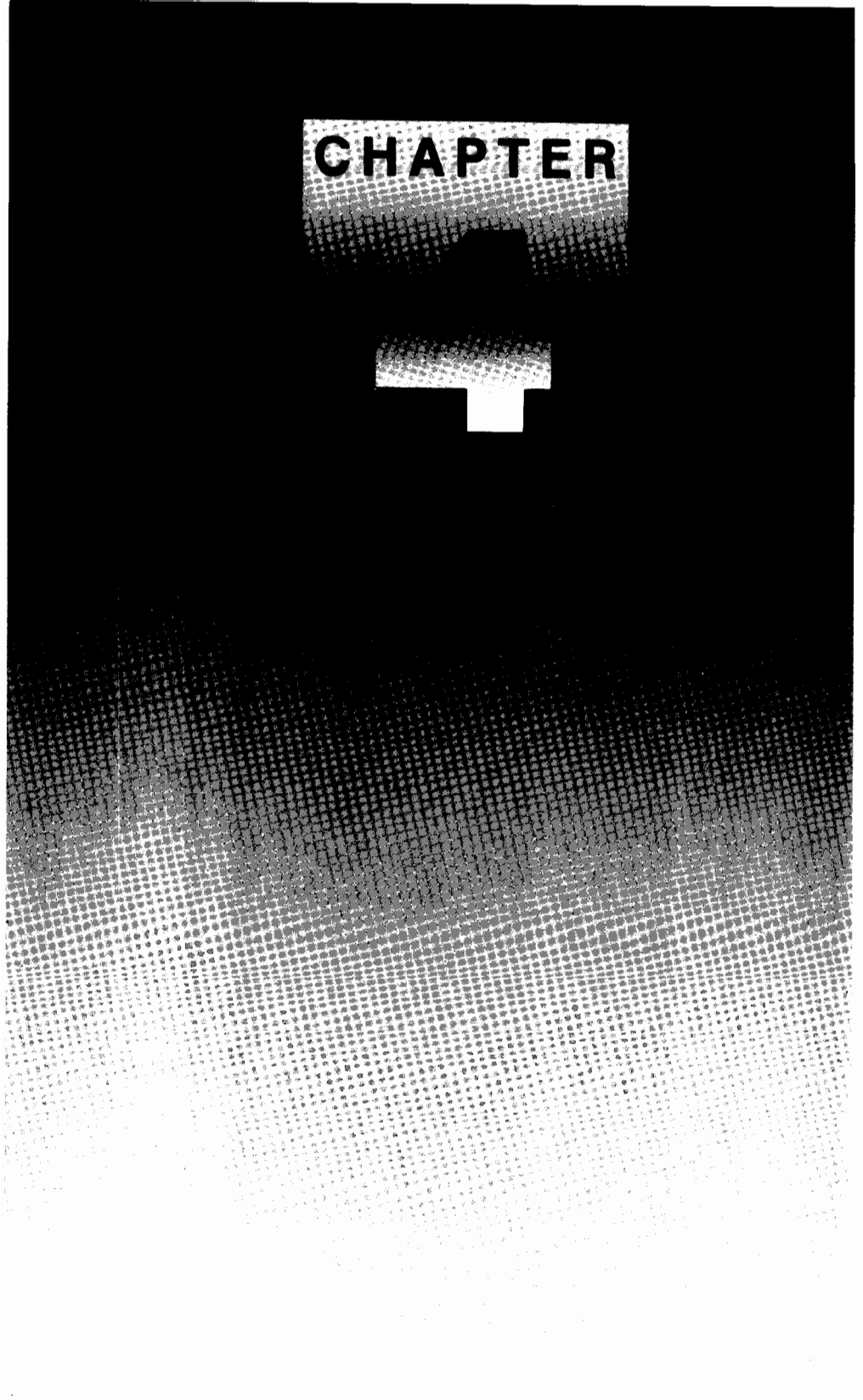
| | Fiber-tip Paper Pens | Disposable Drafting Pens | Refillable Drafting Pens |
|---|---|---|---|
| **Plotter Paper** | Excellent quality for multicolor graphics and preliminary drawings.<br><br>Good for solidly-filled areas.<br><br>40 cm/s | Good quality for preliminary drawings.<br><br>Frequent pen-tip cleaning required.<br><br>20 cm/s | Not recommended |
| **Vellum** | Not recommended | Good quality for final drawings.<br><br>Convenient to use.<br><br>Good contrast for diazo reproductions at fast developing speed.<br><br>20 cm/s | Excellent quality for final drawings.<br><br>Good contrast for diazo reproductions at fast developing speed.<br><br>15 cm/s |
| **Double-matte Polyester Film** | Not recommended | Not recommended | Excellent quality for high accuracy applications and final drawings to be archived.<br><br>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 | Corresponding PEN SELECT Buttons |
|---|---|---|
| fiber-tip paper | 5 to 40 | 1 - 6 |
| disposable drafting | 10 to 30 | 2 - 6 |
| refillable drafting | 5 to 15 | 1 - 3 |

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.


CHAPTER
1

CHAPTER 4

# Maintenance

## What You'll Learn in This Chapter

This chapter explains the maintenance required for the plotter and for 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 clean the plotter using the following instructions.

---

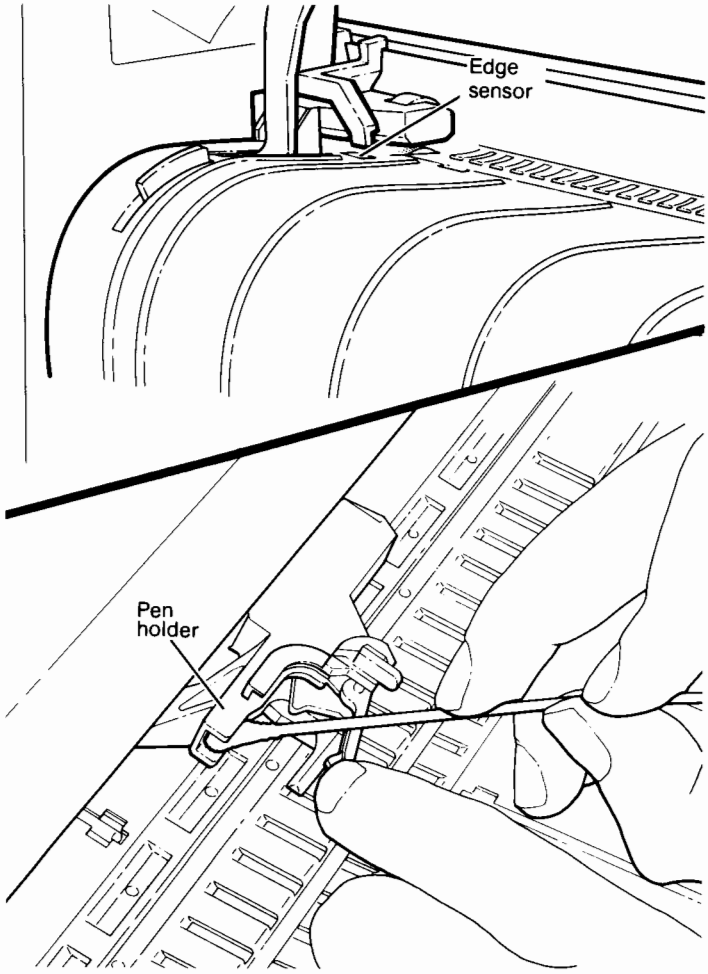
**WARNING**

Unplug the plotter before cleaning. Do not allow water to run inside the plotter as this may create a shock hazard.

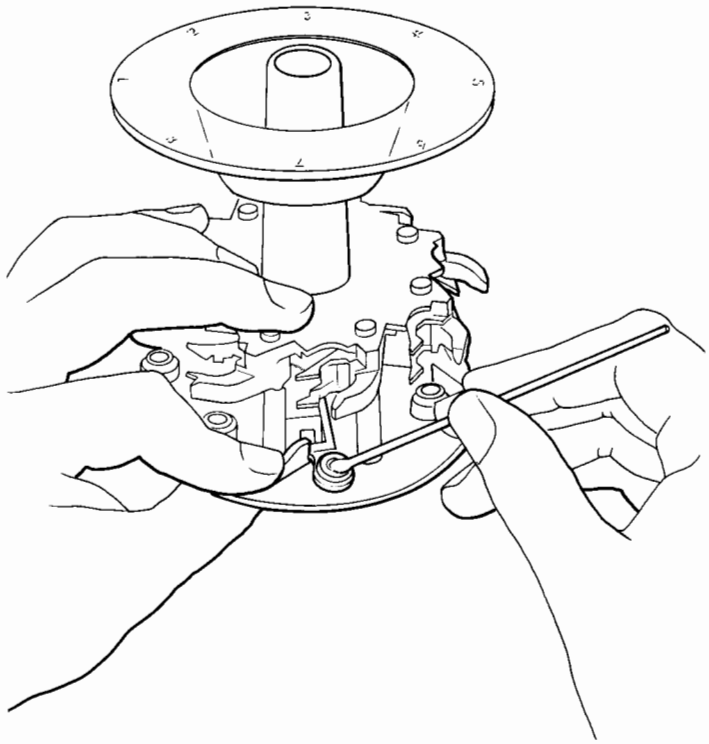
---

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. Clean the carousel's black rubber pen caps using a cotton swab moistened with alcohol or pen cleaning solution, as shown. Allow the carousel to dry thoroughly before inserting pens. Replace any cracked or damaged pen caps.

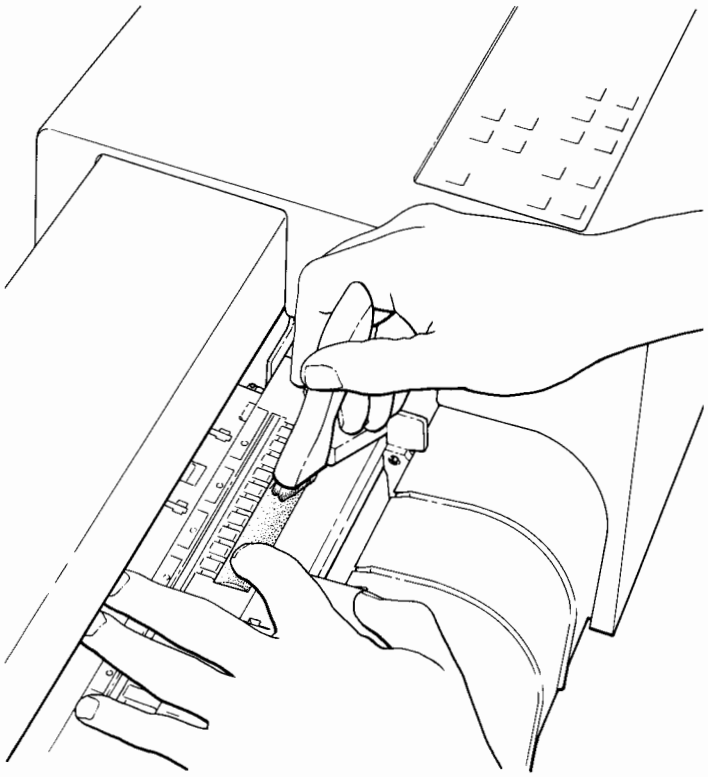


4. To clean the grit wheels, refer to the following steps and illustration. Be sure the plotter is turned off.

   a. With the pinch wheels raised, slide the right-hand pinch wheel to the right.

   b. Use the grit wheel brush supplied with your plotter to remove dust from the grit surface as you manually rotate the grit wheel.

