



PRELIMINARY

INSTALLATION AND SERVICE MANUAL

12996A

LINE PRINTER SUBSYSTEM

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GENERAL INFORMATION

SECTION

I

1-1. INTRODUCTION

1-2. This manual covers the HP 12996A Line Printer Subsystem and its components. The five sections of the manual contain general information, installation, operation of the printer in the subsystem, programming the subsystem, and maintenance. Separate manuals included with the subsystem provide details of the line printer and computer interface. The remainder of this section provides a general description, a list of equipment furnished, and subsystem specifications.

1-3. GENERAL DESCRIPTION

1-4. The HP 12996A Line Printer Subsystem consists of all the equipment and software required to provide line printing capability for HP 2100-Series Computer Systems. Subsystem components consist of a printer, an interface PCA, an interface cable, and diagnostic software. Drivers are available for DOS, RTE, BCS, and SIO.

1-5. The printer utilizes heat sensitive paper and a fast, non-impact thermal printing method. The print rate is 240 lines-per-minute with 80 columns and a 64-character set of symbols. Two switches on the printer rear panel select the required mains voltage at a frequency of 48 to 60 Hz. Additional details of line printer and interface performance and capabilities are provided in the printer operating and service manuals supplied with the subsystem.

1-6. EQUIPMENT FURNISHED

1-7. The following equipment, software, and manuals are supplied with the HP 12996A Line Printer Subsystem:

- a. HP 9866A Line Printer.
- b. HP 12566B-004 Line Printer Interface Kit.
- c. Diagnostic Paper Tape, part no. 12996-16001.
- d. *HP 9866A Printer Peripheral Manual*, part no. 09866-90000.

- e. *HP 9866A Printer Service Manual*, part no. 09866-90030.
- f. *HP 12566B Microcircuit Interface Kit Operating and Service Manual*, part no. 12566-90015.
- g. *HP 12566B-004 Line Printer Interface Kit Operating and Service Manual*, part no. 12566-90019.
- h. *HP 9866A/12566B Line Printer and Interface Diagnostic Reference Manual*, part no. 12996-90001.
- i. *HP 12996A Line Printer Subsystem Installation and Service Manual*, part no. 12996-90003.

1-8. The line printer is supplied with a power cord, part no. 8120-1378, for operation in the U.S.A. on 120 Vac power. For 220 Vac and 240 Vac operation, part no. 8120-0698 power cord should be used. Power cords or adapters for other countries must be furnished by the user.

1-9. Also supplied with the line printer are spare fuses, a dust cover (part no. 4040-0504), and two rolls of printer paper (part no. 9281-0414).

1-10. The HP 12566B Line Printer Interface Kit with Option 004 includes the following items:

- a. Microcircuit Interface Card, part no. 12566-60024.
- b. Cable Assembly, part no. 12566-60028 (20 ft., 6.1m in length) or part no. 12566-60030 (23 ft., 7.0m in length).
- c. Operating and service manuals as specified above in the subsystem list.

1-11. SPECIFICATIONS

1-12. Operating and environmental specifications for the line printer are found in the *Hewlett-Packard 9866A Printer Peripheral Manual*, part no. 09866-90000. Electrical specifications for the microcircuit interface card (hereafter called the interface PCA) are covered in the *HP 12566B Microcircuit Interface Kit Operating and Service Manual*, part no. 12566-90015. Current requirements for the interface PCA are 1.1A at +5.0 Vdc and 0.05A at -2 Vdc.

INSTALLATION

SECTION

II

2-1. INTRODUCTION

2-2. This section provides the required information to incorporate the HP 12996A Line Printer Subsystem into a system containing an HP 2100 Series Computer. Included in this information are the following subjects: unpacking and inspection, cable installation, jumper configuration, line printer installation requirements, interface PCA installation and cabling instructions, and recommended re-packing and shipping methods.

