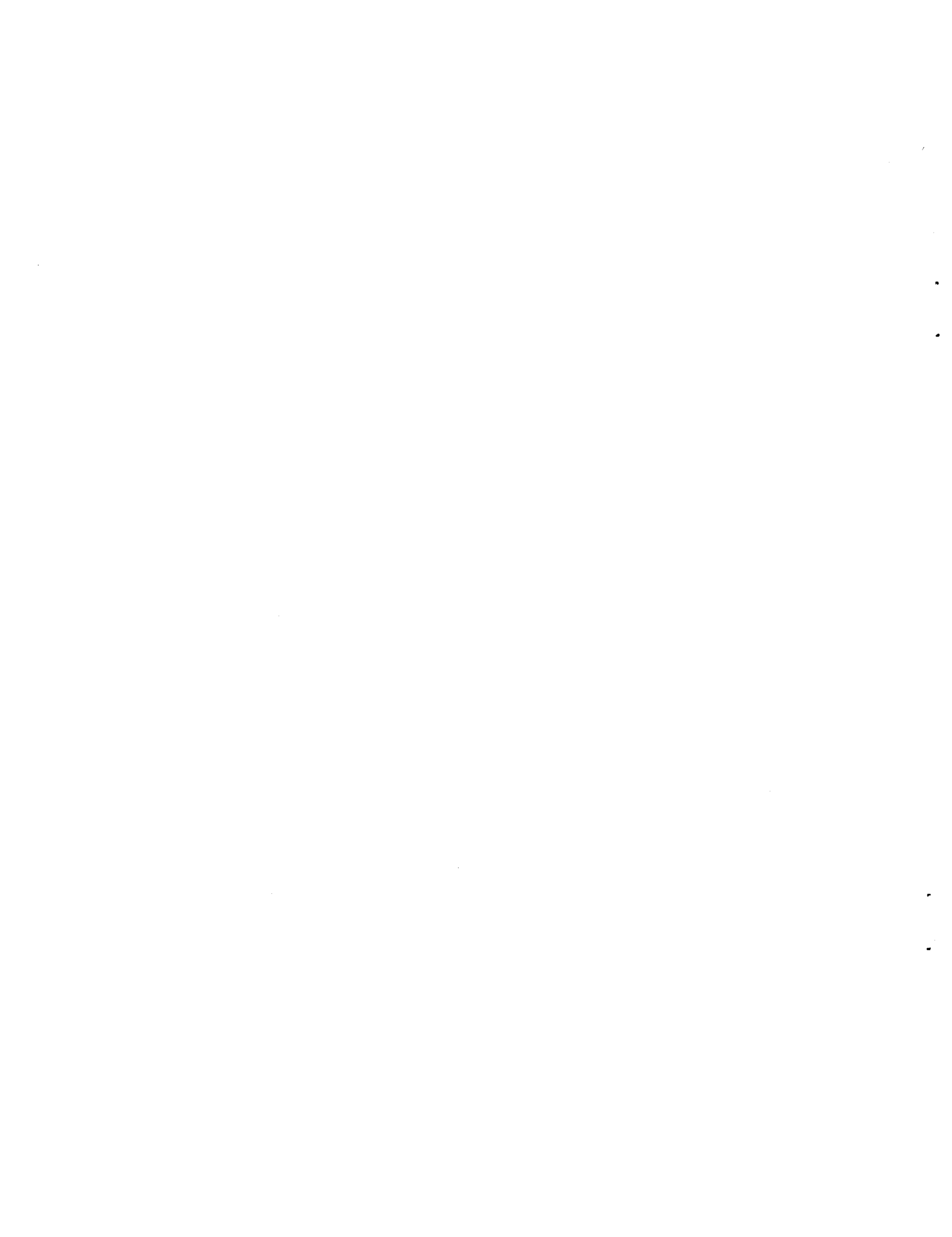


WANG

MODEL 2231W-6  
LINE PRINTER  
USER MANUAL

# SYSTEM 2200





# **MODEL 2231W-6 LINE PRINTER USER MANUAL**

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LABORATORIES, INC.

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## HOW TO USE THIS MANUAL

This manual provides answers to questions concerning the operation of the Model 2231W-6 Line Printer. It is designed for users who are already familiar with the available Wang System and its BASIC language.

For users who are not familiar with the operation of their system, it is recommended that the Programming in BASIC Manual and the Wang BASIC Language Reference Manual (or BASIC-2 Language Reference Manual) be read before proceeding with this manual.

This manual has been divided into four chapters covering all the operational features of the Line Printer. Chapter 1 contains general information on the printer. Chapter 2 describes device selection and the SELECT statement. Chapter 3 demonstrates how to format printed output and Chapter 4 describes the use of HEX codes. Hexadecimal codes, the printer character set, and specifications are collected in the Appendices.

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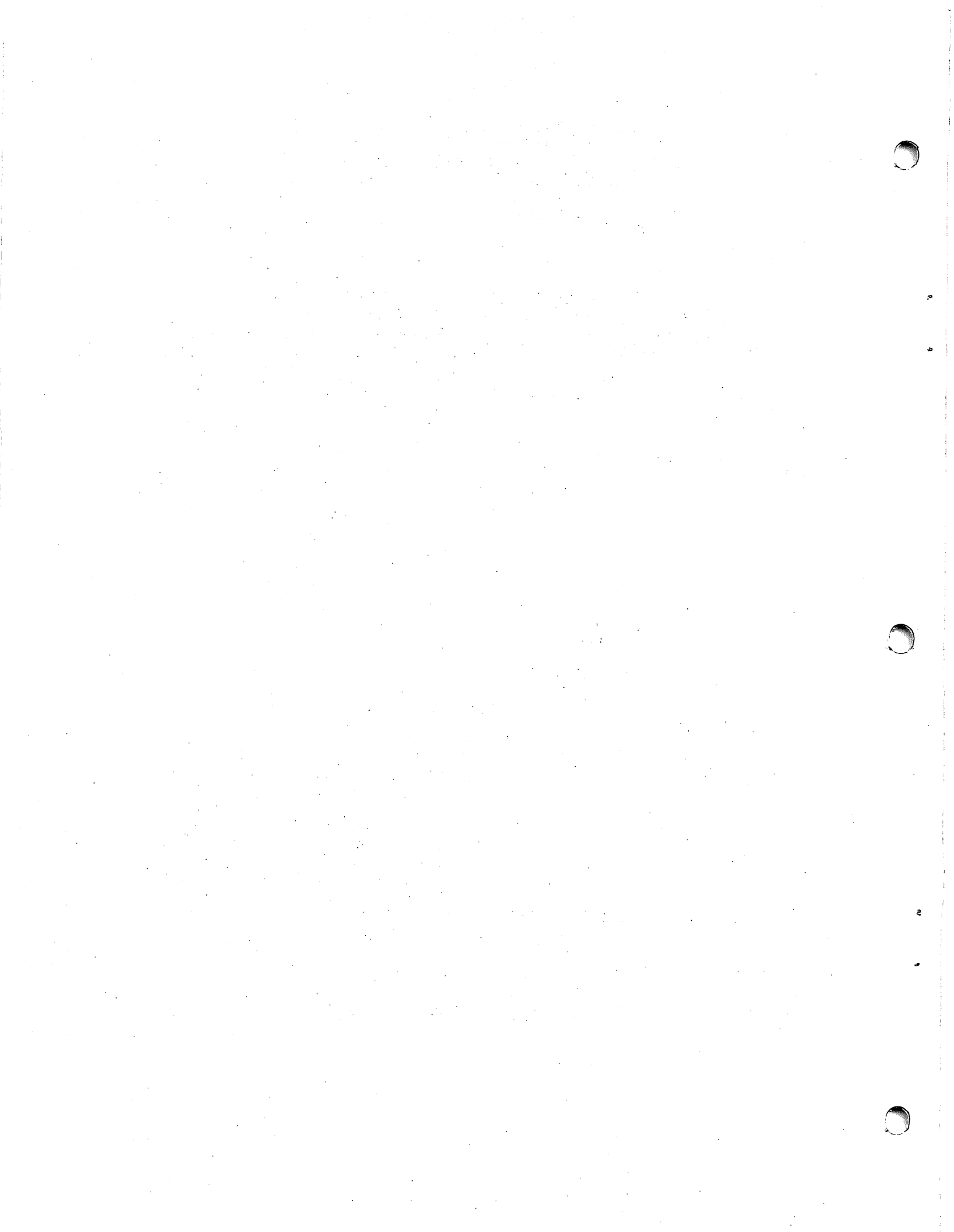
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# CHAPTER 1

## GENERAL INFORMATION

### 1.1 INTRODUCTION

This manual describes the characteristics and operations of the Model 2231W-6 Line Printer (see Figure 1-1). The Model 2231W-6 is an impact printer that generates printed characters in a high-density dot matrix form in a line up to 132 characters long. The printer operates at a rate of 70 characters-per-second and can achieve a rate of 30 to 153 lines-per-minute dependent upon line length. The 2231W-6 prints in both 10-pitch and 12-pitch format at a standard 6 lines per inch (1/6 inch line feed); however, the line feed may be programmed to integer multiples of a quarter-line for special purposes such as printing subscripts and superscripts. When required, characters can be expanded for enhanced output (see Chapter 3). A programmable line suppression feature can be used to overwrite key words or an entire line, or to add accent marks over words. The complete ASCII, 96-character set for the printer is given in Appendix A. A 132-character buffer receives a complete line of data transmitted from the system CPU to the printer. Continuous-form paper of widths from 3.5 to 13.5 inches (8.9 to 34.3 cm) can be used with the printer since the distance between the pin-feed mechanisms is continuously adjustable. Both form length and automatic formfeed length are programmably settable in quarter-line feed (1/24 inch) increments.

