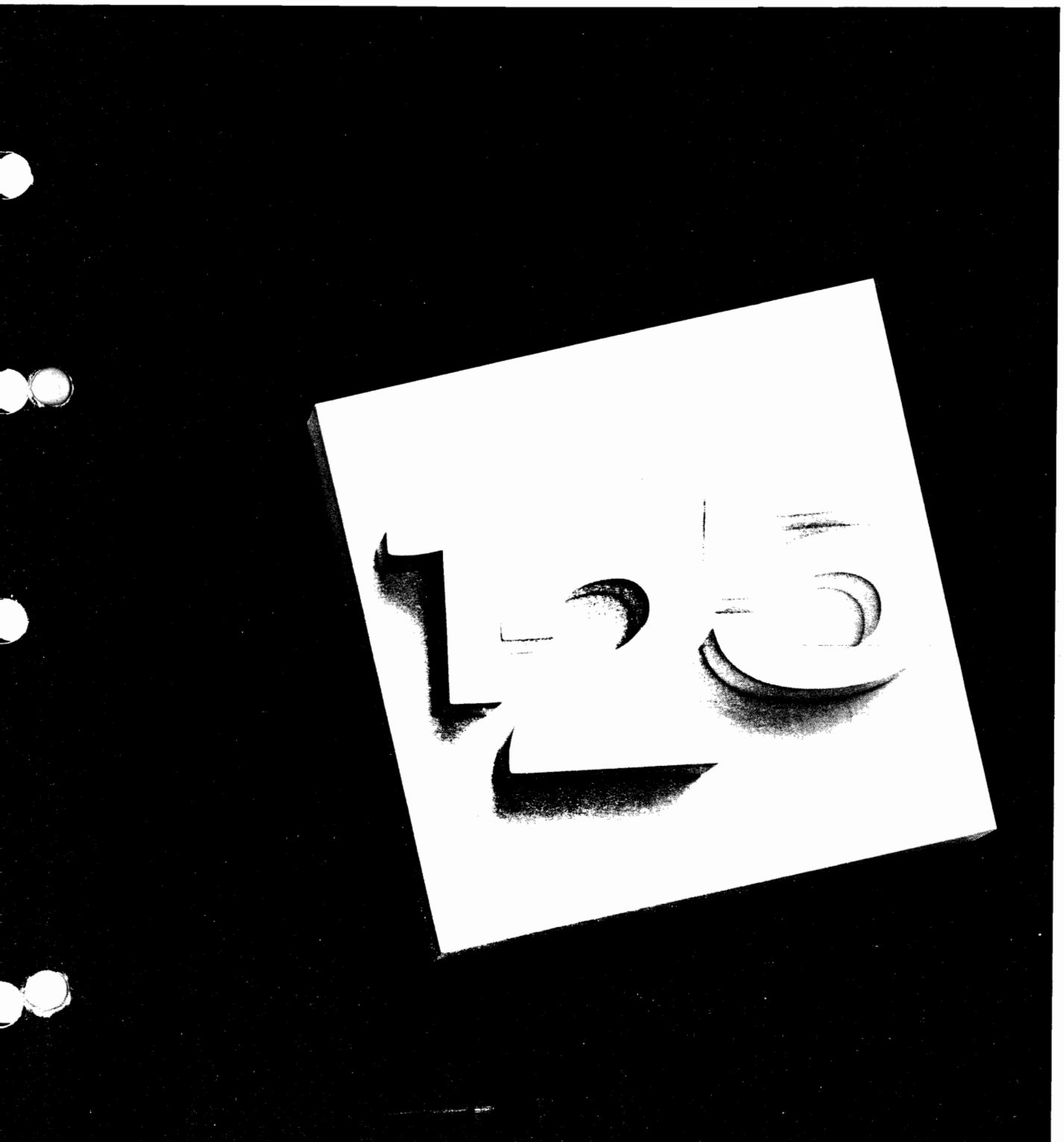
HEWLETT PACKARD

45500A SERVICE MANUAL (HP 125 SYSTEM PROCESSOR)



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45500A

SERVICE MANUAL

(HP 125 system Processor)

Part number 45500-90100

HP 125A/B
SERVICE MANUAL
(45500A and 45500B)

125 Service Manual Part No. 45500-90100
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To update your manual replace the pages in your manual with the pages from this update packet. Do not use the back cover of the update package in your manual.

The following pages are included in this update packet:

Pages Changed: Front Cover, Table of Contents, pg. 1, pg. 3-14, Chapter 6 (Troubleshooting), Chapter 7 (Parts Lists/Repair), Appendix A.

Pages Added: Printing History, 2-22.1, 2-22.2, 2-22.3, Appendix B.

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INTRODUCTION

INTRODUCTION

This section provides an overview of the HP 125 Product and the 45500A Service Manual, lists equipment provided, and briefly describes the options and accessories available.

Although the outward appearance of the 45500A is much like that of some HP terminals, the internal structure is very different. Microcomputer technology has allowed HP to put multiple independent computer systems together in one box with the result being an extremely powerful terminal/processor combination.

In order to describe the different parts of the 125 system and particularly the 45500A Unit, the following terms will be used:

The Terminal is that portion of the 45500A which is directly concerned with the CRT display and the Keyboard input. It also controls the two data communication ports and the Intergral Thermal Printer output.

The Processor Section consists of the second micro-computer, its memory, and the HP-IB Controller. Refer to Section VIII for a block diagram and more detailed description.

The Integral Thermal Printer (also called the Internal Thermal Printer, Thermal Printer Mechanism, and TPM) is the optional printer built into the 45000A package (option 050).

The Keyboard is the detachable Keyboard Unit.

MANUAL OVERVIEW

This manual gives the service information for the HP 45500A. Service information for the HP 125 System is also included. The Service Manual itself consists of the following sections:

Section I - Introduction. This section provides a general overview of the service manual, lists the equipment provided and briefly describes the options and accessories available.

Section II - Installation and Cabling. This section provides procedures for installing the system cabling and configuring for some common peripherals. Options, accessories, and cabling information are also included in this section.

Section III - Configuration and Status. This section provides configuration procedures and status decoding for the 45500A.

Section IV - Preventive Maintenance. This section provides preventive maintenance information.

Section V - Alignment. This section provides procedures for adjusting the power supply and raster.

Section VI - Troubleshooting. This section provides procedures for isolating failures to a replaceable assembly, component, or peripheral device.

Section VII - Parts Lists/Repair. This section provides parts list and repair information. This section also provides removal and replacement procedures for the unit's replaceable parts.

Section VIII - Functional Operation. This section provides a brief functional description of the system.

EQUIPMENT PROVIDED

The following equipment and documentation are provided with the 45500A:

1. HP 45500A Interactive Terminal with a standard 120V, 60Hz power source configuration.
2. HP 45500A Owner's Manual, part no. 45500-90001.
3. System Disc on 5" media
4. One meter HP-IB cable, 45529A
5. Alignment Tool, part no. 8710-1335.
6. Thermal Paper is included with the 45500A-050.

OPTIONS AVAILABLE

Options are factory modifications of a standard unit that are requested by the customer. Available hardware options for the 45500A are listed in table 1-1.

Table 1-1. 45500A Options

OPTION	DESCRIPTION
013	240V, 50Hz Power Source
014	100V, 60Hz Power Source
015	220V, 50Hz Power Source
016	100V, 50Hz Power Source
050	Integral Thermal Printer
080	8" Medium for software

ACCESSORIES AVAILABLE

Accessories may be ordered with the computer or separately from your local Hewlett-Packard Sales and Service Office. Sales and Service Offices are listed at the back of this manual. Accessories are listed in table 1-2.

Table 1-2. Accessories

MODEL	HP PART NO.	DESCRIPTION
13222C	13222-60003	RS232 Cable, Female, 2 meters
13222M	13222-60002	European Modem Cable, Male, 5 meters
13222N	13222-60001	US Modem Cable, Male, 5 meters
13222W	13222-60007	HP 300 Cable, Female, 5 meters
13222Y	13222-60005	Three Wire Cable, Male, 5 meters
13222Z	13222-60006	Three Wire Cable, Female, 5 meters
13242G	13242-60010	RS232 Printer Cable, Male, 4.5 meters
13242M	13242-60002	European Modem Cable, Male, 5 meters
13242N	13242-60001	US Modem Cable, Male, 5 meters
13242Y	13242-60005	Three Wire Cable, Male, 5 meters
45529A		HP-IB Cable, 1 Meter
45529B		HP-IB Cable, 2 Meters

2601A

SPECIFICATIONS

For system specifications, refer to the HP 125 System Data Sheet, which is available from your local HP Sales and Service Office.

INSTALLATION/STRAPPING II

INTRODUCTION

In addition to procedures for installing the system, this section provides instructions for opening and closing the 45500A, removing and replacing the mainframe on the support (figure 2-1), and interfacing information.

OPENING AND CLOSING THE 45500A

WARNING

Always remove AC power before opening the unit or removing the top cover. If servicing requires that power be on while protective covers are removed, proceed only with extreme caution not to touch exposed areas. Failure to do so can result in serious injury. Heed all WARNING --- HAZARDOUS VOLTAGE labels.

OPENING THE UNIT.....

1. Using a small Phillips-head screwdriver, loosen the quarter-turn fastener (figure 2-2) at the lower left rear of the terminal housing. Do not overturn the fastener more than a quarter-turn.

2. Hold the pedestal in place with one hand and push forward on the rear of the mainframe to slide the mainframe forward about 1/4-inch on the support. While holding down the pedestal, lift the left side of the mainframe until it tilts approximately 45 degrees and the top prop locks the mainframe in the half-open (service) position.

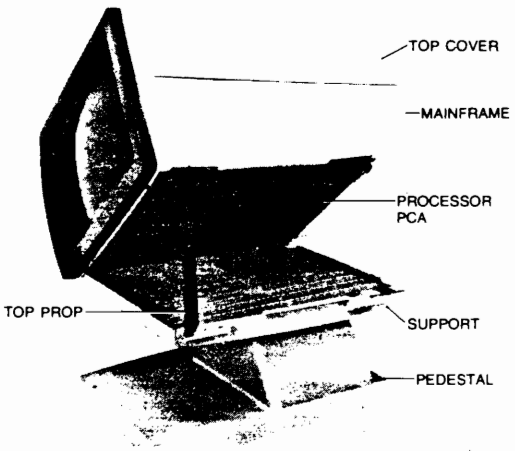

Figure 2-1. 45500A in Half-Open Position

Figure 2-2. Terminal Housing Rear View

REMOVING THE MAINFRAME FROM THE SUPPORT....Removal procedures for the 45500A are different from those for the 45500A-050. For the 45500A, perform steps 2, 3, 4, 6, 7, and 8; for the 45500A-050, perform steps 1 through 8.

1. On the 45500A-050, remove the top cover from the unit by loosening the two quarter-turn fasteners at the top of the terminal housing. Do not over-turn the fasteners.

2. Open the unit to the half-open (service) position.

3. Disconnect the ground strap from the Processor PCA ground lug.

4. Lower the Processor PCA by loosening the four corner snap fasteners which hold it in place.

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+-----------+
|  CAUTION  |
+-----------+
```

When securing snap-in fasteners, always install each snap-in grommet into their respective fastening holes before pushing-in on each snap-in plunger. Observe that each snap-in plunger clicks to ensure that the snap-in fastener is fully seated and secured. Failure to do so will result in an insecure assembly which may cause damage or failure to the assembly or terminal housing.

5. On the 45500A-050, disconnect the fan cable from the FAN connector (J1) on the Power Supply PCA and pull it through the mainframe assembly so that it lies on the support.

6. Reinstall the Processor PCA and reconnect the ground strap.

7. Free the mainframe from the top prop by squeezing the upper end of the top prop (figure 2-3) while exerting an upward force on the left side of the mainframe.

CAUTION

Use extreme care when freeing the mainframe from the top prop and pedestal. Failure to do so may result in damage to the terminal housing or injury to yourself.

8. With the mainframe free of the top prop, slide the mainframe forward an additional 1/4-inch past the detents until the right side clears the fixed hinges (figure 2-3) on the right side of the support; then lift the mainframe free of the support.

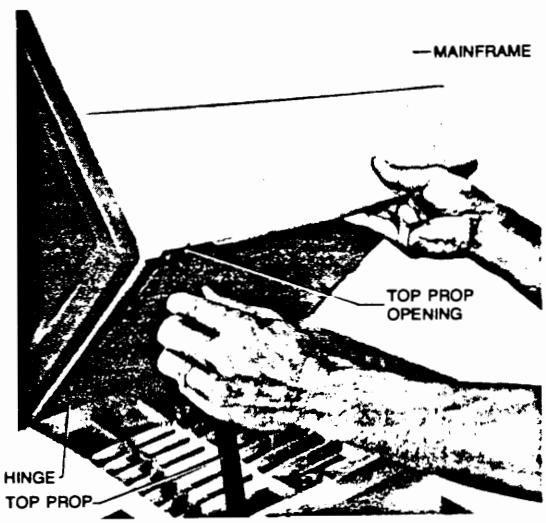


Figure 2-3. Freeing Mainframe from the Top Prop

REPLACING THE MAINFRAME ON THE SUPPORT....1. Hold the mainframe above the support in a tilted position with the left side up, to clear the top prop, and the right side down so that the fixed hinges on the right side of the support enter the hinge openings (figure 2-4) along the right lower edge of the mainframe. Then slide the mainframe rearward past the detents approximately 1/4-inch to lock the hinges.

2. While guiding the top prop so it enters the top prop opening (figure 2-3) in the lower left edge of the mainframe, lower the left side of the mainframe until the top prop locks the mainframe in the half-open (service) position.

3. On the 45500A-050, make sure the fan cable is routed correctly and seated securely in the support slots and cable clip. Failure to do so may cause unusual cable wear which may cause possible shorting.

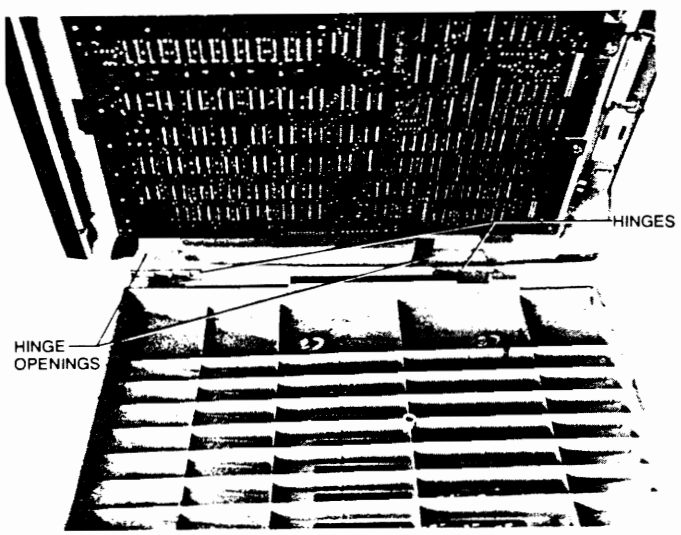


Figure 2-4. Mating the Hinges to the Hinge Openings

CLOSING THE TERMINAL...1. While holding the display housing with one hand to keep it from falling into the closed position, raise it slightly and squeeze the upper end of the top prop to release the catch. Then lower the mainframe to the closed position.

2. Push on the front of the mainframe to slide it rearward approximately 1/4-inch or until it stops.

3. Use a small Phillips-head screwdriver to tighten the quarter-turn fastener at the left rear of the terminal housing. Do not over-tighten the quarter-turn fastener.

INSTALLING THE SYSTEM

PROCEDURE..1. Check that the available power source matches the power source for which the power supply is designed, as marked on the power source and option labels at the rear of the terminal housing (figure 2-2).

45500A

OPTION	POWER SOURCE	RATING	FUSE PART NUMBER	SOCKET	FUSE SIZE
STD	120V, 60Hz	60W,0.5A	2110-0002	X1	250V,2.0A
013	240V, 50Hz	75W,0.3A	2110-0001	X1	250V,1.0A
014	100V, 60Hz	60W,0.6A	2110-0083	X2	250V,2.5A
015	220V, 50Hz	75W,0.4A	2110-0001	X2	250V,1.0A
016	100V, 50Hz	60W,0.6A	2110-0083	X2	250V,2.5A

45500A-050

OPTION	POWER SOURCE	RATING	FUSE PART NUMBER	SOCKET	FUSE SIZE
013	240V,50Hz		2110-0083	X1	250V,2.5A
014	100V,60Hz		2110-0010	X2	250V,5A
STD	115V,60Hz	140W,2.4A	2110-0010	X2	250V,5A
015	220V,50Hz	170W,1.2A	2110-0083	X1	250V,2.5A
016	110V,50Hz	170W,2.4A	2110-0010	X2	250V,5A

2. Remove the top cover by loosening the two quarter-turn fasteners at the top of the terminal housing. Do not overturn the fasteners.

3. Check that the fuse is inserted in the set of fuse holders which comes closest to matching the power source (figures 2-5 and 2-6). Also check that the amperage rating of the fuse is as indicated on the Power Supply PCA. For 45500A-050, the Power Supply PC must be removed to check the fusing.

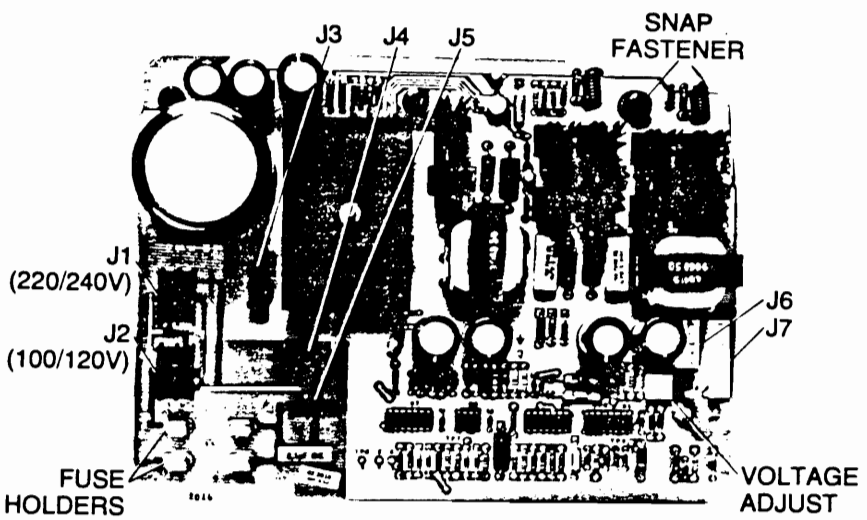


Figure 2-5. 45500A Power Supply PCA

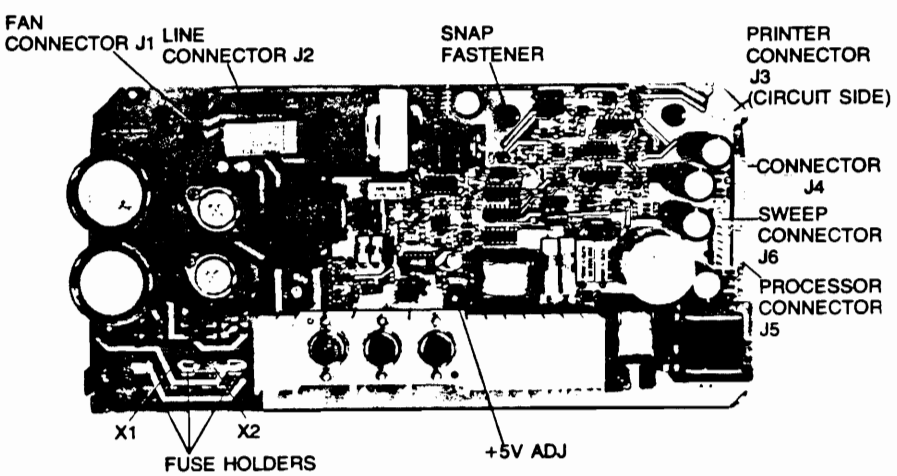


Figure 2-6. 45500A-050 Power Supply PCA

4. Check that the power supply cables are properly connected.

5. Check that the battery is installed with the proper polarity as marked on the battery support.

6. Position the keyboard in front of the unit and connect the keyboard cable to the KYBD connector at the lower right rear of the terminal housing (figure 2-2).

7. Slide the keyboard cable connector lock to the right (as viewed from the rear) to secure the keyboard cable to the KYBD connector.

8. If applicable, connect the data communications cable to the DATA COMM connector at rear of the terminal housing and latch the two securing latches at each side of the connector.

9. Connect the power cord to the power connector at the left rear of the terminal, then turn on the power switch and allow time for the unit to warm up (about 15 seconds).

10. Perform the power supply adjustment procedures and check the raster alignment (refer to the Alignment Section for details).

11. Reinstall the top cover.

12. Perform the self-tests (refer to the self-test procedure in the Troubleshooting Section).

13. Put the unit into configuration mode and configure the straps as desired (refer to the Strapping Section).

14. Turn off terminal power, wait a couple of minutes, then turn on the power and check that the strapping remains as it was configured.

15. Place the disc drive close to the 45500A and insure that the cardboard inserts are removed from the drives.

16. Connect the HP-IB cable between the rear of the terminal housing and the rear of the disc drive.

17. Place the CP/M Operating System disc into the disc drive and press F6 (select Op. Sys. softkey). CP/M should be loaded and a prompt A> should appear.

THERMAL PAPER

INTRODUCTION..The 45500A-050 must use thermal print paper for its thermal print mechanism (TPM). Hewlett-Packard's thermal print paper is especially formulated for prolonged print head life. If Hewlett-Packard's thermal print paper is not used, the equipment warranty and service contract will be void. The part numbers for Hewlett-Packard's thermal print paper are as follows: blue printing 9270-0638, black printing 9270-0656.

PAPER
LOADING...To load a paper roll into the thermal printer (TPM), perform the following:

1. Raise the TPM door to gain access to the TPM

2. Raise the door latch (figure 7-13) and remove the remaining paper and paper core (if any) and rod from the TPM mainframe.

3. Remove the rod from the old core and insert the rod through the core of a new paper roll.

Note: One side of the thermal paper is coated with printing material (the glossy side) and it must be installed correctly to produce the print image. See the embossed illustration on the underside of the TPM door for correct paper roll installation.

4. With the leading edge of the paper roll facing out (as viewed from the front), place the paper roll and rod into the slotted guides of the TPM housing. Press the paper roll down and toward the rear of the TPM until it clicks into place.

5. Feed the leading edge of the paper roll toward the front between the latching frame and the clear plastic tear window. Be careful not to sharply touch the print head because damage may result.

6. Lower the latching frame without locking it into place.

7. Align the paper roll sides with guide lines embossed on each side of the tear window.

8. Feed approximately 12 inches of paper through the latching frame so that the glue spot is beyond the print head and tear window. The glue spot, which holds the paper roll together, must not be allowed to come in contact with the print head during print operations.

9. Press down on the latching frame until it locks into place with an audible click.

10. Tear off the excess paper using the edge of the tear window as a cutting edge.

11. Close the TPM door securely.

Note

If subsequent print operations appear normal except that no print image appears, the paper may have been installed backwards. An image can be printed only on one side of the paper.

INTERFACING INFORMATION

RS-232-C SIGNAL CHARACTERISTICS..DATA SIGNALS. The characteristics for data signals on the datacomm connectors are as follows:

SPACE	MARK
Logic 0	Logic 1
>+3V but <+25V	<-3V but >-25V

CONTROL AND TIMING SIGNALS. The characteristics for control and timing signals are as follows:

ON (ACTIVE)	OFF (INACTIVE)
Logic 1	Logic 0
>+3V but <+25V	<-3V but >-25V

CABLING....Pin-to-pin wiring for some data communication cables is shown in figures 2-7 to 2-12. Table 2-1 translates the RS-232-C/CCITT V.24 (European equivalent) signal identification code for each signal to the name of the signal. Refer to the Data Terminals Cabling Manual (Part # 5952-2047) for additional cabling information.

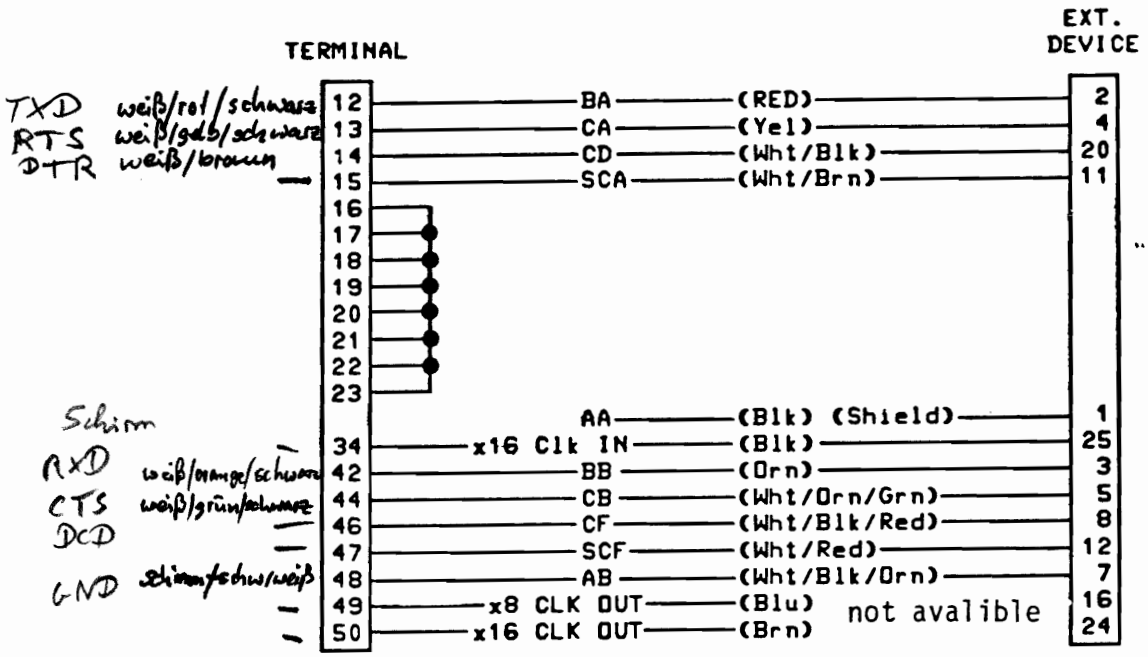


Figure 2-7. 13222C (RS232C) Cable Wiring

PORT 1 CONNECTOR PINOUT

PIN #	J5 PIN #	RS-232-C NOTATION	RS-449 NOTATION	DESCRIPTION
9	18	CE	OCR1	opt. control receiver 1
10	18	-	-	+12V power
11	20	-	-	-12V power
12	21	BA	SD	transmit data
13	22	CA	RS	request to send
14	23	CD	TR	data terminal ready
15	24	SCA	OCD2	optional control driver
23	32	-	-	power ground
24	33	AA	SHIELD	shield
35	2	-	-	+5V power
36	3	-	-	+5V power
37	4	-	-	power ground
38	5	-	-	power ground
39	6	-	-	power ground
40	7	CH	OCD1	optional control driver
42	8	BB	RD	receive data
44	11	CB	CS	clear to send
45	12	CC	DM	data mode
46	13	CF	RR	receive ready
47	14	SCF	OCR2	opt. control receiver 2
48	15	AB	SG	signal ground

** NOTE ** Pins not specified are no-connects.

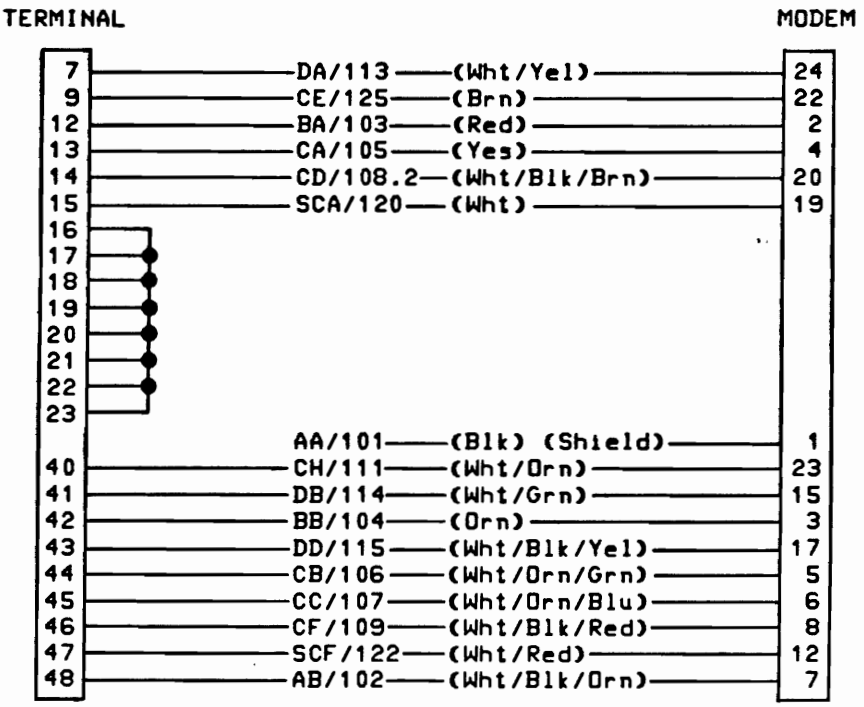


Figure 2-8. 13222M (European Modem) Cable Wiring

PORT 2 CONNECTOR PINOUT

PIN #	J6 PIN #	RS-232-C NOTATION	RS-449 NOTATION	DESCRIPTION
1	1	AA	SHIELD	shield
2	2	BA	SD	transmit data
3	3	BB	RD	receive data
4	4	CA	RS	request to send
5	5	CB	CS	clear to send
6	6	CC	DM	data mode
7	7	AB	SG	signal ground
8	8	CF	RR	receive ready
12	12	SCF	OCR2	opt. control receiver 2
19	19	SCA	OCD2	optional control driver
20	20	CD	TR	data terminal ready
22	22	CE	OCR1	opt. control receiver 1
23	23	CH	OCD1	optional control driver

** NOTE ** Pins not specified are no-connects.

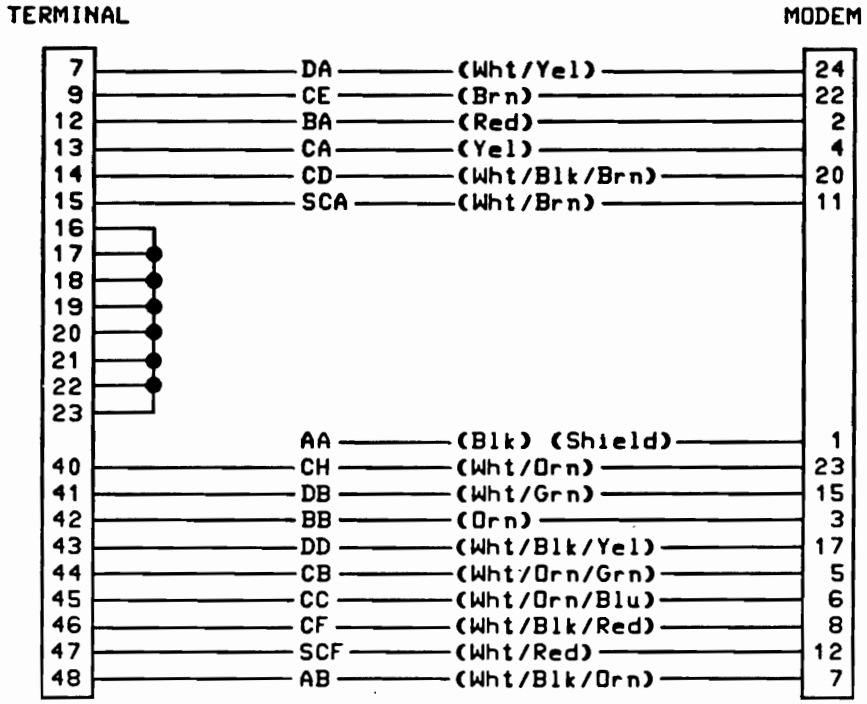


Figure 2-9. 13222N (U.S. Modem) Cable Wiring

Table 2-1. RS-232-C/CCITT V.24 Signal Code-to-Name Translation

CODE		NAME
RS232C	CCITT V.24	
AA	101	Protective Ground
BA	103	Transmitted Data (Data Out)
BB	104	Received Data (Data In)
CA	105	Request To Send
CB	106	Clear To Send
CC	107	Data Set Ready
AB	102	Signal Ground (Common Return)
CF	109	Received Line Signal Detector
SCF	122	Secondary Received Line Signal Detector
DB	114	Transmission Signal Element Timing **
DD	115	Receiver Signal Element Timing **
SCA	120	Secondary Request To Send
CD	108.2	Data Terminal Ready
CE	125	Ring Indicator
CH	111	Data Signal Rate Selector
DA	113	Transmit Signal Element Timing **
x16 Clock In*		Receive Timing **
x16 Clock Out*		Transmit Timing **
x8 Clock Out*		Transmit Timing **

*These signals do not conform to the RS-232-C/CCITT V.24 voltage levels.

**These signals are not sourced on the 45500A.

CABLE
FABRICATION...Parts for cable fabrication are available from Hewlett-Packard if you should need to fabricate your own cable. The required parts are shown in figure 2-10 and are listed below.

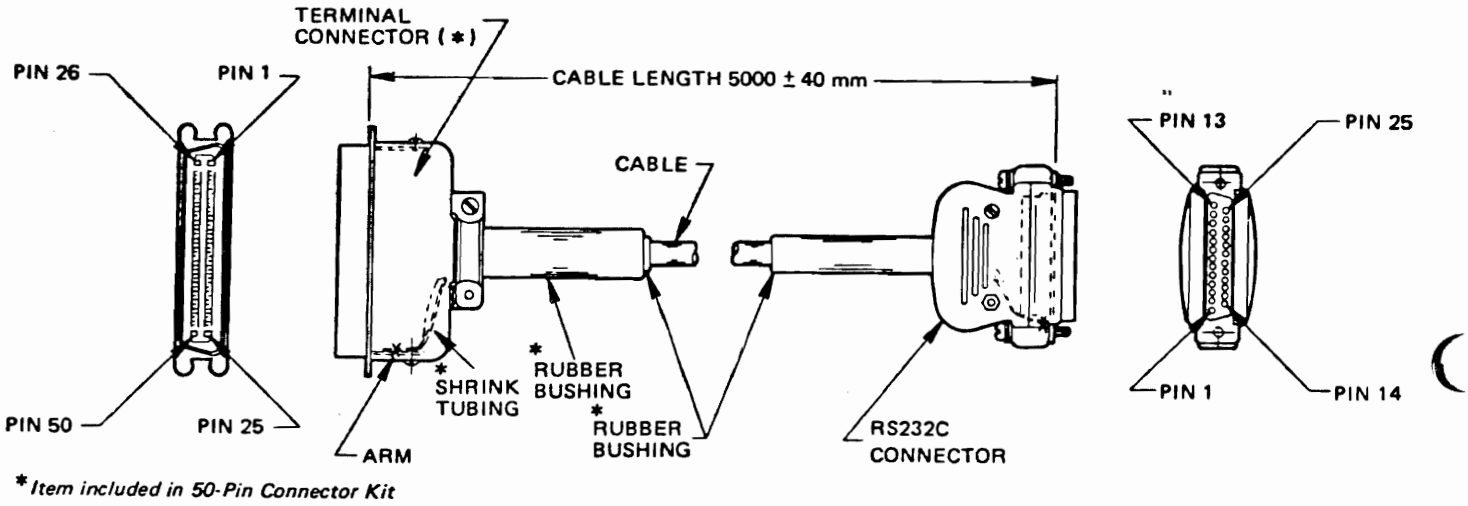


Figure 2-10. 13222 Series Cable Fabrication

ITEM	PART NUMBER
Cable (13222X)	8120-1950
(13222Y)	8120-2849
(others)	8120-2398
50 Pin Kit	5061-2412
Terminal Connector	0850-0311
Terminal Connector	1251-0086
Shrink Tubing	0890-0311
Rubber Bushing (11.1 mm)	1251-0171
Rubber Bushing (7.9 mm)	1251-0352
RS232C Connector	5061-2405

INSTRUCTIONS..Instructions for fabricating a 13222 Series cable are as follows:

1. Solder a bare wire, size 24 AWG, between pins 16 through 23, inclusive, of the terminal connector to ensure contact and solder the wire to each of pins 16 through 23.

2. Solder a black wire, size 24 AWG, to the cable shielding at the RS232C connector end only. (This wire carries the RS232C signal code AA.)

3. At the terminal connector, place shrink tubing over the extended bare arm in the connector housing. Then solder the cable shiled flat to the arm which extends from the pin portion of the connector.

4. At the RS232C connector, solder the cable shield flat to the inside of the connector shell.

5. Strip the ends of the cable wires and solder them to the connector pins at the terminal connector.

6. At the RS232C connector end of the cable, strip the ends of the wires, insert them in the pins, crimp the pins, and insert them into the connector shell.

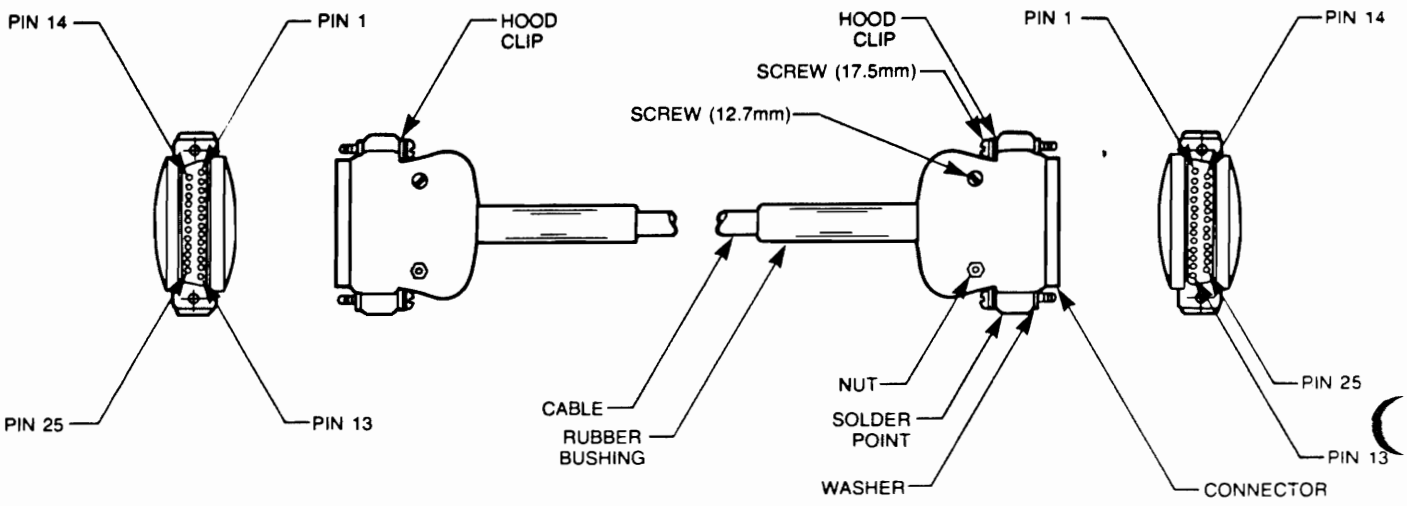


Figure 2-11. 13242 Series Cable Fabrication

ITEM	PART NUMBER
Cable (13242G)	8120-1950
(13242M)	8120-2398
(13242Y)	8120-2849
RS232C Connector Kit	5061-2405
Shrink Tubing	0890-0311
Rubber Bushing (7.9mm)	1251-0352

Figure 2-12. Cable Parts

INSTRUCTIONS..Instructions for fabricating an HP 13242 Series Cable are as follows:

1. Strip the outer jacket from each end of the cable for distance of 30 mm. Separate the braided shield from the wires.

2. Strip the ends of the cable wires to be used (see figures 2-12 through 2-16) for insertion into pins and clip off all wires which will not be used at the termination of the outer jacket.

3. Insert each wire to be used into a pin, crimp the pin, and insert each pin into the correct hole in the connector (figure 2-18).

4. Strip one end of the 100 mm section of wire (part no. 8150-0447), insert it into a pin and insert the pin into pin hole 1 of the connector.

5. Solder the other end of the 100 mm section of wire to the braided shield at the point where the shield exits from the outer jacket of the cable.

6. Break off the cable guide pin to provide more room for the following operation. Then slide the 50 mm section of heat shrink tubing (part no. 0890-0732) over the shield, solder the end of the shield flat to the connector, and shrink the tubing.

7. After performing the above operations on each end of the cable, test the cable from the pins on one end to the pins on the other end for continuity and short circuits.

8. Lay the connector and cable end in place on a connector half shell, lay two of the longer (17.5 mm) 4-40 screws (each with a hood clip and lockwasher threaded on it), in place at each side of the half shell, then place another connector half shell over it, and secure them together with the two shorter (12.7 mm) 4-40 screws.

HP-IB
DEVICES....CABLING. HP-IB devices must be connected using shielded HP-IB cables (HP Part # 45529A/B or equivalent). All HP-IB controllers are connected together to the HP-IB port at the rear of the 45500A unit.

> NOTE. The HP-IB protocal used in the 45500A is a specific subset of the IEEE 488-1978 specificaion. Only GSD specified peripheral devices can be attached to the HP-IB on the 45500A.

The 45529A cable is one meter in length, and the 45529B is two meters in length. The total length of all HP-IB cables in the HP 125 system may not exceed one meter plus one meter per device. (Two meters for the first device and one meter for each additional device).

DEVICE STRAPPING

The following pages present the information needed to configure the 45500A and cable and configure some of the more common peripheral devices used with the HP 125 system.

The information presented for each device represents one way to connect that device. It should not be taken to mean that the device is supported on the HP 125, nor that it is the only way that the device can be connected to the HP 125. It only means that some question has arisen about device connection, and that the method presented seems to work.

Refer to the installation manuals for each device for the method of physically setting the device configuration for the hardware. The information presented here is the information needed to properly set the configuration of the device.

HP-IB Device Configuration

All devices on the HP-IB use the same cables and are configured by setting the device address on the device itself. No configuring of the 125 system is necessary since the supported devices have assigned device addresses. Table 2-12 shows the addresses for the current HP-IB devices.

Device	HP-IB Device Address	Cable
82901M and 9895A	0 (first drives) 2 (second controller)	45529A/B 45529A
7225A and 9872B/C	5	45529A
2631B	1	45529A

Notes:

One disc controller must be at device address 0.

Only one printer device can be on the HP-IB.

Only one plotter device can be on the HP-IB.

Figure 2-12. HP-IB DEVICE ADDRESS ASSIGNMENTS

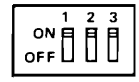
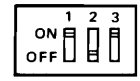
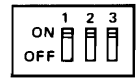
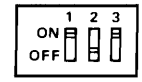
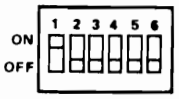
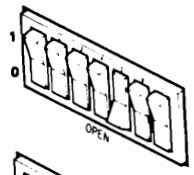
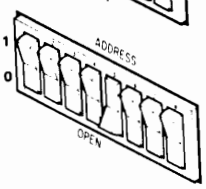
DISC DRIVE	DESCRIPTION	DISC DRIVE ADDRESS SWITCH SETTING "0" 1st Contr.	"2" 2nd Contr.
9121 D/S	3" Dual/Single Drive		
82901M	5 1/4" Dual Drive		
82902M	5 1/4" Single Drive		
9895A	8" Dual Drive		
9895A-010	8" Single Drive		
9133A	3 1/2" Flexible + Winchester		
9134A	Winchester		
9135A	5 1/4" Flexible + Winchester		
9138A	8" Flexible + Winchester	See 9895A-010 and 9134A, above.	

Figure 2-12a. HP-IB Disc Drives

HP-IB PRINTER	DESCRIPTION	HP-IB PRINTER ADDRESS SWITCH SETTING "1"
82905B	Dot Matrix Printer	
2631B*	Dot Matrix Printer	
2671A	Thermal Printer	

*NOTE. The 2631B printer also requires hardware strapping of the DIP switch on its front panel (see below).

SWITCH	DESCRIPTION	SETTING
1	Lines/Inch	OFF (6 LPI)
2	Print Pitch	OFF
3		OFF (10 CPI)
4	Perf Skip	OFF (disabled)
5	Page Length	OFF
6		OFF
7		OFF
8		OFF (11.0 inches)

Figure 2-12b. HP-IB Printers

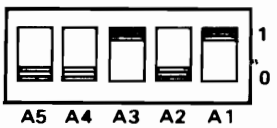
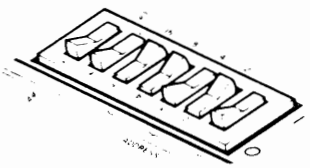
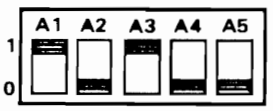
HP-IB PLOTTER	DESCRIPTION	HP-IB PLOTTER ADDRESS SWITCH SETTING "5"
7225B	1-Pen Plotter	
7470A	2-Pen Plotter	
9872C	8-Pen Plotter	

Figure 2-12c. HP-IB Plotters

2601A RS-232-C Printer Interface

Cable Required : 13242G (13242-60010 G)

45500A Configuration

DATA COMMUNICATIONS / SERIAL PRINTER Port 2

BaudRate	1200	Parity	EVEN	Straps	xz	Hndsk	etX
Ptr Nulls	0	SRRXmit	OFF	SRRInvert	OFF	Xon/Xoff(X)	Xmit

2601A Hardware

Left Switch

Switch	Function	Setting
1	Dbl LF	OFF
2	Not Used	OFF
3	Auto LF	OFF
4	Not Used	OFF
5	UC Only	OFF
6	Not Used	OFF
7	Msg Load	OFF
8	Not Used	OFF

Right Switch

Switch	Function	Setting
1	Full Duplex	ON
2	Parity On	ON
3	Baud	OFF
4	Rate	OFF
5	Select	ON
6	Even Parity	ON
7	Paper out	OFF
8	Not Used	OFF

2631B RS-232-C Interface

Cable Required : 13242G (13242-60010 G)

Software XON/XOFF Handshake Configuration:

45500A Configuration

DATA COMMUNICATIONS / SERIAL PRINTER Port 2

BaudRate	2400	Parity	NONE(0)	Straps	xz	Hndsk	etX
Ptr Nulls	0	SRRXmit	OFF	SRRInvert	OFF	Xon/Xoff(X)	XMIT

2631B Hardware

Switch S1 on Serial I/F Adaptor on back of 2631B

Switch	Function	Setting
1	XON/XOFF	OPEN
2	ENQ/ACK	CLOSE
3	SCA LINE	CLOSE
4	SCA LINE	CLOSE
5	CD LINE	CLOSE
6	CD LINE	CLOSE
7	Monitor CB	OPEN
8	Modem dis.	CLOSE

Switch S2 on Serial I/F PCA inside of 2631B

Switch	Function	Setting
1	Baud Rate	CLOSE
2	when front	CLOSE
3	panel set	CLOSE
4	to EXT.	CLOSE
5	Strip DEL	CLOSE
6	Not Used	---
7	Rec'd bit 8	CLOSE
8	Not Used	---

Front Panel Switches

Switch	Setting
PARITY	NONE
DUPLEX	FULL
BAUD	2400

Note: The Baud rate settings can be vaired, but must agree.

2631B RS-232-C Interface

Cable Required : 13242G (13242-60010 G)

Hardware Handshake (Clear to Send) Configuration:

45500A Configuration

DATA COMMUNICATIONS / SERIAL PRINTER Port 2

BaudRate	2400	Parity	NONE(0)	Straps	xz	Hndsk	eTx
Ptr Nulls	0	SRRXmit	OFF	SRRInvert	OFF	Xon/Xoff(X)	NONE

2631B Hardware

Switch S1 on Serial I/F Adaptor on back of 2631B

Switch	Function	Setting
1	XON/XOFF	CLOSE
2	ENQ/ACK	CLOSE
3	SCA LINE	CLOSE
4	SCA LINE	CLOSE
5	CD LINE	CLOSE
6	CD LINE	OPEN
7	Monitor CB	OPEN
8	Modem dis.	CLOSE

Switch S2 on Serial I/F PCA inside of 2631B

Switch	Function	Setting
1	Baud Rate	CLOSE
2	when front	CLOSE
3	panel set	CLOSE
4	to EXT.	CLOSE
5	Strip DEL	CLOSE
6	Not Used	---
7	Rec'd bit 8	CLOSE
8	Not Used	---

Front Panel Switches

Switch	Setting
PARITY	NONE
DUPLEX	FULL
BAUD	2400

Note: The Baud rate settings can be vaired, but must agree.

2631A RS-232-C Interface

Cable Required : 13242G (13242-60010 G)

45500A Configuration

DATA COMMUNICATIONS / SERIAL PRINTER Port 2

BaudRate	1200	Parity	NONE(0)	Straps	xz	Hndsk	Etx
Ptr Nulls	0	SRRXmit	OFF	SRRInvert	OFF	Xon/Xoff(X)	NONE

2631A Hardware

"Old" Interface
(02631-60083)

Switch S1 on Serial I/F

Switch	Function	Setting
1	Baud Rate	CLOSE
2	when front	CLOSE
3	panel set	CLOSE
4	to EXT.	CLOSE

Switch S2 on Serial I/F

Switch	Function	Setting
1	Frame	CLOSE
2	Characters	CLOSE
3	CKT. ASSUR.	CLOSE
4	CPU Break	CLOSE
5	CHAR DET.	CLOSE
6	Auto Discon	CLOSE
7	FDX Modem	CLOSE
8	Rec'd bit 8	CLOSE

Switch S3

CH OFF

"New" Interface
(02631-60159 or -60376)

Switch S1 on Serial I/F

Switch	Function	Setting
4	Strip DEL	CLOSE
5	Baud Rate	OPEN
6	when front	OPEN
7	panel set	OPEN
8	to EXT.	OPEN

Switch S2 on Serial I/F

Switch	Function	Setting
1	Frame	CLOSE
2	Characters	CLOSE
3	CKT. ASSUR.	CLOSE
4	FDX Modem	CLOSE
5	Rec'd bit 8	CLOSE
6	Auto Discon	CLOSE
7	CHAR DET.	CLOSE
8	CPU Break	CLOSE

Switch S3

CH OFF

2631A RS-232-C Interface (Continued)

Jumpers		
Switch	Function	Setting
W8	DIAGONAL	X6 - X8
W9	DIAGONAL	X3 - X5

Jumpers		
Switch	Function	Setting
W5	X8 CLOCK	OUT
W6	X8 CLOCK	IN
W9	CLEAR to SEND	IN
W10		OUT

Front Panel Switches

Switch	Setting
PARITY	NONE
DUPLEX	FULL
BAUD	1200

Note: The Baud rate settings can be varied, but must agree.

SYSTEM/TERMINAL CONFIGURATION

INTRODUCTION

The method provided for making system/terminal configuration changes is a configuration menu. A menu is a list of configuration parameters which are displayed on the screen. Each parameter has an associated space for a value which you select. Many of the parameters have a system-defined list of values. For others, you must enter the value from the keyboard. For parameters with systemdefined values, two function key labels are displayed with the menu to enable you to scroll forward (NEXT CHOICE) or backward (PREVIOUS CHOICE) through the list of values.

When the menu is called to the display screen, the values currently in use are displayed. The sequence for changing a set of configuration values is to display the menu, and make the desired changes, which will store the values in non-volatile memory.

The system contains a battery powered portion of memory called nonvolatile memory in which the current configuration values are stored when power to the system is shut off. The set stored is the one last selected by the user. When power to the terminal is turned on, the set of configuration values stored in non-volatile memory becomes the active set.

CONFIGURATION MENUS

MENU.....DISPLAY FORMAT. The configuration requirements for your terminal and system are contained in a menu displayed on the screen. Figure 3-1 shows a typical configuration menu. There are four sections to the menu displayed on your screen:

1. The Terminal Configuration section enables you to select the terminal characteristics.

2. The two Data Communication sections enable you to configure the data comm and printer functions.

3. The OpSys List Device section enables you to select which list devices are enabled or disabled on your system.

