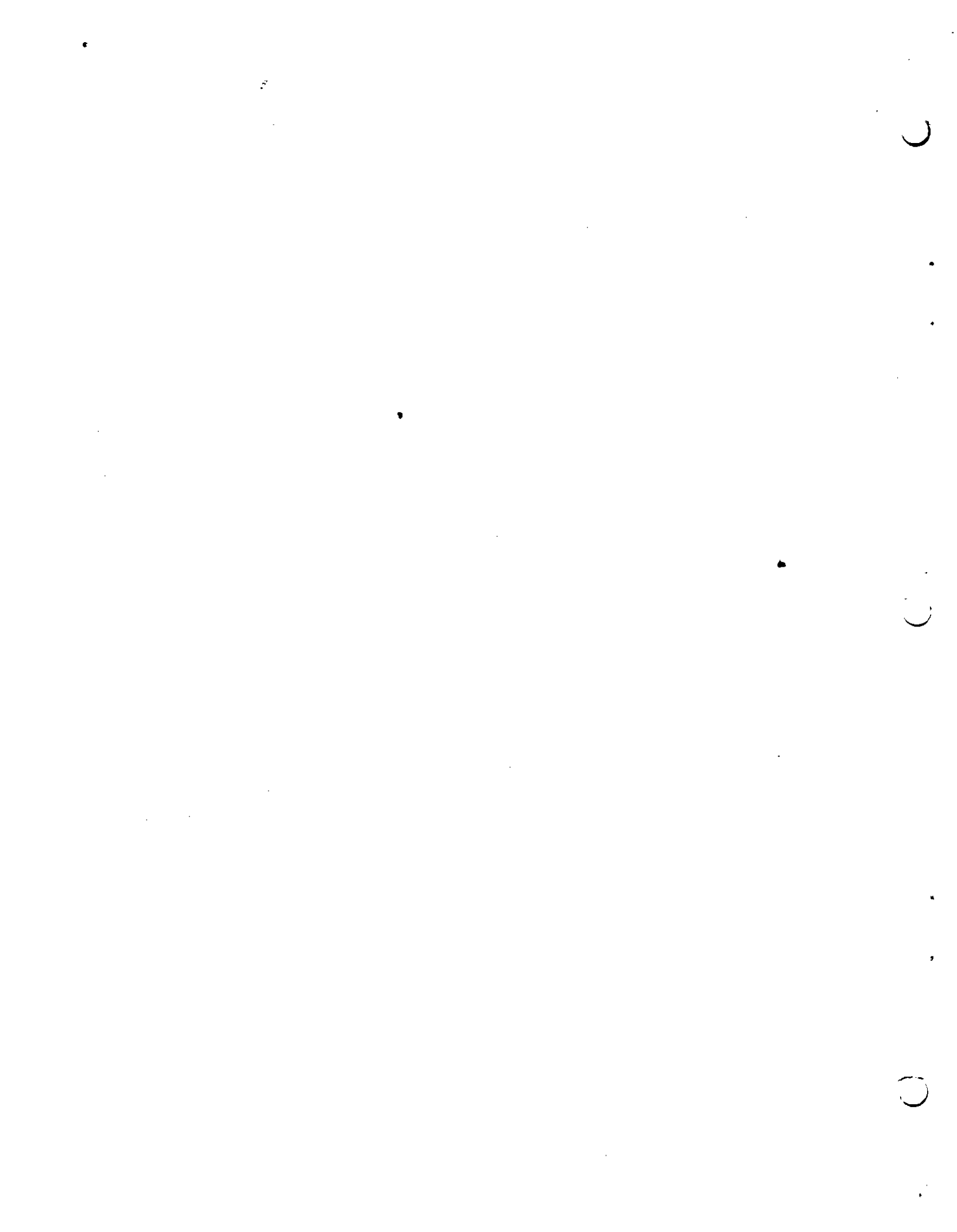


WANG

**Model 2273
Band Printer
User Manual**





Model 2273 Band Printer User Manual

© Wang Laboratories, 1979



LABORATORIES, INC.

ONE INDUSTRIAL AVENUE, LOWELL, MASSACHUSETTS 01851. TEL. (617) 459-5000. TWX 710 343-6769. TELEX 94-7421

Disclaimer of Warranties and Limitation of Liabilities

The staff of Wang Laboratories, Inc., has taken due care in preparing this manual; however, nothing contained herein modifies or alters in any way the standard terms and conditions of the Wang purchase agreement, lease agreement, or rental agreement by which this equipment was acquired, nor increases in any way Wang's liability to the customer. In no event shall Wang Laboratories, Inc., or its subsidiaries be liable for incidental or consequential damages in connection with or arising from the use of this manual or any programs contained herein.



LABORATORIES, INC.

ONE INDUSTRIAL AVENUE, LOWELL, MASSACHUSETTS 01851. TEL. (617) 459-5000, TWX 710 343-6769, TELEX 94-7421

HOW TO USE THIS MANUAL

The Model 2273 Band Line Printer User Manual provides instructions regarding the operation of the Model 2273 Band Line Printer. It is designed for users who are already familiar with the available Wang 2200 System and its BASIC language.

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

The text has been divided into several chapters covering all the operational features of the Band Line Printer. Chapter 1 contains general information about the Printer. Chapter 2 describes device selection and the SELECT statement. Chapter 3 demonstrates how to format printed output. Chapter 4 describes the Vertical Format Unit and various methods of vertical formatting using HEX codes, the Forms Length Selector, and the Direct Access Vertical Format Unit. Hexadecimal codes, the available character sets, maintenance information, and specifications are collected in the appendices.

TABLE OF CONTENTS

CHAPTER 1	GENERAL INFORMATION	
1.1	Introduction	1
1.2	Unpacking and Inspection	3
1.3	Installation	3
1.4	System Turn-On Procedure	3
1.5	2273 Controls and Interlocks	4
1.6	2273 Turn On and Turn Off Procedures	8
1.7	Ribbon Replacement	10
1.8	Band Replacement	11
1.9	Paper Insertion	13
1.10	Print Adjustment	14
1.11	Status Indicator	16
CHAPTER 2	DEVICE SELECTION	
2.1	The SELECT Statement	20
2.2	Device Type Codes	21
2.3	SELECT PRINT	22
2.4	SELECT LIST	24
2.5	SELECT CO (Console Output)	25
2.6	Line Length	25
2.7	Combined Parameters	27
2.8	\$OPEN and \$CLOSE Statements	27
2.9	Deselecting the Model 2273	28
CHAPTER 3	HORIZONTAL FORMATTING	
3.1	PRINT, PRINTUSING, HEXPRINT and HEXOF Operations	29
3.2	The TAB Function	32
CHAPTER 4	VERTICAL FORMAT CONTROL	
4.1	Introduction	33
4.2	Twelve-Channel Vertical Format Unit	33
4.3	Formatting Using the Forms Length Selector	36
4.4	Formatting Using the Direct Access Vertical Format Unit	37
APPENDICES		
Appendix A	Hexadecimal Codes	43
Appendix B	Bit Patterns Represented by Hex Digits	44
Appendix C	Specifications	45
Appendix D	Paper Specifications	46
Appendix E	Ribbon Selection	48
Appendix F	Maintenance and Cleaning	49
INDEX		51

CHAPTER 1 GENERAL INFORMATION

1.1 INTRODUCTION

This manual introduces users to the characteristics and operations of the Model 2273 Band Line Printer (see Figure 1-1). The Model 2273 is a solid-character impact printer available in two models: the Model 2273-1, providing nominal throughput of 250 lines per minute in 10- or 15-pitch, and the Model 2273-2, providing nominal throughput of 600 lines per minute in 10-pitch. Each horizontal line contains 132 print columns; six or eight vertical lines may be printed per inch. Bands presently are available in three different character sets and a variety of type styles. Each character set band is accompanied by its own Programmable Read Only Memory (PROM) chip, which controls the character sequence for the particular band. A buffer receives a complete line of data transmitted from the system CPU to the Printer. Direct Access Vertical Formatting allows the user to control vertical tabs and spacing on special forms. The Forms Length Selector enables the user to manually select the form length. A digital readout diagnostic status indicator helps the user to locate printer problems by displaying error codes, which can be referenced by a table located inside the Printer's hood. Continuous-form paper 3 to 16 inches (7.62 to 40.6 cm) wide can be used with the Printer since the distance between the pinfeed mechanisms is continuously adjustable. The COPIES control allows printing on single or multi-part forms, by enabling the user to adjust hammer pressure upon the forms.



Figure 1-1. Model 2273 Band Printer

1.2 UNPACKING AND INSPECTION

When you receive your equipment, be sure to notify your Wang Service Representative, who will then unpack and set up your Printer. Failure to notify your Wang Service Representative will void your warranty. In the future, your Service Representative will also maintain your system with the latest updates and revisions.

1.3 INSTALLATION

To install your Printer, your Wang Service Representative follows this procedure:

1. The Printer Controller Board is installed in the CPU chassis of your system. 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 into the printer output connector on the back of Wang terminals that have that capability).
3. The power cord from the Band Line Printer must be plugged into a wall outlet (see power requirements in Appendix B).

1.4 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 the 2200 System CPU.
2. Turn on all power switches. At turn-on, the system is Master Initialized, 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).

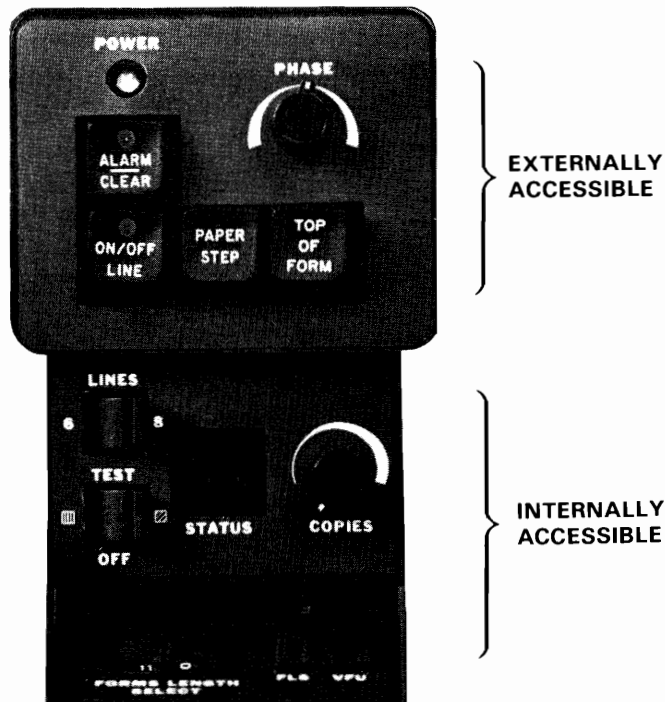


Figure 1-2. Control Panel

1.5 2273 CONTROLS AND INTERLOCKS

The control panel on the right-hand side of the Printer contains switches, buttons, lamps, and a digital readout status indicator for controlling manual operations of the Printer. Figure 1-2 is a labelled illustration of the control panel. Note that certain controls are externally accessible while others can only be accessed by opening the printer cover.

