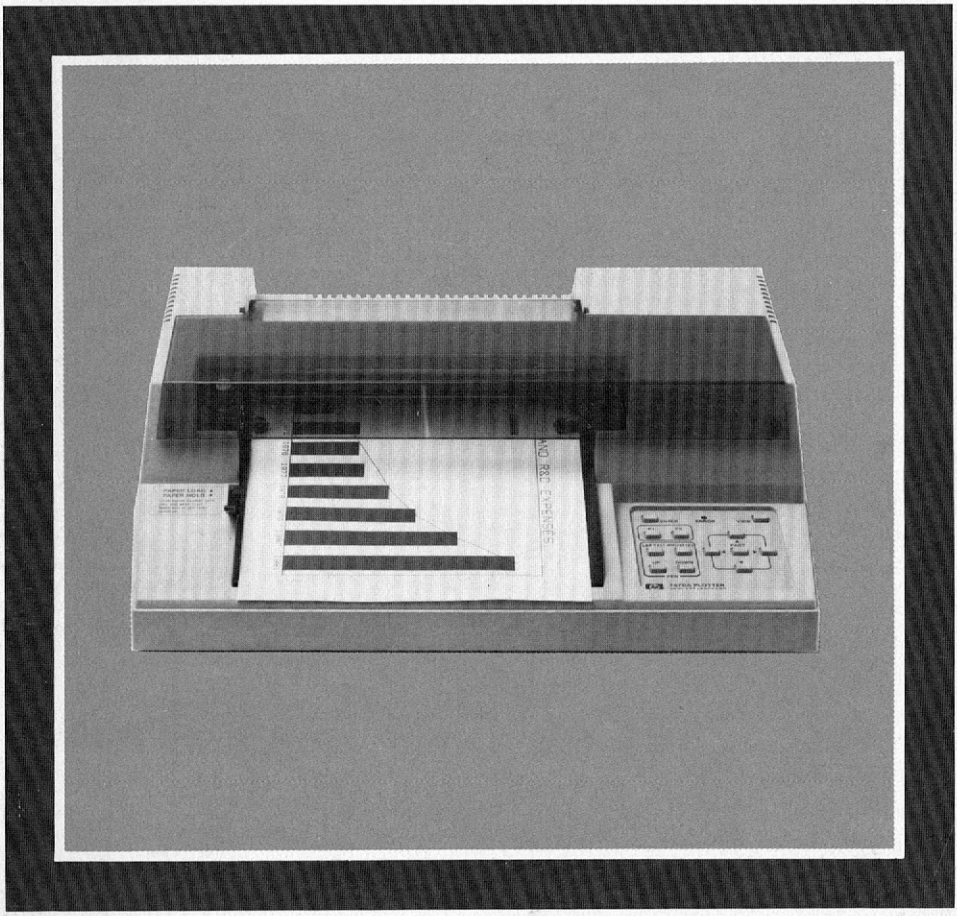
INTERCONNECTION GUIDE

HP 7470A
Graphics Plotter

RS-232-C/CCITT V.24

DESIGNED FOR HP-IB SYSTEMS

HP-IL



The United States Federal Communications Commission (in 47 CFR 15.838) has specified that the following notice be brought to the attention of users of this product.

FEDERAL COMMUNICATIONS COMMISSION RADIO FREQUENCY INTERFERENCE STATEMENT

"This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

— reorient the receiving antenna
— relocate the computer with respect to the receiver
— move the computer away from the receiver
— plug the computer into a different outlet so that computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

'How to Identify and Resolve Radio-TV Interference Problems'.

This booklet is available from the US Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4."

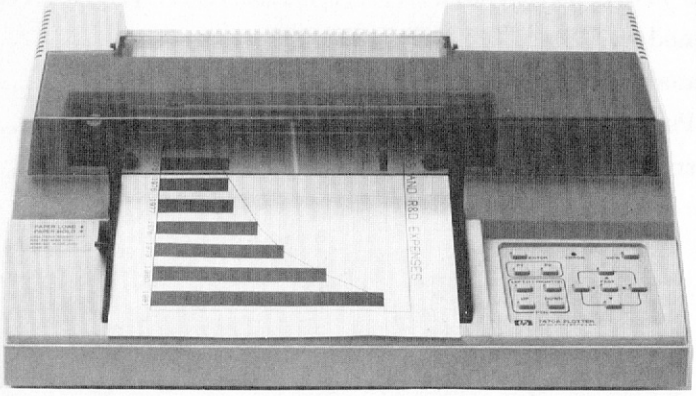
INTERCONNECTION GUIDE

HP 7470A
Graphics Plotter

RS-232-C/CCITT V.24

DESIGNED FOR HP-IB SYSTEMS

HP-IL



©1982 by Hewlett-Packard Company
16399 W. Bernardo Drive, San Diego, CA 92127-1899

Table of Contents

Introduction 1
What If My Computer Isn't Listed? 1
What I My System Configuration Doesn't Match the One in the Guide? 2
I've Done Everything You Said and It Still Doesn't Work 2
General Instructions 3
HP-41/HP 7470A-003 4
HP-75/HP 7470A-003 6
HP-85/HP 7470A-002 8
HP-86/HP 7470A-002 10
HP-87/HP 7470A-002 12
HP Series 80/HP 7470A-003 14
HP 125/HP 7470A-002 16
HP Series 200/HP 7470A-002 17
Apple* II Plus/HP 7470A-001 19
Apple* II Plus/HP 7470A-002 21
Apple* *III*/HP 7470A-001 23
Commodore CBM* 8032/HP 7470A-002 25
Commodore PET* 2001/HP 7470A-002 27
IBM Personal Computer/HP 7470A-001 29
Osborne 1/HP 7470A-001 31

*Apple is a trademark of Apple Computer, Inc.
Commodore CBM and PET are trademarks of Commodore Business Machines, Inc.

Introduction

This interconnection guide is designed to help you connect the HP 7470A Graphics Plotter to your computer and verify communication between them. It is not the purpose of this guide to teach general interfacing theory. Chapters 9 through 11 of the Interfacing and Programming Manual contain detailed information about HP-IB, RS-232-C, and HP-IL interfacing.

General instructions which pertain to all systems are given in the following paragraphs. Detailed instructions for connecting the HP 7470A to specific computers follow the general instructions. They are organized alphanumerically by computer manufacturer's name and model number and numerically by plotter interface option number. Hewlett-Packard computers are in one group, followed by computers by other manufacturers.

Each detailed instruction set lists a required minimum system configuration, gives connection instructions for the hardware, and provides a short program to verify communication between the computer and the plotter. The programs contained in this manual are written with the intention of establishing communication between the computer and the plotter and instructing the plotter to label the message "COMMUNICATION OK". Each program is written in a programming language that is accessible to the majority of users of a specific computer. The programs should not be considered solutions for your general programming needs. Consult the Interfacing and Programming Manual for more general programming and interfacing information.

What If My Computer Isn't Listed?

If your computer isn't listed, there is a good possibility that it still can be interfaced to the HP 7470A. First, determine which kinds of communication interfaces are available for your computer. If your computer supports an RS-232-C/CCITT V.24 interface, an ANSI/IEEE 488-1978 (HP-IB) interface, or an HP-IL interface, then it probably can be interfaced to the HP 7470A. Read the manual that describes the communications equipment for your computer, and then determine how information is sent and received. Next, read either Chapter 9, 10, or 11 in the HP 7470A Interfacing and Programming Manual (depending on which interface you're using) to get a better understanding of how information is sent and received by the plotter. In the RS-232-C environment, pay particular attention to the cabling requirements between the computer and the plotter. Then, choose a computer configuration in this guide that appears similar to yours and use this as a guideline for creating your own communication verification program.

