



HP 2235X Table of Contents

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PRODUCT INFORMATION

A. PRODUCT DESCRIPTION

The HP RuggedWriter 480 series printers are a family of 24 wire dot matrix impact printers, capable of a draft burst speed of 480 cps (characters per second) and letter quality burst speed of 240 cps in 12 pitch (12 characters per inch). HP RuggedWriter 480 printers handle paper up to 380 mm wide and up to 6 parts thick. Convenient handling of Z-fold (tractor-fed), sheet feeder, and manual hand-fed paper is selectable from the keypad. Paper does not have to be removed from the tractors for sheet feeder or hand-fed paper operation. HP RuggedWriter 480 printers support Epson and HP PCL level III printer languages.

B. MODEL IDENTIFICATION

The HP RuggedWriter 480 series consists of four printer models. A label located on the rear base wall near the dip switches identifies the printer (HP 2235) and model (A, B, C, or D). All RuggedWriter 480 printers have the same product capabilities listed in this chapter. Model numbers identify the printer interfaces and whether it has a factory installed sheet feeder. See table 1-1 for HP RuggedWriter 480 model comparison. The sheet feeder can be ordered separately as an accessory. See table 1-2 for HP RuggedWriter 480 Supplies and Accessories.

Table 1-1. HP RuggedWriter 480 Printer Models

	WITHOUT SHEET FEEDER	WITH SHEET FEEDER
CENTRONICS & RS-232-C INTERFACES	HP 2235A	HP 2235C
HP-IB & RS-232-C INTERFACES	HP 2235B	HP 2235D

Note

Model numbers are used throughout this manual to identify information pertinent to specific HP RuggedWriter 480 printers. If the information applies to more than one but not all HP RuggedWriter 480 printers, the model letters are separated by a "/". For example, HP 2235A/C refers to the two models with Centronics and RS-232-C interfaces and HP 2235C/D refers to the two models with a factory installed sheet feeder. If the information applies to all HP RuggedWriter 480 printers, "HP 2235X" is used.

Graphics Resolution	
HP PCL Mode	See table 1-4
Epson Mode	See table 1-6
Dot Size	0.013 inch with cloth ribbon
MTBF (Mean Time Between Failures)	20,000 hours (excluding wear-out)
Printer Usage	2500 pages/month (No duty cycle limitation)
Average Ribbon Life	5 million draft characters
Average Print Head Life	250 million draft characters

Table 1-3. HP PCL Character Information

CHARACTER SPECIFICATION	DRAFT MODE	LETTER QUALITY
Dot Resolution		
20 cpi	1/240 in.	1/360 in.
16.67 cpi	7/1440	1/360
12 cpi	1/144	1/360
10 cpi	1/120	1/360
5 cpi	1/120	1/360
Dot Spacing		
20 cpi	1/120 in.	1/120 in.
16.67 cpi	14/1440	1/120
12 cpi	1/72	1/120
10 cpi	1/60	1/120
5 cpi	1/120	1/360
Character Cell		
20 cpi	6/12x12	6/18x16
16.67 cpi	6/12x12	6/18x16
12 cpi	6/12x12	10/30x24
10 cpi	6/12x12	12/36x24
5 cpi	12/24x12	24/72x24

Table 1-4. HP PCL Graphics Copy Information

HORIZONTAL	VERTICAL	DOTS/ SCAN LINE
90 dpi (dots/inch)	90 dpi	1224
180 dpi	180 dpi	2448

Table 1-5. Epson Mode Character Information

CHARACTER SPECIFICATION	DRAFT MODE	LETTER QUALITY
Dot Resolution		
20 cpi	1/240 in	1/360 in.
17.14 cpi	7/1440	1/360
15 cpi	1/180	1/360
12 cpi	1/144	1/360
10 cpi	1/120	1/360
8.53 cpi	7/1440	1/360
7.5 cpi	1/180	1/360
6 cpi	1/144	1/360
5 cpi	1/120	1/360
Dot Spacing		
20 cpi	1/120 in.	1/180 in.
17.14 cpi	7/720	1/180
15 cpi	1/90	1/180
12 cpi	1/72	1/120
10 cpi	1/60	1/120
8.53 cpi	7/1440	1/360
7.5 cpi	1/180	1/360
6 cpi	1/144	1/360
5 cpi	1/120	1/360
Character Cell		
20 cpi	6/12x12	9/18x24
17.14 cpi	6/12x12	9/18x24
15 cpi	6/12x12	9/18x24
12 cpi	6/12x12	10/30x24
10 cpi	6/12x12	12/36x24
8.53 cpi	12/24x12	18/36x24
7.5 cpi	12/24x12	18/36x24
6 cpi	12/24x12	18/36x24
5 cpi	12/24x12	24/72x24

Table 1-6. Epson Mode Graphics Copy Information

HORIZONTAL	VERTICAL	DOTS/SCAN LINE
60 dpi (dots/inch)	60 dpi	816
80 dpi	60 dpi	1088
90 dpi	60 dpi	1224
120 dpi	60 dpi	1632
240 dpi	60 dpi	3264
60 dpi	180 dpi	816
90 dpi	180 dpi	1224
120 dpi	180 dpi	1632

Paper Handling

Maximum Paper Width	
Z-Fold	14.95 in. (380 mm)
Sheet Feeder	8.5 in. (215.9 mm)
Hand-Fed	14.57 in. (370 mm)
Printable Width	
Z-Fold	13.6 in. (345.4 mm)
Sheet Feeder	8.25 in. (209.55 mm)
Hand-Fed	13.6 in. (345.4 mm)
Multiple Part Forms	Up to 6 parts *
Maximum Pack Thickness	0.018 in. *
Paper Weight	
Z-Fold	15 to 32 lb
Sheet Feeder	16 to 21 lb
Hand-Fed	18 to 24 lb

- * See chapter 11 of the HP 2235 Series RuggedWriter 480 Printer Service Manual.

Note

All forms and card stock should be tested for satisfactory feeding, registration, and print quality. For more printable area specifications, see "Printable Area" later in this chapter.

Interface

Interface Types	
HP 2235A/C	RS-232-C & Centronics
HP 2235B/D	RS-232-C & HP-IB
RS-232-C Specifications	
Baud Rate	1200, 2400, 9600, or 19200 baud
Number of Stop Bits	1 stop bit
Word Length	7 or 8 bits
Parity	Odd, even, ones, or none
HP-IB Specifications	
Selectable Modes	Standard (IEEE 488 (1978)), secondary command mode, and listen always
Addressing	0, 1, 2, 3, 4, 5, 6, or 7
Service Request (SRQ)	Switch selectable

Note

The first interface to receive data after power-on is the active interface. The other interface is disabled and ignored.

E. KEYPAD INFORMATION

The following section explains keypad keys and lights. All keypad keys are momentary contact.

ON LINE Key and Light

Pressing the ON LINE key toggles the printer between an off-line mode and an on-line mode. Pressing the ON LINE key during the printing self-test terminates the test and sets the printer in an off-line mode.

HP 2235X printers with a firmware revision date of 12/23/87 or later use the ON LINE key in conjunction with other keys for more keypad operations. This use of the ON LINE key is similar to a keyboard shift key application. See "UP and DOWN Arrow Keys" and "Print Mode Key and Lights" for more information.

The ON LINE light is lit when the printer is on-line. A self-test failure is indicated by the ON LINE light flashing.

Paper Path Key and Lights

The paper path key selects one of three paper paths:

- Z-fold (left icon on key).
- Hand-fed (center icon on key).
- Sheet feeder (right icon on key).



Three lights above the paper path key indicate the selected paper path. Each light refers to the icon directly below, on the paper path key. The paper path lights flash if a paper-load operation fails.

Form Feed (FF) Key

The FF key function is dependent on the selected paper path and whether paper is loaded.

Z-Fold	If the Z-fold path is selected without paper above the tractors, pressing the FF key loads paper. If paper has been loaded, it is advanced to position the next paper perforation at the tear edge, located under the sound muffler (top-of-form position). If the FF key remains pressed, additional form feeds are executed until the FF key is released.
Hand-Fed or Sheet Feeder	If hand-fed or sheet feeder paths are selected and the paper sensor does not detect paper, a sheet is loaded from the selected path. If paper is loaded, pressing the FF key ejects paper from the printer. Another sheet is not automatically loaded when the paper is ejected.

Pressing the FF key while turning on the printer causes the printer to execute a printing self-test. The width of the printing self-test is dependent on the default paper path selected by the rear panel dip switches. The printing self-test is 136 columns wide if Z-fold is the default paper path. The printing self-test is 80 columns wide if the sheet feeder is the default paper path.

Line Feed (LF) Key

The LF key advances the paper one line. If the LF key remains pressed, additional line feeds are executed until the LF key is released. The LF key does not affect the top margin setting. Pressing the LF key while turning the printer on causes the printer to execute an 80 column printing self-test.

UP and DOWN Arrow Keys

Press the UP arrow key or DOWN arrow key to advance paper for fine vertical paper control. Paper movement continues until the key is released. The UP and DOWN arrow keys affect the top margin setting and both keys are inactive for cut sheet paper unless the front cover is open. With the front cover open, the UP and DOWN arrow keys can be used to clear paper jams.

Firmware Revision Date 12/23/87 or Later

While holding down the ON LINE key, the UP and DOWN arrow keys select manual view mode and label mode. For more information, read "View Modes" and Label Mode" later in this chapter.

Print Mode Key and Lights

The print mode key (key with sets of Aa) selects the next available print mode. Print mode selections include character cartridge fonts if a character cartridge is installed. Print mode lights above the print mode key indicates an internal print mode is selected:

- Courier at the default pitch (left light above print mode key).
- Draft at the default pitch (center light above print mode key).
- Compressed print (right light above print mode key).

If all three print mode lights are off, a character cartridge font is selected. The selected cartridge font is indicated by a light on the character cartridge.

Pressing the DOWN arrow key and the print mode key simultaneously while holding down the ON LINE key selects label mode. There is no keypad operation to exit from label mode. There is no keypad light to indicate label is selected. For more label mode information, See "Label Mode" later in this chapter.

F. PAPER HANDLING

Z-Fold Last Form Tear-Off

If Z-fold paper is at the top-of-form position, the printer will slew the paper so that the perforation is aligned with the tear edge. This feature allows the user to tear-off the last page printed without wasting a page. When the printer receives more data, the printer will slew the paper back to the actual top-of-form position. Selecting label mode disables the last form tear-off feature.

View Modes

View modes advance the paper such that the operator can see the last line of data printed at the tear edge. There is two view modes:

- Auto view mode.
- Manual view mode.

In auto view mode, the printer automatically advances the paper such that the operator can see the last line of data printed whenever there is a pause in printing (for example, setting the printer off-line, no data communications, etc.). Manual view mode does not automatically advance the paper for viewing the last line of print when there is a pause in printing. Instead, manual view mode allows the operator to see the last line of print only when a command for viewing is requested. To view the last line of print in manual view mode (firmware revision 12/23/87 or later), press the UP arrow key while pressing the ON LINE key. To return the paper to the printing position (unview), press the DOWN arrow key while pressing the ON LINE key or send data to the printer.

Printers with a firmware revision date earlier than 12/23/87 power-on in the auto view mode and do not have the manual view mode feature. Printers with a firmware revision date 12/23/87 or later power-on in manual view mode and auto view mode can only be enabled through an escape sequence (HP PCL only).

Caution

The tear edge is intended to be used at the paper perforation only. (See "Z-Fold Last Form Tear-Off".) Tearing paper off anywhere other than the perforation may cause a paper jam. Therefore, do not use the tear edge while viewing the last line of print since the paper perforation may not line up with the tear edge.

Label Mode

Labels are susceptible to jamming in the printer when the printer backs labels down, away from the output tray. Therefore, label mode disables Z-fold last form tear-off and view modes to minimize the backward motion of labels. Label mode is available in firmware revision 12/23/87 and later. There is no keypad light to indicate when the printer is in label mode. Label mode is only selectable with the Z-fold paper path.

To select label mode, press the DOWN arrow key and the print mode key simultaneously while pressing the ON LINE key or send an escape sequence (HP PCL only). To exit label mode, select a view mode using escape sequences (HP PCL only) or cycle power.

G. OPENING THE FRONT COVER

HP RuggedWriter 480 printer ribbon and paper path access requires opening the front cover. Open the front cover as follows:

1. Press the front cover release tabs inward at both ends of the front cover while lifting the front edge of the front cover.
2. Lift the front edge of the front cover until the front cover is latched open. The latch holds the front cover in the open position.

Note

Unless the interlock key is inserted in the printer interlock switch, the front cover must be closed for printer operation. To close the front cover, press the latch while gently lowering the front cover to the closed position.