1.5.1 Controls, Switches, and Indicators

POWER ON Indicator

This lamp illuminates when power is ON.

ON/OFF LINE Switch/Indicator

Touching this switch alternately places the Printer online and offline. In an online condition, the 2200 System is able to communicate with the printer, and the lamp on the ON/OFF LINE switch is illuminated. In an offline condition, the user may change paper, ribbon, and band, and set up the test for print registration.

ALARM/CLEAR Switch/Indicator

This switch illuminates during power up or whenever a fault condition occurs. Any alarm condition is displayed by the STATUS indicator.

PAPER STEP Switch

Touching this switch causes the paper to advance one print line. Before the PAPER STEP switch is actuated, the Printer must be taken offline. The switch is disabled while the printer is online.

TOP-OF-FORM Switch

Touching this switch advances the paper to the first print position of the next form. Like the PAPER STEP switch, the TOP-OF-FORM switch only operates when the Printer is offline. An on-line condition will disable the switch.

PHASE Control

This control is used to maintain equal printing density on both the left and right side of the characters. Proper phasing can be achieved most effectively by running the test for print registration. Testing is described in detail in Section 1.10, Print Adjustment.

LINES PER INCH Switch

This switch has two positions that enable the user to select either 6 or 8 vertical lines per inch printing density.

TEST Switch

This three-position switch activates the Printer's self-testing capabilities. Two types of tests may be printed. Moving the switch to the right selects a 132-column diagonal sliding pattern containing the entire character set; moving the switch to the left causes the printing of a pattern of the letter H in fixed vertical columns. The center or OFF position disables the self-test function. More information about the TEST switch can be found in Section 1.10, Print Adjustment.

STATUS Indicator

This indicator is an alphanumeric display showing printer status. Fault conditions are explained in a table on the inside of the printer hood or in Section 1.11, Status Indicator, of this manual.

COPIES Control

This variable control allows printing on single or multi-part forms, by controlling the pressure of the hammers. As the COPIES control is moved from left to right, the pressure on the form becomes lighter. For maximum ribbon, hammer, and character band life, the lowest possible setting that gives a clear printout should be used.

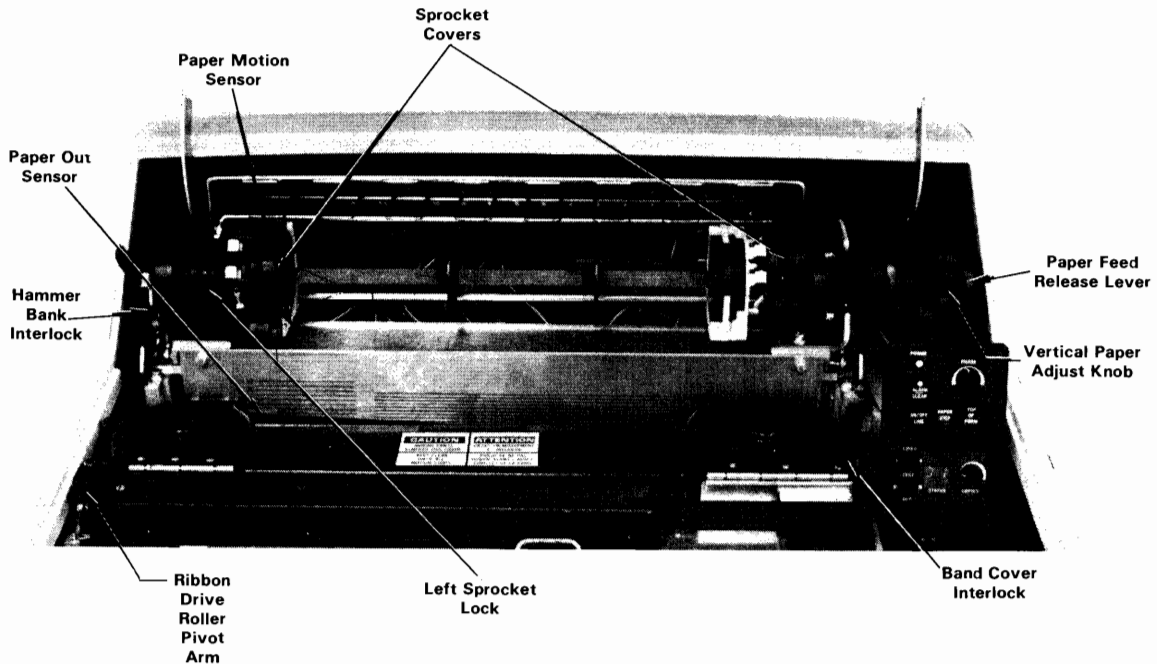


Figure 1-3. The Model 2273 Band Line Printer Controls and Interlocks

VFU/FLS Switch

This switch allows the operator to indicate whether vertical formatting will be accomplished by the Forms Length Selector or supplied by a program in the Vertical Format Unit.

FORMS LENGTH SELECTOR Switches

These thumbwheel switches enable the operator to manually supply the printer with the desired forms length.

1.5.2 Paper Controls

The following paper controls are used when loading the Printer:

Sprocket Covers

The sprocket covers (right and left) open to reveal the pin feed mechanisms, upon which forms are secured.

Paper Feed Release Lever

This lever controls the paper feed motor. Paper is fed automatically through the sprockets when the lever is in the run position, with the numeral "1" visible. When the lever is adjusted so the numeral "0" is visible, the motor is disengaged, thereby allowing manual operation of the vertical paper adjust knob.

Vertical Paper Adjust Knob

This knob rotates the drive shaft upon which the right and left sprockets are mounted. When the paper feed motor is disengaged, the vertical paper adjust knob can be operated manually.

Sprocket Locks

Sprocket locks control the horizontal movement of the sprockets along the drive shaft. Squeezing the locks moves the sprockets to accommodate a particular form width.

1.5.3 Printer Interlocks

Printer interlocks detect the existence of the various error conditions that impede the operation of the Printer. When any of these conditions arise, the appropriate error message is displayed on the status indicator.

Paper Out Sensor

This interlock detects the end of the last form and causes the error code 01, paper supply low, to be displayed.

Paper Motion Sensor

The paper motion interlock detects paper moving through the sprockets. If there is a loss of motion for a maximum of eight lines, the error code 02, paper motion fault, will be displayed.

Band Cover

This interlock senses the character band cover is closed. When the cover hasn't been properly closed, the error code 03, band cover open, is displayed.

Hammer Bank

This sensor detects the hammer bank is unlatched, and causes the error code 04, hammer bank not closed, to be displayed.

1.6 2273 TURN ON AND TURN OFF PROCEDURES

Before the Printer is powered up, it should be properly loaded with paper, ribbon, and band. The TEST switch should be in the OFF position, and all covers and latches closed. Sections 1.7, 1.8, and 1.9 describe in detail how to load a character band, ribbon, and paper.

1.6.1 Printer Power Up

To power up the Printer, perform the following steps:

1. Move the power switch to the ON position. The POWER ON lamp should illuminate at this time.
2. Allow three seconds for the ALARM/CLEAR lamp to extinguish. If it remains illuminated, check the status indicator for an error code, and, if possible, correct the condition.
3. Open the cover door. Determine whether vertical formatting will be handled by the Forms Length Selector (FLS) or Direct Access Vertical Format Unit (DAVFU). (See Chapter 4 for a full discussion of vertical formatting.) Set the VFU/FLS to the unit selected.
5. Press the TOP-OF-FORM switch to ensure that printing will begin at the desired starting location.
6. Verify that the ON/OFF LINE lamp is illuminated.

1.6.2 Printer Shut Down

The following steps should be taken to power down the printer:

1. Check the status of the ON/OFF LINE switch. If the lamp remains illuminated after the ON/OFF LINE switch is depressed, the print buffer still contains unprinted data. If shutdown operations are continued at this point, the unprinted data will be lost. A carriage return code--HEX(OD)--must be issued from the central processor to cause the printing of the remaining data.
2. Place the Band Printer's POWER switch to the OFF position, ensuring that the power lamp is extinguished. At the end of this procedure, the Printer is no longer operational.