2-3. UNPACKING AND INSPECTION

2-4. If the shipping container is damaged upon receipt, request that the carrier's agent be present when the item is unpacked. Inspect it for damage (scratches, cracks, loose components, etc.). If the visual inspection reveals any damage or it fails to meet specifications, notify the nearest Hewlett-Packard Sales and Service Office. Hewlett-Packard will arrange for replacement or repair without waiting for settlement of claims against the carrier. In the event of damage in transit, retain the packing container for inspection.

2-5. INSTALLATION

2-6. Installation of the HP 12996A Line Printer Subsystem consists of the following: Verifying the positioning of the jumpers on microcircuit interface card, installing card and interface cable, checking power requirements and installing power cord, installing roll of paper in line printer, and running the line printer diagnostic as a verification of operation.

2-7. HP 12566B JUMPERS

2-8. Jumpers on the HP 12566B Microcircuit Interface Card should be positioned according to table 2-1. Location of the jumpers can be found in the operating and service manual for the interface card.

2-9. HP 9866A POWER REQUIREMENTS

2-10. The HP 9866A Line Printer operates from nominal mains voltages of 100, 120, 220, and 240 Vac over a range of + 5% to - 10%. The voltage should be selected at installation, using the two switches on the rear panel. The mains frequency must be within 48 to 66 Hz.

Table 2-1. Interface Jumper Positions

JUMPER	POSITION	FUNCTION
W1	A	Positive True Command to Printer
W2	B	Clears Command FF on negative-going Flag from Printer
W3	A	Sets Flag Buffer and Strobes Data on positive-going edge of Printer Flag
W4	B	Continuously available output data
W5	Removed	
W6-W8	Installed	
W9	A	Command FF cleared by CLC, CRS, and Printer Flag

WARNING

Before changing the fuse, be sure that the printer is disconnected from any power source.

2-11. The proper fuse **MUST** be installed. For 100V to 120V operation, use a 3.0A, 250V, slow-blo fuse. For 220V to 240V operation, use a 1.5A, 250V, slow-blo fuse.

2-12. In operation, the line printer cabinet should be grounded through the power cord to an appropriate power receptacle. The HP 9866A Line Printer is shipped with a NEMA/CEE type power cord to mate with receptacles in the U.S.A. for 110 Vac to 120 Vac mains voltages. For 220 Vac to 240 Vac mains voltages in the U.S.A., obtain the proper power cord, part no. 8120-0698, from Hewlett-Packard. For power mains in other countries, the appropriate power cord must be fabricated or an adapter used to mate the NEMA plug with the local receptacle.

2-13. INTERFACE PCA

2-14. Install the interface PCA in one of the HP 2100 or 21MX computer I/O slots or I/O extender as follows:

a. Determine the I/O select code to be used and the corresponding I/O slot in the computer or I/O extender. (Note: The line printer's baud rate is approximately 3000.)

b. For an HP 2100 installation proceed as follows:

- (1) Turn off power at the computer and I/O extender (if used).
- (2) Remove top cover from the computer or I/O extender (if used).
- (3) Install the interface PCA, part no. 12566-60024, in the required I/O slot. (Be sure the component side of the PCA faces in the same direction as on the other PCA's in the I/O section of the computer or I/O extender.) Secure by pushing down on the PCA extractor levers.
- (4) Feed the interface cable, part no. 12566-60028 or 12566-60030, through the cable exit port and press the hooded PCA connector onto the connector of the interface PCA. Connect opposite end of interface cable to rear of line printer on the connector labeled SIGNAL.
- (5) Replace top cover and turn on power.

c. For an HP 21MX installation, proceed as follows:

- (1) Rotate key-operated switch to the STANDBY position which removes CPU and I/O power. If an I/O extender is used instead of the CPU set extender LINE switch to OFF.

NOTE

Do not set computer LINE switch to OFF, and if the computer is housed in a system cabinet, do not use the system power switch to remove power. Switching off ac power removes power to the memory and its contents will be lost.

- (2) If the computer is equipped with the optional power fail recovery system, set BATTERY switch to OFF and remove battery cable from the BAT. INPUT connector.
- (3) Remove the I/O PCA cage cover from the computer or the I/O extender rear cover or front panel (depending upon I/O slot number to be used).
- (4) Loosen the PCA retainer on the computer or I/O extender and slide the PCA retainer to the right (or remove retainer for I/O extender front access).

