HP 250 Computer Systems

Special Documentation

Using the HP 7470A Graphics Plotter On Your HP 250 Computer System

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PREFACE

The HP 7470A Graphics Plotter offers high-performance plotting at a low price. You can generate high-quality line, bar, and pie charts on your HP 250 Computer System with DSG/250, an easy-to-use interactive program. Or you can create custom graphics using the convenient programming library, Graphics Plotting Library/250.

The HP 7470A Graphics Plotter is compatible with HP 250 Computer Systems (operating system 4.02 and subsequent releases), and DSG/250 (version B.01.00 and subsequent releases).

In the future, when the following manuals are updated to contain the information in this booklet, this ***Special Documentation Package*** will become **OBSOLETE**.

Preparing for Your HP 250	(Manual Part No. 45260-90040)
HP 250/20 Site Preparation	and Installation Guide (Manual Part No. 45260-90005)
Operating the HP 250	(Manual Part No. 45260-90002)
GPL/250 Programming Manual	(Manual Part No. 45260-90064)
DSG/250 User Manual	(Manual Part No. 45150-90000)

The following manuals, which are supplied with your HP 7470A Graphics Plotter, contain further information.

Interfacing and Programming Manual (07470-90001)
Operator's Manual (07470-90002)
Interconnection Guide (07470-90003)

CONTENTS

HP 7470A Graphics Plotter - section 1

The HP 7470A Graphics Plotter utilizes a new high-performance, low inertia paper-moving system that is simple to use. Its advantages include high speed, high quality, and low price.

Features include:

* high resolution for publication-quality graphics

* versatile writing system:

    - Plots on Paper or Overhead Transparencies
    - Pens available in two line widths
    - Pens automatically capped

* Color - two-pen automatic plotting, may use up to ten colors

* RS-232-C version (OPT 001) supported on HP 250 Computer System

* HP 250 application software: DSG/250 and GPL/250

* Hewlett-Packard quality, reliability, service, and support

Ordering Information: The HP 7470A Graphics Plotter interfaces with computers made by HP, IBM, Apple, Commodore, and others. For operation on the HP 250 Computer System, option 001 (standard RS-232-C/CCIT V.24 interface) must be selected.

To connect the HP 7470A to the HP 250, use cable HP part No. 8120-3258. This three-meter cable can connect any RS-232-C plotter to the HP 250 Computer System. It must be ordered separately.

Site Preparation & Installation - section 2

Environmental Considerations

Watts: 25
BTU/hr: 85

Size and Weight

Component	Crated Weight	Crated Dimensions Length	Width	Depth
7470A Plotter	12.6 kg (28 lb)	1295 mm (51 in)	1219 mm (48 in)	838 mm (33 in)

Component	Uncrated Weight	Uncrated Dimensions Height	Width	Depth
7470A Plotter	6.1 kg (13.5 lb)	127 mm (5 in)	432 mm (17 in)	343 mm (13.5 in)

Plotter Installation

Connect AC Power - The plotter is normally shipped with a power cable suited to your country. Consult the HP 7470A Operator's Manual (Manual Part No. 07470-90002) for more details.

The Plotter Self Test - verifies the mechanical and electronic integrity of the HP 7470A, independent of its connection to the HP 250 Computer System. It is performed as follows:

1. With AC power OFF, load pens and paper. (see Section 3)

2. Turn on the AC power **while** pressing the PEN UP button.

   a. The plotter goes through an initialization cycle.

   b. After initialization, the plotter self test cycle begins and lasts approximately 55 seconds:

      1. The plotter will select alternate pens, moving between scaling points P1 and P2.

      2. It will draw an asterisk with pen 2 and move 79 spaces along the X axis.

      3. Pen 2 will be stored and the holder will return to P1, indicating that the test is completed.

   c. If the asterisk is drawn, there is a high probability that the plotter is functioning properly.

   d. The confidence test cycle repeats every 55 seconds, placing asterisks at different locations on the page. There is little need

to continue testing after the first asterisk is plotted. There is a long quiet period between test cycles.

e. To stop the confidence test, shut off power to the plotter.

Software Configuration

1. RUN "CONFIG" from the operating system disc and select function 9, entitled "Remote I/O configuration." Configure the port to which the plotter is connected as a terminal of type 26xx with 8N1 format. In the remarks column, it is useful to note the baud rate for the plotter. The HP 7470A Graphics Plotter may be run at up to 9600 baud, (whereas other HP plotters operate to 2400 baud.)

