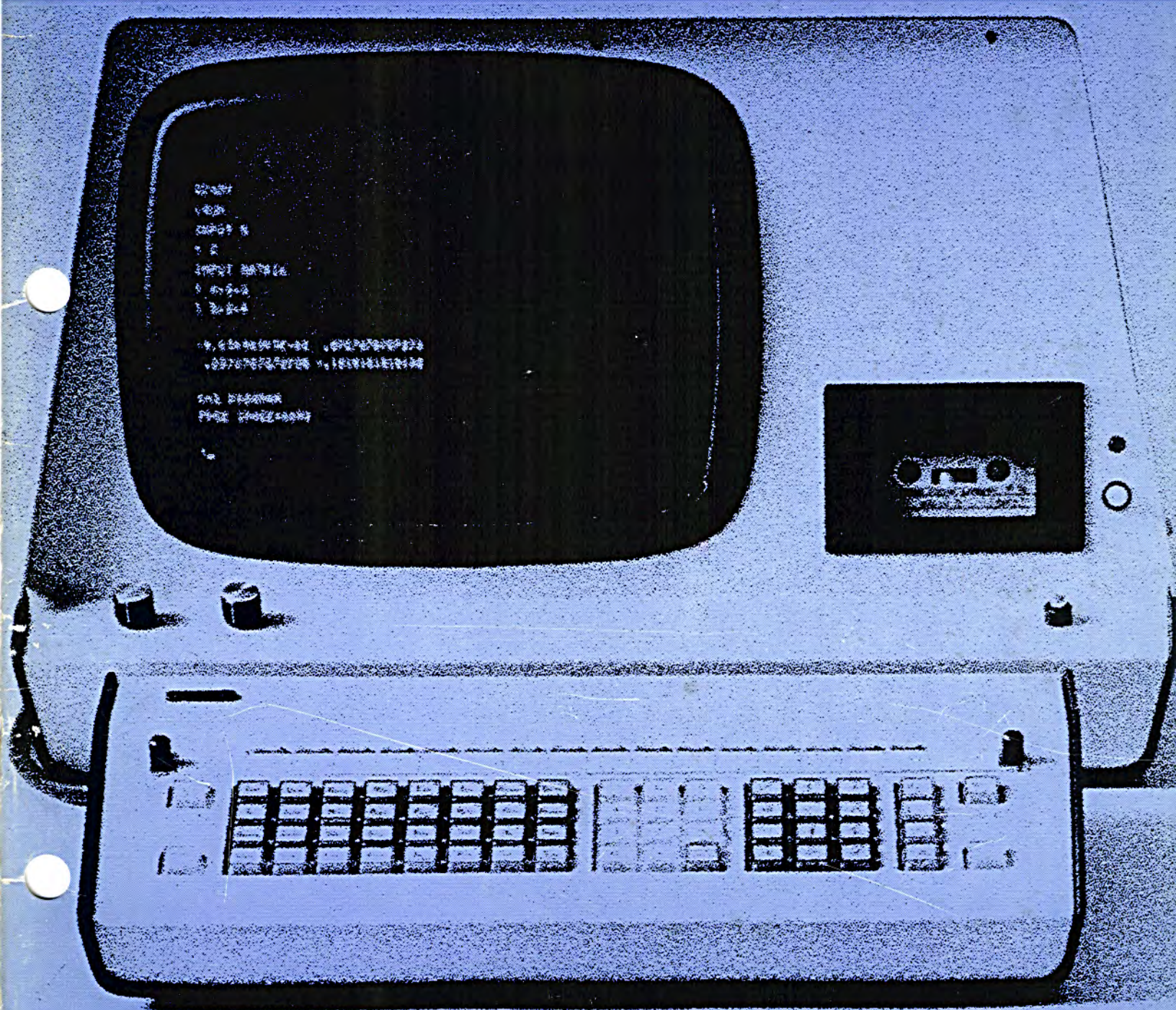
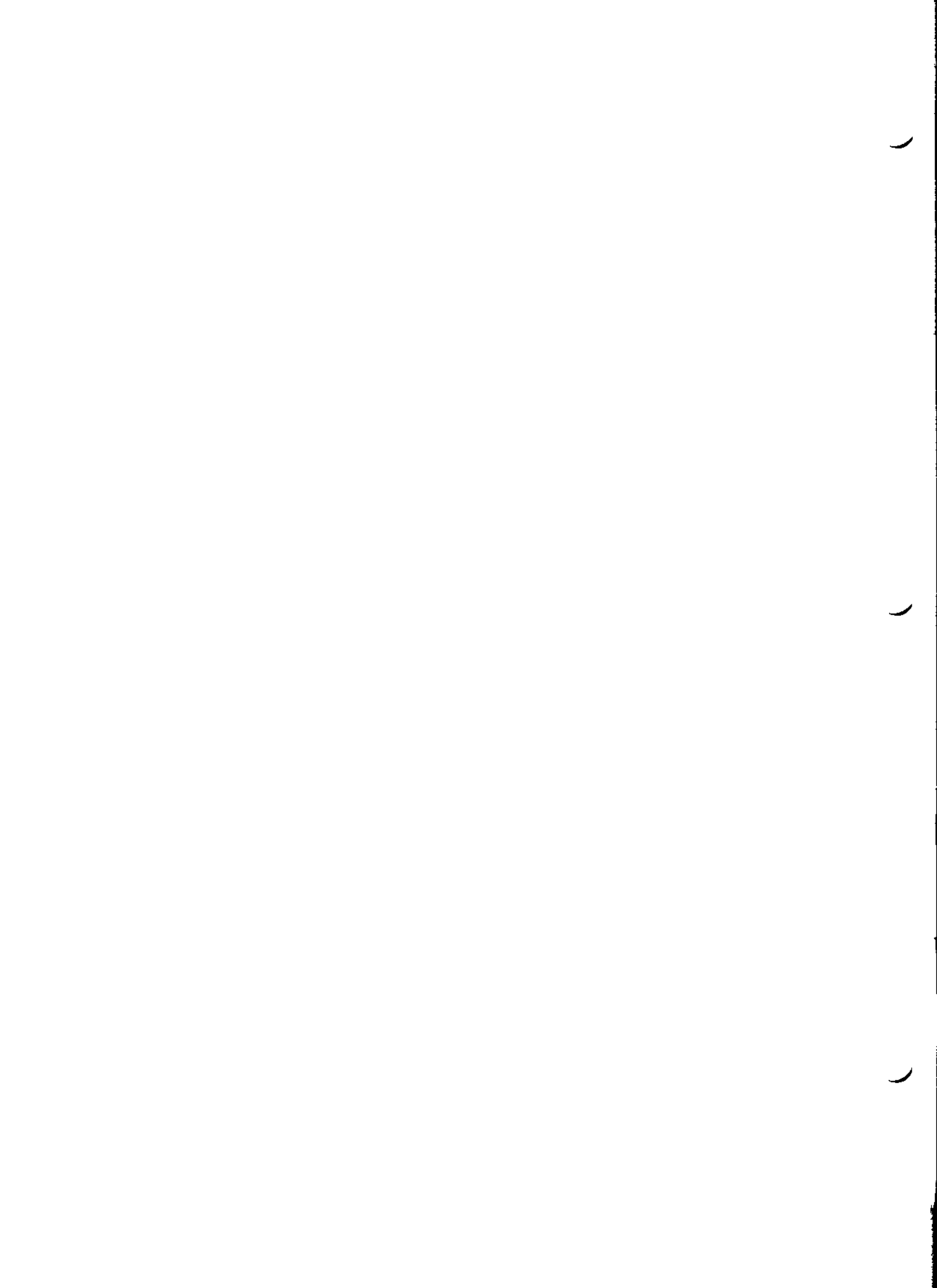


