



LASERJET 2000 I/O KIT INSTALLATION PROCEDURE

THIS DOCUMENT OUTLINES THE INSTALLATION AND CONFIGURATION PROCEDURES FOR THE FOLLOWING KITS:

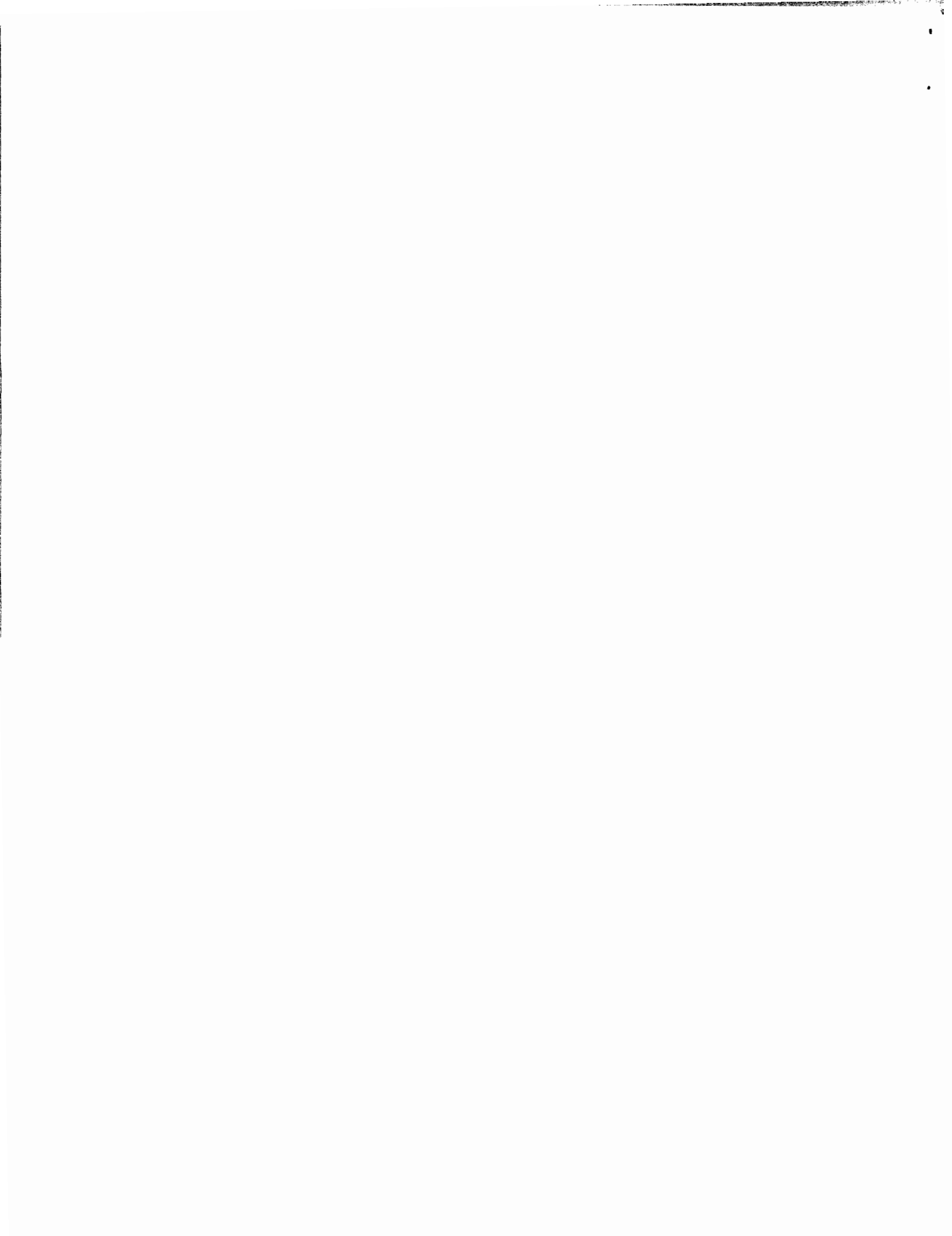
- (1). RS232/422 Interface Kit HP26843A**
- (2). Centronics Interface Kit HP26843B**

Data Products Interface Kits:

- (3). Short Lines HP26843C**
- (4). Long Lines HP26843D**

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LaserJet 2000
I/O PCAs and CABLE INSTALLATION PROCEDURE

The following material lists identify the material in each of the I/O kits.
 Compare the material received with the material listed below.