```
TERMINAL CONFIGURATION

 RemoteTo Port  1   LocalEcho OFF      ReturnDef<% >      FrameRate 60
 CapsLock OFF           Click  ON    Enhancement  UI         Straps abcghl
 StartCol   1
-------------------------------------------------------------------------

DATA COMMUNICATIONS  Port   1

 BaudRate 2400         Parity NONE(0)     Straps xz           Hndsk Etx
 Asterisk OFF
-------------------------------------------------------------------------

DATA COMMUNICATIONS  /  SERIAL PRINTER  Port   2

 BaudRate 2400         Parity NONE(0)     Straps xz           Hndsk etX
 PtrNulls   0        SRRXmit OFF      SRRInvert OFF    Xon/Xoff(X) Xmit
-------------------------------------------------------------------------

OPSYS GENERAL LIST DEVICE

  Display OFF          IntPtr OFF         Port 2  ON          HPIB OFF


          NEXT   PREVIOUS            3   11
         CHOICE   CHOICE
```

Configuration Menu

Figure 3-1. Typical Configuration menu

MENU.....HOW TO DISPLAY. To display the menu, perform the following procedures:

1. Press the [AIDS] key to display the Primary set of function key labels.

2. Press the "config" function key ([f8]) to display the menu with its active values. Figure 3-2 lists the function key labels displayed along the bottom of the screen; they allow you to change a selection on the menu. To exit: Press [AIDS] key.

Figure 3-2. Configuration Mode Function Key Labels

LABEL	FUNCTION
NEXT CHOICE	Allows cycling forward through all the values within a field in the menu.
PREVIOUS CHOICE	Allows cycling backward through all the values within a field in the menu.

MENU.....HOW TO CHANGE A SELECTION.

The menus contain a set of fields that you can access using the [TAB>] and [TAB<] keys. To change a selection on a menu, perform the following steps:

1. Place the cursor at the character position to be changed. This can be done using the [TAB>] key or the cursor positioning keys.

2. If the choices are restricted to a system-defined list of selections (such a field is in inverse video), use the NEXT CHOICE and PREVIOUS CHOICE function keys to cycle through the list of selections until the desired one is displayed.

3. If the choices are not restricted to a system-defined list, enter the desired value from the keyboard.

4. Once you have made all the changes, return to normal operation by pressing the [AIDS] key, [MODES] key, [USER KEYS] key, [SHIFT-USER KEYS] key, or [SHIFT-AIDS] key.

The meanings of the various fields in the four configuration menus are described in Tables 3-1 through 3-3.

Table 3-1. Terminal Configuration Menu Fields

FIELD	FUNCTION
Remote To	This field specifies which data comm port is assigned to a remote device. Values: Port #1 Port #2 Default: Port #1
Local Echo	This field specifies whether or not the terminal should display characters as they are typed. ON = Characters entered through the keyboard are both displayed on the screen and transmitted to the host computer. This is called half duplex. OFF = Characters entered through the keyboard are transmitted to the remote computer only. If they are to appear on the screen, the remote computer must "echo" them back to the terminal. This is called full duplex. Default: OFF
ReturnDef	This field specifies the definition of the RETURN key. The definition may consist of up to two characters (a trailing blank is not recognized). Default: <CR>
FrameRate	This field specifies the power line frequency (50 or 60 Hz) the terminal will operate at the screen refresh rate is then synchronized to the specified frequency. If this field is set to the wrong value, the images on the screen will pulsate visibly. Values: 50 (for 50 Hz power source) 60 (for 60 Hz power source) Default: 60

Table 3-1. Terminal Configuration Menu Fields (cont.)

FIELD	FUNCTION
CapsLock	This field allows selection of Upper case only. ON = The system generates only Teletype-compatible codes: uppercase ASCII and DEL. Unshifted alphabetic keys (a-z) generate the codes for their uppercase equivalents, the {, }, and | generate the codes for [,], and \ (respectively). The key for generating ~ and ` is disabled. The CAPs key on the keyboard is ignored. OFF = The system generates the full 128-character ASCII set of codes. The CAPs key on the keyboard toggles between the two states. Default : OFF
lick	The system is capable of producing an audible "click" as each key is pressed. This field specifies whether that feature is enabled or disabled. Values: ON (click enabled) OFF (click disabled) Default: ON
nhancement	This field specifies the desired display enhancements (inverse video, underline video, blink video, and half bright) you want displayed on your screen. These enhancements may be used separately or in any combination, such as U, HU B, IB . Note that the chosen enhancement is active when the enhancement select function key is enabled. Values: I (Inverse video) U (Underline) B (Blinking) H (Half bright) Default: U (Underline)

Table 3-1. Terminal Configuration Menu Fields (cont.)

FIELD	FUNCTION
Straps	This field specifies the additional strapping selections for additional terminal display characteristics and the selections associated with data transfer. Each strap is represented on the display by an alphabetic character (a, b, c, g, h and 1). A strap is enabled or disabled by changing the state of the displayed character from lowercase to uppercase, or vice versa. (For further information on strapping, refer to the discussion on "Strap Configuration" at the end of this chapter.) Values: a (escape sequence transmission) b (space overwrite (SPOW) latch) c (cursor end-of-line wrap around) g (Block transfer handshake) h (Inhibit DC2) 1 (inhibit self-test) Default: abcghl (See page 3-12 regarding straps)
StartCol	This field determines which column the system starts transmitting text. This is used in Modify Line or Modify All mode. (For further information on the Start Col field, refer to chapter 9 on "Using Start Column". Values: 1-80 Default: 1

Table 3-2. Data Comm Configuration Menu Fields

FIELD	FUNCTION
BaudRate	This field specifies what speed you want the data transmission to take place at (in bits per second). Values: 110, 150, 300, 600, 1200, 1800, 2400, 3600, 4800, 9600 Default: 2400
Parity	This field specifies what type of parity generation and checking you wish used with each data character. Values: NONE(0) (No parity generated (0); eighth bit is ignored) NONE(1) (No parity generated (1); eighth bit is ignored) EVEN (Even parity generated; eighth bit is parity result). The Z strap determines whether parity is checked. ODD (Odd parity generated; eighth bit is parity result). The Z strap determines whether parity is checked. Default: NONE(0)
Straps	This field specifies the additional strap selections associated with data transfer. Each strap is represented on the display by an alphabetic character (x and z). A strap is enabled or disabled changing the state of the displayed character. This is done by selecting the strap and changing it from uppercase to lowercase or vice versa. For more information on these straps, refer to the description following these tables. Values: x (Data speed select) z (Parity check) Default: xz

Table 3-2. Data Comm Configuration Menu Fields (cont.)

FIELD	FUNCTION
Hndsk	This field specifies what type of communications "handshake" is to be used by a single alphabetic character (e,t, and x). You enable or disable the type of handshake by changing the state of the displayed character from lowercase to uppercase, or vice versa. For further information, refer to the discussion on handshaking following these tables. Values: e (ENQ/ACK handshake) t (Transmit handshake) x (XON/XOFF) Default: Etx
Asterisk	This field specifies whether the transmit indicator should be enabled or disabled and, if enabled, which RS-232C control line it should reflect. When the asterisk is present, the transmit indicator is on; when the asterisk is missing, the transmit indicator is off. (This applies to Port #1 only.) Values: OFF disables the transmit indicator. CS specifies the transmit indicator should reflect the state of the RS-232C Clear to Send (CS) control line (asterisk=HI; no asterisk=LO). DM specifies the transmit indicator should reflect the state of the RS-232C Data Mode (DM) or Data Set Ready (CC) control line (asterisk=HI; no asterisk=LO). Default: OFF

Table 3-2. Data Comm Configuration Menu Fields (cont.)

FIELD	FUNCTION
PtrNulls	This field specifies the number of ASCII null codes (0-99) to be transmitted to an external printer after each ASCII control code. Values: 0-99 Default: 0
SRRXmit	This field specifies whether or not a -12V on the RS-232C Secondary Receiver Ready (SRR) or Secondary Carrier Detect (SCF) control line is enabled or disabled for transmitting data. This mechanism is primarily used in conjunction with printers which must be able to control the transmission of data from other devices. Values: ON (enabled) OFF (disabled) Default: OFF
SRRINVERT	This field applies only when the SRRSMIT field is required. When both the SRRXMIT and SRRInvert fields are enabled, the RS-232C Secondary Receiver Ready (SRR) or Secondary Carrier Detect (SCF) control line is inverted from -12V to +12V. Values: ON (+12V) OFF (-12V) Default: OFF
XON/XOFF(X)	This field defines whether the XON/XOFF handshake protocol is to be for Receive Pacing (computer communication) or Transmit Pacing (printer communication). Only functions if port 2 Handshake X is enabled.

Table 3-3. OpSys General List Device Menu Fields

FIELD	FUNCTION
Display	This field specifies whether or not the Op Sys list device is assigned to the display screen. Values: ON (display enabled) OFF (display disabled) Default: ON
IntPrtr	This field specifies whether or not the Op Sys list device is assigned to the internal printer. Values: ON OFF Default: OFF (if no internal printer is present) Default: ON (if internal printer is present)
Port #2	This field specifies whether or not the Op sys list device is assigned to data comm port #2. Values: ON OFF Default: OFF
HPIBprtr	This field specifies whether or not the Op Sys list device is assigned to the HPIB printer port. Values: ON OFF Default: OFF

Note: Any of these list devices can be active at the same time.

STRAP CONFIGURATION

The strapping configured for your system allows the following conditions when you specify lowercase or uppercase alphabetic conditions:

STRAP	ENABLED	DISABLED	DEFAULT
Transmit Escape Sequence	A	a	Disabled
Space Overwrite (SPOW) Latch	B	b	Disabled
Wraparound Cursor, End-of-Line	c	C	Enabled
Short Transfer Trigger Handshake	g	G*	Enabled
Long Transfer Warning Handshake	h	H	Enabled
Data Speed Select	X	x	Disabled
Parity Check	z	Z	Enabled
Inhibit Self Test	L	l	Disabled

* Although the Short Transfer Trigger Handshake is disabled, transfer conditions become dependent on the state of the Long Transfer Warning Handshake strap. For more information, refer to the description for these straps (g,h) below.

When configuration menus are displayed, you use the cursor left [<] or cursor right [>] keys to move the cursor to a position beneath the character representing the strap you want to change.

STRAP(a)...TRANSMIT ESCAPE SEQUENCE. When this strap is enabled, any keyboard-generated escape sequence (cursor movements, etc) are passed through to the host system and not executed. When disabled the keyboard-generated escape sequence is executed locally and no information is given to the host system.

STRAP(b)...SPACE OVERWRITE (SPOW) LATCH. When this strap is enabled, the SPOW latch can be turned on by the RETURN, and turned off by [↖] (home up), a Linefeed, or [<TAB>]. When the SPOW latch is on, the space bar causes the cursor to move to the right along the current line without overwriting existing characters. When the SPOW latch is off, the space bar causes an overwrite of blank (space) characters as the cursor moves along the current line.

When this strap is disabled (the defaulted state), the SPOW latch is not accessible.

STRAP(c)...WRAPAROUND CURSOR, END-OF-LINE. When enabled (the defaulted state), this strap causes the cursor to wraparound to the beginning of the next line on the display whenever column 80 of any line is passed. The terminal generates a Return and a Linefeed character to accomplish this.

STRAP(g&h). SHORT TRANSFER TRIGGER HANDSHAKE AND LONG TRANSFER WARNING HANDSHAKE. The HP 125 provides three kinds of data transfer operations; Long Transfer in Line Mode, Long Transfer in Character Mode, and Short Transfer.

Short Transfer	A data transfer operation involving: o Cursor Sensing o Terminal Status o f1 through f8 functions o escape sequence response
Long Transfer, Line Mode	A data transfer operation initiated via the [RETURN] or [ENTER] keys while one of the terminal's Modify Modes are enabled.
Long Transfer, Character Mode	A data transfer operation initiated via the [ENTER] key while both of the terminal's Modify Modes are off.

(See table 3-4 for correct g and h strap settings.)

HANDSHAKE PROTOCOL

The transfer mode affects the type of handshake used. The complete DC1/DC2 handshake protocol consists of a "trigger" signal (DC1) sent from the host computer to inform the terminal that a data transfer is possible. In response, the terminal sends a "warning" signal (DC2) to the host computer indicating that the data to be transferred is ready. The host computer sends another trigger signal (DC1) to enable the transfer. Figure 3-3 illustrates the handshake protocol.

HOST	TERMINAL	
DC1-----trigger---------->		Host opens data transfer operation.
<------warning----------DC2		Terminal signals ready state.
DC1-----trigger---------->		Host enables transfer operation.
<------transfer---------<data>		Terminal transmit data.

Figure 3-3. DC1/DC2 Handshake Protocol

Depending on the state of the g and h straps, one of three subsets of the handshake protocol shown in figure 3-4 is used by the terminal, as follows:

TYPE 1 (No Handshake)

HOST	TERMINAL	
<--------transfer----------	<data>	Terminal transmits data

TYPE 2 (DC1 Trigger Handshake)

HOST	TERMINAL	
DC1------trigger----------->		Host enables transfer operation.
<-------transfer-----------	<data	Terminal transmits data

TYPE 3 (DC1/DC2/DC1 Warning Handshake)

HOST	TERMINAL	
DC1-----trigger------------->		Host opens data transfer operation.
<-------warning------------	DC2	Terminal signals ready state.
DC1-----trigger------------->		Host enables transfer operation.
<-------transfer-----------	<data	Terminal transmits data

Figure 3-4. Handshake Protocols

See strap configuration for correct g and h strap settings.

Table 3-4. DC1/DC2 Handshake Protocol Strapping Effects

Strap State	Transfer Category: Long (Line Mode)	Short	Long (Char Mode)
g,h default	TYPE 3	TYPE 2	TYPE 1
g,H	TYPE 1	TYPE 2	TYPE 1
G,h	TYPE 3	TYPE 3	TYPE 3
G,H	TYPE 1	TYPE 1	TYPE 1

STRAP(X)...DATA SPEED SELECT. When this strap is enabled, the data speed signal is set high (CH=on). When disabled (the defaulted state), the data speed signal is set to low (CH=off).

STRAP(Z)...PARITY. Parity is a way the terminal and computer can verify that your data was transfered correctly. Therefore, parity refers to a vertical redundancy check bit that is added as the high bit of each byte as it is transmitted and checked for the correct value as it is received over the data communications line.

When the Parity strap is enabled (the default state), a parity check for even or odd parity is performed by the terminal on the received data.

When this strap is disabled, no parity check is performed.

Note that parity is never checked for received data if the terminal is configured for either zero or ones parity.

STRAP(1)...INHIBIT SELF-TEST. When this strap is disabled, the Power-On Test, OpSys Test, Data Comm Test, Integral Printer Test, and Manufacturing Test are enabled.

When enabled, the Power-On Test, OpSys Test, Data Comm Test, Internal Printer Test, and Manufacturing Test are not performed. Any attempt to initiate these tests results in an error message; to clear the message, press [RETURN].

HANDSHAKE CONFIGURATION

The handshaking configured for your system allows the following conditions when you specify lowercase or uppercase alphabetic characters:

HANDSHAKE	ENABLED	DISABLED	DEFAULT
ENQ/ACK Handshake	E	e	Enabled
Transmit Handshake	T	t	Disabled
XON/XOFF	X	x	Disabled

When configuration menus are displayed, you use the cursor left [<] or cursor right [>] keys to move the cursor to a position beneath the character (e,t,x) to be changed.

HANDSHAKE..ENQ/ACK HANDSHAKE. This type of handshake may be used to ensure that the terminal has an empty buffer before the host computer transmits more data. When this strap is enabled (the defaulted state), an acknowledge signal (ACK) is transmitted by the terminal each time an enquiry signal (ENQ) is encountered from the host computer. Any data contained in the buffer is processed before the ACK signal is transmitted.

When this strap is disabled, any enquiry signal (ENQ) encountered from the host computer is treated as a normal data character. No acknowledge signal (ACK) is generated.

HANDSHAKE..TRANSMIT HANDSHAKE. When this handshake type is enabled, the host computer or printer can transmit a "busy" signal across the Clear to Send (CB for RS-232C or 106 for CCITT V.24) control line to temporarily stop the transmission of data from the terminal.

When this handshake type is disabled (the defaulted state), data transmission continues uninterrupted by the computer.

HANDSHAKE..XON/XOFF. This handshake protocol allows the terminal to signal the host computer to stop sending data and, subsequently, to resume sending data as the input buffer fills and empties.

When this strap is enabled, the input buffer fills to within approximately 40 bytes of its capacity. At this point, the terminal sends a Transmit Off signal (XOFF) to cause the host computer to stop transmitting data. When the buffer has emptied below 1/4 of its capacity, the terminal sends a Transmit on signal (XON) which causes the host computer to resume data transmission. This process is repeated until the current data transfer operation is completed. When disabled (the defaulted state), no XON/XOFF handshake occurs.

Note that the XON signal is represented by a DC1 (ctrl Q) character transmission. The XOFF signal is represented by a DC3 (ctrl S) character transmission.

STATUS INFORMATION

INTRODUCTION

This section contains information on how to obtain and interpret terminal status information. In addition to terminal portion status, it also includes status information on output devices used with the terminal.

Status requests are made by sending an escape code sequence to the terminal to select the desired status information. All status requests are treated as block transfers. See the section on short data transfers for further information on handshake protocol.

STATUS....INTERPRETING STATUS. In reponse to status requests, the terminal portion returns an escape sequence followed by one or more bytes of data. Whether the request was initiated locally from CP/M or remotely from a host system, the status bytes are terminated by a 'carriage return' character. A 'line feed' character will also be appended if the terminal portion is configured for 'auto line feed'.

The actual status information is contained in the lower four bits of each status byte. The upper four bits are set by the terminal portion to assure the byte represents a printable ASCII character. Each byte can be interpreted as one of the character values listed in Figure 3-5.

STATUS....TERMINAL STATUS REQUESTS. Terminal status is made up of 14 status bytes, numbered 0 through 13. Each byte contains specific information about some aspect of the HP 125 terminal configuration. Memory size and other strapping options are just two examples of some of the information available. The status is available in two sets of 7 bytes each. These two blocks are called primary and secondary status, respectively.

When you perform a terminal self-test from the keyboard, you will notice the line of 14 alphanumeric characters which appear across the last line of test information. These 14 bytes represent the terminal portion status, and reflect the same data which would be returned when status is requested via escape sequence.

Under program control you can request either primary or secondary terminal portion status separately. This is true from both remote systems and from CP/M running locally. In fact, the protocol required to request and read status from remote systems is identical to the protocol used by CP/M programs.

ASCII CHARACTER	BINARY STATUS
0	0011 0000
1	0011 0001
2	0011 0010
3	0011 0011
4	0011 0100
5	0011 0101
6	0011 0110
7	0011 0111
8	0011 1000
9	0011 1001
:	0011 1010
;	0011 1011
<	0011 1100
=	0011 1101
>	0011 1110
?	0011 1111

Figure 3-5
Status Byte Values

STATUS....PRIMARY TERMINAL STATUS. The first block of status, bytes 0 through 6 inclusive, is requested by sending the following escape sequence:

ESC ^

No terminator (such as a 'carriage return') is required locally, although a 'trigger' may be required depending on the status of the G and H strap settings.

The terminal portion will respond with an 'ESC \' followed by seven bytes of primary status information. A 'carriage return' will be terminate the block.

The meaning of each byte of primary status is shown in Figure 3-6.

Configuration/Status

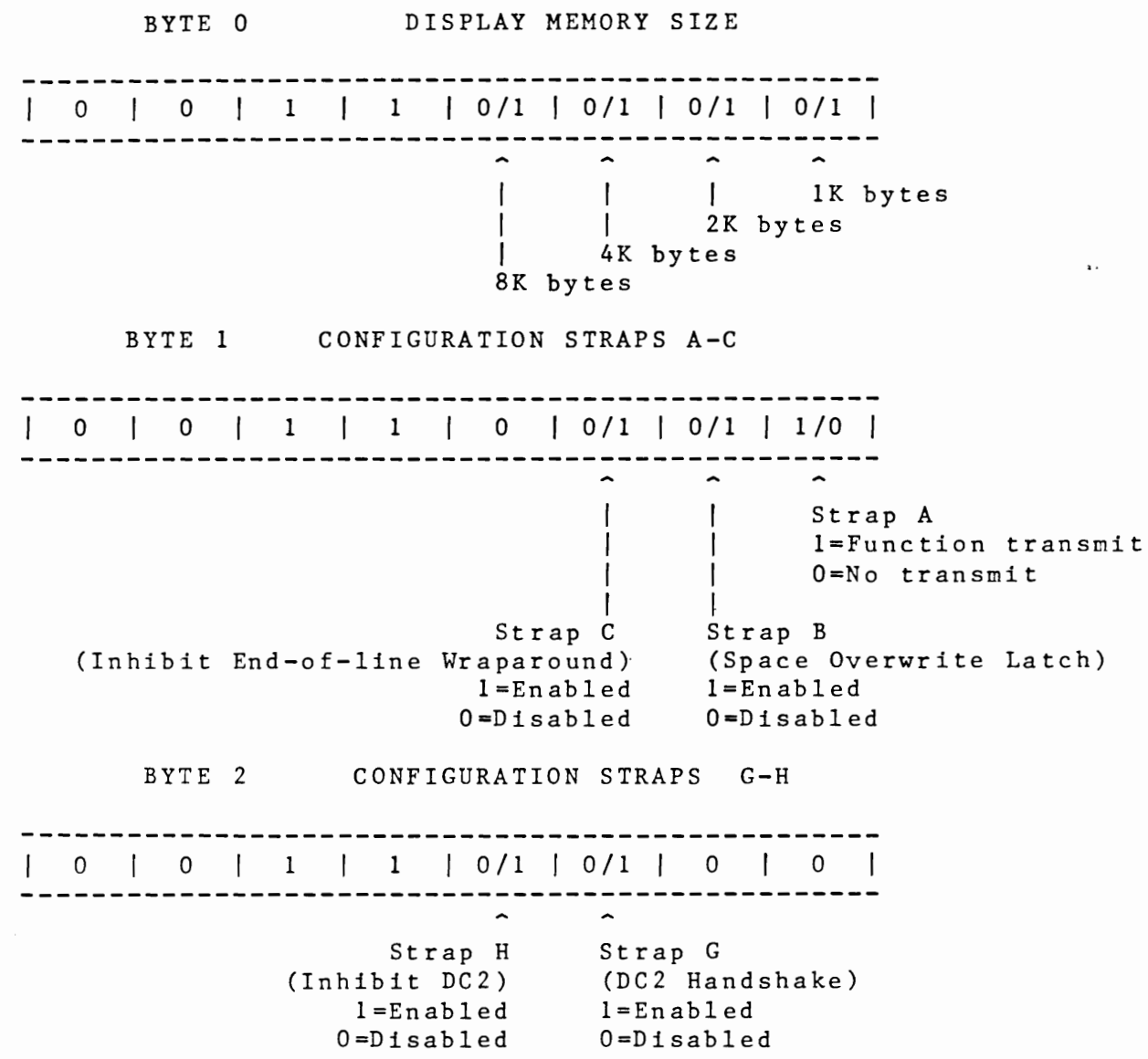


Figure 3-6. PRIMARY STATUS DECODING

BYTE 3 LATCHING KEYS

0	0	1	1	1	0/1	0	0/1

Auto LF Key
1=Auto LF
0=No Auto LF

Caps Lock Key
1=Upper Case only
0=Upper and Lower Case

BYTE 4 TRANSFER PENDING FLAGS

0	0	1	1	0/1	0/1	0/1	0/1

Secondary Status
1=Pending
0=Not Pending

ENTER Key
1=Pending
0=Not Pending

Function Key
1=Pending
0=Not Pending

Cursor Sense
1=Pending
0=Not Pending

BYTE 5 ERROR FLAGS

0	0	1	1	0/1	0	0/1	1/0

Device Error
1=Error
0=No Error

Self-test Error
1=No Error
0=Error

Data Comm Error
1=Error
0=No Error

BYTE 6 DEVICE TRANSFER PENDING FLAGS

0	0	1	1	0	0	0/1	0/1

Device Operation
1=Status Pending
0=No Status Pending

Device Status
1=Status Pending
0=No Status Pending

Figure 3-6. PRIMARY STATUS DECODING

STATUS....SECONDARY TERMINAL STATUS. The second block of terminal portion status, bytes 7 through 13, is requested by using the following escape sequence:

ESC ~

(The second character is a 'tilde', HEX code 7E, DECIMAL 126.) Again, any trigger for a remote request will depend on the status of the G and H straps in the terminal portion.

The terminal portion responds with an 'ESC |' and seven status bytes. (The second character is a 'bar', HEX code 7C, DECIMAL 124.) Once gain, the block is terminated by a 'carriage return'.

The meaning of each byte of secondary status is given in Figure 3-7.

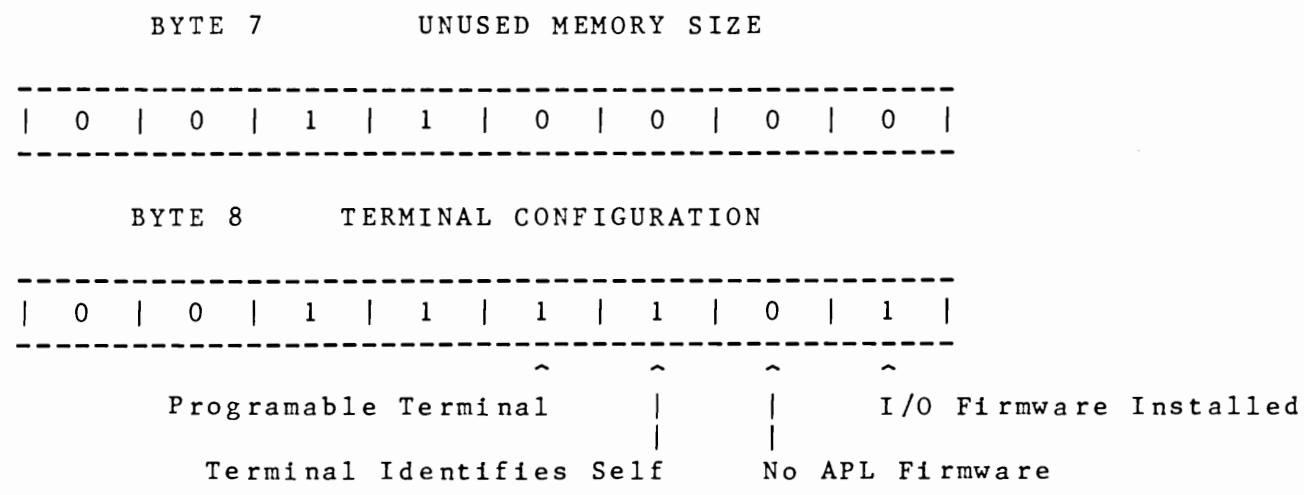


Figure 3-7. SECONDARY STATUS DECODING

BYTE 9 CONFIGURATION STRAP L

| 0 | 0 | 1 | 1 | 0 | 0/1 | 0 | 0 |

Strap L (Inhibit Self-test)
1=Inhibit testing
0=Allow testing

BYTE 10 UNUSED

| 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |

BYTE 11 UNUSED

| 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |

BYTE 12 UNUSED

| 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |

BYTE 13 UNUSED

| 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |

Figure 3-7. SECONDARY STATUS DECODING

STATUS....PRINTER STATUS. The terminal portion can report the status of any printer devices which are connected to the HP 125. This status, like terminal status, is requested via an escape sequence.

Typically, such a request might be made to verify the existance of a device, such as the built-in printer, or to confirm completion of an output operation. The device status bytes are decoded in much the same manner as the terminal status bytes. Additionally, the trigger mechanism and return terminators are similar to those used with terminal status.

Device status is requested by sending the following escape sequence to the terminal portion:

ESC & p <code> ^

The last character is an "up arrow" character (SHIFT-6) on the USA 125 Keyboard.

The possible values for <code> are:

code	device
4	-> Serial device on port 2
5	-> HP-IB device at address 1
6	-> Internal thermal printer (TPM)

The terminal portion will return the four character sequence:

ESC \ p <code>

followed by three status bytes. A 'carriage return' will terminate the sequence, as was the case with terminal portion status.

An explanation of the three bytes of status is provided in Figure 3-8 and in the text which follows. In general, each different type of printer uses each byte in a slightly unique manner.

PRINTER STATUS DECODING

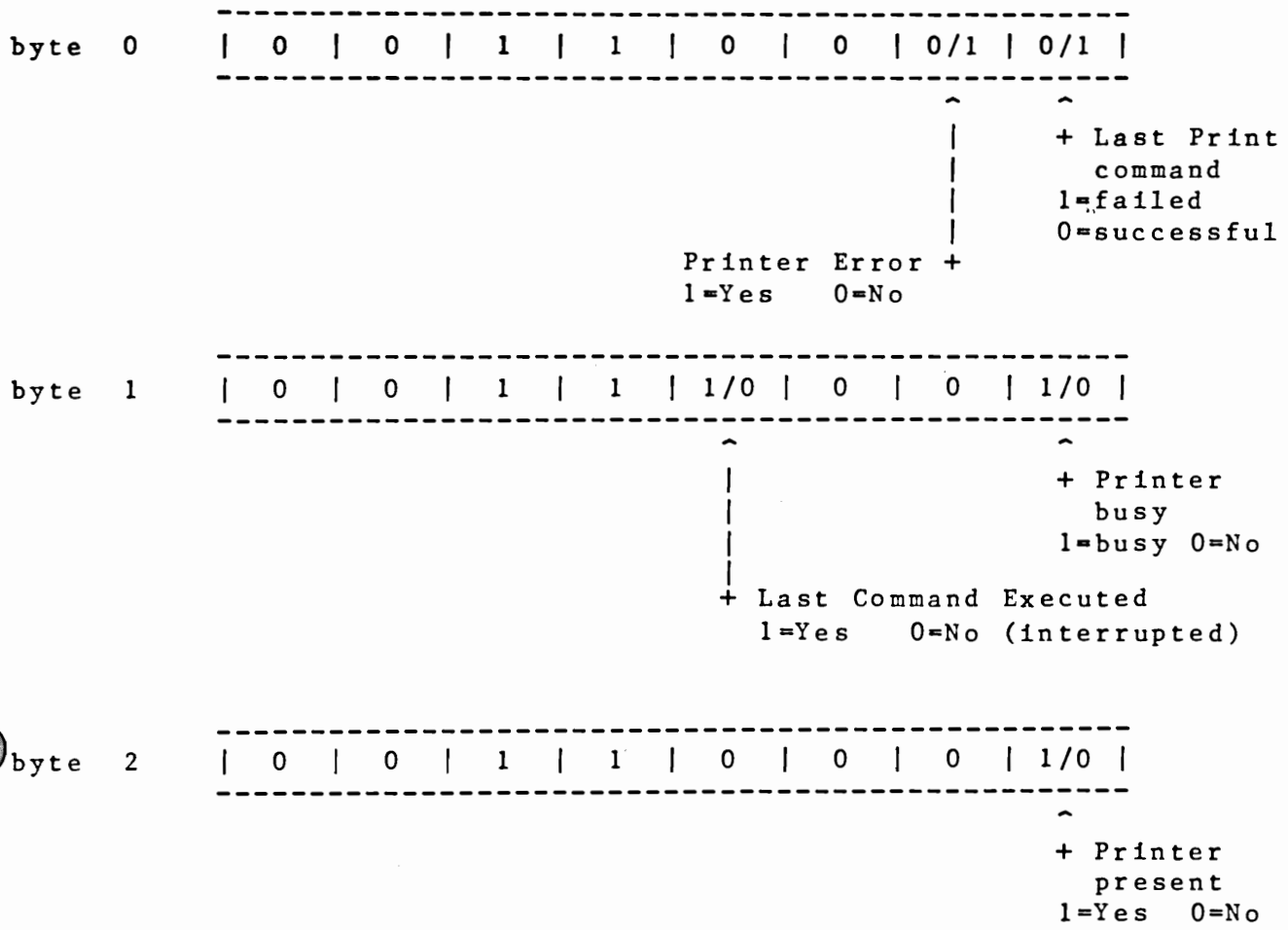


Figure 3-8

The device specific decodings follow.

STATUS....HP-IB PRINTER STATUS. A status request for the HP-IB printer returns a fixed set of data bytes when queried for status with a <code> of 5. Because of the manner in which the CPU implements the HP-IB protocol, the actual status of any HP-IB printer is not available in the terminal portion status.

The status you will receive will be the ASCII characters

ESC \ p5 0 8 1

Looking back at Figure 3-8, you can see that this value indicates:

- o No print error, last command successful (Byte 0)
- o Last command performed, device not busy (Byte 1)
- o Printer connected (Byte 2)

HP-IB Device address 1 should be reserved for HP supplied printer devices.

STATUS....INTERNAL PRINTER STATUS. The status returned for the internal printer does not use all of the possible values. Specifically:

Byte 0 uses the two low order bits. Bit 1, labeled 'Print Error', is set to indicate that the last command sent to the TPM failed. If bit 1 is 0, the command was successful. Bit 2, labeled 'Paper Out', is set if the TPM is out of paper or if the bail is open. If bit 2 is clear, the printer has paper and is closed.

Byte 1 uses only bit 4. The bit 1 'Printer Busy' flag does not apply. Bit 4, 'Command Execution', is set if the last command was performed. It is cleared if the last command was interrupted.

Byte 2 uses only bit 1, 'Printer Connected'. If bit 1 is set, the TPM is present on this HP 125. If the bit is clear, no TPM is available.

STATUS....SERIAL PRINTER STATUS. The device on asynchronous port 2 is considered the serial printer device as far as the terminal portion is concerned. The serial device status is interpreted as follows:

Byte 0 includes valid information on bit 1 only. No data is available on bit 4, 'Paper Out'. When bit 1 is set, the last command sent to the printer failed. Bit 1 clear indicates the last command was successful.

Byte 1 uses bits 1 and 4. Bit 1, 'Printer Busy', reflects the status of one of three conditions. Remember that when bit 1 is set, the device is busy. This means:

- o SRRXmit is enabled and the reverse channel is busy.
- o Transmit handshake is enabled and the 'clear to send' (CTS) line, pin CB, is low (ie, busy). A handshake menu entry of eTx indicates this condition.

or

- o Xon/Xoff handshaking is enabled and Xoff has been received from the device. A handshake menu entry of etX indicates this condition.

Bit 4, 'Command Execution', is set if the last command was performed. It is cleared if the last command was interrupted.

Byte 2 uses bit 1, 'Printer Present'. It is set when 'Clear to send' (CTS), line CB, is low. The bit is clear whenever CTS is high (false).

PREVENTIVE MAINTENANCE

IV

INTRODUCTION

This section provides preventive maintenance instructions for the 45500A. Preventive maintenance is performed by the customer. The only customer maintenance procedure is for the Thermal Printer included with the 45500A Option 050. Refer to the appropriate peripheral manuals for details as to any preventive maintenance procedures for the peripheral devices.

NOTE

The expected life of the battery is ten years, therefore customer replacement is not anticipated.

TPM PREVENTIVE MAINTENANCE

WHY.....To ensure quality printing and to prolong optimum performance of the TPM.

HOW.....Follow the preventive maintenance steps as described in the "PROCEDURE" paragraph below.

WHEN.....TPM preventive maintenance should be performed each time thermal paper is to be replaced.

Preventive Maintenance

REQUIRED...To maintain good print quality and to prolong TPM performance, observe the following:

1. Always replace thermal paper with HP thermal paper, part no. 9270-0638 (blue printing) or part no. 9270-0656 (black printing). If Hewlett-Packard's thermal paper is not used, the equipment warranty and service contract will be void.

2. Install thermal paper with printing (glossy) side facing thermal print head. (Refer to Installation Section.)

3. Be careful not to sharply touch the print head or damage may result.

ALIGNMENT V

INTRODUCTION

Alignment procedures for the terminal consist of adjustment of the power supply output and raster alignment.

WARNING

Power Supply contains exposed high-voltage components. Use extreme caution not to touch these exposed parts when performing alignment procedures. Failure to do so can cause serious injury.

POWER SUPPLY ADJUSTMENT

WHY.....To ensure that the power supply is generating the voltages required to enable correct operation of all terminal and processor circuits.

HOW.....Adjustment of the +5V power source also adjusts the +12V power source which uses the +5V source as a reference. The -12V source is not adjustable. On the 45500A-050, the +5V adjustment also affects the +16.1V output.

Power supply adjustment should be checked at installation and whenever any equipment is added or removed from the 45500A unit.

EQUIPMENT REQUIRED....1. A 20,000 ohms/volt voltmeter with a fine voltage probe.

2. Alignment tool 8710-1355, or equivalent.

3. A small Phillips-head screwdriver.

PROCEDURE..1. Turn off power.

2. Loosen the two quarter-turn fasteners securing top cover to mainframe. Remove top cover. Do not overturn fasteners.

3. Turn on power.

CAUTION

Use care not to short together exposed Power Supply parts while checking the Power Supply voltages. To do so could result in damage to the Power Supply.

4. Using a 20,000 ohms/volt voltmeter, check the Power Supply PCA voltages (table 5-1 and figure 5-1 or 5-2) for accuracy. A fine-tipped voltage probe can be easily inserted through the holes in the cable connector (J5) or (J7).

5. Adjust the +5V potentiometer (figure 5-1 or 5-2) until the +5V and +12V (or +16.1V for 45500A-050) sources are within tolerance. If they cannot be adjusted to be within tolerance or if the -12V source is out of tolerance, refer to the Troubleshooting Section.

Table 5-1. Power Supply Test Points

45500A	TEST POINT 45500A-050	SIGNAL	VOLTAGE
J7-1	J5-1	+5V	+5(+-0.2)VDC
NO PIN	NO PIN	-----	-----
J7-3	J5-3	+5V	+5(+-0.2)VDC
J7-4	J5-4	+12V	+12(+-0.3)VDC
J7-5	J5-5	RETURN	-----
J7-6	J5-6	RETURN	-----
J7-7	J5-7	PWR ON/FAIL	+4.5(+0.5,-1)VDC
J7-8	J5-8	-12V	-12V(+-0.5)VDC
----	J4-1	+16.1V	+16.1(+-0.5)VDC

6. Replace the top cover on the terminal housing and tighten the two quarter-turn fasteners. Do not overtighten the fasteners.

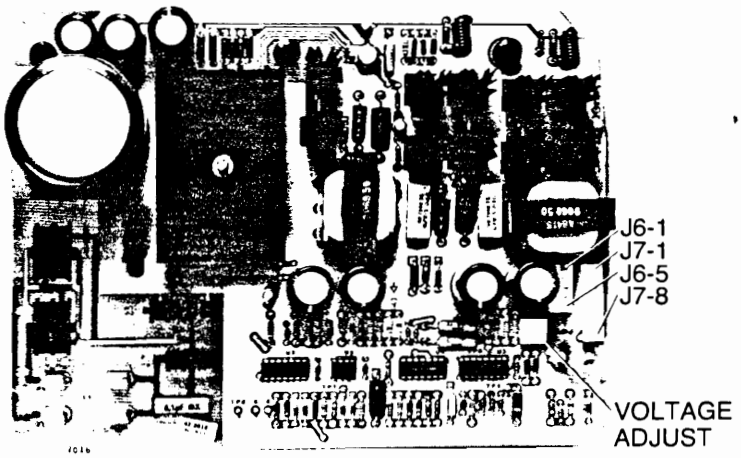


Figure 5-1. 45500A Power Supply Test Points and +5V Adjustment Locations

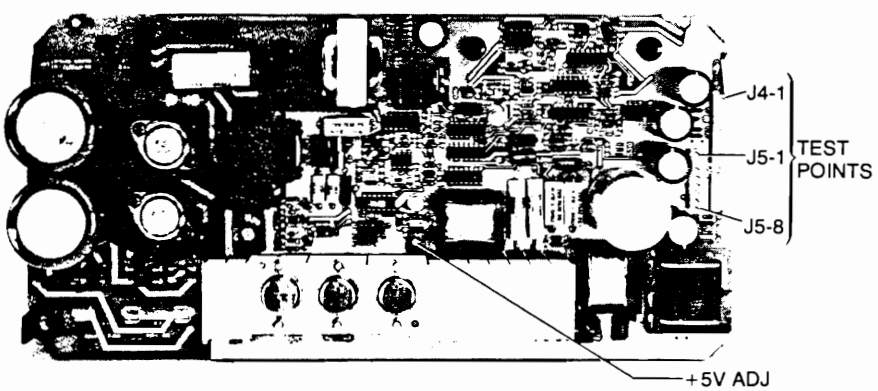


Figure 5-2. 45500A-050 Power Supply Test Points and +5V Adjustment Locations

RASTER ALIGNMENT

WHY.....This procedure performs the following display adjustments:

1. Centers the display on the screen in the horizontal dimension.
2. Expands or contracts the display in the vertical dimension.
3. Focuses the beam for display clarity.
4. Adjusts for desired display brightness.
5. Expands or contracts the display in the horizontal dimension.
6. Adjusts tilt out of the display.

HOW.....With a display on the screen, the CENTER, HEIGHT, FOCUS, and BRIGHT adjustments at the top of the unit, the width adjustment on the Sweep PCA, and the CRT yoke assembly are adjusted for the desired effects.

WHEN.....Raster alignment can be performed anytime the display is considered unsatisfactory. It should be checked at installation and whenever the Sweep PCA is replaced.

EQUIPMENT REQUIRED...1. A small Phillips-head screwdriver.

2. Alignment tool 8710-1355.

PROCEDURE..1. Fill a portion of the display screen with a single letter, such as "@".

2. Using the hex end of the alignment tool, adjust the CENTER adjustment at the top of the unit (figure 5-3) to center the display on the screen in the horizontal dimension.

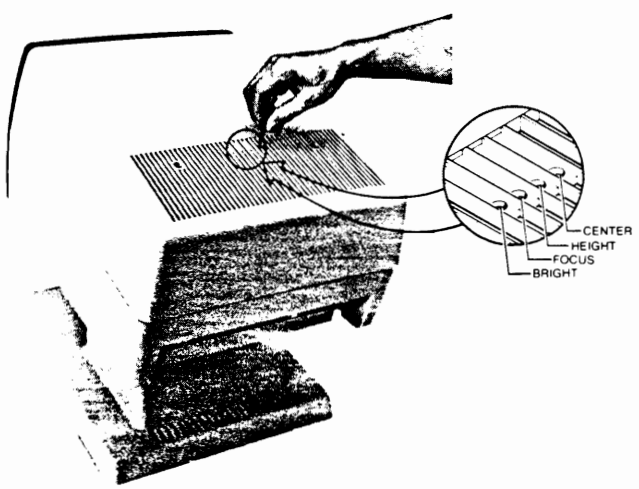


Figure 5-3. Location of Four Raster Adjustments (CENTER, HEIGHT, FOCUS, AND BRIGHT)

3. Adjust the HEIGHT adjustment to expand or contract the display in the vertical dimension, as desired.

4. Adjust the FOCUS adjustment for uniform clarity across the screen.

5. Adjust the BRIGHT adjustment for the desired brightness.

6. Open the unit to the half-open (service) position and lower the Processor PCA to expose the component side of the PCA by pulling on the four snap fasteners which hold it in place. Disconnect the ground strap from the Processor PCA ground lug.

7. Use the alignment tool to adjust the width adjustment on the Sweep PCA (figure 5-4) to expand or contract the display in the horizontal dimension.

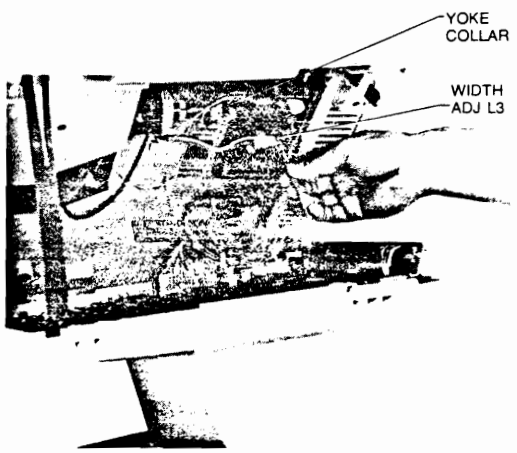


Figure 5-4. Location of Raster Width Adjustment and Yoke Collar

WARNING

Use care in performing the following step; high voltages, sufficient to cause serious injury are present on exposed portions of the yoke assembly. Grasp the yoke only by its plastic donut-shaped body.

8. To adjust a tilted display, the yoke assembly must be rotated on the CRT neck by its plastic donut-shaped body, but first the yoke collar screw (figure 5-4) must be loosened. After the adjustment has been made, retighten the yoke collar screw.

9. Replace the Processor PCA by holding it in position (the metal I/O panel on one end of the PCA fits into a groove in the chassis). Install each of the four snap-in grommets into their respective fastening hole and press on each of the four snap-in plungers until they click into place.

10. Reconnect the ground strap to the ground lug on the Processor PCA.

TROUBLESHOOTING VI

INTRODUCTION

This chapter covers various techniques of fault isolation and repair. The chapter is broken into three main sections: Power-on Tests; Key Selectable Tests; and System Fault Isolation.

The Power-on Tests section covers the meanings of the messages and LED displays upon failure of one of the Power-on Self-tests.

The Key Selectable Tests section describes the different tests which can be selected after power-on. It also covers the error messages generated by each, and the method and order of the selected tests themselves.

The System Fault Isolation section covers some of the most common system fault symptoms and the most probable causes and methods of analysis and repair.

Note: This section references the 45500-60085, Rev. B and the 45500-60085 Rev. C Processor Boards.

POWER-ON SELF TEST

THE POWER-ON TEST IS a 16 second extensive diagnostic test which occurs while the tube is warming up, each time the power is turned on. Around 70-80% of the processor boards electronics is tested during this period. This built in tool should allow you to quickly isolate the majority of failures.

The Power-on Tests show their results in two ways. When the test completes, any failures are described on the CRT (if possible). During the tests, if any faults are detected they are displayed in some of the twelve LEDs on the processor board. These LEDs can be viewed from the top of the unit, looking down past the power supply through the air vents in the top.

The messages on the screen describe in natural language the general nature and location of a fault. This can be used by a customer to determine if a call is necessary for service.

The LED codes are quite specific, and usually identify the fault to a specific socketed component or a replaceable printed circuit board.

SELF TEST LEDS are Z80A output ports with one set of LEDs for each module. If the power-on test fails in the TERMINAL MODULE then the YELLOW LEDs display a code for ten seconds. If the power-on test fails in the CPU MODULE then the RED LEDs display a code for ten seconds.

POWER-ON TEST MESSAGES

[Power-on test failed PPTT]..... A Power-on Test has failed. The PPTT code indicates the functional area of the detected fault. PP is the code for the processor portion. TT is the code for the terminal portion. Refer to Figure 6-1 for the meanings of the PP and TT codes.

[Default configs used]..... configuration information should be retained within the system even while the power is switched off. This message means that the configuration set-up was lost when the unit was switched off. The system may or may not be able to hold any changes made to the default settings after the power is turned off. All other parts of the system should operate correctly. Contact your service representative.

[Internal printer error]..... your system is unable to print on the internal printer correctly. This could be due to the paper latch not being closed properly or the unit is out of paper. Check this. Otherwise contact your service representative.

[Disc did not identify at address zero]..... This could be due to (i) disc drive power not turned on, (ii) cable linking disc drive(s) and the system is loose or disconnected, (iii) a disc drive is not configured to device 0 on the HP-IB, or another device is also configured to the HP-IB address 0.
(iv) a fault with your system / disc drives. If power was switched on at the drive(s), the drive was configured to device 0, the cable was secure, and none of the above problems exist, then contact your service representative.

POWER-ON MESSAGE CODES

The codes for both the terminal portion and the processor portion are eight bit codes, shown as two hexadecimal digits each. Each bit is the status for a test section with a '0' representing passing the test and a '1' representing failure of the test section. Refer to Appendix A for binary to hexadecimal conversion and a quick reference guide for the Self-test LED codes.

Processor Portion Power-on Test Screen Messages