WANG

2241
THERMAL PRINTER
REFERENCE MANUAL

SYSTEM 2200





2241

Thermal Printer

Reference

Manual

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Section I

General Information

INTRODUCTION

The WANG Model 2241 Thermal Printer features fast, quiet operation and low cost alphanumeric output. The 5 x 7 dot matrix print head contains 35 heating elements. Applying electric current to a selected combination of wires heat the required elements to produce the desired character prior to contact of the print head to special heat sensitive paper. The thermal printing technique results in faster and quieter operation than conventional impact type printer. Printed hardcopy output from the Thermal Printer can be reproduced on standard copying equipment.

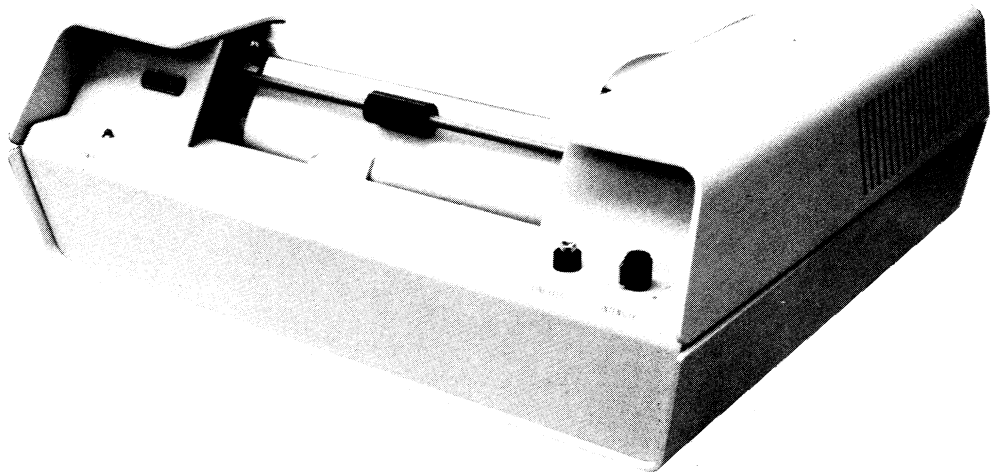
The print head can generate a 63 character set. Alphabetic characters are in uppercase only.

The following characters are valid on the Model 2241 Thermal Printer.

LETTERS: ABCDEFGHIJKLMNPOQRSTUVWXYZ

DIGITS: 0123456789

SPEC. CHAR: !'#\$%&'*+,-./:;<=>[\] ↑←@



UNPACKING AND INSPECTION

Call your WANG Service Representative to unpack and install your equipment. He uses the procedures outlined below.

Carefully unpack equipment and inspect all units for shipping damage. If damage is noticed, do not proceed; notify the shipping agency. Check equipment received against the purchase order. Decals specifying model numbers can be found on all WANG equipment, **usually on the back of each unit.**

INSTALLATION

To install your Model 2241, use the following procedure:

1. Turn ON/OFF switches on all equipment OFF.
2. Plug the Model 2241 Thermal Printer into CPU chassis. The peripheral connector on the CPU is labeled for the Model 2231/2221 Line Printer. After attaching the cord, make sure the lock clips are snapped shut.
3. Plug Thermal Printer power cord into wall outlet.
4. Plug the main power cord of the CPU chassis into Power Supply Unit; plug Power Supply Unit into wall outlet.