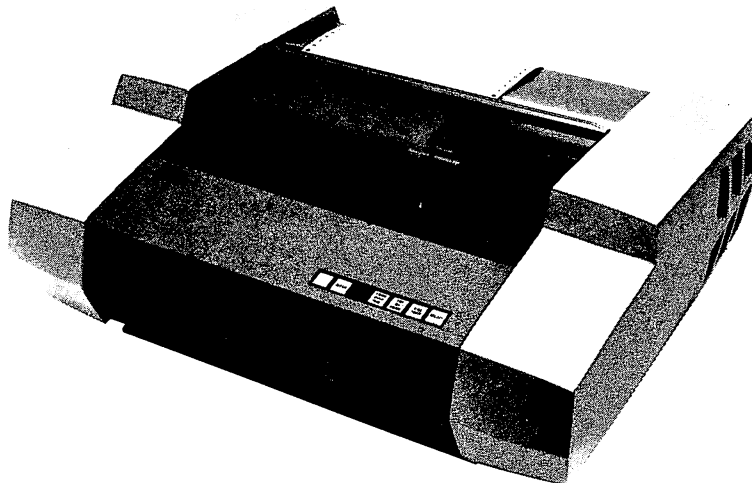


Figure 1-1 Model 2231W-6 Line Printer

## 1.2 UNPACKING AND INSPECTION

When you receive your equipment, notify your Wang Service Representative; he should unpack and set up your printer. Failure to notify your Wang Service Representative will void your warranty.

## 1.3 INSTALLATION

To install your printer, your Wang Service Representative uses the following procedure:

1. The Printer Controller Board should be installed in the CPU chassis of your system by a Wang Service Representative. The controller board screws should be fully tightened.
2. The 36-pin interface connector must be plugged into the Printer Controller Board on the CPU (or the PRINTER output connector on the Wang systems that have an internal CPU).
3. The power cord from the Line Printer must be plugged into a grounded wall outlet (see power requirements in Appendix C).

## 1.4 PAPER INSERTION

Paper is inserted in the Model 2231W-6 using the following procedure:

1. Raise the cover from the printer. Secure the cover in the raised position with the cover rod located on the right side of the printer.
2. Push continuous-form pin-feed paper into the slot at the bottom front of the printer until it comes out between the pin-feed mechanisms (see Figure 1-2 and Figure 1-3). (Note: An optional slot for paper insertions is located at the bottom of the printer.)
3. Open the pin-feed gates, insert the paper holes evenly over the pins, and close the gates. If the distance between the pin-feed mechanisms must be adjusted, unscrew the right-hand lock knob and slide the mechanism to the proper position. After the paper is in proper position screw the lock knob and close the cover of the printer.
4. Press the ON/OFF rocker switch at the rear of the printer. When the printer is on, the power lamp (left indicator of Control Panel) is illuminated.
5. Press the LINE FEED switch to advance paper in the printer.

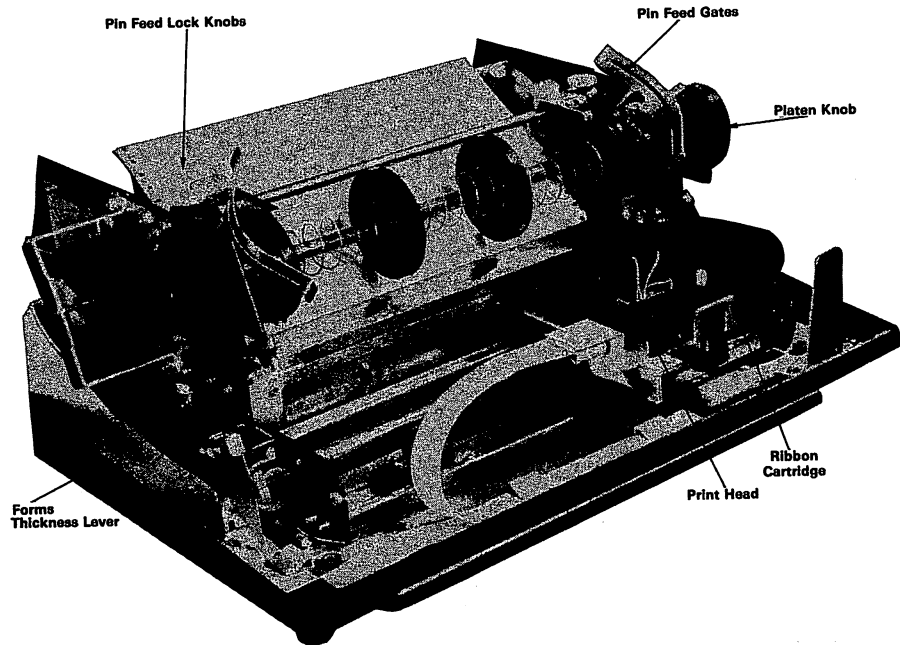


Figure 1-2. Model 2231W-6 Line Printer, Definition of Terms

6. Manual adjustments of forms in the vertical direction can be made with the Platen Knob by pushing in and rotating the knob. In particular, the Top-of-Form position on the paper can be selected in this manner.
7. NEVER OPERATE THE LINE PRINTER WITHOUT PAPER.
8. If paper runs out while printing (SELECT lamp lit), your Wang System ceases operation, an audible one-second tone is sounded, and the PAPER OUT lamp is lit. To complete printing the page, press FORMS OVERRIDE to print one line at a time. To change paper, first press the SELECT switch (lamp is extinguished) and then follow the procedure in step 6 above. Press the SELECT switch to continue printing after inserting fresh paper in the printer.

**NOTE:**

Do not press CLEAR when changing paper; doing so erases the current line in the printer buffer.

**NOTE:**

The cover of the printer can be opened for making adjustments to the print head (adjusting print head gap or disengaging paper at the print head).

When the cover is open, a two-second alarm is sounded and power to the carriage motor is turned off; the print head can now be moved manually. Once the cover is closed, the printer is ready for normal operation.

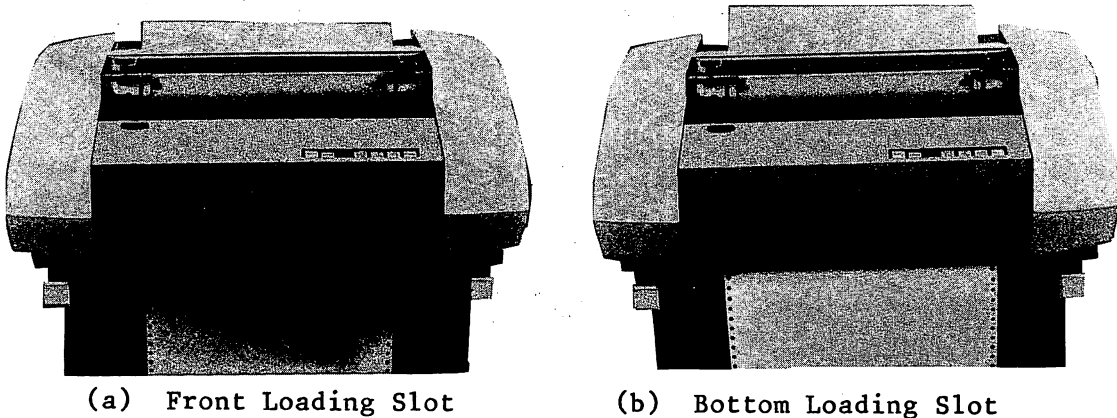


Figure 1-3. Paper in Loading Slots

**1.5 PRINT ADJUSTMENT**

To adjust the print blackness for different form thicknesses, follow the procedure detailed below.