What If My System Configuration Doesn't Match the One in the Guide?

There are many variables in computer systems. Often substituting one piece of hardware or software for another can cause communication problems. Therefore, if you're going to make substitutions, be aware that these may affect the operation of the system or the communication verification program.

If you are having problems getting your system to work with substitute hardware, carefully read the manual on the substitute equipment. Try to identify the difference between the hardware you are using and that which is recommended. Also consult either Chapter 9, 10, or 11 of the Interfacing and Programming Manual to understand what is required to communicate with the plotter. Again, in the RS-232-C environment, pay particular attention to the cabling requirements between the computer and the plotter. Finally, adapt the interconnection and programming information for use with your hardware configuration.

If you are having problems getting the program to work with substitute software, read the software manual, paying particular attention to the sections dealing with programming the communications hardware. There are usually two parts to this type of program — opening the communications port and writing to the communications port. Opening the communications port may require specifying a number of interface parameters, such as baud rate, parity, etc. For more information on what the plotter requires for communication, see Chapter 9, 10, or 11 of the Interfacing and Programming Manual. Writing to the communications port is usually straightforward. The plotter communicates using ASCII code. Find the output statement in your language that can send an ASCII string to the communications port. Then adapt the communication verification program for use with your operating system and/or programming language.

I've Done Everything You Said and It Still Doesn't Work . . .

If you have connected the system as shown, running the verification program should cause the plotter to label "COMMUNICATION OK". If it doesn't, there are a number of things to check:

Is your computer working properly?

- Check the computer by running a program that you know works.

Is your communications hardware and cable working properly?

- Check the interface and cable with another peripheral.

- Check that none of the connectors on the computer interface, cable, or plotter interface are damaged.
- Try another cable if one is available.
- See that the switches are set properly on your communications hardware.
- Make sure the card is in the proper slot in the computer.

Is your plotter working properly?

- The Operator's Manual describes how to perform the HP 7470A plotter self-test.
- Make sure the switches on the back of the plotter are set properly.
- Check to see that the plotter is turned on.

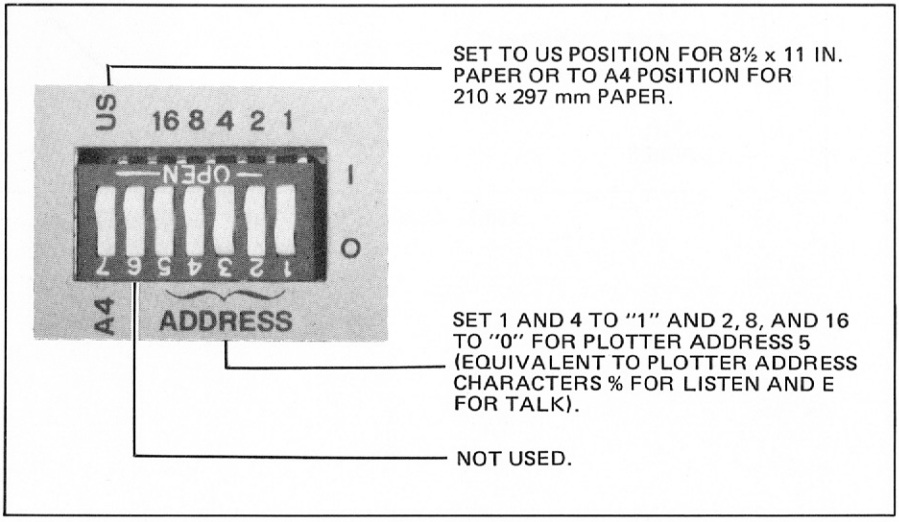
Are you using the proper operating system and programming language?

- Check to see if you are using the operating system and/or programming language listed in the guide.

If you are still having problems, contact your salesperson. Your salesperson will probably be able to help solve your problem or refer you to someone who can.

General Instructions

The switch settings shown in the following illustration should be considered as part of the specific instruction set for all HP 7470A Option 002 interconnection examples.



Computer: HP-41
Plotter Interface Option: HP 7470A-003 (HP-IL)

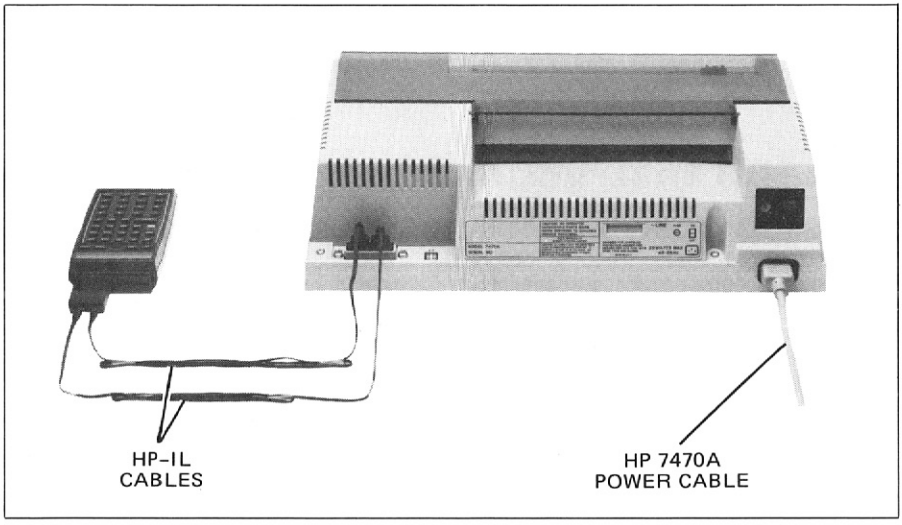
Minimum System Configuration

Equipment	Model/Part Number
Graphics Plotter	HP 7470A-003
Handheld Computer	HP-41
HP-IL Module	HP 82160A
HP-IL Cable (2 required)*	HP 8120-3380

*One cable is supplied with the HP-IL Module, and one cable is suppied with the plotter.

Connection Instructions

The illustration below shows how the HP 7470A-003 plotter is to be connected to your HP-41 computer.



HP-IL Cable Connection

Communication Verification

Load pens and paper in the plotter and run the following RPN program.

NOTE: The characters that are enclosed in quotation marks must be entered in the alpha mode (the quotation marks do not need to be entered). The " " symbol is the "alpha append" symbol; it is produced by pressing the shift and K keys while in the alpha mode.■

```
01◆LBL "OK"
02 AUTOIO
03 "IN SP1"
04 "┣PA500,500"
05 OUTA
06 "LBCOMMUNICATION"
07 "┣ OK"
08 0
09 ENTER↑
10 3
11 BLDSPEC
12 ARCL X
13 OUTA
14 "PA0,0 SP0"
15 OUTA
16 END
```

Plotter labels: COMMUNICATION OK

Computer: HP-75
Plotter Interface Option: HP 7470A-003 (HP-IL)

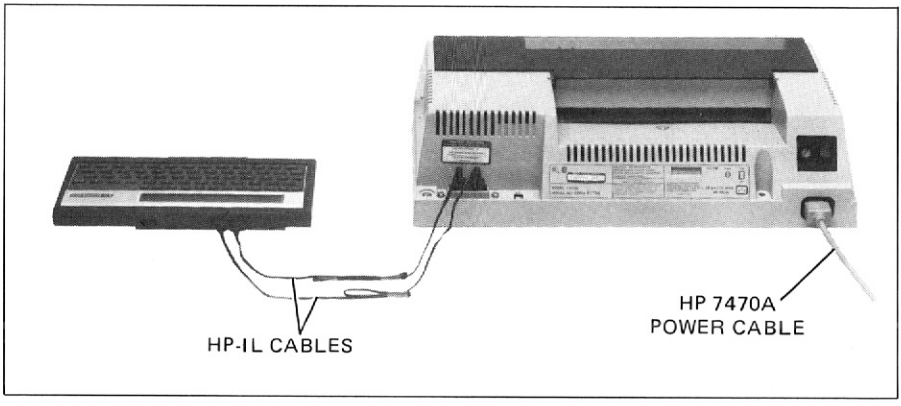
Minimum System Configuration

Equipment	Model/Part Number
Graphics Plotter	HP 7470A-003
Portable Computer	HP-75
HP-IL Cable (2 required)*	HP 8120-3380

*One cable is supplied with the HP-75, and one cable is supplied with the plotter.