SECTION I – GENERAL INFORMATION

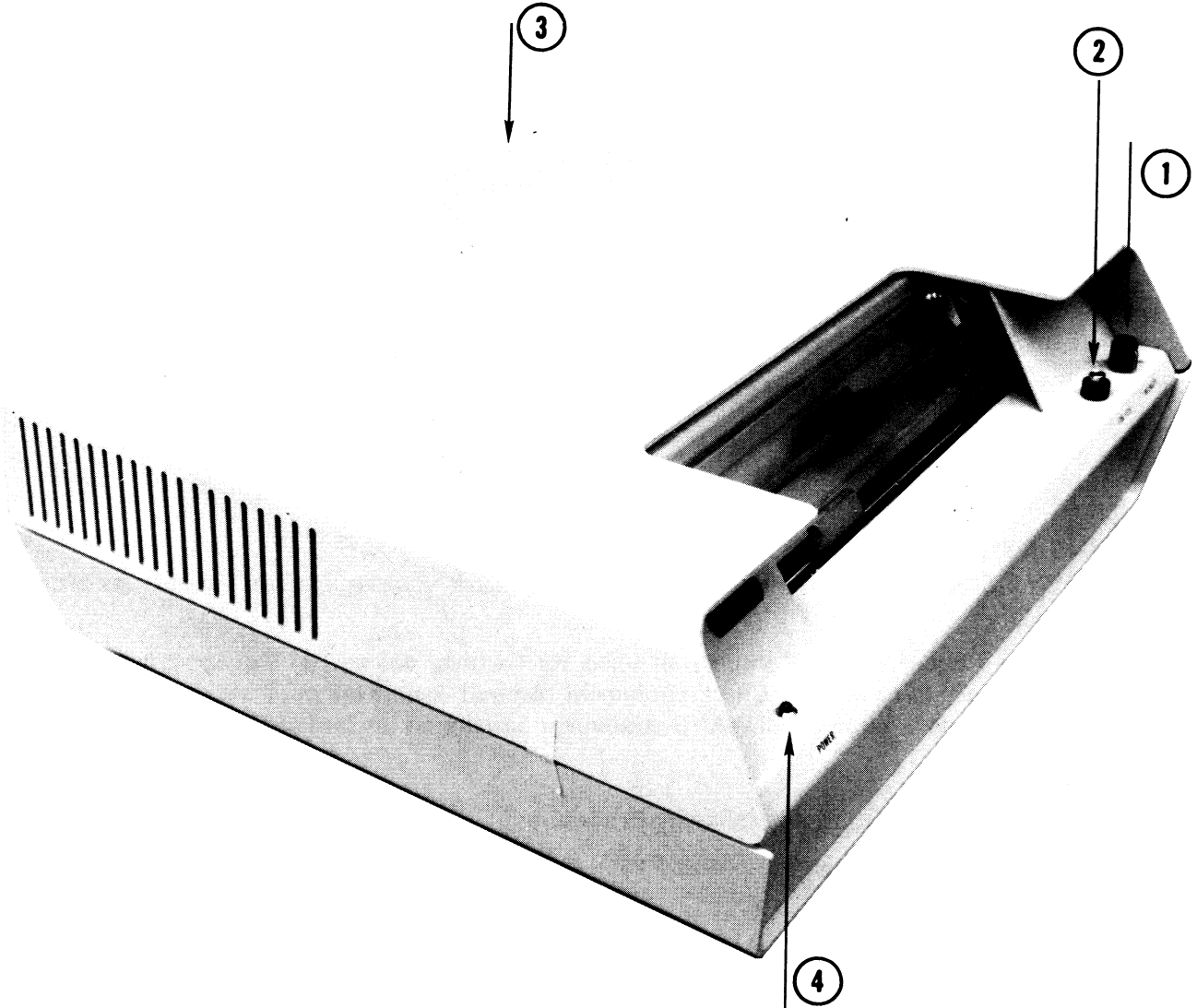
CONTROLS AND INDICATORS

- Intensity** 1. Controls darkness of characters.
- Line Feed** 2. When pressed, advances paper one line. When held depressed, continually advances paper until released.
- Power Switch** 3. Turns unit on and off.

NOTE:

When power is turned on, the unit executes an automatic carriage return.

- Power Lamp** 4. Indicates unit on when illuminated.