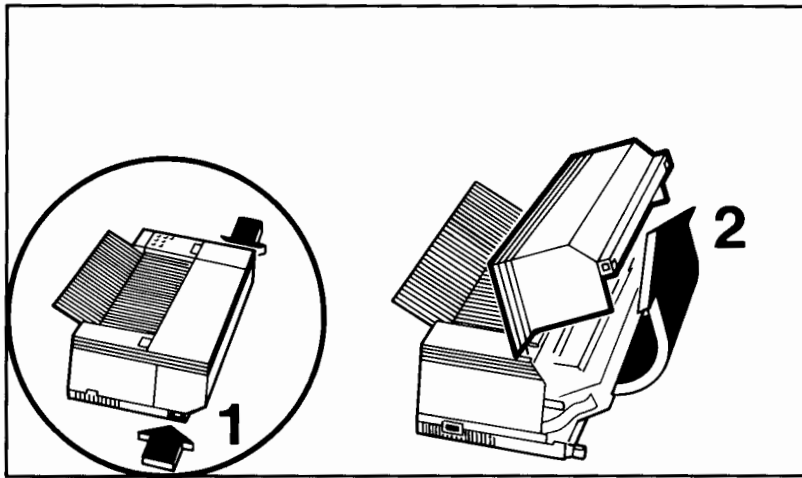


Figure 1-1. Opening the Front Cover

H. PRINTABLE AREA

Although not recommended, HP RuggedWriter 480 printers will print on the first line of a page. The printable width is 345.4 mm (13.6 in.). The maximum paper width is 380.0 mm (15 in.). The minimum width is 76.2 mm (3 in.), tractor pin to tractor pin. If the left tractor is positioned as far left as possible, the distance from the left edge of the paper to the left edge of the leftmost printable character is 22.93 mm (0.9 in.). If the right tractor is positioned as far right as possible, the distance from the right edge of the paper is 23.63 mm (0.93 in.). On the last sheet, the unprintable bottom area is 5 mm (0.2 in.) from the bottom of the paper to the lowest dot of the last graphics line. On the first sheet, the distance from the top of the first character to the top edge of the paper is 0.7 mm (0.03 in.).

Sheet Feeder

The distance from the left edge of the paper to the left edge of the leftmost printable character is 6.35 mm (0.25 in.). There is no unprintable right area. The nominal paper width is 215.9 mm (8.25 in.). The unprintable bottom area is 5 mm (0.2 in.) from the bottom of the paper to the lowest dot of the last graphics line. The distance from the top of the first character to the top edge of the paper is 0.7 mm (0.03 in.).

Hand-Fed

The distance from the left edge of the paper to the left edge of the leftmost printable character is 6.35 mm (0.25 in.). The printable area width is 345.4 mm (13.6 in.). The maximum paper width is 370 mm (14.57 in.). The minimum paper width is 76.2 mm (3 in.) and minimum length is 104 mm (4.1 in.). The unprintable bottom area is 5 mm from the bottom of the paper to the lowest dot of the last graphics line. The distance from the top of the first character to the top edge of the paper is 0.7 mm (0.03 in.).

I. TOOLS AND EQUIPMENT

The following tools and equipment are recommended for proper HP RuggedWriter 480 printer maintenance and repair:

- Flat blade screwdriver.
- Posi-drive screwdriver.
- Long nose pliers.
- Platen cleaner, P/N 92193T.
- DMM.
- HP RuggedWriter 480 test fixture, P/N 02235-60029.
- Interlock key, P/N 02235-40100.



J. SUPPORTED EQUIPMENT

HP Ruggedwriter 480 printers are designed to operate on Hewlett-Packard, Epson, or IBM compatible systems. The HP 2235A and 2235C printers have Centronics parallel and RS-232-C interfaces. HP 2235B and 2235D printers have HP-IB (IEEE 488) and RS-232-C interfaces.

K. SUPPORT STRATEGY

With the exception of coordinated shipments where systems are also being installed, HP RuggedWriter 480 printers are installed by the user following the instructions in the HP RuggedWriter 480 Printer Owner's Manual.

The power supply assembly and main logic PCA (printed circuit assembly) is handled on an assembly level basis. The firmware is NOT included with the main logic PCA. The mechanism is repaired to the subassembly or part as listed in chapter 8. See chapter 4 for HP RuggedWriter 480 troubleshooting and chapter 5 for self-test information.

HP following product support services are available:

- On Site Product Agreement (PMMC).
- Field Repair Center Agreement (FMMC).
- Priority On Site Maintenance Agreement (WMMC).

2

ENVIRONMENTAL/ INSTALLATION/PM

A. PHYSICAL SPECIFICATIONS

Product Dimensions	
Width	600 mm (23.6 in.)
Height	209 mm (8.2 in.)
Depth *	356 mm (14 in.)
Product Weight	
	13.6 kg (30 lb)
Packaged Dimensions	
Length	730 mm (28.75 in.)
Width	476 mm (18.75 in.)
Height	403 mm (15.875 in.)

- * Product dimensions do not include the sheet feeder paper cassette tray. Paper cassette tray access requires a minimum additional depth of 13 inches directly behind the printer.

B. ELECTRICAL SPECIFICATIONS

Rated Input Voltage	
115 VAC Setting	100/120 VAC, 50-60 Hz
230 VAC Setting	220/240 VAC, 50 Hz
Operating Voltage Range	
115 VAC Setting	90 to 132 VAC
230 VAC Setting	198 to 264 VAC
Line Voltage Power-Fail Threshold Level	
	0.010 seconds
Frequency Range	
	47 to 63 Hz
Transient Spike Immunity	
Amplitude	1 kV
Pulse Width	0.050 seconds
Rise Time	300 nsec
Surge Immunity @ 50 Hz	
Amplitude	20% above nominal
Duration	0.5 seconds
Sag @ 115 VAC/50 Hz	
	80.5 V for 0.5 seconds
Power Cord Length	
	Approx 2 meters

4. Lift the back cover off the printer and place the cover behind the printer.

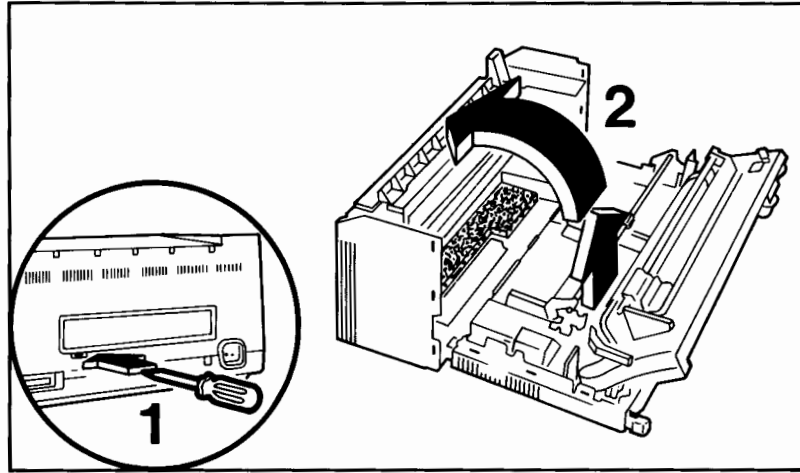


Figure 2-3. Removing the Back Cover

5. Make sure the carriage is not against the left mechanism wall.
6. Lift the bail and lower the sheet feeder onto the mechanism. A sheet feeder gear meshes with a gear on the left end of the platen.

Note

The cardboard structure holds the sheet feeder rigid during installation.

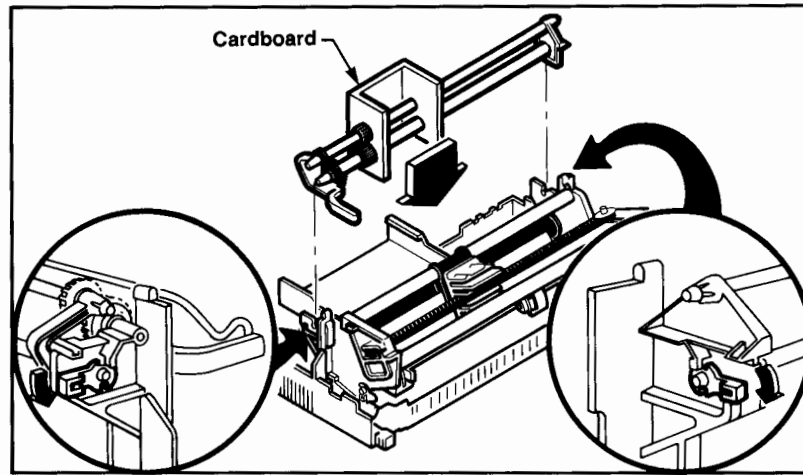


Figure 2-4. Installing the Sheet Feeder

7. Turn the sheet feeder bearings to lock the sheet feeder to the mechanism.
8. Remove the cardboard from the sheet feeder.
9. Remove the paper cassette tray cover plate from the back cover by prying the top edge of the cover plate free with a flat blade screwdriver or coin.

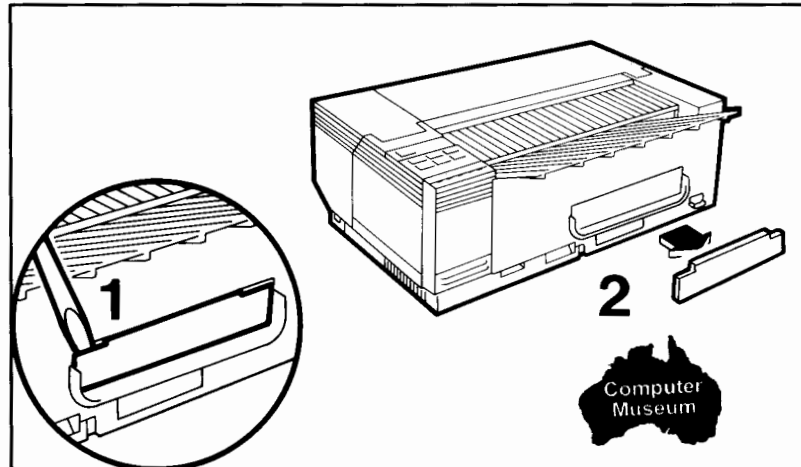


Figure 2-5 Removing the Cassette Tray Cover Plate

10. Reinstall the back cover.

11. Reinstall the front cover, ribbon cartridge, and any character cartridge or personality cartridge.

E. ITEMS INCLUDED

HP RuggedWriter 480 printers are shipped with the following items:

- HP RuggedWriter 480 Owner's Manual, P/N 02235-90002.
- One power cord (part number country dependent).
- One ribbon cartridge.
- One paper support.
- One paper cassette tray (2235C/D only).

F. SETTING THE VOLTAGE

HP RuggedWriter 480 printers contain an internal power supply with two selectable input voltage settings:

- 115 VAC.
- 230 VAC.

The following procedure selects the appropriate input voltage setting:

1. Set the rear panel voltage setting (near the power plug) to match your country's wall receptacle voltage:
 - 115 VAC setting is for input voltages from 100 to 120 VAC.
 - 230 VAC setting is for input voltages from 220 to 240 VAC.
2. Verify the printer power switch is off (0 position) and connect the power cord to the HP RuggedWriter 480 printer.

Caution

A nonreplaceable fuse in the power supply assembly will blow if the printer is powered on with 220 VAC at the 115 VAC voltage setting. If this occurs, replace the power supply assembly.

G. INTERFACE CONNECTOR PIN-OUTS

Note

For interface cable part numbers, see Table 1-2, HP RuggedWriter 480 Supplies and Accessories.

Serial Pin-Out Information

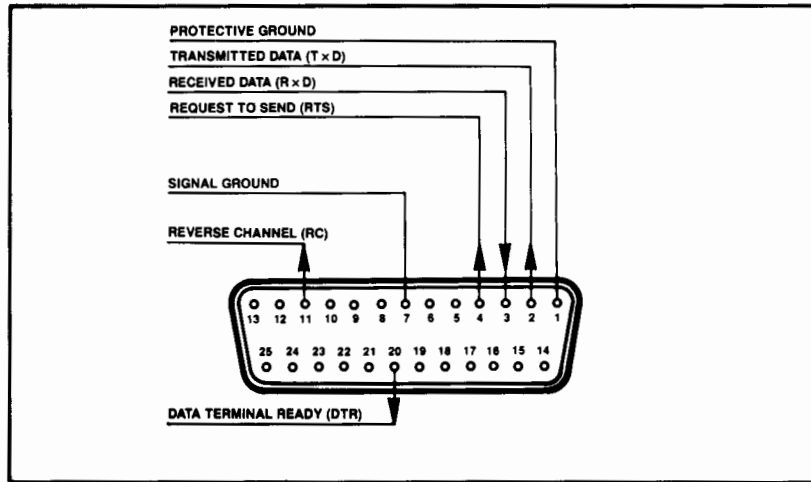


Figure 2-6. RS-232-C I/O Connector

Chassis Ground (1)	This conductor serves as an electrically grounded line for connecting the cable shield.
Transmitted Data (2)	Serial data transmitted by the printer to the host.
Received Data (3)	Serial data received by the printer from the host.
Request to Send (4)	This signal is "ON" (+ 12 V) when the printer is on-line.
Clear to Send (5)	No connection
Data Set Ready (6)	No connection.
Signal Ground (7)	The established reference potential for all data communication.
Carrier Detect (8)	No connection.
Reverse Channel (11)	This pin is directly tied to pin 20, Data Terminal Ready.
Data Terminal Ready (20)	Signal line for hardware handshake mode. Data Terminal Ready is "ON" (+ 12 volts) when the printer is powered on and is able to receive data. DTR is set "OFF" (-12 volts) to stop transmission of data from the host.