Connection Instructions

The illustration below shows how the HP 7470A-003 plotter is to be connected to your HP-75 computer.



HP-IL Cable Connection

Communication Verification

Load pens and paper in the plotter and run the following BASIC program.

```
10 ASSIGN IO ":PL"
20 PRINTER IS ":PL"
30 PRINT "IN;SP1;PA500,500;"
40 PRINT "LB COMMUNICATION OK"&CHR$(3)
50 PRINT "PA 0,0;SP0;"
60 END
```

Plotter labels: COMMUNICATION OK

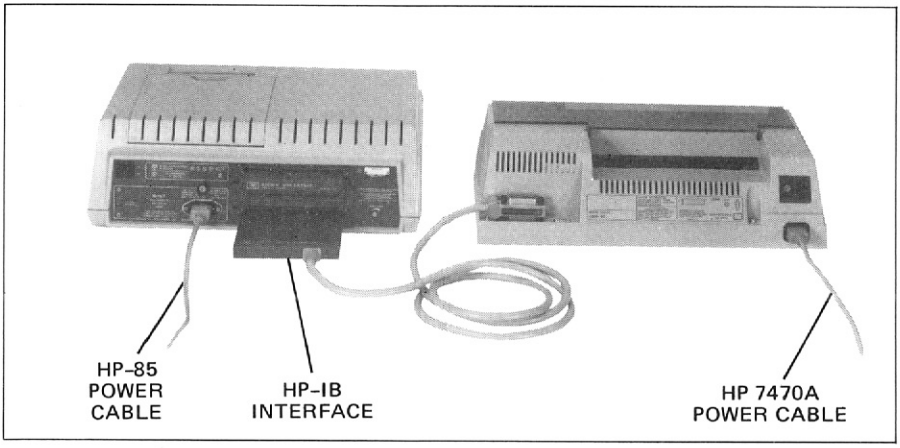
Computer: HP-85
Plotter Interface Option: HP 7470A-002 (HP-IB)

Minimum System Configuration

Equipment	Model/Part Number
Graphics Plotter	HP 7470A-002
Personal Computer	HP-85
ROM Drawer	HP 82936A
Plotter/Printer ROM	HP 00085-15002
HP-IB Interface	HP 82937A

Connection Instructions

The illustration below shows how the HP-7470A-002 plotter is to be connected to your HP-85 computer.



HP-IB Interface Cable Connection

Communication Verification

Load pens and paper in the plotter and run the following BASIC program.

```
10 PLOTTER IS 705
20 PEN 1
30 MOVE 5,10
40 LABEL "COMMUNICATION OK"
50 MOVE 0,0
60 PEN 0
70 END
```

Plotter labels: COMMUNICATION OK

Computer: HP-86
Plotter Interface Option: HP 7470A-002 (HP-IB)

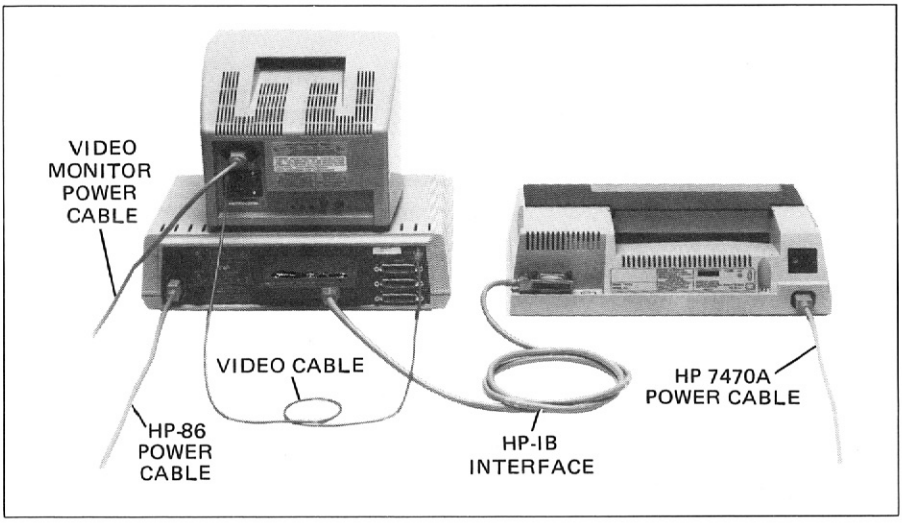
Minimum System Configuration

Equipment	Model/Part Number
Graphics Plotter	HP 7470A-002
Personal Computer	HP-86
Video Monitor	HP 82912A or HP 82913A
ROM Drawer	HP 82936A
Plotter ROM	HP 00087-15002
HP-IB Interface	HP 82937A

Connection Instructions

The illustration below shows how the HP 7470A-002 plotter is to be connected to your HP-86 computer.

NOTE: The select code of the HP-IB interface should be set to 6.■



HP-IB Interface Cable Connection

Communication Verification

Load pens and paper in the plotter and run the following BASIC program.

```
10 PLOTTER IS 605
20 PEN 1
30 MOVE 5,10
40 LABEL "COMMUNICATION OK"
50 MOVE 0,0
60 PEN 0
70 END
```

Plotter labels: COMMUNICATION OK

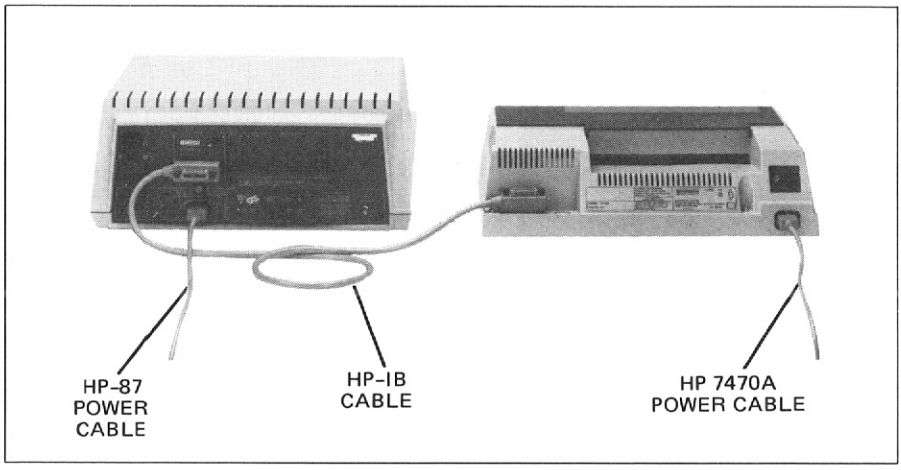
Computer: HP-87
Plotter Interface Option: HP 7470A-002 (HP-IB)

Minimum System Configuration

Equipment	Model/Part Number
Graphics Plotter	HP 7470A-002
Personal Computer	HP-87
ROM Drawer	HP 82936A
Plotter ROM	HP 00087-15002
HP-IB Cable	HP 10833A,B,C, or D

Connection Instructions

The illustration below shows how the HP 7470A-002 plotter is to be connected to your HP-87 computer.