SECTION I – GENERAL INFORMATION

PAPER INSTALLATION

1. Remove tape from side panels of Printer (see Figure 3) and lift up Printer cover.

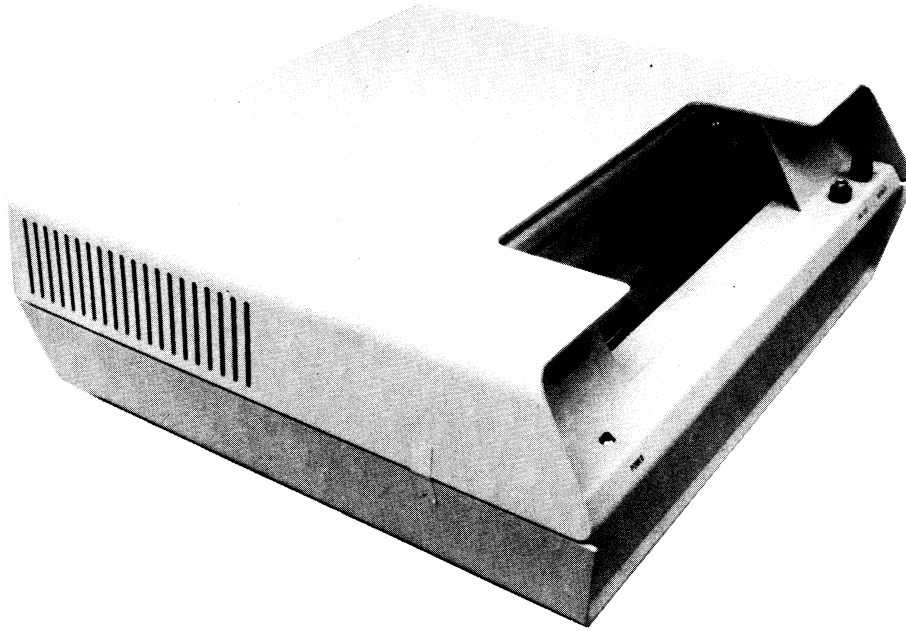


Figure 3. Packing Tape Location

2. Remove paper roller and insert into paper roll. Do not remove tape as indicated (see Figure 4).

DO NOT
REMOVE
THIS
TAPE.

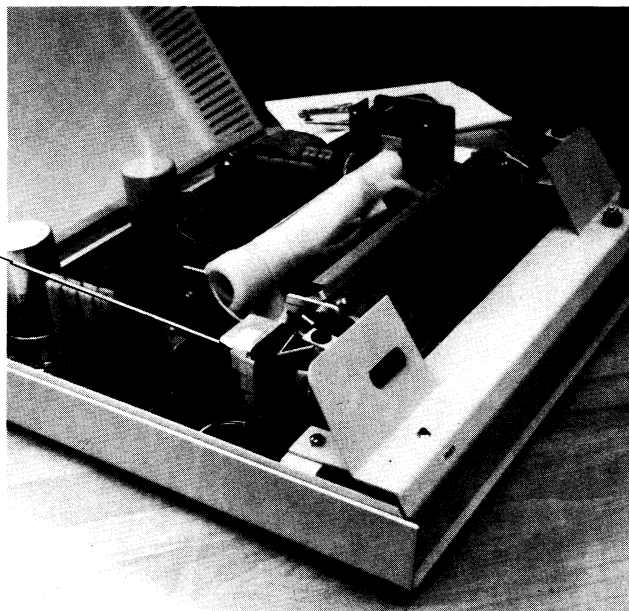


Figure 4. Inserting Paper Roll

SECTION I – GENERAL INFORMATION

3. Fold paper and seat roller and paper as shown in Figure 5.

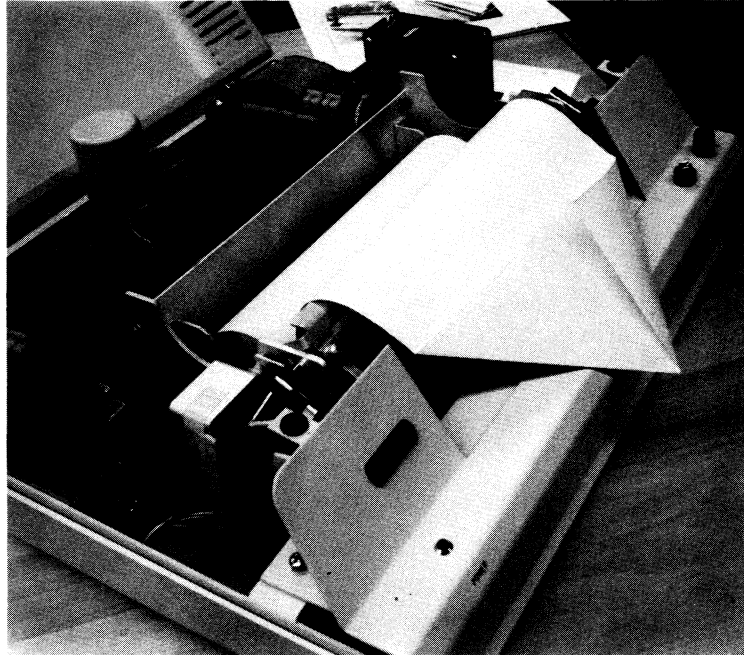


Figure 5. Folded Paper and Seated Roller

4. Advance folded paper between flange and curved paper guide, and underneath the narrow roller bar as shown in Figure 6.