Centronics Parallel Pin-Out Information

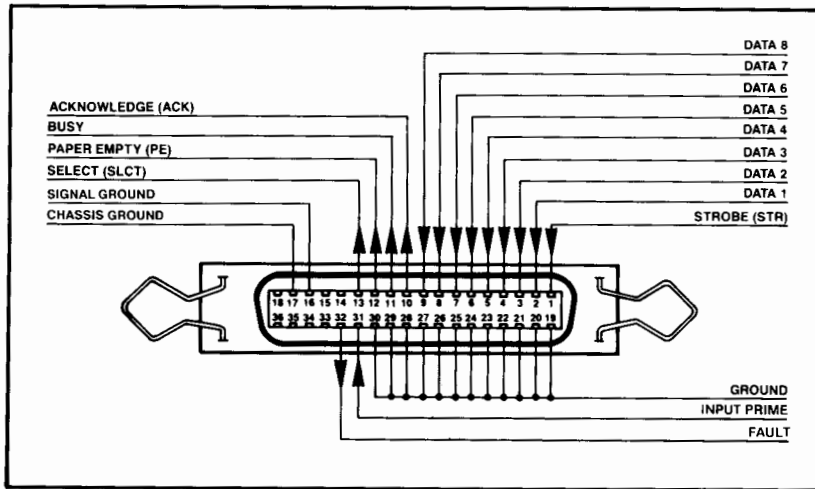


Figure 2-7. Centronics Parallel I/O Connector

- *Strobe (1) Data is latched into the printer with this signal. It must be at least 0.005 seconds wide.
- Data 1 - Data 8 (2-9) These lines are the data lines. Data 1 is the least significant bit (LSB).
- *Ack (10) This pulse indicates that the printer is ready for another byte of data and that the last data byte has been received. The pulse has a width of 0.004 seconds. The printer is ready to receive data after the start (leading edge) of this pulse.
- Busy (11) The busy signal indicates that the printer is unable to accept data.
- PE (12) This signal indicates that the printer is out of paper.
- SLCT (13) Printer is on-line.
- *Auto Feed Xt (14) No connection.
- Gnd (16) Signal ground.
- Chassis Gnd (17) Chassis ground.
- Gnd (19 - 30) Signal ground.
- *Input Prime (31) This signal causes the printer to initialize its logic to power on conditions and clear the

print buffer. Minimum pulse width required is 0.010 seconds.

*Fault (32)

This signal indicates that a fault exists in the printer.



HP-IB Pin-Out Information

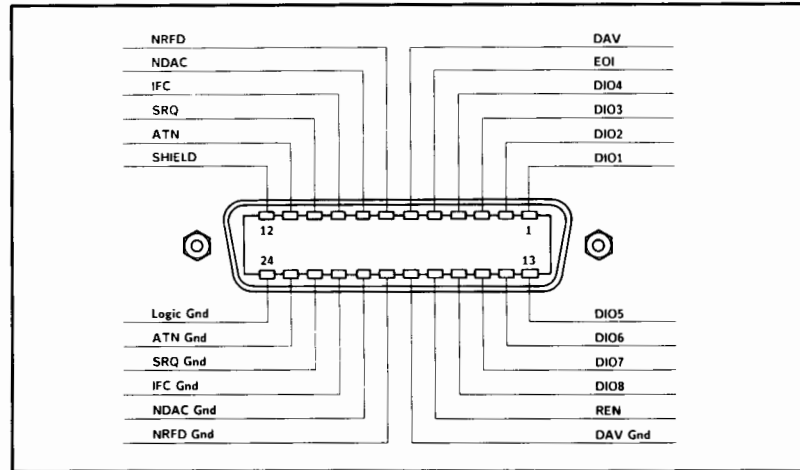


Figure 2-8. HP-IB I/O Connector

DIO Lines (1-4, 13-16)

The data lines are used to communicate all data including input, output, program codes, status, and control information.

EOI (5)

EOI (End Or Identify) may be used to indicate the end of a string of characters.

DAV (6)

DAV (Data Valid) is low to indicate the information on the DIO lines is valid.

NRFD (7)

NRFD (Not Ready For Data) is high to indicate that all listeners are ready to accept information on the DIO lines. NRFD is low when at least one listener is not ready for data.

NDAC (8)

NDAC (Not Data Accepted) NDAC is high to indicate all listeners have accepted information on the DIO lines.

IFC (9)

IFC (Interface Clear) The system controller can set this line true to unconditionally terminate all activity on the bus. This line

3-2 Configuration HP 2235X

Bank A switches have a common definition for all HP RuggedWriter 480 printers. Default interface configuration settings are defined by bank B switches. Therefore, bank B switch definitions differ between models with parallel and those with HP-IB interfaces. Remember, the first interface to receive data after power-on is the active interface. The other interface is disabled and ignored.

Note

HP RuggedWriter 480 printer configuration for specific host devices can be found in the owners and service manuals.

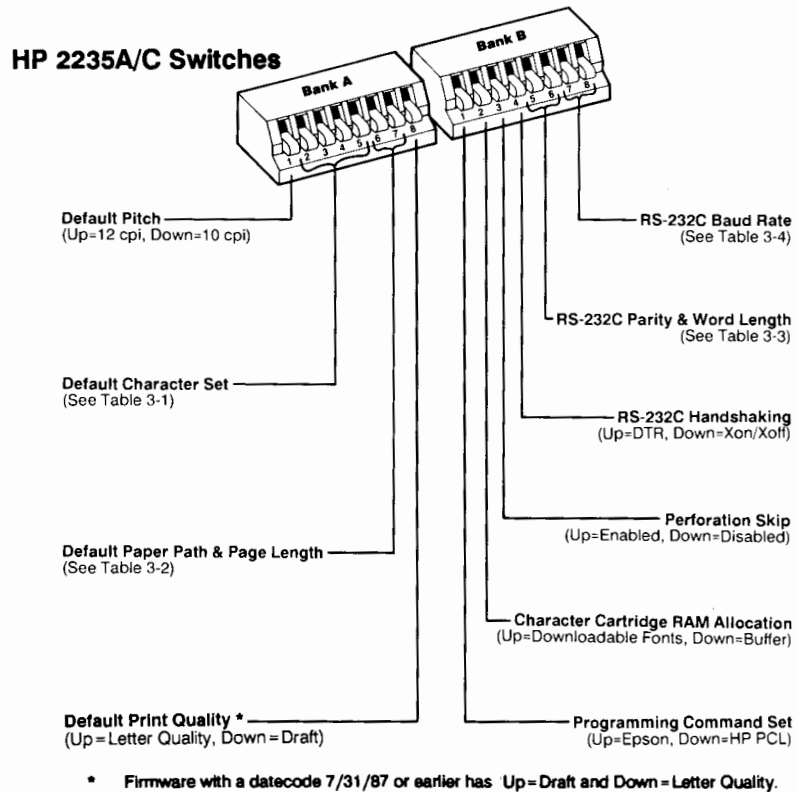


Figure 3-2. HP 2235A/C Switches

Note

The parallel Centronics interface does not require configuration switch settings.

Table 3-1. Default Character Set

A2	SWITCH			EPSON MODE (B1 UP)	HP PCLMODE (B1 DOWN)
	A3	A4	A5		
Dn	Dn	Dn	Dn	Epson USA	HP Roman-8
Dn	Dn	Dn	Up	PC-8	PC-8
Dn	Dn	Up	Dn	PC-8 D/N	PC-8 D/N
Dn	Dn	Up	Up	England	UK (04)
Dn	Up	Dn	Dn	Germany	Germany (21)
Dn	Up	Dn	Up	France	France (69)
Dn	Up	Up	Dn	Italy	Italy (15)
Dn	Up	Up	Up	Norway	Norway (60)
Up	Dn	Dn	Dn	Sweden	Sweden (11)
Up	Dn	Dn	Up	Spain	Spain (TBD)
Up	Dn	Up	Dn	Japan	JIS ASCII
Up	Dn	Up	Up	Denmark	ECMA 94
Up	Up	Dn	Dn	Denmark II	Reserved
Up	Up	Dn	Up	Spain II	Portugal (16)
Up	Up	Up	Dn	Latin America	Sweden (10)
Up	Up	Up	Up	Reserved	Reserved

Table 3-2. Default Paper Path and Page Length

DEFAULT PAPER PATH	PAGE LENGTH	SWITCH A6	SWITCH A7
Z-fold	11"	Dn	Dn
Sheet Feeder	11"	Dn	Up
Z-fold	12" *	Up	Dn
Z-fold	11" *	Up	Up

* If the sheet feeder paper path is selected from the keypad with switch A6 up, the page length is European A4.

Table 3-3. RS-232-C Parity and Word Length

SWITCH B5	SWITCH B6	PARITY	WORD LENGTH
Dn	Dn	None	8 Data Bits
Dn	Up	Odd	7 Data Bits
Up	Dn	Even	7 Data Bits
Up	Up	One	7 Data Bits

Table 3-4. RS-232-C Baud Rate

SWITCH B7	SWITCH B8	BAUD RATE
Dn	Dn	9600 Baud
Dn	Up	19200 Baud
Up	Dn	2400 Baud
Up	Up	1200 Baud

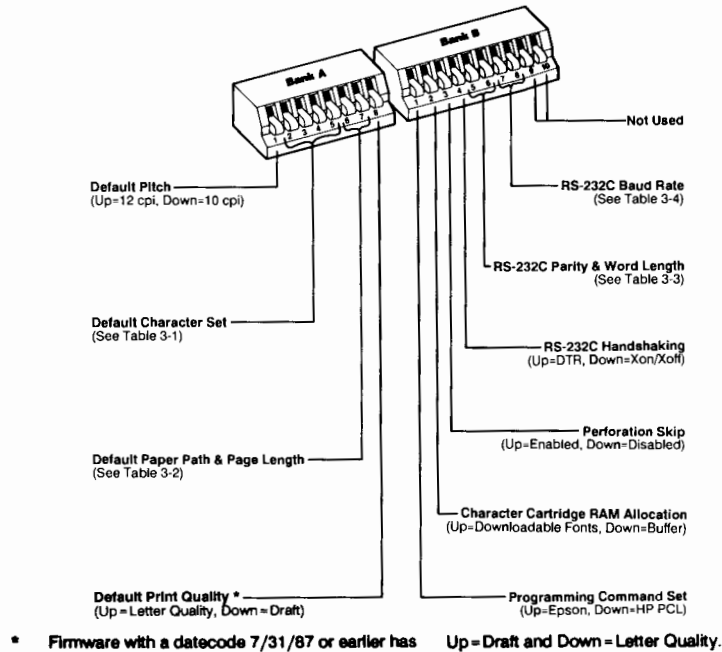
HP 2235B/D Switches

Interface Configuration Switches

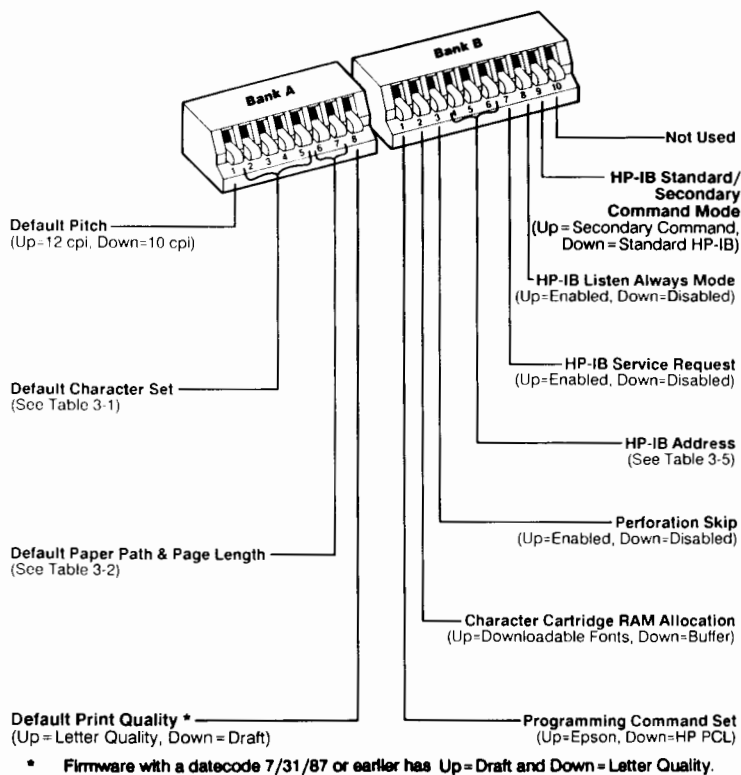
HP 2235B/D switches B4 through B8 serve dual purposes. These switches not only set the RS-232-C default configuration setting but also set the HP-IB configuration. The first interface to receive data determines whether the switches define the RS-232-C or HP-IB interface.

Note

Always check the bank B switches when connecting the printer to the host to verify the switches are properly set for the desired interface and interface configuration.



**Figure 3-3. HP 2235B/D Switches
(In Relation to the RS-232-C Interface)**



**Figure 3-4. HP 2235B/D Switches
(In Relation to the HP-IB Interface)**

Table 3-5. HP 2235B/D HP-IB Address Selection

B4	SWITCH		ADDRESS SELECTED
	B5	B6	
Dn	Dn	Dn	0
Dn	Dn	Up	1
Dn	Up	Dn	2
Dn	Up	Up	3
Up	Dn	Dn	4
Up	Dn	Up	5
Up	Up	Dn	6
Up	Up	Up	7

B. CABLING AND CONFIGURATION

HP Vectra PC To The RuggedWriter 480 Printer

HOST SET UP:

Follow the instructions below for the type of interface you will be using with your RuggedWriter 480 printer.

Parallel Interface:

When using HP 24540A Serial/Parallel interface card –
Cable: HP 24542D.

No other configuration is required.

Serial Interface:

If using the HP 24540A – Serial/parallel interface card, use –
Cable: HP 24542G

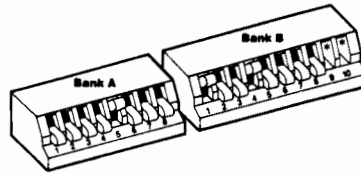
If using the HP 24541A – Dual serial interface card, use –
Cable: For port 1 (9 pin connector) use HP 24542G cable.
For port 2 (25 pin connector) use HP 13242G cable.