HP-IB Cable Connection

Communication Verification

Load pens and paper in the plotter and run the following BASIC program.

```
10 PLOTTER IS 705
20 PEN 1
30 MOVE 5,10
40 LABEL "COMMUNICATION OK"
50 MOVE 0,0
60 PEN 0
70 END
```

Plotter labels: COMMUNICATION OK

Computer: HP Series 80
Plotter Interface Option: HP 7470A-003 (HP-IL)

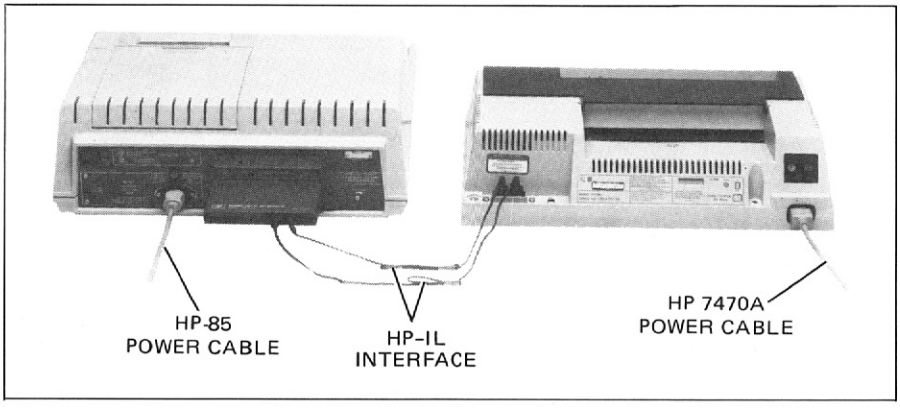
Minimum System Configuration

Equipment	Model/Part Number
Graphics Plotter	HP 7470A-003
HP-IL Interface	HP 82938A
ROM Drawer	HP 82936A
HP-IL Cable (2 required)*	HP 8120-3380
One of the following computers:	
HP-85 Personal Computer	HP-85
Plotter/Printer ROM	HP 00085-15002
HP-86 Personal Computer	HP-86
Plotter ROM	HP 00087-15002
Video Monitor	HP 82912A or 82913A
HP-87 Personal Computer	HP-87
Plotter ROM	HP 00087-15002

*One cable is supplied with the HP-IL Interface, and one cable is supplied with the plotter.

Connection Instructions

The following illustration shows how the HP 7470A-003 plotter is to be connected to your HP Series 80 computer. The HP-85 is shown; the setups for the HP-86 and HP-87 are similar.



HP-IL Interface Cable Connection

Communication Verification

Load pens and paper in the plotter and run the following BASIC program.

```
10 PLOTTER IS 901
20 PEN 1
30 MOVE 5,10
40 LABEL "COMMUNICATION OK"
50 MOVE 0,0
60 PEN 0
70 END
```

Plotter labels: COMMUNICATION OK

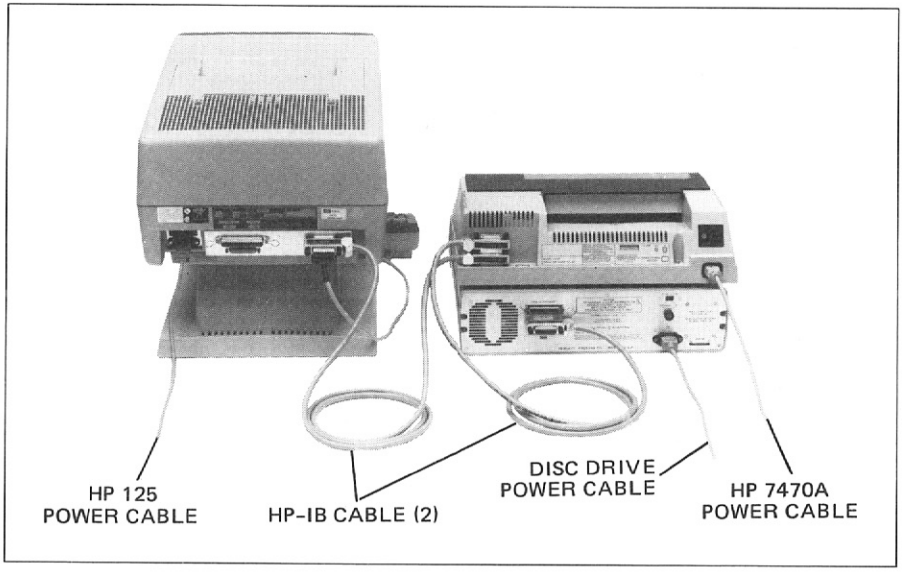
Computer: HP 125
Plotter Interface Option: HP 7470A-002 (HP-IB)

Minimum System Configuration

Equipment	Model/Part Number
Graphics Plotter	HP 7470A-002
Personal Computer	HP 125
Disc Drive	HP 82901M
HP-IB Cable (2 required)	HP 10833A,B,C, or D
GRAPHICS/125	HP 45532A

Connection Instructions

The illustration below shows how the HP 7470A-002 plotter is to be connected to your HP 125 computer.



HP-IB Cable Connection

Communication Verification

Use GRAPHICS/125 to verify communication. See the GRAPHICS/125 manual for examples.

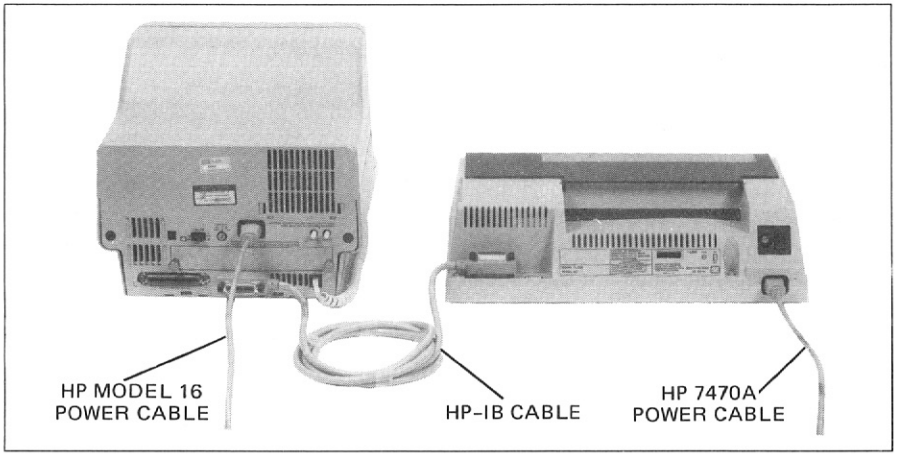
Computer: HP Series 200
Plotter Interface Option: HP 7470A-002 (HP-IB)

Minimum System Configuration

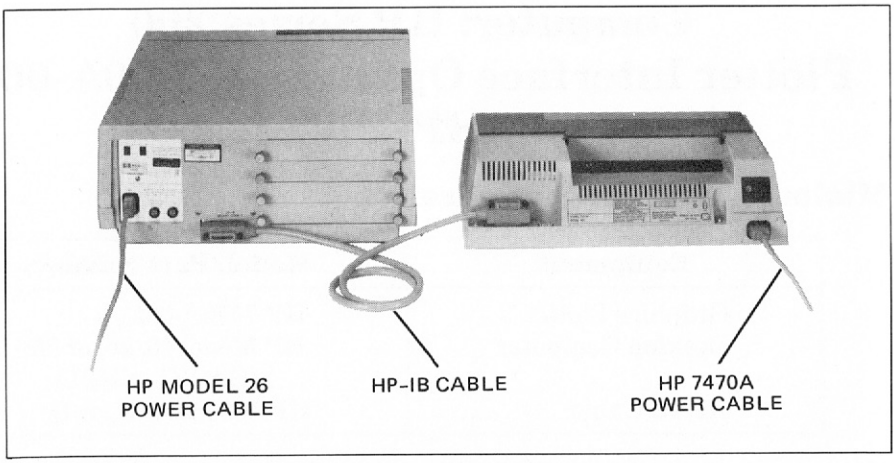
Equipment	Model/Part Number
Graphics Plotter	HP 7470A-002
Desktop Computer	HP Model 16, 26, or 36 (BASIC or HPL)
HP-IB Cable	HP 10833A,B,C, or D

Connection Instructions

The illustrations below show how the HP 7470A-002 plotter is to be connected to your HP Series 200 computer.