(5) Install the interface PCA, part no. 12566-60024, in the required I/O slot in the computer or I/O extender (if used). (Be sure that the component side of the PCA faces upward.) Secure the PCA in place by pushing inward on the PCA extractor levers.

(6) Install the interface cable, part no. 12566-60028 or 12566-60030. The hooded connector pushes onto the PCA with the cable going toward the right. Place cable in the cable exit area at the rear of the computer, or I/O extender, feed through and connect the opposite end to the line printer on the connector labeled SIGNAL.

(7) Reposition or replace the PCA retainer, PCA card cage cover or I/O extender cover (if used), and battery and battery cable.

(8) Turn on power of I/O extender (if used) and turn key-operated switch of the computer to RESET, then OPERATE.

For reference and for use in case of difficulty, the wiring data for the interface cable assembly is shown in figure 2-1.

2-15. VERIFYING OPERATION

2-16. Operation of the line printer can be verified by loading and running the Line Printer Diagnostic Tape, part no. 12996-16001. To run the diagnostic, it will be necessary to first load the Diagnostic Configurator Tape, part no. 24296-60001, which is used for equipment configuration and as a console device driver. Be sure to install a roll of paper in the line printer before the test is started. Refer to paragraph 3-3 for paper loading instructions. While the program is running the system console will display operator instructions, information messages, and error messages. Specific instructions for verification are given below. For diagnostic program details, refer to the *HP 9866A/12566B Line Printer and Interface Diagnostic Reference Manual*, part no. 12996-90001.

2-17. After both tapes are loaded into the computer with the computer's binary tape loader (refer to the computer operator's manual for instructions) proceed as follows:

- a. Enter 100 (octal) in the P-register which is the program starting location.
- b. Enter the octal select code (S.C.) of the line printer interface into the S-register bits 0-5.
- c. Press PRESET (EXT. and INT.), RUN.
- d. The computer should run and halt with a display of 102074 (octal). If the wrong select code was entered the halt code will be 102073 (octal), so try again.

- e. Clear the S-register.
- f. Press PRESET (EXT. and INT.), RUN.
- g. Unless there is an error halt, a series of seven tests will be performed, including pattern printouts on the line printer. Upon a successful completion, the computer will halt with a display of 102077 (octal).
- h. If an error halt occurs, refer to the error halt list in the *HP 9866A/12566B Line Printer and Interface Diagnostic Manual*.

2-18. Diagnostic test options can be selected when the computer halts displaying 102074 (octal). All tests from 00 to 06 will be run and all messages and error halts will occur if the S-register is CLEAR (all 0's). Test 01 for Status and Buffer Clear, checks the Out-of-Paper status and thus requires operator intervention. At this point the program will halt with a message on the console to "Remove Paper". The program is restarted by pressing RUN. A second message asks the operator to "Load Paper". The paper status check can be skipped so that the program runs to the end without a stop by entering a *one* into S-register bit eight when the program requests that the test options be entered. If a halt after each test is desired, set bit 15 to *one*. The A-register will contain the test number in octal code.

2-19. REPACKAGING FOR SHIPMENT

2-20. The following paragraphs provide instructions for repackaging the line printer and interface PCA for shipment. Included are instructions for using the original packaging or new packaging. If the component is being sent to the factory for servicing, attach a tag specifying the return address, type of service or repair required, model number, and full serial number.

2-21. ORIGINAL PACKAGING

2-22. Package the components to be returned in their original factory packaging material whenever possible. If