1. The printer must have paper in it.
2. Raise the cover of the printer and find the Print Head and the Forms Thickness Lever (see Figure 1-2).
3. Notice that the Forms Thickness Lever has position notches marked from one to nine for different print adjustments. The lower number positions are for single forms; the higher numbers are for multiple forms.
4. Unlock the Forms Thickness Lever.
5. Turn the Forms Thickness Lever to move the head in or out; move the lever in to provide a blacker imprint and out to move the head back to accommodate thicker forms.
6. Lock the Lever to the proper adjustment position.
7. When the head has been properly adjusted, close the cover of the printer. The printer does not operate unless the cover is on.

8. If, during printer operation, the paper does not feed smoothly due to its catching on the front surface of the Print Head, check to be sure that the Print Head is properly adjusted and locked in place.

## 1.6 CARTRIDGE RIBBON REPLACEMENT

The ribbon cartridge can be replaced using the following procedure:

1. Raise the cover of the printer and find the Form Thickness Lever. Pull the Lever completely backward to the "L" position so that the Print Head is removed from the paper.
2. Remove the exposed ribbon from the Print Head; rotate the cartridge spindle as required to remove the ribbon.
3. Remove the cartridge by grasping the sides and pulling it up from the print head carriage.
4. Place the new cartridge in the printer; guide its exposed ribbon over the Print Head while rotating the cartridge spindle as required and snap cartridge in place.
5. Readjust Forms Thickness Lever to proper Print Adjustment position.
6. Replace the cover of the printer and turn power ON to resume operation.

## 1.7 FUSE REPLACEMENT

Two fuses (see Figure 1-4) are located on the rear panel of the Line Printer. One fuse monitors main line current while the second fuse controls current to the carriage motor. A fuse can be changed by twisting the bad fuse out of the socket and replacing it with a new fuse. The printer should be turned OFF when changing a fuse.

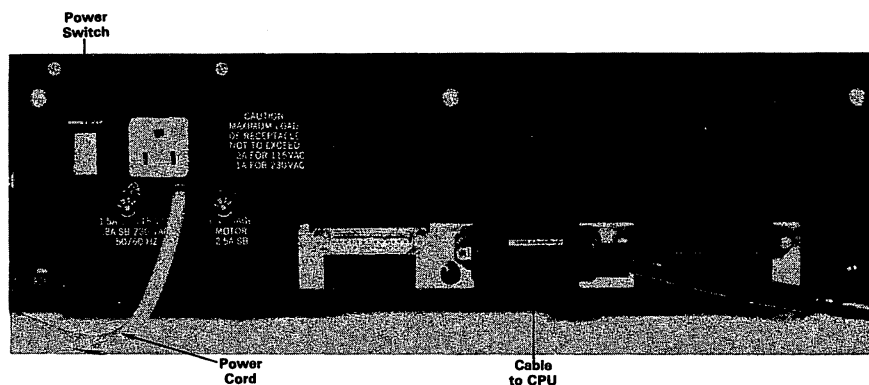


Figure 1-4 Back of Printer

## 1.8 SYSTEM TURN-ON PROCEDURE

1. Verify that all power cords are connected to a source of electrical power and all peripheral cables are connected to your Wang system CPU.
2. Turn on all power switches. When the system is turned on, Master Initialization occurs, i.e., memory is cleared of all programs and variables, and the addresses of primary devices are set to their default values.

No device address is automatically set for the printer when the system is Master Initialized. The device address for the printer must be specified using a SELECT statement (see Chapter 2).

## 1.9 2231W-6 TURN-ON PROCEDURE

The control panel on the front side of the printer contains a number of switches, buttons, and light indicators for controlling the manual operations of the printer (see Figure 1-5).

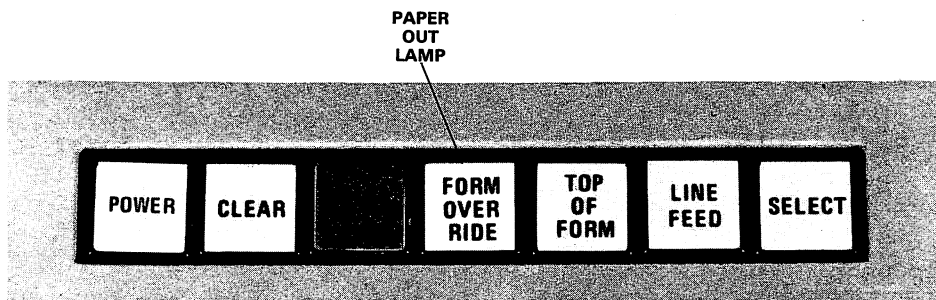


Figure 1-5. Control Panel

### ON/OFF

The ON/OFF switch is located in the rear of the printer. To turn the printer ON, press the ON rocker switch. The Power lamp at the control panel is illuminated. To turn OFF the printer, press the OFF switch; the Power lamp is extinguished.

### SELECT

After turning ON the printer, press the SELECT switch; the Select lamp is illuminated. SELECT places the printer in the ready position to receive data from the CPU. The SELECT lamp is illuminated when the printer can receive data. When the SELECT switch is depressed again, the SELECT lamp is extinguished. The SELECT switch can be used to halt printing temporarily (as when aligning forms) without causing loss of data in the print buffer; press SELECT to turn off the SELECT lamp, align forms, and press SELECT again.

## LINE FEED

Paper is advanced one line when this switch is depressed briefly; if the switch is held down, paper advances continuously. This switch operates only when the printer is in deselect mode (has not been SELECTed).

### NOTE:

The actual paper advancement with the line feed switch depends upon the value of line feed spacing set in the user's program (see section 4.2).

## TOP OF FORM

With the printer ON (but not SELECTed), the paper is advanced to the top-of-form by pressing this switch. When inserting new paper, it should be manually adjusted to the paper's Top-of-Form position with the platen knob. The paper is adjusted to the physical Top-of-Form by pushing in and rotating the knob.

## FORMS OVERRIDE

When out of paper, the printer ceases operation, an audible tone is sounded, the PAPER OUT lamp (under the FORMS OVERRIDE button) is lit and the printer stops. The next line of output may be printed by pressing FORMS OVERRIDE. Succeeding lines on the page may be printed by continually pressing FORMS OVERRIDE. Be sure to insert paper in the printer before continuing operation.

## CLEAR

Depressing this switch clears the printer line buffer if the printer is not in SELECT mode (has not been SELECTed).

## ALARM LAMP

This lamp (between the CLEAR and FORMS OVERRIDE switches) indicates the fuse of the carriage motor has burned out. It is generally caused by a paper or ribbon jam. To recover from this condition, shut off power (push OFF switch), fix jammed paper or ribbon, replace the burned fuse, and turn the power on again. If the new fuse burns out, contact your Wang Service Representative.

### 1.10 POINTS TO BE CHECKED

1. The printer must be connected to either the Line Printer Controller Board on the CPU or the PRINTER output connector on the Wang systems which have an internal CPU.

2. The printer must be plugged into a source of electrical power.
3. Paper must be inserted in the printer. (Push paper into either front or bottom slots of printer, place holes over pins, and use Platen Knob to adjust forms.)
4. The Forms Thickness must be set for good print quality. It can be adjusted as described in Section 1.5, PRINT ADJUSTMENT.
5. Turn on the printer and your Wang system.
6. Push SELECT to enable the printer to receive data from the CPU.
7. Your Line Printer is now ready to use.



## CHAPTER 2 DEVICE SELECTION

### 2.1 THE SELECT STATEMENT

The SELECT statement must be used to select the printer as the output device. A SELECT statement can be used either in the Immediate Mode or as a statement within a program. When used with the Model 2231W-6, the syntax of the SELECT statement requires that it contain the BASIC verb PRINT, LIST or CO, a Device Type, and a Unit Address code. Line length can also be specified.

Example:

```
100 SELECT PRINT 215 (132)
Device Type_____↑
Unit Address_____↑
Line Length_____↑
```

If line length is not specified in a SELECT statement, then the line length defaults to the standard width of the CRT, either 64 or 80 columns.

Example:

```
:SELECT PRINT 215
:10 PRINT "THE MODEL 2231W-6 LINE PRINTER PRINTS AT A RATE OF 30 TO
      153 LINES PER MINUTE DEPENDING ON LINE LENGTH."
:RUN(EXECUTE)
```

Output: (80 columns)

```
THE MODEL 2231W-6 LINE PRINTER PRINTS AT A RATE OF 30 TO 153 LINES PER MINUTE DE
PENDING ON LINE LENGTH
```

### 2.1.1 Device Type Codes

Every peripheral attached to your Wang System is assigned a three-digit Device Selection Code. The Device Selection Code is in the form (xyy), where x is the Device Type and yy is the Unit Address. The Device Type (x) determines which internal system I/O routines are used to control the printer. The Model 2231W-6 automatically executes a line feed (i.e., advances the paper to a new line) following the execution of a carriage return; it is thus usually selected with a Device Type of 2 (see Device Types below). Generally, carriage return commands are initiated from the Wang System CPU. The printer, however, automatically prints characters in the buffer and executes a carriage return at the end of a 132 character line.