```
PPPPPPPP
--------
||||||||
|||||||+ (OPSYS bank 0* memory problems)  (Code 0100) The
|||||||   operating system may not load or run correctly.
|||||||
||||||+- (OPSYS bank 1* memory problems)  (Code 0200) The
          operating system may not load or run correctly.
||||||
|||||+-- (OPSYS bank 2* memory problems)  (Code 0400) The
|||||     operating system may not load or run correctly.
|||||
||||+--- (OPSYS bank 3* memory problems)  (Code 0800) The
||||      operating system may not load or run correctly.
||||
|||+---- (OPSYS read-only memory problems)  (Code 1000) The
|||       local operating system hardware is malfunctioning
|||       and may or may not be reliable.
|||
||+----- (HP-IB controller problems)  (Code 2000) The HP-IB
||        interface is malfunctioning and HP-IB peripheral
||        operations may be unreliable.
||
|+------ (HP-IB address identify problems)  (Code 4000)
|         The HP-IB interface is malfunctioning and HP-IB
|         peripheral operations may be unreliable.  This
|         normally will result in the message: "Disc did not
|         identify at address zero" being displayed.
|
+------- (Mailbox problems) (Code 8000) The local operating sys-
          tem hardware is malfunctioning and may be unreliable.
```

* Rev. C Processor boards have one bank of RAMs, see Appendix A.

Figure 6-1a. Power-On Test Failure Display Codes (Processor)

Terminal Portion Power-on Test Screen Messages

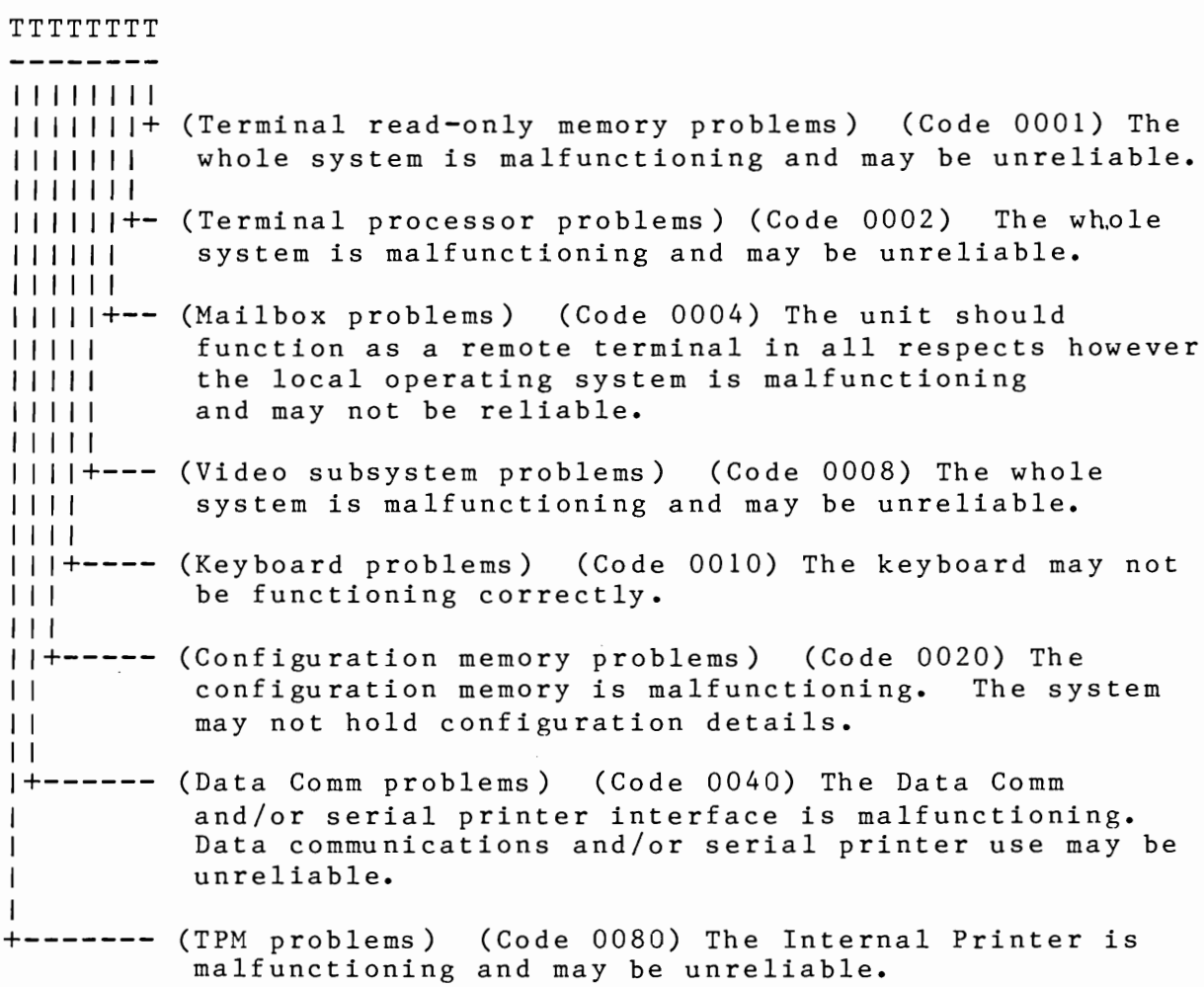


Figure 6-1b. Power-On Test Failure Display Codes (Terminal)

LED CODE MEANINGS

In this section "(85B)" represents the 45500-60085, Rev. B processor board and "(85C)" represents the 45500-60085 Rev. C processor board.

The first LED code displayed following the LED scan is usually correct. Use it first when troubleshooting power-on test failures. Any codes displayed after this may be invalid.

Replacement of a component will not always solve the problem, the LED code is only a good estimation of what is wrong. It merely gives you the best opportunity to diagnose a problem without sophisticated test equipment. For example it is impossible for the test to differentiate between a faulty component and a faulty socket, or poor solder joint at the socket.

The socketed component to replace is outlined below under 'red led codes' for the CPU module and 'yellow LED codes' for the terminal module.

For non-socketted components, identified by self-test, on the "85C" board, we recommend replacing the processor board.

Power-on Test flow is outlined in the flowchart in Figure 6-3. The LED codes for self-test failures are shown in Figure 6-2. The LEDs are scanned one at a time to begin the tests. The scan verifies that the core components are at least partially functional and capable of being used to test the remaining hardware. As they proceed with the testing, LED codes are displayed for 10 seconds each as faulty hardware is found. These codes will identify either socketed component(s) which are bad or indicate a 'non-field serviceable problem' which usually indicates that the board cannot be serviced at the replacable component level and the board must be replaced.

RED LED CODES	(CPU module failure) Read the codes with the rear panel behind the LEDs (0=off 1=on).
111111	Power-on condition. All LEDs should come on briefly and then go out at power on.
000000	First instruction executed properly. This should be followed quickly by a 'walking one' LED test as the core components test.
000001	Replace U75 (85B)/U513 (85C) (ROM). The checksum test failed on the ROM contents.
010000	Replace U76 (85B)/U515 (85C) (Z80A). The functionality test on the Z80A failed.
011000	Between two and seven RAMs U21-28 (85B)/U66-U69, U610-613 (85C) failed. Replace U21 through U28 one at a time until LED code changes. The last RAM replaced was faulty. To isolate and replace ONLY the bad parts, replace all RAMs substituted except the last with the originals and repeat the procedure.
011001	Between two and seven RAMs U31-38 (85B)/U66-U69, U610-U613 (85C) failed. Replace U31 through U38 one at a time until LED code changes. The last RAM replaced was faulty. To isolate and replace ONLY the bad parts, replace all RAMs substituted except the last with the originals and repeat the procedure.
011010	Between two and seven RAMs U41-48 (85B)/U66-U69, U610-U613 (85C) failed. Replace U41 through U48 one at a time until LED code changes. The last RAM replaced was faulty. To isolate and replace ONLY the bad parts, replace all RAMs substituted except the last with the originals and repeat the procedure.

Figure 6-2a. Red Led Codes

RED LED CODES cont'

11011	Between two and seven RAMs U51-58 (85B)/U66-U69, U610-U613 (85C) failed. Replace U51 through U58 one at a time until LED code changes. The last RAM replaced was faulty. To isolate and replace ONLY the bad parts, replace all RAMs substituted except the last with the originals and repeat the procedure.
011100	Between two and seven RAMs in two or more banks (the groups U21-28, U31-38, U41-48, U51-58) (85B)/(U66-U69, U610-U613 (85C)*) failed. Work horizontally and vertically with chip replacement to isolate the defective parts. Find the defective bank(s) by substituting whole banks at a time with known good parts. Then use the above procedures to isolate the bad parts in the bad banks.
011101	Replace U320 (85B)/U119 (85C) (the HP-IB controller chip). The HP-IB controller chip test failed.
011111	Non-field servicable failure. A non-socketed component failure has probably occurred. Repair should be attempted at the technician level. If this is not available, as a last resort try replacing the core components, U315, U75, U76 and X1, in that order (85B)/U13, U513, U515 and X1, in that order (85C).
100000	Replace U21 (RAM chip failure bank 0, chip 1,(85B*)
100001	Replace U22 (RAM chip failure bank 0, chip 2,(85B*)
100010	Replace U23 (RAM chip failure bank 0, chip 3,(85B*)
100011	Replace U24 (RAM chip failure bank 0, chip 4,(85B*)
100100	Replace U25 (RAM chip failure bank 0, chip 5,(85B*)
100101	Replace U26 (RAM chip failure bank 0, chip 6,(85B*)
100110	Replace U27 (RAM chip failure bank 0, chip 7,(85B*)
100111	Replace U28 (RAM chip failure bank 0, chip 8,(85B*)
101000	Replace U31 (RAM chip failure bank 1, chip 1,(85B*)
101001	Replace U32 (RAM chip failure bank 1, chip 2,(85B*)
101010	Replace U33 (RAM chip failure bank 1, chip 3,(85B*)
101011	Replace U34 (RAM chip failure bank 1, chip 4,(85B*)
101100	Replace U35 (RAM chip failure bank 1, chip 5,(85B*)
101101	Replace U36 (RAM chip failure bank 1, chip 6,(85B*)
101110	Replace U37 (RAM chip failure bank 1, chip 7,(85B*)
101111	Replace U38 (RAM chip failure bank 1, chip 8,(85B*)
110000	Replace U41 (RAM chip failure bank 2, chip 1,(85B*)
110001	Replace U42 (RAM chip failure bank 2, chip 2,(85B*)
110010	Replace U43 (RAM chip failure bank 2, chip 3,(85B*)
110011	Replace U44 (RAM chip failure bank 2, chip 4,(85B*)

110100	Replace U45 (RAM chip failure bank 2, chip 5,(85B*)
110101	Replace U46 (RAM chip failure bank 2, chip 6,(85B*)
110110	Replace U47 (RAM chip failure bank 2, chip 7,(85B*)
110111	Replace U48 (RAM chip failure bank 2, chip 8,(85B*)
111000	Replace U51 (RAM chip failure bank 3, chip 1,(85B*)
111001	Replace U52 (RAM chip failure bank 3, chip 2,(85B*)
111010	Replace U53 (RAM chip failure bank 3, chip 3,(85B*)
111011	Replace U54 (RAM chip failure bank 3, chip 4,(85B*)
111100	Replace U55 (RAM chip failure bank 3, chip 5,(85B*)
111101	Replace U56 (RAM chip failure bank 3, chip 6,(85B*)
111110	Replace U57 (RAM chip failure bank 3, chip 7,(85B*)
111111	Replace U58 (RAM chip failure bank 3, chip 8,(85B*)

*The RAM ICs on all "85C" boards are not socketed, the RAM ICs on some "85B" boards are socketed. See Appendix A for the "85B", "85C" cross reference table.

Referring to Appendix A, RAM banks 0-3 on the 85B board map into one row of RAM ICs on the 85C board.

YELLOW LED CODES (terminal module failure). Read the codes with the rear panel behind the LEDs (0=off 1=on).

111111	Power-on condition. All LEDs should come on briefly and then go out at power on.
000000	First instruction executed properly. This should be followed quickly by a 'walking one' LED test as the core components test.
000001	Replace U510 (85B)/U77 (85C) (ROM 1). Checksum test on the ROM contents failed.
000010	Replace U511 (85B)/U79 (85C) (ROM 2). Checksum test on the ROM contents failed.
000011	Replace U510 and U511 (85B)/U77 and U79 (85C) (ROMs 1 and 2). Checksum test on the ROM contents failed.
000100	Replace U513 (85B)/U711 (85C) (ROM 3). Checksum test on the ROM contents failed.
000101	Replace U510 and U513 (85B)/U77 and U711 (85C) (ROMs 1 and 3). Checksum test on the ROM contents failed.
000110	Replace U511 and U513 (85B)/U79 and U711 (85C) (ROMs 2 and 3). Checksum test on the ROM contents failed.
000111	Replace U510, U511 and U513 (85B)/U77, U79 and U711 (85C) Checksum test on the ROM contents failed.
001000	Replace U514 (85B)/U713 (85C) (ROM 4). Checksum test on the ROM contents failed.
001001	Replace U510 and U514 (85B)/U77 and U713 (85C) ROMs 1, 2 and 3). test on the ROM contents failed.
001010	Replace U511 and U514 (85B)/U79 and U713 (85C) (ROMs 2 and 4). Checksum test on the ROM contents failed.

Figure 6-2b. Yellow Led Codes

YELLOW LED CODES cont'

001011	Replace U510, U511 and U514 (85B)/U77, U79 and U713 (85C) (ROMs 1, 2 and 4). Checksum test on the ROM contents failed.
001100	Replace U513 and U514 (85B)/U711 and U713 (85C) (ROMs 3 and 4). Checksum test on the ROM contents failed.
001101	Replace U510, U513 and U514 (85B)/U77, U711 and U713 (85C) (ROMs 1,3 and 4). Checksum test on the ROM contents failed.
001110	Replace U511, U513 and U514 (85B)/U79, U711 and U713 (85C) (ROMs 2,3 and 4). Checksum test on the ROM contents failed.
001111	Replace U510, U511, U513 and U514 (85B)/U77, U79, U711 and U713 (85C) ROMs 1, 2, 3 and 4). Checksum test on the ROM contents failed.
010000	Replace U515 (85B)/U715 (85C) (Z80A). Functionality test on the Z80A failed.
010001	Replace U410 (85B)/U717 (85C) (CMOS RAM 1). Device appears to be faulty.
010010	Replace U411 (85B)/U817 (85C) (CMOS RAM 2). Device appears to be faulty.
010011	Replace U410 and U411 (85B)/U717 and U817 (85C) (CMOS RAMs 1 and 2). Both devices appear to be faulty.
010101	Replace U520 (85B)/U518 (85C) (Data comm ACIA 1). Partial functionality test failed.
010110	Replace U518 (85B)/U517 (85C) (Data comm ACIA 2). Partial functionality test failed.
010111	Replace U518 and U520 (85B)/U517 and U518 (85C) (Data comm ACIA's 1 and 2). Partial functionality test failed on both devices.
011000	Replace U315 (85B)/U13 (85C) (CRT controller). Video subsystem faulty and this device is possibly responsible.

011010	A possible internal printer mechanism (TPM) failure is indicated. Otherwise processor board interfacing logic faulty (non-field replaceable). Try a replacement printer mechanism if available.

YELLOW LED CODES (cont)

011100	Replace U422 (85B)/U318 (85C) (keyboard controller). Partial functionality test failed.
011110	Non-field servicable failure. A non-socketed component failure has probably occurred. Repair should be attempted at the technician level. If this is not available, as a last resort try replacing the core components, U315, U510, U515 and X1, in that order, (85B)/U13, U77, U715 and X1, in that order, (85C).
011111	Non-field servicable failure. A non-socketed component failure has probably occurred. Repair should be attempted at the technician level. If this is not available, as a last resort try replacing the core components, U315, U510, U515 and X1, in that order, (85B)/U13, U77, U715 and X1, in that order, (85C).
100000	Replace U94 (video RAM 1 failure), (85B)*
100001	Replace U95 (video RAM 2 failure), (85B)*
100010	Replace U96 (video RAM 3 failure), (85B)*
100011	Replace U97 (video RAM 4 failure), (85B)*
100100	Replace U98 (video RAM 5 failure), (85B)*
100101	Replace U99 (video RAM 6 failure), (85B)*
100110	Replace U910 (video RAM 7 failure), (85B)*
100111	Replace U911 (video RAM 8 failure), (85B)*
101000	Multiple video RAM failure.

*Video RAMs are not socketed on the 85C boards. The video RAMs on some 85B boards are socketed.

Figure 6-2. (Continued)

YELLOW LED CODES (cont)

The RAM ICs on the "85C" board are not socketed. See Appendix A for the "85B", "85C" cross reference table.

110010	Check U511 (85B)/U79 (85C) (ROM 2). Wrong part indicated.
110100	Check U513 (85B)/U711 (85C) (ROM 3). Wrong part indicated.
110110	Check U511 and U513 (85B)/U79 and U711 (85C) (ROMs 2 and 3). Wrong parts indicated.
111000	Check U514 (85B)/U713 (85C) (ROM 4). Wrong part indicated.
111010	Check U511 and U514 (85B)/U79 and U713 (85C) (ROMs 2 and 4). Wrong parts indicated.
111100	Check U513 and U514 (85B)/U711 and U713 (85C) (ROMs 3 and 4). Wrong parts indicated.
111110	Check U511, U513 and U514 (85B)/U79, U711 and U713 (85C) (ROMs 2, 3 and 4). Wrong parts indicated.

Figure 6-2b. (End)

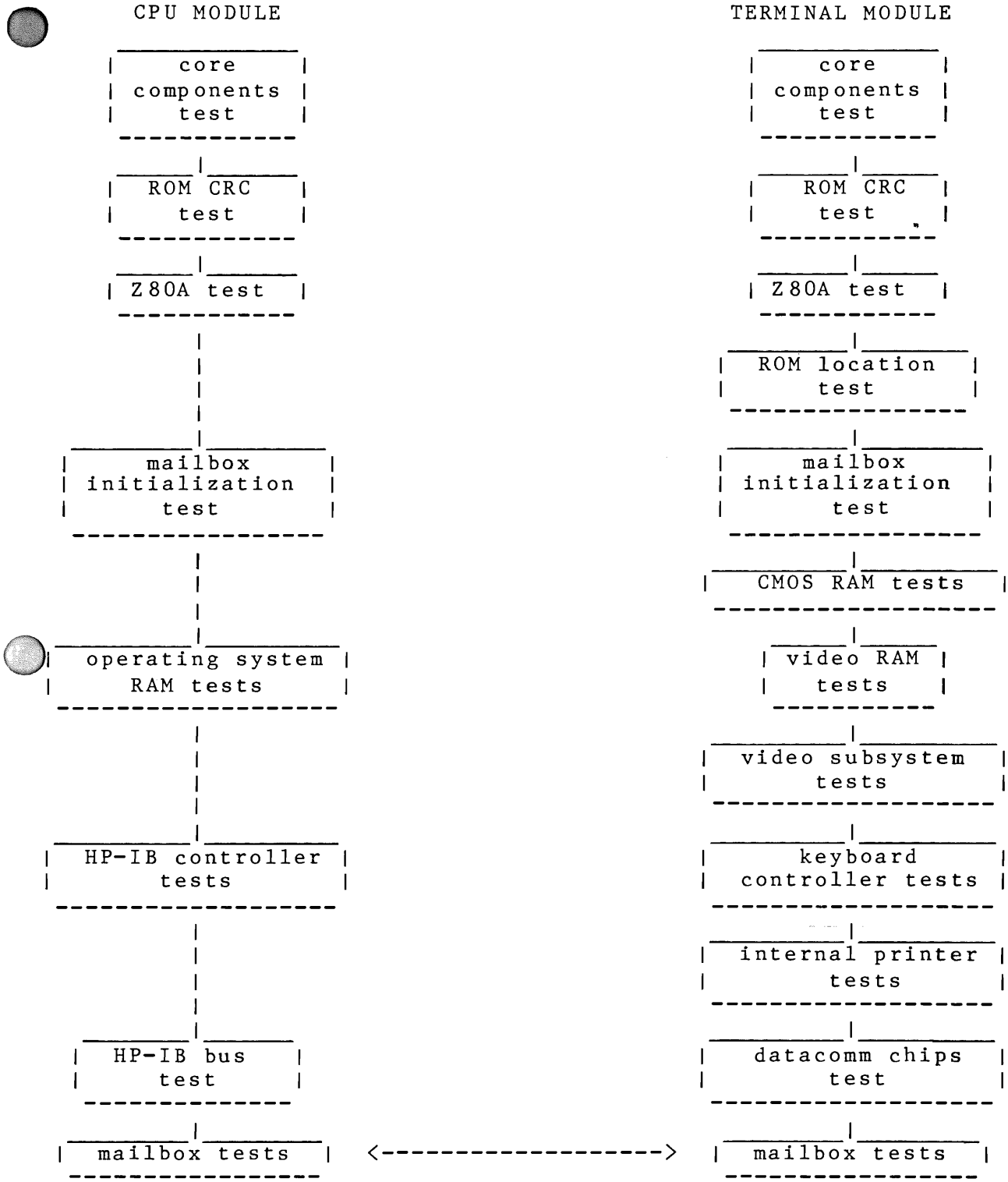


Figure 6-3. Simplified Power-on Test Flowchart

The flowchart (Figure 6-3) shows the basic operations and order of the Power-on Self Tests. A more detailed description of each test follows.

CPU MODULE POWER-ON TESTS

CORE COMPONENTS TEST. The module 'core components' are the Z80A, ROM, and LEDs. Core components test involves the Z80A (U76,(85B)/U515, (85C)) getting the first few instructions out of ROM (U75,(85B)/U513,(85C)). These instructions tell the Z80A to turn off the red LEDs then turn them on again, one at a time. This verifies operation of the red LEDs, Z80A, and partial ROM operation.

ROM CRC TEST. This does a more complete verification of ROM (U75,(85B)/U513,(85C)) than done in core components test. Tests all the contents of the ROM rather than just the first few locations.

Z80A TEST. This tests some additional functions of Z80A (U76,(85B)/U515,(85C)) not directly checked in the core components test.

MAILBOX INITIALIZATION TEST. Does a preliminary test of the mailbox hardware (used for communicating with the terminal module).

OPERATING SYSTEM RAM TESTS. Consists of comprehensive testing of the 64K byte RAM array U21-28, U31-38, U41-48 and U51-58 (85B)/U66-U69 and U610-U613 (85C)).

HP-IB CONTROLLER TESTS. Checks part of the HP-IB controller chip (U320 (85B)/U119 (85C)) for proper operation.

HP-IB BUS TESTS. Checks to see if a disc drive is accessible on the HP-IB at address zero. Any problem found with this test is reported at a later stage on the screen.

MAILBOX TESTS. Communication with the terminal module is attempted eventually verifying the operation of all the interfacing logic between CPU and terminal modules.

TERMINAL MODULE POWER-ON TESTS

CORE COMPONENTS TEST. The module 'core components' are the Z80A, TERM. ROM U510 and LEDs. Core components test involves the Z80A (U515 (85B)/U715 (85C)) getting the first few instructions out of ROM (U510 (85B)/U77 (85C)). These instructions tells the Z80A to turn off the yellow LEDs then turn them on, one at a time. This verifies operation of the yellow LEDs, Z80A, and partial ROM operation.

ROM CRC TEST. This does a more complete verification of TERM. ROM U510 (85B)/U77 (85C) than in the core components test and also tests all locations in the three remaining TERM. ROMs U511 (85B)/U79 (85C), U513 (85B)/U711 (85C) and U514 (85B)/U713 (85C).

Z80A TEST. This tests some additional functions of Z80A (U515) (85B)/U715 (85C)

ROM LOCATION TEST. Checks to see that the second, third and fourth ROM (U511 (85B)/U79 (85C), U513 (85C)/U711 (85C) and U514 (85B)/U713 (85C)) are inserted in the correct order.

MAILBOX INITIALIZATION TEST. Does a preliminary test of the mailbox hardware (used for communicating with the CPU module).

CMOS RAM TESTS. Performs some comprehensive testing on the CMOS RAM chips (U410 (85B)/U717 (85C) and U411 (85B)/U817 (85C)). This is the non-volatile (battery backed-up) memory which holds configuration information.

VIDEO RAM TESTS. Comprehensive testing of the video RAM (U94-911 (85B)/U86-U813 (85C)) used for video display memory and other terminal data storage applications.

VIDEO SUBSYSTEM TESTS. Performs partial testing of video controller chip (U315 (85B)/U13 (85C)) and other hardware responsible for generating a video display.

TERMINAL MODULE POWER-ON TESTS (Continued)

KEYBOARD CONTROLLER TESTS. Partial testing of keyboard controller chip (U422 (85B)/U318 (85C)) used for interfacing the keyboard to the processor logic board.

INTERNAL PRINTER TESTS. Tests for the ability to send certain characters to the internal printer (thermal printer mechanism) if it is installed.

DATACOMM CHIPS TEST. Tests some of the functions of the data communications ACIAs (U518 (85B)/U517 (85C) and U520 (85C)/U518 (85C).

MAILBOX TESTS. Communication with the CPU module is attempted eventually verifying the operation of all the interfacing logic between CPU and terminal modules.

KEY SELECTABLE TESTS

The Key Selectable Tests are a set of built-in tests which are selectable by certain keystroke sequences after the unit has powered up. The keystroke sequences as well as a description of the tests and their error messages are presented here.

KEY SELECTABLE [POWER-ON TEST]

KEYSTROKES [AIDS], [f3], [f1]

TEST DESCRIPTION The tests perform as described earlier in this chapter for the Power-on Self-test with the tests being followed by a hard reset (initialization).

KEY SELECTABLE [IDENTIFY ROMS]

KEYSTROKES [AIDS], [f3], [f6]

TEST DESCRIPTION The Identify ROMs is not a test, but does check each ROM for its identifying partnumber and datecode. The printout form and a description of the fields is shown in the example, Figure 6-4.

Example of Rev. C Firmware, see parts/lists.