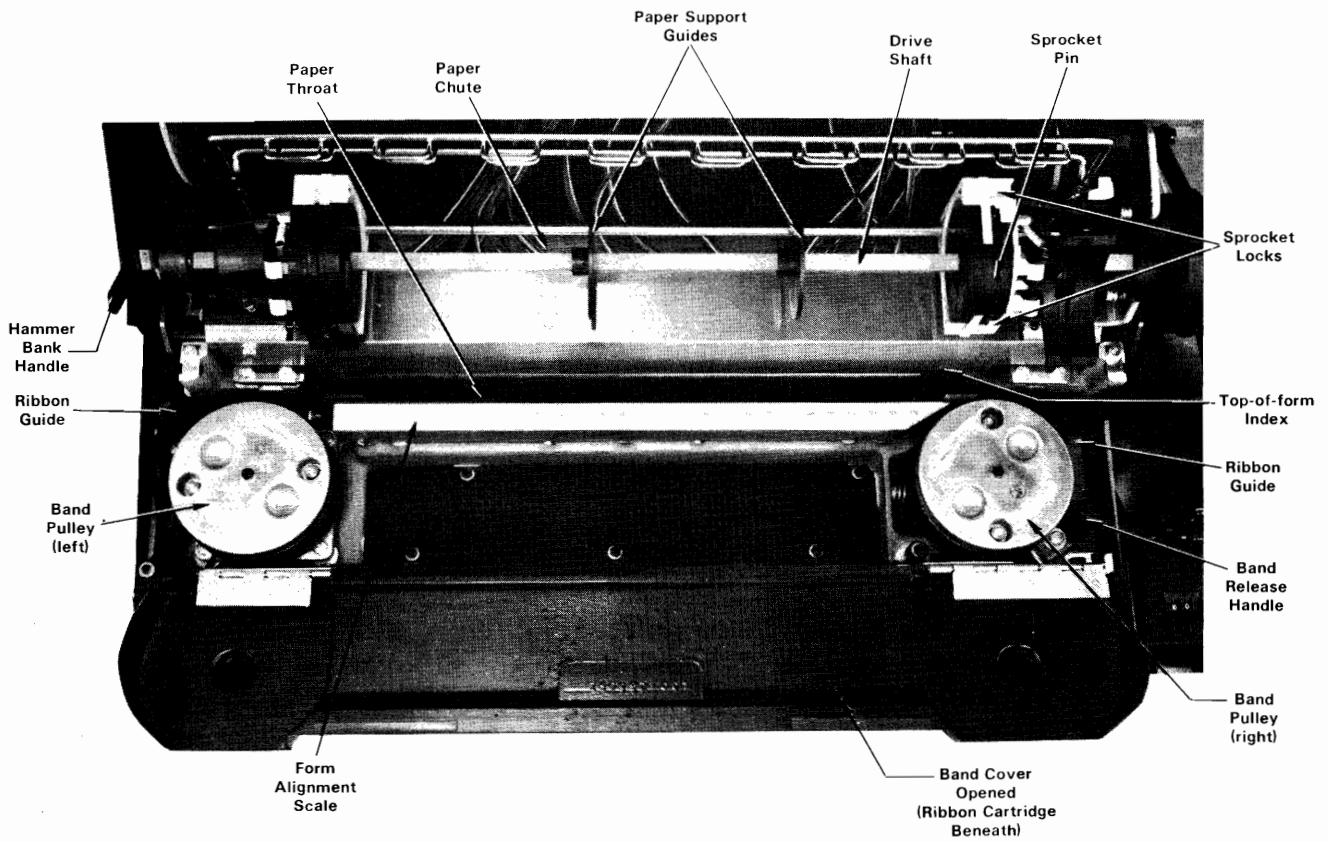


Figure 1-4. Model 2273 Band and Ribbon Placement

1.7 RIBBON REPLACEMENT

The following instructions explain how to remove and insert a ribbon cartridge. (A diagram illustrating these instructions can be found inside the Printer hood.):

1. Before performing any operation, make sure the Printer is offline.
2. Raise the printer cover. Open the hammer bank by lifting the plastic-covered hammer bank handle, located beside the left-hand sprocket cover. This releases the hammer bank latch and moves the hammer bank away from the ribbon cartridge.

1.7.1 Ribbon Removal

To remove a ribbon cartridge, perform the following actions:

1. Swing open the ribbon-drive roller pivot arm.
2. Grasp the ribbon cartridge, sliding it approximately 1-1/2 inches to the right, and then removing it from the Printer.

1.7.2 Ribbon Installation

The following steps should be taken to install a new ribbon cartridge:

1. Remove the new ribbon cartridge from its packaging, setting aside the towelette for clean up after the ribbon is installed.
2. To insert the ribbon cartridge, first make sure the two semicircular grooves, indentations for the pivot arm and ribbon drive roller, are on the left-hand side. Then place the cartridge over the two locating buttons.
3. Open the pivot arm, threading the ribbon between the pivot arm roller and the ribbon drive roller, and then around the first ribbon guide. Close the pivot arm.
4. Increase the tension in the ribbon lightly, leaving extra slack on the right side of the cartridge. Slide the cartridge to the left until it locks into place, and then close the ribbon drive roller pivot arm.
5. Thread the ribbon through the second, third, and fourth ribbon guides and between the two plastic flaps that appear behind the ribbon cartridge. The ribbon should be positioned over the band.
6. Spin one of the pulleys by hand in a counterclockwise direction until the ribbon is taut.
7. Lower the hammer bank handle, thereby locking the hammer bank into place, and close the printer cover.

1.8 BAND REPLACEMENT

The character set of the Model 2273 Band Line Printer is contained on an easily removable steel band, controlled by its own PROM (Programmable Read-Only Memory) chip. PROMs must be installed by an authorized Wang Field Service Representative. The printer may contain up to three different PROMs, corresponding to the three available character sets: 48-character, 64-character, and 96-character. The following samples illustrate each character set:

48-character

ABCDEFGHIJKLMN OPQRSTUVWXYZ 0123456789 !#\$%&'*+,-./:;<=>?@[\]^_`{|}~

64-character

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

96-character

ABCDEFGHIJKLMN OPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
0123456789 !"#%&'()*+,-./:;<=>?@[\]^_`{|}~

Two band styles are offered, each suitable for certain printing requirements. They are:

a. Utility Band

This particular band is designed for printing applications that require a mix of alphanumeric characters and some special characters. It prints at a nominal speed of 250 lines per minute. All characters are repeated at least three times on the band. The Utility Band is available in 10- and 15-pitch.

b. 96-character Upper/Lowercase Band

This band contains 96 characters, including both upper/lowercase alphabetic characters, as well as the largest selection of special characters offered for the Model 2273. Since repetition of characters is not as frequent as on the Utility Band, print speed is diminished somewhat when the 96-character Band is used.

The procedures for removal and insertion of character bands are explained on the next page. Note that a band will not be accepted unless its corresponding PROM is already resident in the Printer. Before carrying out these procedures, make sure the ribbon cartridge is properly installed. Place the Printer offline, raise its cover, and disengage the hammer bank latch by lifting up the hammer bank handle.

1.8.1 Band Removal

Before removing the band, it may be convenient to remove the ribbon cartridge, following instructions in Section 1.7. To actually remove the band, carry out the following procedures:

1. Open the band cover. Decrease band tension by moving the band release handle that extends from the right-hand pulley.
2. Hold the band with your left hand, using the right hand to carefully lift the band from the right pulley. Be careful not to bend the band to a curve smaller than that of the pulleys.
3. Squeeze the sides of the band together at the center so that it resembles an "8." Lift it off the left pulley and remove it from the Printer.

1.8.2 Band Insertion

Perform the following steps to insert a new band:

1. With print characters facing outward, place the band in position by first resting its right end on top of the right pulley.
2. Place the left end of the band around the left pulley and carefully insert it between the ribbon mask and the forms alignment scale.
3. Holding the band in position, slide its right end over the right pulley, and carefully position it between the band sensor and the pulley.
4. Slide the band down the right pulley until the bottom edge of the band rests on the edge guide bearing, a grooved, rotating disk located beneath the pulley.
5. Move the band release handle forward until it is in the locked position.
6. Spin either pulley by hand in a counterclockwise direction until the band is properly secured in the groove of the edge guide bearings.
7. Insert the ribbon cartridge, following the instructions given in Section 1.7.
8. Close the band cover, and then lower the hammer bank handle to the locked position. Close the printer cover and return the printer to on-line status.

1.9 PAPER INSERTION

Before loading paper, be sure that the ribbon cartridge and character band are properly installed. If the paper has run out during printing, the Printer must be brought offline, before loading paper, to prevent the loss of data. Raise the Printer cover, and then perform the following operations:

1. Press the TOP-OF-FORM switch indicator to ensure that printing will begin in the desired top-of-form location once the paper is successfully loaded.
2. Grasp the paper feed release lever attached to the paper adjust knob, located next to the right-hand sprocket cover. Pull the lever toward the right, so that the red numeral zero is visible.
3. Open the hammer bank by lifting the plastic-covered hammer bank handle located beside the left-hand sprocket cover. This releases the hammer bank latch and moves the hammer bank away from the band.
4. Position the sprockets to the approximate width of the form by squeezing the sprocket locks and sliding the sprockets along the drive shaft.
5. Move the paper support guides on the sprocket drive shaft an equal distance between the sprockets.
6. Spring open both sprocket covers, uncovering the sprocket pins.
7. Place continuous-form pin-feed paper, either stacked or contained in an open carton, beneath the Printer. From underneath, pull the paper through the paper throat between the hammer bank and the band, and then onto the sprocket pins and up into the paper exit chute. If the forms are fed from a carton, be sure the flaps or ragged edges on the carton do not snag the forms.
8. Align the form feed holes in the right margin over the right side sprocket pins and close the right side sprocket cover.
9. Squeezing the right sprocket lock, slide the right sprocket along the drive shaft until the left margin form feed holes are aligned with the left sprocket pins.
10. Close the left sprocket cover, ensuring that the form is not skewed on the sprockets.
11. To determine horizontal positioning of text on paper, simultaneously squeeze both sprocket locks, and then slide the form to the left or right until the first print column is reached. Be careful not to over-increase tension in the form. Too much tension is indicated by elongation of the form feed holes.

12. To determine vertical positioning, refer to the top-of-form index, a scale which indicates the vertical position upon which the first line of print will appear. Rotate the paper adjust knob to line up the paper perforation with a particular number on the top-of-form index, for example, 6. The first printed line will then appear six vertical spaces down from the top-of-form perforation.
13. Lower the hammer bank handle, moving the hammer bank forward. Make sure that the handle is in the locked position, as far down as possible.
14. Swing the paper feed release lever up, to the run position, so that the green numeral 0 is visible.
15. Close the printer cover.
16. Press the ALARM/CLEAR switch, causing the ALARM/CLEAR indicator lamp to extinguish.

1.10 PRINT ADJUSTMENT

The Model 2273 Band Line Printer is equipped with a number of controls for achieving proper print registration. Three control indicators, TEST, PHASE, and COPIES, allow the user to test and control proper phasing, and control hammer pressure when using multi-part forms. Knowledge of these indicators, plus other troubleshooting factors, will enable the user to provide print clarity for all documents.

Three print registration problems that often occur are simple to correct. They are:

- a. Left or right portions of all characters missing.

This condition indicates that the PHASE and COPIES controls settings need to be readjusted.

- b. Smeared characters.

This condition indicates that the band may be dirty, the ribbon too "wet," or the paper quality may be poor.

- c. Carbon copies too light or too dark.

This may be caused by improper COPIES control adjustment, poor quality ribbon, too many copies, or paper that is too stiff.

The TEST switch located on the control panel enables the user to perform diagnostic tests for print quality. Before attempting print testing and adjustment, the user should make sure all interlocks are closed, and the Printer is properly loaded with paper, ribbon, and character band. To run a test printout, first power up the printer, open the printer cover, and select either 6 or 8 inches from the LINES PER INCH switch. Carry out the following procedures to obtain the actual test printout:

1. Press the TOP-OFF-FORM button, causing the paper to move to the top position of the next form.
2. Select the sliding (diagonal line) test pattern by moving the TEST switch to the right.
3. Press the ON/OFF LINE switch, taking the Printer offline. The test printout will begin by printing the entire character set of the currently mounted band. It should be allowed to run a sufficient amount of lines to determine vertical and horizontal registration.
4. To halt printing, press the ON/OFF LINE switch. Check the printout, ensuring that all characters are legible and all columns contain a printed character.
5. Move the TEST switch to the left, selecting the fixed character (vertical line) pattern. This causes the printing of the character H in every horizontal print position. Ideally, each character should be of equal print density on both its right and left side. The fixed character pattern enables the user to judge letter clarity and adjust character uniformity by using the PHASE control.
6. Press ON/OFF LINE to begin the next print cycle. While printing is in progress, adjust the PHASE control for proper registration. Clockwise movement will cause increased density to the right side of the character. (The letter H is a well suited for this type of test. Properly phased, both sides of the H will have equal density, with the center bar touching both sides).