From the DOS prompt (A > or C >) enter the following commands:

1. **MODE COM1:96,N,8,1,P** then press the **Enter** key.
 - This command sets the serial communications at 9600 baud, no parity, 8 data bits, and 1 stop bit.
2. **MODE LPT1: = COM1** then press the **Enter** key.
 - This command directs the primary communication to the first serial port (COM1).

If your printer is connected to the second serial port, change COM1 to COM2 in the two DOS commands above.

To eliminate the need to type the two MODE commands every time your PC is turned on, create an AUTOEXEC.BAT batch file to AUTOMATICALLY EXECUTE them. Refer to your DOS manual for more information on the MODE command and how to create BATch files.

PRINTER SETTINGS:

The above printer settings match the Host set up described on the previous page, and selects the Epson Control Mode and PC-8 character set. Using Epson Mode and the PC-8 character set will provide the best match with your IBM PC/compatible software.

** - Switches B9 and B10 are only present on RuggedWriter 480 printers equipped with the HP-IB interface, and do not effect this set up. Both the parallel and HP-IB versions of the printer can be used with an IBM PC/compatible over the serial interface with the switches set as shown above.

TO VERIFY:

To verify that your printer is connected properly, type something on your screen and copy it to your printer by doing the following:

1. Make sure both the printer and PC are ON.
2. If you are using the serial interface, make sure the above MODE commands have been executed.
3. Hold down the **Shift** key and press the **PrtSc** key.

All text on the screen will print.



IBM PC Family and Compatibles To The RuggedWriter 480 Printer

HOST SET UP:

Follow the instruction below for the type of interface you will be using with your RuggedWriter 480 printer.

Parallel Interface:

Use Cable: HP 24542D

No other configuration is necessary.

Serial Interface:

If using IBM Asynchronous Communications Adaptor on the PC—
Cable: HP 13242H, or HP 17255D.

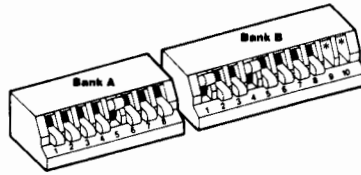
If using Serial/Parallel Dual Interface Card on the PC AT—
Cable: HP 24542G.

From the DOS prompt (A> or C>) enter the following commands:

- 1. MODE COM1:96,N,8,1,P** then press the **ENTER** key.
 - This command sets the serial communications to 9600 baud, no parity, 8 data bits, and 1 stop bit.
- 2. MODE LPT1:=COM1** then press the **ENTER** key.
 - This command directs the primary printer communication to the first serial port (COM1).

If your printer is connected to the second serial port, change COM1 to COM2 in the two DOS commands above.

To eliminate the need to type the two MODE commands every time your PC is turned ON, create an AUTOEXEC.BAT batch file to AUTOMATICALLY EXECUTE them. Refer to your DOS manual for more information on the MODE command and how to create BATCh files.

PRINTER SETTINGS:

The above printer settings match the Host set up described on the previous page, and selects the Epson Control Mode and PC-8 character set. Using Epson Mode and the PC-8 character set will provide the best match with your IBM PC compatible software.

** - Switches B9 and B10 are only present on RuggedWriter 480 printers equipped with the HP-IB interface, and do not effect this set up. Both the parallel and HP-IB versions of the printer can be used with an IBM PC/compatible over the serial interface with the switches set as shown above.

TO VERIFY:

To verify that your printer is connected properly, type something on your screen and copy it to your printer by doing the following:

1. Make sure that both the printer and PC are ON.
2. If you are using the serial interface, make sure the above MODE commands have been executed.
3. Hold down the **SHIFT** key and press the **PrtSc** key.

All text on the screen will print.

Touchscreen/Touchscreen Max/ HP 150 To The RuggedWriter 480 Printer

HOST SET UP:

Serial Cable: HP 13242G

HP-IB Cable(s): HP 10833D, A, B, or C (0.5, 1, 2 and 4 meters long)

Three or four major steps (depending on the interface) are required to set up the Touchscreen for use with the RuggedWriter 480 printer. These steps are the MS-DOS Device Configuration, the device control configuration, and the Terminal Configuration. Carefully follow the steps outlined below as they apply to either the Serial or HP-IB interface.

MS-DOS Configuration

From P.A.M.

1. Select **DEVICE CONFIG** then **Start Applic (f1)**. The menu below will be displayed.
2. Ensure that the values displayed reflect those highlighted below.

Serial Interface* –

MS-DOS Device Configuration		Main		Active Values	
System Devices					
	Interface	Model	Print Wheel	Interface	Address
PRN:	Port2	2934A		PLT:	
LST:				COM1:	
AUX:				COM2:	

*This assumes your printer is connected to Port 2 on the HP 150.

HP-IB Interface

MS-DOS Device Configuration				Main	Active Values		
System Devices							
	Interface	Address	Model	Print Wheel		Interface	Address
PRN:	HP-IB	1	2934A		PLT:		
LST:					COM1:		
AUX:					COM2:		

Only those fields associated with the operation of the RuggedWriter 480 printer have values displayed in them. Refer to your PC's manual for information on changing the values in these fields.

- Once the changes, if any, have been made, save the information by pressing **Save Config** (f4), then **Exit Config** (f8) to return to P.A.M.

DEVICE CONTROL CONFIGURATION

From P.A.M.

- Press the **Terminal** key (f6), then the **User System** key followed by **device control** (f1) and "to" devices (f3).
- Select the appropriate "to" device by pressing **Serial Device** (f2) or **HP-IB Device** (f5). Ensure that an asterisk (*) appears only in the field corresponding to the interface you are using.
- Press the **User System** key.

Port 2 Configuration—Serial Interface Only

From P.A.M.:

- Press the **Terminal** key (f6). Press the **User System** key on your keyboard, then press **config keys** (f8), then **port2 config** (f4). The following menu will be displayed.
- Set the values on your PC to match those shown.

Terminal Config. Screen

FULL DUPLEX HARDWIRED Port 2							
BaudRate	19.2K	Parity	None	DataBits	8	EnqAck	No
Asterisk	Off	Check Parity	No	Stop Bits	1		
TR(CD)	Hi			SR(CH)	Lo		Clock
							INT
RecvPace	None	SRRXmit	No	RR(CF)Recv	No		
XmitPace	Xon/Xoff	SRRIinvert	No	CS(CB)Xmit	No		DM(CC)Xmit
							No

- Once the changes have been made, save the Port 2 configuration by pressing **Save Config** (f1).

GLOBAL CONFIGURATION—Serial Interface Only

From P.A.M.:

1. Press the **Terminal** key (f6). Press the **User System** key on your keyboard, then press **config keys** (f8), then **global config** (f1). Make sure that the Remote/Serial Dev field displays PORT1/PORT2.
2. Once the changes have been made, save the global configuration by pressing **SAVE CONFIG** (f1).

HP LINE DRAW—TERMINAL CONFIGURATION

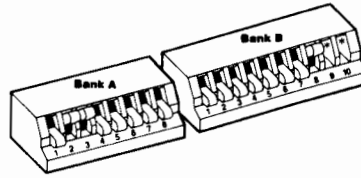
The HP Line Draw Character Set for the RuggedWriter 480 printer is contained in a Character Cartridge, HP P/N 12235A. With this cartridge installed, the following terminal configuration will allow these "special" characters to be printed.

From P.A.M.:

1. Press the **Terminal** key (f6).
2. Press config keys (f8), then **terminal config** (f5).
3. Set the values on your screen to match those shown below. (The other values on your screen govern other functions and do not apply specifically to Line Draw.)
ASCII 8 Bits **YES**
Alternate Set **Line(B)**
4. Once these changes have been made, save the terminal configuration by pressing **Save Config** (f1).
5. Return to P.A.M. by holding down the **Shift** key and pressing the **Stop** key.

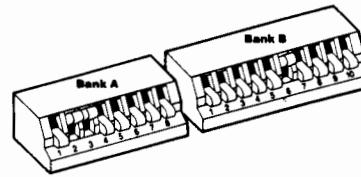
PRINTER SETTINGS:

For Serial Interface



*Switches B9 and B10 are present only on RuggedWriter 480 printers with the optional HP-IB interface.

For HP-IB Interface



Switches B9 and B10 are present only on RuggedWriter 480 printers with the optional HP-IB interface.

TO VERIFY:

From P.A.M.

1. Select **MSDOS COMMANDS**, then press **Start Applic (f1)**.
2. Once the **A>** prompt appears, type **dir>prn**, then press the **Return** key. A directory of the disc in drive A will print.
3. Type **Exit**, then press **Return**. This will exit MS-DOS and return you to P.A.M.



HP 250/260 To The RuggedWriter 480 Printer

HOST CONFIGURATION:

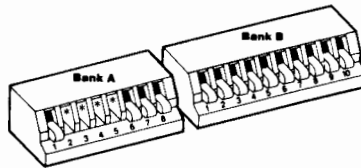
Serial Interface:

- OS Revision: B.08.00 or greater
- DROMS Required: TIO
- ASI Port: Any port. If multiple printers are to be used, each printer must be on a separate port.
- ASI Panel Strapping: Application dependent. Refer to the HP 250/260 manuals for more information, or contact your HP Customer Engineer.
- RFIG Values:
 - Class: Printer
 - Type: 2225 or 268X
 - Format: 8N1

This example assumes 9600 baud.

PRINTER SETTINGS:

Serial Interface:



Switches B9 and B10 are only present on RuggedWriter 480 printers equipped with the HP-IB interface and do not affect this setup.

*Dependent on Primary Language on the system.

TO VERIFY:

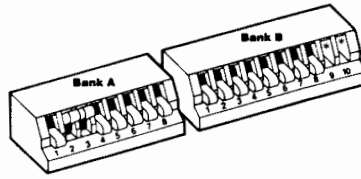
To verify that your printer is connected properly, type something on the screen and copy it to your printer by doing the following:

1. Press the **User System** key.
2. Press the **modes** key (f4).
3. Press **REMOTE MODE** key (f4) until the asterisk (*) disappears from the **REMOTE MODE** label on the screen. This selects Local Mode.
4. Press **AUTO LF** (f8) until the asterisk (*) appears in the **AUTO LF** label on the screen. This selects automatic line feeding.
5. Type **This is a Test!** and press the **Return** key.
6. Hold down the **Shift** key and press the **Print Enter** key. **This is a test!** will print.
7. Press **REMOTE MODE** (f4) until the asterisk (*) appears in the **REMOTE MODE** label, then press the **User System** key to return the terminal to normal operation.

HP Line Draw—

The HP Line Draw Character Set for the RuggedWriter 480 printer is contained in a Character Cartridge, HP P/N 12235A. With this cartridge installed, the configuration described in this application note will allow these "special" characters to be printed.

PRINTER SETTINGS:



** - Switches B9 and B10 are only present on RuggedWriter 480 printers equipped with an HP-IB interface and have no effect on this Set Up.

TO VERIFY:

To verify that your printer is connected properly, type something on the screen and copy it to your RuggedWriter 480 printer by doing the following:

1. Press the **User System** key.
2. Press the **modes** key (f4).
3. Press the **REMOTE MODE** key (f4) until the asterisk (*) disappears from the **REMOTE MODE** label on the screen. This selects Local Mode.
4. Press **AUTO LF** (f8) until the asterisk (*) disappears from the **AUTO LF** label on the screen. This deselects automatic line feeding.
5. Type **This is a Test!** and press the **Return** key.
6. Hold down the **Shift** key and press the **Print/Enter** key. **This is a Test!** will print out on your printer.
7. Press **REMOTE MODE** (f4) until an asterisk (*) appears in the **REMOTE MODE** label. Press the **User System** key to return the terminal to normal operation.

HP Line Draw—

The HP Line Draw Character Set for the RuggedWriter 480 printer is contained in a Character Cartridge, HP P/N 12235A. With this cartridge installed, the configuration described in this application note will allow these "special" characters to be printed.

HP 1000 Series A To The RuggedWriter 480 Printer

HOST SETUP:

For specific information on configuring your system with the appropriate device and interface drivers refer to the HP 1000 Driver Reference Manual and the HP 1000 Generation and Installation Manual.

Serial Interface:

Interface: 12792C/D Multiplexer
Cable: HP 92219G
Device Driver: DDC.00
Interface Driver: ID800, ID400, or ID100
Device Specification: Printer

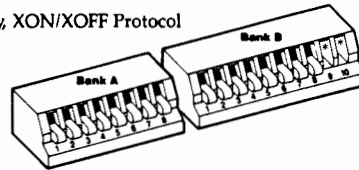
HP-IB Interface:

Interface: 12009A HP-IB Interface
Cable: HP 10833 D, A, B, or C (0.5, 1, 2 and 4 meters long).
Printer Address - 6
Device Driver: %DD*.12
Interface Driver: ID*37
Device Specification: Printer

PRINTER SETTINGS:

Serial Interface:

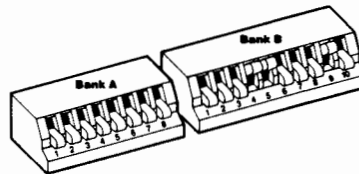
9600 Baud, 8 Data Bits, No Parity, XON/XOFF Protocol



*Switches B9 and B10 are present only on RuggedWriter 480 printers with the optional HP-IB interface.

HP-IB Interface:

Address 6, Secondary Commands ON



Switches B9 and B10 are present only on RuggedWriter 480 printers with the optional HP-IB interface.