```
  Firmware ROMs
  -------------
1818-3133 2238   <-- U510 (85B)/U77/(85C)
1818-1842 2144   <-- U511 (85B)/U79/(85C)
1818-3132 2238   <-- U513 (85B)/U711/(85C)
1818-1844 2144   <-- U514 (85B)/U713/(85C)
1818-3134 2238   <-- U75  (85B)/U513/(85C)
          ^    ^
          |    + ROM Datecode
          |
          + ROM Partnumber
```

Figure 6-4. Identify ROM Output Format.

Please see parts list for part numbers. These numbers vary with different levels of firmware revisions.

KEY SELECTABLE [TERMINAL TEST]

KEYSTROKES [AIDS], [f3], [f5]

TEST DESCRIPTION The Terminal Test consists of a number of separate tests run one after another. The tests are a ROM CRC check, a test of the other CPU, a RAM non-destructive test, CMOS nondestructive test, and a display test. Test descriptions follow.

ROM CRC CHECK. The ROM CRC check is a test of the data in the program Read Only Memory for the terminal portion of the unit.

For ROM's 1 through 4 in the terminal, it verifies that the CRC for the entire 8192 bytes is zero - hence verifies the readability of every byte in the ROM.

PROCESSOR NON-DESTRUCTIVE TEST. This test starts the other processor doing its own non-destructive self-test. The results are reported later in the testing done by the Terminal Processor. The tests performed by the CP/M Processor are:

ROM CRC Test

RAM Memory Non-destructive Test.

TERMINAL RAM NON-DESTRUCTIVE TEST. This tests the RAM memory (addresses C000H - FFFFH) by performing a read-complement-write-read-complement-write test. Initial contents read are compared against the complemented value written and an error is flagged if the values are not the complement of one another.

TERMINAL CMOS RAM NON-DESTRUCTIVE TEST. Tests CMOS RAM memory (8000H - 80FFH) by performing a read-complement-write-readcomplement-write test. Initial contents read are compared against the complemented value written and an error is flagged if the values are not the complement of one another.

PRINTER TEST. The printer test sends 80 spaces, CR, and then another 80 spaces, CR. The test will indicate failure if the unit is out of paper or the paper latch is open. The test will not be performed if no TPM is present in the unit.

DISPLAY TEST. The display test outputs two lines on the screen containing all of the ASCII codes, followed by a blank line and then the 14 bytes of status. See Chapter III for a description of the meanings of the status bytes. :008020 0=00000

KEYBOARD TEST. This test BEEPs the bell to indicate completion of the tests.

KEY SELECTABLE [DATACOMM TEST]

KEYSTROKES [AIDS], [f3], [f7]

TEST DESCRIPTION. The Data Communications tests are for both ports as listed below:

REGISTER FUNCTIONALITY. Both ACIA controllers (U518 and U520 (85B)/U517 and U518 (85C)) are tested for internal register errors.

LOOP-BACK TESTS. The remaining tests assume a loop-back test hood is in place on the datacomm back panel connector linking the signals:

OCD1 - OCR1
OCD2 - OCR2
RS - RR
RS - CS
TR - DM and
SD - RD

FAILURE CODES. The fail code consists of up to three bytes encoded in hexadecimal (leading zeros are supressed). The bit pattern (24 bits) can be broken down into groups of bits which have specific meanings as shown in Figure 6-5. For example if the fail code was "803CAA" it would be broken down as:

Most Significant Byte	(80)	10000000
Middle Byte	(3C)	00111100
Least Significant Byte	(AA)	10101010

If no test hood is present on a data comm port, the error code 8002AA usually results.

Port 1 error 8002AA Press RETURN to clear
Port 2 error 8002AA Press RETURN to clear
(For data communication signal definitions see page 2-12)

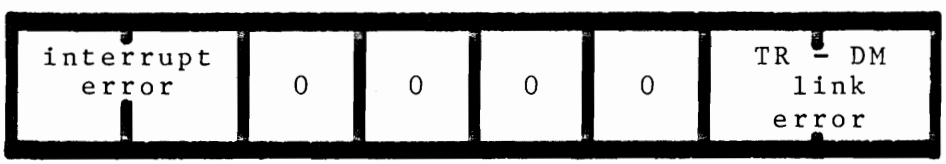
Most significant byte

0	1	bad rx data
1	0	no rx data
1	1	no tx data

0	0	1	rx parity error
0	1	0	rx framing error
1	0	0	rx overrun error

cont/com regs not distinct	0	0	1
cont reg short/open/high	0	1	0
comm reg short/open/high	1	0	0

Middle byte



0	1	invalid dc int while testing data link
1	0	spurious dc int anytime other than above

cannot drive/read link ON	1	0
cannot drive/read link OFF	1	1

Least significant byte

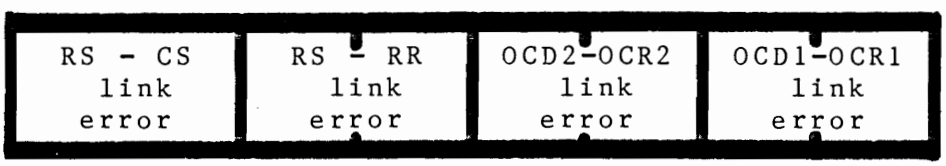


Figure 6-5. Datacomm Fail Codes

link error coding:

	msbit	lsbit
cannot drive/read link ON	1	0
cannot drive/read link OFF	1	1

KEY SELECTABLE [INT PTR TEST]

KEYSTROKES [AIDS], [f3], [f8]

TEST DESCRIPTION. If the TPM is not present, the [INT PTR TEST] key will not be labeled and will not function. If the test is run as a subtest, then if no printer is connected the TPM test is automatically bypassed. The test prints two lines of characters on the printer.

KEY SELECTABLE MANUFACTURING TESTS

KEYSTROKES [SHIFT] [CTRL] [SHIFT] and [ENTER] all at once.

TEST DESCRIPTION. The Manufacturing Test is really not an additional test, but is a sequence of other tests. The tests and any special comments are listed below.

INVERSE VIDEO BLANKS. The screen appears completely white until [RETURN] is pressed to continue or a [CTRL] [SHIFT] [RESET] combination is pressed to reset the unit.

INVERSE VIDEO @. The blanks are replaced with @ in every character position until [RETURN] to continue or the unit is reset.

NORMAL VIDEO @. The inverse video @ is changed to normal @ until [RETURN] is pressed to continue or the unit is reset.

LOOP OF TESTS. The following tests are repeated until [RETURN] is pressed during the Terminal Test display or the unit is reset by [CTRL] [SHIFT] [RESET].

TERMINAL TEST. This is the same as the Key Selectable test except the beep is suppressed.

DATACOMM TEST. This is the same as the Key Selectable test except it runs only at 2400 baud.

POWER-ON TEST. This is the standard Power-on Test.

INTERNAL PRINTER TEST. This is the same as the Key Selectable test. It is only run once every twenty passes through the loop, and only if the unit has an internal printer.

This is a test description using Rev A ROMs. Other revisions of firmware may not appear the same but are similar.

*For boards with Rev. C. ROMs, there are four primary changes to manufacturing test:

DATACOMM TEST: All 10 baud rates are tested
@ sign is replaced by #
D1's appear on screen during datacomm port 1 test
D2's appear on screen during datacomm port 2 test

SYSTEM FAULT ISOLATION

This section describes some general classes of faults at the system level and gives some insight as to the possible causes and isolation techniques for the faults.

WHAT IS THE NATURE OF THE PROBLEM ? The following types of problems are covered in the troubleshooting guide. Other problems should be covered in the allignment or configuration sections of this manual.

HAVING DIFFICULTY STARTING TESTING ..... Refer to the Core Components section which follows.

HAVING DIFFICULTY LOADING THE OPERATING SYSTEM ..... Refer to the System Won't Load section which follows.

MESSAGE DISPLAYED ON SCREEN WHEN POWER TURNED ON ..... various failure conditions are indicated with a message at the bottom of the screen when the power is turned on. These are described in the Power-on Self-test section of theis chapter.

HAVING DIFFICULTY READING SCREEN ..... Either there is no image on the screen, the image is poor, or the wrong characters appear. Refer to SCREEN (VIDEO) section which follows.

HAVING KEYBOARD PROBLEMS ..... Refer to the Keyboard section which follows.

HAVING INTERNAL PRINTER PROBLEMS ..... Refer to the Internal Printer section which follows.

HAVING DATA COMMUNICATIONS / SERIAL PRINTER PROBLEMS ..... Refer to the Data Communications section which follows.

HAVING DISK OR OTHER HP-IB PERIPHERAL PROBLEMS ..... Refer to the HP-IB section which follows.

HAVING POWER PROBLEMS ..... Refer to the Power section which follows.

THE CORE COMPONENTS CONCEPT. The 'core components' in each module are those components required to make the power-on test function in its most basic form. The CRT controller chip (U315 (85B)/U13 (85C)) and crystal (X1) are central to both modules for together, they generate a clock for the module Z80As. Next come the Z80As themselves. They fetch the instructions from the ROMs (U75 (85B)/U513 (85C) - CPU and U510 (85B)/U77 (85C) - Terminal) which form the basis of further testing. Hence these ROMs are core components themselves. In order to see that these components are at least partially functioning, the first few instructions in the ROMs turn off the leds (turned on by the power-on reset signal from the power supply) then scan them from top to bottom. This led scanning is what is termed the 'core components test'. It provides a base from which to build up confidence in processor board operation by using the leds during tests which follow to display the status of those tests.

POSSIBLE REASONS FOR CORE COMPONENTS TEST FAILURE.

a. Failure of an external device (eg. keyboard) is preventing processor board operation.

b. Logic power supply levels on the board are out of spec.

c. A core 'core component' for the module has failed.

d. A non-core component has failed and it is preventing correct operation of the core components.

e. A non-socketed component has failed preventing correct operation of the core components.

CORE COMPONENT SUBSTITUTION.

1. Disconnect all external devices from the processor board. This includes keyboard, thermal printer (if installed), HP-IB, data comm (port 1) and serial printer (port 2). Power-up system again. If leds scan, isolate faulty device by reconnection.

2. Ensure power-supply levels on the logic board are within spec. Test points are located on the top processor board.
   Check for:

+12V	+11.4 -->	+12.6
-5V	-4.75 -->	-5.25
-12V	-11.4 -->	-12.6
+5V	+4.75 -->	+5.25

3. Check for an excessively hot or burnt out component anywhere on board. If socketed replace.

4. Replace CRT controller U315 (85B)/U711 (85C) with known good.

5. Replace ROM — RED leds / CPU module ----> U75 (85B), U513 (85C)
   YELLOW leds / terminal module ----> U510 (85B), U77 (85C)

6. Replace Z80A — RED leds / CPU module ----> U76 (85B), U515 (85C)
   (exchange them) YELLOW leds / terminal module ----> U515 (85B), U715 (85C)

7. Replace crystal X1.

8. If unsuccessful at this point and this processor board must be repaired, refer to the 'core build-up procedure' in the next section.

CORE BUILD-UP PROCEDURE. This is not the preferred procedure for troubleshooting if the above procedure failed to isolate the problem. Use this procedure if a replacement processor board is not available and the core components have all been replaced with no success in repairing the fault.

1. Disconnect all external devices from the processor board. This includes keyboard, thermal printer (if installed), HP-IB, datacomm and serial printer (datacomm 2).

2. Remove all non-core socketed components in the module which is malfuntioning. These are:

RED leds / CPU module	YELLOW leds / terminal module
(HP IB cont.)	(ROM 2)
(RAMs)	(ROM 3)
(RAMs)	(ROM 4)
(RAMs)	(RAMs)
(RAMs)	(CMOS RAM 1)
	(CMOS RAM 2)
	(kbd. cont.)
	(ACIA 1)
	(ACIA 2)
	(char. ROM)
	(line buffer)

(See the 85B, 85C cross reference table in Appendix A)

3. Power up unit again. Did the leds scan this time? If not then the failure is truely in a non-socketed component and the processor board must be replaced.

4. Begin to re-insert components in the order that they were removed (above). Power up the unit after each component is re-inserted. If at any point the leds cease to scan, replace the suspected component with a known good and continue from there.

WON'T LOAD OPERATING SYSTEM

IF THE SYSTEM WON'T LOAD AND NO OTHER FAILURE SYMPTOMS ARE OCCURING, then this is the appropriate section. If any other symptoms are apparent, then repair them first as they may cause this failure. The procedure presented here is aimed at isolating the fault to some failing subsystem (disc, printer, etc.)

TROUBLESHOOTING PROCEDURE. Try each procedure outlined below in order until the fault is isolated. Attempt to load the system after every change to verify the step.

1. Be sure the MODES softkeys indicate LOCAL OP SYS mode with an asterisk (*).

2. Power off and then on all devices on the HP-IB. Sometimes a device other than the processor and disc will hang-up the bus.

3. Disconnect the HP-IB cable from all devices except the 45500A and the Disc. Attempt to load. If the load is successful, add the devices one at a time until a failure occurs. The last device added is probably the cause of the fault.

4. Be sure that the OP SYS Disc is loaded into drive A (left drive of disc device 0) and that the LED for the drive lights when the LOAD OP SYS softkey is depressed. If it doesn't light there is a problem in the disc controller or drive.

5. If the LED is going out after a few seconds then the problem is probably related to the media or its contents. Try another known good operating system flexible disc. If the system still won't load, then the problem is probably in the drive.

SCREEN (VIDEO) PROBLEMS

DIFFERENTIATE BETWEEN SCREEN CONTENT AND SCREEN QUALITY. For example an out-of-focus screen is not in all probability a processor board problem, rather a possibly faulty sweep board. On the other hand having an 'X' displayed where an 'H' should be is certainly a processor board fault.

TROUBLESHOOTING PROCEDURE.

1. Press [CTRL] [SHIFT] and [RESET] at the same time to reset the unit, this should clear the screen.

2. If the screen does not come on at all, check to see that turning the brightness control (top of unit) causes the raster scan to appear on the screen. If not, then the power supply, sweep board, or CRT is probably bad.

3. The Dot Cross Hatch generator (02620-60029) can be substituted for the processor to verify proper operation of the sweep and CRT.

4. In cases where video problems exist and the processor board is suspected, follow this procedure step-by-step checking for proper operation:

   a. Ensure that cable to sweep board is making contact at connector J3 properly.

   b. Substitute a known good video controller chip (U315 (85B)/U13 (85C)).

   c. Substitute a known good character ROM (U313 (85B/U16 (85C)).

   d. Substitute a known good video line buffer chip (U311 (85B)/U19 (85C)).

   e. Ensure +5V logic power supply is within specification (4.75 - 5.25).

   f. If these steps fail to resolve the problem then replace the processor board.

KEYBOARD PROBLEMS

TROUBLESHOOTING PROCEDURE. When keyboard problems occur, follow this procedure step-by-step checking for proper operation at every stage:

1. Press the [AIDS] and [MODES] keys to insure that the keyboard is not responding. The softkey labels should change if the keyboard is working properly.

2. Press [CONTROL], [SHIFT], and [RESET] at once to hardreset the unit. This should unlock any logical keyboard lockouts. The keyboard should beep to end the reset operation.

3. Power-off and then power-on the unit to reset it. The keyboard should beep to indicate that it is connected and has power.

4. Ensure keyboard cable is securely attached to rear panel.

5. Exchange keyboard with a known good if possible.

6. Ensure rear panel cable is securely attached to the processor board at J4.

7. Replace U422 (85B)/U318 (85C) (keyboard controller) with a known good.

8. If these steps fail to resolve the problem refer service to the technician level.

INTERNAL PRINTER PROBLEMS

TROUBLESHOOTING PROCEDURE. When internal printer problems occur, follow this step-by-step procedure checking for proper operation at every stage:

1. Use the procedure outlined in the previous section to execute the Internal Printer Test. If the key does not appear properly labeled, then the printer did not identify itself to the processor as present.

2. Ensure paper latch is fastened down correctly.

3. Ensure TPM cable is securely fastened to processor board at J1 and that it is inserted with pin 1 (red trace) to right.

4. Ensure TPM power cable is securely fastened to power supply board.

5. The TPM can be tested independently of the processor board by shorting together the top two pins located at the top left rear of the printer assembly. This should generate lines of characters if the printer is working and power is present.

6. If known good replacement TPM is available, substitute it.

7. If these steps fail to resolve the problem, refer service to the technician level. There are no socketed components on the processor board which could cause TPM problems alone.

DATA COMM / SERIAL PRINTER PROBLEMS

TROUBLESHOOTING PROCEDURE.

1. Ensure your Data Comm / Serial Printer configuration is correct.

2. Ensure that the Data Communication cable(s) are connected to the rear panel securely and are the correct cable(s) for your application.

3. Disconnect BOTH data comm (port 1) and serial printer (port 2) connectors from the rear panel.

4. Install data comm test connectors 02620-60056 and 02620-60062 to ports 1 and 2 respectively.

5. Turn on power and depress 'DATACOMM TEST' function key (f7) under 'service keys'.

6. If the test passed, the screen will re-appear in about five seconds as it was. A test failure is identified by a message 'port 1 error xxxxxx' or 'port 2 error xxxxxx' at the bottom of the screen. Refer to the Key Selectable [DATA COMM TEST] for a description of the error messages.

7. If the test passed, processor board hardware is indicated to be functional. Check configuration and data communications / serial printer hardware.

8. If the test failed, replace U520 (85B)/U518 (85C) for a port 1 error or U518 (85B)/U517 (85C) for a port 2 error or swap the two parts to move the fault from one port to the other. Run the data comm test once again. If the problem still exists and has not moved, then replace the processor board.

HP-IB PROBLEMS

HP-IB problems are problems which seem to affect more than on device on the HP-IB bus. If only one device is involved, the procedures outlined here may not be appropriate.

TROUBLESHOOTING PROCEDURE. When HP-IB problems occur, follow this step-by-step procedure, checking for proper operation at every stage:

1. Ensure all HP-IB cables are securely attached including the unit rear panel connection.

2. Be sure that all devices on the HP-IB bus are configured to their proper device numbers. Power off and back on any device which has its configuration changed. Refer to the Figure 2-12 for proper device configurations.

3. Be sure that every device connected to the HP-IB is powered-on and is connected by some chain to the 45500A or 45500B.

4. Do not have any cables connected to the HP-IB which are not connected at both ends (no cables hanging free).

5. Be sure that the total HP-IB cable lengths do not sum to more than one meter plus one meter per device. (Three meters for a system with a disc and a printer on the HP-IB).

6. Power off and then on all devices on the HP-IB. Sometimes a device other than the processor and disc will hang-up the bus.

7. Disconnect the HP-IB cable from all devices except the 45500A or 45500B and the Disc. Attempt to load. If the load is successful, add the devices one at a time until a failure occurs. The last device added is probably the cause of the fault.

8. If the problem appears to be on the processor board:

   a. Ensure that the rear panel cable is securely and properly attached to the processor board at J7.

   b. Replace U320 (85B)/U119 (85C) (HP-IB controller) with a known good.

   c. If steps 3 and 4 failed to resolve the problem, replace the processor board.

POWER PROBLEMS

TROUBLESHOOTING PROCEDURE. Most power problems tend to be either problems in connecting the power or problems with the power supplied by the power company. Power conditioners and isolation transformers can be used to help solve the power company power problems. The outline below is aimed at solving problems which originate locally.

1. Be certain that all power cords are plugged into working sockets.

2. All the devices on the system should have the same circuit breaker, and the system should be the only equipment on the breaker. (No toasters or coffee makers).

3. It is highly recomended that the required third-wire ground be isolated from other third-wire grounds. Data transfers will fail if all HP-IB devices are not properly grounded and all are on the same circuit.

4. Be sure that all of the devices are configured for the local voltage and frequency. Check the fuses.

PARTS LISTS/REPAIR

VII

INTRODUCTION

This section provides instructions for removing and replacing modules and assemblies which are designated as field replaceable. Included also is a listing of field replaceable parts, procedures for ordering replaceable parts, and a listing of exchange modules.

REMOVAL AND REPLACEMENT PROCEDURES

The unit's modular design facilitates the removal and replacement procedures for the various field replaceable parts. The following paragraphs describe removal and replacement procedures for the terminal. Differences in the TPM option unit will be noted in each procedure.

WARNING

Hazardous voltages are present inside the unit. Always remove AC power when working inside. Removal and replacement procedures contained in this section shall be performed only by qualified service personnel.

TOP COVER..REMOVAL. Set power to the OFF position, disconnect the power cord, and proceed as follows:

1. Using a small Phillips-head screwdriver, loosen the two quarter-turn fasteners securing top cover to mainframe (see figure 7-1). Do not overtighten the fasteners.

2. Slide top cover toward the rear slightly and remove.

REPLACEMENT. Replace the top cover as follows:

1. Position top cover onto the mainframe and slide it forward into the groove of the bezel.

2. Secure top cover to mainframe by tightening the two quarter-turn fasteners. Do not overtighten the fasteners.