Type	Operation
0	Device Type 0 addresses devices that do not automatically execute a line feed after a carriage return; therefore, with this Device Type, your Wang System CPU supplies a line feed after each system-generated carriage return. When this Device Type is selected for the Model 2231W-6, output which is normally single-spaced is double-spaced.

Example:

```
:SELECT PRINT 015 (100)
:10 FOR I=1 TO 5
:20 PRINT "AABCCDDEEFFGGHHIIJJKLLMMNNOOPPQRRSSTTUUVVWW"
:30 NEXT I
:RUN(EXECUTE)
```

Output:

```
AABCCDDEEFFGGHHIIJJKLLMMNNOOPPQRRSSTTUUVVWW
AABCCDDEEFFGGHHIIJJKLLMMNNOOPPQRRSSTTUUVVWW
AABCCDDEEFFGGHHIIJJKLLMMNNOOPPQRRSSTTUUVVWW
AABCCDDEEFFGGHHIIJJKLLMMNNOOPPQRRSSTTUUVVWW
AABCCDDEEFFGGHHIIJJKLLMMNNOOPPQRRSSTTUUVVWW
```

2	Device Type 2 addresses devices that automatically execute a line feed after a carriage return; it is the Device Type normally used with the printer. With this Device Type, output is single-spaced.
---	---

NOTE:

This is the standard Device Type used with the Model 2231W-6.

Example:

```
:SELECT PRINT 215  
:10 FOR I = 1 TO 5  
:20 PRINT "0123456789ABCDEFGHIJKLMNOPQRSTUVWXYZ"  
:30 NEXT I
```

Output:

```
0123456789ABCDEFGHIJKLMNOPQRSTUVWXYZ  
0123456789ABCDEFGHIJKLMNOPQRSTUVWXYZ  
0123456789ABCDEFGHIJKLMNOPQRSTUVWXYZ  
0123456789ABCDEFGHIJKLMNOPQRSTUVWXYZ  
0123456789ABCDEFGHIJKLMNOPQRSTUVWXYZ
```

4. Device type 4 is intended for use with Wang plotter peripherals and has limited application with other types of peripherals. When Device Type 4 is used with PRINT operations, it suppresses the automatic carriage return normally issued by the CPU at the end of PRINT, PRINTUSING and HEXPRINT statements that contain no trailing punctuation. In this case the Line Printer initiates an automatic carriage return only when the carriage return code HEX (0D) is encountered in the program.

Example:

```
:10 SELECT PRINT 415
:20 FOR I=1 TO 5
:30 PRINT "AABBCC"
:35 PRINT HEX(0D)
:40 NEXT I
:RUN (EXECUTE)
```

Output:

```
AABBCC
AABBCC
AABBCC
AABBCC
AABBCC
```

Device type 4 can also be used with the Line Printer to produce double-spaced program listings. When LISTing a program with Device Type 4, a program statement which overlaps 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.

Example:

```
:10 REM LISTING A PROGRAM WITH DEVICE TYPE 4
:20 DIM A(25), B(25)
:30 PRINT "PASCAL'S TRIANGLE"
:40 B(1)=1: FOR I=2 TO 21: FOR J=2 TO I:
      A(J)=B(J)+B(J-1):PRINT TAB(7*J-20);
      A(J);:NEXT J: FOR J=1 TO I:B(J)=A(J):
      NEXT J:PRINT:
      NEXT I:REM THIS ENDS THE CALCULATIONS, RETURN
      TO PART 5
:50 END
:SELECT LIST 415
:LIST(EXEC)
```

Output: (reduced)

```
10 REM LISTING A PROGRAM WITH DEVICE TYPE 4
20 DIM A(25),B(25)
30 PRINT "PASCAL'S TRIANGLE"
40 B(1)=1: FOR I=2 TO 21: FOR J=2 TO I: A(J)=B(J)+B(J-1): PRINT TAB(7*J-20);A(J);: NEXT J: FOR J=1 TO I: B(J)=A(J): NEXT J: PRINT
: NEXT I: REM THIS ENDS THE CALCULATIONS, RETURN TO PART 5
50 END
```

NOTE:

With the exception of using Device Type 4 for Listing, it is recommended that the Model 2231W-6 normally be selected with Device Type 2 or 0 for PRINT, LIST, and CO operations.

### 2.1.2 Unit Address

The unit address (yy) of the Line Printer Controller is preset to 15 by Wang Laboratories before the unit is shipped, and must be the address used in SELECT statements dealing with the printer. If a second Wang printer is used on the same CPU, it is usually assigned device address 16 by the Wang Service Representative who installs your system. Device address 15 is used in all further examples in this manual.

### 2.1.3 Line Length

Line length is a CPU system parameter which specifies the number of characters to be sent out to the printer before the system automatically sends out a carriage return and resets the internal line count. The value of line length is normally less than the width of the paper in the printer. The maximum number of characters per line that can be printed on the Model 2231W-6 is 132. In the SELECT statement line length is indicated in the parentheses following the Device Selection Code. For example:

```
SELECT PRINT 215 (132)    (Selects the Model 2231W-6 for printing and sets
                           line length to 132.)

SELECT LIST 215 (90)     (Selects the Model 2231W-6 for listing programs and
                           sets line length to 90.)

SELECT CO 215 (120)     (Selects the Model 2231W-6 for console output and
                           sets line length to 120.)
```

If a line length is not specified for PRINT, LIST or CO, the last line length selected for these operations is used. Note: the default line length set during Master Initialization is 64 characters (80 characters with an 80 column CRT). The maximum line length which can be specified in a SELECT statement is 255. However, the use of a line length greater than the physical carriage width of a device is not recommended. A shorter line length causes a carriage return to be sent out when the line length is exceeded.

Example:

```
:10 SELECT PRINT 215(5)
:20 PRINT "THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG"
:RUN(EXECUTE)
```

Output:

```
THE Q
UICK
BROWN
FOX
JUMPS
OVER
THE
LAZY
DOG
```

Note that embedded spaces in the line are included in the line count.

The Line Printer does not print each character as it is received from the CPU. The printer has a buffer for storing each character until the CPU directs it to print a line by sending a carriage return code. If the buffer becomes full before a carriage return is received, the line is automatically printed.

The line length setting is used by your Wang system to generate an automatic carriage return when a line exceeds the specified line length and when no carriage return is supplied by the program. This prevents printout from being lost. As a line of output is printed on the Model 2231W-6 the CPU keeps a count of the number of characters sent (line count). If this line count equals the current value of the line length before the output line is complete, a carriage return is transmitted to the printer, the line count is reset to zero, and the unfinished output is continued on the next line.

Example:

```
:SELECT PRINT 215 (20)
:10 PRINT "ABCDEFGHIJKLMN OPQRSTUVWXYZ"
:RUN(EXECUTE)
```

Output:

```
ABCDEFGHIJKLMN OPQRST
UVWXYZ
```

If the output is completed and a carriage return is transmitted before the line count equals the line length, the system automatically resets the line count to zero for the start of a new line (a PRINT statement with no trailing comma or semicolon causes a carriage return to be executed at the end of the output).

Example:

```
:10 REM EXAMPLE OF PRINT STATEMENT WITH NO TRAILING COMMA OR SEMICOLON
:20 SELECT PRINT 215 (30)
:30 PRINT "KEEP"
:40 PRINT "OUT"
:RUN(EXECUTE)
```

Output:

```
KEEP
OUT
```

The line count is reset to zero under any one of the following conditions:

1. The line count equals the line length.
2. A carriage return is output when a PRINT, PRINTUSING, or HEXPRINT statement is executed.
3. The system is RESET.
4. A CLEAR command is executed.
5. The system is Master Initialized.
6. A SELECT PRINT statement is executed.

## 2.2 PRINT

```
:SELECT PRINT 215
```

This statement selects the printer with Device Type Code 215 for all program output resulting from the execution of PRINT, PRINTUSING or HEXPRINT statements. Printout resulting from PRINT and HEXPRINT statements entered in the Immediate Mode appears on the CRT unless the printer is selected for CO (see Section 2.4).

### NOTE:

When your system is first turned on, PRINT operations are SELECTED to the CRT, the primary device for such operations. Therefore, it is necessary to execute a SELECT statement in the program to direct the output of PRINT statements to the printer. Also, the printer SELECT switch lamp must be on.