HP26843A KIT:RS232/422 MATERIAL LIST

COMPONENT-PART	DESCRIPTION	QTY PER
02684-00003	IO ADPTR PLT	1 w/cable
02684-60104	CONN:IO CABLE	1
02684-60010	PCA:SERIAL IO	1
0515-1895	SCR:MACH M3X8PL	9

HP26843B KIT:CENTRONICS MATERIAL LIST

COMPONENT-PART	DESCRIPTION	QTY PER
02684-00002	IO ADPTR PLT	1 w/cable
02684-60105	CONN:IO CABLE	1
5062-0478	PCA:PARALLEL IO	1
0515-1895	SCR:MACH M3X8PL	9

HP26843C KIT:DATAPRODUCTS SHORT LINES MATERIAL LIST

COMPONENT-PART	DESCRIPTION	QTY PER
02684-00004	IO ADPTR PLT	1 w/cable
02684-60106	CONN:IO CABLE	1
5061-1714	PCA:DP IO SHORT	1
0515-1895	SCR:MACH MSX8PL	9

HP26843D KIT:DATAPRODUCTS LONG LINES MATERIAL LIST

COMPONENT-PART	DESCRIPTION	QTY PER
02684-00004	IO ADPTR PLT	1 w/cable
02684-60106	CONN:IO CABLE	1
5061-1715	PCA:DP IO LONG	1
0515-1895	SCR:MACH MSX8PL	9

CAUTION

**MAKE SURE PRINTER IS TURNED OFF AND
DISCONNECTED BEFORE INSTALLING
ANY I/O KIT**

Required tools:

1. No. 2 Phillips screwdriver.

INSTRUCTIONS: REMOVE COVER OF PRINTER AS SHOWN IN FIGURES 1-1 THRU 1-6

1. LOOSEN the two screws indicated.

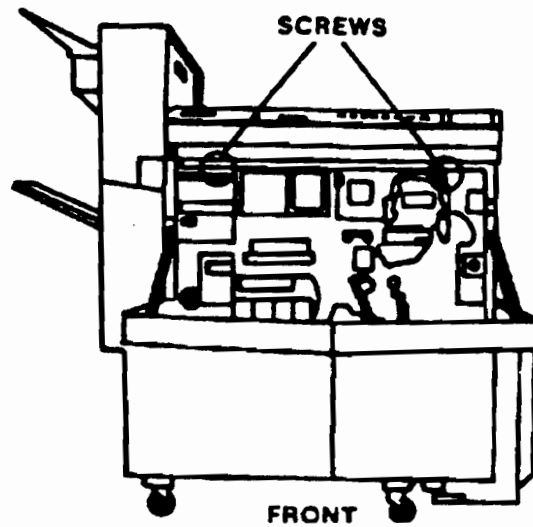


Figure 1-1

2. LIFT top section of printer UP to OPEN. REMOVE the two screws indicated.

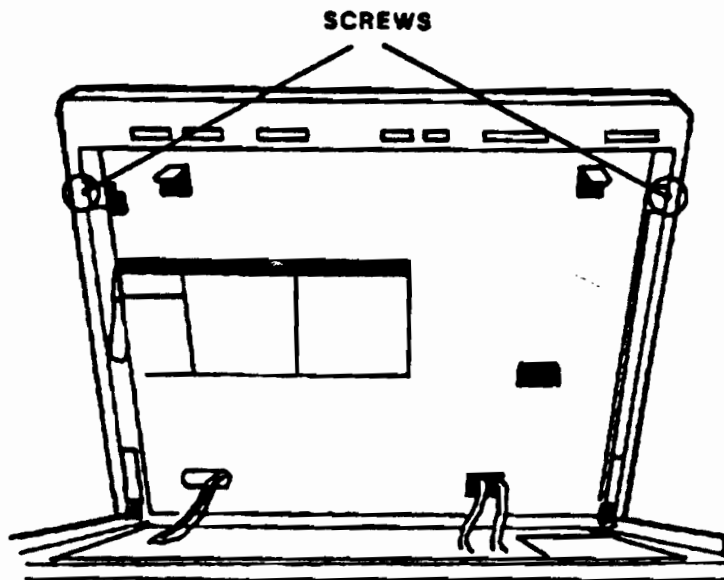


Figure 1-2

3. CLOSE top section of printer.

To close top section, push down on top cover until further movement is prevented by rubber stop. Then push back on rubber stop to close top cover completely. At the back of the top section REMOVE the two screws indicated.

REMOVE paper stacker power & data cables access plate.