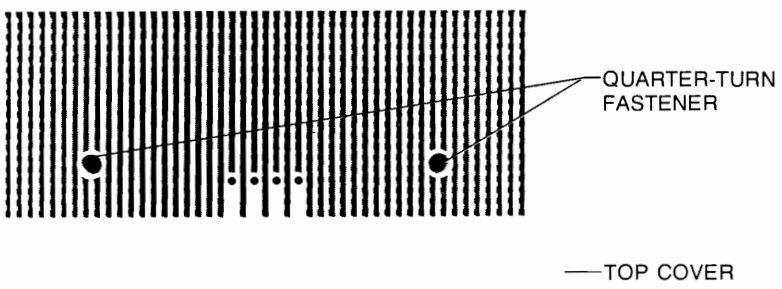


Figure 7-1. 45500A or 45500B Top View

MAINFRAME..REMOVAL. Set power to the OFF position, disconnect all the power cords from the rear panel and proceed as follows:

1. Remove the top cover and disconnect the fan cable assembly from the Power Supply PCA connector J1.

2. Loosen the quarter-turn fastener at the left rear of the terminal housing (as viewed fom the rear). See figure 7-2.

3. Hold pedestal in place and slide the mainframe forward about 1/4-inch.

CAUTION

Use extreme care when placing the terminal housing in the half-open (service) position. Failure to do so may cause the unit to tip over causing personal injury or damage to the unit.

4. Grasp left side of mainframe and lift it upward until the until the top prop locks the mainframe in the half-open (service) position.

5. Remove the ground wire, unfasten the snap fastener and lower the Processor Board, (see Processor PCA). Remove the top cover, disconnect the fan power cable from the power supply and pull it through the opening in the mainframe. Re-attach the Processor Board to the mainframe.

6. Squeeze the upper end of the top prop and lift the mainframe upward (see figure 7-3). Then slide the mainframe forward until it is free from the support hinge and remove.

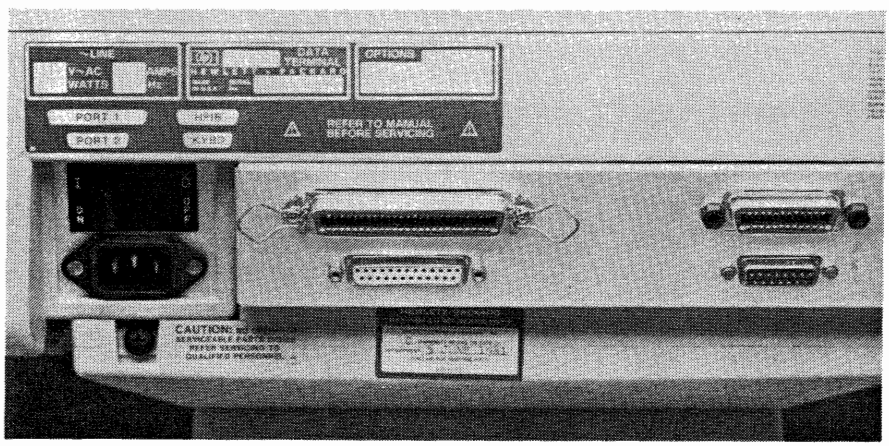


Figure 7-2. 45500A or 45500B (Rear View)

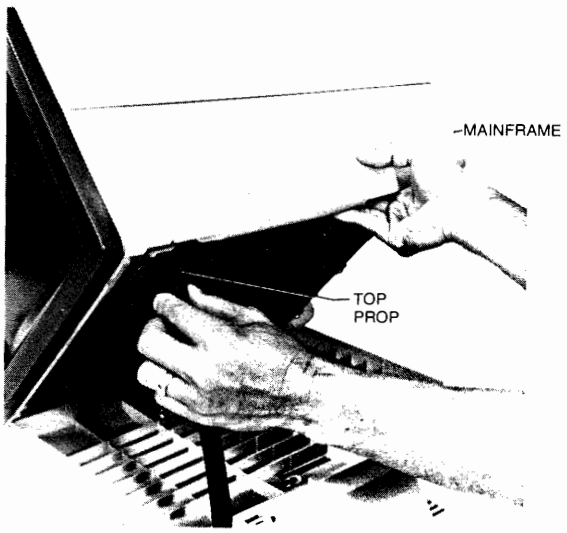


Figure 7-3. 45500A or 45500B Unit Set to the Half-Open Position

REPLACEMENT. Replace mainframe as follows:

1. Position mainframe onto support hinge. Slide mainframe and support together until they are hinged.

2. Lower mainframe onto top prop.

3. Lower the Processor PCA onto the support, route the fan cable assembly through the opening in the mainframe and connect it to the Power Supply PCA connector J1. Reattach Processor PCA to mainframe and reconnect the ground strap.

4. Make sure that the fan cable is resting in the support slots and cable clip.

5. Squeeze the upper end of the top prop and lower the mainframe to its closed position.

6. Slide the mainframe toward the rear and secure it in place by tightening the quarter-turn fastener at the left rear of the terminal housing. Do not overtighten the fasteners.

7. Replace top cover.

8. Reconnect the power cord, keyboard cable assembly, HP-IB cable, and data comm cable assembly (if required).

SUPPORT....REMOVAL. Set the power switches to the OFF position, disconnect all the cords from the rear panel, and proceed as follows:

1. Remove the four screws and washers securing support to pedestal (figure 7-4).
2. Remove support from pedestal.
3. Pull the fan cable assembly through the opening in the support.

REPLACEMENT. Replace support as follows:

1. Position support onto pedestal.
2. Route the fan cable assembly through the support opening, two slots, and cable clip.
3. Secure support in place with the four screws and washers.
4. Attach the mainframe to the support and secure it in place by tightening the quarter-turn fastener. Do not overtighten the fastener.
5. Reconnect the cable assemblies.

PEDESTAL...REMOVAL. Set the power to the OFF position, disconnect all the cords from the rear panel, and proceed as follows:

1. Position mainframe to the half-open (service) position.
2. Remove the mainframe from support.
3. Remove the four screws and washers securing support to pedestal. Remove pedestal.
4. Remove the two screws and washers securing the fan assembly to pedestal.

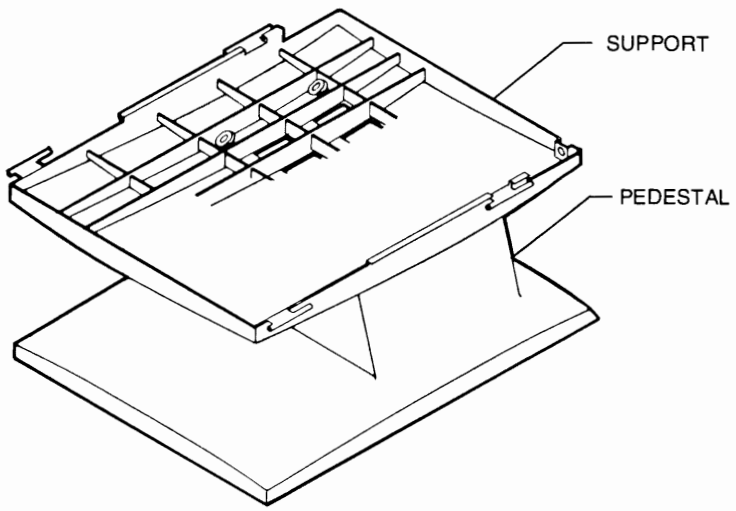


Figure 7-4. Support and Pedestal

REPLACEMENT. Replace pedestal as follows:

1. Reinstall the fan assembly onto the pedestal (refer to "VENTILATING FAN"). Route the fan cable assembly through the support opening, two slots, and cable clip.

2. Position support over pedestal and align the four holes.

3. Secure the support to the pedestal with the four screws and washers.

4. Position the mainframe onto the support and lower it onto the top prop.

5. Connect the fan cable to the Power Supply PCA connector, J1.

6. Lower mainframe onto the support, slide it rearward,
and secure in place by tightening the quarter-turn fastener. Do not overtighten the fastener.

7. Reconnect cable assemblies on the rear panel.

VENTILATING FAN.....The 45500A and 45500B use a ventilating fan for cooling. Procedures for removing and replacing the fan follow:

REMOVAL. Set the power switch to the OFF position, disconnect all the cables from the rear panel, and proceed as follows:

1. Remove top cover and disconnect fan cable assembly from Power Supply PCA connnector J1.

2. Remove mainframe from support (refer to "MAINFRAME").

3. Remove support from pedestal.

4. Remove the two screws and washers securing fan to the pedestal cavity (figure 7-5) and remove the fan.

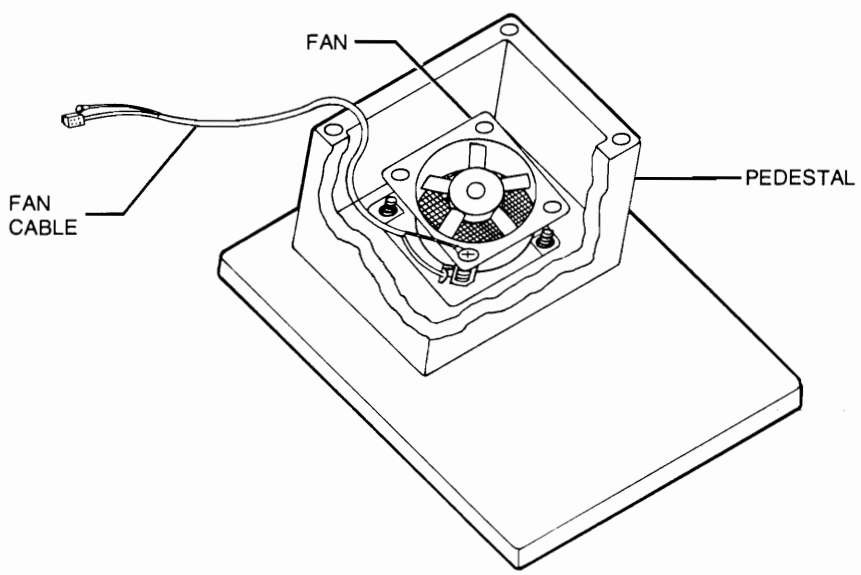


Figure 7-5. Fan Removal

REPLACEMENT. Replace ventilating fan as follows:

1. Position fan into pedestal cavity with the air flow direction of the fan facing upward.

2. Route fan cable assembly through the support opening, two slots, and cable clip.

3. Reinstall the support onto the pedestal and secure it in place with the four screws and washers.

4. Reinstall mainframe onto support hinges in the half-open (service) position.

5. Lower Processor PCA and route the fan cable through the mainframe opening. Connect the fan cable to the Power Supply PCA connector J1.

6. Reinstall the Processor PCA and reconnect the ground strap to the Processor PCA ground lug.

7. Close mainframe and secure in place by tightening the quarter-turn fastener. Do not overtighten the fastener.

8. Replace the top cover and reconnect all cable assemblies.

PRINTED-CIRCUIT ASSEMBLIES. Printed-circuit assemblies (PCA's) are easily removed and replaced. The following paragraphs provide removal and replacement procedures for each PCA installed in the unit.

PROCESSOR PCA AND PANEL I/O..REMOVAL. Set the power to the OFF position, disconnect all the cords from the rear panel, set mainframe to the half-open position, and proceed as follows:

1. Disconnect the ground strap from Processor PCA ground lug at the terminal left rear.

2. Pull outwardly on each of the four snap fasteners securing Processor PCA to mainframe bottom. Lower the Processor PCA until it rests on the support (figure 7-6).

3. Disconnect the two cable assemblies from their respective connectors (J2 and J3).

4. Disconnect the thermal print cable assembly from connector J1.

5. Carefully remove the Processor PCA and rear panel as a single assembly.

6. To remove the I/O Panel from the just removed Processor PCA, disconnect the four interconnecting cable assemblies from the Processor PCA (J4, J5, J6, and J7). Remove the three screws and washers securing I/O Panel to the Processor PCA.

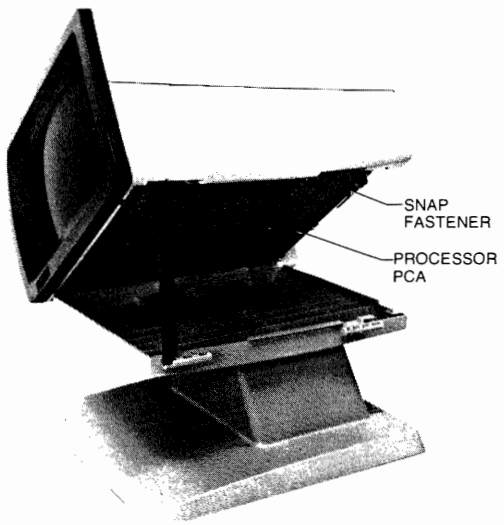


Figure 7-6. Processor PCA Removal

REPLACEMENT. Replace the Processor PCA as follows:

1. To install the I/O Panel onto the new Processor PCA (if necessary), secure it in place with the three screws and washers. Reconnect the four interconnecting cable assemblies to the Processor PCA.

2. If the replacement PCA requires RAMS, ROMS, or IC's, remove them from the just removed PCA. Using care and an IC removal tool (part no. 7710-0585), remove RAMS, ROMS, and IC's from their IC sockets (see figure 7-19).

CAUTION

Integrated circuits can be damaged by electrostatic discharge. Use the following precautions:

ENSURE that IC, work surface (table, desk, etc.) and PCA are all at the same ground potential. Use an anti-static ground pad (Part No. 4342-0036). This can be done by touching the foam pad to the PCA and then touch the foam pad, circuit, and PCA to work surface.

DO NOT wear clothing subject to static charge buildup, such as wool or synthetic materials.

DO NOT handle integrated circuits in carpeted areas.

DO NOT remove the IC from its conductive foam pad until you are ready to install it.

AVOID touching circuit leads. Handle it by the plastic package only.

3. Connect the two cable assemblies to their respective connectors (J2 and J3).

4. For TPM Option units, connect the thermal print cable assembly to connector J1.

5. Position the Processor PCA onto the mainframe bottom and align the I/O panel into the mainframe groove. Install each of the four snap-in grommets into their respective fastening holes and then push inwardly on each of the four snap-in plungers until they click in place.

6. Reconnect the ground strap to the Procesor PCA ground lug.

7. Lower the mainframe onto the support and secure it in place by tightening the quarter-turn fastener. Do not overtighten the fastener.

8. Reconnect the cable assemblies on the rear panel.

SWEEP PCA..REMOVAL. Set the power switch to the OFF position, disconnect the power cord, set the mainframe to the half-open position, lower the Processor PCA, and proceed as follows:

CAUTION

High voltages are present within the Sweep PCA and CRT area. Use caution when working near these assemblies.

1. Disconnect the four cable assemblies from their respective connectors on the Sweep PCA, (J1 through J4).

2. Use caution and carefully disconnect the high voltage cable assembly from the CRT high voltage connector (hole in CRT) by squeezing the insulated connector.

3. Remove the Sweep PCA (figure 7-7) from the mainframe by pulling outwardly on each of the two snap fasteners. Use care and remove the Sweep PCA.

REPLACEMENT. Replace the Sweep PCA as follows:

1. Carefully position Sweep PCA into mainframe and secure in place by pushing inward on each of the two snap-in grommets and then the two snap-in plungers. Ensure that wiring and cabling are not pinched.

2. Reconnect the four cable assemblies to their respective connectors (J1 thru J4) and the high voltage cable to the CRT connector (hole in CRT). Hook the high voltage cable onto tie-down tab in mainframe.

3. Replace Processor PCA.

4. Lower the mainframe and secure it in place by tightening the quarter-turn fastener.

5. Reconnect the power cord.

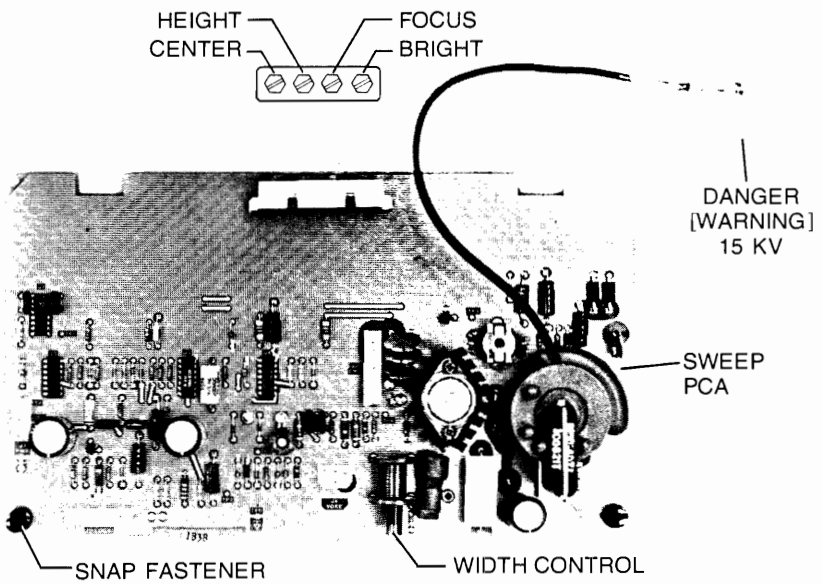


Figure 7-7. Sweep PCA

POWER
SUPPLY
PCA.....REMOVAL. Set the terminal power switch to the OFF position, disconnect the power cord, remove the top cover, and proceed as follows:

1. Disconnect the five cable assemblies from their respective connectors: J1, J2 or J3, and J4 thru J6. For TPM option units, these connectors are J1 thru J3, J5 and J6.

2. At the top of the Power Supply PCA, pull outwardly on each of the three snap fasteners securing the PCA to the mainframe (see figure 7-8).

Note: For units with printers, there are four snap fasteners securing the Power Supply PCA to the mainframe (see figure 7-9).

3. Remove the Power Supply PCA by pulling it upward from the mainframe cavity.

REPLACEMENT. Replace the Power Supply PCA as follows:

1. Slide the Power Supply PCA into the mainframe cavity and secure it in place by pushing inwardly on each of the three snap-in grommets and then the three snap-in plungers. For TPM option units, there are four snap fasteners.

2. Reconnect the five cable assemblies to their respective connectors J1, J2 or J3, and J4 thru J6. For TPM option units, these connectors are J1 thru J3, J5 and J6.

Note: For standard units, connector J2 is for 100-120V and connector J3 is for 220-240V.

3. Check that the line fuse is correct for the configured line voltage. Refer to "Installing the System" in Section II for a description of fuse placement.

4. Replace top cover and reconnect the power cord.

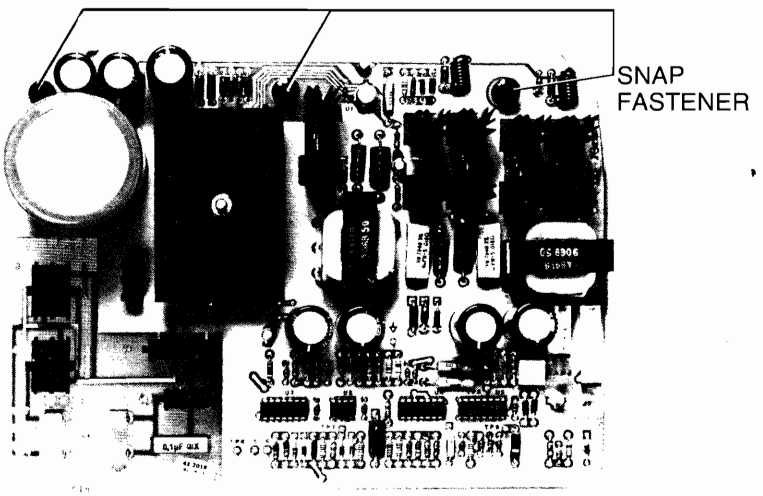


Figure 7-8. Power Supply PCA (Standard)

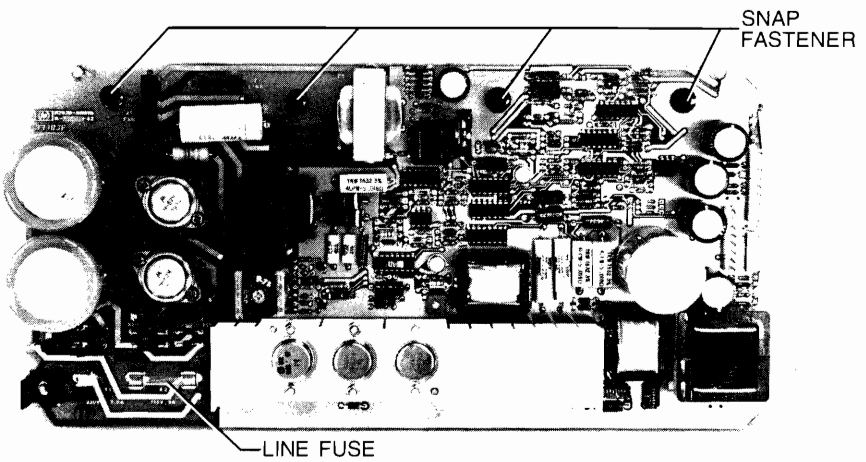


Figure 7-9. Power Supply PCA (TPM Option Unit)

KEYBOARD ASSEMBLY...REMOVAL. Turn the power OFF, disconnect the power cord and keyboard cable, and remove the Keyboard Assembly.

REPLACEMENT. Replace Keyboard Assembly as follows:

1. Connect keyboard cable to KYBD connector at terminal rear. Secure in place by sliding connector lock to the right.

2. Reconnect the power cord.

KEYBOARD PCA.....REMOVAL. Remove the Keyboard PCA as follows:

1. Turn the power OFF and disconnect the power cord.

2. Disconnect the Keyboard Cable Assembly.

3. Remove the four screws securing keyboard top to keyboard base (figure 7-18).

4. Remove the keyboard top, disconnect the keyboard and speaker cables from the Keyboard PCA, and then remove the Keyboard PCA from the keyboard base.

REPLACEMENT. Replace the Keyboard PCA as follows:

1. Place the Keyboard PCA over the keyboard base standoffs.

2. Route the keyboard and speaker cables into their respective grooves on the keyboard base. Reconnect the keyboard and speaker cables to their respective Keyboard PCA connectors.

3. Place the keyboard top over the Keyboard PCA and secure it in place with the four screws.

4. Reconnect the keyboard cable to the KYBD connector at the terminal rear and secure the cable in place by sliding the connector lock to the right.

5. Reconnect the power cord.

KEYCAPS....REMOVAL. Using the keycap disassembly tool (part no. 5040-7433), carefully hook the keycap bottom edge and lift the keycap from the Keyboard Assembly (see figure 7-10).

REPLACEMENT. Install the new keycap over the vacated switch on the Keyboard Assembly as follows:

CAUTION

Switch Contacts can be damaged if keycap is not installed at its designed angle. Use care when installing keycaps.

1. Position replacement keycap over vacated switch at its designed angle and orientation.

2. Push down on the keycap at its designed angle and orientation until the keycap is fully seated.

Figure 7-10. Keycap Removal

BATTERY....REMOVAL. The battery can be replaced with terminal power on or off. The processor board must be removed first. The battery is removed as follows:

CAUTION

Configuration will be lost from memory when removing the battery from the terminal if the power is turned off. Before removing the battery, ensure that configuration is recorded so that original strapping can be duplicated.

1. If battery is to be replaced with power on, go to step 2. If not, record configuration and then turn the power off.

2. Set the mainframe to the half-open position.

3. Disconnect the ground strap from the Processor PCA ground lug at the left rear of the terminal.

4. Pull outwardly on each of the four snap fasteners securing Processor PCA to mainframe bottom. Lower the Processor PCA until it rests on the support (figure 7-6).

5. Locate the battery support at rear of the unit.

6. Grasp and squeeze battery support clips and pull it downward for removal. (See figure 7-11.)

7. Remove the battery from battery support.

REPLACEMENT. Replace battery as follows:

1. Install new battery in battery support. Observe polarity markings on battery support for correct battery orientation.

2. Install the battery support into the battery receptacle at the rear of the unit. Make sure that battery clips are seated fully. To ensure correct installation, both the battery support and receptacle are keyed.

Lithium Batterie Größe AA (Mignon)
z.B. Schmicht 4.031.5

3. Position the Processor PCA onto the mainframe bottom and align the I/O panel into mainframe groove. Install each of the four snap-in grommets into their respective fastening holes and then push inwardly on each of the four snap-in plungers until they click in place.

4. Reconnect the ground strap to the Procesor PCA ground lug.

5. Lower the mainframe onto the support and secure it in place by tightening the quarter-turn fastener. Do not overtighten the fastener.

6. If the battery was replaced with power off, restore terminal power and restrap configuration (refer to Strapping Section).

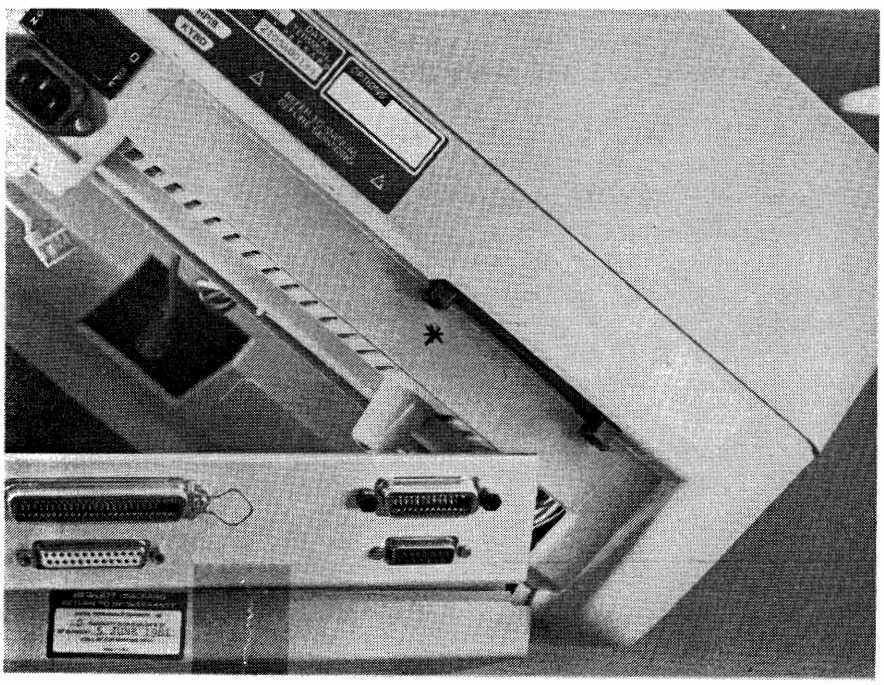


Figure 7-11. Battery Removal

INTEGRATED CIRCUIT.....REMOVAL. If a defective integrated circuit (IC), such as a Read-Only-Memory (ROM) or Random-AccessMemory (RAM) is to be replaced; set the power to the OFF position, disconnect the power cord, remove the defective PCA, and proceed as follows:

CAUTION

Integrated circuits can be damaged by electrostatic discharge. Use the following precautions:

ENSURE that the circuit, work surface (table, desk, etc.) and PCA are all at the same potential. Use an anti-static ground pad (P/N 4342-0036). This can be done by touching the foam pad to the PCA and then touch the foam pad, circuit, and PCA to the work surface.

DO NOT wear clothing subject to static charge buildup, such as wool or synthetic materials.

DO NOT handle IC's in carpeted areas.

DO NOT remove the IC from its conductive foam pad until you are ready to install it.

AVOID touching the circuit leads. Handle by the plastic package only.

1. Locate the defective IC.

2. Using an IC removal tool (part no. 7110-0585), remove defective IC from its socket.

REPLACEMENT. When replacing a defective IC, be aware that each IC must be oriented and aligned in its socket, i.e., pin 1 of the IC matches pin 1 of the PCA. All IC's on a PCA are usually installed in the same direction, i.e., the notched ends of the IC's are facing in one direction for correct orientation. Pin 1 is marked on the PCA by a square hole, and pin 1 on the IC is marked by a dot or notch. These markings help to ensure that both the IC socket and IC are installed correctly (figure 7-12). Install the new IC as follows:

1. Observe correct IC orientation and install the replacement IC into IC socket.

2. Reinstall the PCA.

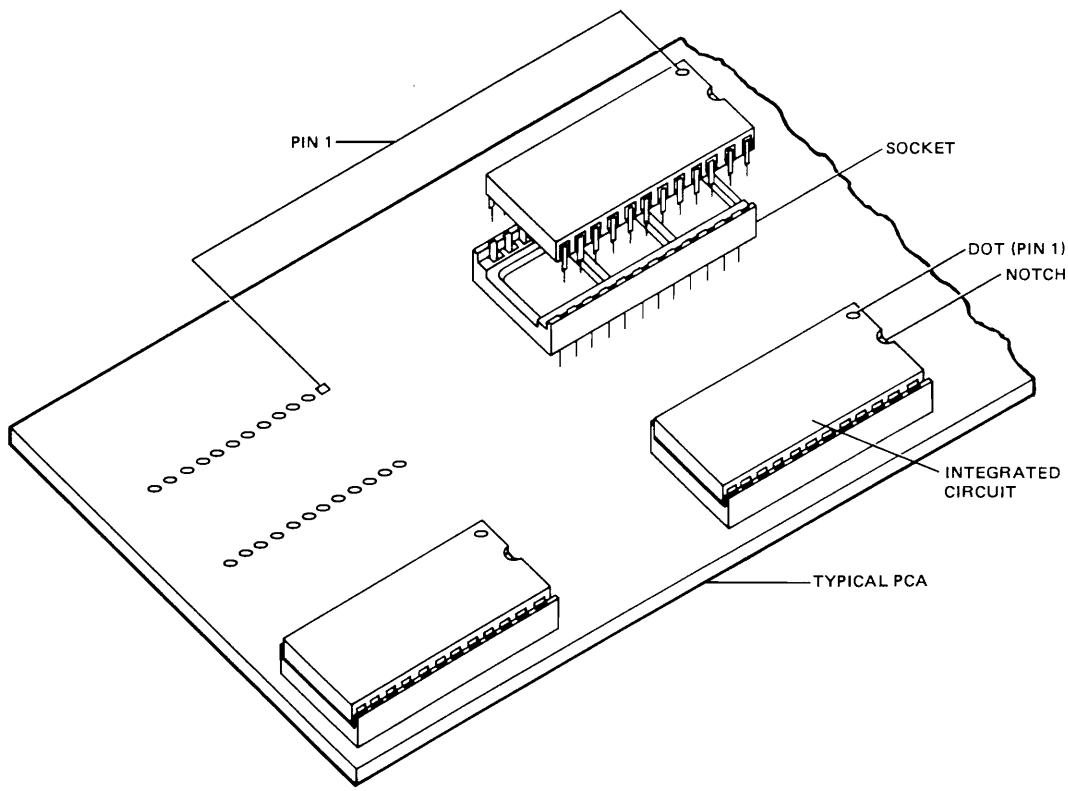


Figure 7-12. Installing an IC

THERMAL
PRINT
MECHANISM..The thermal print mechanism (TPM) is replaceable as an assembly, however, some subassemblies have been designated as field replaceable: the TPM PCA, and the print head. Procedures for removing and replacing these subassemblies follow.

REMOVAL. Set the power to the OFF position, disconnect the power cord, remove the top cover, and proceed as follows:

1. Raise door latch and remove paper and paper roll rod from the TPM.

2. Use an IC removal tool and unsnap the two snap fasteners securing TPM to mainframe (see figure 7-13).

3. Lift the back of TPM mainframe and slide the TPM forward slightly. Do not grasp the TPM motors when handling the TPM.

4. Disconnect the two cable assemblies from their respective connectors (J2 and J3) and remove the TPM.

5. Loosen the three screws securing magnetic shield to the TPM. Slide magnetic shield outward for removal.

REPLACEMENT. Replace the TPM as follows:

1. Slide the magnetic shield onto the TPM replacement and secure in place with the three screws.

2. Reconnect the two cable assemblies to their respective connectors (J2 and J3) and position the TPM onto mainframe.

3. Slide the TPM forward to hook front hooks onto mainframe. Be sure that the TPM is properly positioned with the front hooks and snap fastener holes in mainframe.

4. Raise the door latch and secure the TPM in place by pushing inward on the two snap-in grommets and then the two snap-in plungers.

5. Replace the paper roll and lower door latch.

6. Replace the top cover and reconnect the power cord.

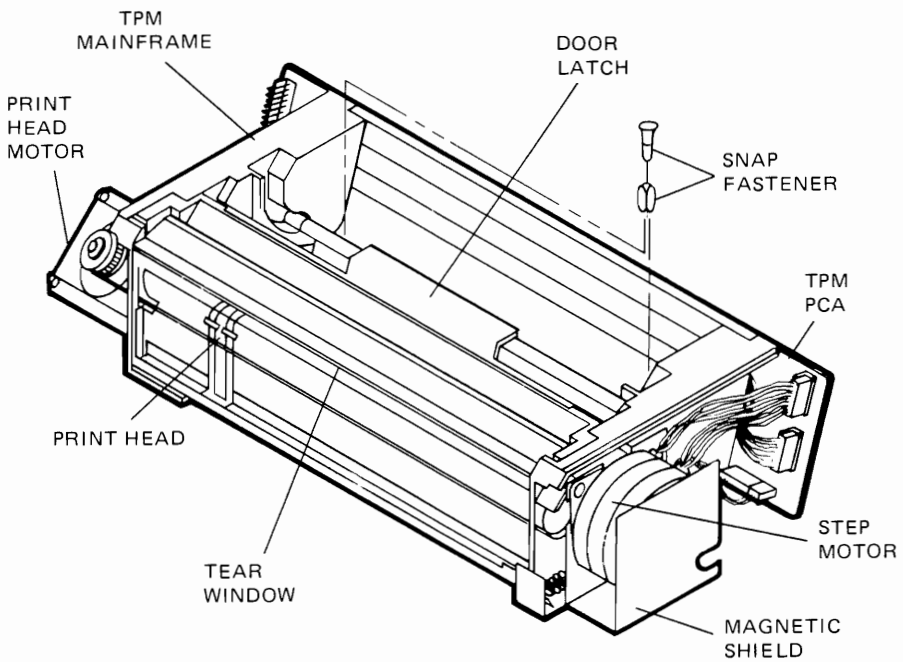


Figure 7-13. TPM Removal

TPM PCA....REMOVAL. Set the power switch to the OFF position, disconnect the power cord, remove the top cover, the TPM, and proceed as follows:

1. Remove the three screws securing the TPM PCA to the TPM mainframe.

2. Disconnect the remaining five cable assemblies from their respective connectors.

3. Remove the TPM PCA from the TPM mainframe.

REPLACEMENT. Replace the TPM PCA as follows:

1. If the replacement PCA requires ROMS, remove them from the just removed PCA. Reinstall these ROMS in their respective IC sockets. Refer to "INTEGRATED CIRCUIT" and see figure 7-26.

2. Position the TPM PCA onto the TPM mainframe hooks and secure in place with the three screws.

3. Install the print head (flex) cable into connector J4 (slot in the TPM mainframe).

4. Reconnect the remaining cable assemblies to their respective connectors.

5. Reinstall the TPM.

6. Replace the top cover and reconnect the power cord.

7. Reconfigure the TPM strapping (refer to Strapping Section).

PRINT HEAD....Removal of the print head is made up of two major parts. First the thermal print mechanism must be removed from the unit. Second the print head assembly (which includes the print head) must be removed.

To remove the thermal print mechanism (TPM) from the unit proceed as follows:

1. Set the power switch to the off position, disconnect the power cord, and remove the top cover.

2. Raise the door latch and remove paper and paper roll rod from TPM.

3. Use an IC removal tool and unsnap the two snap fasteners securing the TPM to the mainframe (see figure 7-13).

4. Lift the back of the TPM mainframe and slide the TPM forward slightly. Do not grasp the TPM motors when handling the TPM.

5. Disconnect the two cable assemblies from their respective connectors (J2 and J3) and remove the TPM.

To remove the print head assembly from the TPM and proceed as follows:

1. Raise the door latch.

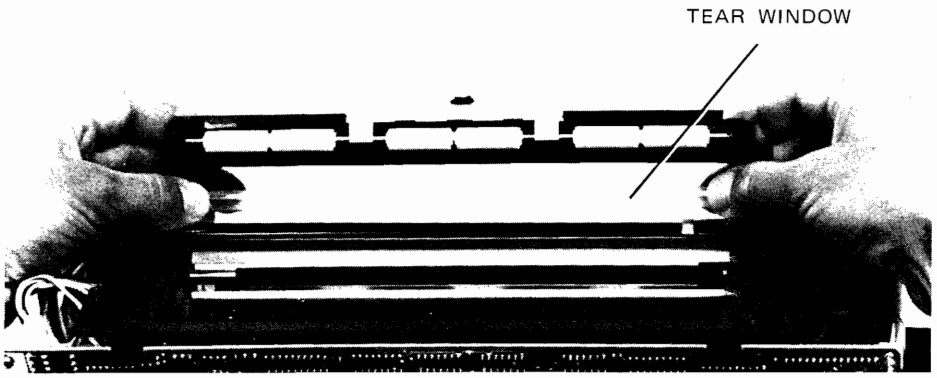


Figure 7-13A. Tear Window

Figure 7-13A. Tear Window

2. Remove the tear window. (See figure 7-13A.)

3. Remove the removable rod.

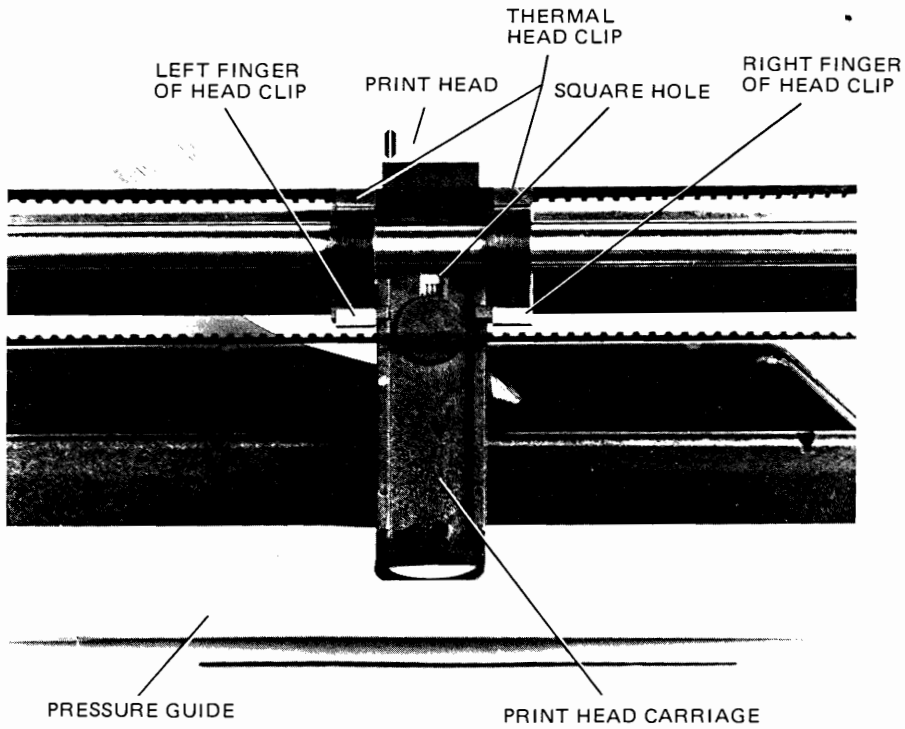


Figure 7-13B. TPM Front View

4. Slide the print head carriage down to the middle of the TPM. (See figure 7-13B).

5. Loosen the right and left fingers of the thermal head clip which secures the print head in place. (See figure 7-13B.)

6. Push the print head out from the print head carriage and down.

7. Pull the print head out of the print head carriage.

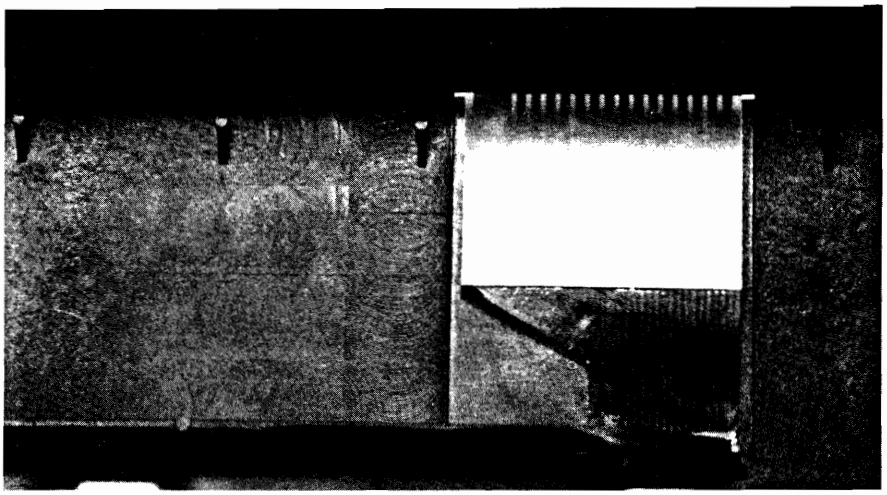


Figure 7-13C. Print Head Assembly Connector

8. Unplug the connector end of the print head assembly. (See figure 7-13C.)