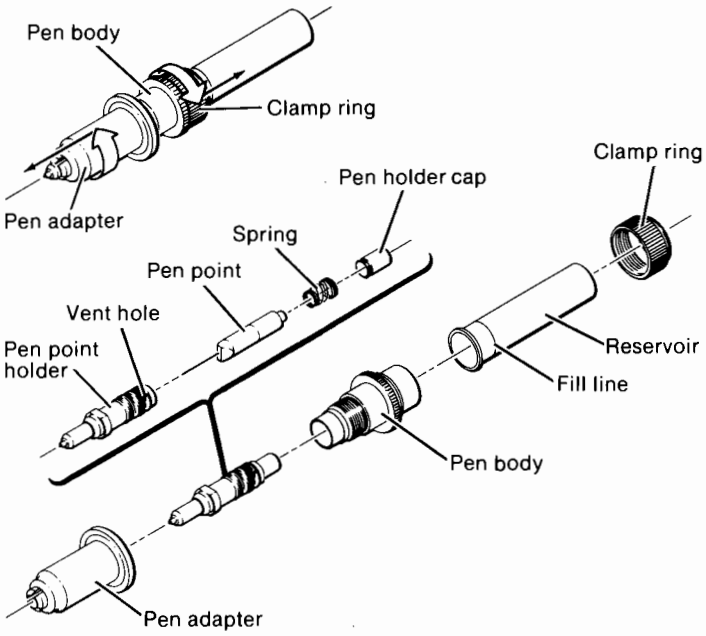
   c. Slide the pinch wheel to the left and continue cleaning.



# Maintaining Refillable Drafting Pens

For best results, clean your drafting pens after each plotting session. The following steps and illustration explain how to disassemble, clean, and reassemble an HP drafting pen. If a sink is available, use it.

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



2. Throughly 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 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.

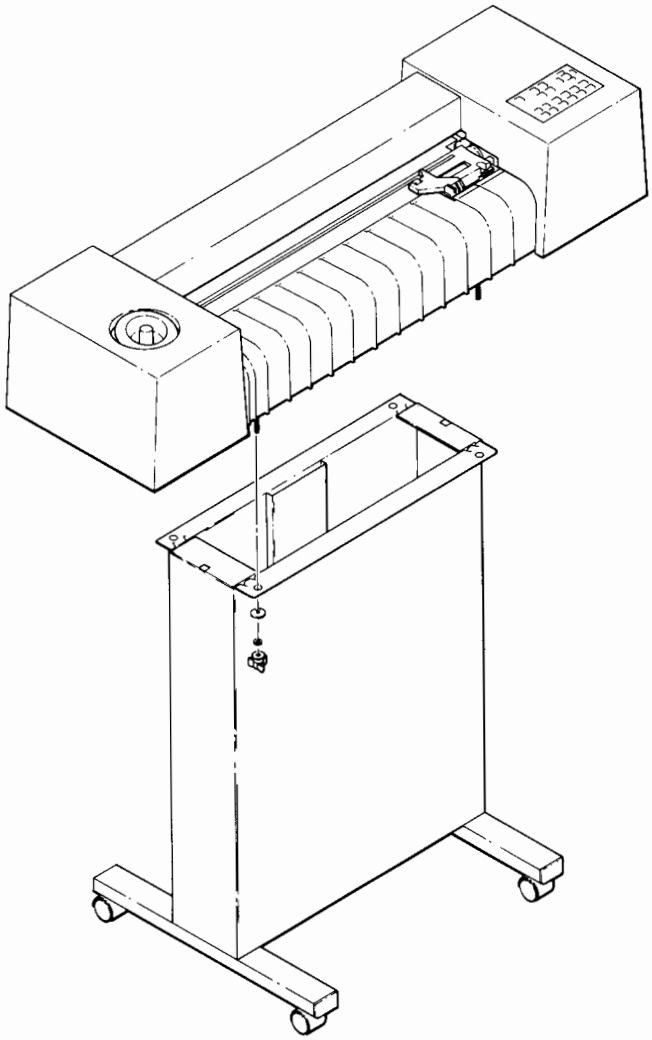
## Filling the Drafting Pen with Ink

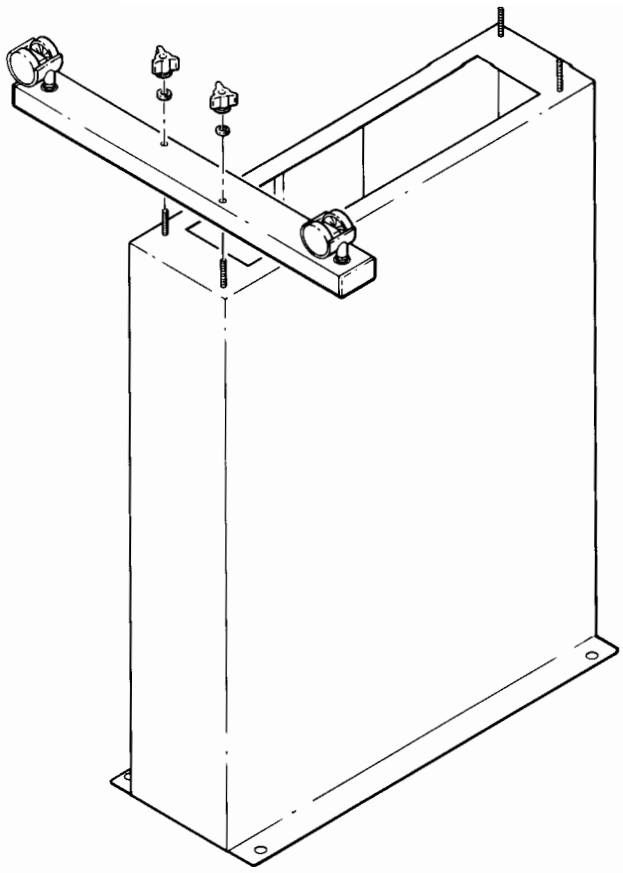
Use the following instructions to fill a pen with ink.

1. Remove the clamp ring and 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.
4. Shake the pen (point down) to force ink into pen point.
5. Moisten the point and draw with the pen until ink appears.
6. Immediately cap or load the pen into the drafting pen carousel.

# Disassembling the Plotter

Refer to the following illustrations should you need to disassemble and move your plotter.





# Notes

# CHAPTER 3

CHAPTER 5

# Troubleshooting


## What You'll Learn in This Chapter

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 in the following table; 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 error or a malfunction in your computer or software.

If you determine that a repair is required, 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.
   - 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 front-panel green light turn on?

   **No** — Have the plotter and power cord serviced.

   **Yes** — Try using your plotter again.

## 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 line on the right-hand 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?

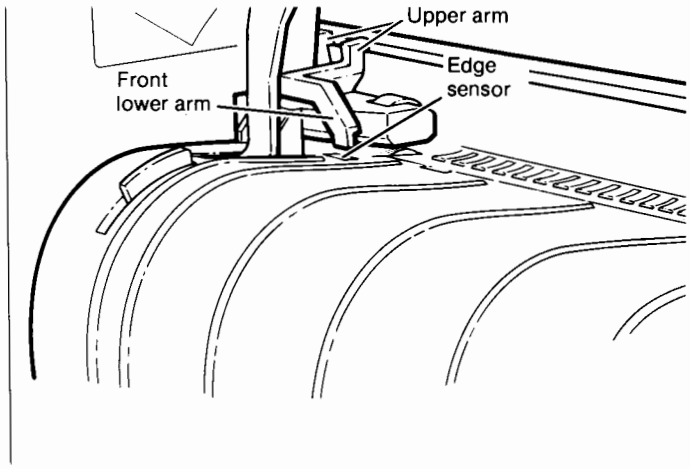
   **No** — Have your plotter serviced.

   **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-hand rear of the platen.) Try loading paper again. If the problem persists, refer to the following illustration and instructions.




Gently press each upper arm to the right. Each lower arm should drop into its edge sensor; each 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. 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 obstruction.

   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.

## Front-Panel Buttons Do Not Work

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

1. Check the rear-panel switches. Are any of the reserve switches 9-11 in the **ON** position?

   **No** — Go to step 2.

   **Yes** — Turn the plotter off. Turn off any reserve switches. Try using your plotter again.

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

   **No** — Note which lights are still on. 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, 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, re-read the section, *Performing the Plotter's Demonstration Plot.* 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.

# 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.*
   - Front-panel buttons should operate properly. If they do not, follow the instructions in the section, *Front-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. Is your plotter in an eavesdrop configuration, connected between a computer and a terminal?

   **No** — Go to step 3.

   **Yes** — Go to step 6.


3. Run a simple program on your computer, for example, list a file to the screen.

   Is your computer system working properly?

   **No** — Go to step 4.

   **Yes** — Go to step 5.

4. Disconnect the plotter from your computer system. Try running a simple program again.

   Does your computer system work now?

   **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 5.

5. 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.

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

   If the problem persists, follow the instructions in the section, *Software Problems.*

6. Are you using a hardwire handshake?

   **No** — Go to step 7.

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

7. Turn the plotter off. Make sure the rear-panel **EAVESDROP** switch is in the **ON** 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 8.

   **Yes** — Go to step 10.

8. 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 9.

9. 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 10.

10. 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 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 OA, OC, and OH instructions are useful for debugging a program. (Be sure **PEN SORT** is off before debugging.)

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

   Try running the program again. If the problem persists, follow the instructions in the section, *Plot Location Problems.*

   **Yes** — If you know how to send and receive commands from the plotter, refer to the *Programmer's Reference* to identify the error. Try running the program again.

3. Verify that the software works with your computer and plotter. Does your software documentation indicate 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** — Try using the recommended cable. 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. Is the paper loaded correctly against the front and rear paper guides? Is the line on the right-hand pinch wheel aligned with the right edge of the paper.

   **No** — Properly load a new sheet of paper. Try running your plot again.

   **Yes** — Go to step 2.

2. 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 indicated the correct size for the paper you are using. Run your plot again.

   If you are unable to select a paper size, or the problem persists, go to step 3.

3. Is **ROTATE** on?

   **No** — Press the **ROTATE** button. This orients the plot vertically on the page unless changed by your software. Run your plot again.

   **Yes** — Press the **ROTATE** button. This orients the plot horizontally on the page unless changed by your software. Run your plot 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

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** — Refer to the *Programmer's Reference* 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 6 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.

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 front-panel **PEN SPEED** button to lower your pen speed. Run the program again. If the problem persists, go to step 5.

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

   **No** — Go to step 7.

   **Yes** — If you are using the **EXPAND** feature and have an expanded plotting area, the plotter's pinch wheels may be rolling over the wet ink. To resolve this, change the order in which lines are drawn so the ink has time to dry before the plot moves under the pinch wheels.

   If you do not need to plot to the outer edges of the page, turn off the rear-panel **EXPAND** switch.

6. Does the ink flake off of the plotting media?

   **No** — Go to step 7.

   **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.

7. 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 back 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

Before following the steps in this section, note that in dry climates, you can expect ink to dry out more rapidly than in humid environments. In a dry climate, 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 drafting pens if you will not be using them in the next 8 hours.)

   **Yes** — Go to step 2.

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

   **No** — Go to step 3.

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

3. Are you using refillable drafting pens?

   **No** — Make sure pens have not been stored longer than their shelf life.

   **Yes** — Read the section, *Maintaining Refillable Drafting Pens*, in Chapter 4. Follow maintenance instructions carefully.