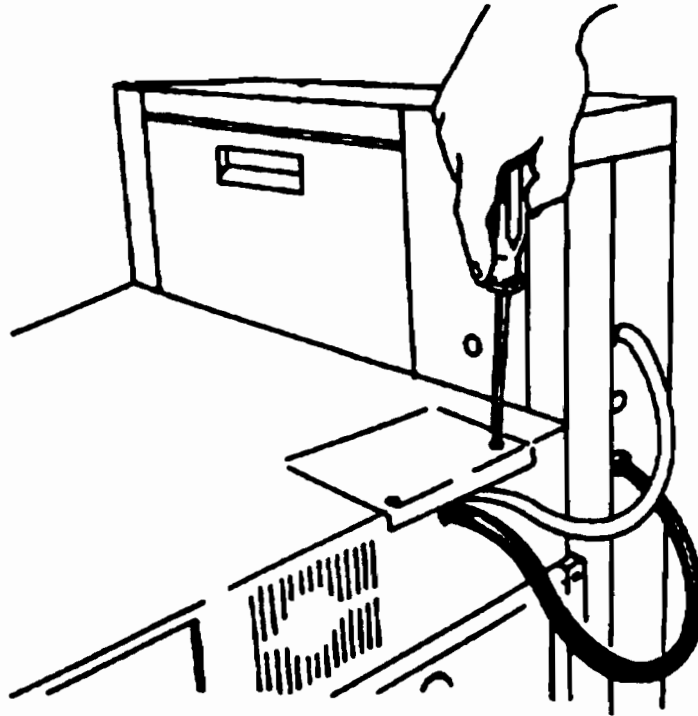


Figure 1-3

4. UNSNAP data cable connector (A) and DISCONNECT it.

SQUEEZE power cable connector (B) and **DISCONNECT** it.

REMOVE the three screws indicated.

LIFT out the sheet metal bracket with power and data cables attached to it.

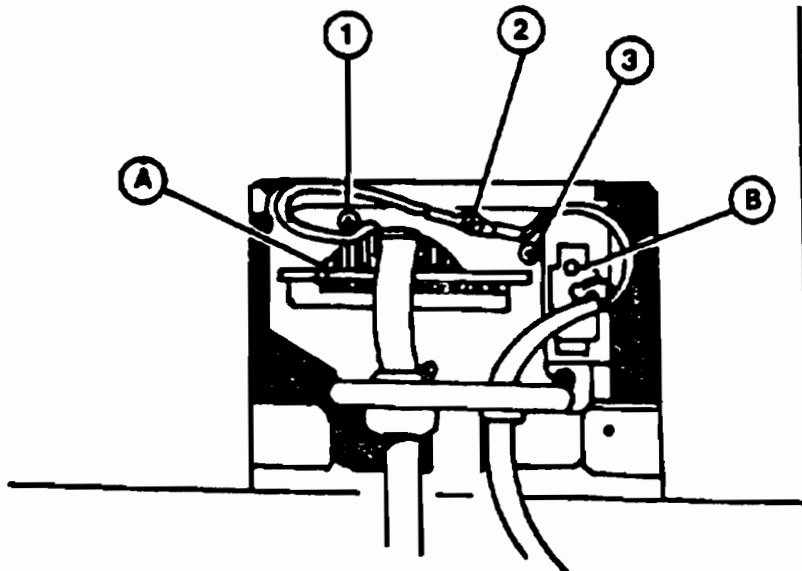


Figure 1-4

5. REMOVE the top cover. Pull and lift the cover as indicated.
Set the top cover to the side using care not to scratch it.

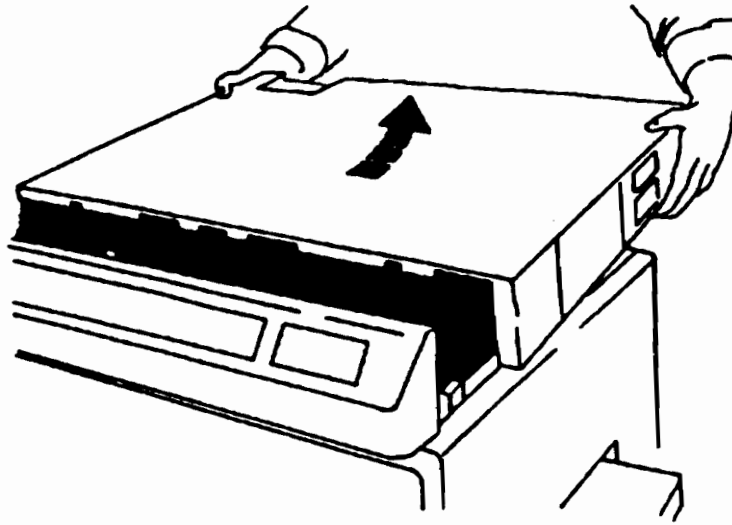


Figure 1-5

6. INSTALL I/O Controller PCA into the "T" connector located on the Formatter PCA as indicated.
7. Secure the I/O PCA with the screws provided in the kit (5 @ MACH M3X8PL).
8. Attach the I/O interconnect cable and route to the rear of the printer as indicated.