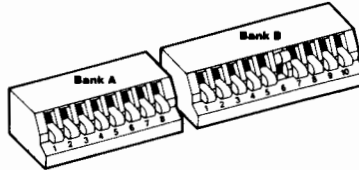
HP9000 Series 200, 300 and 500 Using BASIC To The RuggedWriter 480 Printer

HOST SET UP:

An HP-IB interface is standard with all HP Series 200, 300 and 500 Technical Computers.

HP-IB Cable(s): HP 10833 D, A, B or C (0.5, 1, 2 and 4 meters long).

PRINTER SETTINGS:



TO VERIFY:

The BASIC program below can be used to verify the correct set up of both the computer and printer. Load BASIC and enter this program.

```
10 PRINTER IS 701
20 FOR I=1 TO 2
30 FOR J=33+I TO 111+I
40 PRINT CHR$(J);
50 NEXT J
60 PRINT
70 NEXT I
80 PRINT
90 END
```

Press the RUN key and this pattern will print:

```
"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnop
#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnop
```


HP9000 Series 300 HP-UX To The RuggedWriter 480 Printer

HOST SET UP:

An HP-IB interface is standard on all HP Series 300 Technical Computers. The following describes the system set up for the RuggedWriter 480 printer as the default system printer using that interface.

HP-IB Cable(s): HP 10833 D, A, B or C (0.5, 1, 2 and 4 meters long).

HP-UX Reconfiguration

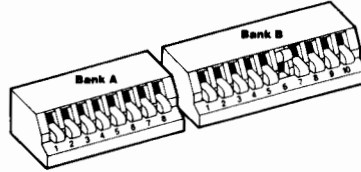
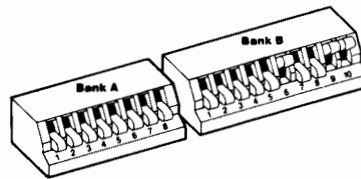
1. Execute the **RECONFIG** command.
2. Hi-light **Configure the line printer** using the **TAB** key.
3. Press the **SELECT** softkey to display the Printer Configuration Menu.
4. Fill in the menu as shown below:

PRINTER NAME:	2235	MODEL:	dumb
PRINTER INTERFACE:	HPIB (NON-CIPER)	SUB-ADDRESS:	1
SELECT CODE:	7		
DO YOU WANT THIS TO BE THE DEFAULT SYSTEM PRINTER?:			yes

5. Press the **DONE** softkey to exit.

PRINTER SETTINGS:

There are two modes of HP-IB operation supported by the RuggedWriter 480 printer. These are referred to as Standard and Secondary Command modes and are selected as shown below. The Secondary Command mode should be used if the same HP-IB bus is driving your printer and a disc drive. Otherwise, the Standard mode is the better set up.

STANDARD MODE:**SECONDARY COMMANDS MODE:****TO VERIFY:**

To verify the correct set up:

1. Execute the LPSTAT -T command. RuggedWriter 480 should be displayed as the default system line printer.
2. Execute "ls | lp -dprintername". This will result in the current directory being printed.

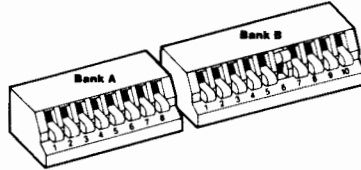
HP9000 Series 200, 300 Using PASCAL To The RuggedWriter 480 Printer

HOST SET UP:

An HP-IB interface is included standard with all HP Series 200 and 300 Technical Computers.

HP-IB Cable(s): HP 10833 D, A, B or C (0.5, 1, 2 and 4 meters long).

PRINTER SETTINGS:



TO VERIFY:

From the Main System Menu:

1. Type F (runs the Filer).
2. Then enter L (Directory Listing).
3. Now enter ***.PRINTER:** and press **Return**.

A listing of the default directory will be printed.

(Intentionally Blank)

3-28 Configuration HP 2235X

(Intentionally Blank)

(Intentionally Blank)

(Intentionally Blank)

4

TROUBLESHOOTING

A. TROUBLESHOOTING TOOLS

- HP RuggedWriter 480 test fixture, P/N 02235-60029.
- Interlock key, P/N 02235-40100.
- Flat blade screwdriver.
- Posi-drive screwdriver.
- Long nose pliers.
- DMM.



B. AVOIDING PAPER JAMS

The following guidelines help avoid paper jams:

- Use paper that meets chapter 1 paper specifications.
- Do not use paper with folds (except Z-fold), tears, staples, etc.
- Adjust the print head gap for proper print head to platen distance.
- When loading sheet feeder paper, make sure the paper is positioned below the two metal corner clips on the paper cassette tray.
- The paper tear edge is designed to tear Z-fold paper only at the paper perforations. (The paper tear edge is located near the output rollers under the sound muffler.)
 - Adjust paper so the perforation lines up with the tear edge when at top-of-form.
 - Form feed paper to the perforation before tearing off Z-fold paper.
 - Check that the paper perforation is positioned at the printer tear edge before changing paper paths or turning the printer off.
- Do not use the sound muffler as the paper tear edge.
- Do not cycle power with the top edge of the paper to the platen (tripping the paper sensor) but below the bail. The printer will not lift the bail when paper is advanced.
- Do not change from the Z-fold paper path to the cut sheet paper path with the Z-fold paper top-of-form approximately 8 inches or more beyond the tear edge. The printer will not back the Z-fold paper far enough to locate the top edge of the paper. The printer must be able to locate the Z-fold paper top edge to clear the mechanism of the Z-fold paper.
- Do not print at the extreme top and bottom regions of cut sheet paper.

4-2 Troubleshooting HP 2235X

- Check that the paper has been torn off cleanly at the perforation.
- Check that the paper length matches the page length specified by the dip switches or escape sequences. Pressing the FF key should move the paper from one perforation to the next perforation.

Note

Always cycle power after paper jams.

C. TESTING THE KEYPAD

Use the following procedure to verify HP RuggedWriter 480 keypad operation:

1. Turn the printer off.
2. Remove paper and any installed cartridge from the printer. Set all the function dip switches down. The dip switches are located on the back of the printer near the I/O connectors.
3. Turn the printer on and press the following keys to verify keypad operation:
 - A. The print mode key cycles through the print mode lights.
 - B. The paper path key cycles through the paper path lights.
 - C. The ON LINE key toggles the ON LINE light if the sheet feeder paper path or Z-fold paper path is selected.
 - D. The LF key attempts to load paper. Since there is no paper installed, the selected paper path light will flash.
 - E. The FF key attempts to load paper. Since there is no paper installed, the selected paper path light will flash.
 - F. With the tractor path selected, the UP key attempts to advance the paper slowly.
 - G. With the tractor path selected, the DOWN key attempts to retract the paper, but only after a paper advance has been executed.

D. SELF-TESTS

The HP RuggedWriter 480 printer has two built-in self-tests:

- Power-on self-test.
- Printing self-test.

See chapter 5 for more information on the printer self-tests.

E. TEST FIXTURE

The HP RuggedWriter 480 test fixture, P/N 02235-60029, is a troubleshooting tool designed specifically for testing HP RuggedWriter 480 printers. The test fixture tests the following parts and assemblies:

- Power supply assembly.** By plugging a power supply assembly into the test fixture, turning on the test fixture and power supply assembly, and pressing the test fixture power supply button, the test fixture identifies a good or faulty power supply assembly.
- Stepper motors (paper and carriage).** By plugging a motor into the test fixture and manually turning the motor shaft, two test fixture LEDs should light with equal brightness.
- Mechanism sensors (home and paper) and interlock switch.** By plugging a sensor into the test fixture, turning on the test fixture, and manually tripping the sensor, a test fixture LED should toggle as the sensor is tripped.
- Print head and print head cable.** By plugging a pair of print head cables into the test fixture and turning on the test fixture, the test fixture will identify an open circuit in the print head or print head cable.

Although the test fixture cannot thoroughly test the logic PCA, the test fixture can help identify faulty logic PCAs by checking printer parts separate from the PCA. For example, if the paper motor does not operate in the printer but the test fixture indicates the paper motor is ok, the logic PCA is probably the cause for no paper motor operation.

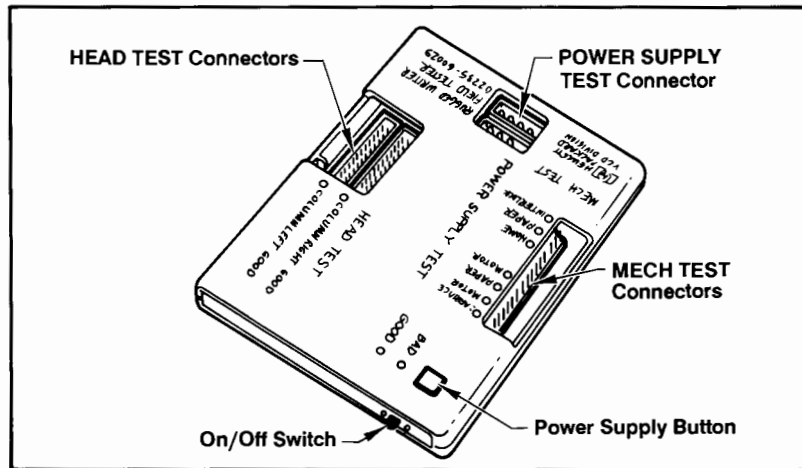


Figure 4-1. HP RuggedWriter 480 Test Fixture

Test Fixture Battery

The test fixture is powered by a 9 volt battery mounted inside the test fixture case.

Checking the Battery

Use the following procedure to check the test fixture battery:

1. Turn on the test fixture. The on/off switch is mounted on the side of the test fixture near the power supply button. See Figure 4-1.
2. Press the test fixture power supply button. With the test fixture disconnected from a power supply assembly, the "BAD" LED will light if the battery is ok.

Note

To prolong the battery life, be sure to turn off the test fixture when the test fixture is not used.

Replacing the Battery

Use the following procedure to replace the 9 volt battery in the test fixture:

1. Remove the screws located on the bottom of the test fixture.
2. Lift the cover off the test fixture.
3. Replace the battery.
4. Reinstall the test fixture cover and test fixture screws.

Troubleshooting with the Test Fixture

Testing HP 2235X Power Supply Assemblies

Caution

To avoid damaging power supply assemblies, do not power-on a power supply assembly unless the power supply assembly is connected to a logic PCA or the test fixture.

Use the following procedure to test an HP RuggedWriter 480 power supply assembly:

1. Turn on the test fixture. Check the battery condition.
2. With the printer turned off, disconnect the power supply assembly from the logic PCA and connect the power supply assembly to the "POWER SUPPLY TEST" connector on the test fixture.
3. Turn on the power supply assembly (that is, the HP RuggedWriter 480 printer power switch).

Caution

To avoid damaging the test fixture, do not leave the power supply assembly connected to the test fixture and powered-on for longer than one minute.

4. Press the power supply button on the test fixture. The "GOOD" or "BAD" LED will light to indicate the condition of the power supply assembly.
5. Turn off the power supply assembly before disconnecting the power supply assembly from the test fixture.

Testing HP 2235X Motors and Sensors

Use the following procedure to test the HP RuggedWriter 480 printer stepper motors, sensors, and interlock switch:

Note

You do not have to connect all the motors and sensors; only the motors and sensors you desire to test.

1. Turn the test fixture on. Check the battery condition.
2. Connect the stepper motors and sensors to the "MECH TEST" connectors on the test fixture. The motors and sensors connect to the test fixture in the same order they connect to the logic PCA.
3. Manually slide the print head to the left and right. Both "CARRIAGE MOTOR" LEDs should light with equal brightness.
4. Manually turn the platen. Both "PAPER MOTOR" LEDs should light with equal brightness.
5. Slide the carriage to the left wall and back to the center of the mechanism. The "HOME" LED should light only when the carriage is away from the left mechanism wall (that is, the carriage flag is out of the home sensor).
6. Reach above the Z-fold tractors to the paper sensor lever. The "PAPER" LED should light when the paper sensor does not detect paper (paper lever out of the paper sensor). The "PAPER" LED should be off when the paper sensor detects paper (paper lever positioned in the paper sensor).
7. Insert and remove the interlock key in the interlock switch. The "INTERLOCK" LED on the test fixture should be on with the interlock key inserted and the "INTERLOCK" LED should be off with the interlock key removed.

Testing HP 2235X Print Heads and Print Head Cables

Use the following procedure to test the print head and print head cable for electrical continuity (no open circuits):

1. Turn the test fixture on. Check the battery condition.



2. Plug the HP RuggedWriter 480 printer print head cables into the "HEAD TEST" connectors. If the print head and cables pass the continuity test, both "HEAD TEST" LEDs will light. If a "HEAD TEST" LED does not light:
 - A. Verify the print head is connected to the print head cable.
 - B. Connect a known good print head to the print head cable in the printer.
 1. If both "HEAD TEST" LEDs light, the original print head is faulty. Replace the print head.
 2. If either "HEAD TEST" LEDs still don't light, the print head cable is faulty. Replace the print head cable.

F. PAPER PATH TROUBLESHOOTING

HP RuggedWriter 480 printers have two to three paper paths (model dependent) selectable by the keypad or escape sequences. Read "Mechanism" in chapter 5 of the service manual for a functional description of each paper path.

Check the paper path operation by the following procedure:

1. Remove paper from the printer. Paper may interfere with the your observation of the mechanism action.
2. Remove the front cover and back cover from the printer (See removal procedure 6.A and 6.B in chapter 6 of the service manual). Do not disconnect the keypad from the logic PCA.
3. Insert the interlock key into the interlock slot located below the motors on the printer base. This interlock key allows the printer to operate with the front cover open or removed.