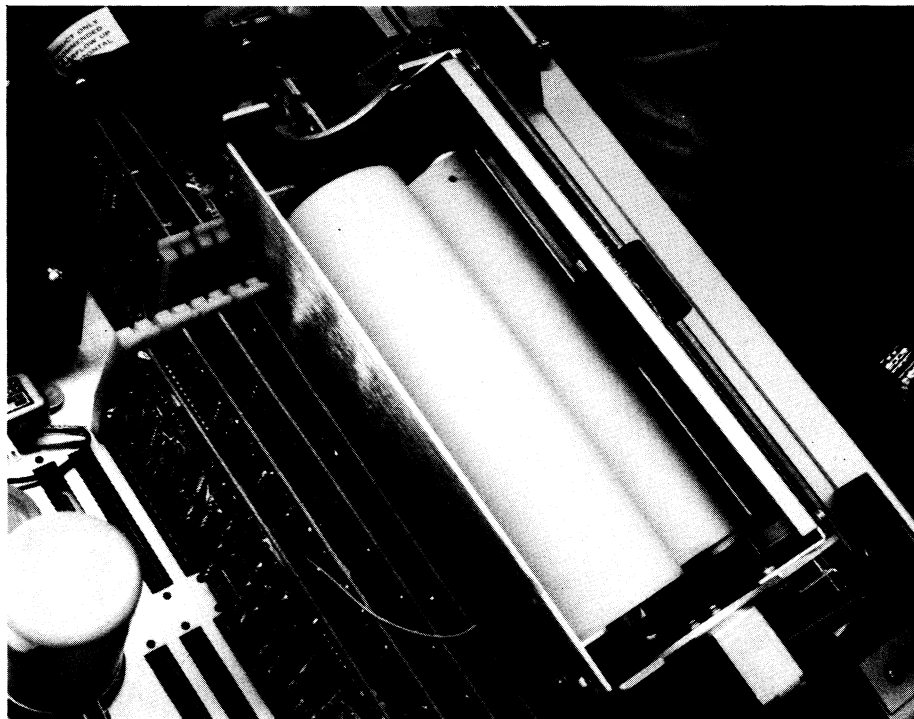


Figure 6. Paper Advanced Under Roller Bar.

SECTION I – GENERAL INFORMATION

5. Pull paper through and feed under paper bail and paper cutter as shown in Figure 7.

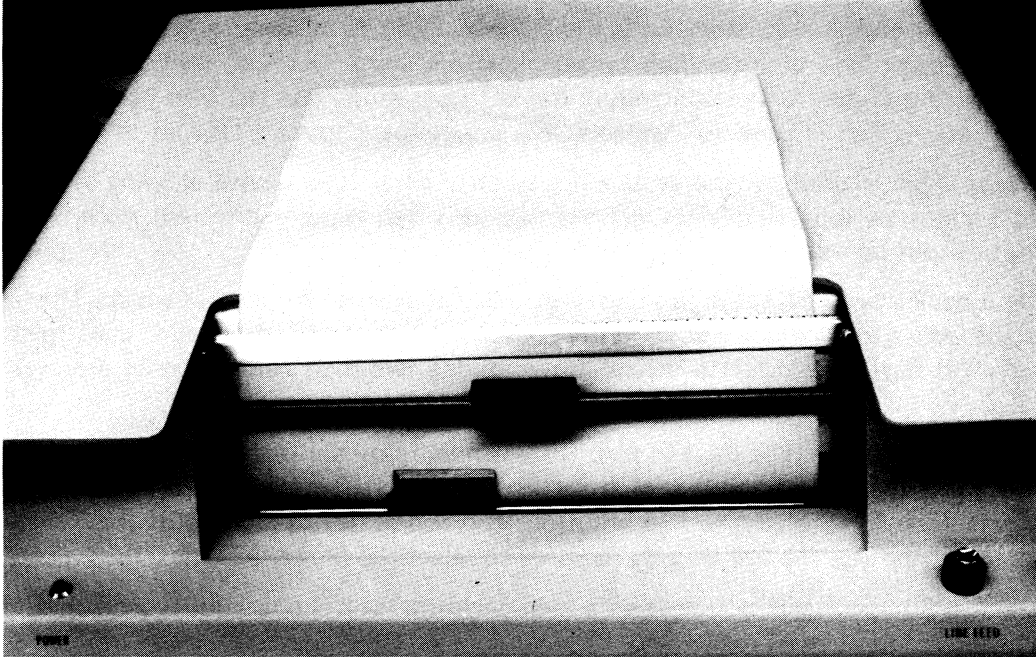
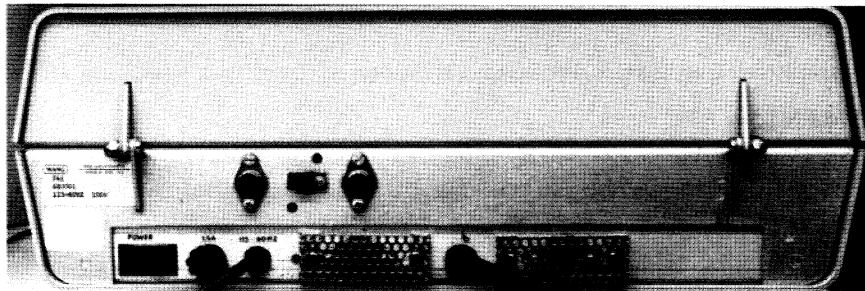


Figure 7. Paper Under Bail and Cutter.

Depress the line feed button. The paper is fed through in a continuous motion.



Section II

Device Selection

Each peripheral I/O device associated with the System 2200 is assigned a unique device address. All device addresses are composed of three-digit hexadecimal numbers. The first hex digit identifies the device type. It is used by the system when controlling the I/O operation. The last two hex digits represent the actual device address, which is used to electronically select the correct I/O controller card in the CPU.

The device type digit is used by the system to identify what type device is being selected for an I/O operation. The various peripheral devices on the system often require different control procedures to perform an input/output operation.

For example, a device type of 1 signifies cassettes, a device type of 3 indicates a disk. The last two digits correspond to the actual device address which is preset in each device controller card in the CPU. For example, if a system has three cassette drives, three unique two-digit address codes are available for the cassettes.