Example:

```
:10 SELECT PRINT 215      or      :SELECT PRINT 215
:20 PRINT "N", "2 to the Nth"  :20 PRINT "N", "2 to the Nth"
:30 FOR X=0 TO 8           :30 FOR X=0 TO 8
:40 PRINT X,2↑X           :40 PRINT X,2↑X
:50 NEXT X                :50 NEXT X
```

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

N	2 to the Nth
0	1
1	2
2	4
3	8
4	16
5	32
6	64
7	128
8	256

Example:

```
:10 SELECT PRINT 215
:20 X=7: Y=2.0: Z=0.5
:30 PRINT USING 40, X; Y; Z
:40% ##.##
:RUN(EXECUTE)
```

Output: 7.0 2.0 0.5

Example:

```
:10 SELECT PRINT 215
:20 DIM A$ 25
:30 A$ = "THE MODEL 2231W-6 PRINTER"
:40 HEXPRINT A$
:RUN (EXECUTE)
```

Output:

544845204D4F44454C2032323331572D36205052494E544552



### 2.3 LIST

```
:SELECT LIST 215
```

This statement selects the printer with Device Type Code 215 for all program listings (LIST operations).

**NOTE:**

The default address for LIST operations is 005, the CRT.

#### Example:

To list the program in the first example above on the printer, key in as Immediate Mode statements:

```
:SELECT LIST 215  
:LIST(EXECUTE)
```

The printed output is:

```
10 SELECT PRINT 215  
20 PRINT "N", "2 to the Nth"  
25 PRINT  
30 FOR X=0 TO 8  
40 PRINT X, 2X  
50 NEXT X
```

### 2.4 CO (CONSOLE OUTPUT)

```
:SELECT CO 215
```

This statement selects the printer with Device Type Code 215 for all console output. This 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.

## 2.5 COMBINED PARAMETERS

It is possible to combine parameters in a SELECT statement.

Example:

```
SELECT PRINT 215 (100), LIST 215(80), CO 215 (112)
```

However, it is not possible to select two output devices with the same parameter.

For example, the statement

```
SELECT LIST 215, LIST 005
```

produces a listing of programs on the CRT only.

## 2.6 DESELECTING THE MODEL 2231W-6 FROM THE CPU

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 (turn system power OFF, then ON). Master Initialization selects the CRT for all LIST, PRINT, and CO operations.
3. Key in CLEAR and touch the RETURN/EXECUTE key. PRINT and LIST operations are returned to the device currently selected for Console Output (CO). If the printer is currently the CO device, either method 1 or 2 must be used to deselect it.
4. Turn off the SELECT lamp.

## CHAPTER 3

# FORMATTING OUTPUT

### 3.1 PRINT, PRINTUSING AND HEXPRINT STATEMENTS

The PRINT, PRINTUSING and HEXPRINT statements are used with the Line Printer in the same manner as they are used with the CRT, although more zones are available on the printer than on the CRT.

The 2231W-6 in 12-pitch format has a line length of 132 characters, divided into eight zones of 16 characters each, and one zone of 4 characters. The zones constitute columns 0-15, 16-31, 32-47, 48-63, 64-79, 80-95, 96-111, 112-127, and 128-131 respectively.

The 2231W-6 in 10-pitch format has a line length of 110 characters, divided into six zones of 16 characters each, and one zone of 14 characters. The zones constitute columns 0-15, 16-31, 32-47, 48-63, 64-79, 80-95, and 96-109, respectively.

If commas separate elements in a PRINT statement, then each element begins at the start of a new zone. If semicolons separate elements in a PRINT statement, the output appears in packed format, with no spaces between items. (See the Wang BASIC Language Reference Manual or BASIC-2 Language Reference Manual for a discussion of zoned and packed format.)

Example 1:

```
:10 REM PRINTING IN ZONED FORMAT WITH COMMAS
:20 SELECT PRINT 215(132)
:30 PRINT "COLUMNS", "COLUMNS", "COLUMNS"
:40 PRINT "0 TO 15", "16 TO 31", "32 TO 47"
:RUN(EXECUTE)
```

Output:

COLUMNS	COLUMNS	COLUMNS
0 TO 15	16 TO 31	32 TO 47

Example 2:

```
:10 REM SKIPPING OVER ZONES WITH COMMAS
:20 SELECT PRINT 215(132)
:30 PRINT "FLIGHT NO." ,,, "ARRIVAL TIME"
:40 PRINT "(COLUMNS 0-15)" ,,, "(COLUMNS 48-63)"
:45 PRINT
:50 PRINT "117",,, "2:50 PM"
:RUN(EXECUTE)
```

Output:

FLIGHT NO. (COLUMNS 0 TO 15)	ARRIVAL TIME (COLUMNS 48 TO 63)
117	2:50 PM

Example 3:

```
:10 REM PRINTING IN PACKED FORMAT WITH SEMICOLONS
:20 SELECT PRINT 215(120)
:30 A$="U.S.S BOSTON": B$="MISSLE CRUISER"
:40 PRINT "NAME: "; A$, "CLASSIFICATION: "; B$
:RUN(EXECUTE)
```

Output:

NAME:U.S.S BOSTON                   CLASSIFICATION:MISSLE CRUISER

Example 4:

```
:10 REM FORMATTING WITH PRINTUSING STATEMENT
:20 SELECT PRINT 215
:30 A$="U.S.S BOSTON": B$="MISSLE CRUISER"
:40 PRINTUSING 50, A$, B$
:50% NAME: ##### CLASS: #####
:RUN(EXECUTE)
```

Output:

NAME: U.S.S BOSTON   CLASS: MISSLE CRUISER

Example 5:

```
:10 REM PRINTING WITH HEXPRINT STATEMENT
:20 SELECT PRINT 215
:30 A$="ABC DEF GHI JKL"
:40 HEXPRINT A$
:RUN(EXECUTE)
```

Output:

4142432044454620474849204A4B4C20

**NOTE:**

In zone printing on the 2231W-6, it is important to make sure that information supplied to the last zone does not exceed the legal length of the last zone (either 4 or 14 characters long, depending on pitch selection). For instance, in 12-pitch format, if the information for the last zone exceeds four columns, the zone is omitted and the information is presented in the first zone of the next line.

**Example:**

```
:SELECT PRINT 215 (132)
:20 PRINT "LOT", 2.3, 35.67, 90.89, 70.2, 55.6, 12.3, 67.9, 284.3
:RUN(EXECUTE)
```

**Output: (compressed)**

```
LOT 2.3 35.67 90.89 70.2 55.6 12.3 67.9
284.3
```

In the above example the ninth print element (284.3) exceeded 4 characters in length and thus was printed on the next line.

### 3.2 THE TAB( FUNCTION

The TAB( function is used in the same manner with the Line Printer as it is used with the CRT. When a PRINT statement containing a TAB( function is executed, the Line Printer prints at the column specified by the integer portion of the TAB( expression.

**Example:**

```
:SELECT PRINT 215 (132)
:10 PRINT TAB (35); "FLIGHT SCHEDULE"
:20 PRINT: PRINT
:30 PRINT "FLIGHT NO."; TAB (25);
"DESTINATION"; TAB (50); "DEPARTURE";
TAB(75); "ARRIVAL"
:RUN(EXECUTE)
```

**Output:**

**FLIGHT SCHEDULE**

<b>FLIGHT NO.</b>	<b>DESTINATION</b>	<b>DEPARTURE</b>	<b>ARRIVAL</b>
-------------------	--------------------	------------------	----------------

In the above example "FLIGHT SCHEDULE" is printed starting at column 60; similarly, the headings in line 30 are printed at the specified TAB settings.

If the value of the TAB( expression is greater than the selected line length, the printer moves to the next line and completes the PRINT statement starting at column 0.

Example:

```
:10 SELECT PRINT 215 (132)
:20 A = 50
:30 PRINT TAB(A); "FIGHTER MODEL"; TAB(3*A); "MAXIMUM ALTITUDE"
:RUN(EXECUTE)
```

Output:

```
MAXIMUM ALTITUDE                                FIGHTER MODEL
```

When using the TAB( function to print numeric values in columnar format, an additional column (to the left of the value) is allocated for the sign (+ or -). If not used (for positive numbers), actual printing begins at the column specified plus one.

Example:

```
:10 SELECT PRINT 215
:20 PRINT TAB(10); "POWER"; TAB(20); "VALUE"
:30 FOR N=-1 TO 10
:40 PRINT TAB(10); N; TAB(20); (-2)↑N
:50 NEXT N
:RUN(EXECUTE)
```

Output:

POWER	VALUE
-1	-.5
0	1
1	-2
2	4
3	-8
4	16
5	-32
6	64
7	-128
8	256
9	-512
10	1024

### 3.3 EXPANDED PRINT

It is possible to print expanded characters for enhanced or highlighted output on the Line Printer by using the HEX code (OE) in a PRINT statement.