HP-IB Cable Connection; Model 16



HP-IB Cable Connection
Model 26 is shown; Model 36 is similar

Communication Verification

Load pens and paper in the plotter and run the program which corresponds with the currently selected language.

BASIC

```
10 PLOTTER IS 705, "HPGL"
20 PEN 1
30 MOVE 5,10
40 LABEL "COMMUNICATION OK"
50 MOVE 0,0
60 PEN 0
70 END
```

Plotter labels: COMMUNICATION OK

HPL

```
0: pclr
1: pen# 1
2: plt 1,2,1
3: lbl "COMMUNICATION OK"
4: plt 0,0,1
5: pen# 0
6: end
```

Plotter labels: COMMUNICATION OK

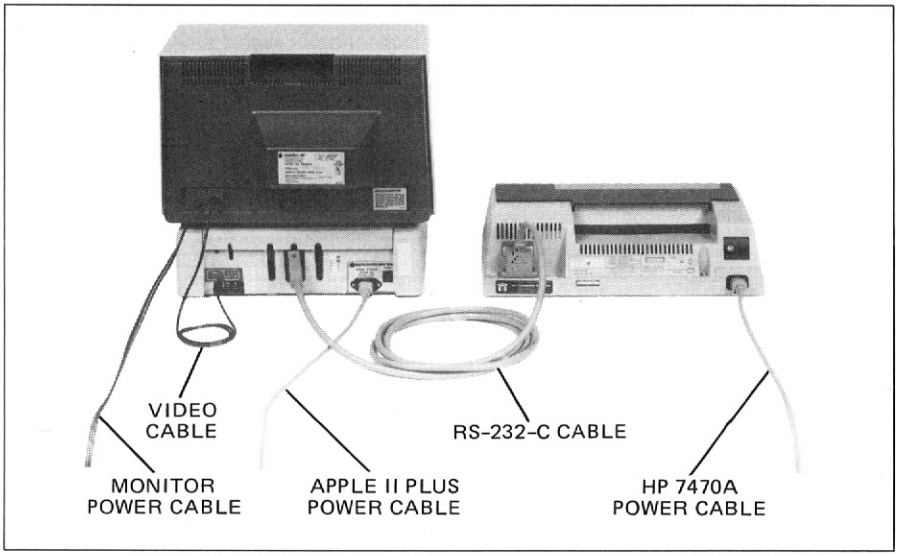
Computer: Apple II Plus
Plotter Interface Option: HP 7470A-001
(RS-232-C/CCITT V.24)

Minimum System Configuration

Equipment	Model/Part Number
Graphics Plotter	HP 7470A-001
Apple II Plus Unit	—
Apple /// Monitor or equivalent	—
Apple Super Serial Card	Apple A2B0044
Male-to-male RS-232-C Cable	HP 8120-3258 or equivalent

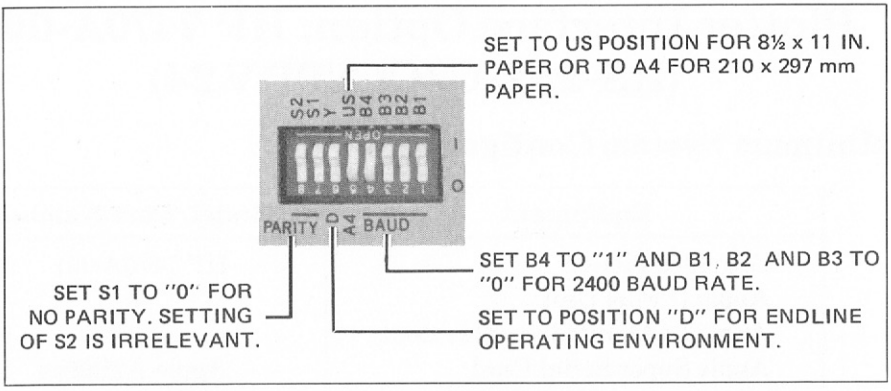
Connection Instructions

The illustration below shows how the HP 7470A-001 plotter is to be connected to your Apple II Plus computer.



RS-232-C Cable Connection

Set the plotter switches as follows:



Install the Apple Super Serial Card in slot #1. Set the two banks of switches on the Super Serial Card as follows:

	1	2	3	4	5	6	7
SW1	OFF	ON	OFF	ON	OFF	ON	ON
SW2	ON	OFF	OFF	ON	OFF	OFF	OFF

This sets the Super Serial Card to 2400 baud, no parity, 8 data bits, etc.

Check to see that the arrow on the Super Serial Card's jumper block is pointing toward the word "TERMINAL." If it isn't, reverse its direction.

NOTE: Pressing the **RESET** key on your Apple II Plus computer turns on the plotter's **ERROR** light. This error condition does not affect the operation of the plotter. The error may be cleared and the error light turned off by pressing the **ENTER** button simultaneously with the **VIEW** button on the plotter.■

Communication Verification

Load pens and paper and run the following Applesoft BASIC program:

```
10 PR# 1
20 PRINT "IN;SP1;PA500,500;"
30 PRINT "LB COMMUNICATION OK"+CHR$(3)
40 PRINT "PA0,0;SP0;"
50 PR# 0
60 END
```

Plotter labels: COMMUNICATION OK

Computer: Apple II Plus
Plotter Interface Option: HP 7470A-002 (HP-IB)

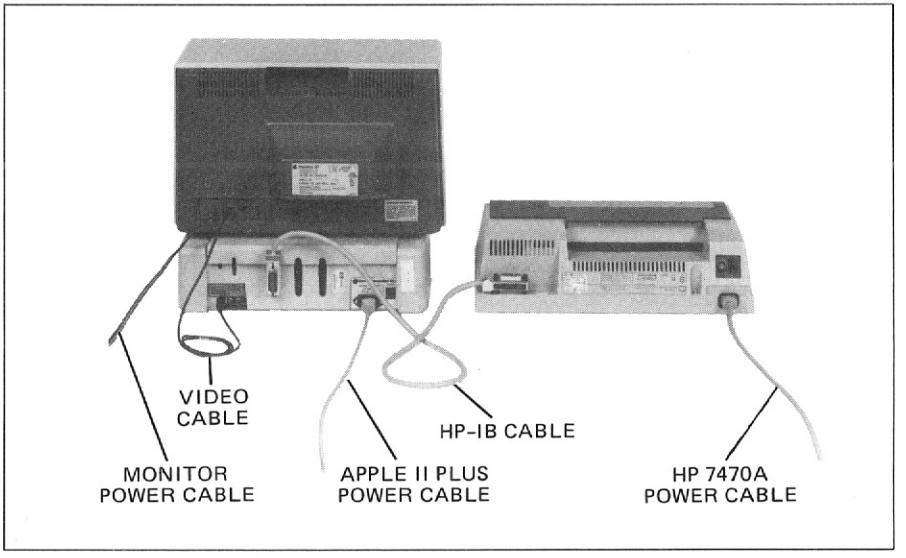
Minimum System Configuration

Equipment	Model/Part Number
Graphics Plotter	HP 7470A-002
Apple II Plus Unit	—
Apple /// Monitor or equivalent	—
IEEE-488 Card	Apple A2B0015
HP-IB (IEEE-488) Cable	HP 10833A,B,C, or D **or** Apple 590-0040

Connection Instructions

The illustration below shows how the HP 7470A-002 plotter is to be connected to your Apple II Plus computer.