9. Pull the print head assembly out of the thermal print mechanism.

CAUTION

When replacing the print head assembly do not bend the flex cable where it connects to the print head.

Replace print head as follows:

1. Put the TPM on the edge of a table top with the pressure guide and print head carriage facing you. The pressure guide needs to hang over the edge of the table. (See figure 7-13B.)

2. Hold the print head so that the side which is one-half silver and one-half black is facing you. Thread the print head under pressure guide, between the pressure guide and black portion of the TPM.

3. Slide the print head up the print head carriage between the print head carriage and the thermal head clip. (See figure 7-13B.) Do not bend the flex cable where it connects to the print head because the wires will break.

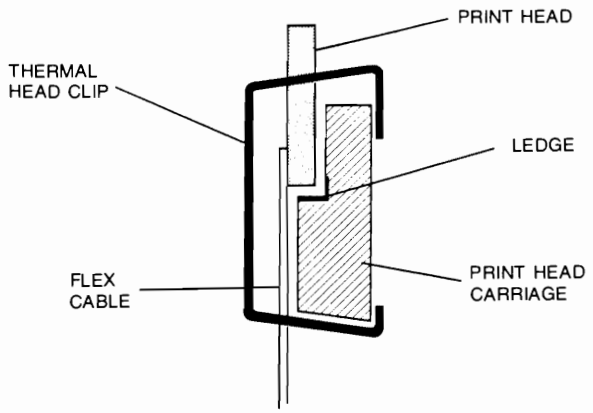


Figure 7-13D. Ledge Inside Print Head Carriage

4. Pull the print head up until you can see some of the flex cable through the square hole in the front of the print head carriage. Then push the print head down until it rests on the ledge which exists on the inside of the print head carriage. (See figure 7-13D.)

5. Look through the square hole of the print head carriage. Be sure that print head ceramic is seen in half of the square hole, and that flex cable is seen in the other half of the square hole. (See figure 7-13B.)

6. Latch the left and right fingers of the thermal head clip. (See figure 7-13B.)

7. Press the flex cable back inside of the TPM.

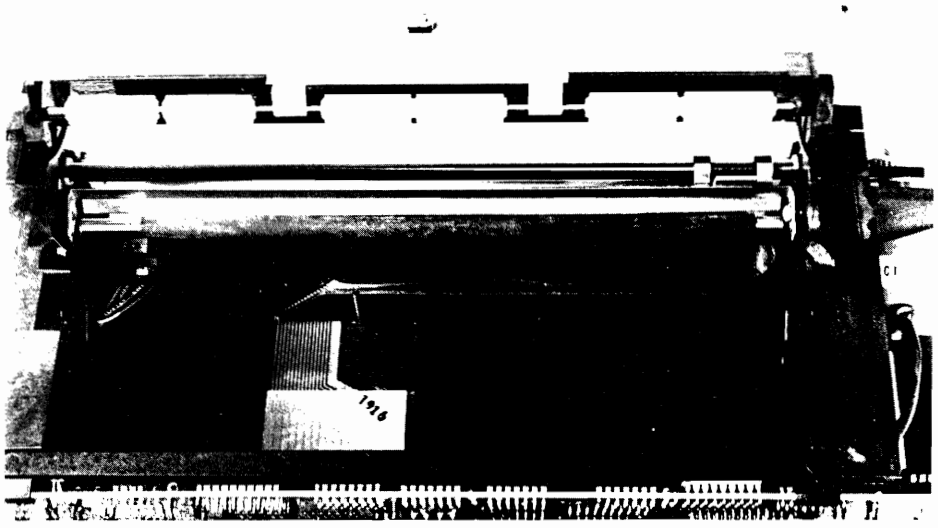


Figure 7-13E. Print Head Assembly in Place

8. Make a similar fold in the flex cable as in the defective flex cable and route it along the TPM. (See figure 7-13E.)

Note

To insure correct folding of the flex cable, the replacement cable has been previously creased.

9. With the insulated side up, install the flex cable into TPM PCA connector (slot in TPM mainframe). Ensure that the flex cable is seated fully into the TPM PCA Connector and that the contacts of the print head cable assembly are aligned with the contacts on the TPM PCA. To be sure of a perfect alignment, turn the TPM upside down to view the connection pin assignment. (See figure 7-13C.)

Replace the TPM complete with the new print head into the terminal as follows:

1. Reconnect the two cable assemblies to their respective connectors (J2 and J3) and position the TPM onto the mainframe.

2. Slide the TPM forward to hook front hooks onto the mainframe. Be sure that the TPM is properly positioned at the front hooks and then snap the fastener into the holes in the mainframe.

3. Raise door latch and secure the TPM in place by pushing inward on the two snap-in grommets and then the two snap-in plungers.

4. Replace the removable rod.

5. Replace the paper and the paper roll rod.

6. Replace the tear window.

7. Lower and secure the door latch.

8. Replace the cover and reconnect the power cord.

REMOVABLE PARTS

Removable parts for the 45500A or 45500B are listed in the following tables. The removable parts in tables 7-1 through 7-4 are referenced to the exploded views (figure 7-14 through 7-18) of the terminal by index numbers which are in disassembly order, except attaching parts are listed immediately after the parts they attach. Table 7-12 gives the part numbers for replaceable components shown in figures 7-31 and 7-32. Items in the DESCRIPTION column of tables 7-1 through 7-4 are indented to indicate item relationship. In addition the symbol "---x---" follows the last one or more attaching parts. Indentation is as follows:

Tables 7-1 through 7-4 provide the following information for each part:

a. FIG. & INDEX NO. The figure and index number where the removable parts are shown in the exploded view.

b. HP PART NO. The Hewlett-Packard part number for each removable part.

c. DESCRIPTION. The description and any special application (accessories and options) for each removable part.

d. UNITS PER ASSY. The total quantity of each part used in the major assembly.

ORDERING REMOVABLE PARTS

To order removable parts for the terminal or options and accessories, address the order to your local Hewlett-Packard Sales and Service Office listed at the end of this manual. The following information should be included in the order for each part.

a. Complete model number (including options and accessories) and serial number.

b. Hewlett-Packard part number for the ordered part.

c. Complete part description as provided in the removable parts list.

EXCHANGE MODULES

Exchange modules are replacement modules less some removable components. Table 7-13 lists the available exchange modules and the components that must be removed before a module is sent to Hewlett-Packard's Customer Service Division (CSD). These exchange modules are available from CSD under the "Blue Stripe Program." The Customer Service Engineer can exchange a defective module for a replacement module at the prevailing exchange rate. Contact your local HP Sales and Service Office for details.

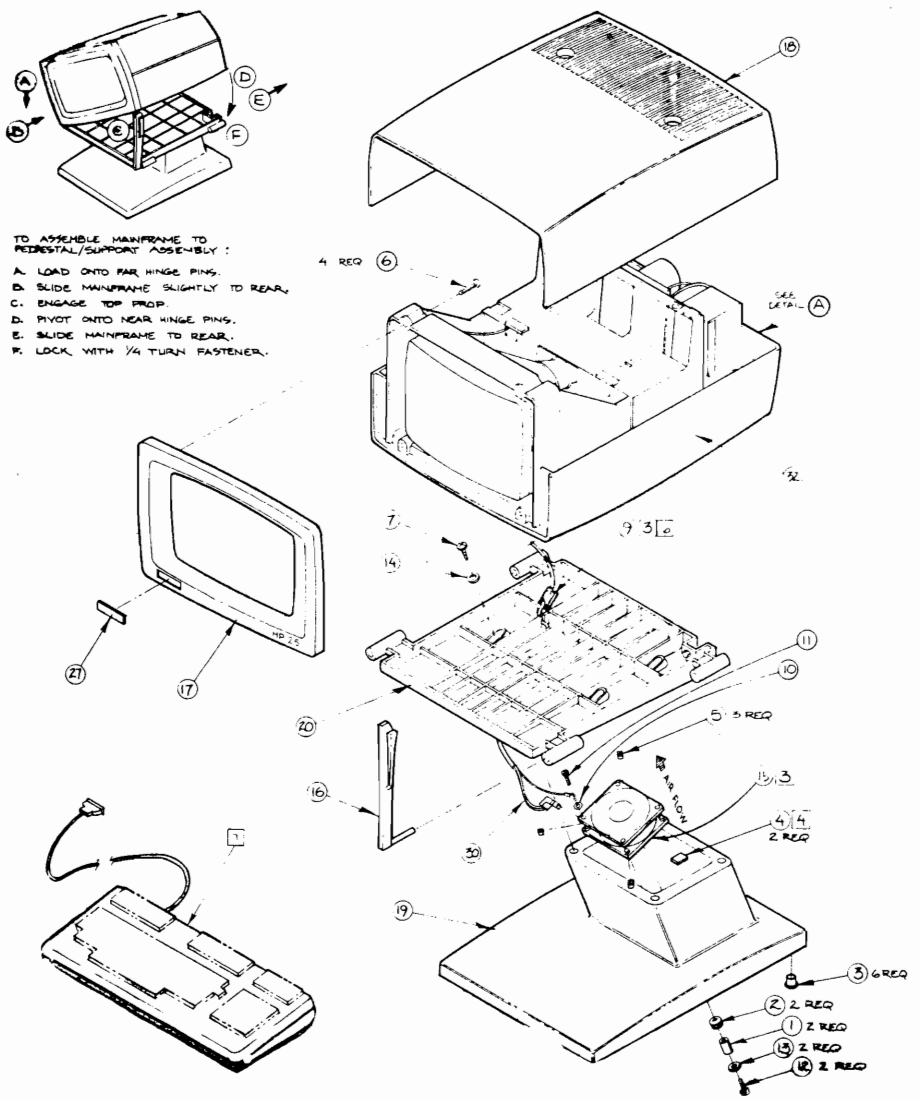


Figure 7-14. Standard Unit

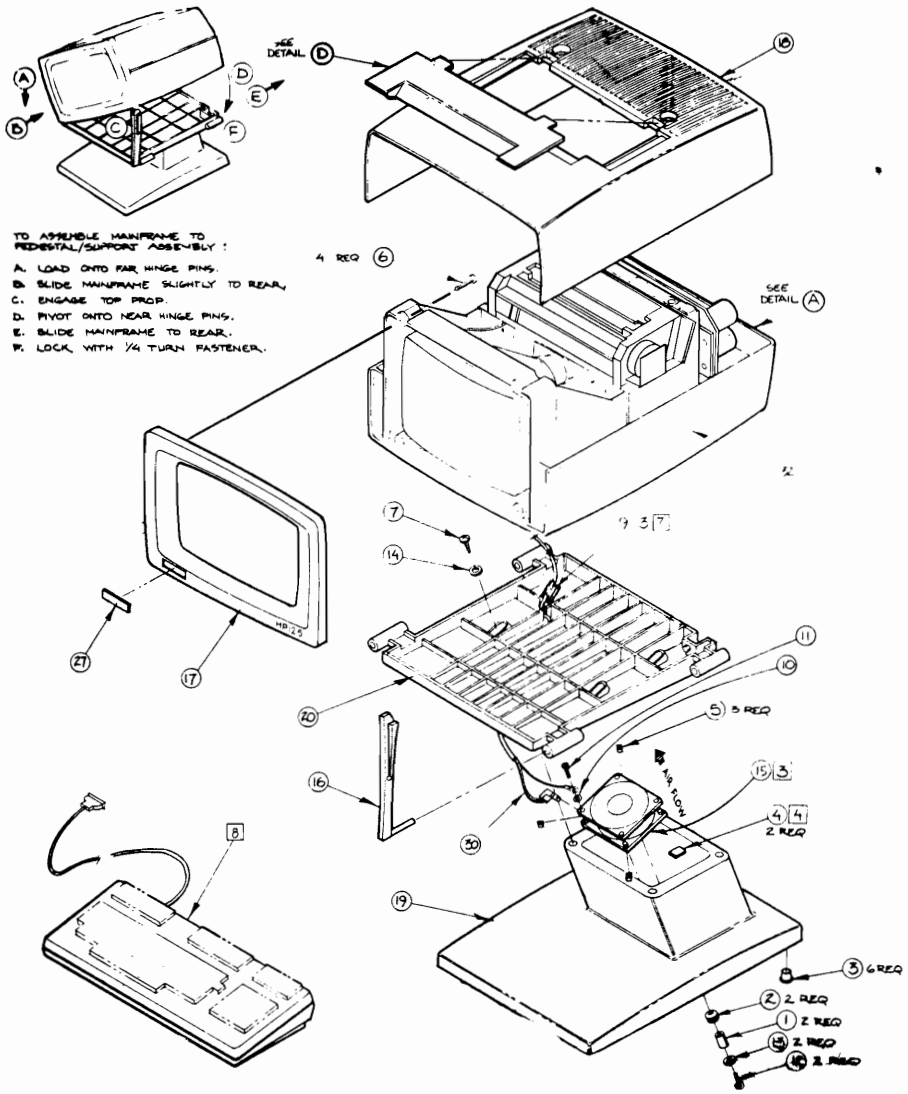


Figure 7-15. Option 050 Terminal

Table 7-1. Top Cover, Support, and Pedestal

FIG & INDEX NO.	UNITS PER ASSY Standard	UNITS PER ASSY Option 050	HP PART NO.	DESCRIPTION
7-14	1		4040-1479	Top Cover
7-15		1	4040-1481	TPM Top Cover
				(Attaching Parts)
	2	2	1390-0475	Quarter-Turn Fastener
	2	2	1390-0293	Quarter-Turn Spring
	2	2	1390-0257	Quarter-Turn Retainer
	2	2	1390-0071	Quarter-Turn Washer
				--- X ---
7-15		1	4040-1482	TPM Door
				--- X ---
7-14,15	1	1	4040-1484	Support
				(Attaching Parts)
	1	1	1390-0475	Quarter-Turn Fastener
	1	1	1390-0293	Quarter-Turn Spring
	1	1	1390-0257	Quarter-Turn Retainer
	1	1	1390-0071	Quarter-Turn Washer
	1	1	7120-7538	Label Warning
				--- X ---
	1	1	4040-1447	Top Prop BLK
				--- X ---
7-14,15	1	1	4040-1480	Pedestal PGC Plastic
				(Attaching Parts)
	4	4	0624-0439	Screw, tapping
	4	4	3050-0099	Washer, flat #12
	6	6	0403-0284	Foot, press-in
7-14,15	1	1	3160-0208	Fan 51 CFM
				(Attaching Parts)
	2	2	2360-0127	Screw, machine, 6-32 x 7/8
	2	2	3050-0066	Washer, flat, no.6
	1	1	02620-60172	Fan cable Assembly

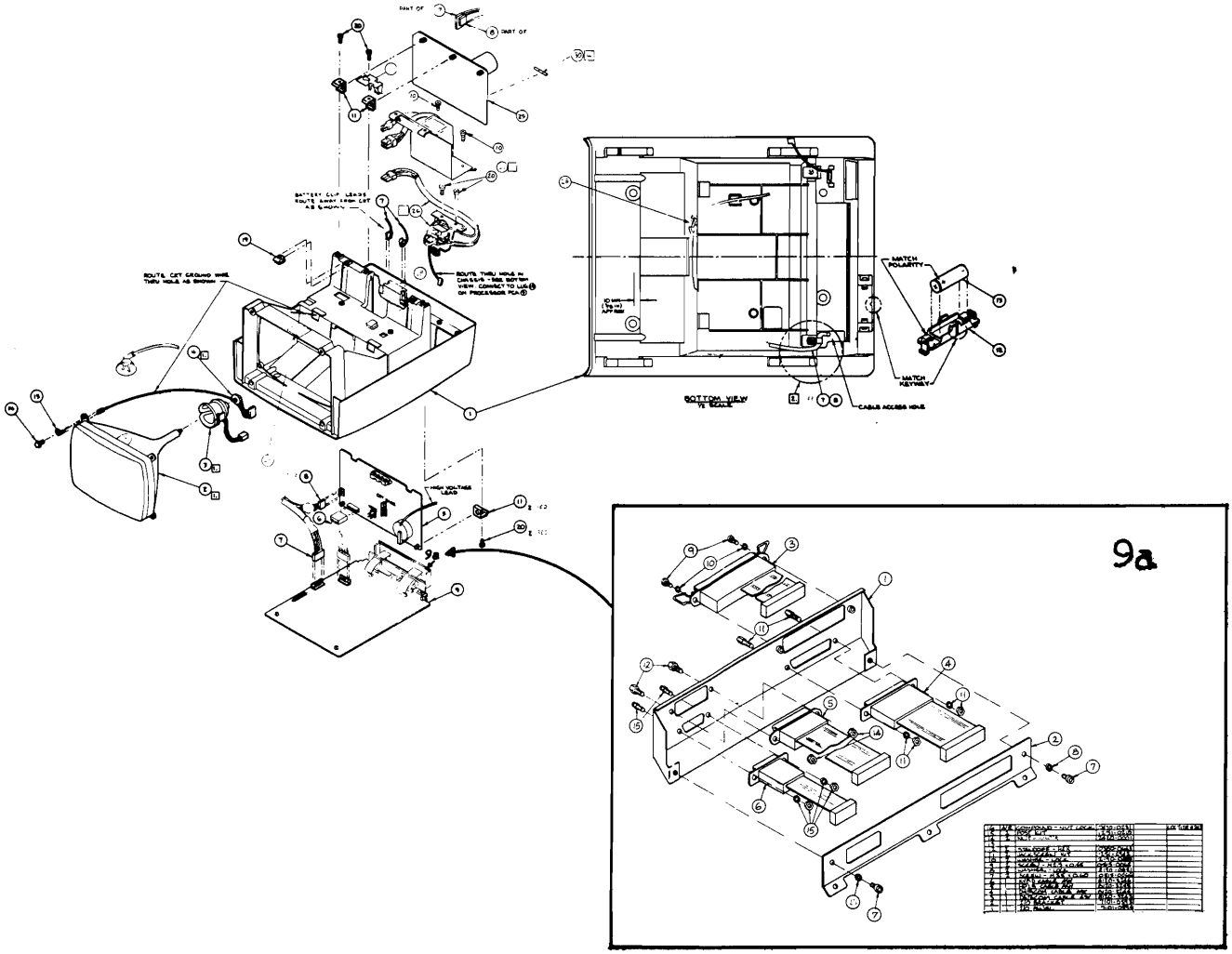
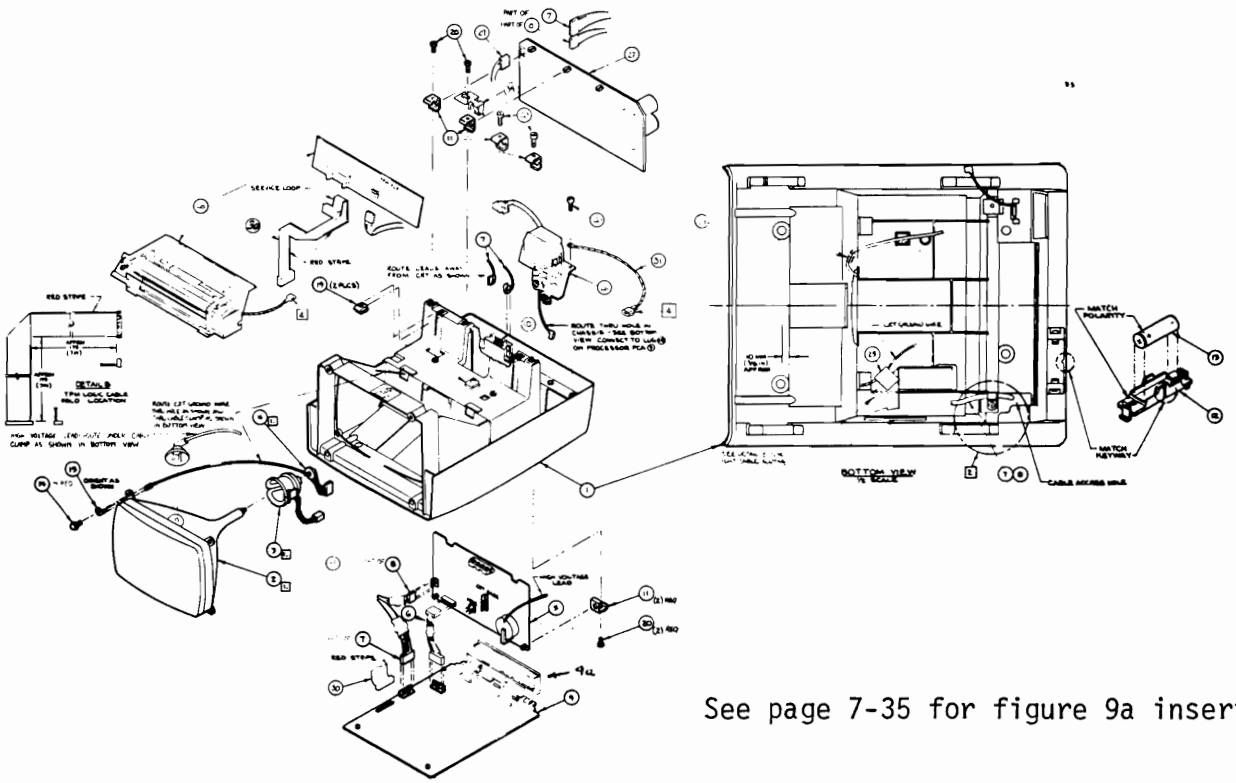


Figure 7-16A. Mainframe, Exploded View (Standard)



See page 7-35 for figure 9a insert.

Figure 7-16B. Mainframe, Exploded View (Option 050)

Table 7-2. Mainframe Module Assembly

FIG & INDEX NO.	UNITS PER ASSY: Standard	UNITS PER ASSY: Option 050	HP PART NO.	DESCRIPTION
7-16-				
1	1	1	4040-1486	Chassis
2 & 3	1	1	45701-63001	White CRT/YOKE Assembly
	1	1	45701-63002	Green CRT/YOKE Assembly
2	1	1	2090-0060	White Cathode Ray Tube(CRT)
	1	1	2090-0038	Green CRT
3	1	1	9100-4159	Yoke, Deflection
4	1	1	02620-60009	CRT Base Cable Assembly
14	4	4	0624-0524	Screws for the CRT
	4	4	02620-40064	CRT Spacers
15	1	1	0360-1934	Lug, quick disconnect
	1	1	02620-40008	Bezel (125)
	1	1	45500-40001	Bezel (Series 100)
	1	1	7121-2057	Name Plate (HP 125)
20	8	4	0624-0413	Screw, tapping
				--- X ---
5	1	1	02620-60182	Sweep PCA
8	1	1	02620-60022	Sweep Power Cable Assembly
6	1	1	02620-60010	Video Cable Assembly
				--- X ---
9	1	1	45500-60085	Processor PCA (125)
				(Attaching Parts)
	7	10	1390-0104	Snap Fastener Insert
	7	10	1390-0281	Tall Snap Fastener
7	1	1	02620-60021	Logic Power Cable Assembly
9a	1	1	45500-62095	I/O Panel Assembly
	3	3	0515-0066	Screw, machine
	3	3	2190-0007	Lockwasher
	1	1	0360-1263	Lug, quick discon, rt.angle
				--- X ---
12	1	1	1400-0965	Battery Support
13	1	1	45701-63003	3.5V Battery with sleeve
				--- X ---
26	1		02620-62006	Power Panel Assembly Filter
27	1	1	02620-60205	Transformer Assembly
25	1		02620-60199	65 Watt Power Supply PCA
	1		02110-0002	Fuse, 2.0A, (Standard)
	1		02110-0001	Fuse, 1.0A,(Opt. 13,15)
	1		02110-0083	Fuse, 2.5A, (Opt. 014,016)
				--- X ---

Table 7-2. Mainframe Module Assembly (Continued)

FIG & INDEX NO.	UNITS PER ASSY: Standard	UNITS PER ASSY: Option 050	HP PART NO.	DESCRIPTION
7-16-				
				--- X ---
11	4	6	1600-0886	Bracket, PC Board
20	8	8	0624-0413	Screw, tapping, 8-16 x 1/2
19	2	2	1390-0464	Quarter-Turn Receptacle
				--- X ---
		1	02620-60183	120 Watt Power Supply PCA
		1	2110-0010	Fuse, 5A, 250V
		1	2110-0083	Fuse, 2.5A, 250V (used for option 015)
29		1	02620-60013	TPM Power Cable Assembly
30		1	8120-2805	TPM Cable
25	2	3	1400-0611	Cable Clasp
31	1	1	02620-60172	Fan Cable Assembly
31	1	1	3160-0208	Fan (51 CFM)
28		1	02670-40003	TPM Mainframe
31			02620-60081	Ground Strap Assembly
	1	1	8730-0016	Tuning Wand
	1	1	8120-1378	Power Cord Set, N-FCE22 (Standard)
	1	1	8120-1351	Power Cord Set, BS1363/CCC (option 900)
	1	1	8120-1369	Power Cord Set, ASCII2/CEE (option 901)
	1	1	8120-1689	Power Cord, M-FCE22 (option 902)
	1	1	8120-2104	Power Cord Set, SEV/CEE (option 906)
	1	1	8120-2956	Power Cord Set, DEMKO (option 912)
Note 1			13222-60003	13222C (RS232C) Cable
Note 1			13222-60001	13222N US Modem Cable
Note 1			13222-60002	13222M European Modem Cable
Note 1			13222-60007	13222W HP 300 Cable
Note 1			13222-60005	13222Y Three Wire Cable

Table 7-2. Mainframe Module Assembly (Continued)

FIG & INDEX NO.	UNITS PER ASSY		HP PART NO.	DESCRIPTION
	Standard	Option 050		
Note 1			13242-60010	13242G RS232 Printer Cable Male
Note 1			13242-60009	13242H RS232 Printer Cable, Female
Note 1			13242-60002	13242M European Modem Cable
Note 1			13242-60001	13242N US Modem Cable
Note 1			13242-60005	13242Y E.M.P. Protection Cable, Male
				--- X ---
	1	1	8120-1378	Power Cord Set, NEMA5/CEE (Standard)
Note 1			13222-60003	13222C (RS232C) Cable
Note 1			13222-60001	13222N US Modem Cable
Note 1			13222-60002	13222M European Modem Cable

Note 1. Data Communications Cable (refer to Installation Section for fabrication and parts information).

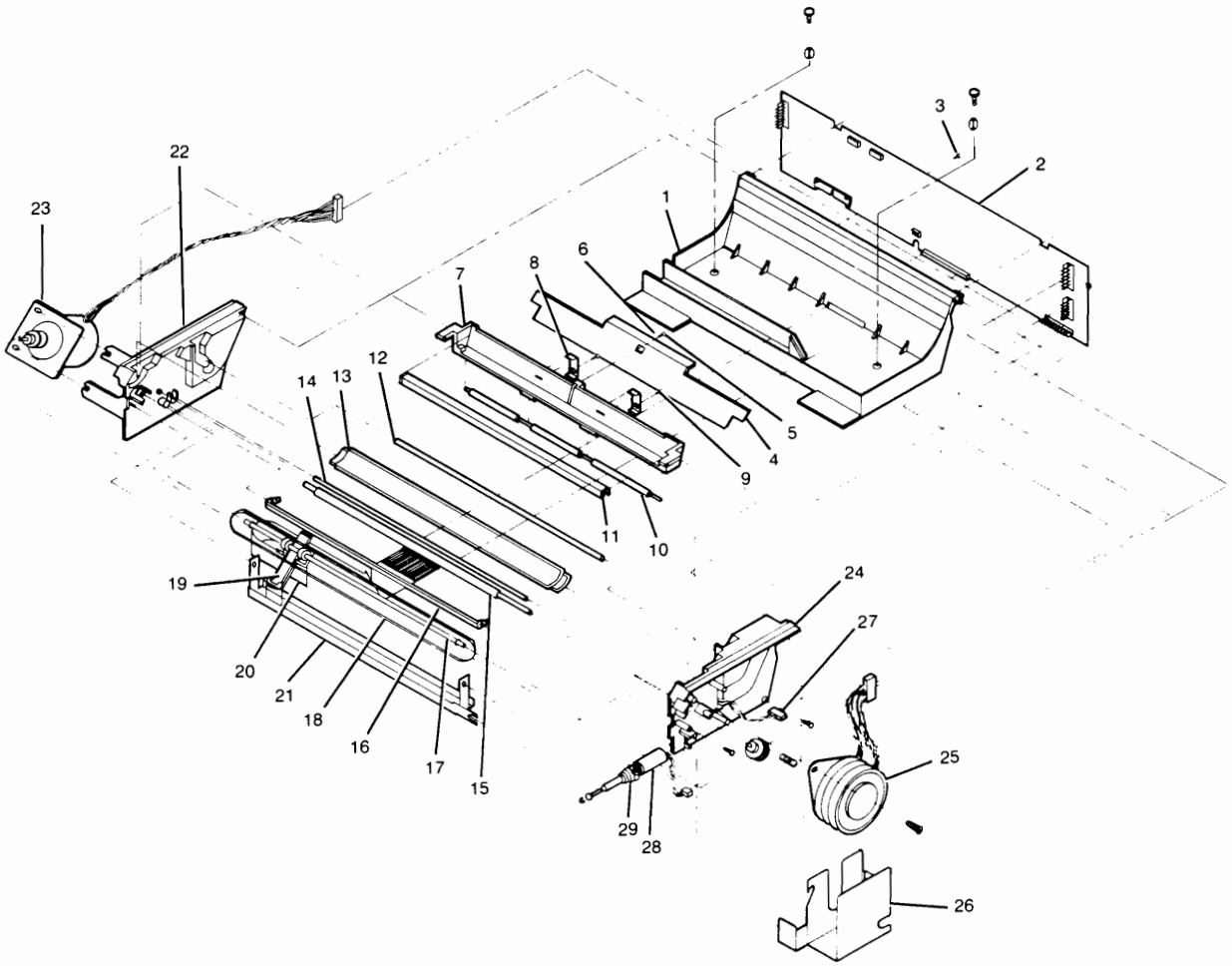


Figure 7-17. TPM, Exploded View

Table 7-3. Thermal Print Mechanism

FIG & INDEX NO.	UNITS PER ASSY.	HP PART NO.	DESCRIPTION
7-17-	1	02670-60015	*Thermal Print Mechanism (TPM)
1	1	02670-40003	*Mainframe (Attaching Parts)
1a	2	1390-0450	*Shot Fastener
1b	2	1390-0104	*Snap Fastener Insert
2	1	02670-60001*	*TPM PCA (Exchange Module)
3	3	2360-0125	*Screw, machine
4	1	1600-0758	*Door Latch
5	1	0624-0364	*Screw, no.4-20 x .25 in.
6	1	3050-0100	*Washer, flat, no.4
7	1	02670-60031	*Latching Frame Assembly
8	2	1600-0757	*Clip, platen holder
9	2	0624-0364	*Screw, tapping, no.2-28
10	1	1531-0021	*Shaft, idle roller
11	1	02670-60007	*Platen Assembly
12	1	1531-0019	*Rod, paper roll
13	1	02670-40007	*Tear Window
14	1	1531-0022	*Rod, removeable
15	1	1530-2154	*Shaft, rubber drive
16	1	1600-0756	*Guide, paper
	1	9270-0638	*Paper, Thermal
17	1	1531-0017	*Shaft, head carriage
18	1	1530-0520	*Belt, timing
19	1	02670-60014	*Print Head Cable Assembly
20	1	1600-0761	*Clip, head
21	1	1600-0755	*Guide,pressure
22	1	02670-40001	*Plate, left end
23	1	02670-60002	*Motor, Print Head Assembly
24	1	02670-40002	*Plate, right end
25	1	3140-0613	*Motor, Paper Step
26	1	8160-0309	*Shield, Magnetic
27	1	02670-60005	*Microswitch Assembly
28	1	02670-60004	*Solenoid Assembly
29	1	1460-1683	*Spring, Solenoid

Note* National options must use TPM PCA 02670-60050

Notes:
* Exchange Module
** These components or assemblies must be removed

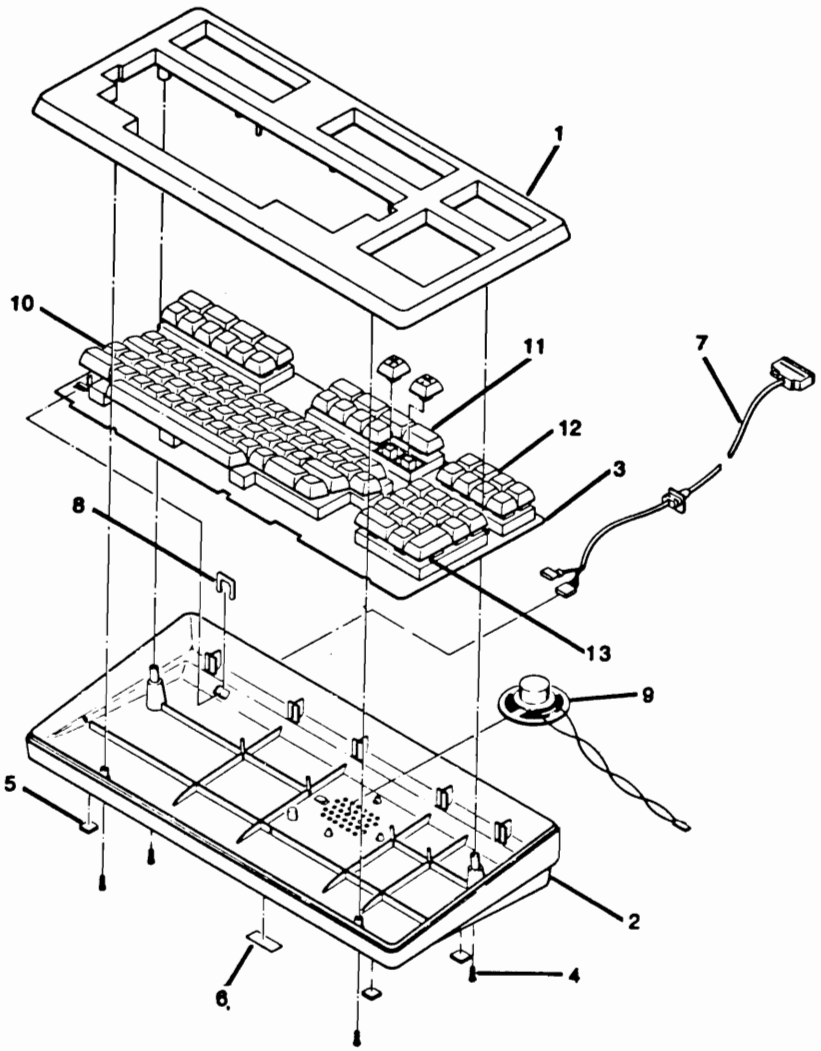


Figure 7-18. Keyboard Assembly

Table 7-4. Keyboard Assembly

FIG & INDEX NO.	UNITS PER ASSY: Standard	UNITS PER ASSY: Option 050	HP PART NO.	DESCRIPTION
7-18-				
1	1	1	02620-40012	**Keyboard Top 125A
2	1	1	02620-40011	**Keyboard Base 125A
			7101-0729	**Top Keyboard 125B
			7101-0711	**Keyboard Base 125B
4	1	1	02620-69061	**Extended Keyboard PCA
	1	1	45500-60061	Extended Keyboard PCA with sculpted keycaps
			02620-69058	European Extended Keyboard PCA
	4	4	0624-0400	**Screw,Tapping,no.6-19
6	4	4	0403-0285	**Rubber Bumper
9	1	1	7120-1927	**Serial Tag
3	1	1	02620-60028	**Keyboard Cable Assembly
8	1	1	1600-0767	**Retainer, Cable
5	1	1	02620-60016	**Loudspeaker Assembly
			7120-3428	@CSA Label
			7120-7404	@@PTB X-RAY Label
			7121-1305	@FCC Label
			7121-1840	@UL Label
			7121-2425	Back Panel into Label
				Refer to keyboard diagrams for additional information.

Notes:
** These components or assemblies must be removed
@ US/Canada (100V/120V Shipments)
@@ European (220V/240V Shipments)

Table 7-5. Standard Keycaps

UNITS PER ASSY	HP PART NO.	DESCRIPTION
1	0371-1219	** A Keycap
1	0371-1220	** B Keycap
1	0371-1221	** C Keycap
1	0371-1222	** D Keycap
1	0371-1223	** E Keycap
1	0371-1224	** F Keycap
1	0371-1225	** G Keycap
1	0371-1226	** H Keycap
1	0371-2016	** I Keycap
1	0371-2017	** J Keycap
1	0371-2018	** K Keycap
1	0371-2019	** L Keycap
1	0371-2020	** M Keycap
1	0371-1232	** N Keycap
1	0371-2021	** O Keycap
1	0371-1234	** P Keycap
1	0371-1235	** Q Keycap
1	0371-1236	** R Keycap
1	0371-1237	** S Keycap
1	0371-1238	** T Keycap
1	0371-2022	** U Keycap
1	0371-1240	** V Keycap
1	0371-1241	** W Keycap
1	0371-1242	** X Keycap
1	0371-1243	** Y Keycap
1	0371-1244	** Z Keycap
1	0371-1245	** 1 ! Keycap
1	0371-1246	** 2 @ Keycap
1	0371-1247	** 3 # Keycap
1	0371-1248	** 4 $ Keycap
1	0371-1249	** 5 % Keycap
1	0371-1250	** 6 ^ Keycap

UNITS PER ASSY	HP PART NO.	DESCRIPTION
1	0371-1251	** 7 & Keycap
1	0371-1252	** 8 * Keycap
1	0371-1253	** 9 (Keycap
1	0371-1254	** 0) Keycap
1	0371-1255	** - _ Keycap
1	0371-1256	** = + Keycap
1	0371-1257	** ` ~ Keycap
1	0371-1258	** [{ Keycap
1	0371-1259	**] } Keycap
1	0371-1260	** \ Keycap
1	0371-1261	** ; : Keycap
1	0371-1262	** ' " Keycap
1	0371-1263	** , < Keycap
1	0371-1264	** . > Keycap
1	0371-1265	** / ? Keycap
1	0371-1267	** BACKSPACE Keycap
1	0371-1268	** CAPS Keycap
1	0371-1269	** CTRL Keycap
1	0371-1270	** ENTER Keycap
1	0371-1995	** BREAK Keycap
1	0371-1273	** TAB Keycap
1	0371-1274	** SHIFT Keycap
1	0371-1275	** RETURN Keycap
1	0371-1277	** Space Bar Keycap
1	0371-1971	** ↑ (Homeup) Keycap
1	0371-2031	** ROLL ^ Keycap
1	0371-2032	** ROLL V Keycap
4	0371-1970	** Cursor Keycap
1	0371-1973	f1
1	0371-1974	f2
1	0371-1975	f3
1	0371-1976	f4

UNITS PER ASSY	HP PART NO.	DESCRIPTION
1	0371-1977	f5
1	0371-1978	f6
1	0371-1979	f7
1	0371-1980	f8
1	0371-1981	ESC
1	0371-1982	DEL
1	0371-1983	TAB LEFT
1	0371-1984	TAB RIGHT
1	0371-1985	0
1	0371-1986	NEXT PAGE
1	0371-1987	PREV PAGE
1	0371-1990	INS LINE
1	0371-1991	DEL LINE
1	0371-1992	INS CHAR
1	0371-1993	DEL CHAR
1	0371-1994	CLEAR DSPLY
1	0371-1996	RESET
1	0371-1997	1
1	0371-1998	2
1	0371-1999	3
1	0371-2000	4
1	0371-2001	5
1	0371-2003	7
1	0371-2004	8
1	0371-2006	– (MINUS)
1	0371-2007	. (PERIOD)
1	0371-2013	AIDS
1	0371-2015	CLEAR LINE
1	0371-2029	MODES
1	0371-2030	USER KEYS
2	0371-2081	6 and 9

Table 7-6. Standard Keycaps

UNITS PER ASSY	HP PART NO.	DESCRIPTION
1	0371-1219	** A Keycap
1	0371-1220	** B Keycap
1	0371-1221	** C Keycap
1	0371-1222	** D Keycap
1	0371-1223	** E Keycap
1	0371-1224	** F Keycap
1	0371-1225	** G Keycap
1	0371-1226	** H Keycap
1	0371-2016	** I Keycap
1	0371-2017	** J Keycap
1	0371-2018	** K Keycap
1	0371-2019	** L Keycap
1	0371-2020	** M Keycap
1	0371-1232	** N Keycap
1	0371-2021	** O Keycap
1	0371-1234	** P Keycap
1	0371-1235	** Q Keycap
1	0371-1236	** R Keycap
1	0371-1237	** S Keycap
1	0371-1238	** T Keycap
1	0371-2022	** U Keycap
1	0371-1240	** V Keycap
1	0371-1241	** W Keycap
1	0371-1242	** X Keycap
1	0371-1243	** Y Keycap
1	0371-1244	** Z Keycap
1	0371-1245	** 1 ! Keycap
1	0371-1864	** 2 " Keycap
1	0371-1248	** 4 $ Keycap

UNITS PER ASSY	HP PART NO.	DESCRIPTION
1	0371-1249	** 5 % Keycap
1	0371-1865	** 8 (Keycap
1	0371-1866	** 9) Keycap
1	0371-1867	** 0 = Keycap
1	0371-1868	** , ; Keycap
1	0371-1869	** . : Keycap
1	0371-1874	** < > Keycap
1	0371-1255	** - __ Keycap
1	0371-1267	** BACKSPACE Keycap
1	0371-1268	** CAPS Keycap
1	0371-1269	** CTRL Keycap
1	0371-1270	** ENTER Keycap
1	0371-1273	** TAB Keycap
1	0371-1274	** SHIFT Keycap
1	0371-1275	** RETURN Keycap
1	0371-1277	** Space Bar Keycap
1	0371-1971	** Home Keycap
1	0371-2031	** ROLL ^ Keycap
1	0371-2032	** ROLL v Keycap
4	0371-1970	** Cursor Keycap
1	0371-1973	f1
1	0371-1974	f2
1	0371-1975	f3
1	0371-1976	f4
1	0371-1977	f5
1	0371-1978	f6
1	0371-1979	f7
1	0371-1980	f8

UNITS PER ASSY	HP PART NO.	DESCRIPTION
1	0371-1981	ESC
1	0371-1982	DEL
1	0371-1983	TAB LEFT
1	0371-1984	TAB RIGHT
1	0371-1985	0
1	0371-1986	NEXT PAGE
1	0371-1987	PREV PAGE
1	0371-1990	INS LINE
1	0371-1991	DEL LINE
1	0371-1992	INS CHAR
1	0371-1993	DEL CHAR
1	0371-1994	CLEAR DSPLY
1	0371-1995	BREAK
1	0371-1996	RESET
1	0371-1997	1
1	0371-1998	2
1	0371-1999	3
1	0371-2000	4
1	0371-2001	5
1	0371-2003	7
1	0371-2004	8
1	0371-2006	– (MINUS)
1	0371-2007	. (PERIOD)
1	0371-2013	AIDS
1	0371-2015	CLEAR LINE
1	0371-2029	MODES
1	0371-2030	USER KEYS
2	0371-2081	6 and 9

Table 7-7. Standard Keycaps Unique to Each Language

UNITS PER ASSY	HP PART NO.	DESCRIPTION
Swedish/Finnish Option — Option Number 001		
1	0371-1247	** 3 # Keycap
1	0371-1870	** 6 & Keycap
1	0371-1871	** 7 / Keycap
1	0371-1872	** + ? Keycap
1	0371-1873	** É Keycap
1	0371-1875	** Å Keycap
1	0371-1876	** Ü Keycap
1	0371-1877	** ' * Keycap
1	0371-1878	** Ö Keycap
1	0371-1879	** Ä Keycap
French Option — Option Number 003		
1	0371-1871	** 7 / Keycap
1	0371-1883	** 3 § Keycap
1	0371-1884	** 6 + Keycap
1	0371-1885	** ' ? Keycap
1	0371-1886	** ^ ¨ Keycap
1	0371-1887	** ` £ Keycap
1	0371-1888	** à ç Keycap
1	0371-1889	** & * Keycap
1	0371-1890	** é è Keycap
1	0371-1891	** ù o Keycap
United Kingdom Option — Option Number 005		
1	0371-1257	** ` ~ Keycap
1	0371-1258	** [{ Keycap
1	0371-1259	**] } Keycap
1	0371-1260	** \ | Keycap
1	0371-1870	** 6 & Keycap
1	0371-1872	** + ? Keycap
1	0371-1896	** 3 £ Keycap
1	0371-1897	** 7 ^ Keycap
1	0371-1898	** ' / Keycap
1	0371-1899	** * @ Keycap

UNITS PER ASSY	HP PART NO.	DESCRIPTION
Danish/Norwegian Option — Option Number 002		
1	0371-1247	** 3 # Keycap
1	0371-1257	** \ ~ Keycap
1	0371-1870	** 6 & Keycap
1	0371-1871	** 7 / Keycap
1	0371-1872	** + ? Keycap
1	0371-1875	** Å Keycap
1	0371-1877	** ' * Keycap
1	0371-1880	** @ ^ Keycap
1	0371-1881	** Æ Keycap
1	0371-1882	** Ø Keycap
German Option — Option Number 004		
1	0371-1870	** 6 & Keycap
1	0371-1871	** 7 / Keycap
1	0371-1876	** Ü Keycap
1	0371-1878	** Ö Keycap
1	0371-1879	** Ä Keycap
1	0371-1883	** 3 § Keycap
1	0371-1892	** ß ? Keycap
1	0371-1893	** ' ` Keycap
1	0371-1894	** £ ^ Keycap
1	0371-1895	** + * Keycap
Spanish Option — Option Number 006		
1	0371-1257	** ` ~ Keycap
1	0371-1870	** 6 & Keycap
1	0371-1872	** + ? Keycap
1	0371-1898	** ' / Keycap
1	0371-1899	** * @ Keycap
1	0371-1900	** 3 ¿ Keycap
1	0371-1901	** 7 ¡ Keycap
1	0371-1902	** o { Keycap
1	0371-1903	** # } Keycap
1	0371-1904	** ñ Keycap

Figure 7-19. 125A Option 001 Keyboard

Figure 7-20. 125A Option 002 Keyboard

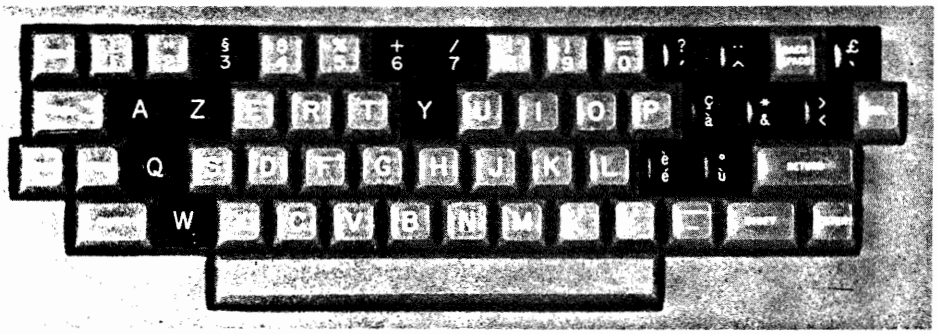


Figure 7-21. 125A Option 003 Keyboard

Figure 7-22. 125A Option 004 Keyboard

Figure 7-23. 125A Option 005 Keyboard

Figure 7-24. 125A Option 006 Keyboard

Table 7-8. Sculptured Keycaps (for the 125B)

UNITS PER ASSY	HP PART NO.	DESCRIPTION
1	0371-3211	A Keycap
1	0371-3269	B Keycap
1	0371-3267	C Keycap
1	0371-3213	D Keycap
1	0371-3222	E Keycap
1	0371-3207	F Keycap
1	0371-3214	G Keycap
1	0371-3215	H Keycap
1	0371-3227	I Keycap
1	0371-3208	J Keycap
1	0371-3216	K Keycap
1	0371-3217	L Keycap
1	0371-3271	M Keycap
1	0371-3270	N Keycap
1	0371-3228	O Keycap
1	0371-3229	P Keycap
1	0371-3220	Q Keycap
1	0371-3223	R Keycap
1	0371-3212	S Keycap
1	0371-3224	T Keycap
1	0371-3226	U Keycap
1	0371-3268	V Keycap
1	0371-3221	W Keycap
1	0371-3266	X Keycap
1	0371-3225	Y Keycap
1	0371-3265	Z Keycap
1	0371-3193	1 ! Keycap
1	0371-3194	2 @ Keycap
1	0371-3195	3 # Keycap
1	0371-3196	4 $ Keycap
1	0371-3197	5 % Keycap
1	0371-3198	6 ^ Keycap
1	0371-3206	7 & Keycap
1	0371-3199	8 * Keycap
1	0371-3200	9 (Keycap
1	0371-3201	0) Keycap

UNITS PER ASSY	HP PART NO.	DESCRIPTION
1	0371-3202	- _ Keycap
1	0371-3203	= + Keycap
1	0371-3205	` ~ Keycap
1	0371-3230	[{ Keycap
1	0371-3231	] } Keycap
1	0371-3232	\ Keycap
1	0371-3218	; : Keycap
1	0371-3219	' " Keycap
1	0371-3272	, < Keycap
1	0371-3273	. > Keycap
1	0371-3274	/ ? Keycap
1	0371-3371	BACKSPACE Keycap
1	0371-3209	CAPS Keycap
1	0371-3210	CTRL Keycap
1	0371-3275	ENTER Keycap
1	0371-3369	BREAK Keycap
1	0371-3370	TAB Keycap
1	0371-3191	SHIFT Keycap
1	0371-3374	RETURN Keycap
1	0371-3276	Space Bar Keycap
1	0371-3250	(Homeup) Keycap
1	0371-3256	ROLL Keycap
1	0371-3255	ROLL Keycap
1	0371-3251	∧ Keycap
1	0371-3252	< Keycap
1	0371-3253	> Keycap
1	0371-3254	∨ Keycap
1		
1		
1		
1		
1		
1		
1		
1		
1		

UNITS PER ASSY	HP PART NO.	DESCRIPTION
1	0371-3192	ESC
1	0371-3233	DEL
1	0371-3372	TAB LEFT
1	0371-3373	TAB RIGHT
1	0371-3299	0
1	0371-3248	NEXT PAGE
1	0371-3249	PREV PAGE
1	0371-3261	INS LINE
1	0371-3262	DEL LINE
1	0371-3257	INS CHAR
1	0371-3258	DEL CHAR
1	0371-3260	CLEAR DSPLY
1	0371-3264	RESET
1	0371-3235	1
1	0371-3236	2
1	0371-3237	3
1	0371-3238	4
1	0371-3302	5
1	0371-3241	7
1	0371-3242	8
1	0371-3244	- (MINUS)
1	0371-3234	. (PERIOD)
1	0371-3245	AIDS
1	0371-3259	CLEAR LINE
1	0371-3246	MODES
1	0371-3247	USER KEYS
1	0371-3239	6
1	0371-3243	9
1	0371-3304	f1
1	0371-3305	f2
1	0371-3293	f3
1	0371-3294	f4
1	0371-3295	f5
1	0371-3296	f6
1	0371-3297	f7
1	0371-3201	f8

Table 7-9. Common Sculptured Keycaps to National Option Keyboards (for the 125B)

UNITS PER ASSY	HP PART NO.	DESCRIPTION
1	0371-3269	B Keycap
1	0371-3267	C Keycap
1	0371-3213	D Keycap
1	0371-3222	E Keycap
1	0371-3207	F Keycap
1	0371-3214	G Keycap
1	0371-3215	H Keycap
1	0371-3227	I Keycap
1	0371-3208	J Keycap
1	0371-3216	K Keycap
1	0371-3217	L Keycap
1	0371-3271	M Keycap
1	0371-3270	N Keycap
1	0371-3228	O Keycap
1	0371-3229	P Keycap
1	0371-3223	R Keycap
1	0371-3212	S Keycap
1	0371-3224	T Keycap
1	0371-3225	U Keycap
1	0371-3268	V Keycap
1	0371-3266	X Keycap
1	0371-3193	1 ! Keycap
1	0371-3376	2 " Keycap
1	0371-3196	4 $ Keycap