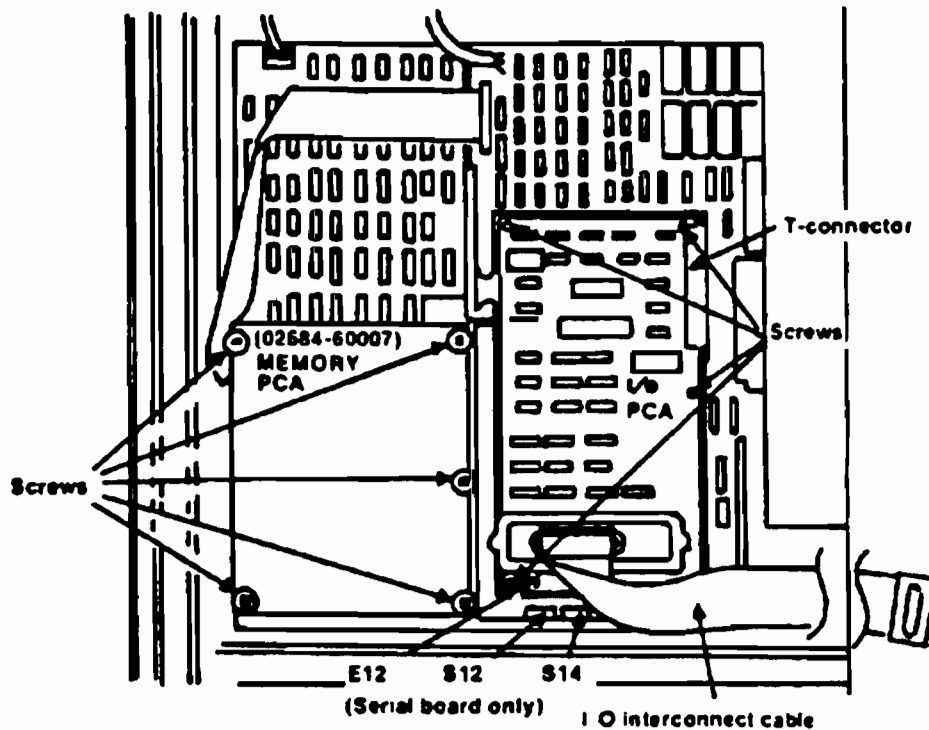


Figure 1-5A

9. Set the I/O selection switches.

Note: Set switches S12, S14, and E12 in accordance with the information furnished on the next 8 pages.

A. Serial I/O configuration switch selection (KIT: HP26843A - RS232/422).

Switch S12

ROCKER #	FUNCTION
1	SET TO OPEN
2	SET TO OPEN
3	SET TO OPEN
4	SET TO OPEN
5	SET TO OPEN
6	SET TO OPEN
7	SET TO OPEN
8	SET TO OPEN

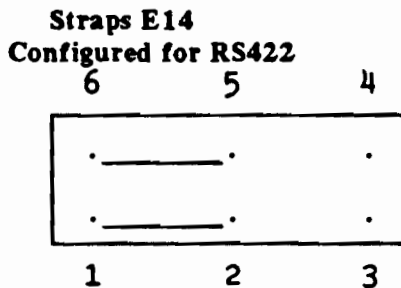
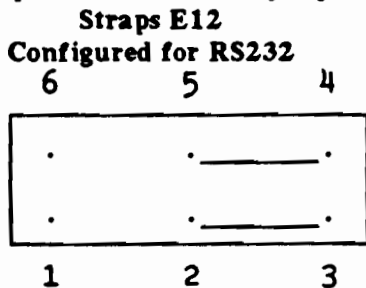
Switch S14

ROCKER #	FUNCTION
1	SET TO OPEN
2, 3, 4	Used for baud rate selection 000 = 300 BAUD 001 = 600 BAUD 010 = 1200 BAUD 011 = 2400 BAUD 100 = 4800 BAUD 101 = 9600 BAUD 110 = 19200 BAUD 1 = Closed, 0 = Open
5	SET TO OPEN
6	SET TO OPEN
7	SET TO OPEN
8	SELECT DTR POLARITY IF DTR IS ENABLED
9	DTR handshake enabled if closed
10	SET TO OPEN
11	SET TO CLOSED
12	Xon/Xoff protocol enabled if closed

The initial factory configuration is to set all of SWITCH S12 rockers to OPEN. For SWITCH S14, set rockers 2, 4, 8, 9, 11 and 12 to CLOSED and all of the other rockers to OPEN.

After selecting the proper rocker switch settings, turn the printer OFF, then ON, wait until it is ready, take printer offline then press the SELF TEST key. The first page that the self test prints will list the I/O configuration along with a representation of the rockers in switches S12 and S14. A "0" means the rocker is OPEN and "1" indicates that the rocker is CLOSED.

Use straps E12 on the I/O board near the data cable connector to configure the printer for RS232 or RS422 operation. Place the jumpers on the straps as indicated below.



B. CENTRONICS I/O CONFIGURATION SWITCH SELECTION (KIT:HP26843B - CENTRONICS)

SWITCH S12

ROCKER #	FUNCTION
1	SET TO OPEN
2	SET TO OPEN
3	SET TO OPEN
4	SET TO OPEN
5	SET TO OPEN
6	SET TO OPEN
7	SET TO CLOSED (To select Centronics interface)
8	SET TO OPEN

SWITCH S14

ROCKER #	FUNCTION
1	SET TO OPEN
2	SET TO OPEN
3	SET TO OPEN
4	SET TO OPEN
5	SET TO OPEN
6	SET TO OPEN
7	SET TO OPEN
8	SET TO OPEN
9	SET TO OPEN
10	SET TO OPEN
11	SET TO OPEN
12	SET TO OPEN



After selecting the proper rocker switch settings, turn the printer OFF, then ON, wait until it is ready, take printer offline then press the SELF TEST key. The first page that the self test prints will list the I/O configuration along with a representation of the rockers in switches S12 and S14. A "0" means the rocker is OPEN and "1" indicates that the rocker is CLOSED.