NOTE: It is assumed the IEEE-488 interface card is installed in connector slot #3.■



HP-IB Cable Connection

Communication Verification

Load pens and paper in the plotter and run the following Applesoft BASIC program.

```
10 PR# 3: IN# 3
20 PRINT "WT%"+CHR$(26);
30 PRINT "IN;SP1;PA500,500;";
40 PRINT "LB COMMUNICATION OK"+CHR$(3);
50 PRINT "PA0,0;SP0;";
60 PRINT CHR$(13);
70 PR# 0: IN# 0
80 END
```

Plotter labels: COMMUNICATION OK

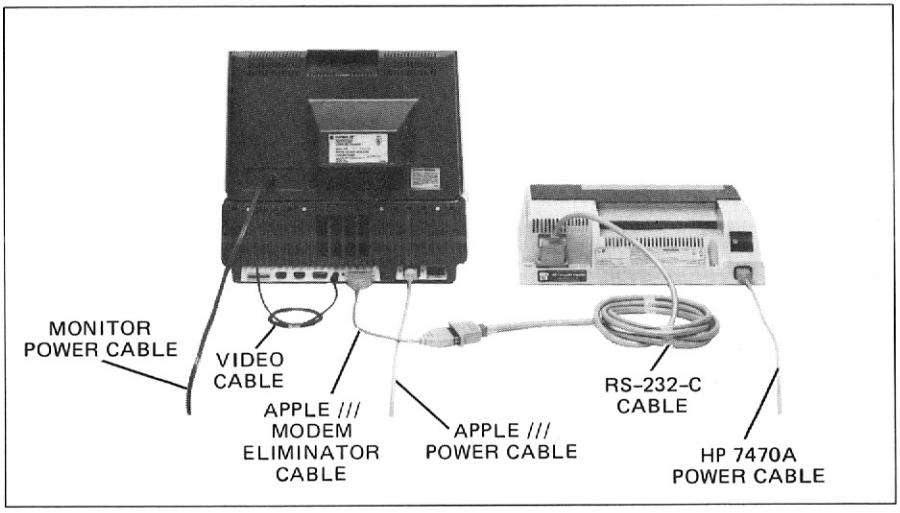
Computer: Apple ///
Plotter Interface Option: HP 7470A-001
(RS-232-C/CCITT V.24)

Minimum System Configuration

Equipment	Model/Part Number
Graphics Plotter	HP 7470A-001
Apple /// Unit	—
Monitor ///	—
Male-to-male RS-232-C Cable	HP 8120-3258 or equivalent
Apple /// Modem Eliminator Cable	Apple A3M0019

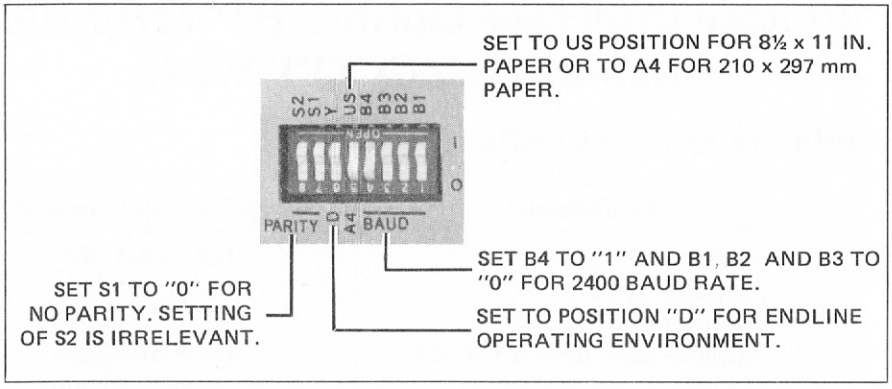
Connection Instructions

The illustration below shows how the HP 7470A-001 plotter is to be connected to your Apple /// computer.



RS-232-C Cable Connection

Set the plotter switches as shown below.



Using the Apple /// System Configuration Program, modify the RS-232-C Serial Driver by setting the Driver Configuration Block as follows (for more details, see the Apple /// Standard Device Drivers Manual):

Byte	0	1	2	3	4	5	6	7	8	9	A	B
Value	0A	2E	00	00	00	00	00	00	00	00	00	80

This sets the driver to 2400 baud, 7 data bits, space for parity, and hardwire handshaking.

Communication Verification

Run the following Apple Business BASIC program.

```
10 OPEN #1, ".RS232"
20 PRINT #1; "IN;SP1;PA500,500;"
30 PRINT #1; "LB COMMUNICATION OK"+CHR$(3)
40 PRINT #1; "PA0,0;SP0;"
50 CLOSE #1
60 END
```

Plotter labels: COMMUNICATION OK

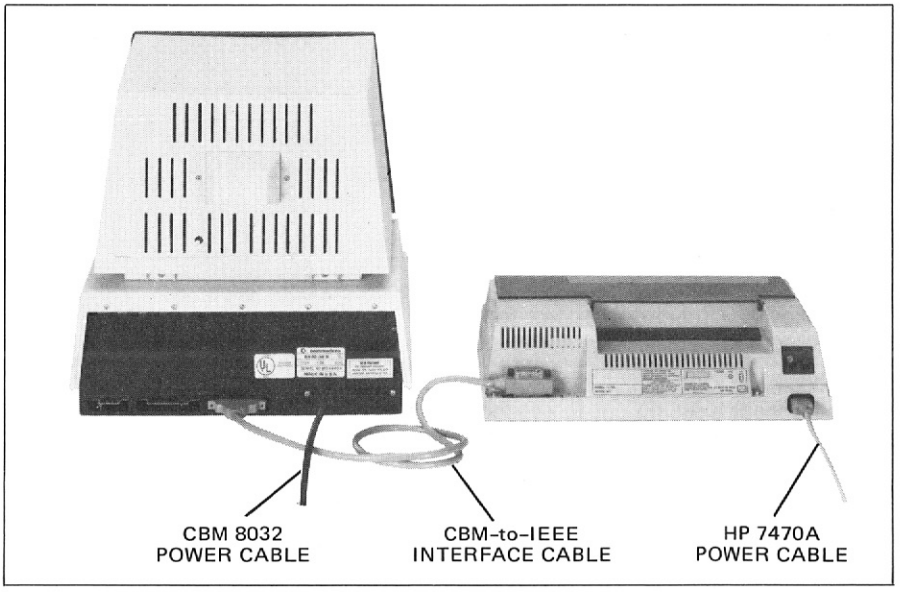
Computer: Commodore CBM 8032
Plotter Interface Option: HP 7470A-002 (HP-IB)

Minimum System Configuration

Equipment	Model/Part Number
Graphics Plotter	HP 7470A-002
Commodore CBM System Unit	CBM 8032
CBM-to-IEEE Interface Cable	Commodore 320202

Connection Instructions

The illustration below shows how the HP 7470A-002 plotter is to be connected to your Commodore CBM 8032 computer.