The ability to regulate the printing force of the hammers enables the Model 2273 Band Line Printer to print evenly through multiple forms. Continuous form purchase orders and other multiple copy documents can be handled with ease by using the COPIES control. To adjust the COPIES control, perform the following procedures:

1. Start the test print cycle, selecting the fixed character pattern.
2. Set the COPIES control to the lowest setting that allows the best print quality for the number of forms being printed. To increase hammer pressure, adjust the control by moving it slightly to the right.
3. Momentarily press the ON/OFF LINE switch to stop the print cycle.
4. Set the TEST switch to the center (or off) position and close the Printer cover.

1.11 THE STATUS INDICATOR

The Model 2273 Band Line Printer contains a diagnostic status indicator located on the control panel. When the Printer is forced offline, an alphanumeric error code is displayed, informing the user of the problem at hand.

Table 1-1 defines each possible error code and the action necessary to correct the fault. Each error is listed by status symbol, condition, corrective action, and possible means of clearing the Printer. Actions 1, 2, and 3, defined immediately below, are suggested methods for clearing the problem indicated on the status display:

- 1 = Press ALARM/CLEAR switch.
- 2 = Correct fault.
- 3 = Shut down and power up. If fault persists, call service personnel.

Table 1-1.
Status Indicator Codes

STATUS DISPLAY	DEFINITION	CORRECTIVE ACTION	CLEARED BY
01	Paper supply low	Reload paper.	1
02	Paper motion fault	Ensure paper movement.	1
03	Band cover open	Close band cover.	1
04	Hammer bank not closed	Close and latch hammer bank.	2
05	Undefined character band loaded	Band must be changed to be PROM-compatible.	1
06	Ribbon motion fault	Check ribbon. Re-thread or replace, if necessary.	2
08	Undefined form length selected	Reset FLS thumbwheel.	2
10	Memory not loaded	Press TCVFU tape load switch.	1
11	Tape reader jam	Check for torn or damaged tape.	1

Table 1-1.
Status Indicator Codes (Cont.)

STATUS DISPLAY	DEFINITION	CORRECTIVE ACTION	CLEARED BY
12	No TOF from tape	Check tape for proper TOF location. Tape Channel One.	1
13	Tape too long	Punch new tape with less than 144 lines.	1
14	Channel not found	Check tape punched hole locations.	1
15	Unable to read tape	Check tape for proper installation.	1
16	Single step mode	Call service personnel.	3
17	Loss of print sync	RESET 2200.	1
20	Data unprintable	Data error	1
21	Off line - Print inhibit	Call service personnel.	3
22	Interlock cable error	Call service personnel.	3
23	Parity error	Data error	1
24	Eight consecutive carriage returns	Data error	1
25	Format code error	DAVFU program error	1
26	DAVFU stop code error	DAVFU program error	1
27	DAVFU data greater than 126 lines	DAVFU program error	1
28	VFU check sum error	Data error	1
29	I/O parity error DAVFU load	Data error	1
30	VFU memory check error	Data error	1

Table 1-1.
Status Indicator Codes (Cont.)

STATUS DISPLAY	DEFINITION	CORRECTIVE ACTION	CLEARED BY
31	DAVFU data load error	DAVFU program error	1
32	Vertical skip code (HEX(1F)) received while in FLS mode	Switch to VFU mode.	1
40	Band speed fault	Call service personnel.	3
41	Paper drive system fault	Call service personnel.	3
42	Hammer system fault	Call service personnel.	3
44	12 volt fault	Call service personnel.	3
45	-9 volt fault	Call service personnel.	3
46	VCL fault	Call service personnel.	3
47	+38 volt fault	Call service personnel.	3
48	Transducer fault	Call service personnel.	3
49	Band current fault	Call service personnel.	3
50	System status fault	Call service personnel.	3
60	Failure Mode - start motor	Call service personnel.	3
66	Self Test - print inhibit	Call service personnel.	3
67	Self Test	Place test switch to OFF.	1
68	DAVFU load routine	Normal indication.	
76	ON Line - print inhibit	Call service personnel.	3
77	ON Line	Normal indication.	
88	OFF Line - ready	Press ON/OFF LINE switch.	

Table 1-1.
Status Indicator Codes (Cont.)

STATUS DISPLAY	DEFINITION	CORRECTIVE ACTION	CLEARED BY
P	Power fault	Call service personnel.	3
H	HOT condition	Call service personnel.	3
C	Clock fault	Call service personnel.	3

CHAPTER 2
DEVICE SELECTION

2.1 THE SELECT STATEMENT

The SELECT statement must be used by a programmer 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 2273, the syntax of the SELECT statement requires that it contain the BASIC word PRINT, LIST or CO, a Device Type and a Unit Address Code. Line length can also be specified. Each of these SELECT parameters is described in the following paragraphs.

Example:

```
100 SELECT PRINT 215 (132)
      Device Type—|
      Unit Address—|
      Line Length—|
```

If Line Length is not specified in a SELECT statement, the line length initially defaults to 80, the standard width of the CRT. In a system with a 64-column CRT, the line length defaults to 64. Pitch does not affect line length as specified in the SELECT statement. However, when the Model 2273 Band Line Printer is used, the line length should not exceed 132 characters.

2.2 DEVICE TYPE CODES

Every peripheral attached to a Wang 2200 System is assigned a three-character 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. Since the Model 2273 automatically executes a line feed (i.e., advances the paper to a new line) following the execution of a carriage return, it is usually selected with a device type of 2 (See device types as follows). Generally, carriage return commands are initiated from the 2200 System CPU. Characters are not printed one by one as they are received from the CPU. Each character is stored in a print buffer until the CPU directs the Printer to print the line with a carriage return code. The Printer automatically prints the characters in the buffer and performs a line feed at the end of a full character line (132 characters).

Type	Operation
0	This Device Type addresses devices that do not automatically execute a line feed after a carriage return; therefore with Device Type 0, the Wang system CPU supplies a line feed after each system-generated carriage return. When this Device Type is selected for the Model 2273, output which is normally single-spaced will be double-spaced.

Example:

```
:SELECT PRINT 015(132)
:10 FOR J = 1 TO 5
:20 PRINT "HAVE TICKETS READY WHEN BOARDING"
:30 NEXT J
:RUN (EXECUTE)
```

Output:

```
HAVE TICKETS READY WHEN BOARDING
HAVE TICKETS READY WHEN BOARDING
HAVE TICKETS READY WHEN BOARDING
HAVE TICKETS READY WHEN BOARDING
HAVE TICKETS READY WHEN BOARDING
```

2	This Device Type 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.
---	--

Example:

```
:SELECT PRINT 215
:10 FOR I = 1 TO 5
:20 PRINT "I am he as you are me as you are we and we are all
      together"
:30 NEXT I
:RUN (EXECUTE)
```

Output:

```
I am he as you are me as you are we and we are all together
I am he as you are me as you are we and we are all together
I am he as you are me as you are we and we are all together
I am he as you are me as you are we and we are all together
I am he as you are me as you are we and we are all together
```

The unit address (yy) for the Model 2273 Printer is determined by the address setting on the printer controller to which the printer is attached. Normally, the Model 2273 Printer Controller is preset to address 15 by Wang Laboratories before the unit is shipped, and is therefore the address used in SELECT statements used with the Printer. If a second Wang printer is connected to the same CPU, it is assigned unit address 16 by a Wang Service Representative. If the printer is attached directly to a 2236D type terminal, the unit address is fixed at 04. For the sake of uniformity, device address 15 is used in all further examples in this manual.

2.3 SELECT 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, and HEXPRINT statements. Printout resulting from PRINT statements entered in the Immediate Mode appear on the CRT unless the Printer is selected for CO (see SELECT CO 215).

NOTE:

When the system is first turned on, PRINT operations are displayed on the CRT, the primary or default 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. The Printer must be online in order to receive this information.

Example:

```
:10 SELECT PRINT 215(132)      or  :SELECT PRINT 215(132)
:20 PRINT "N", "2 to the Nth"  :20 PRINT "N", "2 to the Nth"
:25 PRINT                      :25 PRINT
:30 FOR N=0 TO 8               :30 FOR N=0 TO 8
:40 PRINT N, 2^N               :40 PRINT N, 2^N
:50 NEXT N                     :50 NEXT N
```

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(132)
:20 X=7:Y=2:Z=.5
:30 PRINT USING 40, X;Y;Z
:40 % ##.#
:RUN (EXECUTE)
```

Output:

7.0 2.0 0.5

Example:

```
:10 SELECT PRINT 215(132)
:15 DIM A$23
:20 A$ = "THE MODEL 2273 PRINTER"
:30 HEXPRINT A$
:RUN
```

Output:

```
54484520404F44454C2032323733205052494E54455230
```

On the 2200VP and 2200MVP, the following line is equivalent to line 30:

```
:30 PRINT HEXOF(A$)
```

2.4 SELECT 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:

In order to use LIST, rekey the first example in Section 2.3. Then key in the following as Immediate Mode statements:

```
:SELECT LIST 215
:LIST
```

The printed output is:

```
10 SELECT PRINT 215(132)
20 PRINT "N", "2 to the Nth"
25 PRINT
30 FOR N=0 TO 3
40 PRINT N, 2^N
50 NEXT N
```

2.5 SELECT CO (CONSOLE OUTPUT)

```
:SELECT CO 215
```

This statement selects the Printer with Device Address 215 for all console output on 2200T or 2200VP systems. This includes all system displays, such as the READY message and 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. Only TRACE output is directed to the printer on 2200MVP systems.

2.6 LINE LENGTH

A maximum number of 132 characters per line can be printed on the Model 2273 in both 10- and 15-pitch. To accommodate various paper widths and special forms of less width, the length of the output line can be varied by installing either a 10- or 15-pitch band, and by specifying the desired line length in parentheses following the Device Type Code in the SELECT statement. The difference in pitch determines the length of the line in inches; a 132 character line printed in 15-pitch is shorter (in inches) than a 132 character line printed in 10-pitch. The SELECT statement determines the number of characters to be contained in a full line in the pitch selected by the user. This code is stored in the CPU and indicates the effective line length of the selected device to the System.

For example:

```
SELECT PRINT 215 (132)      (Selects the Model 2273 for printing and sets
                             line length to 132 characters.)

