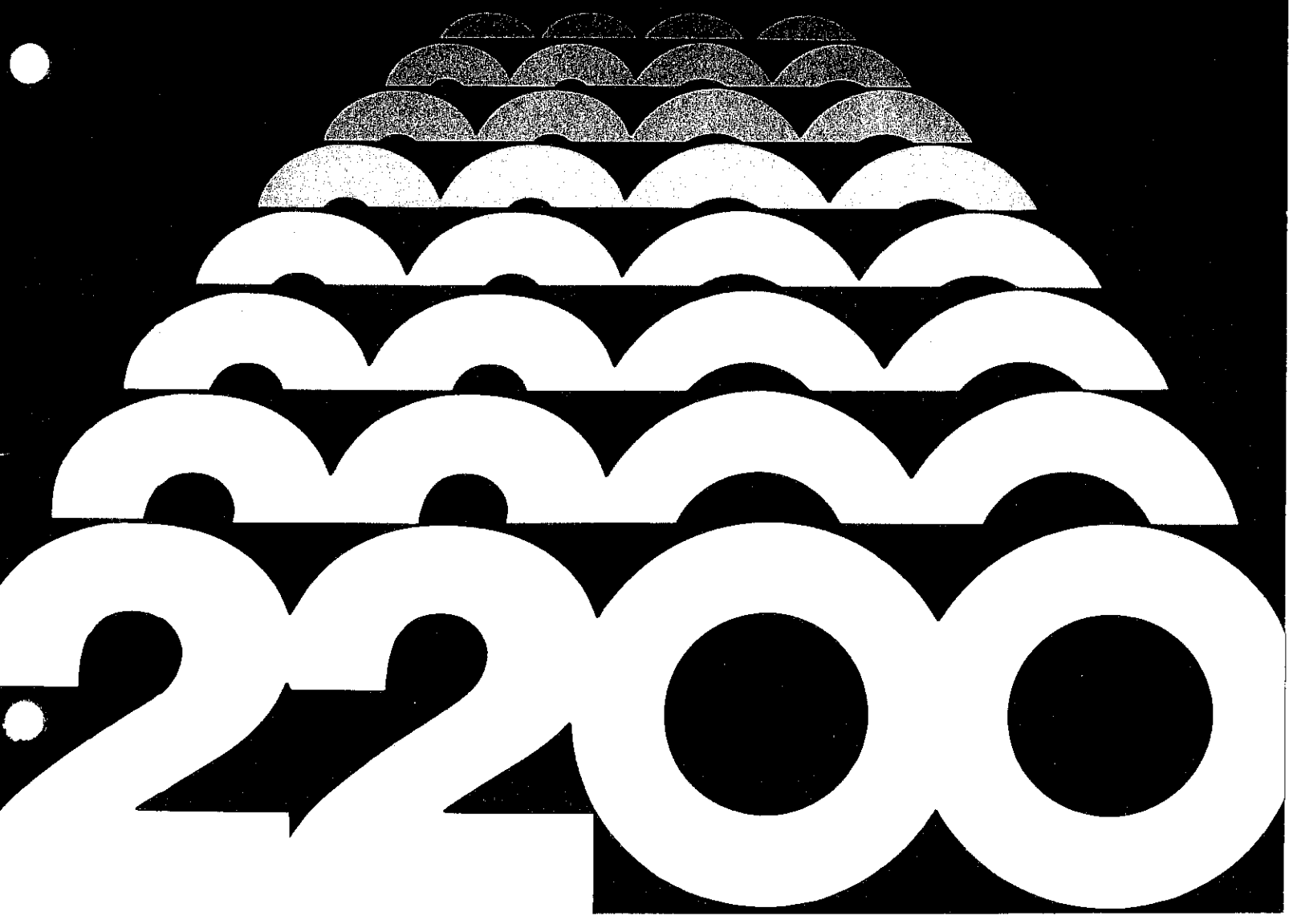
WANG

Model 2245 Matrix Printer User Manual



Model 2245
Matrix Printer
User Manual

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PREFACE

This manual describes the Model 2245 Matrix Printer and instructs the user in its installation, operation, and maintenance. It is assumed that the user is familiar with the Wang 2200 series product line and the BASIC language. Those users not acquainted with the capabilities of BASIC should refer to Programming in BASIC for an introduction to the language and to the Wang BASIC-2 Language Reference Manual for a description of the functions and attributes of the Wang BASIC-2 language.

Chapter 1 of this manual contains general information on the operational features of the Model 2245 Matrix Printer. Chapter 2 describes methods of selecting the printer for output. Chapter 3 illustrates the use of Hex codes to control a wide variety of format and character attributes.

The Appendices include a chart of the Hexadecimal codes and printer and paper specifications.

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FIGURES

CHAPTER 1
OVERVIEW

1.1 INTRODUCTION

This manual describes the operation and features of the Model 2245 Matrix Printer (refer to Figure 1-1). The Model 2245 is a bidirectional impact printer that reproduces the character sets of the Model 2236DE and 2236DW terminals, including alphabetic and numeric characters, special symbols, and special character graphics.

Three fonts may be selected under software control: the default font, an alternate font, and a box graphics font. Fonts 1 and 2 are identical except for 8 box graphics character segments. BASIC programs need only access Fonts 0 and 1. Font 2 is generally useful only to the screen reproduction software in the Model 2236DW terminals.

The characters in the default font are printed in a 9 by 9 dot matrix in 2 pitches: 10 and 16.5. The alternate font and the box graphics font are common to non-U.S.A. fonts. The characters in all fonts are printed in both pitches, but screen dumps automatically default to 10-pitch.

The Model 2245 produces an 80-character line, printing 80 characters per second. When required, characters can be expanded, emphasized, or underscored for enhanced output (refer to Section 3.3). The complete ASCII, 128-character set for the printer is given in Appendix A.

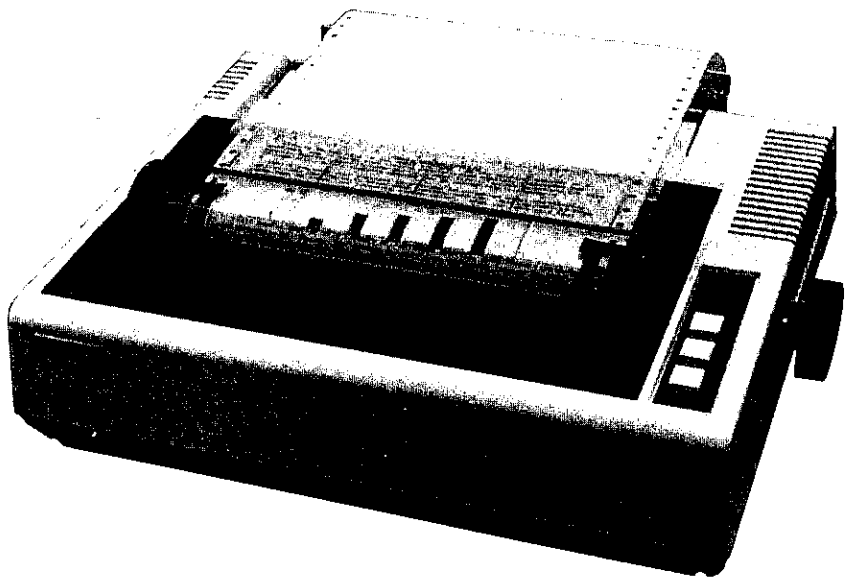


Figure 1-1. The Model 2245 Matrix Printer

A full line buffer receives data transmitted from the system Central Processing Unit (CPU) to the printer and increases throughput by overlapping CPU and printer operations. This buffer allows the printer to retain data while temporarily deselected for a paper change.

The distance between the pin-feed mechanisms is adjustable, enabling the use of continuous-form paper in widths from 4 to 10 inches (10.2 to 25.4 cm). Format can be controlled by a variety of BASIC-2 commands and a series of printer control codes.

1.2 UNPACKING

The Model 2245 can be unpacked and inspected by the customer using the following tools: a #2 Phillips head screwdriver, a medium size regular screwdriver, and a pair of scissors. If a complete system is being installed, or if a printer controller board is being installed, the unpacking and inspection procedure is performed by a qualified Wang Service Representative.

The unpacking procedure is as follows.

1. Open the carton and remove accessories.
2. Remove the Model 2245 printer by holding its underside and lifting it straight up with the packing materials attached.
3. Place the printer with the packing material on any flat surface such as a table.
4. Carefully remove the packing material.
5. Remove the vinyl cover.
6. When repacking the printer for shipment, remove the ribbon cartridge and follow the installation and unpacking steps in reverse order.

NOTE

All original materials must be saved to return the Model 2245 for maintenance purposes. The printer must be repacked according to the instructions in this manual.

1.3 GENERAL INSTALLATION

1. Remove the paper that has been inserted between the inner and outer paper guides to protect the paper end detector from damage due to shocks or vibrations during transportation.

2. Two shipping screws, located at the underside of the printer (refer to Figure 1-2), protect the printer from any shocks or vibrations during transportation. Stand the printer on its left side and remove them with a screwdriver.

3. Set the separator in the printer by inserting its edge into the two holes located at the rear part of the paper feeding mechanism (refer to Figure 1-3).

4. Connect the printer power cord to a wall outlet. Refer to Appendix C for the correct power specifications.

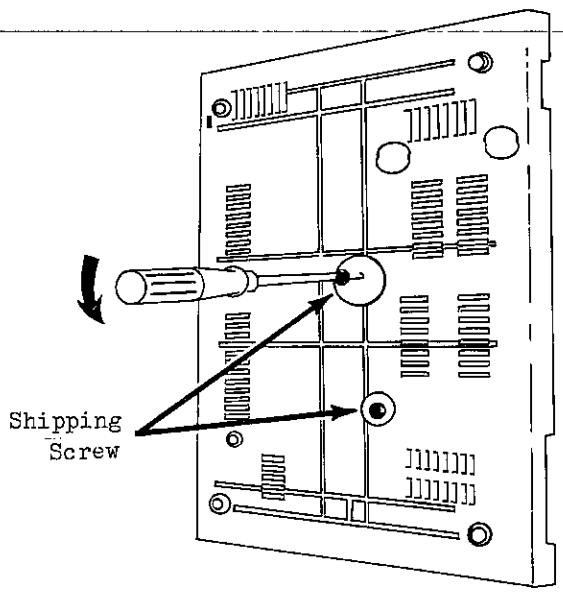


Figure 1-2. Removal of Shipping Screws

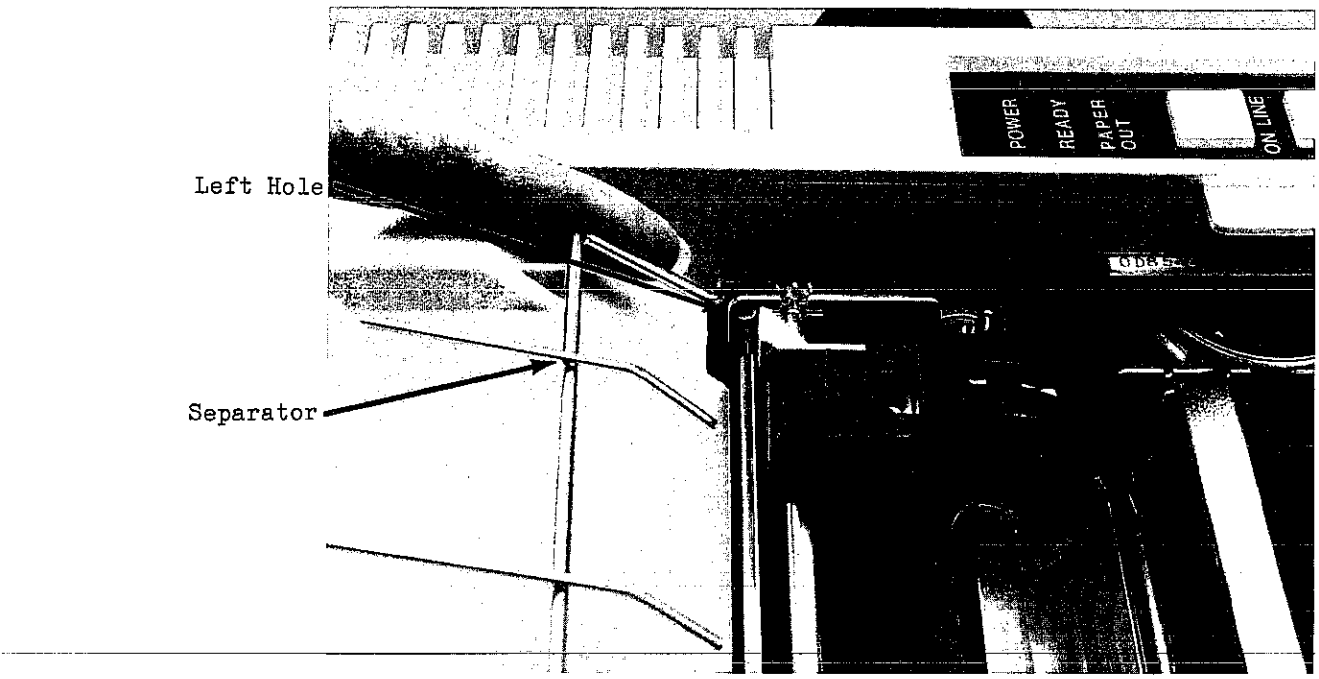


Figure 1-3. Insertion of Separator

1.4 RIBBON CARTRIDGE INSERTION

The ribbon cartridge is inserted using the following procedures. (Figure 1-5 shows an overview of the printer.)