C. DATAPRODUCTS I/O CONFIGURATION SWITCH SELECTION (KIT:HP26843C/D SHORT/LONG)

SWITCH S12

ROCKER #	FUNCTION										
1	SET TO OPEN										
2	SET TO OPEN										
3	SET TO OPEN										
4	SET TO OPEN										
5	SET TO OPEN										
6	SET TO CLOSED (To select Dataproducts interface)										
7	SET TO OPEN										
8	Used to set record limiting. Rocker 8 of S12 and rocker 1 of S14 are used together as follows:										
	<table border="1"> <thead> <tr> <th>8 of S12</th> <th>1 of S14</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0 = No limiting (usual setting)</td> </tr> <tr> <td>0</td> <td>1 = 1 record per buffer</td> </tr> <tr> <td>1</td> <td>0 = 2 records per buffer</td> </tr> <tr> <td>1</td> <td>1 = 4 records per buffer</td> </tr> </tbody> </table>	8 of S12	1 of S14	0	0 = No limiting (usual setting)	0	1 = 1 record per buffer	1	0 = 2 records per buffer	1	1 = 4 records per buffer
8 of S12	1 of S14										
0	0 = No limiting (usual setting)										
0	1 = 1 record per buffer										
1	0 = 2 records per buffer										
1	1 = 4 records per buffer										
	1 = closed, 0 = open										

SWITCH S14

ROCKER #	FUNCTION
1	Used in conjunction with rocker 8 of S12 to set record limiting.
2,3,4	Demand to check delay (usually set to 001) Set rockers 2 and 3 open, set rocker 4 closed 1 = closed, 0 = open
5	Enable Hex dump mode if closed
6	Auto CARRIAGE RETURN after VERTICAL TAB if close
7	Auto CARRIAGE RETURN after FORM FEED if closed
8	Auto CARRIAGE RETURN after LINE FEED if closed
9	Auto LINE FEED after CARRIAGE RETURN if closed
10	Parity check disabled if closed Parity check enabled if open
11	Use PI for 8th data bit if open Use D8 for 8th data bit if closed
12	Connect the PI line to the printer if open Ignore the PI line if closed

After selecting the proper rocker switch settings, turn the printer OFF, then ON, wait until it is ready, take printer offline then press the SELF TEST key. The first page that the self test prints will list the I/O configuration along with a representation of the rockers in switches S12 and S14. A "0" means the rocker is OPEN and "1" indicates that the rocker is CLOSED.

The Dataproducts Long and Short Line interfaces use the same configuration for switches S12 and S14. A host computer with a Long Line driver (up to 500 feet) can not drive a printer with a Short Line interface, and a host computer with a Short Line interface (up to 50 feet) can not drive a printer with a Long Line interface.

CONFIGURATION AND INSTALLATION HINTS FOR DATAPRODUCTS



1. D8, PI, and Parity ENABLE/DISABLE MODES:

The standard Dataproducts interface has historically been seven bit interface. As the need for eight bit interfaces developed over the years, the industry has solved the eighth bit problem using two different solutions. Use of the paper instruction line (PI) has fallen off over the years, so some interfaces have reallocated PI to carry the eighth data bit. If parity is used on these interfaces, the PI line is also used in the parity check just as D1 through D7 are. Some interfaces do not use PI for the eighth data bit, rather they have allocated an additional line as D8. With the additional D8, PI can still be used for paper instruction if it is needed, but even when PI is available, not all interfaces use it. The use of PI is gradually becoming obsolete.

Rocker 12 of switch S14 will pass PI to the printer if the switch is open. Rocker 11 of switch S14 is used to determine the use of the PI line. It will be used for D8 if the rocker is open or it will be used as PI if the rocker is closed. If rocker 11 of switch S14 is closed, then the eighth data bit is taken from D8.

Systems that use the PI bit MUST have it available to do any printing at all. However, systems that do not use the PI bit MUST turn it off.

Newer systems need the eighth data bit for graphics and font downloads. They MUST leave this bit enabled to get full access to those features. Older systems do not have an eighth data bit and will leave it floating so that it may be ON or OFF. If the host is configured to send only 7 bit data transmissions and normal text, a floating eighth bit will cause the printer to print spaces for each of the characters with the 8th bit set. Random or unpredictable voltage fluxuations on the unused 8th bit may cause the value of the bit to float on and off. If a system is incapable of 8 bit data transmission and must use 7 bit data transmission, not all of the LaserJet 2000 features will be accessable, and the eighth bit must be disabled to prevent unexpected character disappearance.