Example:

```
: 5 SELECT PRINT 215 (132)
:10 PRINT HEX(OE),"CODE HEX(OE) USED FOR EXPANDED PRINT"
:RUN
```

Executing the above example causes the following to appear on the Line Printer:

**CODE HEX(OE) USED FOR EXPANDED PRINT**

The PRINT HEX(OE) command expands the print for only one line.

The 2231W-6 performs an automatic carriage return and line feed after 66 expanded characters although the 132 character buffer is only half full. If more characters are sent, they are stored in the buffer but are never printed and are erased upon completion of the line.

The HEX code (OE) can also be used with the PRINTUSING statement. For example, the following program prints 'CODE =' in expanded print.

```
:10 A$ = HEX(OE)
:20 PRINTUSING 30, A$
:30% CODE = ####
RUN(EXECUTE)
```

Output:

**CODE =**

# CHAPTER 4

## HEX CODES

### 4.1 THE HEX FUNCTION

The HEX function is used in a BASIC program to output characters on the printer that do and do not appear on the standard keyboards or to output special printer Control Codes. The HEX function has the form:

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

Where h = a HEX digit 0 to 9 or a letter A to F. An even number of characters must always appear in a HEX statement; spaces are not allowed. (See the Wang BASIC Language Reference Manual or BASIC-2 Language Reference Manual for hexadecimal characters and codes.) HEX codes can also be combined. For example, the following program in memory,

```
:10 SELECT PRINT 215  
:20 PRINT HEX(410DOA42)  
:RUN(EXECUTE)
```

produces:

A

B

when run, since the code for 'A' is HEX(41), 'carriage return' is HEX(0D), 'line feed' is HEX(0A), and 'B' is HEX(42). (see Appendix A.)

### 4.2 CONTROL CODES

When the 2231W-6 printer receives a HEX code for a printable character, it simply places the code into its print buffer. Unless the buffer is full, no immediate action is taken. However, certain special HEX codes do not enter the buffer, and instead cause immediate action by the printer. These special codes are the Printer Control Codes.



The special Control Codes for the printer are:

Function	Hex Code	Description
SET 10-PITCH	HEX(0201)	Sets the printer at 10 characters per inch for all output following the HEX(0201) code.

Example:

```
:10 SELECT PRINT 215
:20 PRINT HEX(0201);
:30 PRINT "ABCDEFGHIJ"
```

Output:

**ABCDEFGHIJ**

SET 12-PITCH	HEX(0202)	Sets the printer at 12 characters per inch. for all output following the HEX(0202) code. When the printer is first turned on the print format defaults to 12-pitch.
--------------	-----------	---

Example:

```
:10 SELECT PRINT 215
:20 PRINT HEX(0201)
:30 PRINT "ABCDEFGHIJ"
:40 PRINT HEX(0202);
:50 PRINT "ABCDEFGHIJKL"
```

Output:

**ABCDEFGHIJ**  
**ABCDEFGHIJKL**

SUPPRESS LINE FEED	HEX(020000)	Suppresses the line feed. This feature can be used for text highlighting or for inserting accent marks over characters.
--------------------	-------------	---

Example:

```
:10 SELECT PRINT 215
:15 PRINT HEX (020000);
:20 FOR N=1 TO 3
:30 PRINT "THIS IS A HEADING"
:40 NEXT N
:45 REM STATEMENT 50 RETURNS PRINTER TO
    NORMAL LINE FEED
:50 PRINT HEX(0200040A)
```

Output:

**THIS IS A HEADING**

NOTE:

In line 50 of the example, the HE(0A) (or HEX(0D)) is required in order to line feed and return the print head to the left margin.

SET QUARTER LINE    HEX(020001)  
FEED SPACING

Sets the line feed spacing at one quarter of the default value. The default value for line feed spacing is 1/6 inch (6 lines per inch). Sending a HEX (020001) code to the printer sets the line feed spacing to 1/4 times 1/6 inch for all subsequent print lines until another line spacing code is encountered in the program.

Example:

```
:10 SELECT PRINT 215
:20 PRINT HEX(020001);
:30 PRINT " 2 2 2"
:40 PRINT "a + b = c"
:45 REM STATEMENT 50 RETURNS PRINTER TO
    NORMAL LINE FEED
:50 PRINT HEX(0200040A)
```

Output:

$a^2 + b^2 = c^2$

SET HALF LINE        HEX(020002)  
FEED SPACING

Sets the line feed spacing at one half of the default value (1/6 inch). Sending a HEX(020002) code to the printer sets the line feed spacing to 1/2 times 1/6 inch for all subsequent print lines until another line spacing code is encountered in the program.

Example:

```
:10 SELECT PRINT 215
:20 PRINT HEX (020002);
:30 PRINT " 2 2 2"
:40 PRINT "a + b = c"
:45 REM STATEMENT 50 RETURNS PRINTER TO
    NORMAL LINE FEED
:50 PRINT HEX(0200040A)
```

Output:

$a^2 + b^2 = c^2$

SET THREE  
QUARTER LINE  
FEED SPACING

HEX(020003)

Sets the line spacing at three quarters of the default value (1/6 inch). A HEX(020003) code sets the line feed spacing to 3/4 times 1/6 inch for all subsequent print lines until another line spacing code is encountered in the program.

Example:

```
:10 SELECT PRINT 215
:20 PRINT HEX(020003)
:30 PRINT " 2  2  2"
:40 PRINT "a + b = c"
:45 REM STATEMENT 50 RETURNS PRINTER TO
    NORMAL LINE FEED
:50 PRINT HEX(0200040A)
```

Output:

```
  2  2  2
a + b = c
```

SET FULL LINE  
FEED SPACING

HEX(020004)

The HEX(020004) code sets the line feed spacing to the default value of 1/6 inch for all subsequent print lines until another line spacing code is encountered in the program. In the following example, line 70 resets the printer to the full line feed spacing. The normal line feed spacing is produced after the 'FIVE' is printed.

Example:

```
:10 SELECT PRINT 215(80)
:20 PRINT HEX(020001)
:30 PRINT "ONE"
:40 PRINT "  TWO"
:50 PRINT "    THREE"
:60 PRINT "      FOUR"
:70 PRINT HEX(020004);
:80 PRINT "                FIVE"
:90 PRINT "                SIX"
```

Output:

```
ONE TWO THREE FOUR FIVE
                SIX
```

FORM LENGTH

HEX(0209XXXX)

Allows the operator to select a form length other than the normal 66 line form. XXXX is a 4-digit hexadecimal value between 0001 and 0318 (three normal pages). Each increment is a quarter line feed. The values of XXXX for typical form lengths are shown in table 4-1.

Table 4-1 Conversion of Form Length to HEX Values.

Form Length (lines)	XXXX value in HEX(0209XXXX)
60	00F0
66*	0108
70	0118
80	0140
90	0168
100	0190
198	0318 (3 normal pages)

\*Default value of form length at printer power on.

AUTOMATIC FORM FEED

HEX(020AXXXX)

Sets the total number of lines that can be printed on a form before an automatic Top of Form command is executed. XXXX is a 4-digit hexadecimal value between 0001 and the current form length represented in quarter-line feed increments. Typical values of XXXX are shown in table 4-2.

Table 4-2. Conversion of Automatic Form Feed to Hexadecimal Values.

Printed Lines Per Form	XXXX Value In HEX(020AXXX)
5	0014
10	0028
15	003C
20	0050
25	0064
30	0078
35	008C
40	00A0
45	00B4
50	00C8
55	00DC
60	00F0
65	0104
70	0118
75	012C
80	0140

NOTES ON SETTING FORM LENGTH

AND AUTOMATIC FORM FEED

1. Values for Form Length and Automatic Form Feed should be set while the paper is at the top of form and before any other control codes are executed.
2. The value for Automatic Form Feed should always be less than or equal to the value for Form Length.
3. The maximum value for Form Length is three regular pages (66 lines per page) or HEX(02090318). Any value greater than three pages is automatically set equal to HEX(02090318) by the printer.
4. The printer ignores zero assignments for Form Length or Automatic Form Feed (e.g., HEX(02090000) and HEX(020A0000)).
5. A HEX(0D) or HEX(0A) code immediately following a Form Length or Automatic Form Feed assignment causes a line feed, and the printer's internal line counter starts counting down one line from the value just assigned.