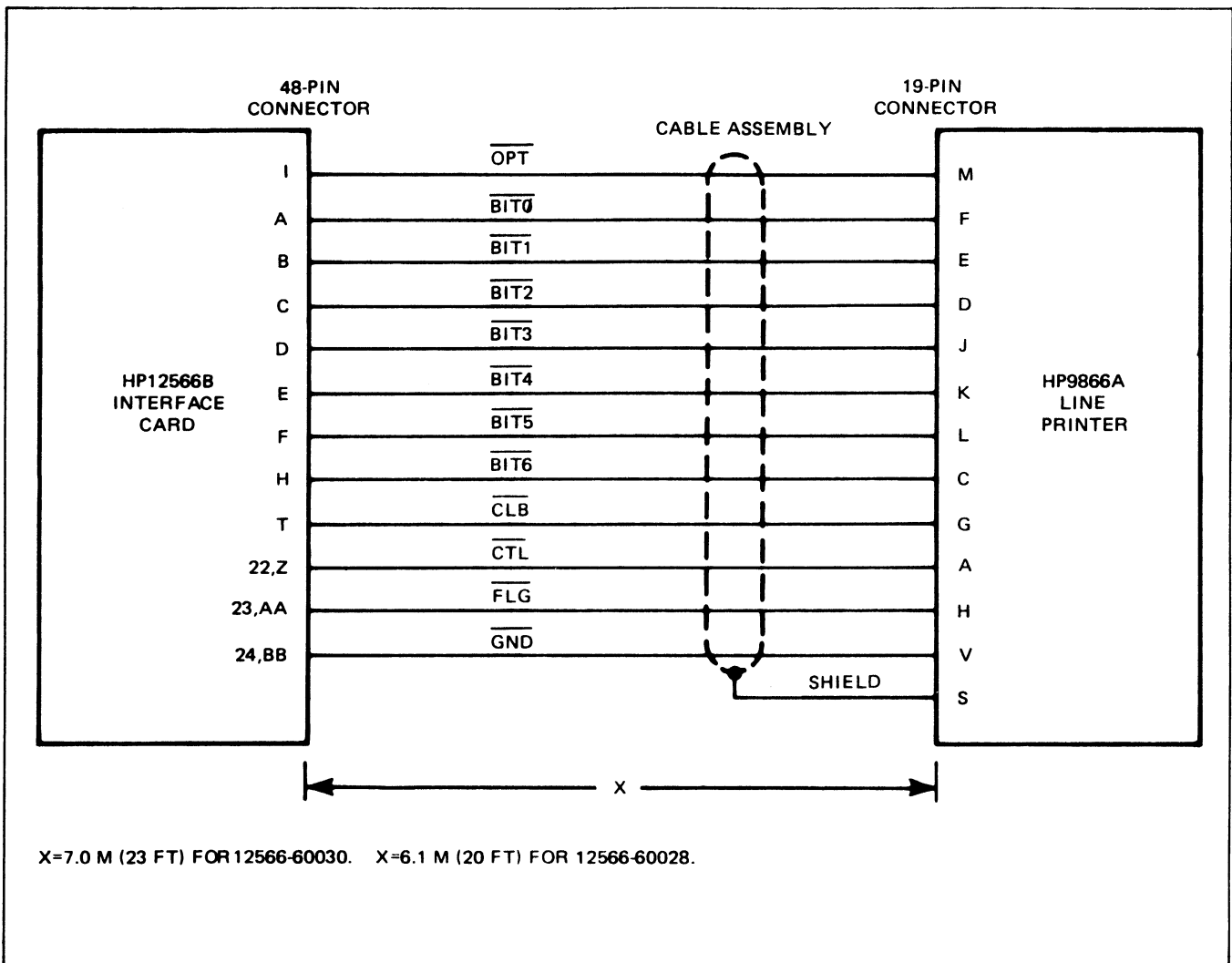
the original packaging material is not available, it can be ordered from a local Hewlett-Packard Sales and Service Office. Comply with the following instructions:

- a. Be sure the component is tagged.
- b. Seal the shipping container securely and mark it "FRAGILE" to ensure careful handling.
- c. In any subsequent correspondence with the factory, refer to the component by model number and full serial number.