When parity is enabled, a check is done on all 8 data lines regardless of the choice between D8 and PI for the eighth data bit. Parity check is not available for seven bit data transmission.

2, END-OF-RECORD SEQUENCE COMPENSATION:

This feature was added to take care of what may be the most common problem to be encountered during installation.

Line printers DO NOT print received data until the entire line of data has been received. The problem is that a variety of methods have evolved to indicate that the end of the line (or record) has been reached. The Dataproducts interface in the LaserJet 2000 has been designed to handle them all.

The oldest method of indicating end-of-record (EOR) with Dataproducts interfaces is to send down a "print command", i.e., a byte of data with the PI bit set high. The PI bit indicates that the data is not a character but rather an EOR and that the previously received data is to now be printed, and the paper to be moved. Exactly how the paper is to be moved is detailed in the byte of data received with the PI bit. If the customer is using this method, the PI bit must be enabled, and rocker 12 on DIP switch S14 set closed. NO EOR compensation needs to be done.

If the user has a relatively new system, the PI command concept may have been abandoned. Instead, the newer systems tend to use some combination of CR/LF. On some systems, the convention has been adopted to use only CR or only LF. They did this because they wanted to be able to indicate EOR with a single byte, as they were able to with the PI command.

The Hewlett-Packard Printer Command Language (PCL) will not produce usable printout if the user sends records terminated only by CR or only by LF. The CR only moves the cursor to the left margin. If the system is sending only CR's at the end-of-record, nothing will ever print. If the system is sending only LF's at the end-of-record, only the first line will print. The Printer Command Language (PCL) formatter in the LASERJET 2000 interprets CR and LF literally, and for normal operation, each line must be terminated with both a CR and LF.

With the Data Products interface installed, rockers 6, 7, 8, and 9 of switch S14 allows the printer to be attached to any system that terminates lines with a single byte. For example, if the host is only terminating lines with LF, by setting rocker 8 of S14 to the closed position, the interface will insert a CR after each LF that is received while printing text. Hence, the printer can be immediately attached to such systems without modifying the host operating system.

3. DEMAND-ON TO CHECK-FOR-CHARACTER DELAY

This configuration setting is one of the most esoteric features provided. Only if much slower than expected print speeds or if the HP printer is suspected of causing undue overhead on the host system should these rockers be set at any value other than 001.

The symptoms of the problem, which can only be viewed with a logic timing analyzer such as the HP-1615A, are that the interface will raise the DEMAND signal and check immediately if a character has been strobed in. If it checks BEFORE the host cpu has a chance to strobe the byte in, the program in the printer interface suspends the "read data" section of its code and branches to "background" tasks. Only after some delay does it come back and check again for a strobed-in byte. This adds about 180 extra microseconds between strobed-in bytes.

By using rockers 2 through 4 of S14, the user can cause the interface to insert a delay between raising DEMAND and checking for the character. This will keep the printer from suspending the read operation after every byte.

Again, the problem cannot be viewed without the aid of a timing analyzer, and the precise setting of the timing cannot be determined without an analyzer. When the minimum setting of the byte is reached, the time between DEMAND pulses will suddenly decrease by about 180 microseconds.

4. HEX DUMP MODE:

This rocker allows the CE or user to set the printer into a special print mode that can be extremely handy in debugging system problems of all kinds. In particular, end-of-record sequences can be determined so that the configuration switch settings can be resolved.

The hex-dump feature prints out the data, 20 bytes per line. No data will print until 20 bytes have been received, but there are no restrictions on what that data has to be; i.e., no end-of-record needs to be received to cause printing. Each print line displays the data received by the printer in two formats; on the right, the ASCII representations of the data are printed, including all control characters. If print commands are being used, a lower-case "p" appears before the hex representation of the data bytes that have the PI bit set. If parity is enabled, a lower case "e" appears before error and a lower case "b" occurs after the byte if a buffer clear was received prior to the byte. The hardware detection and reporting of parity errors is independent of hex-dump mode, so the CPU will still get parity error reports if errors occur.

Incomplete end-of-record sequences will also be printed out. This will allow the CE or the customer to determine exactly what bits in configuration byte 23 need to be set to allow normal printing. For example, if the user is sending only line feeds, the ASCII portion of the Hex mode dump will show the user's text separated only by line feeds. The CE or customer will then know that they need to have the interface insert carriage returns after feeds, by setting rocker 8 of S14 to closed.

5. RECORDS-PER-BUFFER LIMITING:



This is another configuration byte that will be useful during many system installations.

Many older Dataproducts printer drivers were written to detect when the printer was failing. One of the ways this was accomplished was for the programmer to set timers after each command it sent to the printer. If the timer expires before response from the printer is received, the driver assumes the printer is defective. The values of these timers were derived from the characteristics of the printers that they had on hand at the time.