2. Select function 2 and configure the following DROM's:

   TIO (always)
   PACK (to use GPL/250 or DSG/250)
   TRIG, FORMS (to use DSG/250)

3. Store the configuration and reload the operating system by turning the HP 250 off and then on again.

Physical Connection to System - consists of four different operations:

1. SET PLOTTER BACK PANEL SWITCHES

PARITY S1 - Set to 0 (this disables parity checking).

PARITY S2 - Doesn't matter with S1 set to "0".

D/Y - Position D indicates that the plotter is connected directly to the computer.

US/A4 - Set this rocker switch on US for 8.5 x 11 inch paper and 7470A Overhead Transparency Film; on A4 for 210 x 297 millimeter paper.

B4/B3/B2/B1 - Set these four rocker switches to select the baud rate to be used with the computer. Normally, for direct connections, 9600 baud will be used. Other common baud rates are 2400 (for compatibility with other HP Graphics Plotters), 1200 (for 1200 baud MODEMs), and 300 (for 300 BAUD MODEMs). The switch positions that give these rates are shown below.

BAUD RATE	B4	B3	B2	B1
300	0	1	0	1
1200	0	1	1	1
2400	1	0	0	0
9600	1	0	1	0

The HP 7470A Graphics Plotter has a maximum baud rate of 9600. (Other plotters compatible with the HP 250 have a maximum baud rate of 2400.) **Keep baud rates in mind when moving plotters between different computers.**

2. SET JUMPERS OR SWITCHES ON ASYNCHRONOUS SERIAL INTERFACE PANEL

Two versions of the Asynchronous Serial Interface panels were available when this booklet was published: 45120A for the "desk" models and the 45120B for the "pod" models. The jumpers for both should be set the same as for a 26xx application terminal. See the documentation for the particular Asynchronous Serial Interface for details.

3. SET BAUD RATE ON ASYNCHRONOUS SERIAL INTERFACE BOARD

The baud rate for HP 250 Asynchronous Serial Interface ports are set with thumbwheel switches in the cabinet. This should be done by an HP Customer Representative.

The Asynchronous Serial Interface baud rate must match the B4/B3/B2/B1 setting on the HP 7470A plotter.

4. CONNECT PLOTTER TO ASYNCHRONOUS SERIAL INTERFACE PORT

The recommended cable, which must be **ordered separately** from the plotter, is HP Part No. 8120-3258, a three-meter RS-232-C cable. This same cable can be used to connect the HP 7220, HP 7221, or HP 7225 Plotters to the HP 250 Computer System.

The System Confidence Test - is executed by RUN "TEST". To perform one of the tests, follow the steps displayed on the screen and described below.

1. Push the "PLOTTER TEST" key.

2. Select the plotter to test. If 7470A does not appear in the list of plotters on the screen, press EDIT GPL%CF in order to enter the plotter model number and device address. When the plotter has been properly identified and initialized, the plotter buffer size will be printed on the screen.

3. Select the test complexity. The SIMPLE test draws a frame around the plotting region and the message TEST COMPLETED when finished. The COMPLETE test exercises all plotter functions used by GPL/250.

4. Depending on the test complexity and plotter capabilities, more questions will be asked.

5. When ready to start plotting, push START PLOTTING.

6. The console display will indicate when the program is finished with the confidence test.

Operating the HP 7470A - section 3

This section supplements ***Chapter 7 - Graphics Devices***, of "Operating the HP 250" (Manual Part No. 45260-90002). Included is detailed information only for operating the HP 7470A (OPT 001) Graphics Plotter.

A more detailed reference on this plotter is the HP 7470A Graphics Plotter Operator's Manual (Manual Part No. 07470-90002), which is supplied with your plotter.

Turning on AC Power

If the device has never been connected to your power line, be sure it is properly configured for your type of AC Power BEFORE plugging it in. See the HP 7470A Operator's Manual (Manual Part No. 07470-90002) for details.

1. Locate the Power Switch on the rear panel,

2. Turn on the Power - Push the upper side of the large rocker switch. To later turn off the power, just push the lower side; a "0" will be exposed on the top of the switch.

When the power is turned on:

1. The plotter moves the pen holder to the left pen stall to check the occupancy status of the left stall. If a pen is not installed in the left pen stall, the pen holder checks the occupancy status of the right pen stall. When a pen is found, or if no pens are installed, the pen holder returns to a point near the right plotting limit to complete the initialization cycle.