CBM-to-IEEE Cable Connection

Communication Verification

Load pens and paper in the plotter and run the following BASIC program.

```
10 OPEN 5,5
20 PRINT#5,"IN;SP1;"
30 PRINT#5,"PA500,500;"
40 PRINT#5,"LBCOMMUNICATION OK";CHR$(3)
50 PRINT#5,"PA0,0;SP0;"
60 END
```

Plotter labels: COMMUNICATION OK

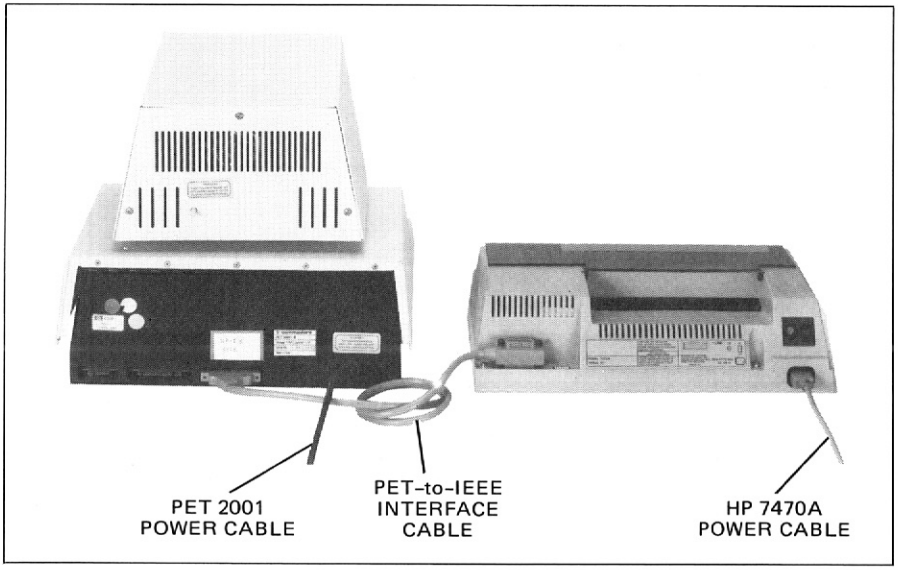
Computer: Commodore PET 2001
Plotter Interface Option: HP 7470A-002 (HP-IB)

Minimum System Configuration

Equipment	Model/Part Number
Graphics Plotter	HP 7470A-002
Commodore PET System Unit	PET 2001
PET-to-IEEE Interface Cable	Commodore 320201

Connection Instructions

The illustration below shows how the HP 7470A-002 plotter is to be connected to your Commodore PET 2001 computer.



PET-to-IEEE Cable Connection

Communication Verification

Load pens and paper in the plotter and run the following BASIC program.

```
10 OPEN 5,5
20 PRINT#5,"IN;SP1;"
30 PRINT#5,"PA500,500;"
40 PRINT#5,"LBCOMMUNICATION OK";CHR$(3)
50 PRINT#5,"PA0,0;SP0;"
60 END
```

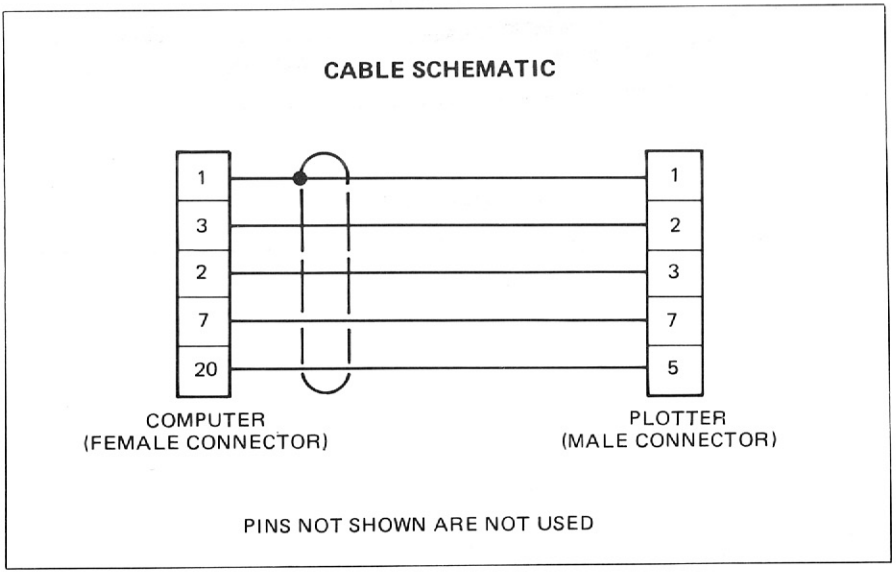
Plotter labels: COMMUNICATION OK

Computer: IBM Personal Computer
Plotter Interface Option: HP 7470A-001
(RS-232-C/CCITT V.24)

Minimum System Configuration

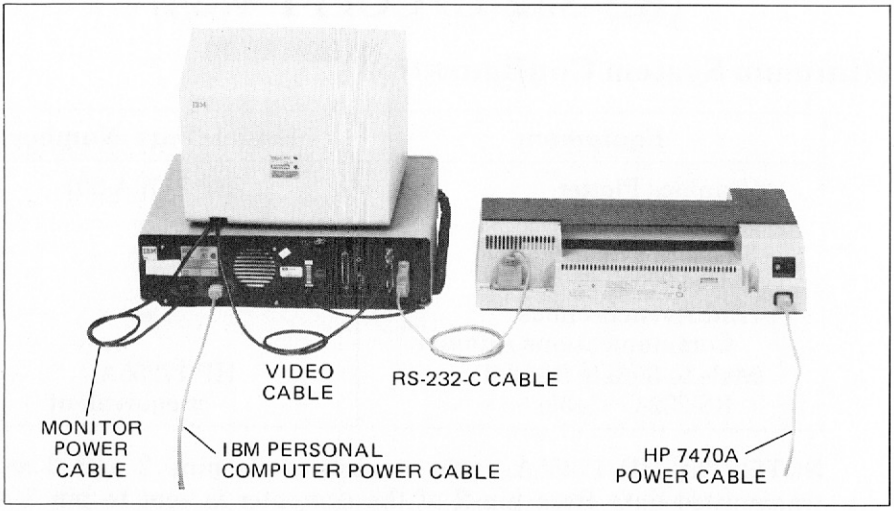
Equipment	Model/Part Number
Graphics Plotter	HP 7470A-001
IBM System Unit	—
Monochrome Display or equivalent	—
IBM Asynchronous Communications Adapter	—
Male-to-female Special RS-232-C Cable	HP 17255A or equivalent

NOTE: The HP 17255A cable cross-connects pins 2 and 3 so that transmitted data from pin 2 of the computer is sent to pin 3 of the plotter. Conversely, plotter outputs are sent to pin 3 of the computer. Pin 20 of the plotter is also cross-connected to pin 5 of the computer to implement hardwire handshake.■



Connection Instructions

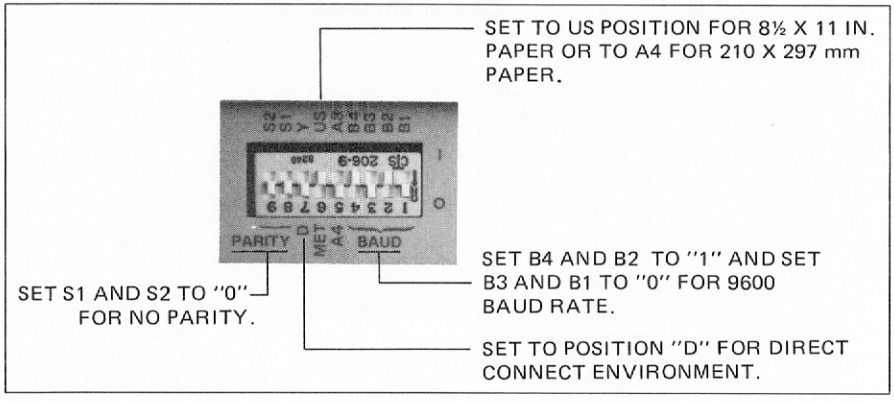
The illustration below shows how the HP 7470A-001 plotter is to be connected to your IBM Personal Computer.