## 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?

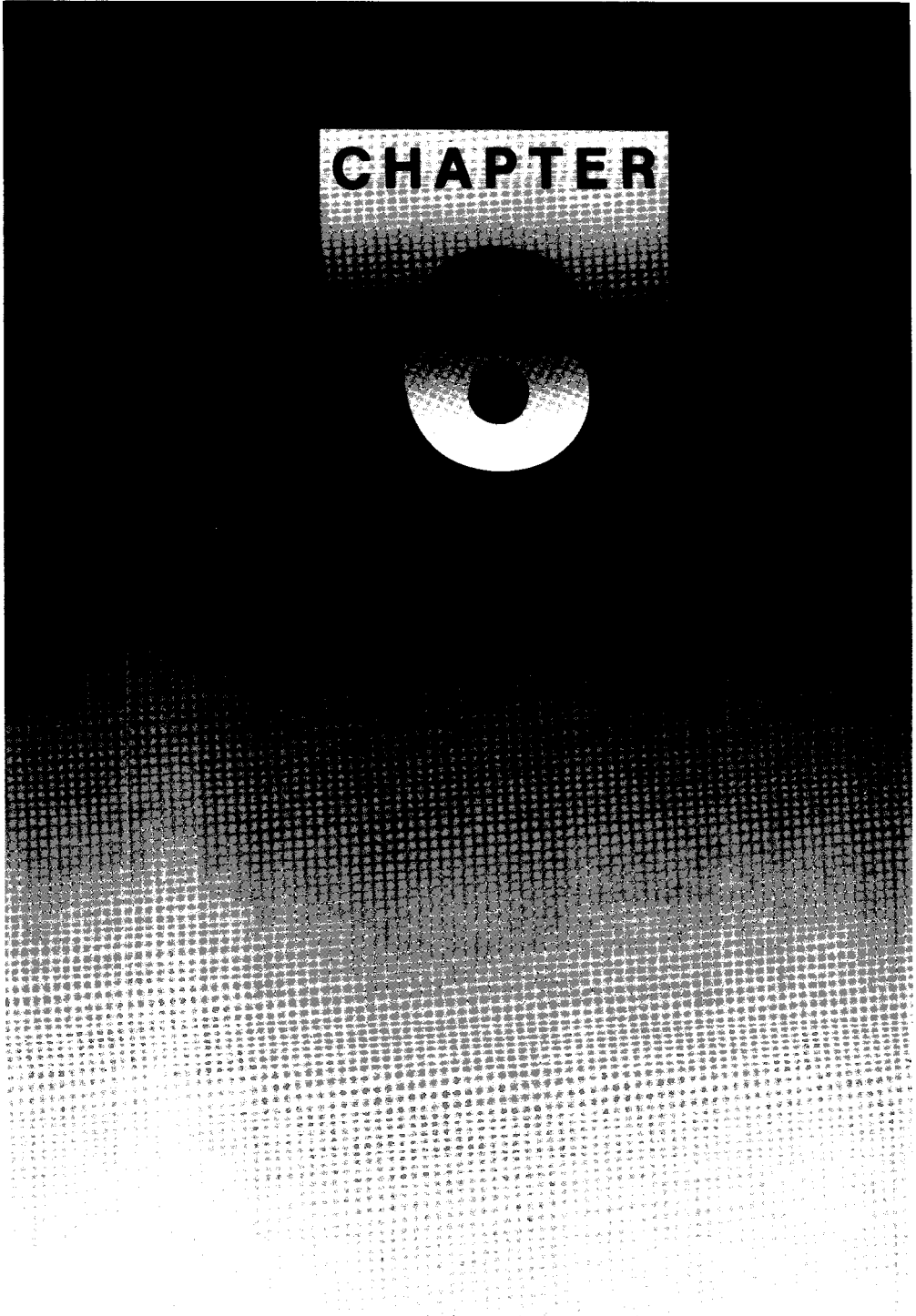
   **No** — Go to step 4.

   **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.


CHAPTER


# Connecting Your Plotter to a Computer



## What You'll Learn in This Chapter

This chapter deals with generic configurations and setting interface conditions. (Chapter 7 shows computer-specific interconnections.) 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, you do not need to read the rest of this chapter. Go directly to Chapter 7 and follow the interconnection instructions for your computer.

- Apple IIc
- Apple IIe
- Apple Macintosh
- DEC VAX
- HP 3000
- HP 9000 Series 200
- HP 9000 Series 300
- HP Touchscreen
- HP Vectra
- IBM AT
- IBM PC/XT

If your computer isn't listed, and it supports an RS-232-C or an HP-IB interface, follow the RS-232-C or HP-IB 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 Appendix A.

# Setting Up an RS-232-C/CCITT V.24 Interconnection

Use this section to help you establish RS-232-C (CCITT V.24) communication between the plotter and your computer. RS-232-C is also known as serial interfacing.

**NOTE:** All information in this manual applies equally to RS-232-C and CCITT V.24 interfaces, except where noted. For simplicity, only the term RS-232-C is used. ■



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

1. **Identify system configuration.** Read the following section to learn how to configure the plotter with your computer equipment.
2. **Connect the equipment.** With both computer and plotter turned off, connect the RS-232-C cable between the plotter's RS-232-C port and the appropriate port on your computer. Tighten the screws on both ends of the cable.
3. **Set serial interface conditions.** Use the plotter's rear-panel switches (explained in *Setting the RS-232-C Interface Switches*), to set the type of configuration, baud rate, and parity.
4. **Verify communication.** Use the appropriate read and write statements for your computer and run the following interconnection test program. The program instructs the plotter to print 7570A PLOTTER OK. Make sure you have loaded pens and paper.

   The column to the left of the program indicates whether lines are read or written. (The CHR$(3) string function sends the decimal code of the ASCII character **ETX**. Check your computer language documentation for the proper function to use.)

```
Write   "IN;OI;"
Read    ID$
Write   "SP1;PA500,500;"
Write   "LB"+ID$+" PLOTTER OK"+CHR$(3)
Write   "PA0,0;SP0;"
```

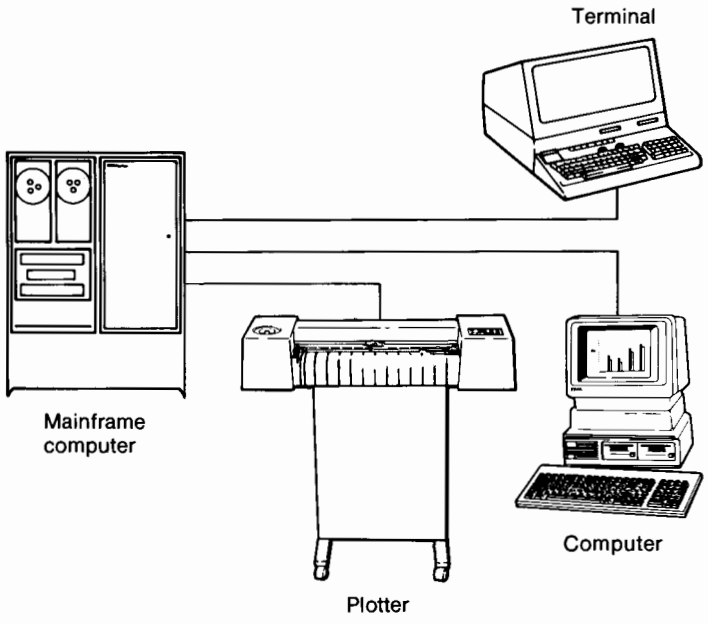
For RS-232-C cable schematics, refer to Appendix A. For additional information about interfacing and handshaking, the *RS-232-C Interfacing and Handshaking Guide*, Application Note 6 (Part No. (11)5953-9770) is available through HP Sales and Support Offices.

## Identifying Your System Configuration

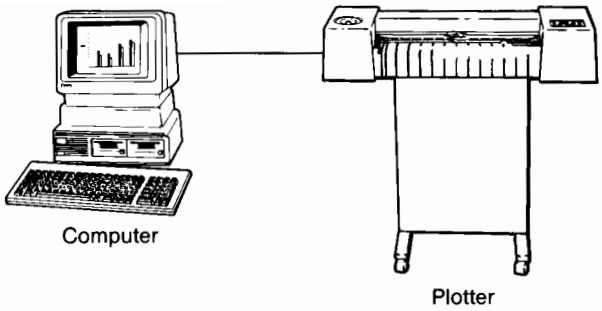
The term "system configuration" refers to the way the plotter is connected to the computer and other equipment. The plotter may be operated in a standalone or eavesdrop configuration. Read the following descriptions to identify your configuration, then go to the section called *Setting the RS-232-C Interface Switches* to learn how to set interface conditions.

### *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*

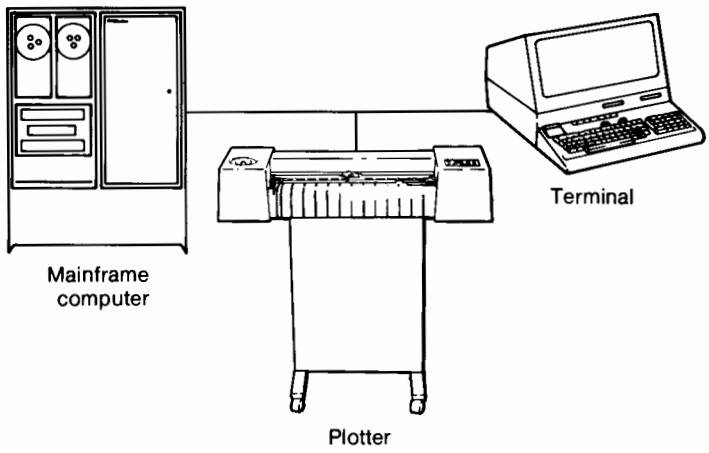



*Standalone Configuration with Personal Computer*



### *Eavesdrop Configuration*

In an eavesdrop configuration, the plotter is connected between a mainframe computer and a terminal, as shown in the following illustration. 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*

## 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 use 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 adjustments need to be made. If you are using a software package, you may need to make adjustments so that the software uses the same parity and baud rate as your computer and plotter.

*RS-232-C Interface Condition Checklist*

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

*When parity is off and the **ODD** switch is on, the plotter sends the parity bit as a 1.

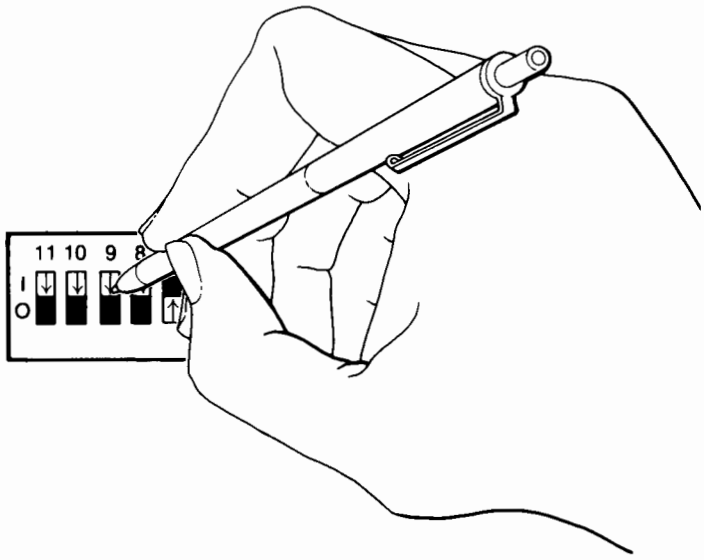
The following section explains how to use the plotter's rear-panel switches to set your plotter's interface conditions.

## 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. Your plotter checks the switch settings only when you turn it on, so be sure the plotter is turned off before resetting switches. Once your plotter's switches are set correctly, you will not need to reset them unless you change your computer/plotter system.

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

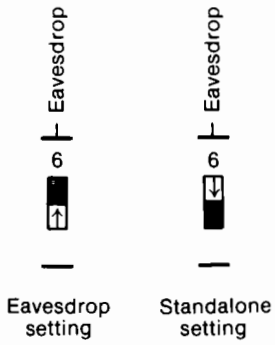
1. Turn off the plotter.
2. Use a pencil or pen to push the switch to the desired position.
3. Turn on the plotter. The new switch settings are now in effect.