2. If the paper loading lever is in the PAPER LOAD position, the ERROR light blinks once, then illuminates steadily after the initialization finishes. If the paper loading lever is in the PAPER HOLD position, the ERROR light remains off during and after initialization.

Now you are ready to add or change pens and paper.

Loading Pens and Paper

Disable the plotter before loading paper and pens by raising the paper loading lever to the PAPER LOAD position.

Changing Pens

1. Raise the protective cover to gain access to the pen stalls.

2. Remove the old pen in the left stall. Cap it if it is to be saved.

3. Select the new pen and remove the pen cap.

4. Place the pen tip in the round hole at the base of the stall, and press down and in gently until the pen snaps into place.

5. Repeat steps 2-4 for the right stall.

6. Close the protective cover to prevent unintentional interruption of the plotter during operation.

Changing Sheet Paper

Paper should be loaded with the power on. This ensures that the paper boundaries are properly initialized in the plotter.

1. Determine that the A4/US switch on the plotter's back side is set correctly. With the power OFF, if necessary, set it on A4 for ISO A4 metric paper; US for ANSI A English paper. Turn the power on.

2. Move the paper loading lever to the PAPER LOAD position. This raises the pinch wheels and the paper stop. It also stores and caps the pen to avoid getting ink on the new paper.

3. Lay a sheet of paper on the platen surface so the paper is against the paper stop and the left edge of the platen. (Read the paper loading instructions printed on the plotter cabinet.) If your paper has pre-punched binder holes, load paper with the holes to your right.

4. Move the paper loading lever to the PAPER HOLD position.

Panic Halts

If you need to stop quickly because of paper jamming or some other problem, follow this sequence:

1. Move the paper loading lever to the PAPER LOAD position.

2. Stop your application program.

3. Put a sheet of paper in the plotter and move the paper loading lever to PAPER HOLD. This allows the application program to finish sending data to the plotter and terminate the plot gracefully.

Loading Overhead Transparency Materials

Overhead Transparencies may be produced with special overhead transparency film developed for the HP 7470A Graphics Plotter. A starter kit of materials, the HP 7470A Overhead Transparency Kit (HP Part No. 17057A), may be ordered. It contains 50 sheets of paper-backed transparency film and 16 pens.

Loading Transparency Film Pens

The transparency film pens used with other HP Graphics Plotters may also be used on the HP 7470A. The pens are available in many different colors and in two line widths. Film pens should be used with overhead transparency film only, not with paper.

Before using overhead transparency pens, remove leftover ink from the capping hole in the pen stalls with a cotton swab. This will prevent the transfer of other inks to the plots.

Loading Transparency Film

The overhead transparency film used on other HP Graphics Plotters may NOT be used on the HP 7470A Graphics Plotter. New transparency film (Part No. 9270-0360) has been developed with a special paper backing. The paper-backed film is more easily gripped by the grit wheels than a sheet of normal transparency film. The new film is 8.5 in by 11 in, and the US setting should be used for the US/A4 rocker switch on the plotter back panel. Turn off the plotter power while changing the US/A4 switch setting.

NOTES

Leave the adhesive paper backing on the film while plotting. Remove the backing when plotting is finished.

If your application program has been thoroughly tested, the US/A4 switch setting may not have to be set. Consult your application software manual for details.

Routine Maintenance

There are no user-serviceable parts inside the HP 7470A plotter. The user should perform routine cleaning of the exterior.

General Cleaning

WARNING

Disconnect the power before cleaning the HP 7470A. To avoid electrical SHOCK HAZARD, DO NOT allow liquids to flow over electrical components, circuits, or inside the enclosure.

CAUTION

Do not attempt to clean the microgrip drive wheels. Cleaning solutions may dissolve the adhesive which secures the grit particles to the wheels.

Exterior cleaning should be performed when needed. Cleaning procedures should include the following:

1. Blow dust from the pen stalls with low pressure compressed air, if available. Dust may also be removed with a lint-free cloth.

2. Clean the outer surface of the plotter with a damp sponge or cloth. Use a mild soap and water solution, if necessary. Wipe dry after cleaning. DO NOT use abrasive cleaners on the plastic carriage cover. To prevent scratching, the cover should be cleaned with a mild solution of soap and water and wiped dry with a lint-free cloth.