RS-232-C Cable Connection

Communication Verification

Set the plotter switches as shown below, load pens and paper, and run the following BASIC 1.10 program.




```
10 OPEN "COM1:9600,S,7,1,RS,CS65535,DS,CD" AS #1
20 PRINT #1, "IN;SP 1;PA 500,500;"
30 PRINT #1, "LBCOMMUNICATION OK"+CHR$(3)
40 PRINT #1, "PA 0,0;SP 0;"
50 END
```

Plotter labels: COMMUNICATION OK

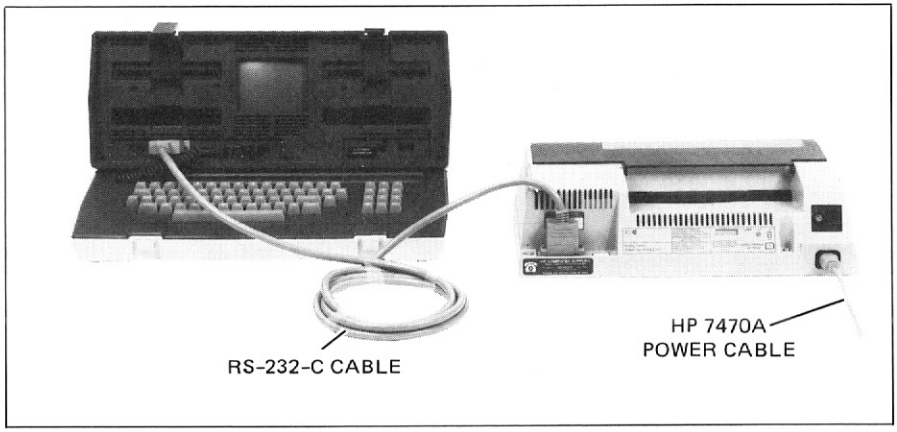
Computer: Osborne 1
Plotter Interface Option: HP 7470A-001 (RS-232-C/CCITT V.24)

Minimum System Configuration

Equipment	Model/Part Number
Graphics Plotter	HP 7470A-001
Osborne 1	—
Male-to-male RS-232-C Cable	HP 8120-3258 or equivalent

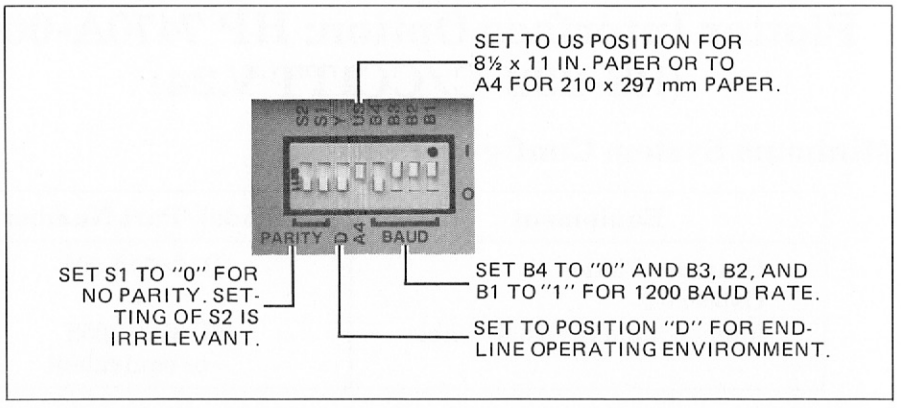
Connection Instructions

The illustration below shows how the HP 7470A-001 plotter is to be connected to your Osborne 1 computer.



RS-232-C Cable Connection

Set the plotter switches as shown below.



Communication Verification

Load pens and paper in the plotter and run the following MBASIC program.

```
10 LPRINT "IN;SP1;PA500,500;"
20 LPRINT "LB COMMUNICATION OK"+CHR$(3)
30 LPRINT "PA0,0;SP0;"
40 END
```

Plotter labels: COMMUNICATION OK

Notes

Notes



HEWLETT PACKARD

Change Sheet

Hewlett-Packard 7470A Graphics Plotter
Interconnection Guide
(For Manual P/N 07470-90003 Dated June 1983)

This manual change corrects information regarding the male-to-female RS-232-C cable and plotter switch settings used to connect the HP 7470A graphics plotter with the IBM® Personal Computer.

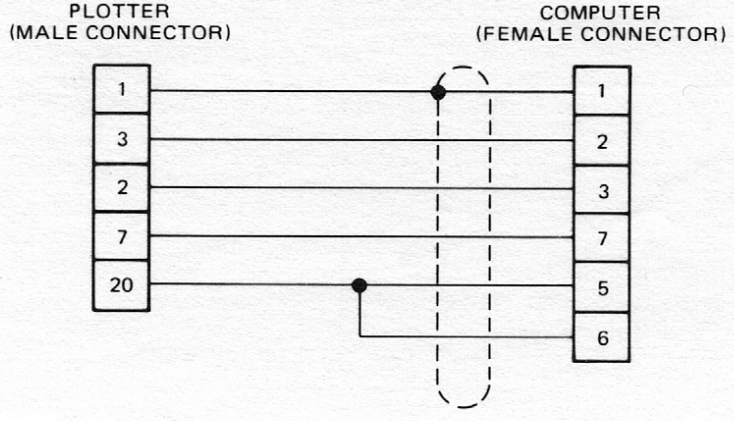
■ indicates changed item

Errata

■ Page 29: In the Model/Part Number column and in the NOTE at the center of the page, change "HP 17255A" to "HP 17255B."

Change the last two sentences in the NOTE to: "Conversely, plotter outputs from pin 2 are sent to pin 3 of the computer. Pin 20 of the plotter is cross-connected to pins 5 and 6 of the computer to implement hardwire handshaking."

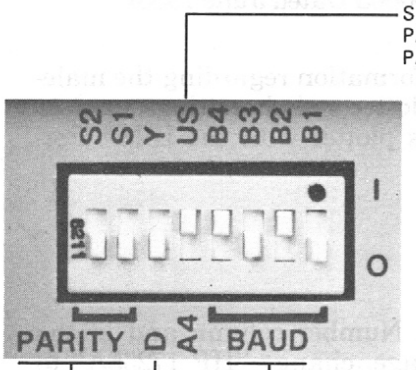
Replace the cable schematic with the following:



IBM is a registered trademark of International Business Machines Corporation.

December 1983

- Page 30: Replace the switch-setting photograph with the following:



SET TO US POSITION FOR 8½ X 11 IN. PAPER OR TO A4 FOR 210 X 297 mm PAPER.

SET B4 AND B2 TO "1" AND SET B3 AND B1 TO "0" FOR 9600 BAUD RATE.

SET TO POSITION "D" FOR DIRECT CONNECT ENVIRONMENT.

SET S1 AND S2 TO "0" FOR NO PARITY.



PART NO. 07470-90003
MICROFICHE NO. 07470-90053

JUNE 1983
PRINTED IN U.S.A.