2-23. NEW PACKAGING

2-24. Use the following instructions when packaging the component with commercially available materials:

- a. Be sure the component is tagged.
- b. Wrap the line printer in heavy paper or sheet plastic and the interface PCA in Air Cap TH-240 Cushioning (or equivalent) manufactured by Sealed Air Corp., Hawthorne, N. J.
- c. Use strong shipping containers, placing the line printer in a double-wall carton constructed of 160-kg (350-lb) test material and the interface PCA in a corrugated carton of 90-kg (200-lb) test material.
- d. Use sufficient shock-absorbing material on all sides of the line printer to provide a firm cushion and to prevent movement inside the container. Use particular care to protect the corners of the line printer.
- e. Seal the shipping container securely and mark it "FRAGILE" to ensure careful handling.
- f. In any subsequent correspondence with the factory, refer to the component by model number and full serial number.



7206-1

Figure 2-1. Wiring Data for Interface Cable Assembly

3-1. TURN-ON PROCEDURE

3-2. Turn-on procedure for the HP 9866A Line Printer is as follows:

- a. Switch on front panel LINE switch. The light above the switch turns on, indicating power is applied.
- b. Amber light below paper button must be ON. If not ON, load paper.
- c. If paper is loaded but does not appear at front of printer, push PAPER button until paper is visible.

3-3. PAPER LOADING PROCEDURE

3-4. Use the following procedure to load paper:

- a. Lift the access cover on top of printer.
- b. Remove paper core of any previous roll. If remaining roll is small, remove old roll by:
 - (1) Unrolling and lifting it upwards until the roll is above the printer.
 - (2) Grasp roll firmly and pull it upward and forward so that the paper guide will tear the paper off cleanly.
- c. If any paper remains in the printer mechanism, remove it by pressing the PAPER button until the paper stops moving.
- d. Remove the first layer of paper from a new roll. Be sure the paper has a cleanly torn or cut edge, as paper with a ragged edge will not load properly.
- e. Insert new roll such that the free end is positioned as shown on the back of the access cover. Press the PAPER button until paper appears at the front of the printer.

3-5. OPERATION

3-6. PAPER STATUS FLAG

3-7. If the paper supply runs out during operation, an Out-of-Paper (OTP) flag command will be returned by the line printer to the interface PCA to set data bit 0.

3-8. ASCII CHARACTER EXCEPTION

3-9. The ASCII character set for the HP 9866A Line Printer is the same as for the HP 2100 Series Computers with one exception. The ← (left arrow) used in the computer has the same octal code as the - (minus) character in the line printer. This will cause some minor complications as follows:

- a. The ← (left arrow) cannot be printed, instead the line printer prints a - (minus) sign.
- b. The Hewlett-Packard I/O drivers for the HP 2767 Line Printer are the same as for the HP 9866A Line Printer except for the SIO driver discussed below. In this driver the ← CR LF combination is used to suppress the CR LF functions so answers to questions or input data can be on the same line as the previous output. Therefore avoid using - (minus), which the driver interpretes as ← (left arrow), in the space immediately before a CR LF. If you do use - CR LF, the (-) character does not print and there will be no carriage return and line feed.

3-10. SOFTWARE MODES

3-11. The subsystem operates in several software modes for which the driver software and manuals are available as options to the subsystem. The driver, which is ordered as an option, will be supplied with the system when the line printer is included in the original configuration. The subsystem will also operate from the diagnostic program using absolute code. The software driver and manual options for the line printer are the following:

- a. System Input/Output (SIO) Drivers (Absolute Binary). Option 12996A-424 includes the following:
 - 8K memory, part no. 24165-60001
 - 12K memory, part no. 24301-60001
 - 16K memory, part no. 24166-60001
 - 24K memory, part no. 29100-60022
 - Manual, part no. 12653-90004, *SIO HP 2767 Line Printer Driver*.
- b. Basic Control System (BCS) Driver (Relocatable Binary). Option 12996A-423 includes the following:
 - Driver tape, part no. 24167-16001, D.16; Manual, part no. 12653-90005, *BCS HP 2767 Line Printer Driver Manual*.

- c. Disc Operating System (DOS) Driver (Relocatable Binary). Option 12996A-421 includes the following:

Driver tape, part no. 24168-60001, DVR 12; Manual, part no. 02767-90007, *RTE-DOS HP 2767 Line Printer Driver Manual*.