Pen Stall Cleaning

Before using overhead transparency pens, remove leftover ink from the capping hole in the pen stalls with a cotton swab. This will prevent the transfer of other inks to the plots.

If trouble occurs, you may want to run both the plotter self test and the system confidence test before calling your service representative. See Section 2, "Plotter Self Test" and "System Confidence Test," for details.

If further assistance is required, contact your service representative.

DSG/250 - section 4

The HP 7470A Graphics Plotter is compatible with DSG/250 (starting with DSG/250 release B.01.00).

Pen Changing - The HP 7470A Graphics Plotter holds two pens simultaneously. The DSG/250 application program allows use of up to 8 pens. When the program calls for more than two pens, the user is prompted at the terminal to insert pens. All required plotting is done with the first set of pens, then the user is prompted to load the next set of pens. DSG/250 will perform all plotting required by one set of pens before requesting that another set be loaded. This will continue until the plot is complete. If you use only one pen, you will still be prompted to put a pen in each stall. Only one pen will actually be used.

Paper Changing

When mixing US (8.5 in by 11 in) and A4 (210 mm by 297 mm) paper and acetate sizes, you may keep the US/A4 rocker switch in the A4 setting.

Programming with GPL/250 - section 5

This material supplements information for other HP plotters in the Graphics Plotting Library/250 Programming Manual (Manual Part No. 45260-90064). The programmer should be able to program graphics from that manual and use the data supplied in this section to modify programs for the HP 7470A Graphics Plotter.

Plot Initialization and Termination (Chapter 4 of GPL/250 Manual)

"7470A" is now an allowable value for the *Model$* parameter of the *Gpl_plotteris* subprogram.

Device Selection (Chapter 5 of GPL/250 Manual)

When a 7470A Graphics Plotter is properly attached, the *Gpl_devident* subprogram returns parameter values indicating 2 pens, 255 bytes of buffer space, and no automatic chart advance.

Establishing Your Coordinate System (Chapter 6 of GPL/250 Manual)

The HP 7470A Graphics Plotter has a smaller plotting area than any other HP 250 supported graphics plotter. Thus the programmer must beware if he has used *Gpl_devorigin* and *Gpl_physarea* parameters that are outside these limits. The plotting limits also depend on the back panel US/A4 rocker switch setting:

US - 257.5 mm by 191.25 mm (for 8.5 by 11 in paper)
A4 - 272.5 mm by 191.25 mm (for 210 by 297 mm paper)

The plotting boundary allows the user to punch binder holes in finished sheets. Although vertical plots appear upside down during plotting, the binder margin will be on the correct side.

The *Gpl_physrotate* parameters of 0 and 1 pertain to the vertical and horizontal plots, respectively. This is the same convention used for all plotters with the specified paper loading conventions.

Pen Control (Chapter 8 of GPL/250 Manual)

The *Gpl_pen* parameter controls the two pens on the HP 7470A. Odd numbers supplied to *Gpl_pen* will select the LEFT pen, and even numbers supplied to *Gpl_pen* will select the RIGHT pen.

Drawing Text Strings (Chapter 9 of GPL/250 Manual)

The 7470A plotter character sets are different from those of other HP plotters. The two files, listed below, can be named in the *Character_file$* parameter of the *Gpl_cset* subprogram.

GPL275 - US ASCII characters (same as firmware-supplied set)
GPL276 - Roman Extended characters for the 7470A

Plotting on Acetate (Chapter 12 of GPL/250 Manual)

A new transparency film was developed for the HP 7470A Graphics Plotter. It has an adhesive paper backing for the grit wheels that move the film.

Previous overhead transparency material had dimensions of 8.5 in by 10.5 in. The new adhesive paper backed film has dimensions of 8.5 in. by 11 in.

The US/A4 rocker switch is normally set to US, but this is inconvenient for a user who also uses ISO A4 paper. If you are careful not to plot off the edge of the paper, the US/A4 switch does not have to be moved when different paper is used. If two kinds of paper are used, the programmer must limit long direction plotting to 257.5 mm. This is set by a combination of *Gpl_physarea* and *Gpl_devorigin* parameters.

GPL/250 Subprogram File Summary (App C of GPL/250 Manual)

Subprogram Files: The GPL/250 subprogram library consists of several subprogram files organized into logical subsets. For plotter initialization, graphing and termination, these files are loaded and deleted during the execution of a program.