SELECT LIST 215 (80)       (Selects the Model 2273 for listing programs and
                             sets line length to 80.)

SELECT CO 215 (112)       (Selects the Model 2273 for console output, and
                             sets line length to 112.)
```

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 80 characters (64 characters with a 64-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 the device (132 columns in the case of the Model 2273) is not recommended, for the characters exceeding 132 will wrap around and print on the next line.

The line length setting is used by the Wang 2200 System to generate an automatic carriage return when a line exceeds the specified number of characters or 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 2273, the CPU keeps a count of the number of characters sent. When this line count equals the current value of the line length before the output line is completed, 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.

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). The line count is reset to zero when any one of the following conditions are met:

1. The line count equals the line length.
2. A carriage return is output when a PRINT, PRINTUSING, HEXPRINT, or HEXOF 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.

The following example illustrates the automatic carriage return generated by the selected line length. With the following program in memory (note line length is set to 5):

```
:10 SELECT PRINT 215(5)
:20 PRINT "THIS IS A SAMPLE OF THE MODEL 2273 BAND LINE PRINTER OUTPUT"
```

the following output is produced at execution time:

```
THIS
IS A
SAMPL
E OF
THE M
ODEL
2273
BAND
LINE
PRINT
ER OU
TPUT
```


2.7 COMBINED PARAMETERS

It is possible to combine parameters in a SELECT statement.

Example:

```
SELECT PRINT 215 (100), LIST 215 (80), CO 215 (132)
```

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

Example:

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

produces listing of programs on the CRT only.

2.8 SPECIAL 2200 MVP CONSIDERATIONS: THE \$OPEN AND \$CLOSE STATEMENTS

Printers attached to the 2200MVP CPU are shared by all its users. It is possible to attach the printer directly to a terminal rather than to the Central Processor. Only partitions assigned to that terminal can access the printer. In both cases, this creates a problem should two or more partitions try to print at the same time, for the printer will intermix the output of the users. As a safeguard, the MVP operating system allows each user to request within a program the exclusive use of a printer. By specifying the device address of the printer in a \$OPEN statement, the user can "hog" the printer for the duration of output until either a \$CLOSE or END statement appears within the program or a CLEAR, RESET, or LOAD RUN command is executed from the terminal.

The general form of the \$OPEN statement is:

$$\$OPEN \text{ [line number]}, \left\{ \begin{array}{l} \text{file-number} \\ \text{device-address} \end{array} \right\} \left[\left\{ \begin{array}{l} \text{file-number} \\ \text{device-address} \end{array} \right\} \dots \right]$$

This statement reserves not only printers but also any other type of peripheral with a device address, such as disks, tape drives, telecommunications units, card readers, etc. If more than one device is required by a program, all should be included in a single \$OPEN statement to prevent a possible device contention deadlock. For example, the statement:

```
10 $OPEN 100, /215, /310, /320
```

requests that the line printer at address 215 and the disks with addresses 310 and 320 be opened when the program reaches line 100. If any one of the devices in a \$OPEN statement cannot be opened, then none can be opened. If two users specify the same device with a \$OPEN statement, the first program to execute the statement receives first priority while the other program either waits or branches to other processing.

There are several methods for releasing currently hogged printers and other peripherals. Within a program, the user may insert a \$CLOSE statement at an appropriate point. The general form of the \$CLOSE statement is:

$$\$CLOSE \left[\begin{array}{l} \text{file-number} \\ \text{device-address} \end{array} \left[\begin{array}{l} ,\text{file-number} \\ ,\text{device-address} \quad \dots \end{array} \right] \right]$$

For example, the following \$CLOSE statement releases the peripherals that have been hogged by the sample \$OPEN statement in the previous paragraph.

```
90 $CLOSE /215, /310, /320
```

If no device addresses are included in the \$CLOSE statement, all the devices hogged by the current user's \$OPEN statement will be released. It is also possible to release hogged devices from within a program by inserting an END statement at the termination of program text. Opened devices may also be closed interactively from the terminal, by using the commands CLEAR (with no parameters), RESET, or LOAD RUN.

2.9 DESELECTING THE MODEL 2273

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 power supply OFF, and then ON). Master Initialization selects the CRT for all LIST, PRINT, and CO operations.
3. Execute a CLEAR command 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.

CHAPTER 3
HORIZONTAL FORMATTING

3.1 PRINT, PRINTUSING, HEXPRINT, AND HEXOF OPERATIONS

The PRINT, PRINTUSING, HEXPRINT, and HEXOF operations are used with the Model 2273 in the same manner as they are used with the CRT, although more printing zones are available on the Printer than on the CRT. For instance, the 80-column CRT is divided into five zones of 16 characters each, whereas the Printer can have up to eight zones of 16 characters each.

The Model 2273 Band Line Printer has a line length of 132, whether one is using a 10- or 15-pitch band. Each line is divided into eight zones of 16 characters each and one zone of four 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.

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

Example 1:

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

Output:

```
COLUMNS 0-15      COLUMNS 16-31      COLUMNS 32-47
```

Example 2:

```
:10 REM SKIPPING OVER ZONES WITH COMMAS
:20 SELECT PRINT 215(132)
:30 PRINT "SAMPLE #" ,,, "CONCENTRATION-%"
:40 PRINT 251 ,,, .015
:RUN (EXECUTE)
```

Output:

```
SAMPLE #          CONCENTRATION-%
251              1.50000000E-02
```

Example 3:

```
:10 REM PRINTING WITH SEMICOLONS
:20 SELECT PRINT 215 (132)
:30 A$="'79 DODGE" :B$="OMNI 4 DR"
:40 PRINT "MAKE: "; A$; B$
:RUN (EXECUTE)
```

Output:

```
MAKE:'79 DODGE  OMNI 4 DR
```

Example 4:

```
:10 REM PRINT USING FORMAT
:20 SELECT PRINT 215(132)
:30 A$="4-BEDROOM CAPE" :P=75000
:40 PRINT USING 50, A$, P
:50% ##### PRICE=$##,###
:RUN (EXECUTE)
```

Output:

```
4-BEDROOM CAPE PRICE=$75,000
```

HEXPRINT is a BASIC statement which causes the output of the hexadecimal value of a given alphabetic variable or literal, when one is programming on a 2200T System. On the 2200VP and 2200MVP Systems, the PRINT function HEXOF will achieve the same results. Example 5 illustrates the conversion of an alphabetic literal to its hexadecimal representation using the HEXPRINT statement. To achieve these results on a 2200VP or MVP, replace the statement on line 30 with:

```
30 PRINT HEXOF(A$)
```

The HEXOF function is legal only if it appears within a PRINT statement, with the variable or literal to be printed enclosed in parentheses.

Example 5:

```
:10 REM PRINTING WITH HEXPRINT STATEMENT
:15 SELECT PRINT 215(132)
:20 A$="ABC DEF GHI JKL"
:30 HEXPRINT A$
:RUN (EXECUTE)
```

Output:

```
4142432044454620474849204A4B4C20
```

NOTE:

In zone printing on the Model 2273, it is important to make sure that information supplied to the last zone does not exceed the legal length of the last zone. For instance, if the information for the last zone exceeds 5 columns, that zone is omitted and the information is printed in the first zone of the next line.

Example:

```
:10 SELECT PRINT 215(132)
:20 PRINT 1.2, 3.4, 5.6, 7.8, 9.0, 5.2, 8.4, 0.5, "END OF DATA"
:RUN (EXECUTE)
```

Output: (compressed)

```
1.2    3.4    5.6    7.8    9.0    5.2    8.4    0.5
END OF DATA
```

In the above example the ninth element in line 20 exceeded 5 characters in length and therefore was printed in the first zone of the next line.

3.2 THE TAB FUNCTION

The TAB function is used in the same manner with the Printer as it is used with the CRT. When a PRINT statement containing a TAB function is executed, the Model 2273 begins printing the specified statement in the column indicated in the integer portion of the TAB expression.

Example:

```
:SELECT PRINT(132)
:10 PRINT TAB(50); "MASTER SCHEDULE"
:20 PRINT :PRINT
:30 PRINT TAB(20); "EMPLOYEE 1" TAB(50);
    "DEPARTMENT"; TAB(80); "SHIFT"
:RUN (EXECUTE)
```

Output:

```
                                MASTER SCHEDULE

EMPLOYEE                        DEPARTMENT                        SHIFT
```

In the previous example, "MASTER SCHEDULE" is printed starting at column 50; likewise the subtitles in line 30 are printed at the specified TAB settings, with the exception of "OVERTIME", which has a TAB setting that exceeds the longest possible line length of the Model 2273. If the value of 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(60)
:20 A=20
:30 PRINT TAB( A); "MODEL"; TAB (3*A); "HORSEPOWER"
:RUN (EXECUTE)
```

Output:

```
                                MODEL
HORSEPOWER
```

CHAPTER 4 VERTICAL FORMAT CONTROL

4.1 INTRODUCTION

Vertical formatting determines the number of lines to be printed and the amount of space to be left blank between lines on a page of output. Most applications require a form that is 11 inches long, with output single- or double-spaced. However, the Model 2273 Band Line Printer is equipped to handle a wide variety of printed output up to 126 lines long. A program, stored in the Printer, determines the type of vertical formatting to be used through its defaults or from information supplied by the user. There are several methods of vertical formatting available for the 2273. These methods are described in the following sections.

4.2 TWELVE-CHANNEL VERTICAL FORMAT UNIT

Vertical formatting for the Model 2273 Band Line Printer is controlled by the 12 channel Vertical Format Unit (VFU).

4.2.1 General Description

The Vertical Format Unit operates in either one of two modes, Direct Access Vertical Format Unit (DAVFU) or Forms Length Selector (FLS). Before using either, the VFU/FLS switch on the control panel must indicate the mode desired. In FLS mode, forms length is controlled by the FLS thumbwheel switches, and a vertical tab stop is automatically set at every sixth line in Channel 2. Detailed information about the Forms Length Selector can be found in Section 4.3, Formatting Using the Forms Length Selector. When the printer is switched to VFU mode, the 12 channel Direct Access Vertical Format Unit is activated. The DAVFU must be loaded with forms control information from the 2200 System before material can be printed in the DAVFU mode. Information about writing a DAVFU formatting program can be found in Section 4.4, Formatting Using the Direct Access Vertical Format Unit.