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

### *Setting Eavesdrop or Standalone Configuration*

The way you configure your computer and plotter determines how you will set the **EAVESDROP** switch. The two settings, eavesdrop and standalone, are shown in the following illustration.




Select the setting appropriate for your computer/plotter configuration.

### *Setting the Baud Rate*

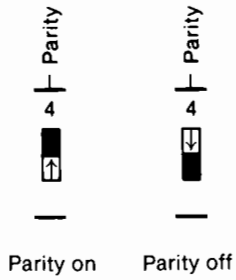
The combined settings of the four **BAUD RATE** switches are used to select the baud rate and stop bits. The following table shows how to set the switches for the available baud rates.

| Baud Rate | Switch settings 3 | 2 | 1 | 0 | Stop bits |
|---|---|---|---|---|---|
| 75 | ▼ | ▼ | ▼ | ▲ | 2 |
| 110 | ▼ | ▼ | ▲ | ▼ | 2 |
| 150 | ▼ | ▼ | ▼ | ▼ | 2 |
| 150 | ▼ | ▼ | ▲ | ▲ | 1 |
| 200 | ▼ | ▲ | ▼ | ▼ | 1 |
| 300 | ▼ | ▲ | ▼ | ▲ | 1 |
| 600 | ▼ | ▲ | ▲ | ▼ | 1 |
| 1200 | ▼ | ▲ | ▲ | ▲ | 1 |
| 2400 | ▲ | ▼ | ▼ | ▼ | 1 |
| 4800 | ▲ | ▼ | ▼ | ▲ | 1 |
| 9600 | ▲ | ▼ | ▲ | ▼ | 1 |

Select the baud rate compatible with your computer. (It is not required that your computer and plotter use the same number of stop bits.)

### *Setting the Parity*

Use the **PARITY** switch to turn parity checking on or off. When parity checking is on, bit 7 is interpreted as a parity bit; when off, bit 7 is interpreted as data. The switch settings for turning parity checking on and off are shown in the following figure.

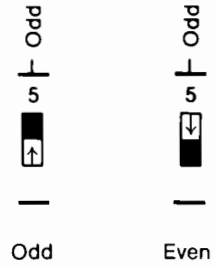



Parity on Parity off

Select the parity setting compatible with your computer. If your computer requires parity, set the **PARITY** switch on then select odd or even parity according to your computer's requirements (refer to the following section).

### *Setting Odd or Even Parity*

If you are using parity, use the **ODD** switch to select odd or even parity, as required by your computer. The following figure illustrates the odd and even switch settings.




This switch has the following effect when parity checking is off: when set to odd, bit 7 is transmitted as 1 (mark parity); when set to even, bit 7 is transmitted as 0 (space or zero parity).

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

If you have purchased the HP-IB Interface Cartridge (Part No. 17570A), 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 A.

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). Insert the other end of the cable into 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.

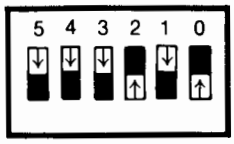
3. **Verify communication.** Use the appropriate read and write statements for your computer language to run the following interconnection test program. The program instructs the plotter to print 7570A PLOTTER OK. Make sure you have loaded pens and paper.

   The column to the left of the program indicates whether lines are read or written. (The CHR$(3) string function sends the decimal code of the ASCII character **ETX**. Check your computer language documentation for the proper string function to use.)

```
Write  "IN;OI;"
Read   ID$
Write  "SP1;PA500,500;"
Write  "LB"+ID$+" PLOTTER OK"+CHR$(3)
Write  "PA0,0;SP0;"
```

## Selecting an Address

If you are using more than one peripheral with your computer, each must have a separate HP-IB address. Most systems use address 05 for plotters — this is the plotter's default address setting, shown in the following illustration. To use an address other than 05, refer to the table of HP-IB address settings in Appendix A.



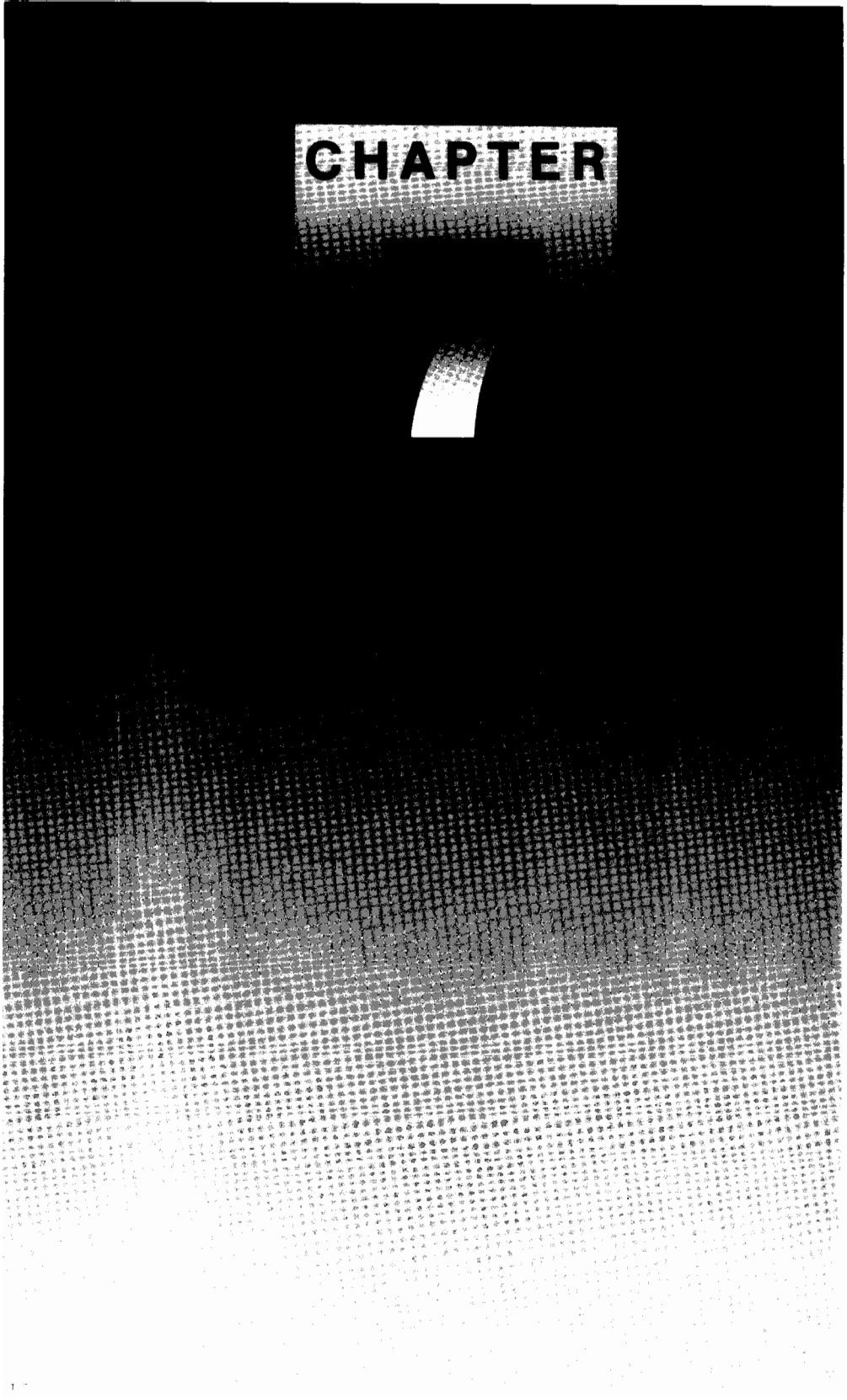

**NOTE:** Switch number 5 is reserved and must remain in the position shown. ■

Your plotter checks the switch settings only when you turn it on, so be sure the plotter is turned off before resetting the switches. Use a pencil or pen to push the switch to the desired position.

If you select listen-only, 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.

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 systems fits this description, refer to *HP-IB Addressing Protocol*, in Appendix A, for details.

# Notes


CHAPTER
7


# Computer/Plotter Interconnection

## What You'll Learn in This Chapter

This chapter explains how to connect your plotter to a computer so that you can use software packages or programs to create graphics on your plotter. Specific instructions are provided for connecting your plotter to the following computers.

- Apple IIc
- Apple IIe
- Apple Macintosh
- DEC VAX
- HP 3000
- HP 9000 Series 200
- HP 9000 Series 300
- HP Touchscreen
- HP Vectra
- IBM AT
- IBM PC/XT



## Using the Computer/Plotter 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 computer and plotter equipment listed for each interconnection is the minimum necessary to establish communication between your computer and plotter. 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.

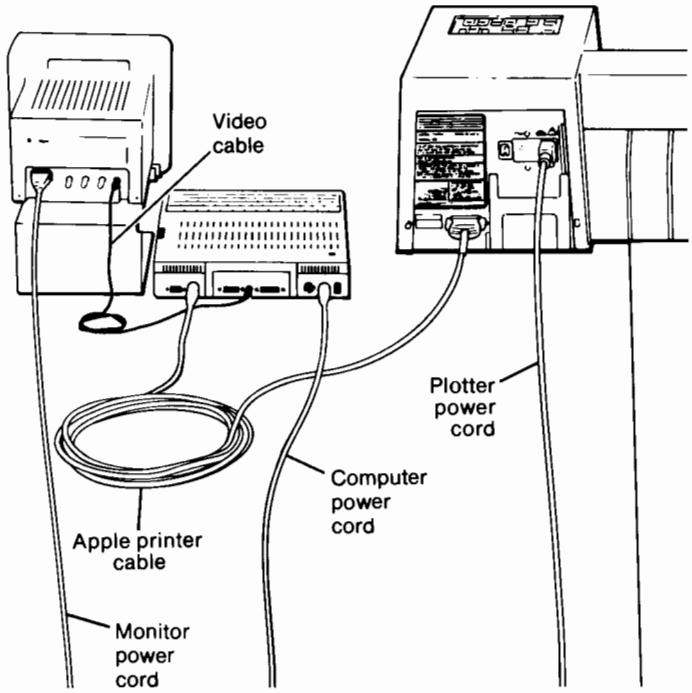
# Apple IIc Computer
(RS-232-C Interface)

Computer Museum

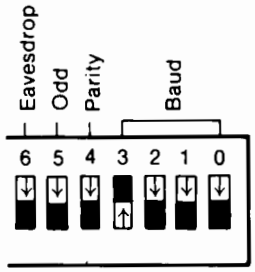
| Computer Equipment | Plotter Equipment |
|---|---|
| Apple IIc computer<br>Apple monitor or equivalent<br>Apple printer cable (Apple Part No. A9C0308) | HP DraftPro |

## Interconnection Instructions

1. Turn off your plotter and computer equipment.
2. Connect the plotter to the computer using the Apple printer cable as shown in the following illustration. The small, round end of the cable connects to port 2 of the computer.



3. Set the plotter's rear-panel switches to 2400 baud rate and space parity, shown in the following illustration.




4. Configure your computer system as follows. (Refer to your computer documentation if you have difficulty with this step.) If you want to save the following configuration on disc so you won't have to repeat the procedure everytime you use your plotter with your computer, first make a copy of the Systems Utilities disc.

   a. Insert the System Utilities disc (copy). From the main menu, press 8 on your keyboard to select ADVANCED OPERATIONS, then press RETURN.

   b. Press 5 to select CONFIGURE THE SERIAL PORTS, then press RETURN.

   c. Press 2 to select SET PORT 2, then press RETURN.

   d. Press 8 to select I KNOW MY PIN, then press RETURN.

   e. When asked to enter the new PIN, type 234/5111 and press RETURN. When asked if the pin is correct, answer YES if correct, and press RETURN.

   f. When asked if you want to save the configuration, answer YES if you have made and are using a **copy** of the Systems Utilities disc. Press RETURN.

   g. Your screen should now display the new PIN number 234/5111 beneath SET PORT 2.

   h. Exit the System Utilities menu by pressing ESC twice, then press 9 and RETURN. When asked if you want to exit, select YES, and press RETURN.