- d. Real Time Executive (RTE) Operating System Driver (Relocatable Binary). Option 12996A-422 includes the following:

Driver tape, part no. 29028-60002, DVR 12; Manual, part no. 09600-93006, *RTE HP 2767 Line Printer Driver Manual*.

Also refer to the overall RTE driver manual *RTE Operating System Drivers and Device Subroutine Programming and Operating Manual*, part no. 92200-

93005 which is supplied with RTE systems.

3-12. SIO drivers are used in programs to minimize memory requirements when execution time requirements are not critical. The HP 9866A Line Printer uses the same SIO driver as the HP 2767A Line Printer. SIO drivers occupy an absolute location in upper memory and therefore differ in memory location for various memory sizes. SIO drivers for the various memory sizes (listed above) are available from Hewlett-Packard and are furnished with the system when the line printer subsystem and its software options are ordered as components of the system.

3-13. BCS, DOS, and RTE software operating procedures are contained in separate manuals. These manuals are included with their respective drive tapes when options 12996A-423, 12996A-421, and 12996A-422 are ordered.

4-1. INTRODUCTION

4-2. The HP 12996A Line Printer Subsystem can be programmed without a driver to print on a line-to-line basis (no motion requests). Adding one of the drivers to the operating system as described in paragraph 3-10 adds other capabilities such as double spacing and advancing lines. The line printer will perform all motion functions as described in the applicable driver manual except for "top-of-form". ASCII characters are printed according to seven bits of the data word where bit 0 is the least significant bit of the ASCII code. Printed character binary and octal codes are given in Appendix A.

4-3. Operation with BCS, DOS, and RTE drivers is in the interrupt mode without DCPC (DMA). Programming information is the same as for the HP 2767 Line Printer which is provided in the driver manuals supplied with your software operating system. The exceptions to this information are given below.

4-4. CONTROL FUNCTIONS

4-5. The subsystem contains the two control functions of PRINT and Clear Line Buffer (CLB) in addition to the interface control and flag functions. The PRINT command is issued in the printer when a LINE FEED (ASCII 0001010) character is received from the interface after all printable characters in a row have been entered. Two LINE FEED characters will advance the paper one print line.

4-6. The CLB command clears all characters in the printer input registers and resets the character pointer to the left margin. The flag must be set (low) for this function to operate. CLB is issued when bit 15 is set in a word transferred from the interface. To clear any residual characters in the printer, then, program a data word to the printer with a *one* in the most significant bit.

4-7. DATA WORD

4-8. The data words for ASCII characters to be printed are loaded into the printer with a data transfer program as shown in figure 4-1. The seven bits of ASCII code must be in bits 0 thru 6 where bit 0 holds the least significant bit.

4-9. STATUS BIT

4-10. The line printer provides an Out-of-Paper (OTP) signal when the paper roll is empty. This signal appears at the interface on its data input (from device) bit 0. At suitable intervals in the program, test for this bit by transferring a status word from the printer to the computer by using an LIAXX instruction, where XX is the select code of the printer. The presence of the bit 0 being set may then be used to initiate an "out-of-paper" message to the operator and halt the transfer of input data words to the printer.

START	LDA	DATA	Load A with Data to be transferred
	OTAXX		Output Data to Printer
	STCXX		Start Handshake
	SFSXX		Wait for Completion Flag
	JMP* - 1		
	JMP START		
NOTE			
Repeat above routine twice where DATA is Line Feed Code 012 (octal) to print character.			

Figure 4-1. Data Transfer Program

5-1. INTRODUCTION

5-2. The HP 9866A Line Printer should be cleaned and checked at least once every three months. Where there appears to be a problem in subsystem operation, isolate the trouble to an individual assembly and then refer to the appropriate manual for instructions.

5-3. Verify subsystem operation and isolate malfunctions of the interface and line printer with the HP 9866A/12566B Line Printer and Interface Diagnostic furnished on paper tape, part no. 12996-16001. For instructions on using the diagnostic, refer to the *HP 9866A/12566B Line Printer and Interface Diagnostic Reference Manual*, part no. 12996-90001.