4.2.2 Control Codes

The HEX function is used within the BASIC program to output any character or function within the ASCII character set (see 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. In addition, HEX codes are also used to load the DAVFU.

The HEX function has the form HEX(hh [hh] .. .), where h = a hexadecimal digit 0 to 9 or a letter A to F. An even number of hexadecimal digits must always appear in a HEX statement. HEX codes may be combined, but spaces are not allowed between codes. When HEX codes are combined in a single statement, control codes are executed as they occur. In a DAVFU formatting program, it may be necessary to use multiple HEX statements for programs containing a large number of control codes, in order to decrease the possibility of programmer error.

HEX codes for printable characters remain in the Printer's buffer until it is full. However, HEX codes used as control codes cause immediate action by the Printer and do not enter the print buffer. The control codes for the Printer are described as follows:

LINE FEED - HEX(OA)

Receipt of this code causes the Printer to advance one line, without affecting the contents of the print buffer.

CARRIAGE RETURN - HEX(OD)

Receipt of this code causes immediate printing of the line of characters currently residing in the print buffer, as long as the Printer is online. The printer automatically issues a line feed after a carriage return is received. If the Printer is offline, it will not respond to the HEX(OD) code.

DESELECT - HEX(13)

Receipt of this code will place the Printer offline, independently of the control panel. The Printer will not respond to the Deselect code if it is in the load cycle, and the first character has been loaded.

START DAVFU LOAD - HEX(1D)

Receipt of this code indicates the beginning of a DAVFU load operation.

STOP DAVFU LOAD - HEX(1E)

Receipt of this code indicates the termination of a DAVFU load operation.

VERTICAL TAB - HEX(OB)

Receipt of this code advances the paper to a pre-set vertical tab location. If the vertical tab default is selected, the paper will advance to the next tab location in Channel 2. These tabs occur in six line increments. When the FLS is selected, the printer automatically assumes the vertical tab default. When a DAVFU load operation is used, HEX(OB) will advance the Printer to the next tab location in Channel 2, as set by the last DAVFU load operation. The HEX(OB) code will not be recognized if the Printer is deselected.

FORM FEED - HEX(0C)

Receipt of this code causes the paper to advance to the next top-of-form location. The location of the top-of-form is determined by the appearance of a tab in the first line of Channel 1 of the VFU, or the forms length indicated on the FLS. The HEX(0C) code will not be recognized if the Printer is deselected.

DELETE - HEX(7F)

Receipt of this code clears the print buffer.

VERTICAL SKIP COMMAND - HEX(1F)

Receipt of this code allows the Printer to recognize the next code after the HEX(1F) as a VFU skip command. HEX(1Fxx) causes the paper either to skip the number of lines specified in the "xx" portion of the code, or skip to the channel indicated in the "xx". HEX representation of the VFU channels is discussed further in Section 4.4, Formatting Using the Direct Access Vertical Format Unit (DAVFU). If the Printer is in FLS mode and a HEX(1F) appears in a program, the Printer will enter an error state, and the error code 32 will be displayed on the status indicator.

4.2.3 Formatting Devices

As mentioned previously, the user has several alternatives for vertical formatting. For most applications, usage of the FLS and HEX codes for tabulation to VFU default tab stops will suffice. For more complicated applications, such as special forms or printing which varies depending on conditions during a program run, the programmer can write a DAVFU formatting program. The Direct Access Vertical Formatting method is advantageous due to its versatility; however, writing a DAVFU load operation is a somewhat complicated process. New users may find it easier to use the FLS thumbwheel switches to set forms length, and set up vertical tabulation within the program. After becoming familiar with the Model 2273, they may then want to write DAVFU load operations to handle special printing conditions.

4.3 FORMATTING USING THE FORMS LENGTH SELECTOR (FLS)

The Forms Length Selector consists of two thumbwheel switches that enable the user to indicate the length of the forms currently loaded in the Printer. To set forms length, the user turns the thumbwheel switches to indicate the vertical length of the form in inches. The FLS is used in conjunction with the Vertical Format Unit.

For most printing applications, it is only necessary to indicate the length of the form on the FLS, and then supply the Printer with a SELECT PRINT statement and HEX codes interactively or within a program. Bottom-of-form is preset for an automatic three-line skipover of the form's perforation. Where tabulation is desired, the programmer should insert the code HEX(OB) into the appropriate sections of the program, causing the Printer to stop at the next tab position in Channel 2 of the Vertical Format Unit. These tabs stops occur at every sixth line on the page.

The following procedures should be carried out when using the FORMS LENGTH SELECTOR:

1. Press the ON/OFF LINE switch to take the Printer offline.
2. If the Printer is empty, load it by following the procedures outlined in Chapter 1, Section 1.9, Paper Insertion.
3. Set the VFU/FLS switch, located to the right of the Forms Length Selector, to FLS, and then set the proper length of the form on the Forms Length Selector.
4. Press TOP-OF-FORM to move the Printer to the top of the next form.
5. Return the Printer to the online condition by pressing the ON/OFF LINE switch.

The FLS switches allow the user to set a form length up to 14 and 3/4 inches, at 6 or 8 lines per inch. The left hand switch contains all allowable whole numbers; the right hand switch contains all allowable fractions. Some FLS forms length specifications are illegal, depending on whether 6 or 8 lines per inch is designated on the LINES PER INCH switch. In such a case, the alarm lamp will illuminate and the appropriate error code will be displayed on the status indicator.

The following form lengths are available on the thumbwheel switches of the Model 2273.

Left Hand Switch (Whole Numbers)

3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 inches

Right Hand Switch (Fractions)

0, 1/4, 3/4, 1/2, 2/3, 3/4 fractions of an inch

To change the form length indication on the FLS, the Printer should first be deselected and positioned at top-of-form. If the switch is changed while the Printer is at any other line but top-of-form, the new form length will not be accepted until the TOP-OF-FORM switch is pressed.

4.4 FORMATTING USING THE DIRECT ACCESS VERTICAL FORMAT UNIT (DAVFU)

The Direct Access Vertical Format Unit consists of a format memory and associated control codes. It is particularly useful for the printing of special forms or printing reports requiring more than one vertical format. Formatting information is supplied by a program written by the user and loaded into the DAVFU before printing. This program overrides previous formatting information resident in the Vertical Format Unit. The DAVFU has twelve channels and a maximum length of 126 lines.

In order to load the DAVFU, it is necessary to write a program defining the vertical format control sequence. In the formatting sequence, each print line on the form should be represented by two bytes (16 bits), with particular bits used to indicate every channel having a tab stop for that particular line. A byte is represented by a two hexadecimal digit code. Therefore, each line of the form should be represented by a four HEX digit code. (See Appendix B for a table of bit patterns represented by HEX digits.) The table on the next page illustrates the bit representation for each channel of the DAVFU. The variable Cn is used, where C = channel and n = number.

In a DAVFU formatting program, the 40 bit should be on for both bytes of each format line code. For example, a line with the HEX code 4040 has no tabs in any channel. As another example, the HEX code 4264 has the 40 bit on and a tab stop in Channel 2 (02) of the first byte. The second byte is composed of a 40 bit plus a tab stop in Channel 12 (40 + 20 = 60) and Channel 9 (04) in the second byte.

Every sequence must begin with HEX(1D), the HEX code for DAVFU load. This code should be followed with the top-of-form code, 4140, placing a one bit in the Channel 1 of the first line. No other tab stops should appear in either byte of the first line. Channel 1 should be used exclusively to mark top- and bottom-of-form. Top-of-form should be followed by a succession of two byte codes, each representing a line until the desired form length is reached. Bottom-of-form is represented by a tab in Channels 1 and 2 of the code representing the desired last line of the text. This code is 4340 (40 bit is on, and 01 + 02 = 03). When the bottom-of-form is reached, the Printer will automatically skip to the next top-of-form. Since bottom-of-form actually indicates the final printed line, it is necessary to insert several more blank lines (4040) until the last physical line on the form is reached. At this line--line 66, for example, another top-of-form code (4140) should be inserted. The HEX code (1E) should then terminate the DAVFU load.

The entire string of codes in the DAVFU load operation must contain an even number of digits; otherwise the Printer will enter a VFU memory not loaded condition, go offline, and display an error code on the status indicator. To prevent this occurrence, it is wise to break up the formatting sequence with a series of HEX statements.

Table 4-1.
VFU Data Loading Format

BIT POSITION	1st Half of Byte 1				2nd Half of Byte 1				1st Half of Byte 2				2nd Half of Byte 2			
	80	40	20	10	08	04	02	01	80	40	20	10	08	04	02	01
CHANNEL NUMBERS	0	1	C6	C5	C4	C3	C2	C1	0	1	C12	C11	C10	C9	C8	C7
START CODE	0	0	0	1	1	1	0	1								
FIRST LINE (Top-of-form required)	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0
SECOND LINE .	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0
.																
BOTTOM-OF-FORM	0	1	0	0	0	0	1	1	0	1	0	0	0	0	0	0
SKIP LINE (optional)	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
.		.							.	.						
.		.							.	.						
TOP OF FORM	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0
STOP CODE	0	0	0	1	1	1	1	0								

The following is an example of a DAVFU formatting program for the VP and MVP. Each HEX code or two byte code has been labeled according to its specific function. Obviously, regular users would not require a form with so few print lines.

```

10 SELECT PRINT 215(0)
20 PRINT HEX(1D4140404042404640404040404040434040404041401E);

```

Load DAVFU _____
Top-of-Form _____
Line without tabs _____
Tab in Channel 2 _____
Tab in Channels 2 & 3 _____
Three lines without tabs _____
Bottom-of-Form _____
Blank line _____
Blank line _____
Top-of-Form _____
Stop DAVFU load _____

The following DAVFU program calls for 15 lines of text printed on a 20 line form, with different tabbing formats set in Channels 2, 3, 9, and 11. The chart on the next page illustrates the tabulation scheme for the 12 channels and 20 lines of the program.

```

10 SELECT PRINT 215(0)
20 PRINT HEX (1D414042404440424440404640405042404440424040544640404042404340
404040404040404041401E);

```

	Channel No.s											
	1	2	3	4	5	6	7	8	9	10	11	12
1	T (4140)											
2		T (4240)										
3			T (4440)									
4		T							T (4244)			
5	(4040)											
6		T	T (4640)									
7											T (4050)	
8		T (4240)										
9			T (4440)									
10		T (4240)										
11									T		T (4054)	
12		T	T (4640)									
13	(4040)											
14		T (4240)										
15	T	T (4340)										
16	(4040)											
17	(4040)											
18	(4040)											
19	(4040)											
20	T (4140)											
Line No.												