You should now be in BASIC and ready to enter and run the test program.

## 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 PRINT CHR$(4); "PR#2"
20 PRINT CHR$(1); "10B"
30 PRINT CHR$(4); "IN#2"
40 PRINT CHR$(27) + ".M50;63;13;13:"
50 PRINT "IN;0I;"
60 INPUT ID$
70 PRINT "SP1;PA500,500;"
80 PRINT "LB"+ID$+" PLOTTER OK" + CHR$(3)
90 PRINT "PA0,0;SP0;"
100 PRINT CHR$(4); "PR#0"
110 PRINT CHR$(4);"IN#0"
120 END
```

Your plotter selects pen #1 and prints 7570A PLOTTER OK.

# Apple IIe Computer
(RS-232-C Interface)

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

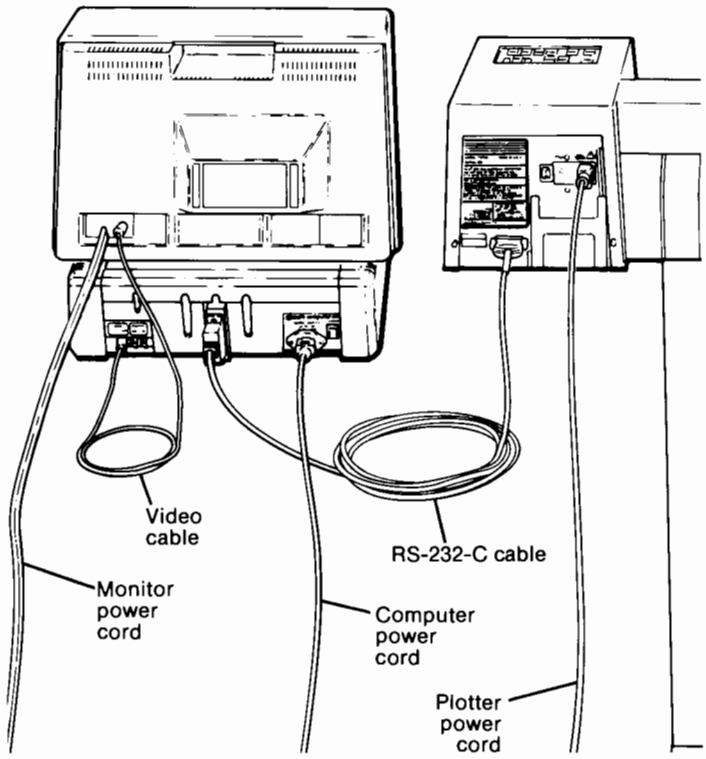
## Interconnection Instructions

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 as shown in the following illustration.

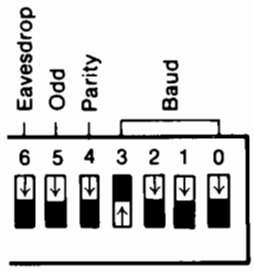
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| **SW1** | Off | On | Off | On | Off | On | On |
| **SW2** | On | Off | Off | On | Off | Off | Off |

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




4. Set the plotter's rear-panel switches to 2400 baud rate and parity checking off, as shown in 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
```

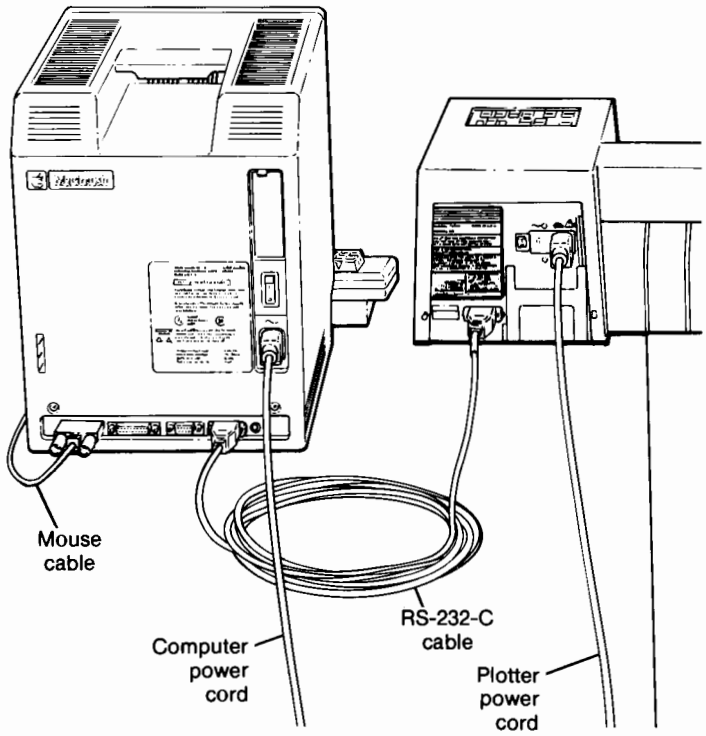
Your plotter selects pen #1 and prints 7570A PLOTTER OK.

# Apple Macintosh Computer
(RS-232-C Interface)

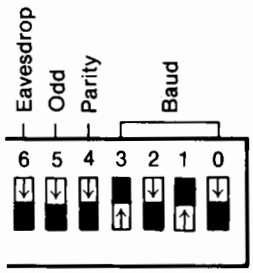
| Computer Equipment | Plotter Equipment |
|---|---|
| Apple Macintosh computer | HP DraftPro<br><br>RS-232-C cable, 9-pin male to 25-pin male (HP 92219M or Apple Part No. 599-0199-A) |

## Interconnection Instructions

1. Turn off your plotter and computer equipment.
2. Connect the plotter to the computer using the RS-232-C cable, as shown in the following illustration. The small end of the cable connects to the computer's modem port.



3. Set the plotter's rear-panel switches to 9600 baud rate and parity checking off, as shown in 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 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 7570A PLOTTER OK.

# DEC VAX Computer
## (RS-232-C Interface)

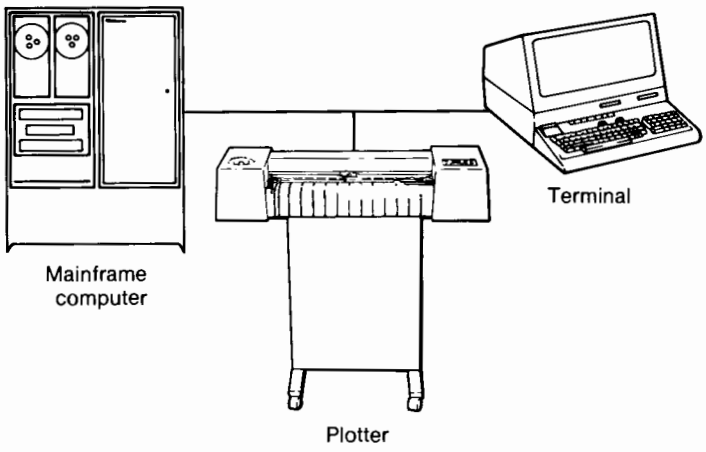
| Computer Equipment | Plotter Equipment |
|---|---|
| DEC VAX computer | HP DraftPro |
| null modem cable (DEC Part No. BC22D or BC03M)* | RS-232-C Y-cable (HP 17455A) |

*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 in an **eavesdrop** configuration. (The same instructions apply for a standalone configuration, with the following changes: use RS-232-C cable HP 17355M to connect the plotter to the computer's null modem cable; and turn **EAVESDROP** off.)

1. Turn off your plotter and terminal.
2. 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.



3. 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.

## 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 ('+',A1,'.(',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 the plotter's *Programmer's Reference* (Part No. 07570-90001) for information on changing these values. ■

Your plotter selects pen #1 and prints 7570A PLOTTER OK.

# HP 3000 Computer
## (RS-232-C Interface)

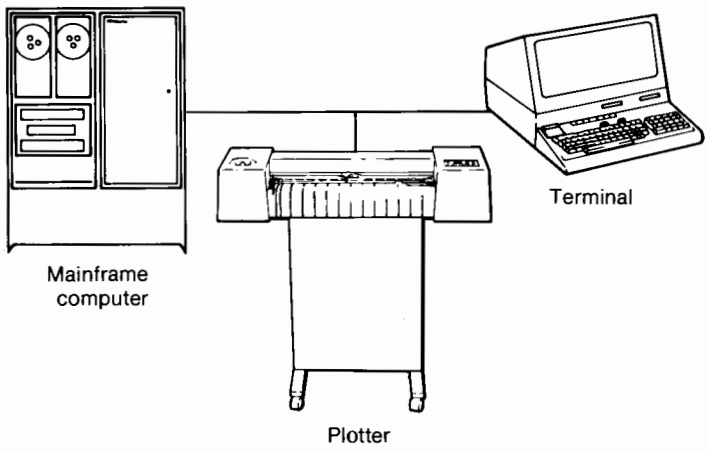
| Computer Equipment | Plotter Equipment |
|---|---|
| HP 3000 computer | HP DraftPro |
| RS-232-C cable HP 17355D* | RS-232-C Y-cable (HP 17455A) |

*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 standalone 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. 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.



3. 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.