1. Make sure the printer is turned off.

2. Remove the printer lid by standing it upright, pushing it toward the right, and pulling its left side up (refer to Figure 1-4).

3. Make sure the paper scale touches the platen (refer to Figure 1-5).

4. Push the cartridge down and set it on the printer mechanism. Carefully insert the ribbon between the head nose and the ribbon mask (refer to Figure 1-6).

5. Adjust ribbon tension by turning the knob on the top left of the cartridge in the direction of the arrow (refer to Figure 1-5).

6. Replace the printer lid by setting the lid on the projection in the left corner. Set the right lid on the right projection and push it down (refer to Figure 1-4).

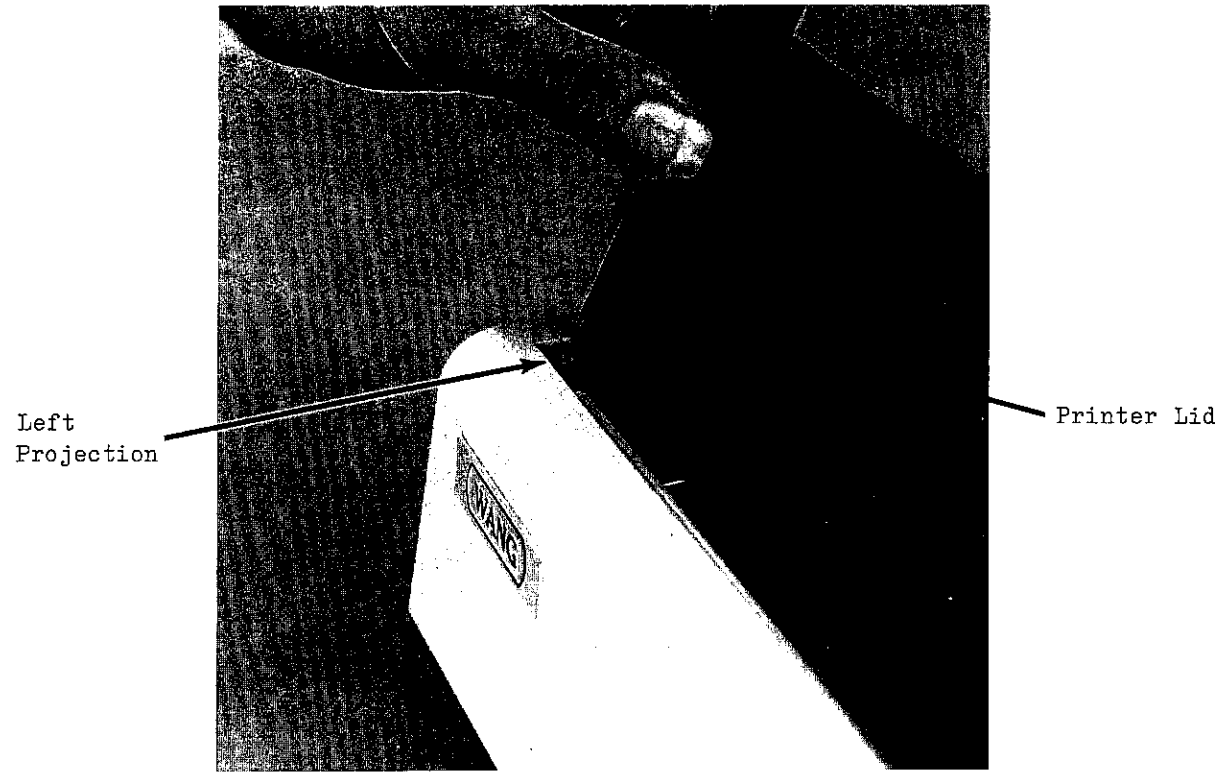


Figure 1-4. Printer Lid Removal

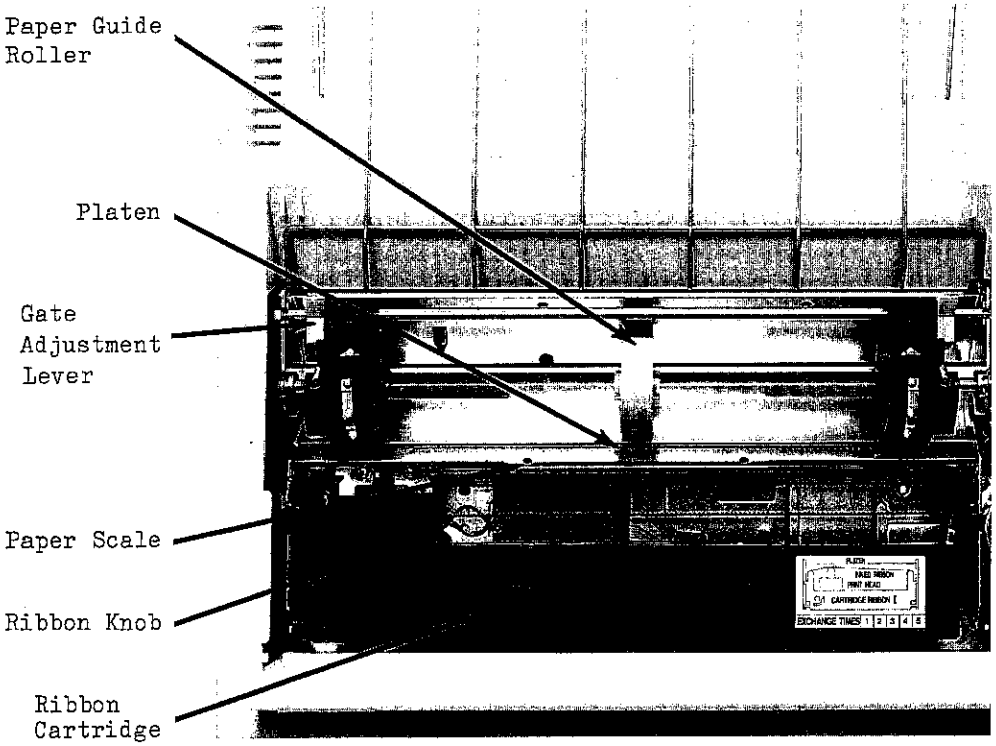


Figure 1-5. Overview of Printer

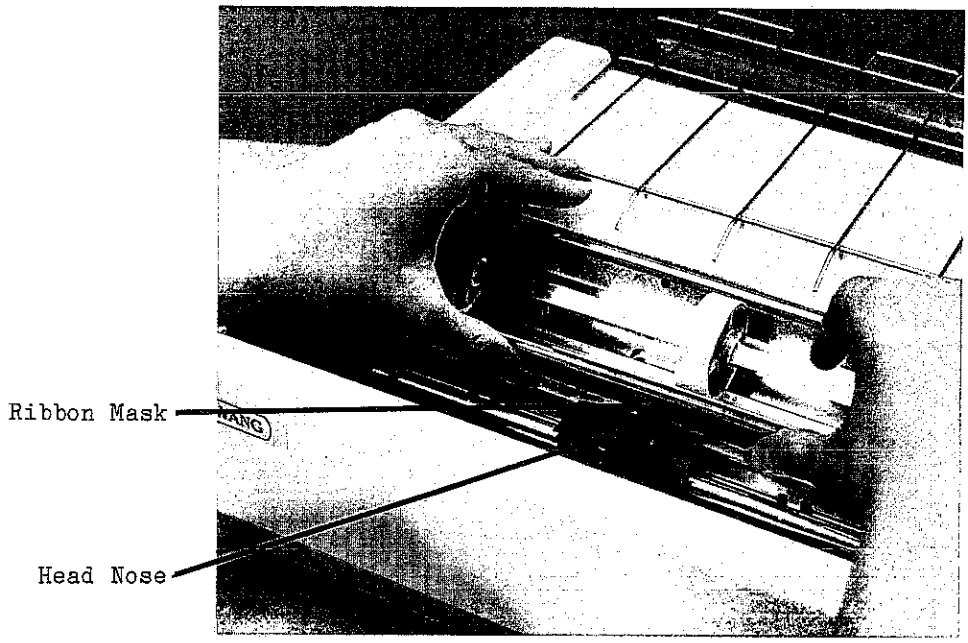


Figure 1-6. Ribbon Cartridge Insertion

1.5 INSTALLATION AS A TERMINAL PRINTER

The Model 2245 Matrix Printer is normally attached to the back of a Model 2236DW terminal to provide local, hard-copy output and screen reproductions. When the 2245 is used as a terminal printer, the following installation procedure is used.

1. Attach the 36-pin interface connector with the cable protruding from the back to the rear panel of the terminal (refer to Figures 1-7 and 1-8). Attach the 36-pin interface connector, with the cable protruding from the side, to the back panel of the printer (refer to Figure 1-9). The interface connector should be correctly attached to the back of the printer so it will not impede paper flow. Tighten the screws on both connectors.

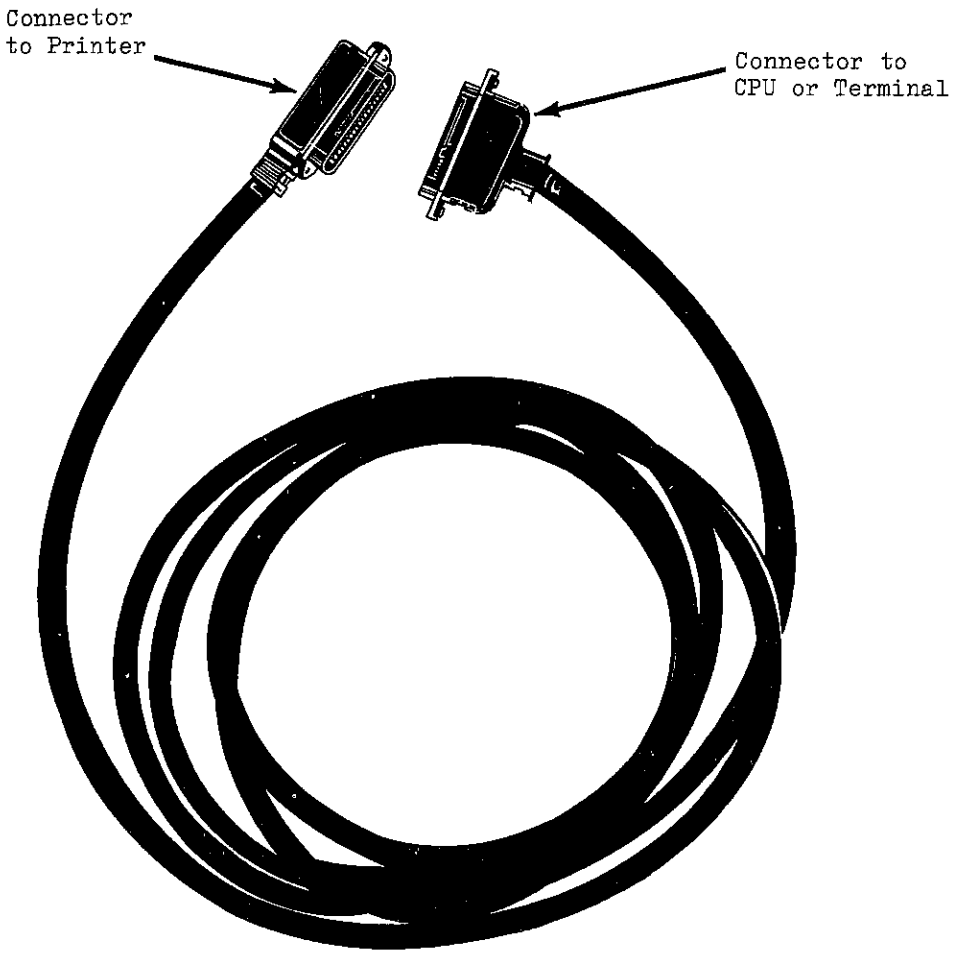


Figure 1-7. Printer Cable

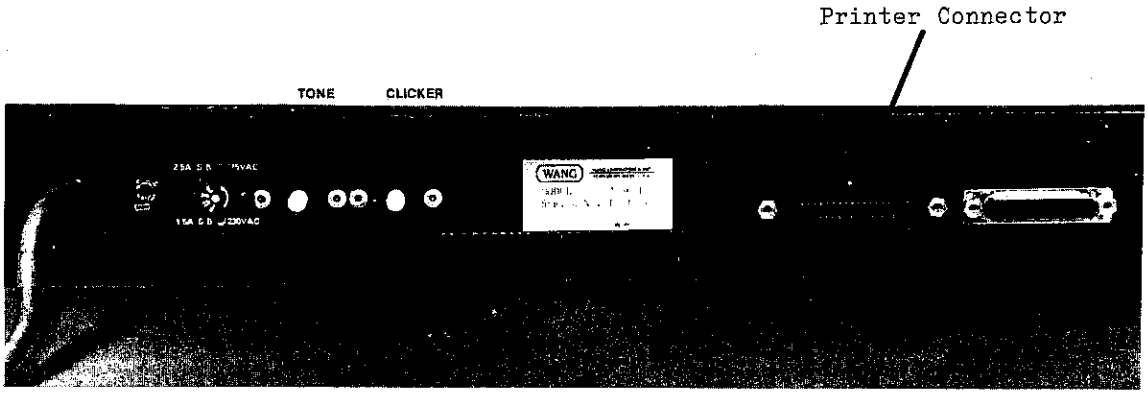


Figure 1-8. Rear Panel of 2236DE Terminal

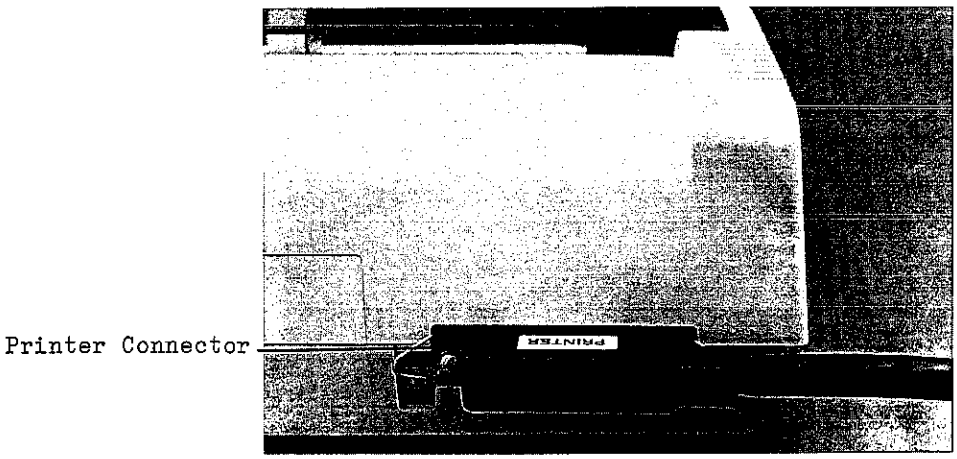


Figure 1-9. Rear Printer Panel

1.6 INSTALLATION AS A SYSTEM PRINTER

If the Model 2245 is to be used as a system printer, and the printer controller board is already installed in the CPU, perform steps 2 and 3 below. The printer controller is self-contained in the 2200SVP. If the printer is to be used as a system printer and the CPU contains no printer controller board, steps 1 thru 3 are performed by a qualified Wang Service Representative.