GPL251 - Device Selection
GPL252 - Plotter Initialization and Plot Setup
GPL253 - Plot Setup and Specifications
GPL254 - Text and Straight Lines
GPL255 - Straight Lines
GPL256 - Text
GPL257 - Plot Termination

Character Set Files: The following files contain character set digitizations and may be specified in a call to *Gpl_cset*. The internal formats may change with subsequent releases and should not be used by a programmer.

GPL271 - US ASCII character digitizations
for 7220/7221/7225 A/B/S plotters
GPL272 - Roman Extension digitizations
for 7220/7221/7225 A/B/S plotters
GPL273 - US ASCII character digitizations
for C/T plotters
GPL274 - Roman Extension digitizations
for C/T plotters
GPL275 - US ASCII character digitizations
for 7470A plotters
GPL276 - Roman Extension digitizations
for 7470A plotters

Other GPL/250 Files: The following files are for internal use by HP-maintained programs. The number and names of these files may change with subsequent releases of the operating system and should not be called directly by the programmer. For the 4.02 operating system, the files are the following:

GPL242 - Used by GPLCFT

GPL243 - Used by GPLCFT
GPL258 - Reserved
GPL261 - Used by GPLFIL
GPLEnn - A series of example and reference programs

GPL/250 Subprograms (App. E of the GPL/250 Manual)

CSET

The character sets encoded in the HP 7470A Graphics Plotter firmware are slight modifications of the characters used in the A/B/S model plotters for the 7220, 7221, and 7225 series plotters. The following files are supplied for the HP 7470A.

"GPL275" - US ASCII set for 7470A plotters
"GPL276" - Roman Extensions for 7470A plotters

The default value for *Character_file$* is "" (null) when *Char_set* = 0. The character set is "GPL275" when *Char_set* = 1.

DEVIDENT

The following parameters are returned when the HP 7470A Graphics Plotter has been properly identified and initialized.

Model$ = "7470A" Advance = 0
Buffer = 255 Pens = 2
Error = 0

DEVORIGIN

The defaults and minimum and maximum values are device-dependent. Following is the current set of parameters for all plotters:

	Defaults		Minimum		Maximum	
Model$	X	Y	X	Y	X	Y
7220A/C 7221A/B/C	10	10	0	0	400	285
7220S/T 7221S/T	10	27	0	0	400	285
7225A/B	10	10	0	0	285.5	203.5
7470A - US	5	5	0	0	257.5	191.25
7470A - A4	5	5	0	0	272.5	191.25

Note that two sets of maximum values are given, depending on the US/A4 switch setting on the back of the plotter.

PEN

Two physical pens may be selected and returned (put back in holder). The *Pen_number* parameter of the *Gpl_pen* subprogram controls pen selection. *Pen_number* may take on integer values from 0 to 8, with the following meanings for the HP 7470A Graphics Plotter:

0 - Put pen away. Suppresses text and lines.
1, 3, 5, or 7 - Select pen 1, if present
2, 4, 6, or 8 - Select pen 2, if present

PENSPEED

The *Velocity_cps* parameter of *Gpl_penspeed* sets the current pen velocity in terms of centimeters per second. Use a pen speed value from 1 to 36.

There are special considerations when a value of 1, 2, or 3 is passed to the *Gpl_penspeed* subprogram. For a value of 1, the velocity is lowered by plotter firmware to 0.38 cm/sec. For values of 2 and 3, the plotter velocity is 3.8 cm/sec. Values from 4 to 36 yield expected velocities.

PHYSAREA

The plotting area of the HP 7470A Graphics Plotter is more limited than on other HP plotters. These limits depend on the back panel US/A4 rocker switch setting. The US setting is used for 8.5 in by 11 in paper, and the plotting limits are 257.5 mm by 191.25 mm. The A4 setting is used for ISO A4 paper (210 mm by 297 mm), and the plotting limits are 272.5 mm by 191.25 mm.

PHYSROTATE

When the *Rotation* parameter = 0, the plots are rotated 90 degrees clockwise on the HP 7470A. This causes plotting to appear upside down. This value is commonly used for vertically oriented plots.

When the *Rotation* parameter = 1, there is no plot rotation on the HP 7470A. This value is normally used for horizontally-oriented plots.

PLOTTERIS

Model$ must be set to "7470A" for the HP 7470A Graphics Plotter. All other parameters follow the same conventions as for other plotters.