## 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.)

```
C
C
      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 the plotter's *Programmer's Reference* (Part No. 07570-90001) for information on changing these values. ■

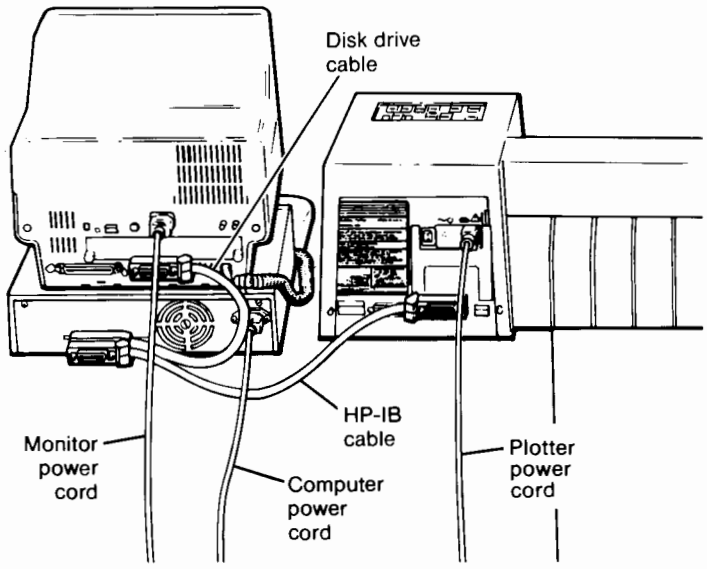
Your plotter selects pen #1 and prints 7570A PLOTTER OK.

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

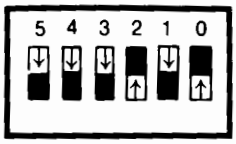
| Computer Equipment | Plotter Equipment |
|---|---|
| HP Model 216, 226, or 236 computer | HP DraftPro<br>HP-IB interface cartridge (HP 17570A or 17571A)<br>HP-IB cable (HP 10833A, B, C, or D) |

## 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. 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.



4. Set the plotter's rear-panel HP-IB switches to address 05, as shown in 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 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 7570A PLOTTER OK.

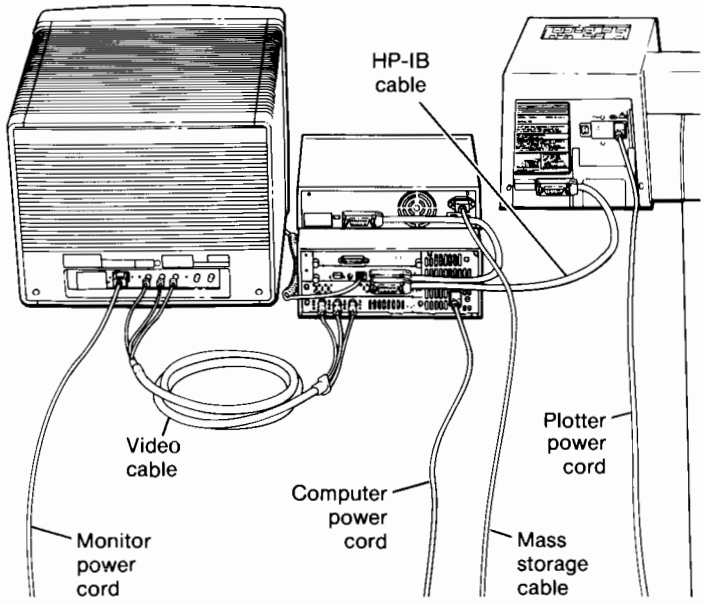
# HP 9000 Series 300 Technical Computer
(HP-IB Interface)

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

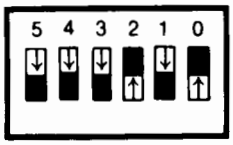
*The test program included in these instructions uses the BASIC operating system.

## Interconnection Instructions

1. Turn off your plotter and computer equipment.
2. 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.



3. Set the plotter's rear-panel HP-IB switches to address 05, as shown in the following illustration.




## 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 7570A PLOTTER OK.

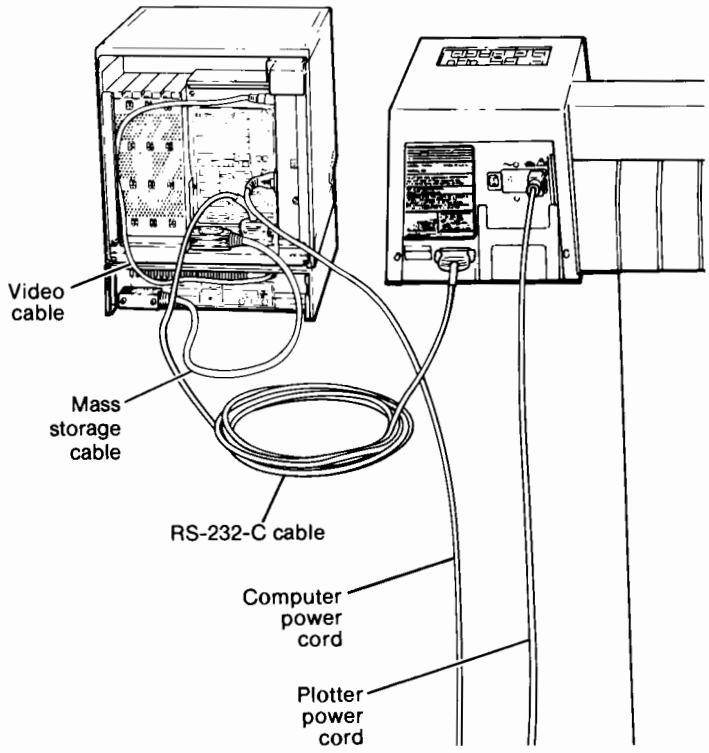
# HP Touchscreen Personal Computer
(RS-232-C Interface)

| Computer Equipment | Plotter Equipment |
|---|---|
| HP 150C, Touchscreen, or Touchscreen II system, including double disc drive (flexible or fixed) and MS-DOS | HP DraftPro<br><br>RS-232-C cable, male-to-male (HP 17255M or HP 13242G) |

Computer Museum

## Interconnection Instructions

1. Turn off your plotter and computer equipment.
2. Connect the plotter to port 2 of the computer using the RS-232-C cable, as shown in the following illustration. Either end of the cable can be connected to the plotter or the computer.



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


4. Configure your computer system as follows. (Refer to your computer documentation if you have difficulty with this step.)

   a. Insert the MS-DOS System Disc. Touch DEVICE CONFIG. Then touch START APPLIC to display the DEVICE CONFIGURATION screen.

   b. Touch the PLT field, then use the NEXT CHOICE key to select PLT: PORT 2. Next, touch SAVE CONFIG.

   c. Press the USER/SYSTEM key on your keyboard twice to change the function key selections. Then select CONFIG KEYS.

   d. Select the PORT 2 CONFIG field to display the PORT 2 screen. Press the SYSTEM DEFAULTS key, then the DEFAULT VALUES key. Use the NEXT CHOICE key to select BAUD RATE 9600. Then use the cursor controls to select the CS(CB)XMIT field. Use the NEXT CHOICE key to set the field to YES.

   e. Touch SAVE CONFIG to save the new configuration. Hold down the SHIFT key and press the USER/SYSTEM key. Press the EXIT CONFIG to return to P.A.M.

## Running the Test Program

To test the computer/plotter interface, turn on your 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 OPEN "O",1,"PLT"
20 PRINT #1, "IN;OI;"
30 CLOSE #1
40 OPEN "I",2,"PLT"
50 INPUT #2, ID$
60 OPEN "O",1,"PLT"
70 PRINT #1, "SP1;PA500,500;"
80 PRINT #1, "LB";ID$;" PLOTTER OK"+CHR$(3)
90 PRINT #1, "PA0,0;SP0;"
100 END
```

Your plotter selects pen #1 and prints 7570A PLOTTER OK.

# HP Vectra Personal Computer
## (RS-232-C Interface)

| Computer Equipment | Plotter Equipment |
|---|---|
| HP Vectra PC with 256K graphics monitor<br><br>diskette drive<br><br>HP Serial/Parallel Interface Card (HP 24540A)*<br>or<br>HP Dual Serial Interface Card (HP 24541A)** | HP DraftPro<br><br>RS-232-C cable (use cable appropriate for interface card) |

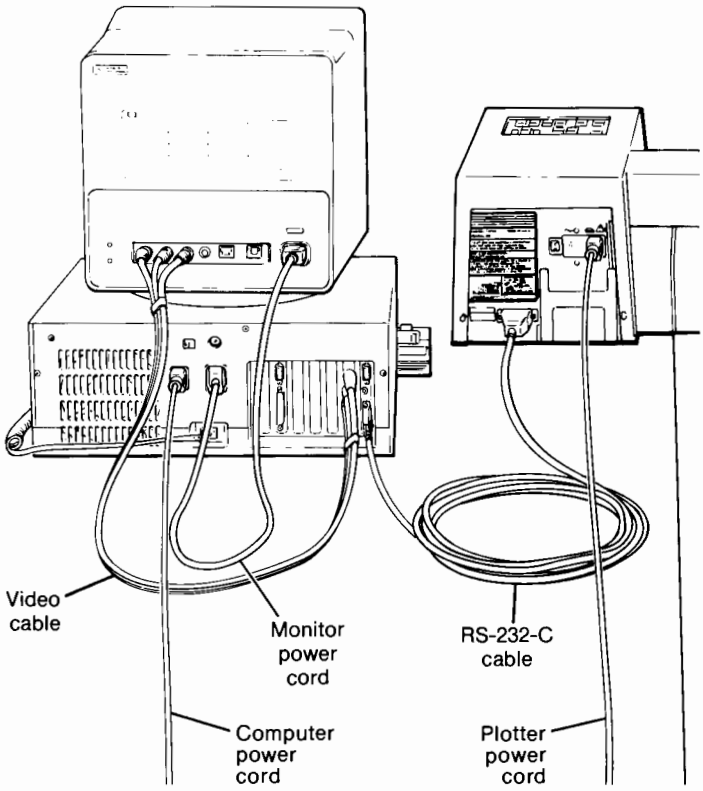
*Use with 9-25 pin RS-232-C cable (HP 24542G).

**Use with RS-232-C cable (HP 17255M or HP 13242G) **or** with 9-25 pin RS-232-C cable (HP 24542G).

### Interconnection Instructions

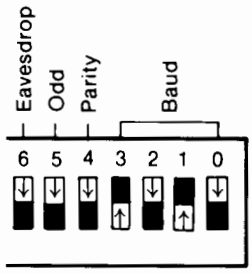
1. Turn off your plotter and computer equipment.
2. Install one of the serial interface cards. (Refer to your computer documentation for details.) If you have already installed a serial card, go to step 3.

3. Connect the plotter to the computer as shown in the following illustration. If you are using the HP 24540A Serial/Parallel Interface card, connect the small end of cable HP 24542G to the 9-pin connector on the back of the computer, and attach the other end of the cable to the plotter.




If you are using the HP 24541A Dual Interface card, you can use either the HP 17255M cable or the HP 24542G cable. To use the HP 17255M cable, attach one end of the cable to the 25-pin connector on the computer, and attach the other end of the cable to the plotter. To use the HP 24542G cable, attach one end of the cable to the 9-pin connector on the computer, and attach the other end of the cable to the plotter.

4. Set the plotter's rear-panel switches to 9600 baud rate and zero parity, as shown in 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 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:** If you are using the HP 24541A Dual Serial Interface Card with RS-232-C cable HP 24542G (9-pin connector), replace line 10 above with the following:

```
10 OPEN "COM2:9600,N,8,1,RS,CS65535,DS,CD" AS #1
```

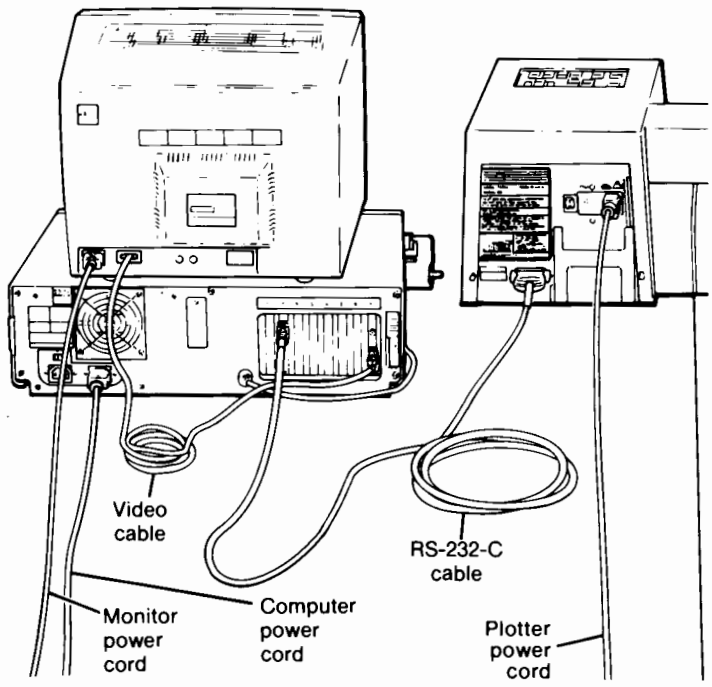
Your plotter selects pen #1 and prints 7570A PLOTTER OK.