Caution

Operating the printer without the front cover closed increases the possibility of tearing Z-fold paper at the tractors.

4. Turn the printer on. Select different paper paths from the keypad and press the FF key. The mechanism components related to the selected paper path should operate.

Example

The tractors should turn when the platen turns if the Z-fold paper path is selected and the FF key pressed.

5. If the selected path does not engage, turn the printer off and try to engage the paper path by manually moving the print head to the right and left. Manually turn the platen and see if the paper path is selected.

Example

If the tractors do not engage, manually move the print head to the right and determine if the print head is coming in contact with the lever on the right end of the tractor shaft. Turn the platen by hand and observe if the tractors turn with the platen. Move the head to the right mechanism wall to disengage the tractor path. The tractors should not turn when the platen turns if the tractor is disengaged.

G. OVERALL TROUBLESHOOTING

Check Motor Resistances

Table 8-1 lists carriage motor and paper motor resistance. Disconnect the motor from the PCA before measuring the motor windings.

Table 8-1. Carriage and Paper Motor Resistance

WIRE PAIR	RESISTANCE
Blue to Red	2.5 ohms
Black to Green	2.5 ohms
Other Wire Pairs	Open Circuit

Note

The carriage motor and paper motor can be checked with the HP Rugged-Writer 480 test fixture. See "Test Fixture" in this chapter.

Note

If a motor winding is shorted, the PCA also needs to be replaced.

Check Voltages

Measure the power supply assembly voltages listed in table 8-2.

Caution

The power supply must be connected to the logic PCA or test fixture. Measuring the power supply assembly with no load will provide meaningless data and may damage the supply. To verify the power supply assembly with the HP RuggedWriter 480 test fixture, read "Test Fixture" in this chapter.

Table 8-2. Table of Voltages

PIN # & (WIRE COLOR)	NOM. VOLT.	MIN	MAX	WHERE USED
1 (Orange)	+38 V	36.1 V	39.9 V	print head & motors
2 (Violet)	Gnd			
3 (Black)	Gnd			
4 (Blue)	-12 V	-13.2 V	-10.8 V	RS-232
5 (White)	+12 V	10.8 V	13.2 V	
6 (Red)	+5.1 V	5.0 V	5.2 V	RS-232, print head, reference logic, LEDs
7 (Green)	Gnd			
8 (N/C)	N/C			

If a voltage listed in table 8-2 is out of tolerance:

Test the power supply assembly on the HP RuggedWriter 480 test fixture. See "Test Fixture" in this chapter. If the power supply assembly fails on the test fixture, the power supply is faulty and requires replacement. If the power supply assembly passes on the test fixture, replace the PCA.

Note

If the +5V line is low on the PCA and the power supply fails on the test fixture, check the resistance of the +5V line with the power supply disconnected. If the resistance is less than 2.50 ohms or an open circuit, replace the PCA and the power supply assembly.

H. TROUBLESHOOTING HINTS

This section provides possible causes for the following problems:

- Keypad Problems.
- Print Head Motion Problems (stalling, no motion).
- Paper Path Problems (jams, misloads, skewing).
- Print Quality Problems.
- Data Communications Error.

Note

This section assumes that the front (and possibly rear) covers are removed and that the interlock key is installed. See "Test Fixture" in this chapter for information on troubleshooting with the HP RuggedWriter 480 test fixture.

Keypad Problems

The normal keypad light state should have: one font light illuminated, one paper path light illuminated or flashing, and the ON LINE light on or off. Possible faulty keypad states include the following:

All keypad lights flashing.

This indicates a power-on self-test error. Check the power supply assembly with the test fixture or check the voltages listed in Table 8-2. If voltages are within range, replace the logic PCA.

Keypad lights in an undefined state.

Cycle the power and observe the print head.

1. If the print head homes during power-on, try a new keypad, then a new logic PCA.
2. If the print head does not home during power-on, check the power supply assembly with the test fixture or check the voltages listed in Table 8-2. If the voltages are ok, replace the logic PCA.
3. Possibly faulty interlock switch. No lights would be on.

The keypad doesn't work.

See "Testing the Keypad" in this chapter to verify proper keypad operation.

1. Verify the front cover closed. The printer will not operate with the front cover open unless an interlock key is used.
2. Check interlock switch with an ohmmeter or the test fixture.
3. If the keypad connectors are fully seated, replace the keypad or PCA.

All paper path lights flashing.

This error indicates a paper jam occurred.

1. Remove any obstruction in the paper path.
2. Verify the paper using meets the paper specifications listed in chapter 1.
3. Check the paper sensor lever and the paper sensor. The sensor can be tested with the test fixture.
4. Replace the logic PCA.

Print Head Motion Problems

No motor activity.

Changing the paper path and pressing the FF key should cause both motors to run. If the motors did not operate, test the motors and interlock switch with the test fixture or the following procedure:

1. Disconnect the interlock switch from the PCA and measure the contact resistance with the switch closed.
2. If the interlock switch resistance is greater than 5 ohms, replace the switch.

Carriage motor failure.

The carriage motor doesn't turn when the printer is powered-on but the paper motor runs when the FF key is pressed.

1. Check the carriage motor with the test fixture or measure the motor winding resistance for opens and shorts (see Table 8-1).
2. If the resistance is incorrect, replace the carriage motor.
3. If the resistance is ok, replace the PCA.

Print head runs into left mechanism wall when powered-on.

1. Check the home sensor on the left mechanism wall for proper installation.
2. Check for carriage stalls or a home sensor obstruction.
3. Check the home sensor with the test fixture. If the home sensor is faulty on the test fixture, replace the home sensor.

Print head binds on the rails.

1. Is the print head gap adjustment set too close?
2. Remove any obstruction in the print head path.
3. Check the carriage motor with the test fixture. Both carriage motor test fixture LEDs should be equally bright when the motor is turned.
4. Make sure the print head connector is fully seated.
5. Clean or replace the carriage rails (but don't lubricate them) or the print head.
6. Check the belt tension. If tension incorrect, replace the wedge, spring, or carriage belt.
7. Check the forms compressor (flexible metal attached to the print head near the tip). If bent, replace the print head assembly.
8. Make sure the carriage motor isolator is mounted correctly between the carriage motor and the right wall of the mechanism structure.

Paper Path Problems

Misloads.

Paper is loaded correctly and paper path light is flashing.

1. If the paper does not trip the sensor lever, install paper according to the owner's manual instructions.
2. If the paper trips the sensor but the paper path light flashes, check the paper sensor lever and paper sensor with the test fixture.

Paper jams above the print head.

1. Check for paper feed obstructions at the following locations:
 - The print head.
 - Behind the paper tension spring.
 - Under the platen.
2. Make sure the bail lifts correctly.



Hand-fed paper problems.

1. Verify the paper using meets the paper specifications listed in chapter 1.
2. Does the paper motor turn when the FF key is pressed? If not, check the paper motor with the test fixture or measure the paper motor winding resistance and PCA voltages.
3. Does the platen turn? If not, check that the platen is firmly seated and that the shaft bearings are locked. If the platen gear is broken, replace the platen assembly.
4. Check that the paper engages with the pinch rollers and that there are no obstructions or damaged parts under the platen roller.

Paper jams or skews.

1. Is the paper loaded correctly?
2. Observe paper operation. Remove the platen and check for obstructions or damaged springs and rollers.
3. If the paper skews, check the pinch roller spring and the paper tension spring for even tension across platen. Replace any bent or damaged parts.

Tractor path doesn't feed.

1. Is the paper loaded correctly?
2. Check the possible causes listed in the hand-fed paper problems.
3. Check the tractor drive gear, shift lever, and shift lever spring.
4. Verify the print head is not stalling on the carriage rails.

Sheet feeder problems.

1. Is the paper loaded correctly?
2. Check the possible causes listed in the hand-fed paper problems.
3. Check the sheet feeder gears, lever that engages the sheet feeder, and paper cassette tray input rollers. If the paper does not load from the sheet feeder path, make sure the print head deflects the sheet feeder shift lever located at the left side of the mechanism.
4. Does the print head stall? If it does, see possible causes listed in the print head motion problems. Check the shift lever for binding and proper assembly. If the print head does not stall, check for broken gears.

Print Quality Problems

General problems.

1. Check that the ribbon cartridge is fully seated onto mechanism.
2. Check the print head to platen spacing by adjusting the print head gap while running a printing self-test.
3. Check for print head obstructions.

Light print.

1. Check the ribbon cartridge for wear and proper ribbon advancement.
2. Make sure the platen bearings are locked so the platen is not "floating".
3. Check the power supply voltages with the test fixture or measure the voltages listed in Table 4-2.

No print.

1. Check the ribbon cartridge for damage.
2. Check the print head cable connection at the PCA.
3. Check the power supply voltages with the test fixture or measure the voltages listed in Table 4-2.
4. Check the print head and print head cable with the test fixture.
5. Replace the logic PCA.

Missing dots.

1. Are the print head cable connectors fully seated?
2. Check the print head and cable with the test fixture.
3. Check the power supply voltages with the test fixture or measure the voltages listed in Table 4-2.
4. Replace the logic PCA.

Bottom dots lighter than upper dots.

1. Check for paper caught between the forms compressor and the print head.
2. Verify the platen is fully seated and locked onto the mechanism structure.
3. Adjust the print head gap. If adjusting does not fix the problem, replace the print head.

Ink smearing.

1. Check the print head gap (too small).
2. Make sure the ribbon is between the forms compressor and the tip of the print head.
3. Check for paper caught between the forms compressor and the tip of the print head.
4. Make sure platen bearings are locked to the mechanism structure rather than "floating".

Incorrect dot patterns.

1. Make sure the print head cable is correctly plugged into the PCA and print head.
2. Check the print head and print head cable with the test fixture. If the print head and print head cable are ok, replace the PCA.

Data Communications Error

1. No communication with the host. Invoke the printing self-test. If the self-test passes:
2. Verify the hardware configuration. See chapter 3 of the service manual for hardware configuration to specific hosts.
3. Try the printer on a known good system.
4. Try another printer on the same computer port with the same cable.
5. Verify the I/O cable and computer port are good.
6. If using an RS-232-C interface, check the baud rate, handshaking, parity, voltages, etc.

5

DIAGNOSTICS/ SELF TEST

A. SELF-TESTS

HP RuggedWriter 480 printers have two internal self-tests:

- Power-on self-test.
- Printing self-test.

B. POWER-ON SELF-TEST

The power-on self-test occurs automatically when the printer is turned on. All keypad lights are on during the test. The power-on self-test checks the following:

- Checksum of the main logic PCA ROM.
- Main logic PCA RAM test.
- Main logic PCA I/O VLSI chips (only partial test).
- Checksum of character cartridge ROM, if installed.

If the power-on self-test passes, the printer is set on-line. If the self-test fails, the printer remains off-line and flashes the keypad lights.

C. PRINTING SELF-TEST

The printing self-test is invoked by turning the printer on with the LF key or PF key held down. The printing self-test performs the following:

- Executes the power-on self-test.
- Prints the firmware date code.
- Prints the dip switch settings.
- Prints the complete character set.
- Prints the contents of any optional cartridge, including datecode.
- Prints a character swirl pattern.

The printer executes an 80 column printing self-test if the LF key is held down at power-on. The printer executes a 136 column printing self-test if the PF key is held down at power-on with Z-fold as the default paper path. All printing self-tests are 80 columns wide if the sheet feeder path is selected as the default paper path. The printing self-test prints a full page or until the ON LINE key is pressed.

6

ADJUSTMENTS

A. PRINT HEAD GAP

The print head gap adjusts the distance between the tip of the print head and the platen. Print head gap is operator adjustable to produce optimum print quality on variable paper thickness, multiple part forms, etc.

A print head gap lever is mounted on the mechanism at the left end of the eccentric upper carriage rail. As the lever is turned, the rail rotates on the eccentric pivot, moving the print head closer to or farther from the platen.

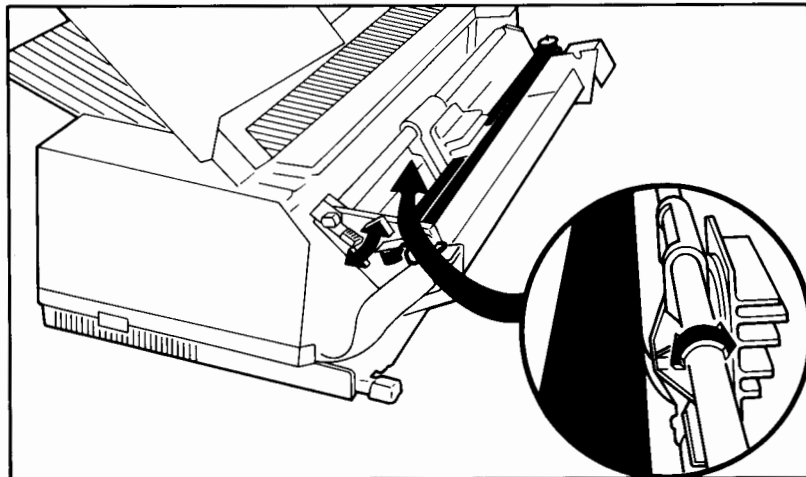


Figure 6-1. Adjusting the Print Head Gap

6-2 Adjustments HP 2235X

Check the following if the print head gap adjustment does not provide acceptable print quality or reliable paper movement:

1. Verify paper meets HP RuggedWriter 480 printer paper specifications listed in chapter 1.
2. Check for worn or frayed ribbon.
3. Verify the ribbon is between print head tip and the metal forms compressor. (Forms compressor is the flexible metal strip between print head and platen.)
4. Check for paper path obstructions.
5. Check for obstructions at the print head and the forms compressor.
6. Check the platen for damage or defects.
7. Check for worn guide rail bushings.