UNITS PER ASSY	HP PART NO.	DESCRIPTION
1	0371-3197	5 % Keycap
1	0371-3379	8 (Keycap
1	0371-3380	9) Keycap
1	0371-3381	0 = Keycap
1	0371-3307	<> Keycap
1	0371-3396	- _ Keycap
1	0371-3371	BACKSPACE Keycap
1	0371-3370	TAB Keycap
1		SHIFT Keycap
1	0371-3374	RETURN Keycap
1	0371-3276	Space Bar Keycap
1	0371-3250	(Home) Keycap
1	0371-3251	∧ (cur up) Keycap
1	0371-3252	< (cur lt) Keycap
1	0371-3253	> (cur rt) Keycap
1	0371-3254	∨ (cur dn) Keycap
1		
1		
1		
1		
1		
1		
1		
1		
1		

UNITS PER ASSY	HP PART NO.	DESCRIPTION
1	0371-3192	ESC
1	0371-3372	TAB LEFT
1	0371-3373	TAB RIGHT
1	0371-3299	0
1	0371-3369	BREAK (HAND)
1	0371-3235	1
1	0371-3236	2
1	0371-3237	3
1	0371-3238	4
1	0371-3302	5
1	0371-3241	7
1	0371-3242	8
1	0371-3244	– (MINUS)
1	0371-3234	. (PERIOD)
1	0371-3239	6
1	0371-3243	9
1	0371-3304	f1
1	0371-3305	f2
1	0371-3293	f3
1	0371-3294	f4
1	0371-3295	f5
1	0371-3296	f6
1	0371-3297	f7
1	0371-3201	f8

Table 7-10. Keycaps Unique to Each Language Option (for the 125B)

UNITS PER ASSY	HP PART NO.	DESCRIPTION
Standard Swedish System — Option Number 001		
2	0371-3191	Keycap SHIFT
1	0371-3195	Keycap #/3
1	0371-3209	Keycap CAPS
1	0371-3210	Keycap CTRL
1	0371-3211	Keycap A
1	0371-3220	Keycap Q
1	0371-3221	Keycap W
1	0371-3225	Keycap Y
1	0371-3233	Keycap DEL
1	0371-3245	Keycap AIDS
1	0371-3246	Keycap "MODES"
1	0371-3247	Keycap "USERS KEYS"
1	0371-3248	Keycap NEXT/PAGE
1	0371-3249	Keycap PREV/PAGE
1	0371-3255	Keycap ROLL/DOWN
1	0371-3256	Keycap ROLL/UP
1	0371-3257	Keycap INS/CHAR
1	0371-3258	Keycap DEL/CHAR
1	0371-3259	Keycap CLEAR/LINE
1	0371-3260	Keycap CLEAR/DISPLAY
1	0371-3261	Keycap INS/LINE
1	0371-3262	Keycap DEL/LINE
1	0371-3264	Keycap RESET
1	0371-3265	Keycap Z
1	0371-3275	Keycap ENTER
1	0371-3377	Keycap 6 &
1	0371-3378	Keycap 7 /
1	0371-3382	Keycap + ?
1	0371-3383	Keycap É
1	0371-3384	Keycap Å
1	0371-3385	Keycap ü
1	0371-3386	Keycap Ö
1	0371-3387	Keycap Ä
1	0371-3390	Keycap ´/*
Standard French System — Option 003		
2	0371-3191	Keycap SHIFT
1	0371-3397	Keycap £3
1	0371-3209	Keycap CAPS
1	0371-3210	Keycap CTRL
1	0371-3225	Keycap Y
1	0371-3233	Keycap DEL
1	0371-3245	Keycap AIDS
1	0371-3246	Keycap "MODES"
1	0371-3247	Keycap "USERS KEYS"
1	0371-3248	Keycap NEXT/PAGE
1	0371-3249	Keycap PREV/PAGE
1	0371-3255	Keycap ROLL/DOWN
1	0371-3256	Keycap ROLL/UP
1	0371-3257	Keycap INS/CHAR
1	0371-3258	Keycap DEL/CHAR
1	0371-3259	Keycap CLEAR/LINE
1	0371-3260	Keycap CLEAR/DISPLAY
1	0371-3261	Keycap INS/LINE
1	0371-3262	Keycap DEL/LINE
1	0371-3264	Keycap RESET
1	0371-3368	Keycap Z
1	0371-3275	Keycap ENTER
1	0371-3378	Keycap ´/7
1	0371-3398	Keycap ?/ ´
1	0371-3399	Keycap ¨/ ^
1	0371-3310	Keycap £/ `
1	0371-3392	Keycap c/ à
1	0371-3393	Keycap */&
1	0371-3401	Keycap è/é
1	0371-3337	Keycap o/ ù
1	0371-3389	Keycap +/6
1	0371-3400	Keycap Q
1	0371-3338	Keycap W
1	0371-3391	Keycap A

UNITS PER ASSY	HP PART NO.	DESCRIPTION
Standard Norwegian System — Option Number 002		
2	0371-3191	Keycap SHIFT
1	0371-3195	Keycap #/3
1	0371-3205	Keycap "~"/"\"
1	0371-3209	Keycap CAPS
1	0371-3210	Keycap CTRL
1	0371-3211	Keycap A
1	0371-3220	Keycap Q
1	0371-3221	Keycap W
1	0371-3225	Keycap Y
1	0371-3233	Keycap DEL
1	0371-3245	Keycap AIDS
1	0371-3246	Keycaq "MODES"
1	0371-3247	Keycap "USERS KEYS"
1	0371-3248	Keycap NEXT/PAGE
1	0371-3249	Keycap PREV/PAGE
1	0371-3255	Keycap ROLL/DOWN
1	0371-3256	Keycap ROLL/UP
1	0371-3257	Keycap INS/CHAR
1	0371-3258	Keycap DEL/CHAR
1	0371-3259	Keycap CLEAR/LINE
1	0371-3260	Keycap CLEAR/DISPLAY
1	0371-3261	Keycap INS/LINE
1	0371-3262	Keycap DEL/LINE
1	0371-3264	Keycap RESET
1	0371-3265	Keycap Z
1	0371-3275	Keycap ENTER
1	0371-3377	Keycap 6 &
1	0371-3378	Keycap 7 /
1	0371-3382	Keycap + ?
1	0371-3384	Keycap Å
1	0371-3388	Keycap @ ^
1	0371-3390	Keycap ´/*
1	0371-3394	Keycap Æ
1	0371-3395	Keycap Ø
Standard German System — Option 004		
1	0371-3211	Keycap A
1	0371-3220	Keycap Q
1	0371-3221	Keycap W
1	0371-3233	Keycap DEL
1	0371-3264	Keycap RESET
1	0371-3308	Keycap ^ £
1	0371-3339	Keycap +/ZEILE
1	0371-3340	Keycap −/ZEILE
1	0371-3341	Keycap TERM MENU
1	0371-3342	Keycap MODUS
1	0371-3343	Keycap PROG MENU
1	0371-3344	Keycap /SEITE PG
1	0371-3345	Keycap /SEITE PG
1	0371-3346	Keycap /ZEILE PG
1	0371-3347	Keycap /ZEILE PG
1	0371-3348	Keycap +/ZEICH PG
1	0371-3349	Keycap −/ZEICH PG
1	0371-3350	Keycap CLR LINE PG
1	0371-3351	Keycap CLEAR/DISPLAY
1	0371-3352	Keycap ? ß
1	0371-3353	Keycap ` ´
1	0371-3354	Keycap +/*
1	0371-3355	Keycap BLANK
2	0371-3356	Keycap BLANK
1	0371-3357	Keycap KTRL
1	0371-3358	Keycap Y
1	0371-3359	Keycap SENDE
1	0371-3368	Keycap Z
1	0371-3377	Keycap & 6
1	0371-3378	Keycap 7 /
1	0371-3385	Keycap ü
1	0371-3386	Keycap ö
1	0371-3387	Keycap ä
1	0371-3397	Keycap 6 § 3

Table 7-11. Common Sculptured Keycaps to National Option Keyboards (for the 125B)

UNITS PER ASSY	HP PART NO.	DESCRIPTION
	Standard U. K. System — Option 005	
2	0371-3191	Keycap SHIFT
1	0371-3205	Keycap " ~"/"\"
1	0371-3209	Keycap CAPS
1	0371-3210	Keycap CTRL
1	0371-3211	Keycap A
1	0371-3220	Keycap Q
1	0371-3221	Keycap W
1	0371-3225	Keycap Y
1	0371-3230	Keycap "{"/"["
1	0371-3231	Keycap "}"/"]"
1	0371-3233	Keycap DEL
1	0371-3245	Keycap AIDS
1	0371-3246	Keycap "MODES"
1	0371-3247	Keycap "USERS KEYS"
1	0371-3248	Keycap NEXT/PAGE
1	0371-3249	Keycap PREV/PAGE
1	0371-3255	Keycap ROLL/DOWN
1	0371-3256	Keycap ROLL/UP
1	0371-3257	Keycap INS/CHAR
1	0371-3258	Keycap DEL/CHAR
1	0371-3259	Keycap CLEAR/LINE
1	0371-3260	Keycap CLEAR/DISPLAY
1	0371-3261	Keycap INS/LINE
1	0371-3262	Keycap DEL/LINE
1	0371-3264	Keycap RESET
1	0371-3265	Keycap Z
1	0371-3275	Keycap ENTER
1	0371-3360	Keycap 3 £
1	0371-3361	Keycap 7 ˆ
1	0371-3362	Keycap / ´
1	0371-3363	Keycap *⁄@
1	0371-3364	Keycap \ PG
1	0371-3377	Keycap 6 &
1	0371-3382	Keycap + ?
	Standard French System — Option 007	
2	0371-3191	Keycap SHIFT
1	0371-3397	Keycap §/3
1	0371-3209	Keycap CAPS
1	0371-3210	Keycap CTRL
1	0371-3225	Keycap Y
1	0371-3233	Keycap DEL
1	0371-3245	Keycap AIDS
1	0371-3246	Keycap "MODES"
1	0371-3247	Keycap "USERS KEYS"
1	0371-3248	Keycap NEXT/PAGE
1	0371-3249	Keycap PREV/PAGE
1	0371-3255	Keycap ROLL/DOWN
1	0371-3256	Keycap ROLL/UP
1	0371-3257	Keycap INS/CHAR
1	0371-3258	Keycap DEL/CHAR
1	0371-3259	Keycap CLEAR/LINE
1	0371-3260	Keycap CLEAR/DISPLAY
1	0371-3261	Keycap INS/LINE
1	0371-3262	Keycap DEL/LINE
1	0371-3264	Keycap RESET
1	0371-3265	Keycap Z
1	0371-3275	Keycap ENTER
1	0371-3378	Keycap / 7
1	0371-3398	Keycap ?/ ´
1	0371-3399	Keycap ¨/ ˆ
1	0371-3310	Keycap £ `
1	0371-3392	Keycap c/ à
1	0371-3393	Keycap *⁄&
1	0371-3401	Keycap é / é
1	0371-3337	Keycap o/ ù
1	0371-3389	Keycap +⁄6
1	0371-3220	Keycap Q
1	0371-3221	Keycap W
1	0371-3211	Keycap A

UNITS PER ASSY	HP PART NO.	DESCRIPTION
	Standard Spanish System — Option 006	
1	0371-3205	Keycap " ˚"/"\"
1	0371-3210	Keycap CTRL
1	0371-3211	Keycap A
1	0371-3220	Keycap Q
1	0371-3221	Keycap W
1	0371-3225	Keycap Y
1	0371-3265	Keycap Z
1	0371-3320	Keycap RESET PG
1	0371-3321	Keycap SELECCION
1	0371-3322	Keycap MODOS PG
1	0371-3323	Keycap PROG PG
1	0371-3324	Keycap PAG/SIG PG
1	0371-3325	Keycap PAG/ANT PG
1	0371-3326	Keycap /PASA PG
1	0371-3327	Keycap PASA/ PG
1	0371-3328	Keycap INSCAR PG
1	0371-3329	Keycap ELIMCAR PG
1	0371-3330	Keycap 3/? PG
1	0371-3331	Keycap 7/! PG
1	0371-3332	Keycap { ¨
1	0371-3333	Keycap # }
1	0371-3334	Keycap ELIM PG
1	0371-3335	Keycap Ñ
1	0371-3336	Keycap ENVIA PG
1	0371-3350	Keycap CLR LINE PG
1	0371-3351	Keycap CLEAR/DISPLAY
1	0371-3355	Keycap BLANK
2	0371-3356	Keycap BLANK
1	0371-3362	Keycap / ´
1	0371-3363	Keycap *⁄@
1	0371-3365	Keycap INS LINEA
1	0371-3366	Keycap ELIM LINEA
1	0371-3377	Keycap 6 &
1	0371-3382	Keycap + ?

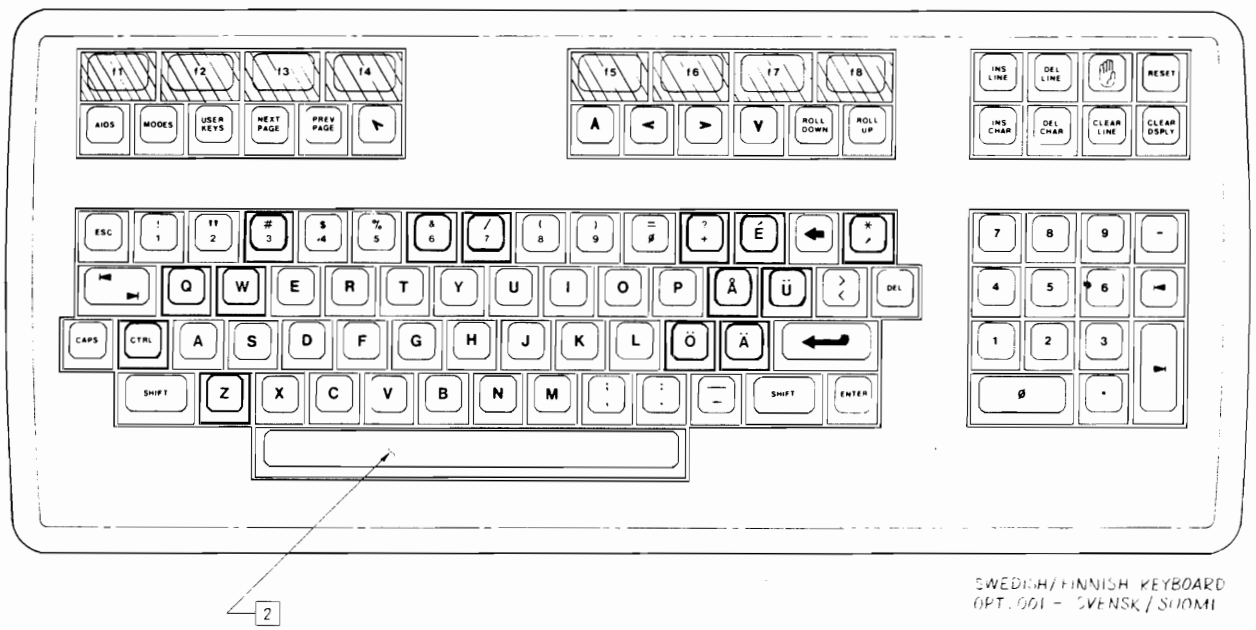


Figure 7-25. Swedish/Finnish Extended Keyboard (125B Option 001)

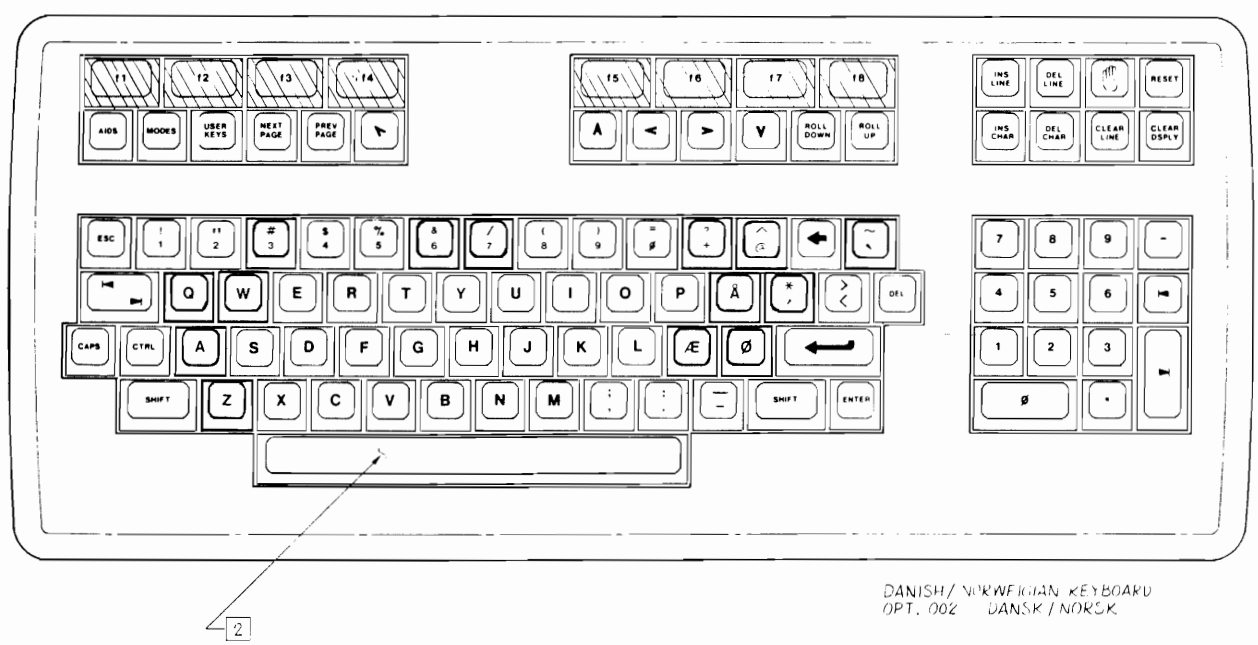


Figure 7-26. Danish/Norwegian Extended Keyboard (125B Option 002)

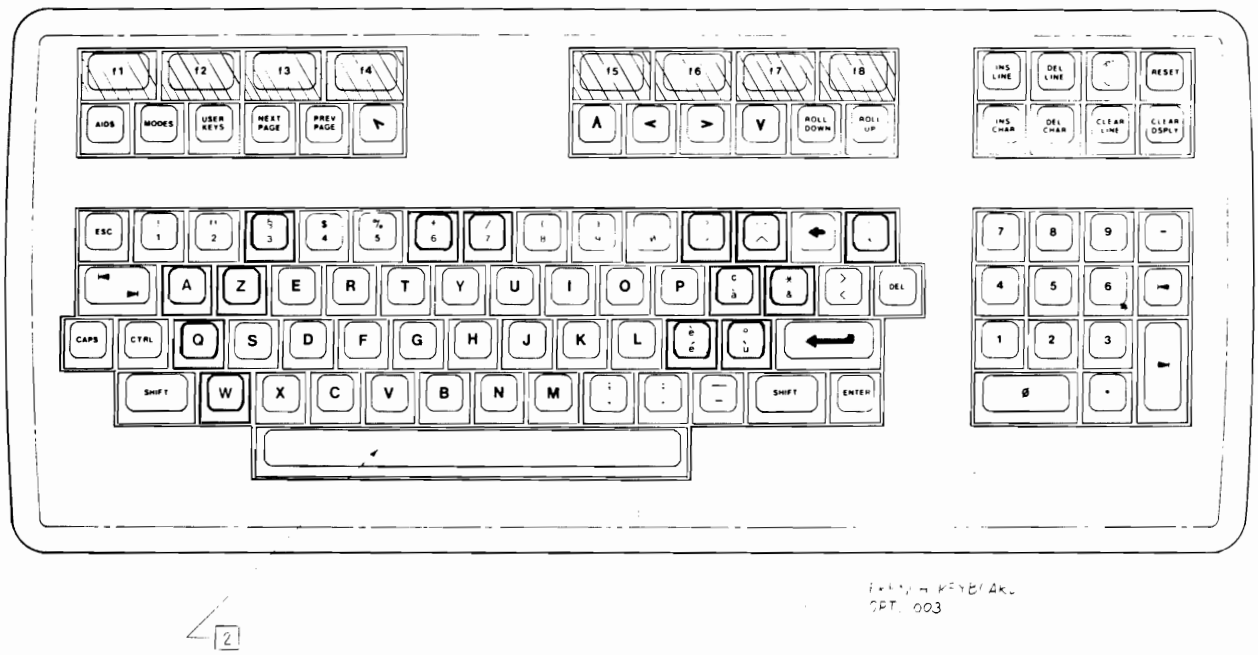
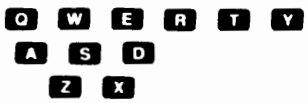


Figure 7-27. French (AZERTY) Extended Keyboard (125B Option 003)

The French keyboard can be configured to the following layout:



When this optional key layout is used, opt 007 (QWERTY) must be selected during the language configuration process. (Refer to the User and Reference manuals for additional information.)

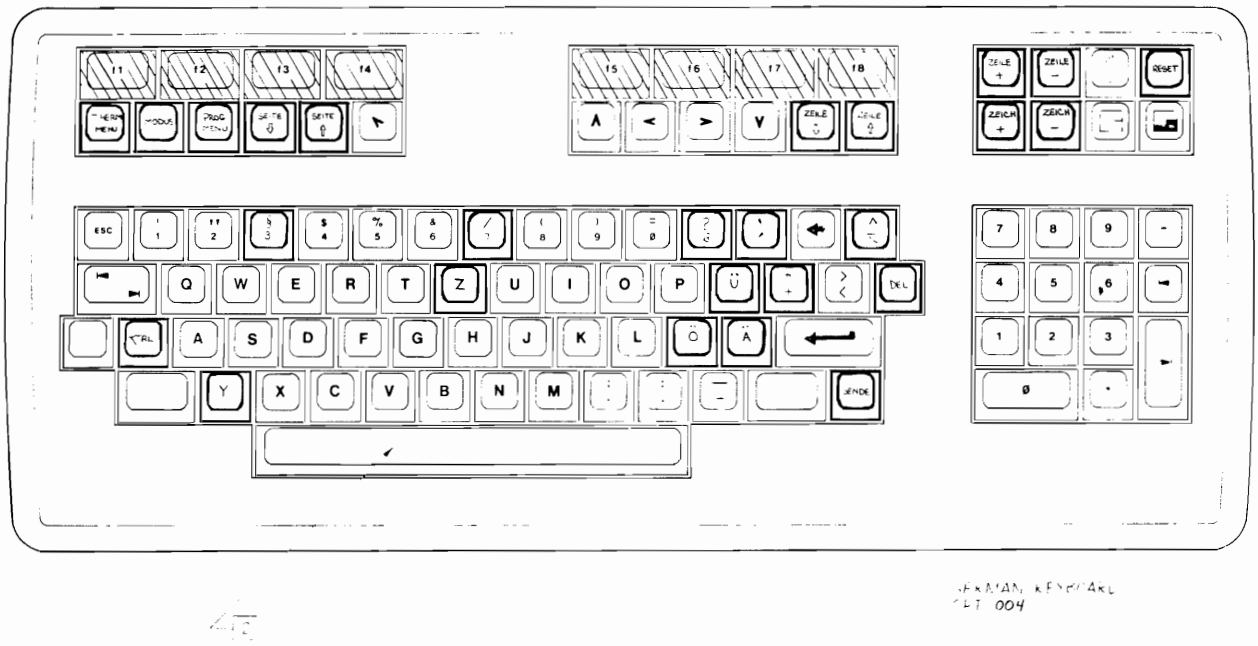


Figure 7-28. German Extended Keyboard
(125B Option 004)

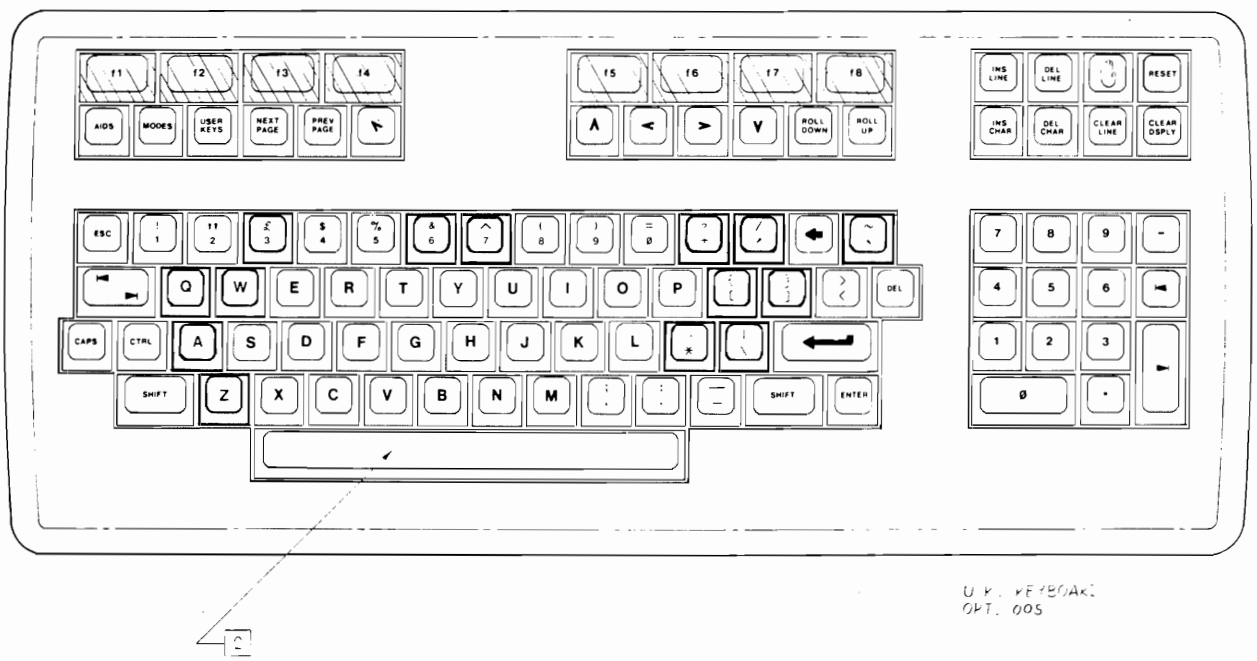


Figure 7-29. United Kingdom Extended Keyboard
(125B Option 005)

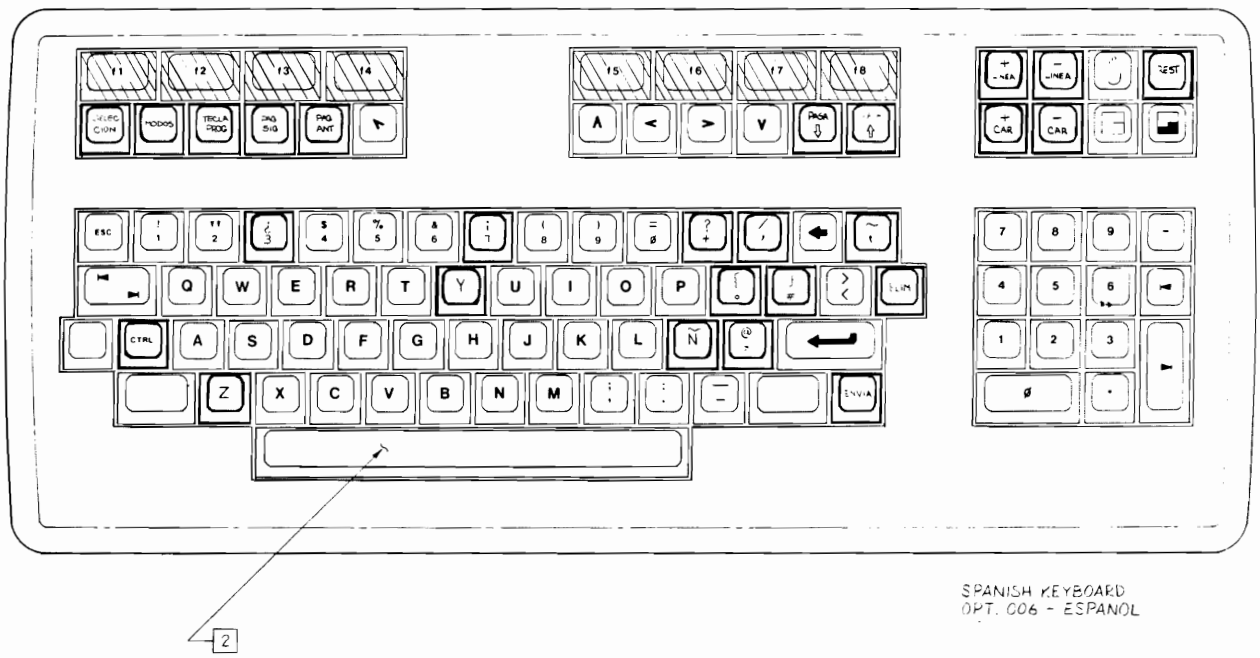


Figure 7-30. Spanish Extended Keyboard
(125B Option 006)

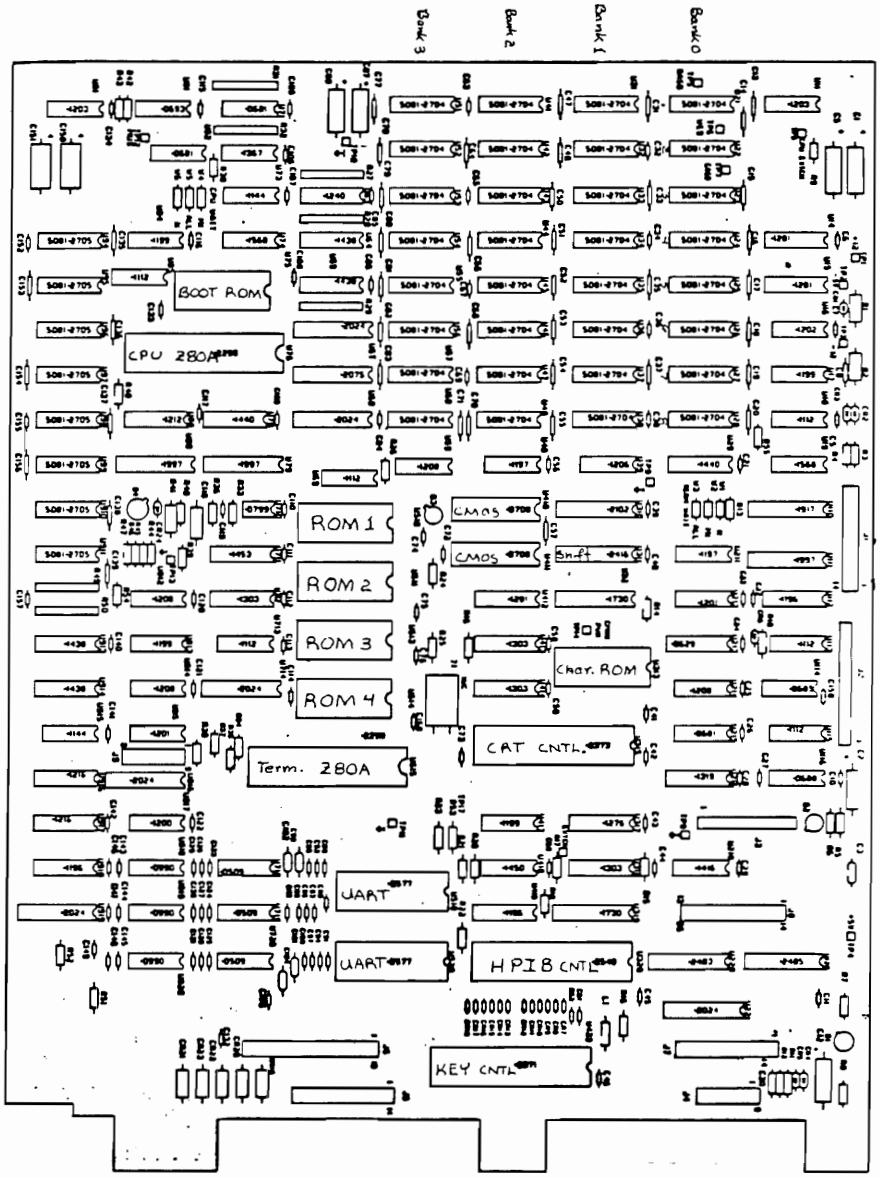


Figure 7-3la. Processor PCA Rev. B

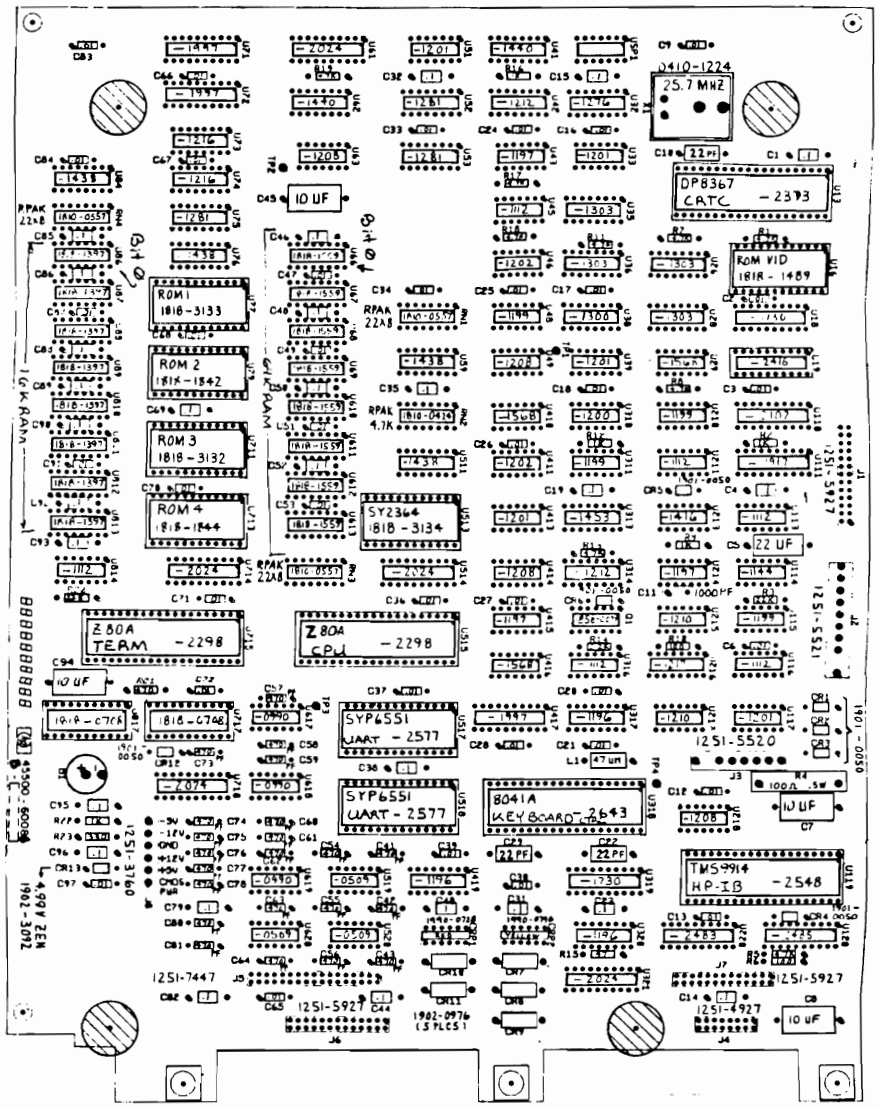


Figure 7-31b. Processor PCA Rev. C

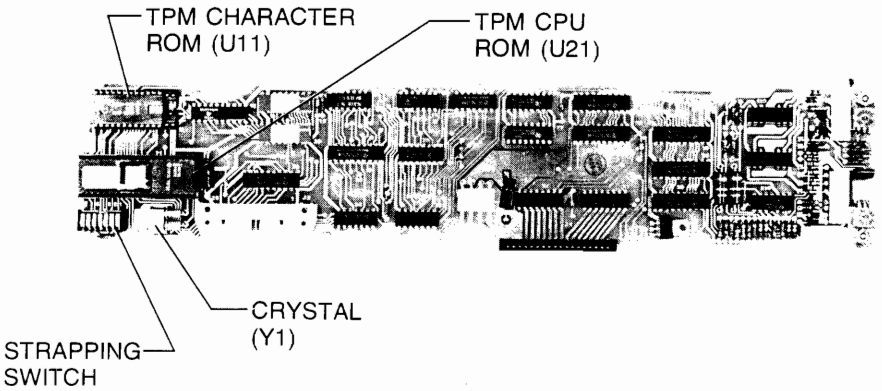


Figure 7-32. TPM PCA

Table 7-12a. Replaceable Components

REFERENCE DESIGNATOR	UNITS PER ASSY.	HP PART NO.	DESCRIPTION
Fig. 7-31a	1	45500-60085 Rev. B	Processor PCA (125)
Fig. 7-31b	1	45500-60085 Rev. C	Processor PCA (125)
(85B) (85C)			
U410 U717	2	1818-0708	CMOS, RAM
U411 U817	2	1818-0708	CMOS, RAM
U76 U515	2	1820-2298	Z80A Processor
U515 U715	2	1820-2298	Z80A Processor
		See Table	
U75 U513	1	7-8b	Loader ROM
U510 U77	1	7-8b	Terminal ROM 1
U511 U79	1	7-8b	Terminal ROM 2
U513 U711	1	7-8b	Terminal ROM 3
U514 U713	1	7-8c	Terminal ROM 4
U313 U16	1	7-8c	Character ROM
U422 U318	1	1820-2643	Keyboard CNR
U315 U13	1	1820-2373	Display Cntl
U311 U19	1	1820-2416	Shft Reg
U94-			
U911	8	1818-1397	RAM Memory (16K) **
U86-			
U813	8	1818-1397	RAM Memory (16K) **
Fig. 7-31a	32	5081-2705	RAM Memory (16K)
U66-			RAM Memory (64K)
U613	8	1818-3006	RAM Memory (64K)
------	32	5081-2705	RAM Memory
U320 U119	1	1820-2548	HP=IB Cntl
U518 U517	2	1820-2577	UART
U520 U518	2	1820-2577	UART
Y1 X1	1	0410-1224	25.7715 MHZ XTAL

**Note: 5081-2705 is a stressed 1818-1397 16K 150NS IC RAM.

Table 7-12b. ROM Revisions

	Terminal				
	U75 (85B) U513 (85C)	U510 (85B) U77 (85C)	U511 (85B) U79 (85C)	U513 (85B) U711 (85C)	U514 (85B) U713 (85C)
Rev.	Loader ROM	ROM 1	ROM 2	ROM 3	ROM 4
A.	1818-1644	1818-1645	1818-1646	1818-1647	See table 7-12c for these
B.	1818-1840	1818-1841	1818-1842	1818-1843	
C.	1818-3134	1818-3133	1818-1842	1818-3132	

*Note: Rev. C was referred to as Rev. I in the HP-120 Service Manual.

**Note: 5081-2705 is a stressed 1818-1397 16K 150NS IC RAM.

Table 7-12c. ROM Revisions

Rev.	Language	U313 (85B) U16 (85C) Char. ROM	U514 (85B) U713 (85C) Term. ROM 4	Option Number
A	English	1818-1489	1818-1704	Standard
A	Swedish/Finnish	1818-1276	1818-1730	001
A	Danish/Norwegian	1818-1277	1818-1731	002
A	French	1818-1278	1818-1732	003
A	German	1818-1279	1818-1733	004
A	United Kingdom	1818-1280	1818-1734	005
A	Spanish	1818-1281	1818-1735	006
B	English	1818-1489	1818-1844	Standard
B	Swedish/Finnish	1818-1276	1818-1730	001
B	Danish/Norwegian	1818-1277	1818-1731	002
B	French	1818-1278	1818-1732	003
B	German	1818-1279	1818-1733	004
B	United Kingdom	1818-1280	1818-1734	005
B	Spanish	1818-1281	1818-1735	006
C	English	1818-1489	1818-1844	Standard
C	Swedish/Finnish	1818-1276	1818-3131	001
C	Danish/Norwegian	1818-1277	1818-3130	002
C	French (AZERTY)	1818-1278	1818-3129	003
C	German	1818-1279	1818-3128	004
C	United Kingdom	1818-1280	1818-3127	005
C	Spanish	1818-1281	1818-3126	006
C	French (QWERTY)	1818-1278	1818-3125	007

Refer to Appendix A for the 85B, 85C cross reference table.
See Appendix A for more information about the ROMs.

FUNCTIONAL OPERATION VIII

INTRODUCTON

This section contains a brief block diagram discussion of the 45500A and the 125 system. A functional block diagram is shown in figure 8-1. The 45500A consists of a Processor and Terminal PCA, Sweep PCA, Power Supply, and Keyboard Module, and optional Thermal Print PCA and Print Mechanics.

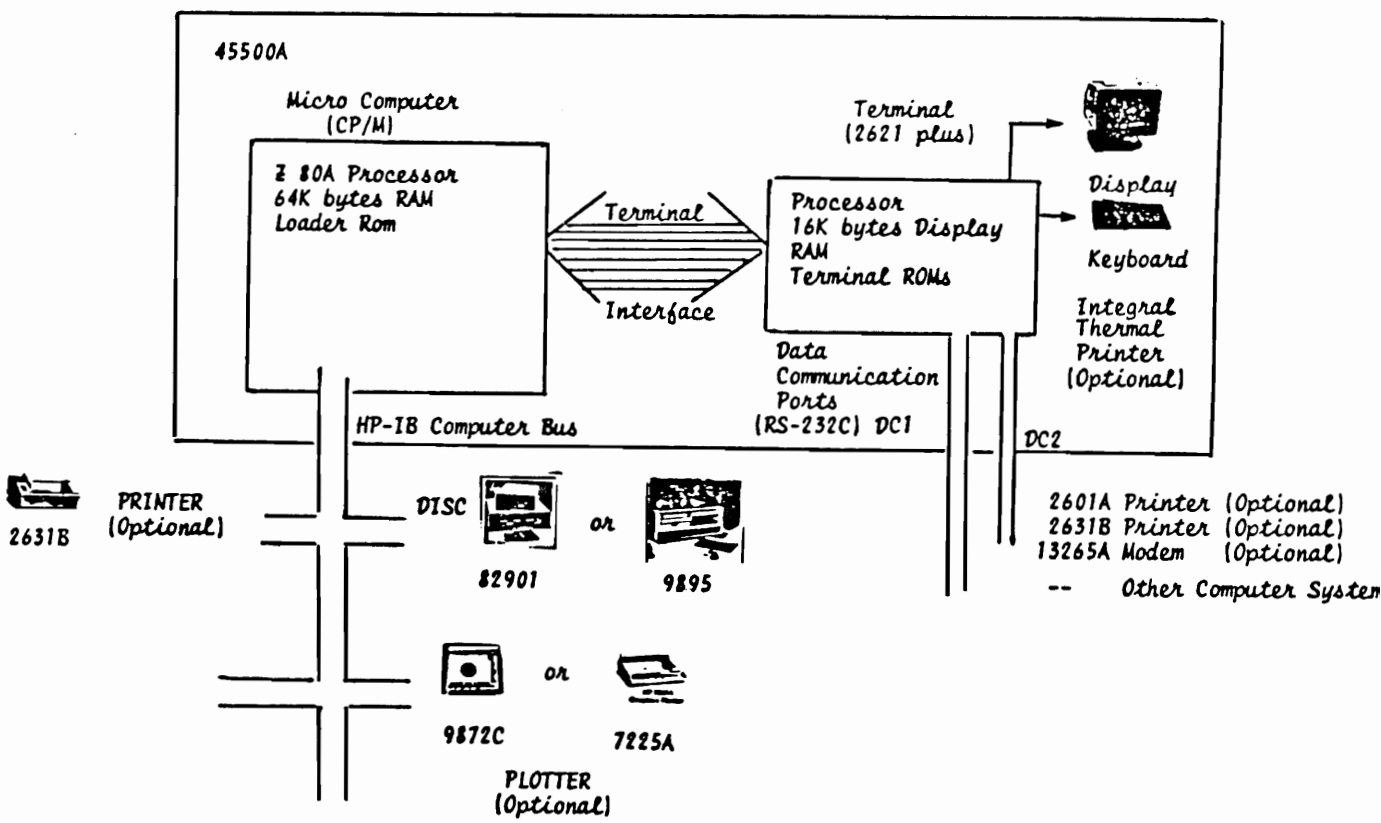


Figure 8-1. 125 Functional Block Diagram

PROCESSOR PCA

INTRODUCTION..The main PCA in the 45500A unit has two distinct sections; the Processor section and the Terminal section.

The Processor section consists of a Z80A Processor 64 Kbytes of RAM, 8 Kbytes of Loader ROM, an HP-IB interface, and an interface to the Terminal section.

The Terminal section consists of a second Z80 Processor, 16 Kbytes of display RAM, 256 bytes of CMOS RAM, 32 Kbytes of ROM, Keyboard Controller, Display Controller, TPM interface, two UART (RS-232C) ports, and an interface to the Processor section. Figure 8-2 shows a block diagram of the 45500A.

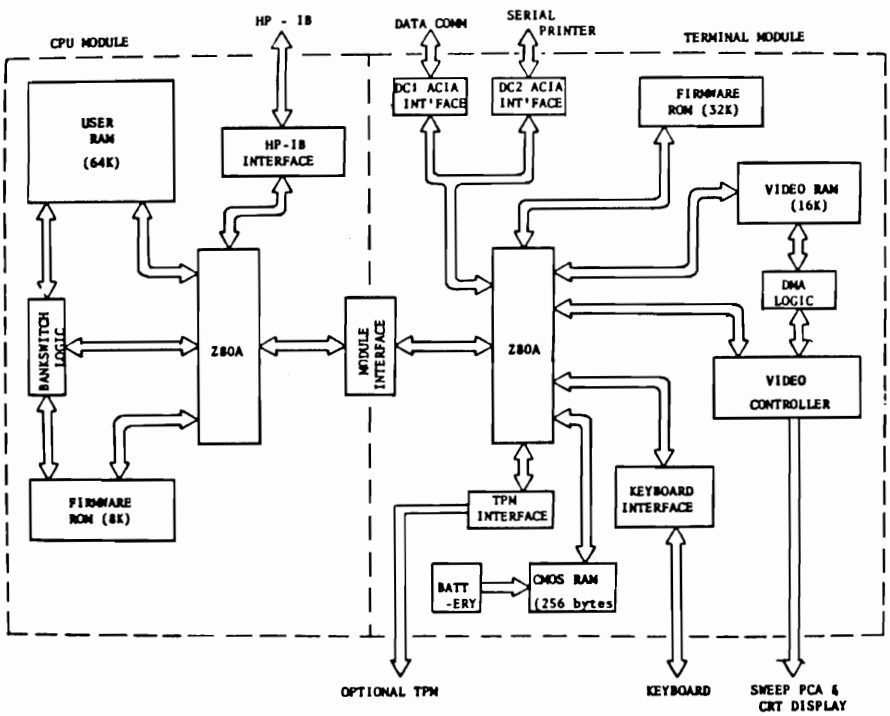


Figure 8-2. 45500A Block Diagram

PROCESSOR SECTION MICRO-COMPUTER...The processor section microcomputer consists of five subsections, the Z80A Microprocessor, Program RAM, Loader ROM, HP-IB Interface, and the Mailbox Interface to the Terminal Section.

Z80A PROCESSOR. The Z80A Processor operates with a 3.6816 MHz clock resulting in a 272ns cycle time. The full 64K byte address space is allocated to RAM memory.

I/O addresses are allocated as shown in Figure 8-3.

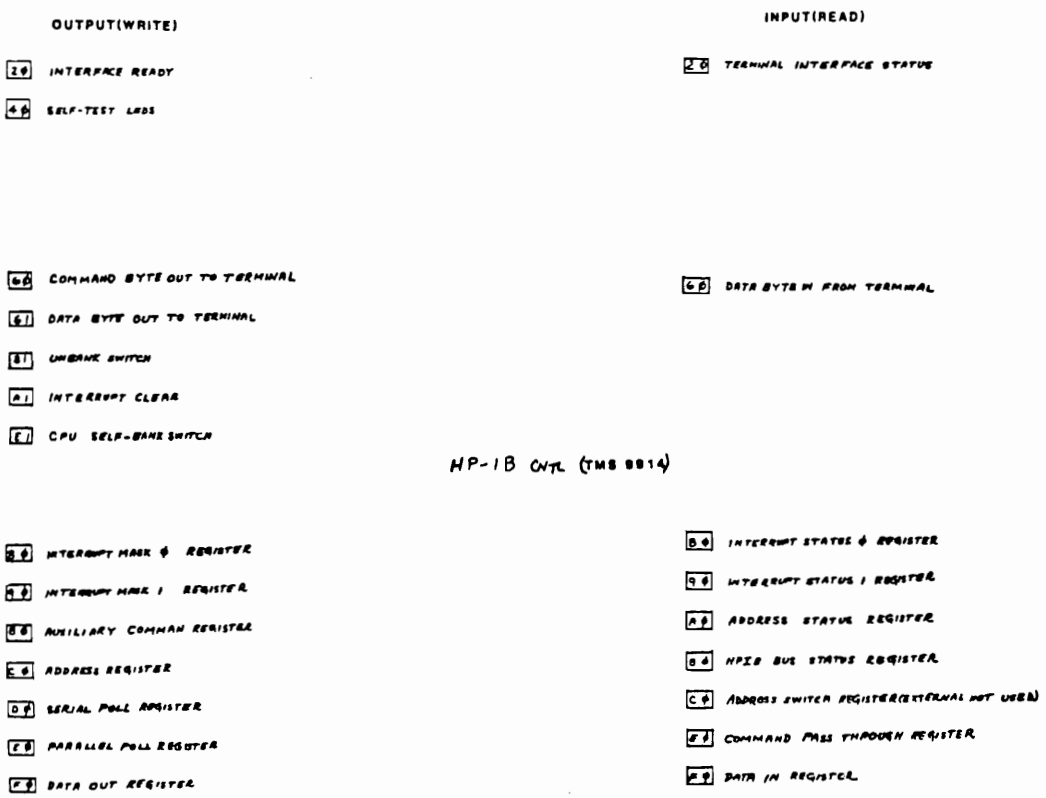


Figure 8-3. CPU Module I/O Ports

RAM MEMORY. Thirty-two 16K bit Random Access Memory chips are used to form the full 64 Kbytes of memory.

LOADER ROM. Upon power-on and reset of the unit the first 8K bytes of memory are replaced with 8K of ROM for test and loading purposes. The ROM is swapped out after the Operating System is loaded and begins execution.

HP-IB INTERFACE. The HP-IB Interface is operated by a TMS-9914 HP-IB Controller chip. The controller operates off of the 3.6816 MHz clock and handles all of the data, control, status, and handshake functions for HP-IB operation.

MAILBOX INTERFACE. The Mailbox Interface is used for communication between the two Z80A processors.

The mailbox interface is symmetrical in both directions, with the exception of control lines which allow the terminal module the ability to reset the Z80A of the CPU. The interface consists of two ports, one of which contains a byte that is either data to be transferred or a command to be executed. The other port has status information.

While the interface has been described as having two ports as it exists in the hardware, logically there are four ports. The interface is structured such that while the command or the data is placed in the same physical register, the register has two write port addresses. One address is written to load data, the other address is for commands. Using one address or the other is what causes the appropriate command/data bit to be set in the status port.

TERMINAL MICRO-PROCESSOR CONTROLLER..The Terminal Microprocessor Controller consists of nine subsections: the Z80A Microprocessor, Program ROM, Program RAM, Display RAM, Display Controller, Data Comm 1, Data Comm 2, Mailbox Interface to Processor Section, and the Integral Thermal Printer Interface. Descriptions of these subsections follow.

Z80A PROCESSOR. The Z80A Processor operates with a 3.6816 MHz clock resulting in a 272ns cycle time. The address space of the processor is decoded into 8K byte increments and is allocated as shown in figure 8-4.

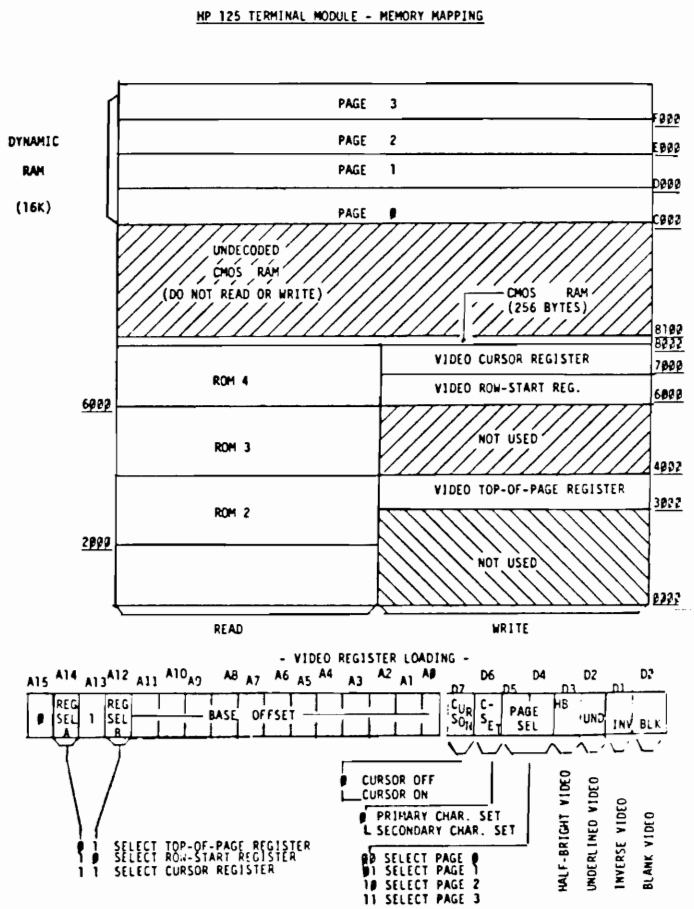


Figure 8-4. Terminal Section Memory Map

The Z80A I/O addressing scheme is decoded by the most significant five I/O address bits (A7-A3). Each I/O device consists of eight registers which are decoded by I/O address bits A2-A0. I/O addresses are allocated as as shown in figure 8-5.

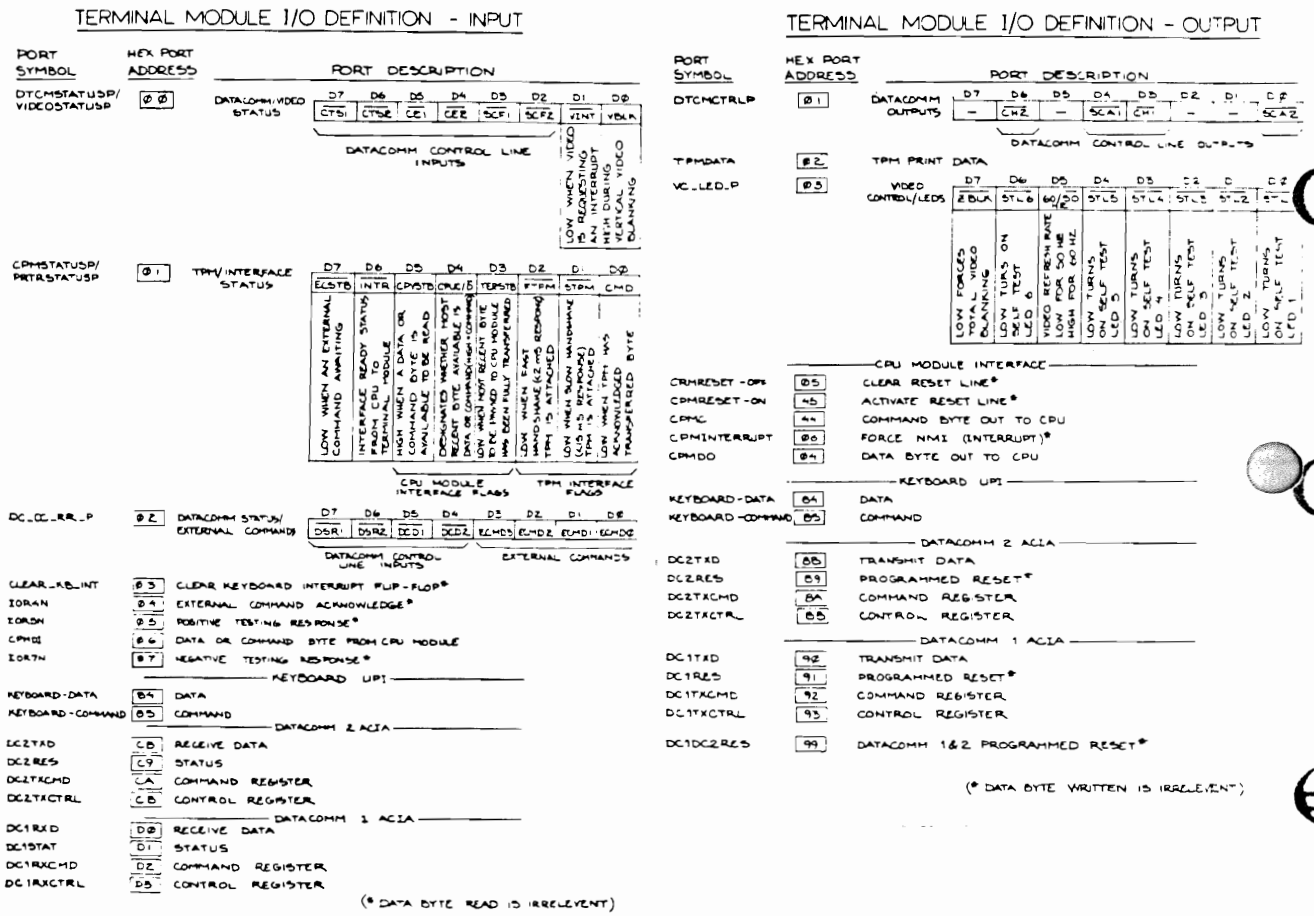


Figure 8-5. Terminal Section I/O Addressing

The wait signal matches the memory read timing of the Z80A to the program ROM and CMOS RAM access times.

PROGRAM ROM...There are four IC sockets that house 8K ROMs. The ROMs receive address bits A0-A12.

PROGRAM RAM...There are two program RAMs that provide the Z80A with 256 bytes of non-volatile RAM. These RAMs are battery backed-up to retain the terminal configuration while the terminal power is off.

The terminal uses a 4.2V mercury or 3.8V lithium battery for back-up power. The +5V and the battery are diode isolated to ensure battery usage only when the terminal power is off. A resistor is included in series for current measurement.

DISPLAY RAM...There are 8 16K RAMs which provide memory for the Display and additional memory for Z80A program use.

This memory is used for Z80A stack, data comm buffer area, user soft key definitions, softkey labels and tree, row start pointer table, variable storage, map of I/O source/destination information, etc. These functions use 5K of the memory, the additional 11K is available for video/program space. Of this 11K, a minimum of 4K must remain video memory to allow two CRT screens of characters, the additional 7K may be allocated by the user between additional video memory and downloadable 'user program' area.

KEYBOARD INTERFACE.....The Keyboard Interface is controlled by a 8041A slave microprocessor, which scans the keyboard, rings the bell, and performs general purpose I/O functions. The keyboard processor scans the entire keyboard every 24ms, and only reports the key location (rather than the ASCII code assigned to that key) to the Z80A terminal processor.

The 8041A consists of two output ports: PORT1 is used for keyboard control and PORT2 is used for ringing the bell and interrupting the Z80A.

DATA COMM INTERFACE.....The data comm interface consists of an Asynchronous Communications Interface Adapter (ACIA) integrated circuit. This ACIA performs a serial to parallel

data conversion for RS-232 data transmission, detects parity, framing, and overrun receive errors, and provides the RS and TR control lines. Data transmission is buffered, driven, and received by the ACIA's associated circuitry. Additional latches and buffers provide a full complement of asynchronous control lines.

TIMING.....Control of the terminal module is done with a Z80A running at a clock frequency of 3.68 MHz. This clock is derived from the National 8368 CRT controller which has a port to which a crystal can be tied to form an oscillator. This 25.7715 MHz oscillator is divided internal to the 8367 and serves to provide most video timing signals used. Additionally a buffered output of the dot frequency is provided and this is externally divided by seven to give the processor clock frequency of 3.68 MHz.

The 3.68 MHz clock is divided by two for use by the Data Comm Ports in generating their own internal baud rates.

INTEGRAL THERMAL PRINTER INTERFACE....The Thermal Printer interface is implemented using the Z80A I/O write port 02H and read port 03H. The data lines are always enabled to the printer and the printer is controlled by a signal on the I/O Write select lines.

MAILBOX INTERFACE.....The terminal module interface to the CPU module appears similar to the interface described previously for the other direction, except for the reset circuitry and the Non-Maskable-Interrupt (NMI) logic which allows the terminal module to reset and interrupt the CPU module. This interface is polled by terminal firmware.

VIDEO CONTROLLER....The video controller logic fetches the ASCII characters from display memory and with basic terminal timing converts the data into a serial video dot stream.

DISPLAY CONTROL.....The display information is controlled by the 8367 CRT controller. The 8367 is responsible for DMA of the information from memory to the 80 character shift register and generation of the timing for dot generation.

DISPLAY GENERATION....The 8367 ROW START register is used as the starting point for the video DMA feature of the 8367 CRT controller. This register is filled by the Z80A prior to a character line with the address of the next 80 byte block of row characters. The 8367 performs the video DMA, filling a MM 5305 line buffer with the 80 ASCII characters. This DMA process takes about a scan line (40 microseconds) of time, allowing the Z80A use of the memory and buses the other 14 scan lines (560 microseconds). Meanwhile, the MM 5035 line buffer/shift register is circulating the 80 ASCII characters. These ASCII characters along with the scan line counter output of the CRT controller is input into the character ROM to generate the appropriate dots for the character scan line. The dots for each character are the data outputs of the ROM, which are parallel loaded into a shift register and serially shifted out to supply the dot information for the video circuitry.

Character enhancement is done by allowing the MSB of the ASCII character in the line buffer to activate the processing of an enhancement (or combination of enhancements) as selected by the firmware at the start of the character row. This allows the enhancements to be chosen for a line and to be selected on a character by character basis.

DISPLAY MEMORY CONTROL.....Display Memory Control generates the appropriate timing signals for the dynamic RAM's. A memory cycle is initiated with either the DMA or Z80A processor requesting a display memory cycle. This memory cycle is clocked through a delay shift register resulting in timing signals for row and column strobing, write enabling, and address selecting.

ADDRESS MULTIPLEXER... The display memory is addressed from two sources: the Z80A processor, and the CRT controller (during video direct memory accesses). Display memory is based upon a matrix of 128 rows by 128 columns, giving 16K distinct bytes of display information. For any given access by either source the address multiplexers provide the video RAMs with the appropriate row address followed by the required column address.

CHARACTER GENERATION ROM..... The Character Generation ROM uses ASCII data and the character scan height to generate dot images. Character resolution is enhanced by half-shifting the dots on appropriate scan lines. The half-shifting generates smoother character angles and curves. Each character scan line segment is stored in ROM as an 8-bit word. Seven of the bits are used character dots, and the eighth is used to specify half-shifting of the dot data.