5-4. If the trouble seems to be associated with the interface PCA, use the information provided by the diagnostic test as a guide to troubleshooting the PCA. Interface PCA information is given in the *HP 12556B Microcircuit Interface Kit Operating Service Manual*, part no. 12566-90019.

5-5. Where a control, flag signal, or data signal appears to be missing, the problem may be caused by a broken wire or connector in the interface cable. The interface connections are identified in figure 2-1.

5-6. CLEANING PRINTER

5-7. Clean fan filter (located at back of printer) at least once every three months. The filter can be removed by prying it out with a screw driver. Clean filter by rinsing it out in water and dry it completely before re-installing it.

5-8. The roller and platen which feeds the paper should be wiped clean on each service call. To access these parts, follow the disassembly instructions in the *HP 9866A Printer Service Manual*, part no. 09866-90030.

5-9. The outside of the line printer can be cleaned with a soft, damp cloth. **DO NOT USE ABRASIVE CLEANERS AND DO NOT LET MOISTURE GET INSIDE THE PRINTER.**

5-10. LINE PRINTER TROUBLESHOOTING

5-11. For information on troubleshooting and repair of the HP 9866A Line Printer refer to the *HP 9866A Printer Service Manual*, part no. 09866-90030. Disassembly instructions and print head alignment procedures are covered in this manual.

HP 9866A PRINTER CHARACTER BINARY AND OCTAL CODES

APPENDIX

A

Printer Character Binary and Octal Codes

CHARACTER	BINARY DO6543210	OCTAL EQUIV.	CHARACTER	BINARY DO6543210	OCTAL EQUIV.
@	1000000	100	@	1100000	140
A	1000001	101	A	1100001	141
B	1000010	102	B	1100010	142
C	1000011	103	C	1100011	143
D	1000100	104	D	1100100	144
E	1000101	105	E	1100101	145
F	1000110	106	F	1100110	146
G	1000111	107	G	1100111	147
H	1001000	110	H	1101000	150
I	1001001	111	I	1101001	151
J	1001010	112	J	1101010	152
K	1001011	113	K	1101011	153
L	1001100	114	L	1101100	154
M	1001101	115	M	1101101	155
N	1001110	116	N	1101110	156
O	1001111	117	O	1101111	157
P	1010000	120	P	1110000	160
Q	1010001	121	Q	1110001	161
R	1010010	122	R	1110010	162
S	1010011	123	S	1110011	163
T	1010100	124	T	1110100	164
U	1010101	125	U	1110101	165
V	1010110	126	V	1110110	166
W	1010111	127	W	1110111	167
X	1011000	130	X	1111000	170
Y	1011001	131	Y	1111001	171
Z	1011010	132	Z	1111010	172
[	1011011	133	[	1111011	173
\	1011100	134	\	1111100	174
]	1011101	135	]	1111101	175
↑	1011110	136	↑	1111110	176
- (minus)	1011111	137	!	0100001	041
SPACE	0100000	040	"	0100010	042
*	0101010	052	#	0100011	043
+	0101011	053	\$	0100100	044
, (comma)	0101100	054	%	0100101	045
-	0101101	055	&	0100110	046
.	0101110	056	' (apost.)	0100111	047
/	0101111	057	(	0101000	050
0	0110000	060	)	0101001	051
1	0110001	061	:	0111010	072
2	0110010	062	;	0111011	073
3	0110011	063	<	0111100	074
4	0110100	064	=	0111101	075
5	0110101	065	>	0111110	076
6	0110110	066	?	0111111	077
7	0110111	067	LF (linefeed)	0001010	012
8	0111000	070			
9	0111001	071			

CERTIFICATION

Products, materials, parts, and services furnished on this order have been provided in accordance with all applicable Hewlett-Packard specifications. Actual inspection and test data pertaining to this order is on file and available for examination.

Hewlett-Packard's calibration measurements are traceable to the National Bureau of Standards to the extent allowed by the Bureau's calibration facilities.

The Hewlett-Packard Quality Program satisfies the requirements of MIL-Q-9858, MIL-I-45208, and MIL-C-45662.