One major timeout is the time after a character has been strobed into the printer until the printer "demands" another character. The design of the DP interfaces can sometimes cause this timeout to be triggered, if the default configuration settings are used. The interface will buffer up as many lines as it can, and not demand another character until the printer has printed ALL of them. This can lead to delays between characters that stretch out for ten or twenty seconds, or even more.

The symptoms of this problem are fairly easily detected: the user will start up a print job, and everything looks like it is working just fine. The printer begins to print at full speed. After one or two pages have printed, it stops dead in its tracks and the console of the host CPU is flashing a message like "PRINTER NOT READY" or "DEVICE TIMEOUT" or something similar.

To know exactly what to do, the CE or user is going to have to use the HEX Dump mode first. Put the printer into HEX mode and let at least half a page of text print. Check the printout to determine if the system is using PRINT COMMANDs to terminate lines, or CR/LF.

If print commands are being used, set rocker 1 of S14 to closed.
Leave rocker 8 of S12 open.

This tells the interface to only store one print line in its internal buffer before sending it on to be printed.

If the system is using CR/LF to terminate lines, rocker 8 of S12 should be set to closed. Leave rocker 1 of S14 open. This lets the interface store two print lines before sending it off to be printed. This is necessary as the first CR is interpreted to be the end of one line, and the LF is considered the end of a second line. Erratic print speed would result if the interface only buffered up one line at a time.

6. REASSEMBLING THE PRINTER

Put the top cover on the printer from the back by placing the cover on to the top at a 15° angle as shown. Slowly push the cover forward. **DO NOT** force the cover. Let the cover extend from the back of the printer about one foot. This will provide the room necessary to connect the I/O PCA cable bracket to the top cover with 4 screws (3x8mm). Connect the cable bracket to the top cover as shown. After connecting bracket to the top cover **CAREFULLY** push top cover in place.

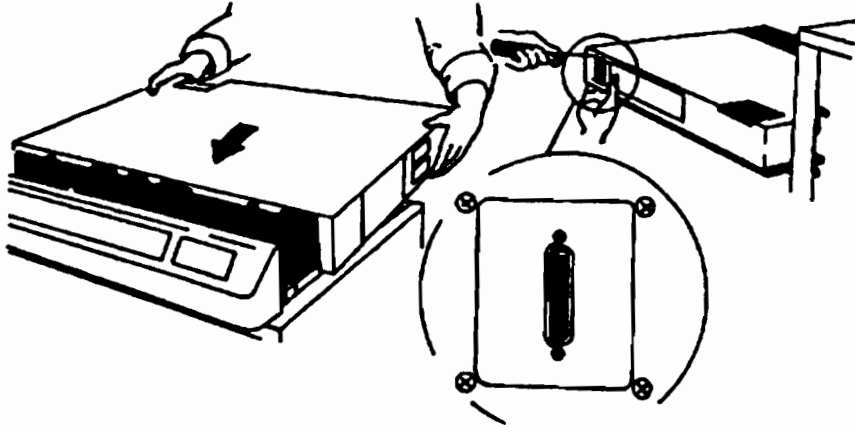


Figure 1-8

7. With the cover in place put the power & data cables back into the access port as indicated. SNAP in connector A and B. Using the same hardware removed earlier, screw down the three wires as indicated.

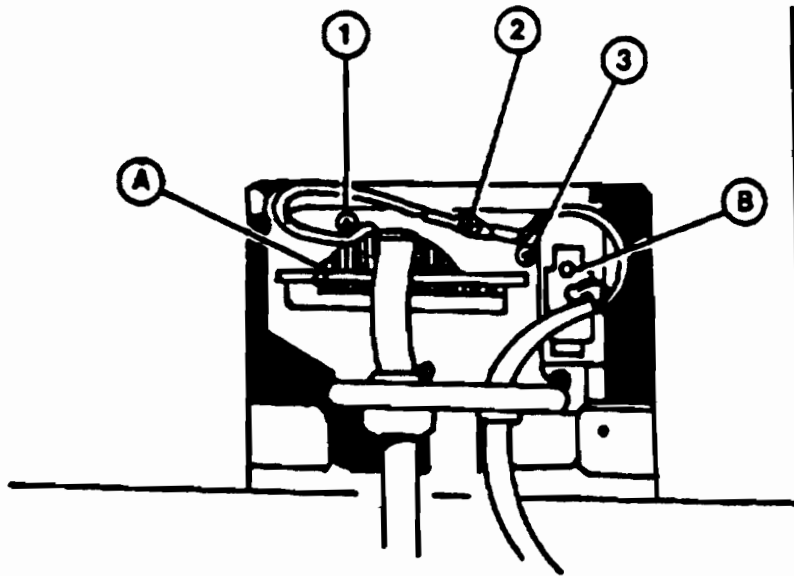


Figure 1-9

8. Install power & data cables access plate using the same screws removed during the top cover removal process. Access plate location shown in figure 1-10.