7

PERIPHERALS

DOES NOT APPLY.



8

REPLACEMENT PARTS

A. OVERALL PARTS LIST**Table 8-1. Overall Parts List**

FIG REF	PART DESCRIPTION	PART NUMBER	QTY
1	Paper Support	02235-40009	1
2	Optional Cartridge	See Table 1-2	1
3	Keypad Assy	02235-60090	1
4	Clamp, Toroid	02235-00025	1
5	Cover Assy, Back	02235-60027	1
6	Cover, Paper Tray	02235-40046	1
7	Sound Muffler	02235-60051	1
8	Latch, Left Rear Cover	02235-40026	1
9	Latch, Right Rear Cover	02235-40027	1
10	Cover Assy, Front	02235-60028	1
11	Nameplate	02235-80024	1
12	Paper Cassette Tray		
	(US)	92285B	1
	(A4)	92285D	1
13	Sheet Feeder Assembly	12239-60020	1
14	Ribbon Cartridge	92156S	1
15	Mechanism	See Table 8-2	1
16	Screw	0515-1859	7
17	Shield, PCA	02235-60019	1
18	Logic PCA **		
	RS-232-C/Centronics		
	New	02235-60032	1
	Exchange	02235-69032	1
	RS-232-C/HP-IB		
	New	02235-60011	1
	Exchange	02235-69011	1
ns *	Firmware **		1
	HP 2235A/B/C/D	02235-60038	1
19	Ground Plane, PCA	02235-00020	1
20	Power Supply	02235-60068	1
21	Base Assy	02235-60026	1
22	Foot	Order Item 21	5
23	Cover Assy, Connector	02235-60088	1
24	Switch, Interlock	02235-80020	1
25	Cover, Interlock	02235-40028	1
ns *	Label, Voltage Caution	02235-80022	1
ns *	Power Cord	See Table 1-2	1
ns *	Nameplate, Serial	02235-80016	1

* Part not shown.

** Firmware not included with Logic PCAs.

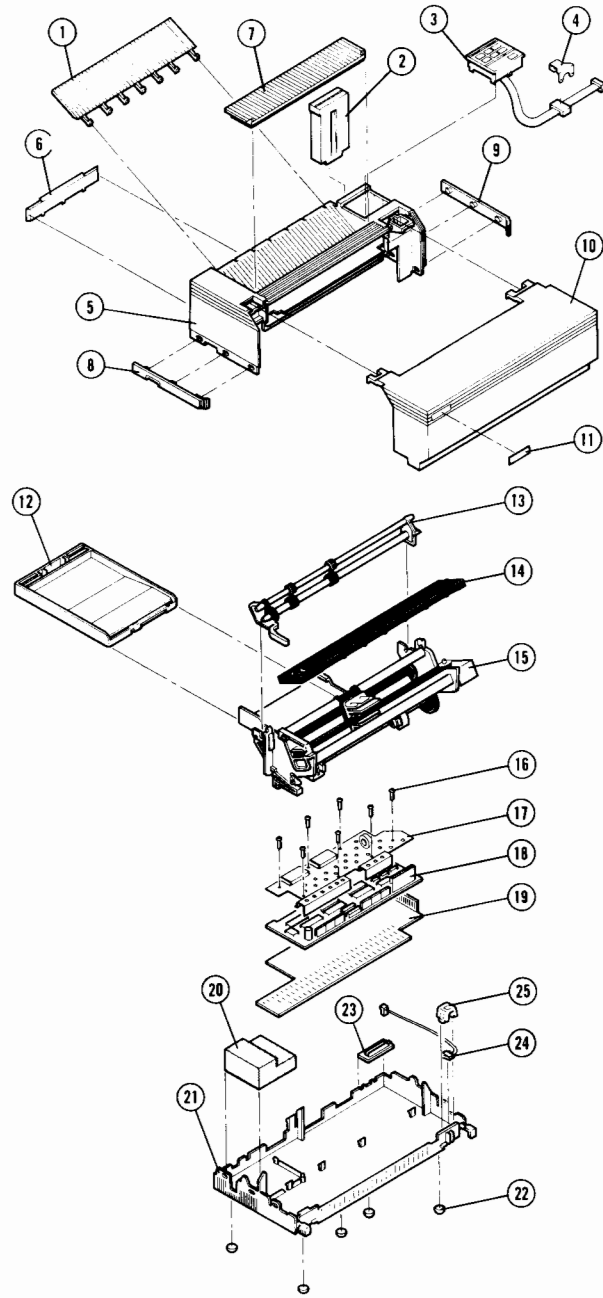


Figure 8-1. Overall Exploded View

B. MECHANISM PARTS LIST**Table 8-2. Mechanism Parts List**

FIG REF	PART DESCRIPTION	PART NUMBER	QTY
1	Sheet Feeder Assembly	12239-60020	1
2	Bail Assy	02235-60059	1
3	Spring, Bail	02235-20006	1
4	Platen Assy	02235-60053	1
5	Bearing/Latch	02235-40017	2
6	Spring, Pinch Roller	02235-00017	1
7	Roller, Pinch	02235-20022	4
8	Spring, Paper Tension	02235-00034	1
9	Structure **	02235-40068	1
10	Lever, Paper Sensor	02235-40033	1
11	Ground Plane, Left	02235-00021	1
12	Ground Plane, Right	02235-00022	1
13	Ground Plane, Back	02235-00023	1
14	RFI Strip	8160-0591	2
15	Sensor, Home	02235-80004	1
16	Sensor, Paper	02235-80005	1
17	Head Cable	02235-60092	1
18	Print Head Assy	02235-60070	1
19	Clip, Cable	02235-00026	1
20	Clip, Wearstrip	02235-00024	1
21	Guide Rail, Upper	02235-20012	1
22	Gap Adjust Lever **	02235-60093	1
23	Belt, Carriage	02235-40011	1
24	Idler Pulley	02235-20004	1
25	Wedge	02235-40016	1
26	Spring, Wedge	02235-20020	1
27	Motor Assembly, Carriage	02235-60091	1
28	Motor Assembly, Paper	02235-60056	1
29	Guide Rail, Lower	02235-20011	1
30	Motor Retainer	02235-00009	1
31	Tractor Drive Assembly	02235-60075	1
32	Spring, Shift Lever	02235-20019	1
33	Tractor Assy, Left	02235-60035	1
34	Tractor Assy, Right	02235-60036	1
35	Detent Plate **	02235-40078	1
ns *	Cable Clamp, Left Wall	1400-0611	1
ns *	Isolator, Carriage Motor	02235-40056	1

* Part not shown.

** See service notes 2235A-01, 2235C-01, and 2235D-01.

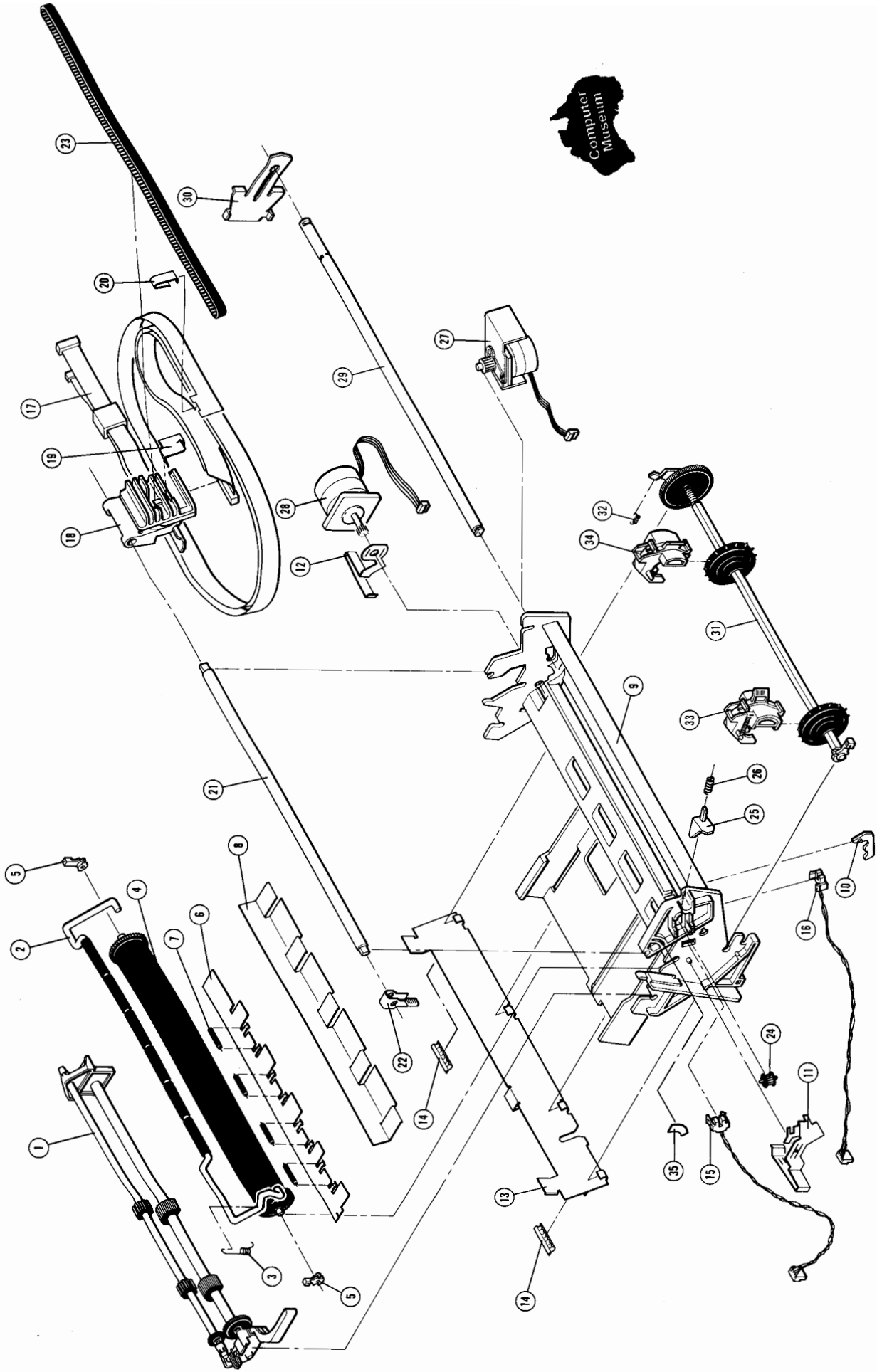


Figure 8-2. Mechanism Exploded View

9

DIAGRAMS

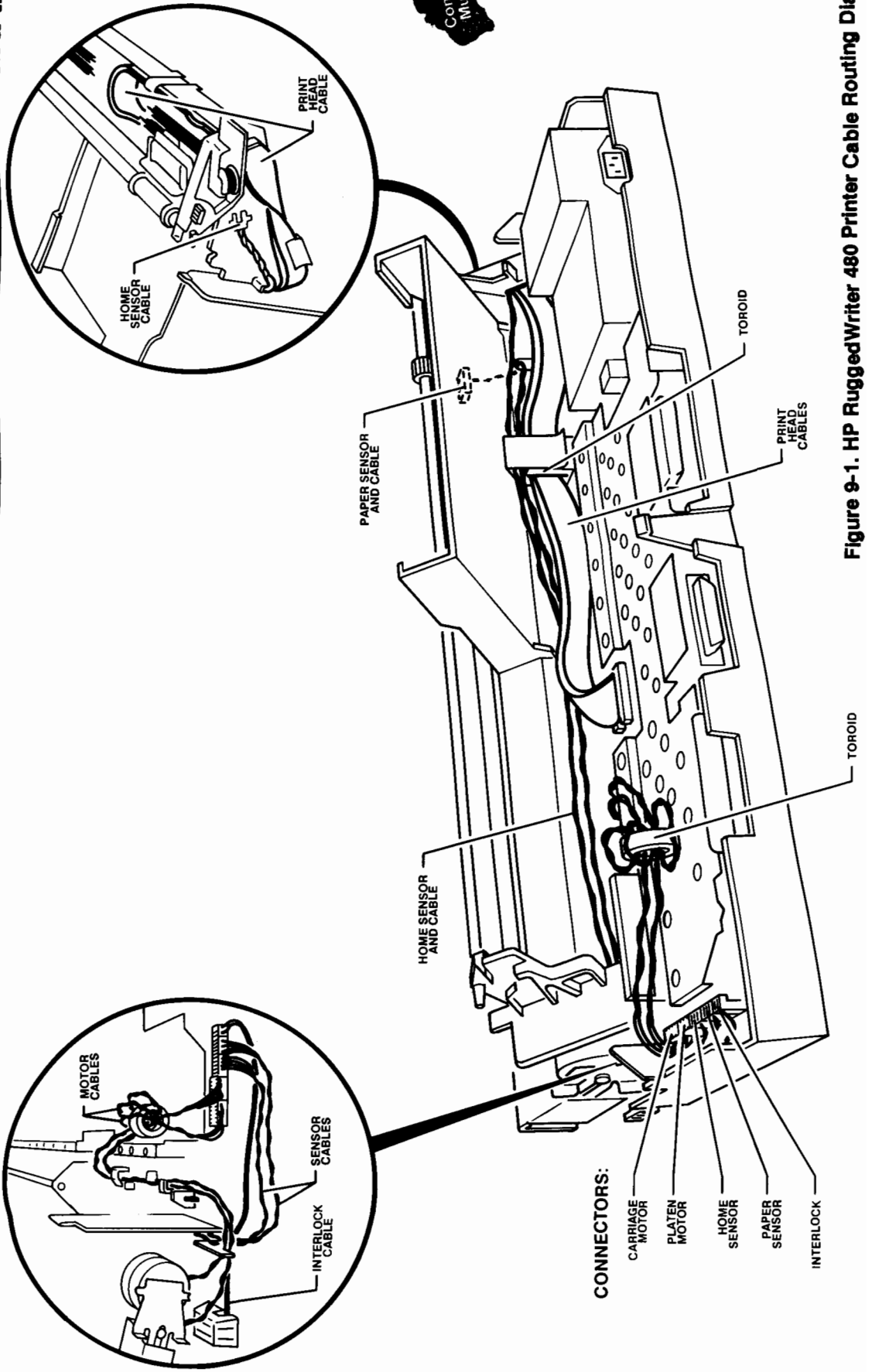


Figure 9-1. HP RuggedWriter 480 Printer Cable Routing Diagram

10

REFERENCE

A. DOCUMENTATION SUMMARY

Table 10-1. HP RuggedWriter 480 Documentation

Part Number	Part Description
02235-90002	<i>HP RuggedWriter 480 Owner's Manual</i>
02235-90003	<i>HP 2235 Series RuggedWriter 480 Service Manual</i>
02235-90021	<i>Anzac 2480 Printer Service Manual Supplement</i>