For the Model 2241 a device type digit of zero (0) is generally used. With this selection, the System 2200 sends out a Line Feed character following each carriage return character that is sent out. The Model 2241 requires a separate Line Feed character. In addition, the actual device address of the Thermal Printer is generally set to 15. Therefore, the full address required to select the Model 2241 is 015.

When a System 2200 command or statement which performs an I/O operation is executed, the appropriate device can be selected in one of two ways:

(1) **DEFAULT** – (Primary Console Device)

If no device address is specified or selected, the system automatically provides the device address which is more commonly used for the operation. This is usually the CRT address (001) if one is present in the system.

(2) **SELECT**

The SELECT statement can be used to assign a device address to a specified I/O operation.

THE SELECT STATEMENT

The SELECT statement (see System 2200A/B Reference Manual) selects the Model 2241 Thermal Printer to output data. The Thermal Printer can be selected for three distinct types of output by using the SELECT parameters PRINT, LIST and CO.

The SELECT statement can be keyed in either in an Immediate Mode statement or as part of a program.

:SELECT PRINT 015

The above SELECT PRINT statement selects the Thermal Printer with the Device Address Code 015 for all program output resulting from the execution of PRINT or PRINTUSING statements. Printout resulting from PRINT statements entered in the Immediate Mode appears on the CRT unless the Thermal Printer is selected for CO (see SELECT CO 015).

Example:

```
READY
:10 SELECT PRINT 015
:20 PRINT "X","X↑2"
:30 FOR X=1 TO 5
:40 PRINT X,X↑2
:50 NEXT X
:RUN
```

OR

```
READY
:10 PRINT "X","X↑2"
:20 FOR X=1 TO 5
:30 PRINT X,X↑2
:40 NEXT X
:SELECT PRINT 015
:RUN
```

SECTION II – DEVICE SELECTION

RESULTANT MODEL 2241 PRINTOUT:

X	X↑2
1	1
2	4
3	9
4	16
5	25

:SELECT LIST 015

The above SELECT LIST statement selects the Thermal Printer with the Device Address Code 015 for all program listing.

Example:

To list the program in the above example on the Model 2241:

:SELECT LIST 015
:LIST

RESULTANT MODEL 2241 PRINTOUT:

```
10 SELECT PRINT 015
20 PRINT "X", "X↑2"
30 FOR X=1 TO 5
40 PRINT X, X↑2
50 NEXT X
```

:SELECT CO 015

The above SELECT CO statement selects the Thermal Printer with the Device Address Code 015 for all console output. Console output includes all system information, such as the READY message, output from the STOP and END statements, any information keyed into the System 2200, and all output from Immediate Mode operations, Trace statements, and error messages.

Key: **SELECT CO 015 EXECUTE**

RESULTANT MODEL 2241 PRINTOUT:

:

Key: **RESET**

RESULTANT MODEL 2241 PRINTOUT:

:
READY
:

All information keyed into the System 2200 is printed on the Thermal Printer, until another device is selected for CO.

Section III

Printing Operations

LINE LENGTH

The maximum number of characters allowed on the Thermal Printer carriage is 80. To accommodate various paper widths and special forms, the maximum length of the output line can be specified by enclosing the desired line length in parentheses following the Device Address Code in the SELECT statement. For example:

```
:SELECT PRINT 015 (40)   SELECT MODEL 2241 FOR PRINTING SET LINE LENGTH 40
:SELECT LIST 015 (80)    SELECT MODEL 2241 FOR PRINTING SET LINE LENGTH 80
:SELECT CO 015 (20)     SELECT MODEL 2241 FOR PRINTING SET LINE LENGTH 20
```

If a line length is not specified for PRINT, LIST, or CO, the last values selected for these operations are used. Master Initialization sets all these values to 64 characters.

The line length setting is used by the system to generate an automatic carriage return when a line exceeds the specified line length and no carriage return is supplied by the program. This prevents losing printout, due to over-typing. As a line of output is typed on the Model 2241 Thermal Printer, the System 2200 keeps a count of the number of characters sent to the Model 2241. If the line count equals the current value of the line length before the output line is complete, a carriage return is executed; 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 carriage width, 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 under any one of the following conditions:

1. the line count equals the carriage width,
2. a carriage return is output when printing,
3. the system is RESET,
4. a CLEAR command is executed,
5. The system is Master Initialized,
6. the Model 2241 is reselected for LIST, PRINT, or Console Output.

The following example illustrates the automatic carriage return generated by the selected line length.

Example:

```
:SELECT PRINT 015 (5)   (NOTE, line length of 5 selected)
:10 PRINT "THE QUICK BROWN FOX JUMPS"
:RUN
```

The following output is printed on the Model 2241:

```
THE Q
UICK
BROWN
FOX
JUMPS
```

NOTE:

The maximum number of characters allowed on any one line is 80. If more than 80 characters are specified overprinting can occur on that line.

SECTION III – PRINTING OPERATIONS

COMBINED PARAMETERS

More than one parameter can be combined in a SELECT statement. For example:

```
SELECT PRINT 015 (30), LIST 015 (80), CO 015 (20)
```

SHORTCUT SELECTION METHOD

The Model 2241 Thermal Printer can be selected for all System 2200 printout by the following procedure:

```
:SELECT CO 015  
:CLEAR
```

The CLEAR command automatically assigns the PRINT and LIST parameters to the current Console Output Device.