1. The printer controller board is installed in the 2200MVP, 2200VP, or 2200LVP CPU chassis. The screws should be fully tightened.

2. Connect the printer cable to the appropriate port in the printer controller board, depending on which CPU is installed. If the CPU is an SVP, there is only one port the printer cable can be connected to (refer to Figure 1-10). If the CPU is a 2200 MVP or LVP, connect the 36-pin interface connector to the port labeled PRINTER on the printer controller board (refer to Figure 1-11). If the port is not labeled PRINTER, contact the Wang Service Representative. Any one of three controller boards may be in the MVP or LVP. Also, the controller board may be located in any I/O slot in the LVP or the MVP. When the cable is connected, the screws should be fully tightened.

3. Plug the printer power connector cord into a wall outlet. Refer to Appendix C for correct power specifications.

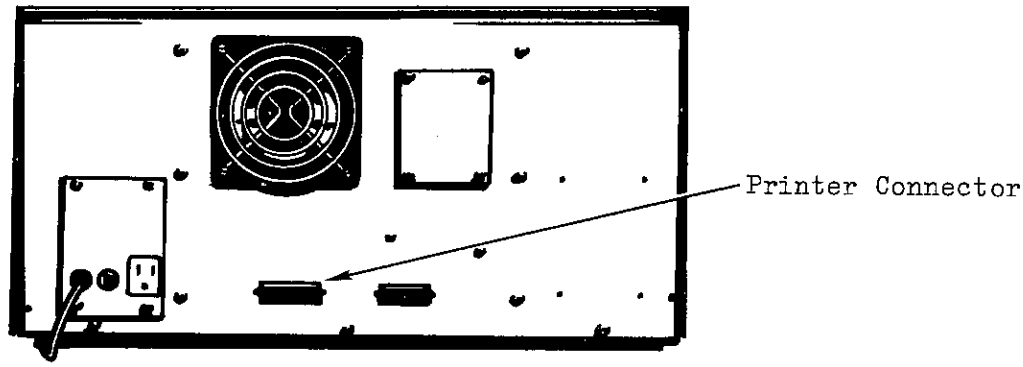


Figure 1-10. Installation of Printer to SVP Rear Panel

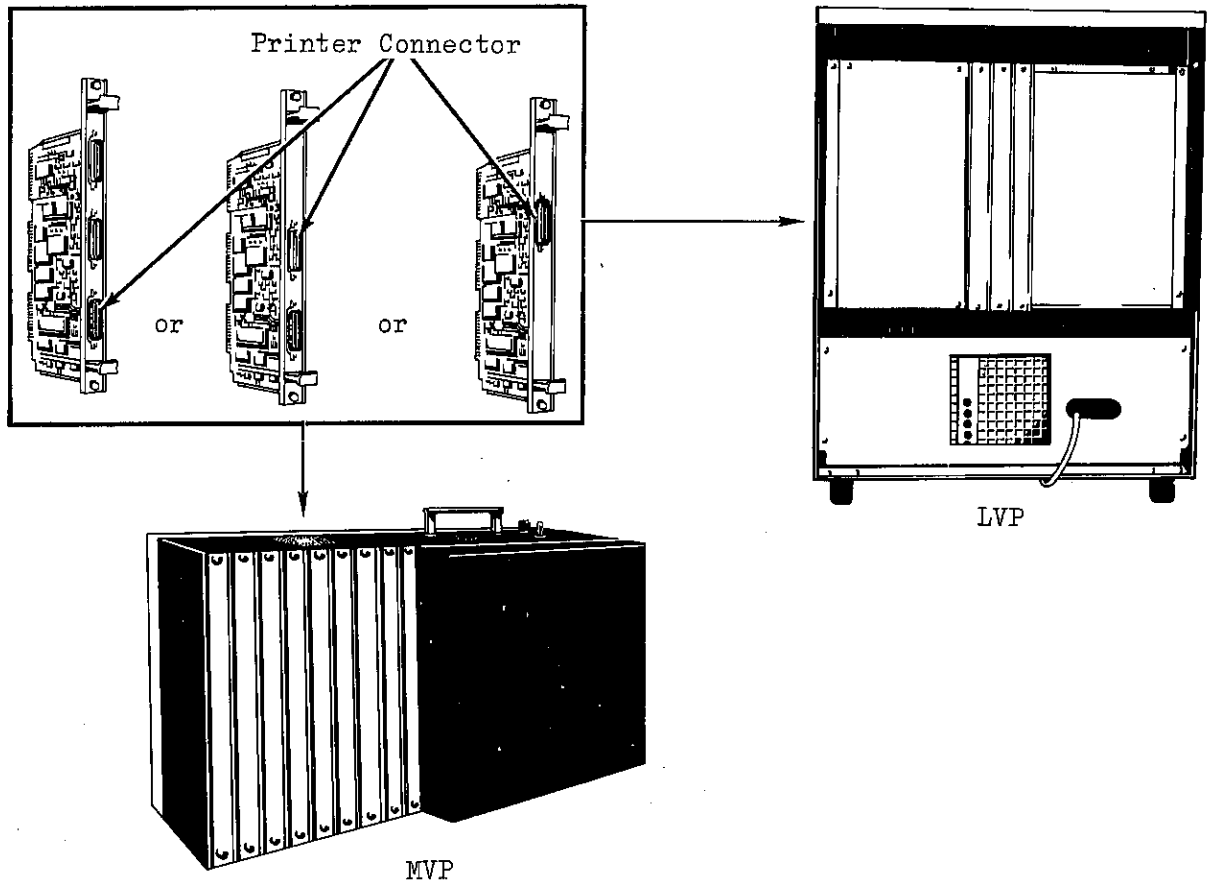
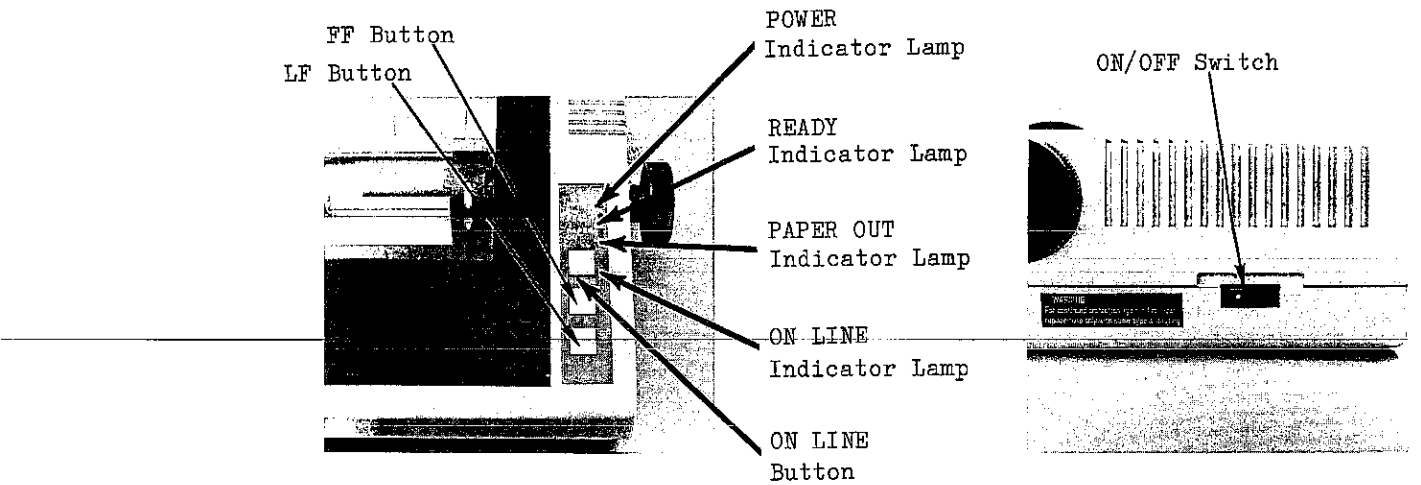


Figure 1-11. Installation of Printer to MVP or LVP Printer Controller

1.7 CONTROLS AND INDICATOR LAMPS

The Model 2245 Matrix Printer contains four switches that control the manual operations of the printer and four indicators that signal printer status (refer to Figure 1-12).



ON/OFF Switch and POWER Indicator Lamp

The ON/OFF switch is located on the right side of the printer (refer to Figure 1-12). To turn the printer on, place the switch to the ON position. When the switch is turned on, the POWER indicator lamp illuminates on the control panel. To turn the printer off, place the POWER switch to the OFF position. The POWER indicator lamp is extinguished.

ON LINE Button, READY and ON LINE Indicator Lamps

The ON LINE button is located on the control panel. When pressed once, the ON LINE button places the printer in the ready position to receive data from the CPU. When the printer is able to receive data, the READY and ON LINE indicator lamps are illuminated.

NOTE

Though the READY and ON LINE indicator lamps are illuminated, and the printer is enabled to receive data, it must still be selected as the system printing device by the execution of a SELECT statement. Refer to Chapter 2 for instructions on how to select the Model 2245 for output.

Pressed a second time, the ON LINE button deselects the printer and extinguishes the READY and ON LINE indicator lamps. The ON LINE button can be used to halt printing temporarily without causing data loss in the print buffer (for example, when aligning forms or changing ribbon).

FF (Form Feed) Button

The FF button is located directly below the ON LINE button on the control panel. This button operates only when the printer is deselected and the READY and ON LINE indicator lamps are extinguished. When the FF button is pressed, paper is automatically advanced to the top of the next page. Refer to Section 1.9 for instructions on setting the top-of-form position.

LF (Line Feed) Button

The LF button is located directly below the FF (Form Feed) button on the control panel. When this button is pressed and released, paper is advanced one line; when the button is held down, paper advances continuously. This button operates only when the printer is deselected and the ON LINE indicator lamp is extinguished.

PAPER OUT Indicator Lamp

The PAPER OUT indicator lamp is located directly below the READY indicator lamp on the control panel. When the PAPER OUT indicator lamp is illuminated, the printer is out of paper.

When out of paper, the printer stops, the PAPER OUT indicator lamp lights, and the SELECT and ON LINE indicator lamps are shut off. At this time, new paper can be inserted and paper advancement can be performed by pressing the FF button. After inserting new paper in the printer, press the ON LINE button to resume printing.

Diagnostic Self Test

The diagnostic test checks the operation of the print head and the operation of such print mechanisms as the motor, cartridge ribbon mechanism, and belt. It is preprogrammed and can be performed by turning the ON/OFF switch on while pressing the LF button. All characters provided by the internal software are printed out on the paper by this operation.

NOTE

The diagnostic test cannot be performed when the printer is out of paper.

1.8 POWER-ON PROCEDURE

System Power-On Procedure

To power on the 2200 system, perform the following steps.

1. Ensure that all power cords are connected to a source of electrical power and all peripheral cables are connected to the Central Processing Unit (CPU).

2. Turn on all power switches in the sequence specified in the system's CPU introductory manual. When the system is turned on, Master Initialization occurs; memory is cleared of all programs and variables, and the addresses of primary devices are set to their default values.

Model 2245 Power-On Procedure

To power on your printer, perform the following steps.

1. Ensure that the printer cable is attached to the printer connector port of the terminal and the printer power cord is plugged into a source of electrical power.

2. Ensure that a ribbon cartridge is properly loaded in the printer (refer to Section 1.4).

3. Insert paper into the printer according to the procedures detailed in Section 1.9.

4. Press the ON side of the ON/OFF rocker switch located on the right side of the printer (refer to Figure 1-12). This procedure illuminates the POWER indicator lamp on the printer control panel.