This program will work effectively for those using a 2200VP or MVP system, as long as the programmer specifies a line length of 0 in the SELECT statement and follows the DAVFU stop load code with a semicolon. These actions suppress any carriage returns that the system might otherwise generate. When a formatting program is created for a form with 66 vertical lines, it may become unwieldy, leaving far more room for error. Therefore, users with 2200VP and MVP systems may want to break down their DAVFU formatting programs in the following fashion:

```

10 SELECT PRINT 215(0)
20 PRINT HEX(1D);           :REM START OF DAVFU LOAD
30 PRINT HEX(4140);        :REM TOP-OF-FORM
40 PRINT HEX(4240);        :REM LINE TWO - TAB STOP IN CHANNEL 2
50 PRINT HEX(4440);        :REM LINE THREE - TAB STOP IN CHANNELS 2 & 3
60 PRINT HEX(4244);        :REM LINE FOUR - TAB STOP IN CHANNELS 2 & 9
.
.
.
170 PRINT HEX(4340);       :REM LINE 15 - BOTTOM-OF-FORM
180 PRINT HEX(4040);       :REM LINE 16 - BLANK LINE
.
.
210 PRINT HEX(4140);       :REM CLOSING TOP-OF-FORM
220 PRINT HEX(1E);         :REM STOP DAVFU LOAD

```

Programmers using the 2200T should assume the DAVFU formatting sequence is an array and should dimension it as such. For example, the variable A\$(1) should have the value HEX(1D), the DAVFU loading command, the variable A\$(2) should have the value 4140, the top-of-form code, and so on. The proper command for loading the DAVFU program on the 2200T is:

```
10 $GIO/215 (A000,G$) A$() 1,L
```

where L equals the line length of the DAVFU sequence.

Since the programmer can reference a particular channel from within a print routine, the DAVFU formatting program can be used for output of materials requiring different formats. The various channels of the DAVFU are referenced by using the vertical skip code HEX(1Fxx).

HEX(1Fxx) causes the printer to skip a number of specified lines or move to a desired tab stop in a DAVFU channel. The second byte of the vertical skip code, represented above by xx, represents the action to be taken by the printer. Its first half byte should be either HEX 0 or 1. A one specifies a line skip. A zero specifies a move to the next tab stop in the channel number following the 0. The second half byte should contain a hexadecimal representation of the number of lines to be skipped or the number of the desired channel. For example, HEX(1F1B) tells the Printer to skip 11 lines and then print. However, (HEX0B) tells the printer to move to the next tab position in channel 11 and print. In the previous DAVFU program, the next print line would be seven or 11, depending on the current print position of the form.

A number of error conditions may arise when attempting to load the DAVFU. Such errors result in a failure to load the Vertical Format Unit, causing the Printer to go offline and an error code to be displayed on the status indicator. The following conditions are considered to be in error:

- a. Loading a program with an odd number of data bytes between the HEX codes 1D and 1E.
- b. Attempting to create a formatting program over 126 lines in length without specifying the end of the load with a bottom-of-form code or "dummy" top-of-form code.
- c. Forgetting to follow the DAVFU start code 1D with a top-of-form code (4140) in the next byte.
- d. Forgetting to set bit 40 to 1 in each byte.

APPENDIX A
HEXADECIMAL CODES

HEX CODE	PRINTER CHARACTER	HEX CODE	PRINTER CHARACTER	HEX CODE	PRINTER CHARACTER
HEX(0A)	Line Feed	HEX(3F)	?	HEX(63)	c
HEX(0B)	Vertical Tab	HEX(40)	@	HEX(64)	d
HEX(0C)	Form Feed	HEX(41)	A	HEX(65)	e
HEX(0D)	Carriage Return	HEX(42)	B	HEX(66)	f
HEX(1D)	Start Load DAVFU	HEX(43)	C	HEX(67)	g
HEX(1E)	Stop Load DAVFU	HEX(44)	D	HEX(68)	h
HEX(1F)	VFU Skip	HEX(45)	E	HEX(69)	i
HEX(20)	Space	HEX(46)	F	HEX(6A)	j
HEX(21)	!	HEX(47)	G	HEX(6B)	k
HEX(22)	"	HEX(48)	H	HEX(6C)	l
HEX(23)	#	HEX(49)	I	HEX(6D)	m
HEX(24)	\$	HEX(4A)	J	HEX(6E)	n
HEX(25)	%	HEX(4B)	K	HEX(6F)	o
HEX(26)	^	HEX(4C)	L	HEX(71)	p
HEX(27)	^	HEX(4D)	M	HEX(72)	q
HEX(28)	(HEX(4E)	N	HEX(73)	r
HEX(29))	HEX(4F)	O	HEX(74)	s
HEX(2A)	*	HEX(50)	P	HEX(75)	t
HEX(2B)	+	HEX(51)	Q	HEX(76)	u
HEX(2C)	,	HEX(52)	R	HEX(77)	v
HEX(2D)	-	HEX(53)	S	HEX(78)	w
HEX(2E)	.	HEX(54)	T	HEX(79)	x
HEX(2F)	/	HEX(55)	U	HEX(7A)	y
HEX(30)	0	HEX(56)	V	HEX(7B)	z
HEX(31)	1	HEX(57)	W	HEX(7C)	{
HEX(32)	2	HEX(58)	X	HEX(7D)	}
HEX(33)	3	HEX(59)	Y	HEX(7E)	~
HEX(34)	4	HEX(5A)	Z	HEX(7F)*	Clear
HEX(35)	5	HEX(5B)	[
HEX(36)	6	HEX(5C)	\		
HEX(37)	7	HEX(5D)]		
HEX(38)	8	HEX(5E)	^		
HEX(39)	9	HEX(5F)	_		
HEX(3A)	:	HEX(60)	`		
HEX(3B)	;	HEX(61)	a		
HEX(3C)	<	HEX(62)	b		
HEX(3D)	=				
HEX(3E)	>				

* ASCII DEL, a non-printable control character

APPENDIX B
BIT PATTERNS REPRESENTED BY HEX DIGITS

HEX DIGIT	BITS
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

APPENDIX C
SPECIFICATIONS

Printout Speed

Model 2273-1..... 250 lines per minute (nominal)
Model 2273-2..... 600 lines per minute (nominal)

Line Width..... 10 pitch: 132 characters
15 pitch (Model 2273-1 only):
132 characters

Character Sets..... 48 characters (uppercase and special)
64 characters (uppercase and special)
96 characters (full alphanumeric)

Duplicate Copies..... The Printer can generate a maximum of
six duplicate copies in addition to the
original.

Printer Size

Height..... 14.9 in. (37.8 cm)
Width..... 30.3 in. (77.0 cm)
Depth..... 25.2 in. (64.0 cm)

Stand Size

Height..... 28.84 in. (73.7 cm)
Width..... 30.30 in. (77.0 cm)
Depth..... 25.20 in. (64.0 cm)

Approximate Net Weight (Printer)
138 lb (62.4 kg)

Approximate Net Weight (Stand)
32 lb

Site Width..... 30.5 in. (77.5 cm)
Site Depth..... 35.0 in. (88.9 cm)

Fuses..... 8A Thermal Circuit Breakers
Power Requirements..... 115 or 230 VAC \pm 10%
50 or 60 Hz \pm 1Hz
250 Watts (maximum)

Cabling..... 12 ft (3.66m) cable with connector to
CPU

Operating Environment

50° to 90°F (10° to 32°C)
20% to 80% relative humidity
35% to 65% recommended relative humidity

APPENDIX D
PAPER SPECIFICATIONS

D.1 PUNCHING

The forms shall have sprocket feed holes in the left- and right-hand margins. Holes shall be $5/32 \pm .004$ inch ($0.156 \pm .010$ centimeter) in diameter; the hole centers shall be located $1/4 \pm 1/32$ inch ($0.64 \pm .08$ centimeter) from the top horizontal tearline perforation (applicable when the form length is evenly divisible by $1/2$ inch (1.27 centimeters)). Hole centers shall be $1/4 \pm 1/64$ inch ($0.64 \pm .04$ centimeter) from the edge of the forms. The horizontal center-to-center distance between holes shall be within $1/64$ inch (0.04 centimeter) of nominal, i.e., $8-1/2$ inch (21.59 centimeters) form; center-to-center hole spacing shall be $1/2 \pm 1/64$ inch ($1.27 \pm .04$ centimeters). The forms used should enter and leave the sprocket pins without tearing.

Holes punched in carbons shall not be less than the actual size of the holes punched in the forms and not greater than $7/32$ inch (0.56 centimeter) in diameter. Holes in carbons and forms shall be centered with corresponding holes in all parts. Holes shall be punched cleanly so that no disks remain in either the forms or carbons.

D.2 PERFORATIONS

The horizontal tearline perforations shall be accurately located at a 90-degree angle to a vertical line through the center of all marginal aligning holes. The perforations shall be cut through both forms and carbons. The cut and uncut portions of the forms shall have dimensions satisfactory for the intended use, but shall not catch in normal handling or feeding through the Printer.

D.3 FASTENING

Forms and carbons shall be secured together by a method that prevents any sheet or carbon shifting positions, relative to the other sheets. Print quality is adversely affected by a loosely fastened form. Fastening on both margins is recommended. The fastening medium must not impair the printing alignment or feeding of forms. Metallic hard-finished fasteners, or any fastening medium that can cause damage to the Printer, shall not be used. If only one side of the form is fastened, it must be the right side.

Recommended types of fastening are as follows: crimping, hook lock, stan lock, fugitive gluing and flexible gluing. The fastening technique used must not cause wrinkling, creases or tears that would restrict form feeding through the Printer.

D.4 PAPER SELECTION GUIDE

The chart below is a guide for selecting paper to be used in the Model 2273 Band Line Printer. Forms meeting the specifications should produce satisfactory printing results. However, it is ultimately the responsibility of the user to ensure that the forms provide satisfactory user printing and do not degrade printer performance.

To verify proper paper handling and print-out legibility, paper should be tested under normal operating conditions. Forms other than those listed below may be used for fulfilling the operating requirements providing they do not increase the Printer's maintenance requirements.