CAUTION: This method should not be used if a program to be saved exists in memory as the CLEAR command clears memory.

DESELECTING THE MODEL 2241 THERMAL PRINTER

The Model 2241 Thermal Printer can be deselected by:

1. Selecting another device for PRINT, LIST, or CO.
2. Master Initialization (turning ON/OFF switch OFF, then ON) automatically selects the Primary Console Devices for all I/O operations.
3. Entering a CLEAR command with no parameters deselects the LIST and PRINT functions to the current Console Output Device.

PRINT AND PRINTUSING STATEMENTS

The PRINT and PRINTUSING statements are used in the same manner with the Thermal Printer as they are used with the CRT. For a detailed explanation of these statements, refer to the System 2200 A/B Reference Manual. The only difference is the maximum number of zones available on the Thermal Printer. The carriage width of all output devices is divided into as many zones of 16 characters as possible.

The Model 2241 has a carriage width of 80 characters, divided into five zones of 16 characters each. The zones constitute columns 0-15, 16-31, 48-63, 64-79.

If commas separate elements in a PRINT statement, then each element is printed at the start of a new zone. If semicolons separate elements in a PRINT statement, zoned format is ignored, and the output appears in packed format (see System 2200 A/B Reference Manual for discussion of zoned and packed format).

HEXPRINT

The HEXPRINT statement, (System 2200B only), can also be used with the Model 2241 to print alphanumeric values in hexadecimal format (see System 2200 A/B Reference Manual).

SECTION III – PRINTING OPERATIONS

THE TAB(FUNCTION

The TAB(function is also used in the same manner with the Thermal Printer as it is used with the CRT. When a PRINT statement containing a TAB(function is executed, the Thermal Printer typing element spaces to the column specified by the integer portion of the TAB expression.

Example:

```
:SELECT PRINT 015 (80)  
:10 PRINT TAB (30); "NAME"  
:RUN
```

Executing the above program causes the Thermal Printer to space to column 30 before typing NAME. If the carriage already has passed the specified column, the TAB command is ignored. Values of TAB expressions greater than 80 are illegal, since the maximum number of characters allowed per line is 80. If the value of the expression is greater than the maximum value, the typewriter moves to the start of the next line.

The TAB(function does not use preset tabs that can be set on the Thermal Printer. The TAB(function spaces each time to the indicated position.

SECTION III – PRINTING OPERATIONS

HEX CODES		
HEX CODE	MODEL 2241 CHARACTER	CRT CHARACTER
HEX (01)	Not Available*	Cursor home
HEX (03)	Not Available*	Clears screen and cursor home
HEX (08)	Backspace	Backspace
HEX (0D)	Carriage Return	Carriage Return
HEX (0A)	Line Feed	Line Feed
HEX (20)	Space	Space
HEX (21)	!	!
HEX (22)	“	“
HEX (23)	#	#
HEX (24)	\$	\$
HEX (25)	%	%
HEX (26)	&	&
HEX (27)	' (apostrophe)	' (apostrophe)
HEX (28)	((
HEX (29)))
HEX (2A)	*	*
HEX (2B)	+	+
HEX (2C)	, (comma)	, (comma)
HEX (2D)	- (minus)	- (minus)
HEX (2E)	.	.
HEX (2F)	/	/
HEX (30)	0	0
HEX (31)	1	1
HEX (32)	2	2
HEX (33)	3	3
HEX (34)	4	4
HEX (35)	5	5
HEX (36)	6	6
HEX (37)	7	7
HEX (38)	8	8
HEX (39)	9	9
HEX (3A)	:	:

**Designates Codes that are different on the CRT than on the MODEL 2241 Thermal Printer.*

SECTION III — PRINTING OPERATIONS

HEX CODE	MODEL 2241 CHARACTER	CRT CHARACTER
HEX (3B)	;	;
HEX (3C)	<	<
HEX (3D)	=	=
HEX (3E)	>	>
HEX (3F)	?	?
HEX (40)	@	@
HEX (41)	A	A
HEX (42)	B	B
HEX (43)	C	C
HEX (44)	D	D
HEX (45)	E	E
HEX (46)	F	F
HEX (47)	G	G
HEX (48)	H	H
HEX (49)	I	I
HEX (4A)	J	J
HEX (4B)	K	K
HEX (4C)	L	L
HEX (4D)	M	M
HEX (4E)	N	N
HEX (4F)	O	O
HEX (50)	P	P
HEX (51)	Q	Q
HEX (52)	R	R
HEX (53)	S	S
HEX (54)	T	T
HEX (55)	U	U
HEX (56)	V	V
HEX (57)	W	W
HEX (58)	X	X
HEX (59)	Y	Y
HEX (5A)	Z	Z
HEX (5B)	[[
HEX (5C)	\	\
HEX (5D)]]
HEX (5E)	↑	↑
HEX (5F)	←	←

SECTION III – PRINTING OPERATIONS

HEX CODE	MODEL 2214 CHARACTER	CRT CHARACTER
HEX (61)	A	A
HEX (62)	B	B
HEX (63)	C	C
HEX (64)	D	D
HEX (65)	E	E
HEX (66)	F	F
HEX (67)	G	G
HEX (68)	H	H
HEX (69)	I	I
HEX (6A)	J	J
HEX (6B)	K	K
HEX (6C)	L	L
HEX (6D)	M	M
HEX (6E)	N	N
HEX (6F)	O	O
HEX (70)	P	P
HEX (71)	Q	Q
HEX (72)	R	R
HEX (73)	S	S
HEX (74)	T	T
HEX (75)	U	U
HEX (76)	V	V
HEX (77)	W	W
HEX (78)	X	X
HEX (79)	Y	Y
HEX (7A)	Z	Z

SECTION III — PRINTING OPERATIONS

SPECIFICATIONS

Printing Method

Electronically heated 5 x 7 dot matrix (0.105 in. high x 0.080 in. wide) print on heat sensitive paper.