> **CAUTION**
>
> Never operate the printer without paper.

5. Set the Forms Thickness lever for good print quality (refer to Section 1.10).

6. Select the printer to receive data from the CPU by pressing the ON LINE button on the front control panel. The READY and ON LINE indicator lamps are illuminated.

7. Specify the device address of the printer in a BASIC-2 SELECT statement to select the printer to print output. Detailed information on device selection is outlined in Chapter 2.

1.9 PAPER INSERTION

Paper is inserted in the Model 2245 printer by using the following procedure.

1. Power off the printer and raise the printer lid.

2. Move the scale away from the platen (refer to Figure 1-5).

3. Make sure the paper guide roller is located at the center of the sprocket shift (refer to Figure 1-5). If not, move it to the center.

4. Push the paper into the insertion slot at the back of the printer, between the separator and the separator roller, until the leading edge of the paper emerges between the scale and platen (refer to Figure 1-13).

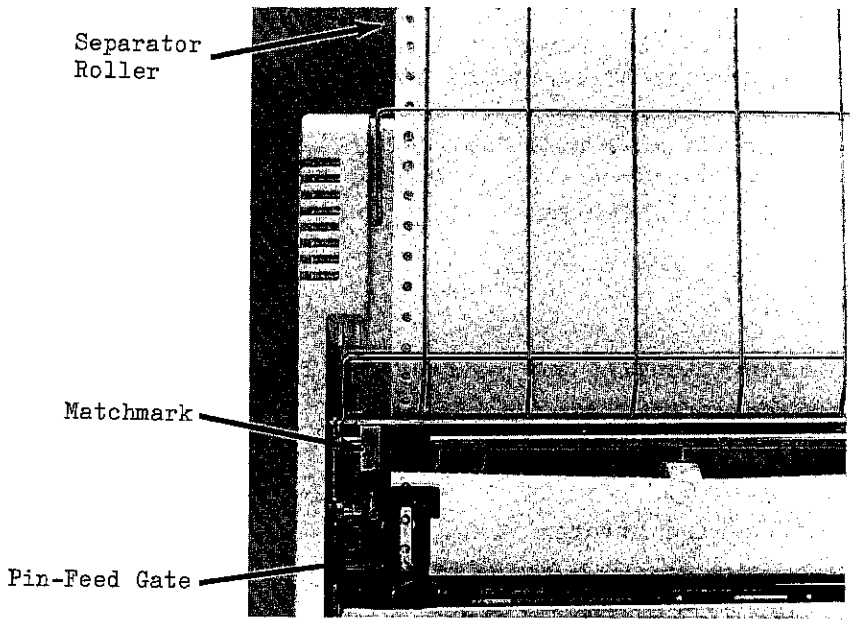


Figure 1-13. Pin-Feed Gate and Separator Roller

5. Gently pull the paper out about 1 foot.

6. The gate adjustment levers are located directly behind the pin feed gates (refer to Figure 1-5). If the distance between the pin feed gates must be adjusted, pull the gate adjustment levers forward and slide the gates to the proper position.

7. Engage the first 4 holes evenly on the tractor pins beneath both pin feed gates (refer to Figure 1-13).

8. After the paper is in position, close the pin feed gates and push the scale back towards the platen.

9. To set the paper to the correct position, use the platen knob to the right of the printer. To set the top-of-form position, place a mark on the edge of the paper, 3 inches (7.6 centimeters) above the perforation, and align this mark with the matchmark on the sprocket (refer to Figure 1-13). Power on the printer. The paper is now at the top-of-form and moves to the top-of-form whenever the FF button is pressed.

10. When the printer is near the end of the paper, the PAPER OUT indicator lamp is illuminated.

1.10 PRINT ADJUSTMENT

To adjust the print intensity for different form thicknesses, perform the following procedures.

1. Make sure the printer has paper.

2. Raise the lid of the printer.

3. Locate the Forms Thickness lever to the left of the print head carriage (refer to Figure 1-14). Notice that the Forms Thickness lever has 7 position notches for print adjustment. When the lever is positioned towards the rear of the printer, the print head moves closer to the platen. When the lever is positioned towards the front of the printer, the print head moves away from the platen.

4. Position the Forms Thickness lever towards the rear of the printer to darken the imprint and to accommodate single forms, or towards the front of the printer to lighten the imprint and to accommodate thicker forms. A normal setting for single-copy, fan-fold paper is either 3 or 4.

5. When the print head has been properly adjusted, close the printer cover.

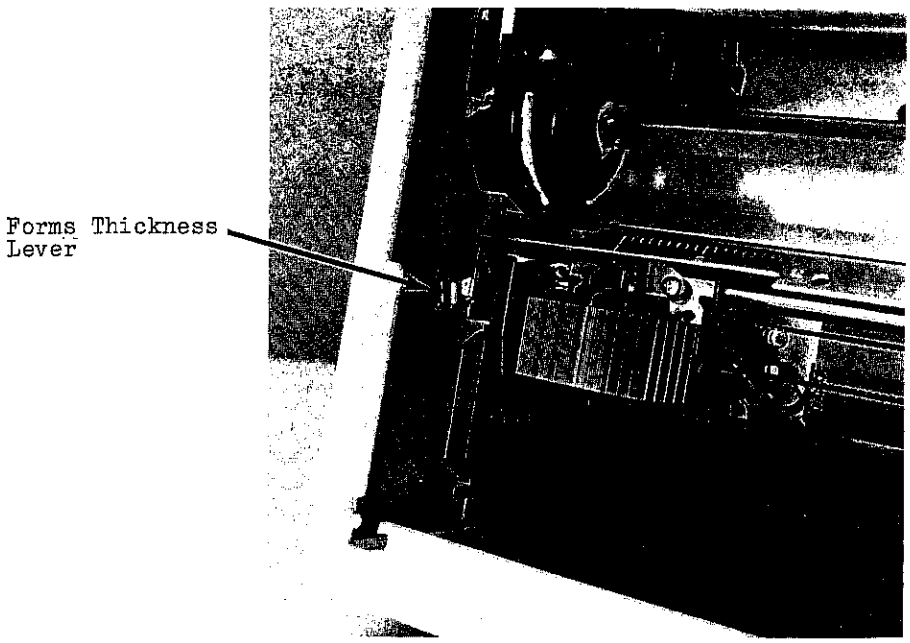


Figure 1-14. Forms Thickness Lever

1.11 PRINT HEAD REPLACEMENT

To replace the print head, perform the following procedures.

1. Power off the printer.
2. Remove the printer lid as specified in Section 1.4.
3. Carefully remove the ribbon cartridge.
4. Move the Print Head Release lever, which is located on the left of the print head, to the left (refer to Figure 1-15).
5. Lift out the print head and gently unplug the ribbon connector cable from the Printed Circuit Board (refer to Figure 1-16).
6. Insert the new print head ribbon connector cable, copper side up.
7. Carefully set the print head into the carriage. Move the Print Head Release lever back into place to secure the print head.
8. Insert the ribbon cartridge, making sure the ribbon is inserted between head nose and ribbon mask (refer to Section 1.4).
9. Adjust ribbon tension by turning the knob on the top left of the ribbon cartridge in the direction of the arrow (refer to Figure 1-5).
10. Replace the print lid as specified in Section 1.4.

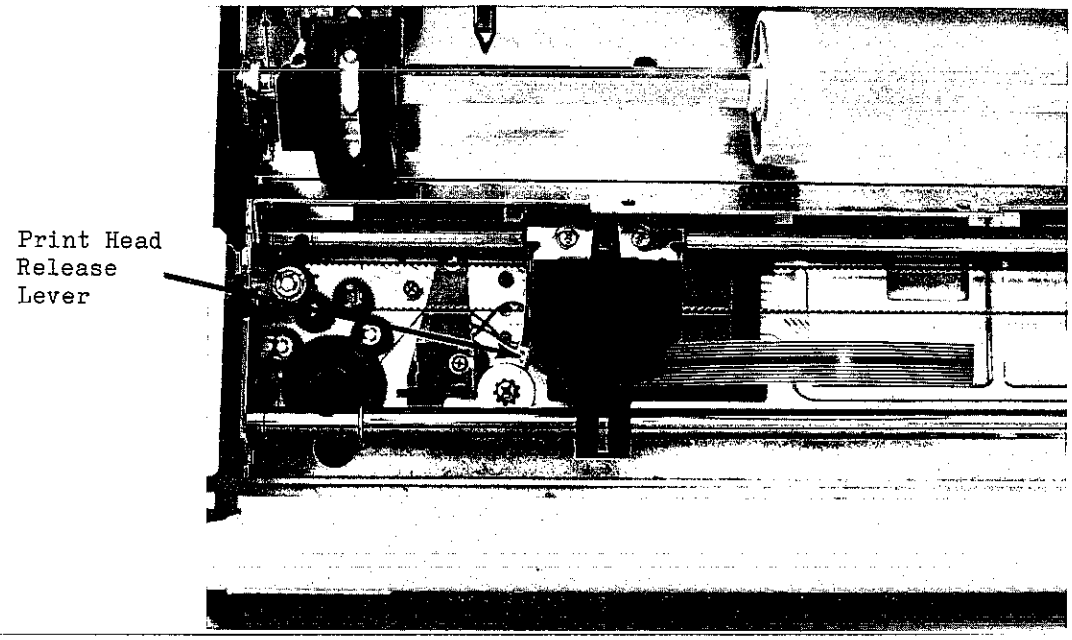


Figure 1-15. Print Head Release Lever

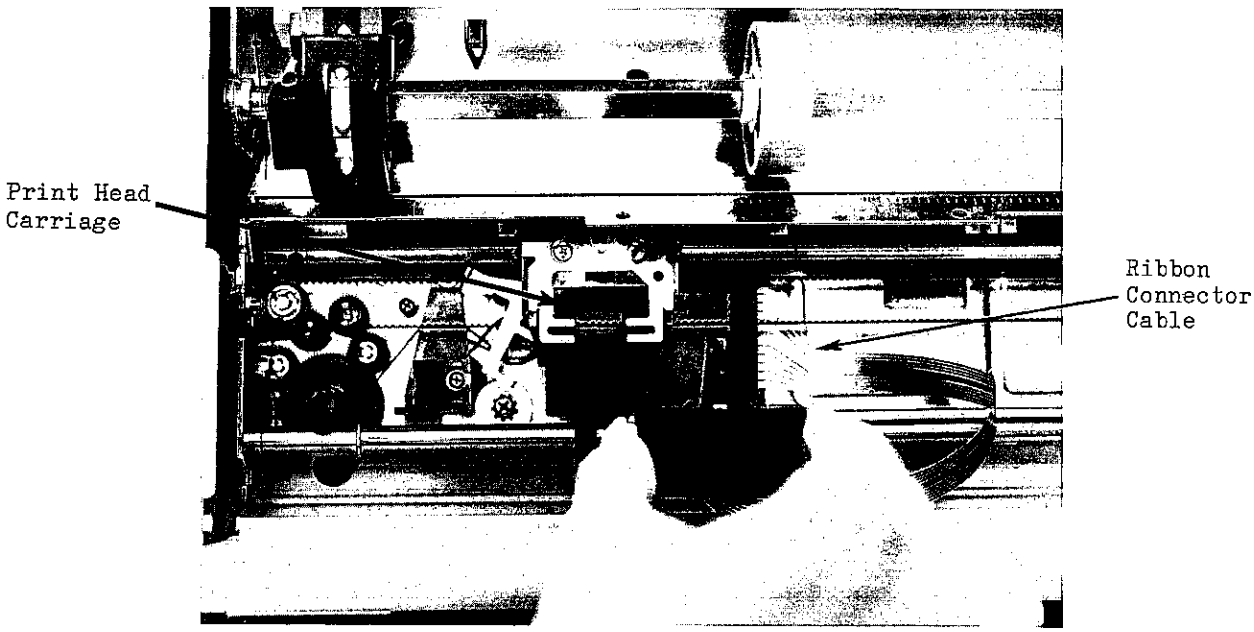
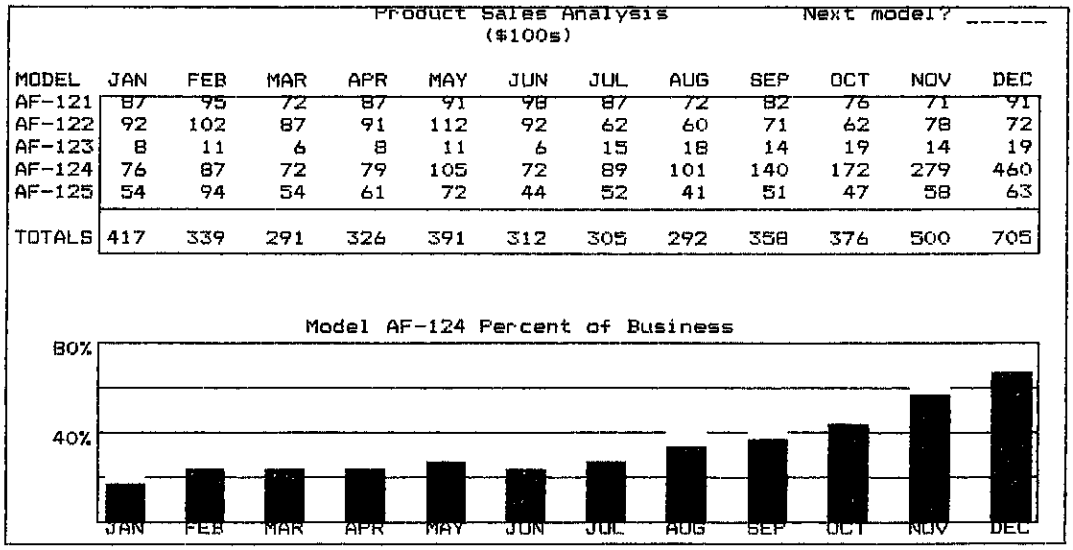