Chart D-1
Paper Selection

Item	Specification
Type	Standard fanfolded, edge punched
Dimensions	
Width	3 to 16 in. (7.63 to 40.64 cm) overall. The basic machine may accommodate 11 or 12 in. (27.94 or 30.48 cm) form lengths.
Length	When the forms length selector is being used, the printer may accommodate a minimum form length of 3 in. (7.62 cm) and a maximum of 14 in. (35.56 cm). When the Direct Access Vertical Format Unit is used, the printer may accommodate up to a maximum of 16.5 in. (41.25 cm) when operating at 8 lines per inch or 21 in. (52.5 cm) when operating at 6 lines per inch.
Weight	A maximum forms thickness of up to 0.02 in. (0.5 mm) can be accommodated. (Paper weights are based on bond = 17 in. x 22 x 500 sheets or carbon = 20 in. x 30 in. x 500 sheets.)
Single Copy	15 lb (56 gsm) bond minimum. 18 to 20 lb (68 to 75 gsm) bond recommended. (gsm = grams per square meter.)
Multi-Copy	Typically a 12 lb (45 gsm) bond with 6 to 8 lb (19 gsm) single-shot carbon for up to six parts.
Card Stock	15 to 125 lb (56 to 470 gsm).
Environment	Recommending operating and storage temperature of 16°C (60°F) and a relative humidity of 40% to 60%.

APPENDIX E
RIBBON SELECTION

Ribbon failure occurs under any one of the following conditions:

- a. Improper loading of the ribbon cartridge.
- b. Holes or other damage to the ribbon fiber.
- c. Wearout of ink to the extent that print quality is impaired.
- d. Permanent creases developing in the ribbon fabric.

Recommended Storage Specifications for Ribbons

Temperature: -55° to +75° C (-67° F to +167° F).
Humidity: 0% to 95% (Non-condensing).
Altitude: Sea Level to 15 km (49,200 feet).
Thermal Shock: 15° Per Minute.

APPENDIX F
MAINTENANCE AND CLEANING

F.1 OPERATOR MAINTENANCE

Though major maintenance should be performed by a Wang Field Service Representative, there are a number of cleaning and inspection procedures that may be carried out by the operator to insure optimum performance by the printer. More frequent servicing may be required if the operating environment is abnormally dirty or if the printer is operated beyond the normal duty cycle.

F.2 MAINTENANCE SCHEDULE

Weekly

Vacuum the band area and inspect the character band and pulleys for ribbon lint.

Monthly

The following functions should be performed at least once a month:

1. Clean Character Band and Ribbon Drive Rollers.
2. Clean the Band Platen.
3. Check the Ribbon Mask for wear or breaks.
4. Check for damaged items.

F.3 OPERATOR CLEANING PROCEDURES

Before cleaning the printer assemblies, make sure that the character band has stopped rotating. Use 91% isopropyl alcohol as a cleaning solution. Please note that isopropyl alcohol is combustible and should be kept away from heat and open flame. DO NOT substitute trichloroethylene, methylethyl-ketone, or acetone for isopropyl alcohol.

1. Remove the ribbon cartridge.
2. Remove the character band, placing it in a shallow pan containing the cleaning solution.
3. Clean both sides of the character band with a stiff bristled brush, and then remove the band from the pan and allow it to drip dry.
4. Moisten a soft cloth with cleaning solution and wipe off the band pulleys and platen and all along the path traveled by the character band.

5. Use the moistened cloth to clean the ribbon drive rollers and the three ribbon guide posts.
6. Replace the character band and ribbon cartridge.
7. After completion of the cleaning procedures, the operator should use the self-testing features to check for proper print registration.

F.4 PREVENTIVE MAINTENANCE INFORMATION

It is recommended that your equipment be service quarterly. A Maintenance Agreement is available to provide this servicing automatically. If the Maintenance Agreement is not 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 this is the financial responsibility of the user.

INDEX

	Page
ALARM/CLEAR Switch	5,8,14
Band Cover	7,12
Band Insertion	12
Band Removal	12
Character Sets	11
COPIES Control	1,5,15
DAVFU Formatting Program	35,37-41
Deselecting the Model 2273	28,34
Device Type	20,21
Direct Access Vertical Format Unit (DAVFU)	1,33,37-41
\$CLOSE	27
\$OPEN	27
Forms Length Selector (FLS)	1,6,33,36
FORMS LENGTH SELECTOR Switches	6,33,36
Hammer Bank	7
HEX Control Codes	33-35
HEXOF	22,30
HEXPRINT	31
Installation	3
LINES PER INCH Switch	5,36
Line Length	20,25
96-Character Band	11
OFF/ON LINE Switch	4,8
Paper Feed Release Lever	7,13
Paper Insertion	13
Paper Motion Sensor	7
Paper Out Sensor	7
PAPER STEP Switch	5
PHASE Control	5,14-15
POWER ON Indicator	4,8
PRINT	20,22,29
PRINTUSING	22,29
Print Adjustment	14-15
Printer Power Up	8
Printer Shut Down	8
PROM	1,11

Ribbon Installation	10
Ribbon Removal	10
SELECT CO	25
SELECT LIST	24
SELECT PRINT	22
SELECT Statement	20
Sprocket Covers	7
Sprocket Locks	7
Status Indicator	1,5,16
Status Indicator Codes	16-19
System Turn On	3
TAB	32
TEST Switch	5,14-15
TOP OF FORM Switch	5
2200T DAVFU Formatting	41
Utility Band	11
Vertical Format Unit (VFU)	33,35
Vertical Paper Adjust Knob	7
VFU/FLS Switch	6
Zone Printing	29,31

To help us to provide you with the best manuals possible, please make your comments and suggestions concerning this publication on the form below. Then detach, fold, tape closed and mail to us. All comments and suggestions become the property of Wang Laboratories, Inc. For a reply, be sure to include your name and address. Your cooperation is appreciated.

700-5726A

TITLE OF MANUAL MODEL 2273 BAND PRINTER USER MANUAL

COMMENTS:

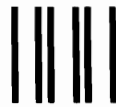
Fold

Fold

(Please tape, Postal regulations prohibit the use of staples.)



Fold



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 16 LOWELL, MA

POSTAGE WILL BE PAID BY ADDRESSEE

**WANG LABORATORIES, INC.
ONE INDUSTRIAL AVENUE
LOWELL, MASSACHUSETTS 01851**



Cut along dotted line.

Attention: Technical Writing Department

Fold

6

.

.

6

.

.

6

International Representatives

American Samoa
Argentina
Bahrain
Bolivia
Botswana
Brazil
Canary Islands
Chile
Columbia
Costa Rica
Cyprus
Denmark
Dominican Republic
Ecuador
Egypt
El Salvador
Finland
Ghana
Greece
Guam
Guatemala
Haiti
Honduras
Iceland
India
Indonesia
Ireland
Israel
Italy
Ivory Coast
Jamaica
Japan
Jordan
Kenya
Korea
Kuwait
Lebanon
Liberia
Malaysia
Mexico
Morocco
Nigeria
Norway
Paraguay
Peru
Philippines
Portugal
Qatar
Saudi Arabia
Senegal
South Africa
Spain
Sri Lanka
Sudan
Syria
Thailand
Turkey
United Arab Emirates
Uruguay
Venezuela
Yugoslavia

United States

Alabama Birmingham Mobile	Georgia Atlanta Savannah	Massachusetts Boston Burlington N. Chelmsford Lawrence Littleton Lowell Tewksbury Worcester	Fairport Liverpool New York City Syosset Tonawanda	South Carolina Charleston Columbia
Alaska Anchorage	Hawaii Honolulu	Idaho Boise	North Carolina Charlotte Greensboro Raleigh	Tennessee Chattanooga Knoxville Memphis Nashville
Arizona Phoenix Tucson	Illinois Chicago Morton Oak Brook Park Ridge Rock Island Rosemont Springfield	Michigan Kalamazoo Kentwood Okemos Southfield	Ohio Akron Cincinnati Cleveland Independence Toledo Worthington	Texas Austin Dallas Houston San Antonio
California Culver City Emeryville Fountain Valley Fresno Inglewood Sacramento San Diego San Francisco Santa Clara Ventura	Indiana Carmel Indianapolis South Bend	Minnesota Minneapolis	Oklahoma Oklahoma City Tulsa	Utah Salt Lake City
Colorado Englewood	Iowa Ankeny	Missouri Creve Coeur St. Louis	Oregon Eugene Portland	Vermont Montpelier
Connecticut New Haven Stamford Wethersfield	Kansas Overland Park Wichita	Nebraska Omaha	Pennsylvania Allentown Camp Hill Erie Philadelphia Pittsburgh State College Wayne	Virginia Newport News Norfolk Richmond
District of Columbia Washington	Kentucky Louisville	Nevada Las Vegas	Washington Richland Seattle Spokane	Wisconsin Appleton Brookfield Green Bay Madison Wauwatosa
Florida Hialeah Jacksonville Orlando Tampa	Louisiana Baton Rouge Metairie	New Hampshire Manchester	Rhode Island Providence	
	Maryland Rockville Towson	New Jersey Bloomfield Toms River		
		New Mexico Albuquerque		
		New York Albany		

International Offices

Australia Wang Computer Pty., Ltd. Adelaide Brisbane Canberra Milsons Point (Sydney) South Melbourne West Perth	Ottawa, Ontario Toronto, Ontario Victoria, B.C. Winnipeg, Manitoba	France Wang France, S.A.R.L. Bagnolet, (Paris) Discheim (Strassbourg) Ecully (Lyon) Nantes Toulouse Cedex	Auckland Wellington	Taiwan Wang Industrial Co. Taipei Kaohsiung
Austria Wang Gesellschaft, m.b.h. Vienna	Germany Wang Europe, S.A. Brussels Erpe-Mere	Hong Kong Wang Pacific Ltd. Hong Kong	Panama Wang de Panama (CPEC) S.A. Panama City	United Kingdom Wang (UK) Ltd. Birmingham London Manchester Richmond
Canada Wang Laboratories (Canada) Ltd. Burlington, Ontario Burnaby, B.C. Calgary, Alberta Don Mills, Ontario Edmonton, Alberta Montreal, Quebec	Japan Wang Computer Ltd. Tokyo	Netherlands Wang Nederland B.V. IJsselstein Gronigen	Puerto Rico Wang Computadoras San Juan	West Germany Wang Laboratories, GmbH Frankfurt Berlin Dusseldorf Essen Freiburg Hamburg Hannover Kassel Koln Munchen Nurnberg Saarbrucken Stuttgart
	New Zealand Wang Computer Ltd.	Sweden Wang Skandinaviska AB Malmo Stockholm (Solna) Groteborg	Singapore Wang Computer (Pte) Ltd. Singapore	
		Switzerland Wang S.A./A.G. Zurich Bern Geneva Lausanne		

WANG

LABORATORIES, INC.

ONE INDUSTRIAL AVENUE, LOWELL, MASSACHUSETTS 01851, TEL. (617) 459-5000, TWX 710 343-6769, TELEX 94-7421

Printed in U.S.A.
700-5726A
2-81-1M