ALARM	HEX(07)	Generates an audible tone about one second in duration from the speaker at the rear of the printer.
LINE FEED	HEX(0A)	Advances the paper one line. The one line is determined by the control code HEX(0200XX) where XX can have a value of 01 (quarter line) to FF (63 3/4 lines). The default value of line feed at printer turn on is the standard 6 lines per inch.
VERTICAL TAB	HEX(0B)	The standard form in the printer is divided into 11 zones of six lines each starting with the Top-of-Form. A HEX(0B) code advances the paper from the last printed position to the start of the next six-line zone. The vertical tab is always six lines and the size of each line is four vertical increments (i.e. quarter lines).
FORM FEED	HEX(0C)	Advances the paper to the selected Top-of-Form of the next form.
CARRIAGE RETURN	HEX(0D)	Causes the line of characters stored in the printer buffer to be printed. An automatic line feed occurs after the line has been printed and the print head returns to the left side of the printer carriage.
EXPANDED CHARACTER	HEX(0E)	Prints a line up to 66 characters as expanded (double-width) characters. (see Chapter 3.)
UNDERSCORE	SEE APPENDIX B	Character underscoring is performed by "turning on" the eighth bit in the binary code representation of a character. For example, "A" is HEX(41) = 01000001; " <u>A</u> " is 11000001 = HEX(C1).

Example:

```

:10 SELECT PRINT 215
:20 PRINT HEX(B0B1B2B3B4B5B6B7B8B9)

```

Output:

**0123456789**

Character underscoring can also be accomplished using the line suppression code HEX (020000) and the underscore character code HEX (5F).

Example:

```
:10 SELECT PRINT 215
:15 REM SUPPRESS LINE FEED FIRST
:20 PRINT HEX (020000); "0123456789"
:25 REM RETURN PRINTER TO NORMAL LINE FEED
:30 PRINT HEX (020004);
:35 REM UNDERSCORE 0123456789
:40 PRINT HEX (5F5F5F5F5F5F5F5F5F5F5F5F)
```

Output:

0123456789

DELETE

HEX(7F)

Clears the buffer of characters sent before the '7F'.

NOTE:

With the exception of the HEX (0D) code, all control codes embedded in a print line are executed in the order in which they appear and before any data is printed on the paper.

Example 1:

```
:10 PRINT HEX(57414E47200D0A4C414253)
```

Output:

**WANG**

**LABS**

Example 2:

```
:10 PRINT HEX (57414E47200A4C414253)
```

Output:

(Blank space via line feed code HEX(0A))  
**WANG LABS**

# APPENDIX A

## HEXADECIMAL CODES

HEX CODE	PRINTER CHARACTER OR OPERATION	HEX CODE	PRINTER CHARACTER	HEX CODE	PRINTER CHARACTER
HEX(020000)	Suppress Line Feed	HEX(30)	0	HEX(58)	X
HEX(020001)	Quarter Line Feed	HEX(31)	1	HEX(59)	Y
HEX(020002)	Half Line Feed	HEX(32)	2	HEX(5A)	Z
HEX(020003)	Three Quarter Line Feed	HEX(33)	3	HEX(5B)	[
HEX(020004)	Normal Line Feed	HEX(34)	4	HEX(5C)	\
HEX(0200XX)	Variable Line Feed	HEX(35)	5	HEX(5D)	]
HEX(0201)	Set 10-pitch	HEX(36)	6	HEX(5E)	↑
HEX(0202)	Set 12-pitch	HEX(37)	7	HEX(5F)	∨
HEX(0209**)	Form Length	HEX(38)	8	HEX(60)	a
HEX(020A**)	Printed Lines Per Form	HEX(39)	9	HEX(61)	b
HEX(07)	Line Feed	HEX(3A)	:	HEX(62)	c
HEX(0A)	Line Feed	HEX(3B)	;	HEX(63)	d
HEX(0B)	Vertical Tab	HEX(3C)	<	HEX(64)	e
HEX(0C)	Form Feed	HEX(3D)	=	HEX(65)	f
HEX(0D)	Carriage Return	HEX(3E)	>	HEX(66)	g
HEX(0E)	Expanded Character	HEX(3F)	?	HEX(67)	h
HEX(20)	Space	HEX(40)	@	HEX(68)	i
HEX(21)	!	HEX(41)	A	HEX(69)	j
HEX(22)	"	HEX(42)	B	HEX(6A)	k
HEX(23)	#	HEX(43)	C	HEX(6B)	l
HEX(24)	\$	HEX(44)	D	HEX(6C)	m
HEX(25)	%	HEX(45)	E	HEX(6D)	n
HEX(26)	&	HEX(46)	F	HEX(6E)	o
HEX(27)	'	HEX(47)	G	HEX(6F)	p
HEX(28)	(	HEX(48)	H	HEX(70)	q
HEX(29)	)	HEX(49)	I	HEX(71)	r
HEX(2A)	*	HEX(4A)	J	HEX(72)	s
HEX(2B)	+	HEX(4B)	K	HEX(73)	t
HEX(2C)	,	HEX(4C)	L	HEX(74)	u
HEX(2D)	-	HEX(4D)	M	HEX(75)	v
HEX(2E)	.	HEX(4E)	N	HEX(76)	w
HEX(2F)	/	HEX(4F)	O	HEX(77)	x
		HEX(50)	P	HEX(78)	y
		HEX(51)	Q	HEX(79)	z
		HEX(52)	R	HEX(7A)	{
		HEX(53)	S	HEX(7B)	
		HEX(54)	T	HEX(7C)	}
		HEX(55)	U	HEX(7D)	~
		HEX(56)	V	HEX(7E)	
		HEX(57)	W	HEX(7F)	Clear Buffer

\*\* = XXXX



# APPENDIX B HEXADECIMAL CODES FOR UNDERSCORED CHARACTERS

HEX CODE	UNDERSCORED CHARACTER	HEX CODE	UNDERSCORED CHARACTER	HEX CODE	UNDERSCORED CHARACTER
HEX(A0)	Space	HEX(C0)	@	HEX(E0)	`
HEX(A1)	!	HEX(C1)	A	HEX(E1)	a
HEX(A2)	"	HEX(C2)	B	HEX(E2)	b
HEX(A3)	#	HEX(C3)	C	HEX(E3)	c
HEX(A4)	\$	HEX(C4)	D	HEX(E4)	d
HEX(A5)	%	HEX(C5)	E	HEX(E5)	e
HEX(A6)	&	HEX(C6)	F	HEX(E6)	f
HEX(A7)	'	HEX(C7)	G	HEX(E7)	g
HEX(A8)	(	HEX(C8)	H	HEX(E8)	h
HEX(A9)	)	HEX(C9)	I	HEX(E9)	i
HEX(AA)	*	HEX(CA)	J	HEX(EA)	j
HEX(AB)	+	HEX(CB)	K	HEX(EB)	k
HEX(AC)	,	HEX(CC)	L	HEX(EC)	l
HEX(AD)	-	HEX(CD)	M	HEX(ED)	m
HEX(AE)	.	HEX(CE)	N	HEX(EE)	n
HEX(AF)	/	HEX(CF)	O	HEX(EF)	o
HEX(B0)	0	HEX(D0)	P	HEX(F0)	p
HEX(B1)	1	HEX(D1)	Q	HEX(F1)	q
HEX(B2)	2	HEX(D2)	R	HEX(F2)	r
HEX(B3)	3	HEX(D3)	S	HEX(F3)	s
HEX(B4)	4	HEX(D4)	T	HEX(F4)	t
HEX(B5)	5	HEX(D5)	U	HEX(F5)	u
HEX(B6)	6	HEX(D6)	V	HEX(F6)	v
HEX(B7)	7	HEX(D7)	W	HEX(F7)	w
HEX(B8)	8	HEX(D8)	X	HEX(F8)	x
HEX(B9)	9	HEX(D9)	Y	HEX(F9)	y
HEX(BA)	:	HEX(DA)	Z	HEX(FA)	z
HEX(BB)	;	HEX(DB)	[	HEX(FB)	{
HEX(BC)	<	HEX(DC)	\	HEX(FC)	
HEX(BD)	=	HEX(DD)	]	HEX(FD)	}
HEX(BE)	>	HEX(DE)	↑	HEX(FE)	~
HEX(BF)	?	HEX(DF)	-		

# APPENDIX C

## LINE PRINTER SPECIFICATIONS

Printout Speed.....	70 characters per second (30 to 153 lines per minute, dependent on line length).
Character Configuration.....	10-pitch: 24 (wide) x 12 (high) - dot matrix 48 (wide) x 12 (high) - dot matrix (for expanded size)  12-pitch: 20 (wide) x 12 (high) dot matrix. 40 (wide) x 12 (high) dot matrix (for expanded size)
Line Width.....	10-pitch: 110 characters, (55 characters, expanded)  12-pitch: 132 characters (66 characters, expanded)
Character Set.....	ASCII 96 characters
Duplicate Copies.....	The printer can generate a maximum of four duplicate copies in addition to the original.
Printer Size: Width.....	24 in. (61 cm)
Depth.....	18 in. (46 cm)
Height.....	10 in. (25 cm)
Weight.....	60 lb (27 kg)
Site Width.....	not less than 40 in. (1m)
Controller.....	Standard Line Printer Controller/CPU interface.
Fuses.....	1.5 amp (SB) for 115 VAC, 0.8 amp (SB) for 230 VAC; 2.5 amp (SB) for DC carriage motor.
Power Requirements.....	115 or 230 VAC $\pm$ 10%, 50 or 60 Hz $\pm$ 1 Hz.
Cable.....	12 ft (3.66m) cable with connector for the CPU plug jack.
Operating Environment.....	50°F to 90°F (10°C to 32°C), 20% to 80% relative humidity, allowable. 35% to 65% recommended.