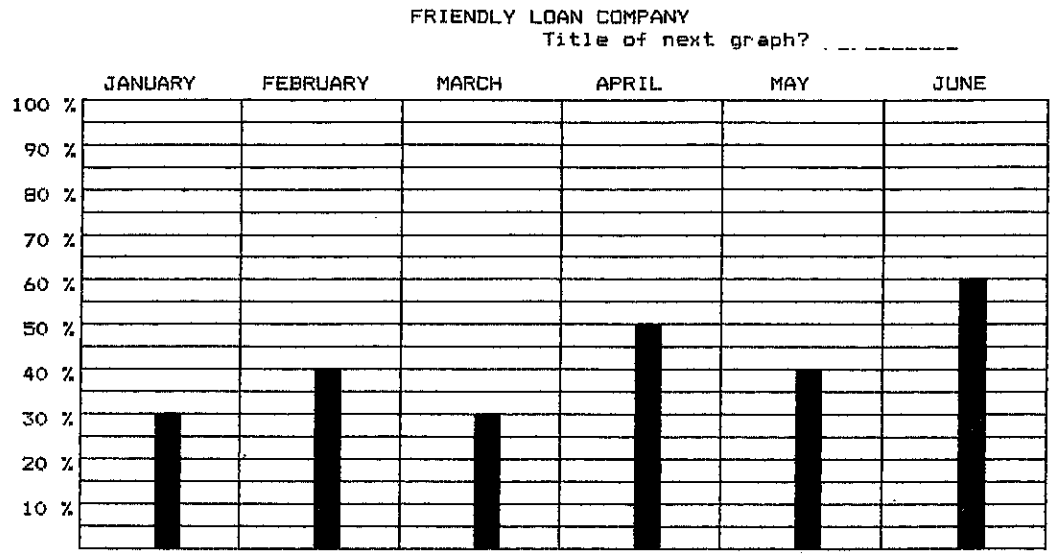
Figure 1-16. Print Head Replacement

1.12 SCREEN REPRODUCTION OF BOX AND CHARACTER GRAPHICS

When the Model 2245 printer is attached to the back of a Model 2236DW terminal, screen images can be reproduced by pressing and holding down the EDIT key until a faint click is heard. When screen images of box and character graphics are reproduced, some lines may be omitted from the printed copy. This does not indicate a problem with the printer. A box and character graphic cannot appear in the same character space. If both are designated to be printed in the same character space, the box graphics character is omitted and the character graphic is printed. Example 1 contains a sample of what may appear on the printout. In Example 2, the box and character graphics have not been designated for the same character space, so no lines are omitted.



Example 1. Graphic Screen Reproduction with Character and Box Graphics Assigned for the Same Character Space



Example 2. Graphic Screen Reproduction with Character and Box Graphics Not Assigned for the Same Character Space

CHAPTER 2
DEVICE SELECTION

2.1 THE SELECT STATEMENT

The SELECT statement must be used by the operator to select the Model 2245 as the output device. A SELECT statement can be used either in Immediate mode or as a statement within a program. When used to select the Model 2245, the SELECT statement requires a PRINT, LIST, or CO command and a 3-digit Device Address code (xyy) consisting of a Device Type (x) and a Unit Address code (yy). Line length can also be specified in the SELECT statement. Each of the parameters of the SELECT statement is described in the following example.

Example 1 (SELECT statement):

```
    100 SELECT PRINT 204 (80)
Device Type ----------^
Unit Address ---------^
Line Length ----------------^
```

If line length is not specified in a SELECT statement, the line length defaults to 80 characters, the standard width of the Cathode Ray Tube (CRT).

Example 2 (SELECT statement):

```
SELECT PRINT 204 (80)

10 PRINT "**********THE MODEL 2245 MATRIX PRINTER PRINTS 80
CHARACTERS PER LINE WHEN 10-PITCH IS SELECTED!**********
**********"
RUN
```

Output (reduced):

```
**********THE MODEL 2245 MATRIX PRINTER PRINTS 80 CHARACTERS PER LINE WHEN 10-PI
TCH IS SELECTED!**********
```

NOTE

Before entering the next program, be sure to clear the previous program from memory, or both programs will merge together.

Device Type

The system uses the Device Type digit in the Device Address code to identify the I/O class for a device and to specify control procedures for communicating with that device. Since the various peripheral devices used in a system often require different control procedures to perform an input/output operation, the programmer must indicate to the system which type of I/O device is being used.

The Model 2245 automatically prints the characters in the buffer and executes a carriage return at the end of a line (80 10-pitch characters). After the printer responds to the carriage return command, it automatically executes a line feed.

Because Device Type 2 addresses devices that automatically execute a line feed after a carriage return, this device type is normally used in statements selecting the Model 2245 for output. When this device type is specified, printer output is single-spaced.

Example 3 (Device Type 2):

```
10  SELECT PRINT 204 (80)
20  FOR J = 1 TO 5
30  PRINT "MODEL 2245 OUTPUT USING DEVICE TYPE 2"
40  NEXT J
RUN
```

Output:

```
MODEL 2245 OUTPUT USING DEVICE TYPE 2
MODEL 2245 OUTPUT USING DEVICE TYPE 2
MODEL 2245 OUTPUT USING DEVICE TYPE 2
MODEL 2245 OUTPUT USING DEVICE TYPE 2
MODEL 2245 OUTPUT USING DEVICE TYPE 2
```

Device Type 0 usually addresses a device that does not automatically execute a line feed after a carriage return: for example, a CRT. When used, this device type causes a line feed after each carriage return executed by the printer. Since the Model 2245 itself also generates a line feed after a carriage return, when selected with Device Type 0, the printed output is double-spaced.

Example 4 (Device Type 0):

```
10  SELECT PRINT 004 (80)
20  FOR J = 1 TO 5
30  PRINT "MODEL 2245 OUTPUT USING DEVICE TYPE 0"
40  NEXT J
RUN
```

Output:

```
MODEL 2245 OUTPUT USING DEVICE TYPE 0

MODEL 2245 OUTPUT USING DEVICE TYPE 0

MODEL 2245 OUTPUT USING DEVICE TYPE 0

MODEL 2245 OUTPUT USING DEVICE TYPE 0

MODEL 2245 OUTPUT USING DEVICE TYPE 0
```

Device Type 4 normally addresses a device without an automatic carriage return: for example, a plotter. When a printer is selected as Device Type 4, the automatic carriage return issued by the CPU at the end of a line is suppressed. Normally when the number of characters in the buffer equals the line length in a SELECT statement, a carriage return is executed. Device Type 4, however, suppresses this feature by not executing a carriage return when the number of characters equals the line length. The carriage return is not executed until the print buffer is full (and a line is printed) or when the carriage return code HEX (0D) is encountered in the program.

Example 5 (Device Type 4):

```
10  SELECT PRINT 404
20  FOR A = 1 TO 15
30  PRINT "AABBCCDDEEFFGGHHIIJJKKLLMMNNOOPPQQRRSSTTUUVVWWXXYYZZ"
40  NEXT A
RUN
```

Output (reduced):

```
AABBCCDDEEFFGGHHIIJJKKLLMMNNOOPPQQRRSSTTUUVVWWXXYYZZAABBCCDDEEFFGGHHIIJJKKLLMMNN
OOPPQQRRSSTTUUVVWWXXYYZZAABBCCDDEEFFGGHHIIJJKKLLMMNNOOPPQQRRSSTTUUVVWWXXYYZZAABB
CCDDEEFFGGHHIIJJKKLLMMNNOOPPQQRRSSTTUUVVWWXXYYZZAABBCCDDEEFFGGHHIIJJKKLLMMNNOOPP
QQRRSSTTUUVVWWXXYYZZAABBCCDDEEFFGGHHIIJJKKLLMMNNOOPPQQRRSSTTUUVVWWXXYYZZAABBCCDD
EEFFGGHHIIJJKKLLMMNNOOPPQQRRSSTTUUVVWWXXYYZZAABBCCDDEEFFGGHHIIJJKKLLMMNNOOPPQQRR
SSTTUUVVWWXXYYZZAABBCCDDEEFFGGHHIIJJKKLLMMNNOOPPQQRRSSTTUUVVWWXXYYZZAABBCCDDEEFF
GGHHIIJJKKLLMMNNOOPPQQRRSSTTUUVVWWXXYYZZAABBCCDDEEFFGGHHIIJJKKLLMMNNOOPPQQRRSSTT
UUVVWWXXYYZZAABBCCDDEEFFGGHHIIJJKKLLMMNNOOPPQQRRSSTTUUVVWWXXYYZZAABBCCDDEEFFGGHH
IIJJKKLLMMNNOOPPQQRRSSTTUUVVWWXXYYZZAABBCCDDEEFFGGHHIIJJKKLLMMNNOOPPQQRRSSTTUUVV
```

Example 6 (Device Type 4):

```
SELECT PRINT 404 (66)
10  FOR B = 1 TO 5
20  PRINT "AABBCC"
30  PRINT HEX(0D)
40  NEXT B
RUN
```

Output:

```
AABBCC
AABBCC
AABBCC
AABBCC
AABBCC
```

Refer to Section 2.3 for information on special printing techniques available by selecting the printer with various Device Type codes.

Unit Address

If the Model 2245 is used as the terminal printer of a Model 2236DE or 2236DW terminal, it is attached directly to the rear panel of the terminal and may be accessed at Unit Address 04 (for example, SELECT PRINT 204).

When the Model 2245 is attached to the printer controller board installed in the system CPU, it functions as a system printer and is usually assigned Unit Address 15. If a second Wang printer is used as a system printer on the same CPU, it is usually assigned Unit Address 16 by the Wang Service Representative who installs the system.

Line Length

The line length parameter is an optional parameter in a SELECT PRINT, SELECT LIST, or SELECT CO statement. This parameter specifies the number of characters to be sent to the printer before the CPU issues a carriage return and resets the internal line count. The user normally varies the line length to accommodate paper of different widths.

The maximum number of characters per line that can be printed on the Model 2245 is 132. In the SELECT statement, line length is indicated in the parentheses following the 3-digit Device Address code. For example:

SELECT PRINT 204 (132)	Selects the Model 2245 for printing operations and sets the line length to 132.
SELECT LIST 204 (80)	Selects the Model 2245 for listing operations and sets the line length to 80.
SELECT CO 204 (55)	Selects the Model 2245 for console output and sets line length to 55.

If a line length is not specified for PRINT, LIST, or CO operations, either the default line length or the last line length selected for each of these operations is used. Note that the default line length set during Master Initialization is 80 characters. The maximum line length specified in a SELECT statement is 132. However, the use of a line length greater than 132 (16.5 pitch) is not recommended. A longer line count typically produces two carriage returns: one performed automatically by the printer when a full line of characters has been printed, and another issued by the system when the line count specified in the SELECT PRINT statement is exceeded.

Example 7 (line length greater than 80 at 10-pitch):

```
10  REM  EXAMPLE OF USING A LINE LENGTH GREATER THAN 80 CHARACTERS AT
10-PITCH
20  SELECT PRINT 204 (80)
30  PRINT "ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890abcdefghijklmnopqrstuv
wxyzABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890abcdefghijklmnopqrstuvwxyz"
RUN
```

Output (reduced):

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQR
STUVWXYZ1234567890abcdefghijklmnopqrstuvwxyz
```

The CPU uses the line length parameter to generate an automatic carriage return when a line exceeds the specified line length and no carriage return has been supplied by the program. The CPU maintains a tally of the number of characters sent to the printer (line count). If this line count equals the current value of the line length before the output line is complete, the CPU issues a carriage return command to the printer and resets the line count to zero. The printer continues the interrupted output on the next line.

Example 8 (line length less than number of characters in print line):

```
5   REM  EXAMPLE  OF USING A LINE LENGTH LESS THAN THE MAXIMUM NUMBER
OF CHARACTERS IN THE PRINT LINE
10  SELECT PRINT 204 (5)
20  PRINT "THE MODEL 2245 PRINTS 80 CHARACTERS PER LINE"
RUN
```

Output:

```
THE M
ODEL
2245
PRINT
S 80
CHARA
CTERS
 PER
LINE
```

Example 9 (line length less than number of characters in print line):

```
SELECT PRINT 204 (20)
10  PRINT "ABCDEFGHIJKLNOPQRSTUVWXYZ"
RUN
```

Output:

```
ABCDEFGHIJKLMNOPQRST
UVWXYZ
```

When the system receives a PRINT statement with no trailing comma or semicolon, it executes a carriage return after the contents of the printer buffer are printed. If the line count has not yet reached the line length specified in the SELECT statement, the system automatically resets the line count to zero for the start of a new line.

Example 10 (PRINT statement with no punctuation):

```
10  REM EXAMPLE OF PRINT STATEMENTS WITH NO TRAILING COMMA OR
SEMICOLON
20  SELECT PRINT 204 (30)
30  PRINT "PLAY"
40  PRINT "TENNIS!"
RUN
```

Output:

```
PLAY
TENNIS!
```

The line count is reset to zero when any of the following conditions exist.

- The line count equals the line length.
- A SELECT PRINT statement is executed.
- A CLEAR command is executed.
- A PRINT, PRINTUSING, or HEXPRINT statement is executed.
- The system is reset.
- The system is master initialized.

2.2 SELECTING THE PRINTER

Print

SELECT PRINT 204

This statement selects the printer at Device Address 204 for all PRINT, PRINTUSING, or HEXPRINT statements entered in Program mode. All subsequent printed output is generated by the terminal printer until another device is selected.

> **NOTE**
>
> When your system is first turned on, print operations are seen on the CRT, which is the primary device for such operations. Therefore, it is necessary to execute a SELECT statement to direct the output of PRINT statements to the printer.

The SELECT PRINT statement can be entered as a program statement or independently as an Immediate mode statement.

Example 1 (Program mode SELECT):

```
10 SELECT PRINT 204
20 PRINT "Y","2Y"
30 FOR Y = 1 TO 50 STEP 5
40 PRINT Y,Y*2
50 NEXT Y
RUN
```

Example 2 (Immediate mode SELECT):

```
SELECT PRINT 204
10  PRINT "Y", "2Y"
20  FOR Y = 1 TO 50 STEP 5
30  PRINT Y, Y*2
40  NEXT Y
RUN
```

When either of these programs is executed, the printed output is:

```
Y             2Y
 1             2
 6             12
 11            22
 16            32
 21            42
 26            52
 31            62
 36            72
 41            82
 46            92
```

NOTE

Though the printer is selected for printed output with SELECT PRINT 204, printout resulting from PRINT statements entered in the Immediate mode still appears on the CRT unless the printer is selected for console output (refer to the Console Output section).

List

SELECT LIST 204

The default address for LIST operations is 005, which is the CRT. The SELECT LIST 204 statement, entered in Immediate mode, selects the printer at Device Address 204 for all program listing operations.

Example 3 (selecting the printer for listing):

```
SELECT LIST 204
5   DIM A$52
17  REM AN EXAMPLE USING THE PRINTER FOR LISTING
20  A$="THE MODEL 2245 PRINTER CAN BE SELECTED FOR LISTING."
30  PRINT A$
999 END
LIST
```

Output:

```
5   DIM A$52
17  REM AN EXAMPLE USING THE PRINTER FOR LISTING
20  A$="THE MODEL 2245 PRINTER CAN BE SELECTED FOR LISTING."
30  PRINT A$
999 END
```

Console Output

SELECT CO 204

This statement selects the printer at Device Address 204 for all console output operations. Console output includes all system displays, such as the READY message; output from STOP and END statements; any data keyed in on the keyboard and entered into the CPU; and all output from Immediate mode operations, TRACE statements, and error messages.

NOTE

On 2200 multiuser systems such as the 2200MVP and 2200LVP, all Console Output (CO) operations are always directed to the CRT (Device Address 005). When the printer is selected for Console Output on these systems, TRACE output alone is sent; all other CO operations remain directed to the CRT.

2.3 SPECIAL TECHNIQUES

When the printer is selected with Device Type 2 for LIST, PRINT, or CO operations, normal single-spaced output is produced. Device Type 0 can also be used with the Model 2245 to obtain double-spaced output. Carriage returns followed by line feeds are initiated by the CPU at the end of each program text line as well as whenever the line count equals the selected line length. After the Model 2245 executes a carriage return, it supplies another line feed, producing the double spacing after each printed line.

Example 1 (double spacing using Device Type 0):

```
SELECT LIST 004
10  FOR E = 1 TO 10
20  PRINT "REDRUMREDRUMREDRUMREDRUMREDRUMREDRUMREDRUMREDRUMRED
RUMREDRUMREDRUMREDRUMREDRUMREDRUMREDRUMREDRUMREDRUMREDRUM!"
30  NEXT E
LIST
```

Output: (reduced)

```
10 FOR E = 1 TO 10

20 PRINT "REDRUMREDRUMREDRUMREDRUMREDRUMREDRUMREDRUMREDRUMREDRUMREDRUMREDR

UMREDRUMREDRUMREDRUMREDRUMREDRUMREDRUMREDRUMREDRUMREDRUMREDRUM!"

30 NEXT E
```

Although Device Type 4 is intended for use with Wang plotter peripherals, it has limited application with other types of peripherals. Device Type 4 can be of use with the Model 2245 Line Printer to produce double-spaced program listings. When listing a program with Device Type 4, a program statement overlapping onto more than one print line is single-spaced; however, each new program statement is double spaced. Thus, a more readable, double-spaced output is achieved with Device Type 4. However, with this exception, it is recommended that the Model 2245 normally be selected with Device Type 2 or 0. For normal printing of a program output, Device Type 4 should not be used.

Example 2 (double spacing using Device Type 4):

```
SELECT LIST 404
10  FOR E = 1 TO 10
20  PRINT "AAAAAAAABBBBBBBBCCCCCCCCDDDDDDDDDDEEEEEEEEFFFF
FFFFGGGGGGGGHHHHHHHHIIIIIIIIJJJJJJJJKKKKKKKKLLLLLLLLMMMMM
MMMNNNNNNNNOOOOOOOOPPPPPPPPQQQQQQQQRRRRRRRRSSSSSSSSTTTTTTTTUUUUUUUUVVV
VVVVWWWWWWWWXXXXXXXXYYYYYYYYZZZZZZZZ?"
30  NEXT E
LIST
```

Output (reduced):

```
10 FOR E = 1 TO 10

20 PRINT "AAAAAAAABBBBBBBBCCCCCCCCDDDDDDDDDEEEEEEEEFFFFFFFFGGGGGGGGHHHHHHHHIIIIII
IIJJJJJJJJKKKKKKKKLLLLLLLLMMMMMMMMNNNNNNNNOOOOOOOOPPPPPPPPQQQQQQQQRRRRRRRRSSSSSS
SSTTTTTTTTUUUUUUUUVVVVVVVVWWWWWWWWXXXXXXXXYYYYYYYYZZZZZZZZ?"

30 NEXT E
```

2.4 COMBINING SELECT PARAMETERS

It is possible to combine parameters in a SELECT statement.

Example:

```
SELECT PRINT 204 (100), LIST 204(80), CO 204 (112)
```

However, it is not possible to select two output devices for the same operation. For example, the following statement produces listing of programs on the CRT (Device Address 005) only.

```
SELECT LIST 204, LIST 005
```

2.5 DESELECTING THE MODEL 2245

To deselect the printer, use one of the following methods.

1. Select another device for PRINT, LIST, or CO by using the SELECT statement.

2. Master initialize the system. Master Initialization selects the CRT for all LIST, PRINT, and CO operations.

3. Enter CLEAR and press the RETURN key. PRINT and LIST operations are returned to the device currently selected for console output. If the printer is currently the CO device, either Step 1 or 2 must be used to deselect it.

4. Press the ON LINE switch until a carriage return is executed. This is the only method of deselection that does not lose the data in the printer buffer. This method should be used when temporary deselection is required, for example, when changing the paper or ribbon cartridge. The ON LINE and READY indicator lamps are extinguished, and the printer can then be reselected by pressing the ON LINE switch again.

CHAPTER 3
PRINTER CONTROL CODES

3.1 THE HEX FUNCTION

The Hex function is used within the BASIC program to output any character or function within the ASCII character set (refer to Appendix A). Hex codes are also used to control vertical tabulation of output from within a BASIC program, regardless of the vertical formatting device chosen by the user.

Character Codes

The Hex function is used in a BASIC program to output characters on the printer (both those that do and do not appear on the standard keyboards) or to execute special printer control codes. The Hex function has the following format.

```
HEX(hh[hh][..])
```

Each h equals a Hex digit (0-9) or letter (A-F). An even number of characters must always appear in a Hex function; spaces are not allowed. Refer to Appendix A for a complete listing of Hexadecimal character codes and control codes.

Hex codes for characters and/or printer control can be combined. For example, enter and run the following program.

```
10  SELECT PRINT 204
20  PRINT HEX (410D0A42)
RUN
```

Since the character code for A is HEX(41) and for B is HEX(42), and the control codes for carriage return and line feed are HEX(0D) and HEX(0A) respectively, the following is printed.

```
A

B
```

Control Codes

When the Model 2245 receives a Hex code for a printable character, it places the code into the print buffer. Unless the buffer is full, no immediate action is taken. However, certain special Hex codes do not enter the buffer, but, instead cause immediate action by the printer. These special codes are the printer control codes.

> NOTE
>
> When Hex codes are combined in a single statement line, most control codes are executed before character codes.

Several features of the Model 2245 printer have been defined in terms of multicharacter control code sequences beginning with HEX(02) and ending in a HEX(0E) or HEX(0F). These code sequences enable, turn on and off, and disable certain attributes and functions in a manner similar to that used by the Model 2236DE and 2236DW terminals.

3.2 LINE FEED CONTROL CODES

Automatic Line Feed/Line Feed Size Control

When powered on, or when a Power-On Reset control sequence [HEX(020D0C030F)] is executed, the Model 2245 defaults to an automatic line feed of six lines per inch after a carriage return. However, several codes are provided to the programmer to suppress or enable the automatic line feed, with or without altering the line feed size.

Automatic line feed can be disabled by the sequence HEX(020A0F) without changing the currently selected line feed size. Subsequently, use of the sequence HEX(020A0E) will enable the automatic line feed without changing the currently selected line feed size.

Line feed size, conversely, can be altered while suppressing or enabling the automatic line feed function. Line feed size can be set to either six or eight lines per inch using the following control codes.

HEX(020A0101060E) or HEX(020A0101060F) for 6 lines per inch

where: 0E = enable automatic line feed
0F = suppress automatic line feed

HEX(020A0101080E) or HEX(020A0101080F) for 8 lines per inch

where: 0E = enable automatic line feed
0F = suppress automatic line feed

Line feed size should only be changed at the top-of-form position to enable the top-of-form and vertical tab commands to move the form to the correct location.

NOTE

The printer executes these sequences before printing unprinted data that may be in the line buffer.

Example 1 (changing line feed size/controlling automatic carriage return):

```
10  SELECT PRINT 204
20  REM SELECT 8 LPI, ENABLE AUTO LINE FEED: PRINT HEX(020A0101080E)
30  FOR X = 1 TO 10: PRINT "THE TRAJECTORY OF THE ELECTRON":NEXT X
40  REM DISABLE LINE FEED: PRINT HEX(020A0F)
50  FOR X = 1 TO 10: PRINT "by Eric Gagne": NEXT X
60  REM LINE FEED:  PRINT HEX(0A)
70  REM  SELECT  6  LPI,  ENABLE  AUTO  LINE  FEED:  PRINT  HEX
    (020A0101060E)
80  FOR  X = 1 TO 5:  PRINT "Chief of Radiology, Smallville General":
    NEXT X
RUN
```

Output:

```
THE TRAJECTORY OF THE ELECTRON
THE TRAJECTORY OF THE ELECTRON
THE TRAJECTORY OF THE ELECTRON
THE TRAJECTORY OF THE ELECTRON
THE TRAJECTORY OF THE ELECTRON
THE TRAJECTORY OF THE ELECTRON
THE TRAJECTORY OF THE ELECTRON
THE TRAJECTORY OF THE ELECTRON
THE TRAJECTORY OF THE ELECTRON
THE TRAJECTORY OF THE ELECTRON
by Eric Gagne
Chief of Radiology, Smallville General
Chief of Radiology, Smallville General
Chief of Radiology, Smallville General
Chief of Radiology, Smallville General
Chief of Radiology, Smallville General
```

Line Feed: HEX(0A)

The Line Feed control code advances the paper one line. Line feed codes embedded within a print line are executed before the data in that line is printed.

Example 2 (Line feed):

```
05  SELECT PRINT 204
10  PRINT "WATCH"; HEX(0A); "YOUR"; HEX(0A); "STEP"
RUN
```

Output:

```
(2 line feeds)

WATCH
YOUR
STEP
```

3.3 ENHANCED PRINTED OUTPUT

The Model 2245 employs three methods of enhancing printed output: emphasized print, underscore, and horizontal expansion. Expanded print and underscore, emphasized print and underscore, or underscore, emphasized, and enhanced print can be combined to provide a variety of print enhancements. The means used to specify the method of enhancing output is similar to that used with the Model 2236DE and 2236DW display terminals. The same control code sequence beginning with HEX(02) can be used to specify enhanced output for both the Model 2245 Matrix Printer and the Model 2236DE and 2236DW terminals.

The control code sequence has the following format.

HEX(0204xxyyzz0E) or HEX(0204xxyyzz0F)

where: xx = 00 to disable emphasized print
02 or 0B to enable emphasized print

yy = 00 to disable underscore
04 or 0B to enable underscore

zz = 00 to disable expanded print
02 or 0B to enable expanded print

0E = enable attributes defined by xx, yy, and zz immediately; do not disable attributes until an isolated HEX(0F) code, a Power-On Reset sequence, or another select attribute sequence is received

0F = activate attributes defined by xx, yy, and zz only upon receiving an isolated HEX(0E) code; disable attributes when an isolated HEX(0F) or HEX(0D) code is received

The flexibility of this control code sequence in enabling and disabling a combination of underscore and expanded print, underscore and emphasized print, or underscore, emphasized, and expanded print attributes is illustrated in the following sections.

Emphasized Print

Emphasized print may not be combined with nonemphasized print on a single line. The last attribute selected for that line will take precedence. Emphasized print may not be used with 16.5-pitch; 16.5-pitch will take precedence.

Emphasized print is selected when the "xx" portion of the control code sequences HEX(0204xxyyzz0E) or HEX(0204xxyyzz0F) is set to 02 or 0B.

A HEX(02040200000E) or HEX(02040B00000E) sequence turns on the emphasized print attribute when the printer receives an isolated HEX(0E) code. The attribute is turned off by either an isolated HEX(0F) code or a carriage return HEX(0D). In this way, a program may emphasize a multiline segment of printout by sending this sequence before the output and by sending a HEX(0F) following the output.

Example 1 (emphasizing a multi-line segment of printout):