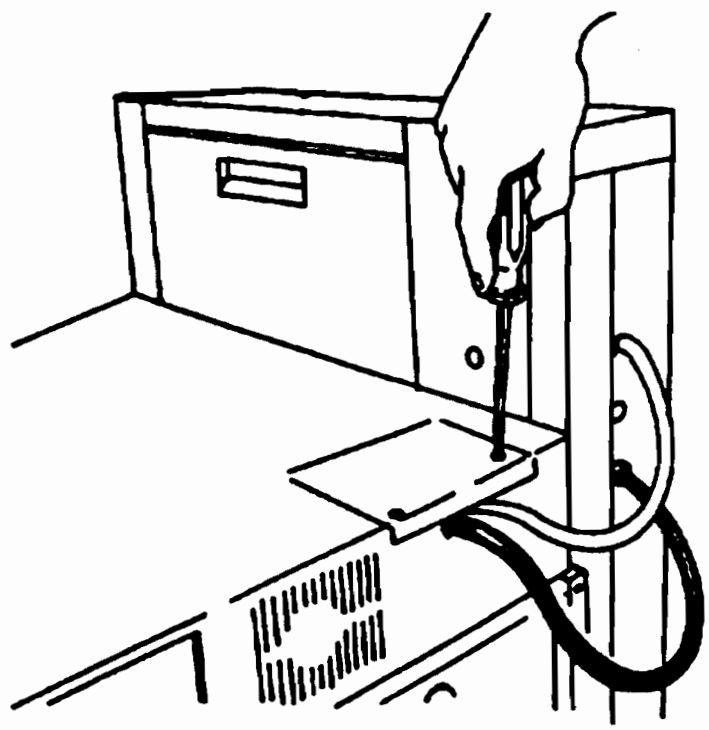


Figure 1-10

9. From the front of the printer LIFT the top section to the open position. REPLACE the two screws on top section where indicated.

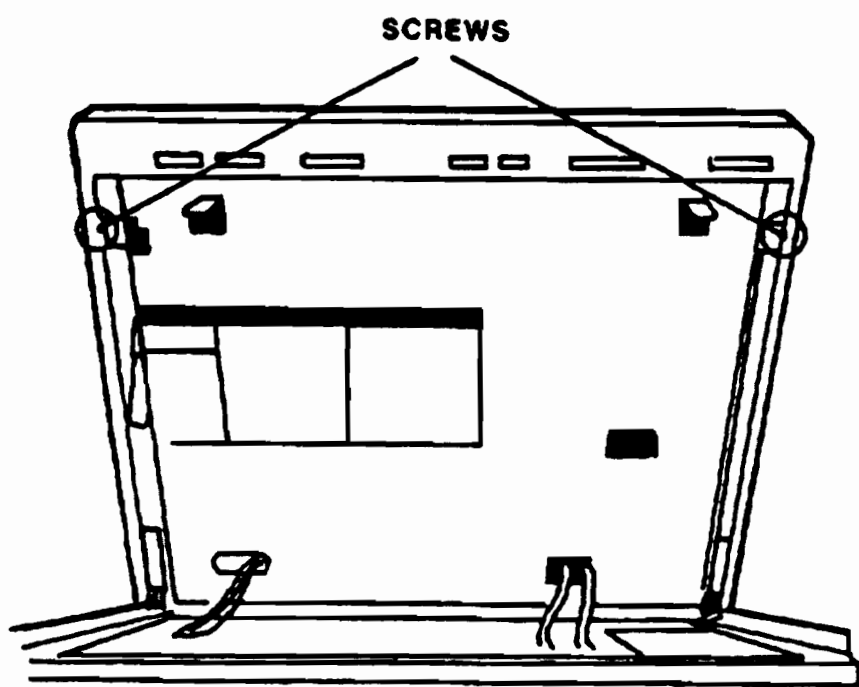


Figure 1-11

10. Close the top cover. Tighten the two screws which were previously loosened. (Location indicated)

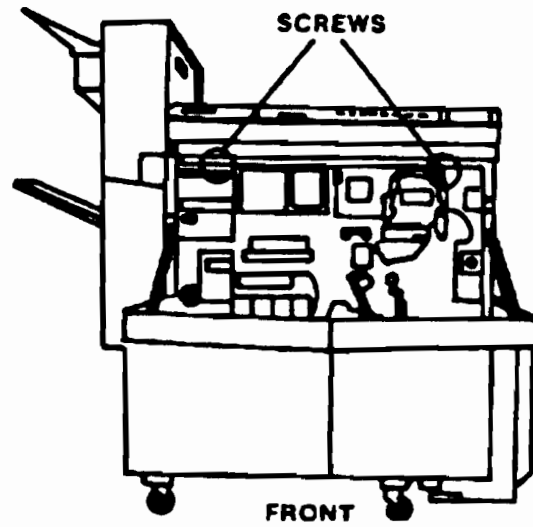


Figure 1-12

11. POWER ON THE PRINTER.

12. Run Self Test.

Verify the I/O configuration on page 1 of self test.