# APPENDIX D

## PAPER SPECIFICATIONS

(If paper does not conform to these specifications, degraded forms handling can occur.)

1. Material must be margin-perforated, fanfold paper or card stock; perforations are used for guiding by pin-feed units.
2. Maximum form length is variable.
3. Paper Stock:
  - a. For single part forms, use 15 to 20 lb bond (20 lb for improved forms handling).
  - b. For multipart forms use:
    - 2 ply: 15/15 lb bond, 7 lb carbon
    - 3 ply: 15/12/15 lb bond, 7 lb carbon
    - 4 ply: 12/12/12/15 lb bond, 7 lb carbon
    - 5 ply: 12/12/12/12/15 lb bond, 5 lb carbon  
(up to four copies in addition to the original can be used)
  - c. Form width must be:
    - 3 1/2 in. (8.9 cm) minimum.
    - 13 1/2 in. (34.3 cm) maximum (edge-to-edge).
4. Fastening of multipart forms:
  - a. Improved multipart paper handling can be achieved with glued margins.
  - b. Multipart forms must otherwise be fastened with crimps every two inches (5.1 cm) along both edges of the forms. NCR or other specialty paper can be fastened up to four parts of the form length.
  - c. Crimp must not come closer to the fanfold than 0.50 in. (1.27 cm).
  - d. Each crimp must have four prongs, two to enter both form and carbon and two to enter forms only. Card stock should be tested first.
5. Forms thickness:
  - a. Maximum in the print area: 0.018 in. (0.046 cm) (allows for four 12-lb, one 15-lb and four 7-lb carbon parts).
  - b. Over crimps in the pin-feed margin: 0.030 in. (0.076 cm).

6. Sprocket holes:
  - a. Must run along both margins  $0.25 + .03$  in. ( $0.635 + 0.076$  cm) from paper edge to the hole center lines.
  - b. Distance between hole centers along the margins must be  $0.5 + 0.005$  in. ( $1.27 + 0.013$  cm) non-accumulative in any 5 in. ( $12.7$  cm) length.
  - c. Hole diameters must be  $0.156 + 0.005$  in. ( $0.396 + 0.013$  cm). The two top and bottom drive holes on each sheet (four per sheet) can be up to 0.200 in. (0.508 cm) in diameter to permit post or ring binding of output.
  - d. Distance between hole centers across the sheet must be uniform within 0.015 in. (0.038 cm) to a maximum of  $12 \frac{5}{16}$  in. (31.27 cm).
7. When using forms with wide and narrow copies in the same set, the top copy should always be the fullest width.
8. For pre-printed forms:
  - a. Pin-hole center to left side of left-most character cannot be less than  $\frac{3}{8} + \frac{1}{16}$  in. ( $1.0 + 0.2$  cm).
  - b. Pin-hole center to right side of last character cannot be less than  $\frac{3}{8} + \frac{1}{16}$  in. ( $1.0 + 0.2$  cm).

# PREVENTIVE MAINTENANCE INFORMATION

## MAINTENANCE

It is recommended that your equipment be serviced quarterly. A Maintenance Agreement is available to assure this servicing automatically. If no Maintenance Agreement is acquired, any servicing must be arranged for by the customer. A Maintenance Agreement protects your investment and offers the following benefits:

**Preventive Maintenance:** Your equipment is inspected quarterly for worn parts, lubricated, cleaned and updated with engineering changes, if any. Preventive maintenance minimizes "downtime" by anticipating repairs before they are necessary.

**Fixed Annual Cost:** When you buy a maintenance agreement, you issue only one purchase order for service for an entire year and receive one annual billing; more frequent billing can be obtained, if desired.

Further information regarding Maintenance Agreements can be acquired from your local Sales Service Office.

### NOTE:

Wang Laboratories, Inc. does not guarantee or honor maintenance agreements for any equipment modified by the user. Damage to equipment incurred as a result of such modification becomes the financial responsibility of the user.

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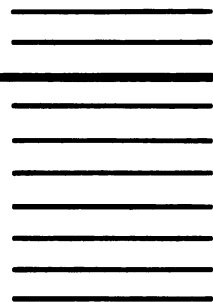


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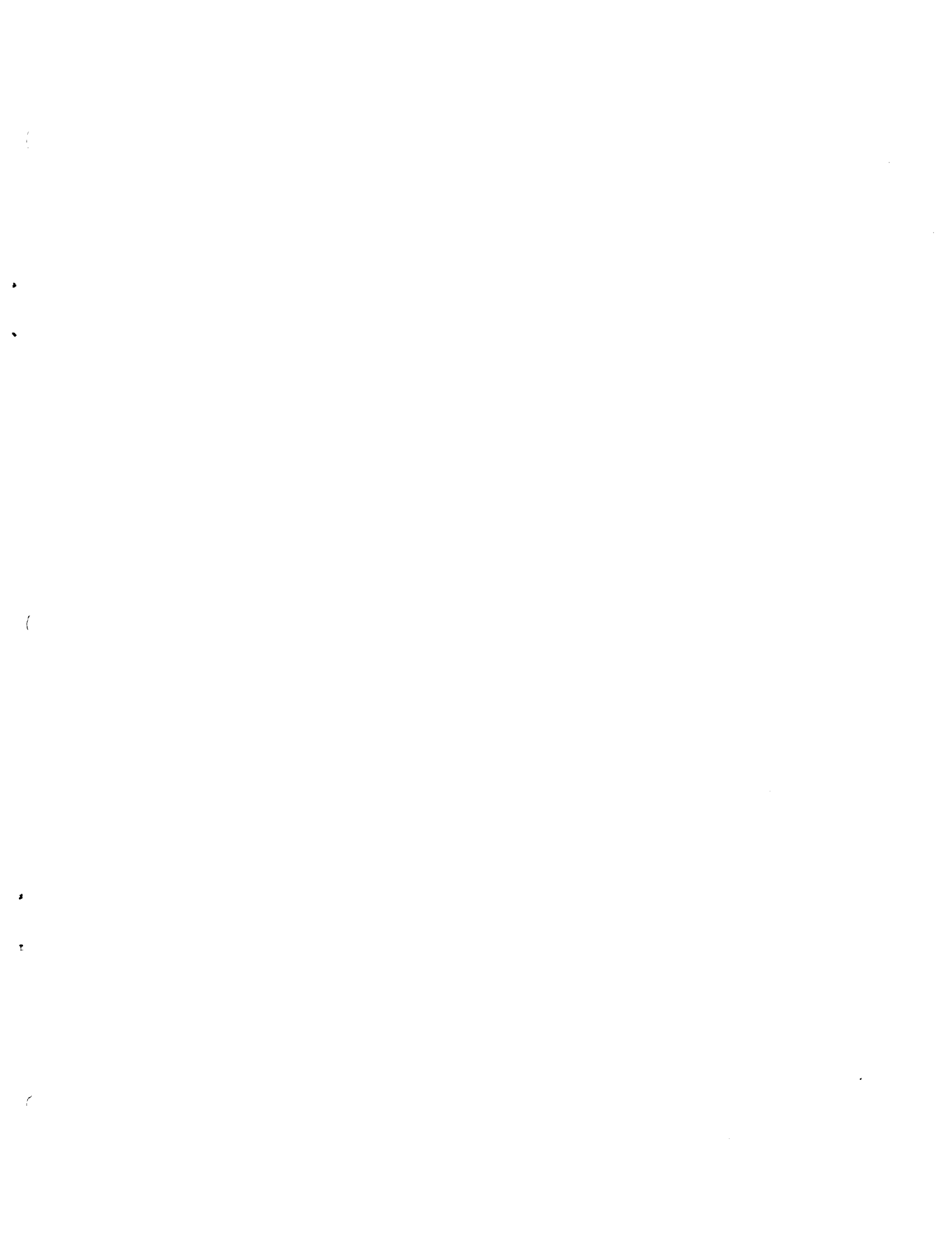


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