# IBM AT Computer
(RS-232-C Interface)

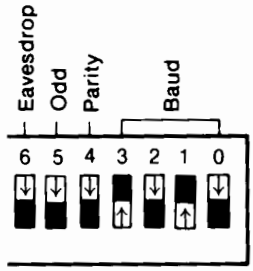
| Computer Equipment | Plotter Equipment |
|---|---|
| IBM AT system unit<br>graphics monitor (color or b&w)<br>IBM color/graphics adapter | HP DraftPro<br>RS-232-C cable, 25-pin male to 9-pin female (HP 24542G) |

## Interconnection Instructions

1. Turn off your plotter and computer equipment.
2. Connect the plotter to the computer using the special RS-232-C cable as shown in the following illustration. The small, 9-pin connector connects to the 9-pin serial port on the back of the IBM AT.



3. Set the plotter's rear panel switches to 9600 baud rate and parity checking off, as shown in 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 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:** If you are using a baud rate other than 9600, substitute that baud rate for 9600 in line 10. ■

Your plotter selects pen #1 and prints 7570A PLOTTER OK.

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

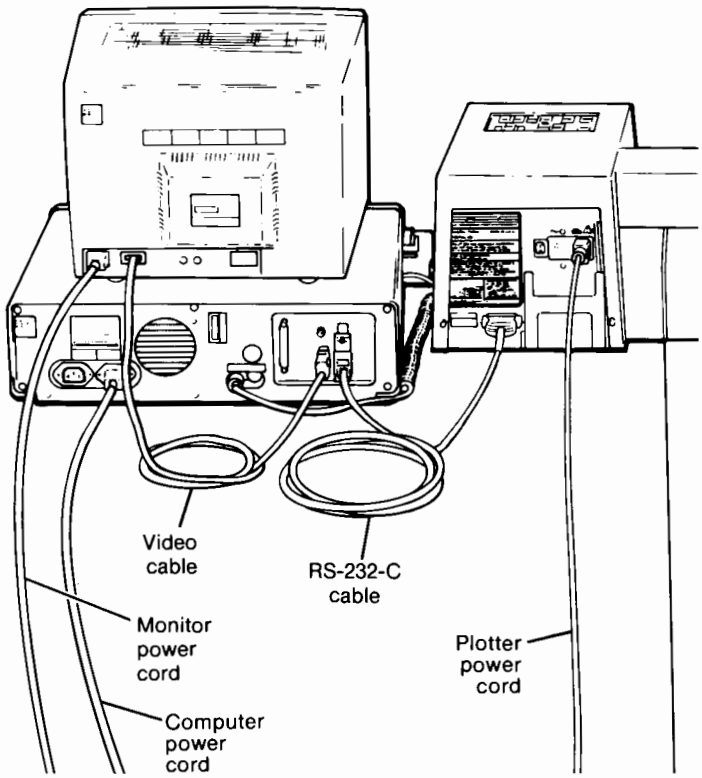
| Computer Equipment | Plotter Equipment |
|---|---|
| IBM system unit<br>graphics monitor (color or b&w)<br>IBM color/graphics adapter<br>diskette drive and adapter<br>Asynchronous Communications Adapter (standard on the PC/XT) | HP DraftPro<br>RS-232-C cable, male-to-female (HP 17255D or equivalent)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

## Interconnection Instructions

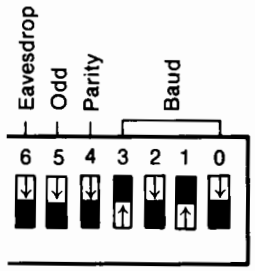
1. Turn off your plotter and computer equipment.
2. Install the Asynchronous Communications Adapter (RS-232-C serial card) in your IBM PC (refer to your IBM documentation for instructions on installation). If you are using an IBM PC/XT or have already installed the serial card, go on to step 3.

   **NOTE:** If you have two Anyschronous 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. ■

3. Connect the plotter to the computer using the RS-232-C cable as shown in the following illustration. Connect the female end of the cable to the IBM Asynchronous Communications Adapter.



4. Set the plotter's rear-panel switches to 9600 baud rate and parity checking off, as shown in the following illustration.



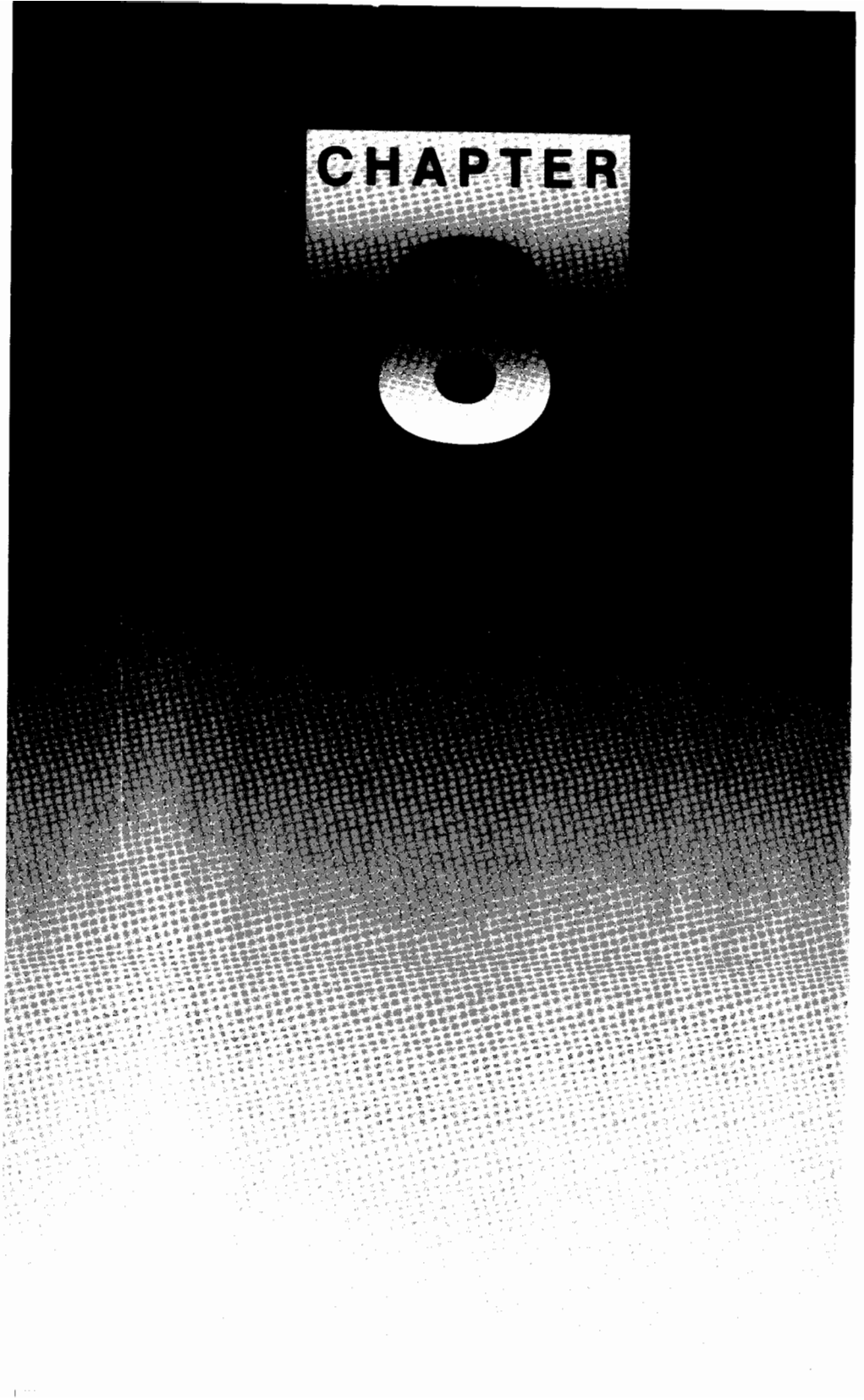

## Running the Test Program

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 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:** If you are using a baud rate other than 9600, substitute that baud rate for 9600 in line 10. If you installed more than one asynchronous communications adapter, COM1 in line 10 may have to be changed. Consult your computer documentation for details. ■

Your plotter selects pen #1 and prints 7570A PLOTTER OK.


CHAPTER
5


# Using Software with Your Plotter


## What You'll Learn in This Chapter

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) 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 communication problems. Read your software documentation when installing 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.

The following two sections summarize information you may need when configuring or installing your software package. Read the section pertaining to the interface type you are using.

## 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 indicated 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 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.

## Notes

APPENDIX

# Technical Information

## What You'll Learn in This Appendix

This appendix contains the functional, physical, and environmental specifications for your plotter. RS-232-C cable schematics and HP-IB interfacing functions and addressing protocol are also provided.

## Functional Specifications

| | |
|---|---|
| number of pens | 8 |
| pen types | fiber-tip paper pens,<br>disposable drafting pens,<br>refillable drafting pens |
| media sizes | 17 × 22 in. (ANSI C)<br>22 × 34 in. (ANSI D)<br>18 × 24 in. (Architectural C)<br>24 × 36 in. (Architectural D)<br>420 × 594 mm (ISO A2)<br>594 × 841 mm (ISO A1) |
| media types | plotter paper, vellum,<br>double-matte polyester film |

*(Table continues)*

| | |
|---|---|
| margins<br>normal mode<br><br>expanded mode | <br>15 mm (0.59 in.) on three edges, 39 mm (1.5 in.) on the fourth<br><br>5 mm (0.2 in.) on three edges, 31 mm (1.2 in.) on the fourth |
| pen velocity<br>pen up<br><br>pen down | <br>50 cm/s<br><br>maximum: 40 cm/s<br>front panel selectable: 5 to 40 cm/s in 5 cm/s increments<br>programmable: 1 to 40 cm/s in 1 cm/s increments |
| pen cycle time | 100 ms |
| acceleration | approximately 2 g's |
| buffer size | 7448 bytes (shared between I/O, polygon, and pen sort buffers) |

## Physical Specifications

| | |
|---|---|
| size<br>height<br>width<br>depth | <br>1030 mm (40.6 in.)<br>1140 mm (44.9 in.)<br>520 mm (20.5 in.) |
| weight | 30 kg (66 lbs) |

## Environmental Specifications

| | |
|---|---|
| operating temperature | 0°C to 55°C |
| non-operating temperature | −40°C to 75°C |
| relative humidity | 5% to 95% (in 0°C to 40°C) |

# Power Specifications

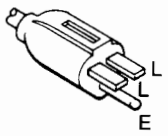
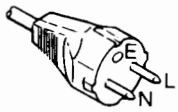
## Requirements

| | |
|---|---|
| source | 100, 120, 220, 240 V~ |
| frequency | 47.5–66 Hz |
| consumption | less than 80 W maximum |

## 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.

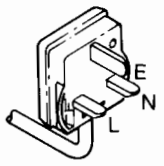
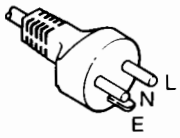
*Power Options*

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

# RS-232-C Interface Specifications

The following sections present RS-232-C 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.

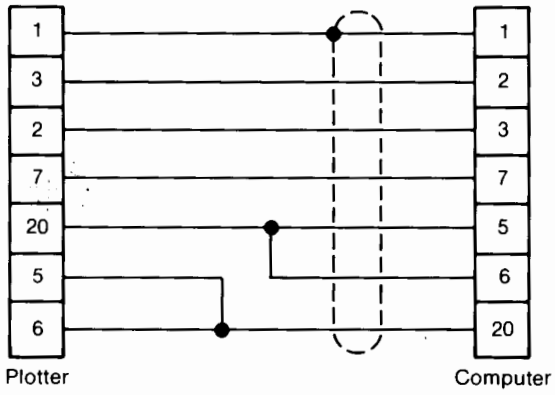
| Wire/Signal Name | Pin # | RS-232-C | CCITT V.24 |
|---|---|---|---|
| Protective Ground | 1 | AA | 101 |
| Transmitted Data | 2 | BA | 103 |
| Received Data | 3 | BB | 104 |
| Request to Send | 4 | CA | 105 |
| Clear to Send | 5 | CB | 106 |
| Data Set Ready | 6 | CC | 107 |
| Signal Ground | 7 | 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

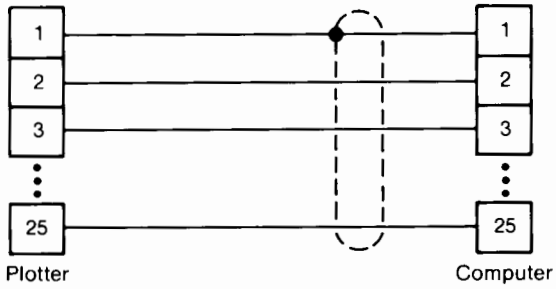
The following cable schematics are for Hewlett-Packard cables.