```
05  SELECT PRINT 204
10  PRINT HEX(02040200000E)
20  PRINT "SMOKY SCOTTISH"
30  PRINT "FINNAN HADDIE"
40  PRINT "HEX (OF); "CHOWDER"
RUN
```

Output:

```
SMOKY SCOTTISH
FINNAN HADDIE
CHOWDER
```

By sending the Hex sequence (02040200000F) to the printer, a program may cause individual lines of printout to be reemphasized by preceding each line with a HEX(0E)

Example 2 (emphasizing individual lines):

```
05  SELECT PRINT 204
10  PRINT HEX (02040200000F)
20  PRINT "PARBOIL a 3 lb.  PIECE OF"
30  PRINT HEX(0E); "FINNAN HADDIE"
40  PRINT "IN 1 PINT OF"
50  PRINT HEX(0E); "SALTED WATER"
RUN
```

Output:

```
PARBOIL a 3 lb. PIECE OF
FINNAN HADDIE
IN 1 PINT OF
SALTED WATER
```

The emphasized print attribute is deactivated when the printer is powered off and on, or when any of the following codes are issued: an isolated HEX(0F) code, a HEX (0204xxyyzz0E) or (0204xxyyzz0F) sequence (where xx is set to 00), or a Power-On Reset code sequence [HEX (020D0C030F)].

Underscore

Underscore is selected when the "yy" portion of the control code sequences HEX(0204xxyyzz0E) or HEX(0204xxyyzz0E) is set to 04 or 0B.

A HEX(02040004000E) or HEX(0204000B000E) sequence immediately turns on the underscore attribute and leaves it on until an isolated HEX(0F) is executed.

Example 3 (immediate use of underscore):

```
05  SELECT PRINT 204
10  PRINT HEX(02040004000E)
20  PRINT "THE LAZY DUCK"
30  PRINT "JUMPS OVER THE"
40  PRINT HEX(0F); "QUICK BLACK DOG."
RUN
```

Output:

```
THE LAZY DUCK
JUMPS OVER THE
QUICK BLACK DOG.
```

A HEX(02040004000F) or HEX(0204000B000F) sequence, however, will not immediately turn on the underscore attribute. Instead, underscore is turned on only when the printer receives an isolated HEX(0E) code. The attribute is turned off by either an isolated HEX(0F) code or a carriage return HEX(0D).

Example 4 (underscoring individual lines):

```
05  SELECT PRINT 204
10  PRINT HEX(02040004000F)
20  PRINT "THE VIKINGS SAILED"
30  PRINT HEX(0E); "IN OCEAN-GOING CARGO SHIPS"
40  PRINT "CALLED KNORRS."
RUN
```

Output:

THE VIKINGS SAILED
IN OCEAN-GOING CARGO SHIPS
CALLED KNORRS.

Example 5 (underscoring partial lines):

```
05  SELECT PRINT 204
10  PRINT HEX(02040004000F)
20  PRINT "THE ISLAND OF "; HEX(0E);  "MALTA";  HEX(0F);  "  RECEIVES
LITTLE RAINFALL DURING"
RUN
```

Output:

THE ISLAND OF MALTA RECEIVES LITTLE RAINFALL DURING

The underscore attribute is deactivated when the printer is powered on and off, or when any of the following codes are issued: an isolated HEX(0F) code, a HEX(0204xxyyzz0E) or HEX(0204xxyyzz0F) sequence (where yy is set to 00), or a Power-On Reset code sequence HEX(020D0C030F).

Expanded Print

Expanded print is selected when the "zz" portion of the control code sequences HEX(0204xxyyzz0E) or HEX(0204xxyyzz0F) is set to 02 or 0B. When selected for expanded print, the Model 2245 prints a line of up to 66 expanded (double-width) characters at 16.5-pitch or up to 40 expanded characters at 10-pitch.

A HEX(02040000020E) or HEX(020400000B0E) sequence immediately turns on the expanded print attribute and leaves it on until an isolated HEX(0F) is executed.

Example 6 (expanding a multiline segment of output):

```
05  SELECT PRINT 204
10  PRINT HEX(02040000020E)
20  PRINT "FRIENDLY"
30  PRINT "PHARMACY"
40  PRINT HEX(0F); "J. Jones, Prop."
RUN
```

Output:

```
FRIENDLY
PHARMACY
J. Jones, Prop.
```

A HEX(02040000020F) or HEX(020400000B0F) sequence does not immediately turn on the expanded print attribute. Instead, expanded print is turned on only when the printer receives an isolated HEX(0E) code. This is the function given an isolated HEX(0E) code when the printer is first powered on or when a Power-On Reset code sequence HEX(020D0C030F) is issued. The expanded print attribute may be turned off by either an isolated HEX(0F) code or a carriage return HEX(0D).

Example 7 (expanding individual lines):

```
05  SELECT PRINT 204
10  PRINT HEX(02040000020F)
20  PRINT "MICROTUBULES ARE PRESENT IN EVERY"
30  PRINT HEX(0E); "EUKARYOTIC (Nucleated)"
40  PRINT "CELL"
RUN
```

Output:

```
MICROTUBULES ARE PRESENT IN EVERY
EUKARYOTIC (Nucleated)
CELL
```

Example 8 (expanding partial lines):

```
05  SELECT PRINT 204
10  PRINT HEX(02040000020F)
20  PRINT  HEX(0E);  "ANDEAN  BEANS,";  HEX(0F);  "  HOWEVER,  ARE
SNOW-COVERED
RUN
```

Output:

```
ANDEAN  BEANS,  HOWEVER,  ARE  SNOW-COVERED
```

The expanded print attribute is deactivated when the printer is powered off and on, or when any of the following codes are executed: an isolated HEX(0F) code, a HEX(0204xxyyzz0E) or HEX(0204xxyyzz0F) code where zz is set to 00 or a Power-On Reset code sequence [HEX(020D0C030F)] is issued.

The Combination of Underscore and Expanded Print

Both underscore and expanded print attributes can be activated at the same time in a manner similar to that used to activate a single attribute. The code sequences HEX(0204xxyyzz0E) or HEX(0204xxyyzz0F) (where yy is set to 04 or 0B and zz is set to 02 or 0B) select both attributes to be activated as previously described.

Either attribute may be turned off and disabled by execution of the appropriate disable attribute code. Execution of a HEX(02040000020E) sequence disables the underscore attribute only. Execution of a HEX(02040002000E) sequence disables the expanded print attribute only.

Example 9 (use of both underscore and expanded print):

```
05  SELECT PRINT 204
10  PRINT HEX(02040004020F)
20  PRINT HEX(0E); "THIS LINE IS UNDERSCORED AND EXPANDED"
30  PRINT HEX(02040000020E)
40  PRINT "THIS LINE IS EXPANDED ONLY"
50  PRINT "THIS "; HEX(0F); "LINE BEGAN AS EXPANDED"
RUN
```

Output:

```
THIS  LINE  IS  UNDERSCORED  AND  EXPANDED
THIS  LINE  IS  EXPANDED  ONLY
THIS  LINE BEGAN AS EXPANDED
```

The Combination of Underscore and Emphasized Print

Both underscore and emphasized print attributes can be activated at the same time in a manner similar to that previously described. Emphasized print pertains to whole lines only; underscored print pertains to whole or partial lines. The code sequences HEX(0204xxyyzz0E) or HEX(0204xxyyzz0F) (where xx is set to 02 or 0B and yy is set to 04 or 0B) select both attributes to be activated as previously described.

Either attribute can be turned off and disabled by execution of the appropriate disable attribute code. Execution of a HEX(02040200000E) sequence disables the underscore attribute only. Execution of a HEX(02040004000E) sequence disables the emphasized print attribute only.

The following are restrictions regarding the combination of underscore and empasized print.

1. Underscoring is not continuous; it is broken between consecutive characters.

2. Emphasized print may not be used with 16.5 pitch.

3. Emphasized print may not be combined with nonemphasized print on a single line. The last attribute selected for that line will take precedence.

Example 10 (use of both underscore and emphasized print):

```
05  SELECT PRINT 204
10  PRINT HEX(02040204000F)
20  PRINT "ABC"
30  PRINT HEX(0E); "XYZ"
40  PRINT "123"; HEX(0F)
50  PRINT "END OF TEST"
RUN
```

Output:

```
ABC
XYZ
123
END OF TEST
```

Example 11 (use of underscore, emphasized and expanded print):

```
05  SELECT PRINT 204
10  PRINT HEX(02040204020F)
20  PRINT "ABC"
30  PRINT HEX(0E); "XYZ"
40  PRINT "123"; HEX(0F)
50  PRINT "END OF TEST"
RUN
```

Output:

```
ABC
XYZ
123
END OF TEST
```

3.4 MISCELLANEOUS CONTROL CODES

Audio Alarm: HEX(07)

The Audio Alarm code generates an audible tone about half a second in duration.

Example (Audio Alarm):

```
30  SELECT PRINT 204
40  X = 2
50  ON X GO TO 700, 800
700 END
800 PRINT HEX(07); "CHANGE PAPER":STOP
RUN
```

Output:

(a half-second tone)

```
CHANGE PAPER
```

Carriage Return: HEX(0D)

The Carriage Return code prints the current contents of the line buffer and advances the paper one line.

Example 1 (Carriage Return):

```
05  SELECT PRINT 204
10  PRINT "INTERNATIONAL SALES"
20  PRINT HEX(0D0D0D)
30  PRINT "LONDON", "ZURICH", "BELGRADE"
RUN
```

Output:

```
INTERNATIONAL SALES


LONDON          ZURICH          BELGRADE
```

NOTE

If the automatic line feed has been suppressed (refer to Section 3.2), the paper will not be advanced one line following the carriage return.

Diagnostics: HEX(02010201000F)

The Diagnostics code triggers a built-in diagnostic test to check the operation of the print head and print head mechanisms. Refer to Section 1.7 for a description of these diagnostics. The diagnostic program will continue to output printed data until the printer is powered off and then on.

Power-On Reset: HEX(020D0C030F)

This control code prints the current contents of the line buffer, executes a form feed, moves the print head to the power-on position at the left end of the carriage, and restores all printer defaults (such as top-of-form, pitch, font, and line feed).

Select Character Font: HEX(0202aa0F)

The Model 2245 contains three fonts. Font 0 is the standard ASCII characters font. Font 1 is the alternate font. Font 2 is the box graphics font. (Refer to Appendices A and B for representations of these fonts.)

> **NOTE**
>
> Fonts 1 and 2 are identical except for the presence of eight box graphics segments defined in Font 2. These are used by the 2236DW terminal microcode when performing screen reproductions from the Model 2245 printer. BASIC programs may not generate boxes in the same fashion as the 2236DE or 2236DW screens. Therefore, there is no need to incorporate Font 2 in a BASIC program.

When the printer is powered on, or when a Power-On Reset sequence [HEX(020D0C030F)] is executed, the font selected is Font 0. The fonts can be selected by using the following code sequence:

HEX(0202aa0F)

where: aa = 00 for Font 0
02 for Font 1
04 for Font 2

Example 2 (select character font):

```
2   SELECT PRINT 204
5   A$ = HEX(A1A2A3A4A5A6F1F2F3F4)
10  FOR X = 0 TO 1: D = X+1
20  ON D GOSUB 50,60
30  PRINT "FONT"; X; " PRINTS "; A$: PRINT
40  NEXT X
45  END
50  PRINT HEX(0202000F): RETURN
60  PRINT HEX(0202020F): RETURN
RUN
```

Output:

```
FONT 0  PRINTS !"#$%&qrst
FONT 1  PRINTS
```

Select Pitch: HEX(02090102aabb0F)

The standard Model 2245 can be selected for 10-pitch or 16.5-pitch. When the printer is powered on or when a Power-On Reset sequence is executed, 10-pitch is automatically selected. If the user then selects 16.5-pitch, the output appears as 16.5-pitch. The select pitch sequence has the following format.

HEX(02090102aabb0F)

where: aabb = 0A00 for 10-pitch
1010 for 16.5-pitch

Example 3 (pitch selection):

```
5   SELECT PRINT 204
10  DIM A$35
20  A$ = "ONE GREAT CHANGE IN THE CITY'S ROLE"
30  REM SELECT FONT 0: PRINT HEX(0202000F)
40  PRINT A$
70  REM SELECT 16.5-PITCH: PRINT HEX(02090102101000F)
80  PRINT A$
90  REM ENABLE EXPANDED PRINT: PRINT HEX(02040000020F)
100 REM PRINT EXPANDED LINE:  PRINT HEX(0E);A$; HEX(0F)
110 REM SELECT 10-PITCH: PRINT HEX(020901020A000F)
120 REM PRINT EXPANDED LINE: PRINT HEX(0E);A$; HEX(0F)
RUN
```

Output:

```
ONE GREAT CHANGE IN THE CITY'S ROLE
ONE GREAT CHANGE IN THE CITY'S ROLE
ONE GREAT CHANGE IN THE CITY'S ROLE
ONE GREAT CHANGE IN THE CITY'S ROLE
```

Vertical Tab: HEX(0B)

This code advances the paper to the next six-line vertical zone. The printer assumes the paper to be divided into vertical zones of six lines each. This is true whether the printer is selected for six or eight lines per inch.

Example 4 (code advancing paper six lines) :

```
5   SELECT PRINT 204
10  PRINT "LIST OF DONORS"
20  PRINT HEX(0B); "NAME"; TAB(25); "BLOOD TYPE"
30  PRINT HEX(0B); "ROBERTA"; TAB(25); "B+"
RUN
```

Output:

```
LIST OF DONORS


NAME                      BLOOD TYPE


ROBERTA                   B+
```

Top-of-Form: HEX(0C)

This code advances the paper to the next top-of-form position. Refer to Chapter 1, Section 1.7, Number 9 for setting top-of-form.

NOTE

Several methods of formatting output are available to the Model 2245 Matrix Printer. These include use of a variety of Hexadecimal codes to control such functions as carriage return and margin setting. Refer to the appropriate language reference manual for formatting output and Hex code operations.

APPENDIX A
HEXADECIMAL CODES

High-order HEX Digit

Low-order HEX Digit	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	â	Space	0	@	P	°	p	Space	â	_	0	@	P	°	p
1	ê	!	1	A	Q	a	q	♦	ê	!	1	A	Q	a	q
2	î	"	2	B	R	b	r	▶	î	"	2	B	R	b	r
3	ô	#	3	C	S	c	s	◀	ô	#	3	C	S	c	s
4	û	$	4	D	T	d	t	→	û	$	4	D	T	d	t
5	ä	%	5	E	U	e	u	⌙	ä	%	5	E	U	e	u
6	ë	&	6	F	V	f	v	|	ë	&	6	F	V	f	v
7	ï	'	7	G	W	g	w	··	ï	'	7	G	W	g	w
8	ö	(	8	H	X	h	x	'	ö	(	8	H	X	h	x
9	ü	)	9	I	Y	i	y	`	ü	)	9	I	Y	i	y
A	à	*	:	J	Z	j	z	^	à	*	:	J	Z	j	z
B	è	+	;	K	[	k	§	■	è	+	;	K	[	k	§
C	ù	,	<	L	\	l	£	!!	ù	,	≤	L	\	l	£
D	Ä	-	=	M	]	m	é	↕	Ä	-	=	M	]	m	é
E	Ö	.	>	N	↑	n	ç	ß	Ö	.	>	N	↑	n	ç
F	Ü	/	?	O	←	o	¢	¶	Ü	/	?	O	←	o	¢

Figure A-1. Font 0. The Default Font.

In the default font (Font 0), HEX(90) through HEX(FF) are the characters HEX(10) through HEX(7F), underscored.

High-order HEX Digit

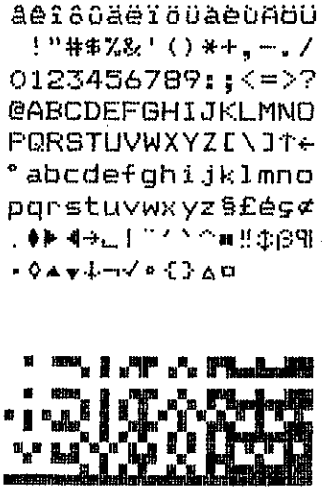
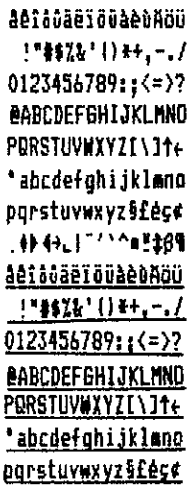
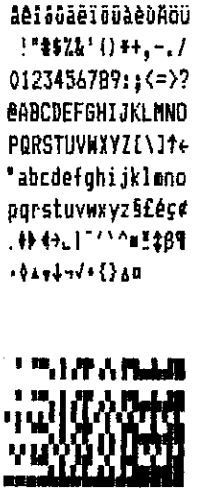
Low-order HEX Digit	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	â	Space	0	@	P	°	p	.	•						
1	ê	!	1	A	Q	a	q	♦	◊						
2	î	"	2	B	R	b	r	▶	▲						
3	ô	#	3	C	S	c	s	◀	▼						
4	û	$	4	D	T	d	t	→	↓						
5	ä	%	5	E	U	e	u	∟	¬						
6	ë	&	6	F	V	f	v	|	√						
7	ï	'	7	G	W	g	w	··	∘						
8	ö	(	8	H	X	h	x	'	{						
9	ü	)	9	I	Y	i	y	`	}						
A	à	*	:	J	Z	j	z	^	Δ						
B	è	+	;	K	[	k	§	■	□						
C	ù	,	<	L	\	l	£	!!							
D	Ä	-	=	M	]	m	é	↕							
E	Ö	.	>	N	↑	n	ç	ß							
F	Ü	. /	?	O	←	o	¢	¶							

Figure A-2. Font 1. The Alternate Font.

The box graphics font (Font 2) is the same as the alternate font (Font 1 above) except the characters HEX(A0) thru HEX(A7) contain special box graphic characters to be used in screen reproductions.

APPENDIX B
INTERNATIONAL FONTS

U.S., U.K., and Azerty Fonts

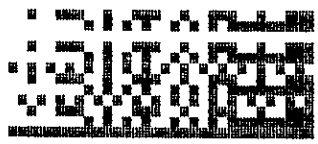
	Default Font (Font 0)	Alternate Font (Font 1)
10 Pitch		
16.5 Pitch		

ÂêîôûAëïöÜàèùÄËÜ
 !"#$%&'()*+,-./
0123456789:;<=>?
@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]↑←
°abcdefghijklmno
pqrstuvwxyzÇéés¢
.♦►◄↔⌟|¨´`^■‼$¦¶
•◊▲▼↓¬√°{}△□

French Canadian Font

Alternate Font (Font 1) at 10-Pitch

ÂêîôûäëïöüàèùÄÖÜ
 !"#$%&'()*+,-./
0123456789:;<=>?
@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]↑←
°abcdefghijklmno
pqrstuvwxyzƒ£éç¢
.♦►◄↔⌟|¨´`^■‼$¦¶
•◊▲▼↓¬√°{}△□



Dutch (Netherlands) Font

Alternate Font (Font 1) at 10-Pitch

âêîôûäëïàèù[\]éß
 !"#$%&'()*+,-./
0123456789:;<=>?
@ABCDEFGHIJKLMNO
PQRSTUVWXYZÄÖÜ†|
°abcdefghijklmno
pqrstuvwxyzäöü§¢
.♦▶◀→_|¨´`^■‼‡β¶
•◊▲▼↓¬√°{}△□

German Font

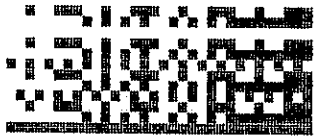
Alternate Font (Font 1) at 10-Pitch

αβγδεζηθικλμνξοπ
 !"#$%&'()*+,-./
0123456789:;<=>?
@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[ρ]↑σ
ΑΒΓΔΕΖΗΘΙΚΛΜΝΞΟΠ
ΡΣΤΥΦΧΨΩςτυφχψω¢
.♦▶◀→_|¨´`^■‼‡β¶
•◊▲▼↓¬√°{}△□

Greek (Greek/Latin) Font

Alternate Font (Font 1) at 10-Pitch

```
ÁÉíóúÝáé      íóúý
 !"#$%&'()*+,-./
0123456789:;<=>?
ÐABCDEFGHIJKLMNO
PQRSTUVWXYZÞ\ÆÖ←
åabcdefghijklmno
pqrstuvwxyzþ æö
.♦▶ ◀→␣|¨´`^■‼‡ß¶
•◊▲▼↓¬√°{}△□
```



Icelandic Font

Alternate Font (Font 1) at 10-Pitch

```
ÄËïåÛäëïöüà[§]éÜ
 !"#$%&'()*+,-./
0123456789:;<=>?
@ABCDEFGHIJKLMNO
PQRSTUVWXYZÆØÅ↑←
`abcdefghijklmno
pqrstuvwxyzæøå£¢
.♦▶ ◀→␣|¨´`^■‼‡ß¶
•◊▲▼↓¬√°{}△□
```

Norwegian and Danish Font

Alternate Font (Font 1) at 10-Pitch

áéíóú Üàéùé¿ïÜ
 !"#$%&'()*+,-./
0123456789:;<=>?
@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[ÑÌ↑←
`abcdefghijklmno
pqrstuvwxyz§ñ§±≠
.♦▶◀→⌴|¨´`^■‼$β¶
•◊▲▼↓¬✓∘{}△□

Spanish and Latin American Font

Alternate Font (Font 1) at 10-Pitch

@æ ø\§£áàéùÍ°]↑Æ
 !"#$%&'()*+,-./
0123456789:;<=>?
ÉABCDEFGHIJKLMNO
PQRSTUVWXYZÄöÅÜ|
éabcdefghijklmno
pqrstuvwxyzäöåü≠
.♦▶◀→⌴|¨´`^■‼$β¶
•◊▲▼↓¬✓∘{}△□

Swedish and Finnish Font

Alternate Font (Font 1) at 10-Pitch

```
ÂêîôûäëïöüàèùÄéÜ
 !"#$%&'()*+,-./
0123456789:;<=>?
@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]↑←
`abcdefghijklmno
pqrstuvwxyzäöüç
.♦▶◀→⌟|¨´`^■‼$ß¶
•◊▲▼↓¬√°{}△□
```

Swiss (Swiss/French, Swiss/German) Font

Alternate Font (Font 1) at 10-Pitch

APPENDIX C
SPECIFICATIONS

C.1 MODEL 2245 MATRIX PRINTER SPECIFICATIONS

Size

Height ..... 4.2 in. (10.7 cm)
Depth ..... 12.0 in. (30.5 cm)
Width ..... 14.7 in. (37.3 cm)

Weight

12.0 lb (5.4 kg)

Speed

80 cps

Character Configuration

9 x 9 dot matrix (16.5-pitch)
9 x 9 dot matrix (10-pitch)

Character Set

A 128-character set, including uppercase and lowercase letters; box and character graphics for reproducing screen images using the 2236DW terminal. This set satisfies the U.S., U.K. and French (Azerty) requirements.

Language Options

Dutch (Netherlands) LO2245-NL
French Canadian LO2245-CA
Germany LO2245-GE
Greece (Greek/Latin) LO2245-GL
Iceland LO2245-IC
Norway and Denmark LO2245-NO
Spain and Latin America LO2245-SP
Sweden and Finland LO2245-SW
Switzerland (Swiss/French, Swiss/German) LO2245-SU

Line Width

132 characters/line (16.5-pitch)
80 characters/line (10-pitch)

Ribbon

Cartridge ink ribbon

Print Head

Operator replaceable, disposable

Buttons

ON/OFF, ON LINE, FF (Form Feed), and LF (Line Feed)

Indicator Lamps

Power, Ready, On Line and Paper Out

Programmable Control Functions

Line Feed, Vertical Tab, Top of Form, Audio Alarm, Set Lines per Inch (6 or 8), Underscore, Expanded Print, Emphasized Print, Select Font, Select Pitch (10 or 16.5), Set and Disable Auto Line Feed (after carriage return), Reset to Power on defaults

Cable

12-ft (3.66-m) cable with connector to controller board

Controller

Standard Wang Printer/CPU Interface

Power Requirements

115 VAC ± 10%
60 Hz ± 0.5 Hz
0.87 amp, 100 W

220/240 VAC ± 10%
49 to 66 Hz
0.44 amp, 100 W

Fuse

2.0 amps for 115 VAC
1.0 amp for 220/240 VAC

Operating Environment

Temperature

50 °F to 90 °F (10 °C to 32 °C)

Relative Humidity

20% to 80%, noncondensing

PAPER SPECIFICATIONS

Forms Size (Continuous Forms Paper)

Maximum width	10.0 in.	(25.4 cm)
Minimum width	4.0 in.	(10.2 cm)
Forms length (60 Hz)	11.0 in.	(27.9 cm)
Forms length (50 Hz)	12.0 in.	(30.5 cm)

Forms Thickness

Thickness	0.01 in. (0.3 mm)
Maximum number	two copies plus original

APPENDIX D
MAINTENANCE

D.1 INSTALLATION

A Wang Laboratories representative will install the 2245 printer under any of the following conditions:

- The installation is in conjunction with a new system installation.
- The Wang Laboratories representatives are installing other equipment at the same time.
- The printer requires the installation of a printer controller e.g., it is the first printer installed with the system.

If these conditions do not pertain, the customer can easily install the printer by following the instructions in Sections 1.5 or 1.6 of this manual.

D.2 REPAIR

Wang will not provide on-site repair. If the printer malfunctions, the customer contacts a Wang Laboratories Service Representative. The Service Representative returns the printer to a Wang repair depot and provides a replacement printer. The printer removed from the site will not be returned to the customer.

If the print head wears out or fails and the printer is under warranty, Wang will provide the customer with a print head without charge. If the printer is not under warranty, the customer is charged the replacement price for the print head.

INDEX

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Bethesda
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Methuen
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Memphis
Nashville

Texas
Austin
Dallas
El Paso
Houston
San Antonio

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