VIDEO DOT GENERATION.... Video Dot Generation creates the basic character cell. The basic character cell is a 9-dot by 15-scan line rectangle. Within this cell is the 7 X 11 character, surrounded by one dot on either side for horizontal spacing, two scan lines below for lower case characters descenders, and one scan line above and below for row-to-row spacing.

VIDEO BLANKING..... Video Blanking generates screen blanking from terminal timing and control signals. Video blanking occurs when character rows are not displayed, horizontal retrace, Z80A controlled blanking, and character row 24.

SWEEP PCA

INTRODUCTION..The Sweep PCA interfaces the low level logic signals from the Processor PCA to the CRT. It generates all drive signals and specialized voltages required by the CRT display.

The Sweep PCA consists of three drive circuits: video, vertical, and horizontal. Figure 8-4 shows a simplified block diagram of the Sweep PCA.

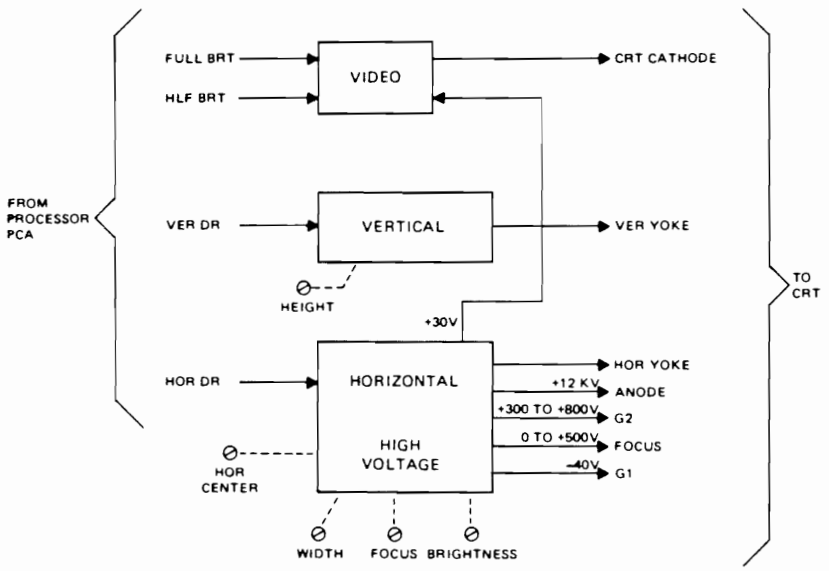


Figure 8-6. Sweep PCA, Simplified Block Diagram

Functional Operation

VIDEO
DRIVE.....The function of the Video Drive is to interface the low level logic input signals from the Processor PCA to higher levels required to drive the cathode ray tube (CRT). The video circuitry is very fast and it typically features rise and fall times of 15ns or less.

Two video amplifiers and a current sourcing device supply 10mA continuously. This current is driven higher on positive going transitions which create a very fast rise time and low power dissipation. Half-bright (+5 volts on CRT cathode) and full-bright (0 volts on CRT cathode) levels are generated in the video drive circuitry.

VERTICAL
DRIVE.....The Vertical Drive circuit generates a vertical scanning waveform which causes the electron beam in the CRT to be moved from the top to the bottom of the screen.

A positive vertical ramp is generated and it is sampled by an integrator. The ramp is integrated into a parabola which is used to slow the deflection down at the extremes of the ramp to correct for non-linearity due to the flatness of the CRT screen.

An output amplifier converts the ramp from the integrator to a current which is applied to the deflection yoke. This current is compared to the ramp voltage by a comparator. The DC operating point of the output amplifier is stabilized.

HORIZONTAL DRIVE.....The Horizontal Drive circuit generates a horizontal scan which sweeps the electron beam from left to right on the CRT screen. The horizontal drive also generates dedicated CRT voltages.

The horizontal drive signal is applied to two one-shot multivibrators which generate an adjustable delay that is used to center the raster by delaying horizontal reset with respect to video blanking.

This adjusted signal is fed into a flyback circuit which forms a ringing horizontal sweep circuit. Nonlinearity is improved by slowing down the sides of the deflection beam with a capacitance circuit.

The flyback circuit generates output voltages of +40V, -40V, +800V, and +12KV. The +12KV, which is used for CRT biasing, is rectified in the flyback. The other output voltages are rectified and filtered on the Sweep PCA.

65 WATT POWER SUPPLY

INTRODUCTION..The 65 Watt Power Supply generates the following voltages: +12V at 3.0A, +5V at 5.5A, and -12V at 0.25A. It also generates a Power On and Power Fail Warning signal.

The Power Supply consists of five sections: the +12 Volt Regulator, +5 Volt Regulator, -12 Volt Regulator, Power On/Power Fail Circuit, and the SYNC Circuit. These five sections plus a power bracket (consisting of a transformer, rectifier, and a filter) generate the necessary power and logic signals for the Processor and Sweep PCA's. Figure 8-5 shows a simplified block diagram of the Power Supply.

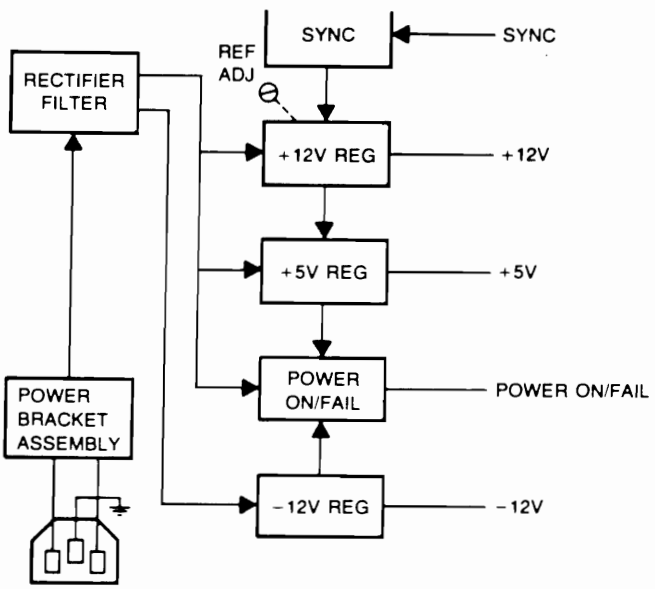


Figure 8.7 65 Watt Power Supply, Simplified Block Digram

+12 VOLT REGULATOR..The +12 Volt Regulator is a switching regulator which steps down and regulates the main unregulated supply voltage (25V typically at 115V line input). It also generates a ramp, +2.5V reference, and a clock pulse which are used by the +5 Volt Regulator.

The switching regulator is an integrated circuit which generates a +5V reference, 25 KHz RAMP, 25 KHz clodk pulse, an output pulse which changes in width to regulate the supply, and the necessary circuitry to sense the +12V supply. The output voltage of the switching regulator is regulated by controlling the on and off time of the switching elements.

The output current is sensed by a comparator and it is protected with a current limit circuit set at 5.0A. A foldback characteristic is obtained because the +12V output forms part of the current reference, and as it decreases (due to current limit) the current limit reference decreases.

The output voltage is filtered by a smoothing filter and it is protected from overvoltaging by a zener voltage of 15V. The output voltage is adjusted by adjusting the +5V potentiometer (located on the Power Supply PCA). Since the +5V supply tracks the +12V supply, adjusting the +5V supply will adjust the +12V supply.

+5 VOLT REGULATOR..The action of the +5 Volt Regulator is identical to the +12 Volt Regulator except that it requires an error amplifier and comparator to generate the drive pulse for the power switching device. An error amplifier compares the +5V output which is divided to the +2.5V reference. The output of the error amplifier is applied to one input of the comparator which compares it to the voltage ramp received from the +12 Volt Regulator. The comparator turns on a current source until the ramp voltage exceeds the error voltage. The output voltage is protected from overvoltaging by a zener diode (6.00V).

-12 VOLT REGULATOR..The -12 Volt Regulator supplies the minimal 250mA requirements of the Processor PCA and the Data Comm Pods for a negative voltage.

The -12 Volt Regulator receives its input voltage from a diode-capacitor circuit. The diodecapacitor circuit operates from a voltage obtained across the AC input of the bridge rectifier for the positive voltage

regulators. This circuit outputs a negatiave voltage equal to the input voltage of the positive regulators.

The -12 Volt Regulator is a linear series-pass regulator and regulates the -25V input down to -12V by controlling the voltage drop across a series-pass transistor.

The output current is limited to 350mA. The output voltage is limited by a 15V zener diode.

POWER ON/FAIL CIRCUIT....The Power On/Fail Circuit serves two functions. It senses all output voltages and it indicates to the Processor PCA when the +5V supply is in regulation. It also senses the line input voltage and it indicates a power fail condition shortly before the switching regulators go out of regulation.

An amplifier is used as a comparator to sense line input voltage. When the voltage drops to about +15V the comparator outputs a power fail signal. another comparator senses the +5V line and outputs a signal to indicate that the +5V supply is in regulation.

SYNC CIRCUIT....The Sync Circuit receives a horizontal drive pulse from the Sweep PCA, and uses it to synchronize switching regulation to that of the sweep rate. This is necessary to prevent the switching rate of the Power Supply from interfering with the CRT display. CRT displays are very sensitive to noise on the power supply lines.

POWER BRACKET ASSEMBLY...The Power Bracket Assembly consists of a line filter, power switch, and a power transformer. The power transformer is shielded to prevent it from interfering with the CRT display. The line input voltage is selected by a combination of selecting the fuse position and by plugging the transformer input cable into the appropriate power source receptable on the Power Supply PCA.

120 Watt POWER SUPPLY

INTRODUCTION..The 120 Watt Power Supply is a switching supply that provides regulated voltage supplies of +-16VDC, +-12VDC, and +5VDC. It also generates a Power On and Power Fail Warning signal.

The 120 Watt Power Supply consists of five basic sections: the Primary Switcher, Secondary Regulation, Protection Circuitry, Logic Signal Interface and the Bootstrap Supply. Figure 8-6 shows a simplified block diagram of the 120 Watt Power Supply.

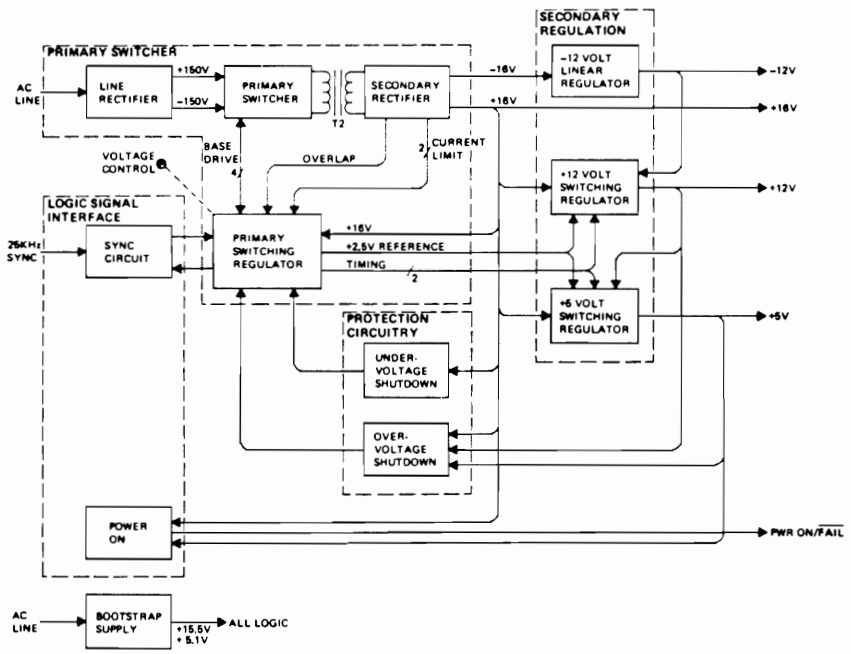


Figure 8-8. 120 Watt Power Supply, Simplified Block Diagram

Functional Operation

PRIMARY SWITCHER...The Primary (off-line) Switcher consists of a Line Rectifier, Primary Switcher, Secondary Rectifier, and Primary Switching Regulator. These subsections transform power from the AC line to isolated +-16VDC sources.

LINE RECTIFIER. The Line Rectifier rectifies and filters the incoming AC power to an output voltage of +-150VDC at nominal line. Line voltage selection is determined by fuse location which configures the Line Rectifier as either a voltage doubler (115VAC operation) or as a full wave bridge (230VAC operation).

PRIMARY SWITCHER. The Primary Switcher uses the Primary Switching Regulator to alternately switch the primary of power switching transformer T2 between +-150VDC (outputs of the Line Rectifier). The Primary Switcher employs pulsewidth modulation to ensure voltage regulation, and voltage clamping to protect the transformer primary from overvoltaging.

SECONDARY RECTIFIER. The output voltage of power transformer T2 is rectified and filtered by the Secondary Rectifier. This section also provides +-16V outputs, current limit sensing, and overlap voltage to the Primary Switching Regulator.

PRIMARY SWITCHING REGULATOR. The Primary Switching Regulator provides the controls necessary for the Primary Switcher section to operate. The main part of the Switching Regulator is a regulator IC (SG3524), which provides fixed frequency pulse-width modulated voltage regulation to the Primary Switcher.

A 2.5V reference from the internal 5V linear regulator powers the external CMOS ICs and provides voltage referencing for the +12V and +5V Switching Regulators. Adjustment of a poteniometer labeled "Voltage Control" proportionally adjusts the +5V, +12V, and +16V supplies.

Switching operation is inhibited by current limiting the secondary of power switching transformer T2.

To prevent destructive conduction overlap in the Primary Switching Regulator during low-line conditions, the overlap voltage output from the Secondary Rectifier inhibits the switching operation of the regulator IC (SG3524).

SECONDARY REGULATION..The Secondary Regulation section of the Power Supply consists of three subsections: -12 Volt Linear Regulator, +12 Volt Switching Regulator, and the +5 Volt Switching Regulator.

-12 VOLT LINEAR REGULATOR. The -12 Volt Linear Regulator consists of a -12V regulator IC and an output bypass capacitor. This regulator provides a fixed output voltage (-12V), and both thermal and current limit protection.

+12 VOLT SWITCHING REGULATOR. The +12 Volt Switching Regulator receives +16V from the Secondary Rectifier, and both +2.5V reference and switch timing from the Primary Switching Regulator, together they generate a +12V regulated supply.

The main component in the +12V Switching Regulator is a switching IC (Darlington transistor) that provides a switching regulated output supply of +12V.

Switching noise and power dissipation is reduced. The switching IC is protected from reverse bias breakdown by a zener diode should a short to ground occur on the +16V output from the Secondary Rectifier.

Voltage Regulation is provided by comparing the switching reference voltage to the feedback voltage. The difference is compared to a linear ramp voltage and when the ramp voltage exceeds the reference voltage, the switching action stops until regulation returns. The switching reference voltage is clamped at 4.3V to prevent overvoltaging at turn-on.

Functional Operation

+5 VOLT SWITCHING REGULATOR. The operation of the +5 Volt Switching Regulator is identical to the +12 Volt Switching Regulator except that it is protected from overvoltaging by a 6.19V zener diode. A comparator prevents the +5 Volt Switching Regulator from operating if the +12V output from the +12V Switching Regulator drops below 10V.

PROTECTION CIRCUITRY...The Power Supply provides protection for both overvoltage and undervoltage conditions on the +16V, +12V, and +5V output supplies.

OVERVOLTAGE SHUTDOWN. The overvoltage threshold of the +16V, +12V, and +5V supplies is set at +17.2V, +13.4V, and +5.6V respectively. The Overvoltage Shutdown subsection monitors these supplies for abnormally high voltages.

Each output supply is compared to a reference voltage (5.1V from the Bootstrap Supply) and if any of these supplies rises above its threshold level, the switching regulator IC (SG3524) is suspended and the Primary Switcher section is disabled. Thus the Power Supply is shutdown if overvoltaging should occur.

UNDERVOLTAGE SHUTDOWN. The Undervoltage Shutdown subsection monitors the +16V output supply for undervoltage conditions. If the +16V supply drops below +13V for approximately two seconds or more, a comparator compares this voltage with a reference voltage from the Bootstrap Supply section and activates a shutdown sequence. The Primary Switching Regulator section is disabled which effectively shuts down the Power Supply.

LOGIC SIGNAL INTERFACE...The Logic Signal Interface section consists of two subsections: the Sync Circuit which synchronizes the Power Supply's switching rate to the video sweep rate, and a Power On circuit which provides indications for both Power On and Power Fail conditions.

SYNC CIRCUIT. The Sync Circuit synchronizes the Power Supply's switching rate to twice the video sweep rate. Sychronizing prevents switching noise from appearing on the CRT display. The Sync Circuit is a digital phase-lock-loop synchronizer limited to input sync signals ranging from 20 to 30KHz, which corresponds to Power Supply switching rates ranging from 40 to 60KHz.

POWER ON. The Power On circuit serves two functions. One, it senses the output of the +5 Volt Switching Regulator and it indicates when the +5V output is in regulation. Two, it monitors +16V output and generates a power fail indication when the +16V output drops below +13V.

BOOTSTRAP SUPPLY.....The Bootstrap Supply provides the start up power for the Primary Switcher. Once the Primary Switcher is operating satisfactorily, the BootStrap Supply receives its operating power from the +16V output.

KEYBOARD MODULE

INTRODUCTION..The Keyboard Module scans the keys and returns their status to the Processor PCA. The Keyboard Module consists of a decoder, multiplexer, and driver. These three subsections make up the scanning circuit of the Keyboard.

KEYBOARD SCANNING.....Address lines from the Processor PCA are continuously scanning the Keyboard every 24ms via the Keyboard Cable, RC filter, decoder, and multiplexer. The address of a selected key is decoded by a BCD to decimal decoder, which decodes the column address of the key matrix, and a multiplexer, which scans the address row of the key matrix. The state of the addressed key is returned to the Processor PCA and decoded.

execution.

HP-IP
INTERFACE.....The HP-IB Interface is operated by a TMS-9914 HP-IB Controller chip. The controller operates off of the 3.6816 MHz clock and handles all of the data, control, status, and handshake functions for HP-IB operations.

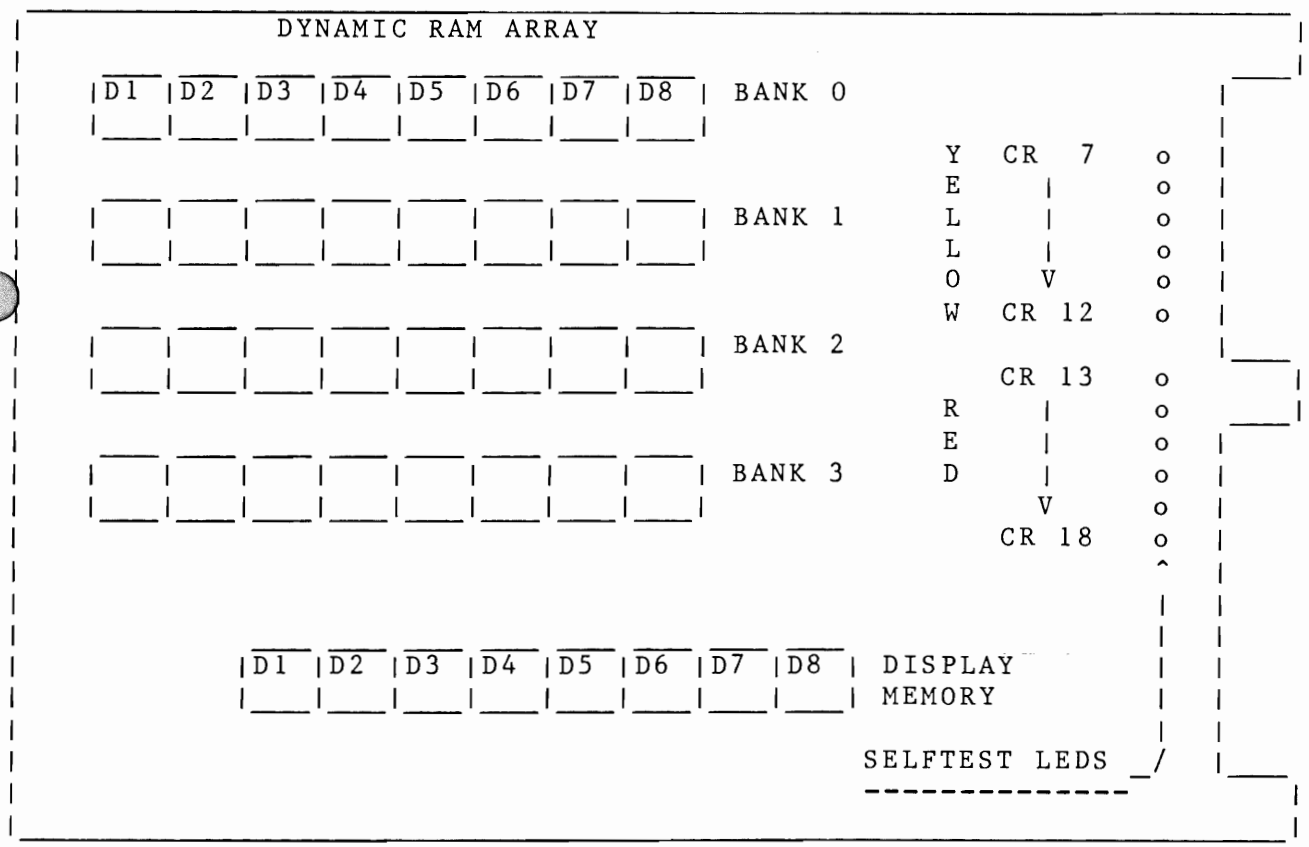
MAILBOX
INTERFACE.....The Mailbox Interface is used for communication between the two Z80A processors.

The mailbox interface is symmetrical in both directions, with the exception of control lines which allow the terminal module the ability to reset the Z80A of the CPU. The interface consists of two ports, one of which contains a byte that is either data to be transferred or a command to be executed. The other port has status information.

While the interface has been described as having two ports as it exists in the hardware, logically there are four ports. The interface is structured such that while the command or the data is placed in the same physical register, the register has two write port addresses. One address is written to load data, the other address is for commands. Using one address or the other is what causes the appropriate command/data bit to be set in the status port.

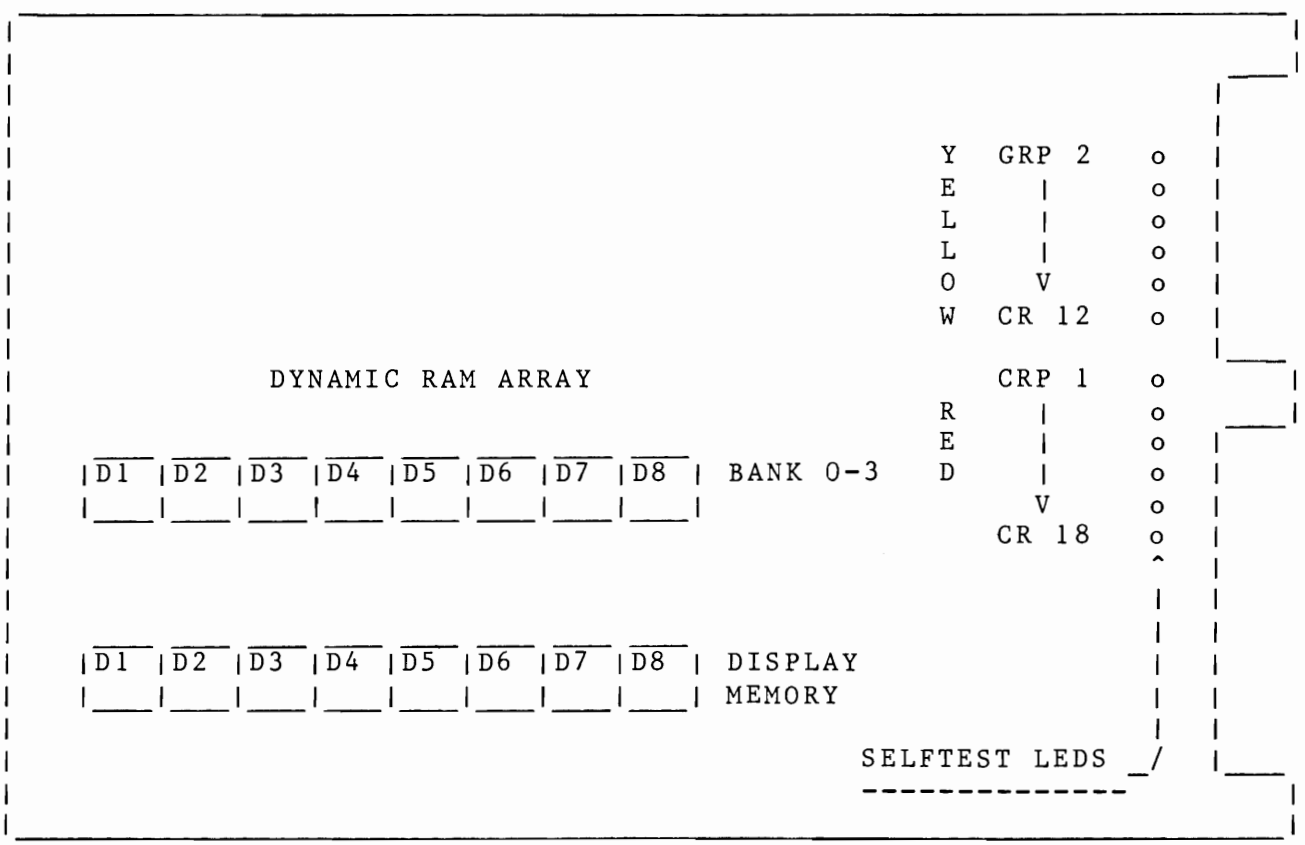
APPENDIX A

DEFINITION OF BANKS AND DATA BITS



Rev. B. Processor Board

DEFINITION OF BANKS AND DATA BITS



Rev. C. Processor Board

How to Read Self Test LEDs

When power is turned on all the LEDs turn on, are turned off and turned on one at a time. Note the diagram below to determine the most significant bit.

Yellow LEDS	Red LEDS
0 0 0 0 0 0	0 0 0 0 0 0
^	^
|	|
most significant bit	most significant bit

If you look at the board such that the Red LEDs are to the right of the Yellow LEDs then decode them as follows:

ON = 1, OFF = 0

Example:

Yellow	Red
0 1 0 1 0 1	0 0 0 0 0 0

See Figure 6-2 (Yellow LED codes)

010101 = Replace U520 (85B)/U518 (85C) (Datacomm ACIA 1). Partial functionality test failed.

85B, 85C Cross Reference Table

85 Rev. B		85 Rev. C
U515	TERM Z80	U715
U510	ROM 1	U77
U511	ROM 2	U79
U513	ROM 3	U711
U514	ROM 4	U713
U76	CPU Z80A	U515
U75	BOOT ROM	U513
U422	KYBD CNTRL	U318
U320	HP-IB CNTRL	U119
U315	VID CNTRL	U13
U313	CHAR ROM	U16
Y1	XTAL	X1
U311	80X8 Shift REG	U19
U410	CMOS RAM 1	U717
U411	CMOS RAM 2	U817
U520	ACIA 1	U518
U518	ACIA 2	U517
U94-U911	VID RAM	U86-U813
U21-U28,U31-U38	CPU RAMS	U66-U613
U41-U48,U51-U58	CPU RAMS	U66-U613

Note: 85B, is used throughout this manual to indicate a Rev. B 45500-60085 board.
85C, is used throughout this manual to indicate a Rev. C 45500-60085 board.

Video RAM and CPU RAM are not in sockets on all 85C boards and some 85B boards.

APPENDIX B

Reference documentation for the Thermal Print Mechanism.

BRIEF PARTS DESCRIPTION AND EXPLANATION

Vancouver Division (VCD) manufactures the thermal print mechanism (TPM) used in all 262X terminals, 267X printers, and 125 systems. The entire TPM consists of three major modules:

1. a TPM PCA which is the mechanism controller

2. a printer mechanism

3. a print head cable assembly

The printer has two basic configurations determined mainly by the combination of socketed chips used on the TPM PCA:

1. The "ASCII" version accepts parallel ASCII input and converts it to a dot pattern through a character ROM on the TPM PCA. The dot pattern forms the printed characters. Later revisions are also capable of printing raster graphics when sent the properly formatted information. This is used in 2621X, 125, and 2671X.

2. The "DOT" version accepts parallel binary information (the dot pattern) and simply prints it out. When printing characters, the ASCII-to-dot conversion has already been made by the sending device. This version also has raster graphics capability and is used in 2622X/23A/24X/26X, 2673A, and 2675A.

The earliest TPM PCA, 02670-60001, was used only in the 2621P and seems to have been ASCII only. The next revision PCA, 02670-60050, could be used in either ASCII or DOT versions depending on the chips used. The current, non-exchange TPM PCA's use two different part numbers, 02670-60084 for ASCII and 02670-60085 for DOT versions.

The TPM PCA's always contain a microprocessor chip (an Intel 8039, 8048, or 8049) along with various combinations of other chips. The following points may help you explain which chips work together:

1. ASCII versions have a character ROM on the TPM PCA.

2. 8048 and 8049 microprocessors contain on-board PROM so

a. they do not need an external firmware ROM

b. the HP part number changes when the internal PROM code is changed.

3. 8039 microprocessors do NOT contain on-board PROM so

   a. they always need an external firmware ROM

   b. the HP part number should remain the same

4. It appears that the 8048 uPU's use a 6 MHz crystal and the 8039 and 8049 uPU's use an 11 MHz crystal.

The TPM PCA has two chip sockets on it: the larger one for the microprocessor and the smaller one for a ROM. A DOT version TPM PCA with an 8049 microprocessor will need no external socketed chips, the ROM socket will be empty. On the other hand, an ASCII version with an 8039 microprocessor will need both a character ROM and a firmware ROM! In this situation, a small carrier PCA with two sockets is plugged into the single ROM socket.

THE -60001 AND -60050 PCA's were exchange items and the socketed chips and crystal did not come on the replacement boards. Therefore, it was necessary to troubleshoot these PCA's to the socketed component level. The newer -60084 and -60085 PCA's are "throw away" boards and come with all of the necessary socketed components on them.

The printer mechanism itself is no different for the two versions of printer. The older unit, 02670-60015, could only handle rolled paper whereas the new unit, 02670-60091, handles rolled or fan-fold paper and has extra ground points on it to help prevent static buildup.

The same print head cable assembly, 02670-60014, is used in all TPM's.

LOCAL SELF-TEST

All versions to-date have "local self-test" capability. In the upper left corner of the TPM PCA, when viewed from the front, is a set of 5 test points. On older PCA's there was a Molex connector soldered into the test points, but in the current PCA's there are only solder-filled feed-throughs. On the back side of the PCA the test points are labeled. The top one is GROUND and the next one down is TEST. When these two are shorted together, the printer will continuously print out a test pattern generated by the circuitry on the TPM PCA.

For the ASCII printers the pattern consists of 64 regular characters and 16 control characters printed always from left to right.