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



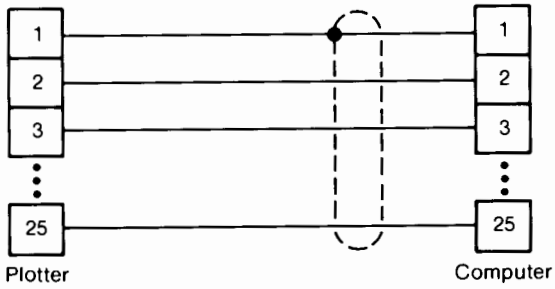

*Symmetrical; either end may be connected to the plotter. Other pins are connected in the 13242G but do not affect plotter operation.

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




*(pins 1-25 are directly connected)*

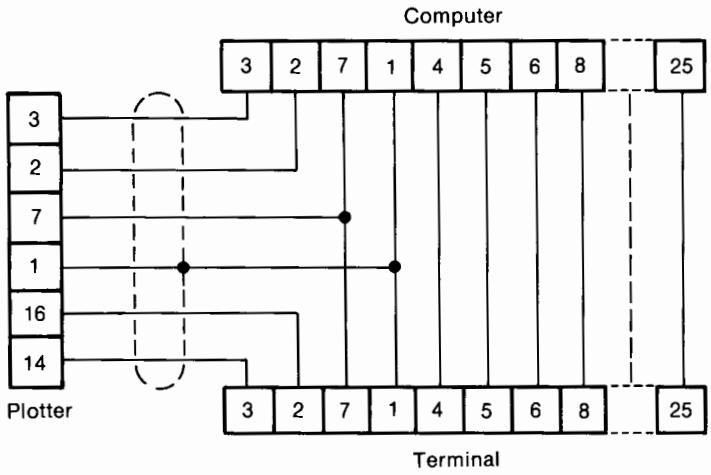
| HP Part Number | Connector Type (25-pin) | |
|---|---|---|
| | Plotter End | Computer End |
| 17355M* | male | male |




*(pins 1-25 are directly connected)*

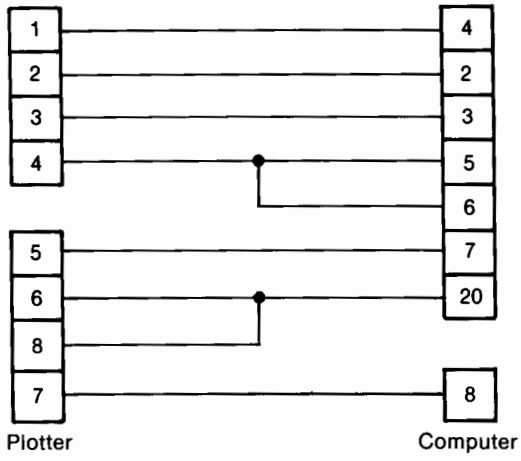
*Symmetrical; either end may be connected to the plotter.

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

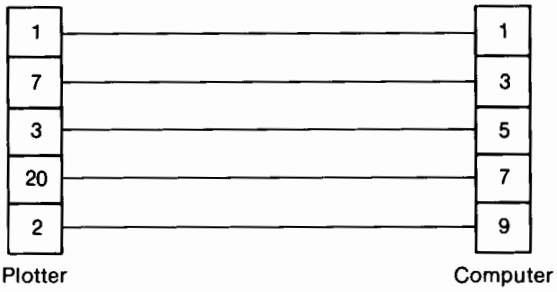



*(pins 4, 5, 6, and 8 through 25 are directly connected between the computer and terminal connectors)*

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




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



# HP-IB Interface Information

The following sections present HP-IB addressing protocol and interface functions.

## 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.

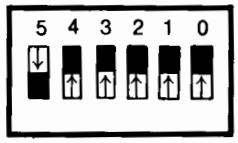
**NOTE:** When using your plotter with an HP desktop computer, do not use address 21; it is reserved for the desktop computer's address. ■

*HP-IB Address Settings*

| HP-IB Address | Address Switch Settings | | | | | Address Characters | |
|---|---|---|---|---|---|---|---|
| | 4 | 3 | 2 | 1 | 0 | Listen | Talk |
| 00 | ↓ | ↓ | ↓ | ↓ | ↓ | SP | @ |
| 01 | ↓ | ↓ | ↓ | ↓ | ↑ | ! | A |
| 02 | ↓ | ↓ | ↓ | ↑ | ↓ | " | B |
| 03 | ↓ | ↓ | ↓ | ↑ | ↑ | # | C |
| 04 | ↓ | ↓ | ↑ | ↓ | ↓ | $ | D |
| 05 | ↓ | ↓ | ↑ | ↓ | ↑ | % | E |
| 06 | ↓ | ↓ | ↑ | ↑ | ↓ | & | F |
| 07 | ↓ | ↓ | ↑ | ↑ | ↑ | ' | G |
| 08 | ↓ | ↑ | ↓ | ↓ | ↓ | ( | H |
| 09 | ↓ | ↑ | ↓ | ↓ | ↑ | ) | I |
| 10 | ↓ | ↑ | ↓ | ↑ | ↓ | * | J |
| 11 | ↓ | ↑ | ↓ | ↑ | ↑ | + | K |
| 12 | ↓ | ↑ | ↑ | ↓ | ↓ | , | L |
| 13 | ↓ | ↑ | ↑ | ↓ | ↑ | – | M |
| 14 | ↓ | ↑ | ↑ | ↑ | ↓ | . | N |
| 15 | ↓ | ↑ | ↑ | ↑ | ↑ | / | O |
| 16 | ↑ | ↓ | ↓ | ↓ | ↓ | 0 | P |
| 17 | ↑ | ↓ | ↓ | ↓ | ↑ | 1 | Q |
| 18 | ↑ | ↓ | ↓ | ↑ | ↓ | 2 | R |
| 19 | ↑ | ↓ | ↓ | ↑ | ↑ | 3 | S |
| 20 | ↑ | ↓ | ↑ | ↓ | ↓ | 4 | T |
| 21 | ↑ | ↓ | ↑ | ↓ | ↑ | 5 | U |
| 22 | ↑ | ↓ | ↑ | ↑ | ↓ | 6 | V |
| 23 | ↑ | ↓ | ↑ | ↑ | ↑ | 7 | W |
| 24 | ↑ | ↑ | ↓ | ↓ | ↓ | 8 | X |
| 25 | ↑ | ↑ | ↓ | ↓ | ↑ | 9 | Y |
| 26 | ↑ | ↑ | ↓ | ↑ | ↓ | : | Z |
| 27 | ↑ | ↑ | ↓ | ↑ | ↑ | ; | [ |
| 28 | ↑ | ↑ | ↑ | ↓ | ↓ | < | \ |
| 29 | ↑ | ↑ | ↑ | ↓ | ↑ | = | ] |
| 30 | ↑ | ↑ | ↑ | ↑ | ↓ | > | ^ |
| 31 | ↑ | ↑ | ↑ | ↑ | ↑ | ? | _ |

## 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.


# 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** | 0.013 mm (0.0005 in.) |
| **addressable resolution** | 0.025 mm (0.001 in.) |

*On 3-mil double-matte polyester film at 10-30°C.



## 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) 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.**

   - As pen tips wear, pen widths begin to vary.
   - 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 |

APPENDIX

C

# Accessories Available


## What You'll Learn in This Appendix

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 *Programmer's Pocket Guide* are included.

## Accessories Available

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 *Drafting Supplies Catalog* shipped with your plotter.

| Item | HP Part Number |
|---|---|
| *HP DraftPro Programmer's Reference* | 07570-90001 |
| *HP DraftPro Programmer's Pocket Guide* | 07570-90003 |
| *HP DraftPro User's Guide* | |
| English | 07570-90002 |
| German | 07570-90004 |
| French | 07570-90005 |
| Spanish | 07570-90006 |
| Italian | 07570-90007 |
| Japanese | 07570-90008 |

*(Table continues)*

| Item | HP Part Number |
|---|---|
| HP-IB interface cartridge | 17570A |
| HP-IB interface cartridge with Kanji | 17571A |
| power cable | see Appendix A |
| RS-232-C cable (for use with IBM PC and PC/XT) | 17255D (1.5 m) |
| RS-232-C cable (for use with HP Touch-screen 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 (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) |
| 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 caps (boots)<br>for fiber-tip pen carousels<br>for drafting pen carousels | <br>07475-40002<br>07570-40235 |
| adapter and pen cap assemblies | 5061-7578 |
| standard digitizing sight | 09872-60066 |
| slanted digitizing sight | 07585-60191 |

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

### The Programmer's Reference and Pocket Guide

The *HP DraftPro 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 *HP DraftPro Programmer's Pocket Guide* is also available and provides a quick, convenient reference when programming in HP-GL. The *Programmer's Pocket Guide* is intended for those who are already familiar with the information contained in the *Programmer's Reference.*

## 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. Use HP's Direct Order telephone service. Telephone numbers for many locations follow.

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 calling one of the numbers below, or by asking at your local HP Sales and Support Office.

| Location | Telephone Number |
|---|---|
| United States | (800) 538-8787 |
| California, Alaska, and Hawaii | (408) 738-4133 |
| Australia | (02) 887-1611<br>(02) 888-7712<br>(03) 895-2615<br>(03) 895-2645 |

*(Table continues)*

| Location | Telephone Number |
|---|---|
| Austria | (0222) 2500-615<br>(0222) 2500-616 |
| Belgium/Luxembourg | (02) 762 32 00 |
| Canada | |
| Toronto Local | 416-671-8383 |
| Ontario | 1-800-387-3417 |
| Quebec | 1-800-387-3417 |
| British Columbia | 112-800-387-3154 |
| Other Provinces | 1-800-387-3154 |
| Denmark | (02) 816640, Ext. 258 |
| Finland | (90) 887 2361 |
| France | (1) 69 28 32 64<br>(1) 69 28 83 39 |
| Greece | (01) 6726090 |
| Italy | (02) 9236 9702 |
| Japan | |
| Tokyo | (0427) 59 1311 |
| Osaka | (06) 304 6021 |
| Middle East/Athens | (01) 6828811 |
| Norway | (02) 171180 |
| South Africa | |
| Johannesburg | (011) 8025111 |
| Cape Town | (021) 537954 |
| Spain | (91) 6374013<br>(91) 6370011 |
| Sweden | (08) 7502400 |
| Switzerland | (057) 31 22 53<br>(057) 31 22 54<br>(057) 31 22 59 |
| The Netherlands | (020) 547 6606 |
| United Kingdom | (0734) 697201 |
| West Germany | (0130) 3322 |

# 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 Interface** — A parallel interface standardized by Electronic Industries Association Standard 488-1978.

**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 Electron Industries Associaton 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 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.

## Notes

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## P (Continued)



## R



## S

# Subject Index (Continued)