Table 10-2. HP PCL Escape Sequences and Control Codes

Print Features	Escape Sequence or Control Code	ASCII Decimal Equiv.	ASCII Hex. Equiv.
<i>CHARACTER & FONT</i>			
<i>DOWNLOAD</i>			
Copy ROM to RAM	E _C *c6F	27,42,99,54,70	1B,2A,63,36,46
Delete Char.	E _C *c3F	27,42,99,51,70	1B,2A,63,33,46
Download One Character	E _C (s#W	27,40,115,#,87	1B,28,73,#,57
Define New Font	E _C)s#W	27,41,115,#,87	1B,29,73,#,57
Set Character Code	E _C *c#E	27,42,99,#,69	1B,2A,63,#,45
Clear RAM Font	E _C *c0F	27,42,99,48,6A	1B,2A,63,30,46
Select RAM as Primary Font	E _C)0X	27,41,48,88	1B,29,30,58
Select RAM as Secondary Font	E _C (0X	27,40,48,88	1B,28,30,58
<i>DISPLAY FUNCTIONS</i>			
<i>MODE</i>			
Enable Display Functions	E _C Y	27,89	1B,59
Disable Display Functions	E _C Z	27,90	1B,5A
<i>MISCELLANEOUS</i>			
Printer Reset	E _C E	27,69	1B,45
Perform Self-Test	E _C z	27,122	1B,7A
Transplant Print Data	E _C &p#X	27,38,112,#,88	1B,26,70,#,58
Line by Line enhance Ctrl	E _C &k0E	27,38,107,48,69	1B,26,6B,30,45
SI/SO Control	E _C &k#F	27,38,107,#,70	1B,26,6B,#,46
Select Line Terminator	E _C &k#G	27,38,107,#,71	1B,26,6B,#,47
Enable Wrap-Around Mode	E _C &s0C	27,38,115,48,67	1B,26,73,30,43
Disable End-of-Line Wrap	E _C &s1C	27,38,115,49,67	1B,26,73,31,43
Mode Enhancement Ctrl.	E _C &k1E	27,38,107,49,69	1B,26,6B,31,45
Mode Basis (Default) SI/SO	E _C &k1F	27,38,107,49,70	1B,26,6B,31,46
Auto View Mode	E _C &k0V	27,38,107,48,86	1B,26,6B,30,56
Manual View Mode (Default)	E _C &k1V	27,38,107,49,86	1B,26,6B,31,56
Request Model Number	E _C *rk	27,42,114,75	1B,2A,72,4B
Request I/O Status	E _C ?D _C 1	27,63,17	1B,3F,11

C. EPSON ESCAPE SEQUENCES AND CONTROL CODES

Table 10-3. Epson Escape Sequences and Control Codes

Print Features	Escape Sequence or Control Code	ASCII	
		Decimal Equiv.	Hex. Equiv.
<i>PITCH CONTROL</i>			
Print Pica-10 cpi	$E_C P$	27,80	1B,50
Print Elite-12 cpi	$E_C M$	27,77	1B,4D
Print Fifteen-15 cpi	$E_C g$	27,103	1B,67
Select Condensed	S_I	15	0F
Select Condensed	$E_C S_I$	27,15	1B,0F
Cancel Condensed	$D_C 2$	18	12
Select Double-width	$E_C W S_H$	27,87,1	1B,57,01
Cancel Double-width	$E_C W N_U$	27,87,0	1B,57,00
Select Double-width by Line	S_O	14	0E
Select Double width by Line	$E_C S_O$	27,14	1B,0E
Cancel Double-width by Line	$D_C 4$	20	14
<i>QUALITY and ENHANCEMENTS</i>			
Select Letter Quality	$E_C x S_H$	27,120,1	1B,78,01
Select Draft Quality	$E_C x N_U$	27,120,0	1B,78,00
Select Emphasized Print	$E_C E$	27,69	1B,45
Cancel Emphasized Print	$E_C F$	27,70	1B,46
Select Double-strike	$E_C G$	27,71	1B,47
Cancel Double-strike	$E_C H$	27,72	1B,48
<i>UNDERLINE</i>			
Select Underline	$E_C -S_H$	27,45,1	1B,2D,01
Cancel Underline	$E_C -N_U$	27,45,0	1B,2D,00
<i>ITALICS</i>			
Select Italics	$E_C 4$	27,52	1B,34
Cancel Italics	$E_C 5$	27,53	1B,35
<i>SUB/SUPERSCRIPTS</i>			
Select Subscript	$E_C S S_H$	27,83,1	1B,53,01
Select Superscript	$E_C S N_U$	27,83,0	1B,53,00
Cancel Sub/Superscript	$E_C T$	27,84	1B,54
<i>MASTER SELECT</i>			
	$E_C !\#$	27,33,#	1B,21,#
<i>SELECT CHARACTER SET</i>			
	$E_C R\#$	27,82,#	1B,52,#
<i>PROPORTIONAL SPACING</i>			
Select Proportional Spacing	$E_C p S_H$	27,112,1	1B,70,01
Cancel Proportional Spacing	$E_C p N_U$	27,112,0	1B,70,00

**Table 10-3. Epson Escape Sequences
and Control Codes (Cont.)**

Print Features	Escape Sequence or Control Code	ASCII Decimal Equiv.	ASCII Hex. Equiv.
<i>TYPESTYLE</i>			
Typestyle-Courier	<i>EckNu</i>	27,107,0	1B,6B,00
Typestyle-Helv*	<i>EckSH</i>	27,107,1	1B,6B,01
Typestyle-Pres. Elite*	<i>EckEX</i>	27,107,3	1B,6B,03
Typestyle-TmsRmn*	<i>Eck}</i>	27,107,125	1B,6B,7D
Typestyle-Ltr. Gothic*	<i>Eck~</i>	27,107,126	1B,6B,7E
<i>PAGE FORMAT</i>			
Line Feed	<i>LF</i>	10	0A
Form Feed	<i>FF</i>	12	0C
Set Line Spacing-6 lpi	<i>ECsX</i>	27,50	1B,32
Set Line Spacing-8 lpi	<i>ECNu</i>	27,48	1B,30
Set Line Spacing 180/# lpi	<i>EC3#</i>	27,51,#	1B,33,#
Set Line Spacing 60/# lpi	<i>ECa#</i>	27,65,#	1B,41,#
Set Page Length-Lines	<i>ECc#</i>	27,67,#	1B,43,#
Set Page Length-Inches	<i>ECcNu#</i>	27,67,0,#	1B,43,00,#
Define/Enable Perf-Skip Lines	<i>ECN#</i>	27,78,#	1B,4E,#
Cancel Perf Skip	<i>EC0</i>	27,79	1B,4F
Set Right Margin	<i>ECQ#</i>	27,81,#	1B,51,#
Set Left Margin	<i>ECl#</i>	27,73,#	1B,49,#
Set Horizontal Tab Stops	<i>HT</i>	09	09
Set Horizontal Tabs	<i>ECd## ... ,Nu</i>	27,68,#, . . . ,0	1B,44,#, . . . ,00
Set Relative Tabs-Horz.	<i>ECeNu#</i>	27,101,0,#	1B,65,00,#
Set Vertical Tab	<i>VT</i>	11	0B
Set Vertical Tab Stops	<i>ECB## ... ,Nu</i>	27,66,#, . . . ,0	1B,42,#, . . . ,00
Set Relative Tabs-Vert	<i>ECeSH#</i>	27,101,1,#	1B,65,01,#
Set Vert Tabs-Channels	<i>ECb## ... ,#Nu</i>	27,98,#, . . . ,0	1B,62,#, . . . ,00
Set Vert Tab Channel	<i>EC/#</i>	27,47,#	1B,2F,#
<i>PRINT POSITIONING</i>			
Select Justification	<i>ECa#</i>	27,97,#	1B,61,#
Select Char. Space	<i>ECsP#</i>	27,32,#	1B,20,#
Absol. Horiz. Pos.	<i>EC\$##</i>	27,36,#	1B,24,#
Relative Horiz. Pos.	<i>EC\#,#</i>	27,92,#1,#2	1B,5C,#1,#2
Relative Vert. Pos.	<i>ECJ#</i>	27,74,#	1B,4A,#
Horiz. Relative Move	<i>ECfNu#</i>	27,102,0,#	1B,66,00,#
Vert. Relative Move	<i>ECfSH#</i>	27,102,1,#	1B,66,01,#

**Table 10-3. Epson Escape Sequences
and Control Codes (Cont.)**

Print Features	Escape Sequence or Control Code	ASCII Decimal Equiv.	ASCII Hex. Equiv.
<i>GRAPHICS</i>			
Single Density Graphics	$E_C K n1 n2$	27,75,#1,#2	1B,4B,#1,#2
Double Density Graphics	$E_C L n1 n2$	27,76,#1,#2	1B,4C,#1,#2
Double Density Graphics	$E_C Y n1 n2$	27,89,#1,#2	1B,59,#1,#2
Quad Density Graphics	$E_C Z n1 n2$	27,90,#1,#2	1B,5A,#1,#2
Print Graphic Image	$E_C ** \#1 \#2$	27,42,#,#1,#2	1B,2A,#,#1,#2
Reassign Graphics Mode	$E_C ? \# \#$	27,63,#,#	1B,3F,#,#
<i>USER-DEFINED CHARACTERS</i>			
Select RAM Font	$E_C \% S_H$	27,37,1	1B,25,01
Deselect RAM Font	$E_C \% N_U$	27,37,0	1B,25,00
Copy ROM into RAM	$E_C : N_U N_U N_U$	27,58,0,0,0	1B,3A,00,00,00
Define User-Defined Char.	$E_C \& 0 \# \dots$	27,38,0,#, ...	1B,26,00,#, ...
<i>MOST SIGNIFICANT BIT CONTROL</i>			
Set MSB=0	$E_C =$	27,61	1B,3D
Set MSB=1	$E_C >$	27,62	1B,3E
Cancel MSB Control	$E_C \#$	27,35	1B,23
<i>MISCELLANEOUS</i>			
Backspace	B_S	08	08
Carriage Return	C_R	13	0D
Space	S_P	32	20
Initialize Printer	$E_C @$	27,64	1B,40
Eject Current Page	$E_C E_M R$	27,25,82	1B,19,52
Activate Tractor Feed	$E_C E_M 0$	27,25,48	1B,19,30
Feed from Bin 1	$E_C E_M 1$	27,25,49	1B,19,31
Feed from Manual Insertion	$E_C E_M 2$	27,25,50	1B,19,32
Activate Sheet Feeder	$E_C E_M 4$	27,25,52	1B,19,34
Cancel Line	$C_A N$	24	18
Delete Character	$D_E L$	127	7F



D. HP-IB SECONDARY COMMANDS**Table 10-4. Secondary Command Mode Commands**

Command	Byte	Description
<i>PRIMARY COMMANDS</i>		
My Listen Address (MLA)	X01DDDDD	Addresses printer to be a listener.
My Talk Address (MTA)	X10DDDDD	Addresses printer to be a talker.
<i>SECONDARY LISTEN COMMANDS</i>		
Data	X1100000	The byte(s) which follow represent data.
Device Clear	X1110000	This command causes the interface to return to the idle state, waiting for the next command.
Print and Slew	X1101000	The print and slew command is followed by one data byte for CR-FF (X1000000) or CR-LF (anything other than X1000000).
<i>SECONDARY TALK COMMANDS</i>		
Data	X1100000	Printer responds with data followed by a CR and LF with EOI asserted. If printer doesn't have data, it responds with a null with EOI asserted.
Device Specified Jump	X1110000	Printer responds with one data byte and EOI asserted. This returned byte will have a binary value of: 00000000 (Ready to receive) 00000001 (Data to send) 00000010 (Printer problem)
I/O Status	X1101110	Printer will return a one byte status word with EOI asserted. The status byte description is as follows:

DDDDD is the binary address of the unit and is referred to as the primary address.

X=Don't care.

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**SERVICE NOTES/
IOSMs**