Paper Roll Size

8½ in. wide, 1 in. core I.D., 3 in. diameter.

Printing Speed

30 characters per second.

Line Length

8 in., 80 characters (10 characters/in.).

Line Spacing

6 lines per in.

Carriage Return Time

330 milliseconds typical (80 characters).

Line Feed Time

120 milliseconds typical per line.

Space Time

33 milliseconds.

Backspace Time

33 milliseconds.

Temperature Range

10°C to 32°C;

40% to 60% relative humidity

Power Consumption

115 Watts (printing) 115/230 VAC ± 10% 50/60 Hz ± ½ cycle.

NOTE:

Heat sensitive paper is designated to respond to heat energy and so it is subject to ambient temperature and humidity. Extreme humidity conditions will increase light and temperature sensitivity. Under normal office conditions, aging changes will be negligible.

CONTROLS AND INDICATORS

Intensity Controls darkness of characters.

Line Feed When pressed, advances paper one line. When held depressed, continually advances paper until released.

Power Turns unit on and off. (Note: when power is turned on, the unit does an automatic carriage return, line feed.)

Power lamp Indicates unit on when lit.

SECTION III — PRINTING OPERATIONS

LISTING OF ERROR MESSAGES

CODE 01	TEXT OVERFLOW	CODE 48	UNDEFINED KEYBOARD FUNCTION
CODE 02	TABLE OVERFLOW	CODE 49	END OF TAPE
CODE 03	MATH ERROR	CODE 50	PROTECTED TAPE
CODE 04	MISSING LEFT PARENTHESIS	CODE 51	ILLEGAL STATEMENT
CODE 05	MISSING RIGHT PARENTHESIS	CODE 52	EXPECTED DATA (NONHEADER) RECORD
CODE 06	MISSING EQUALS SIGN	CODE 53	ILLEGAL USE OF HEX FUNCTION
CODE 07	MISSING QUOTATION MARKS	CODE 54	ILLEGAL PLOT ARGUMENT
CODE 08	UNDEFINED FN FUNCTION	CODE 55	ILLEGAL BT ARGUMENT
CODE 09	ILLEGAL FN USAGE	CODE 56	NUMBER EXCEEDS IMAGE FORMAT
CODE 10	INCOMPLETE STATEMENT	CODE 57	ILLEGAL SECTOR ADDRESS
CODE 11	MISSING LINE NUMBER OR CONTINUE ILLEGAL	CODE 58	EXPECTED DATA RECORD
CODE 12	MISSING STATEMENT TEXT	CODE 59	ILLEGAL ALPHA VARIABLE FOR SECTOR ADDRESS
CODE 13	MISSING OR ILLEGAL INTEGER	CODE 60	ARRAY TOO SMALL
CODE 14	MISSING RELATION OPERATOR	CODE 61	DISK HARDWARE ERROR
CODE 15	MISSING EXPRESSION	CODE 62	FILE FULL
CODE 16	MISSING SCALAR	CODE 63	MISSING ALPHA ARRAY DESIGNATOR
CODE 17	MISSING ARRAY	CODE 64	SECTOR NOT ON DISK
CODE 18	ILLEGAL VALUE	CODE 65	DISK HARDWARE MALFUNCTION
CODE 19	MISSING NUMBER	CODE 66	FORMAT KEY ENGAGED
CODE 20	ILLEGAL NUMBER FORMAT	CODE 67	DISK FORMAT ERROR
CODE 21	MISSING LETTER OR DIGIT	CODE 68	LRC ERROR
CODE 22	UNDEFINED ARRAY VARIABLE	CODE 71	CANNOT FIND SECTOR
CODE 23	NO PROGRAM STATEMENTS	CODE 72	CYCLIC READ ERROR
CODE 24	ILLEGAL IMMEDIATE MODE STATEMENT	CODE 73	ILLEGAL ALTERING OF A FILE
CODE 25	ILLEGAL GOSUB/RETURN USAGE	CODE 74	CATALOG END ERROR
CODE 26	ILLEGAL FOR/NEXT USAGE	CODE 75	COMMAND ONLY (NOT PROGRAMMABLE)
CODE 27	INSUFFICIENT DATA	CODE 76	MISSING < OR > (PLOT ENCLOSURES)
CODE 28	DATA REFERENCE BEYOND LIMITS	CODE 77	STARTING SECTOR > ENDING SECTOR
CODE 29	ILLEGAL DATA FORMAT	CODE 78	FILE NOT SCRATCHED
CODE 30	ILLEGAL COMMON ASSIGNMENT	CODE 79	FILE ALREADY CATALOGED
CODE 31	ILLEGAL LINE NUMBER	CODE 80	FILE NOT IN CATALOG
CODE 33	MISSING HEX DIGIT	CODE 81	/XXX DEVICE SPECIFICATION ILLEGAL
CODE 34	TAPE READ ERROR	CODE 82	NO END OF FILE
CODE 35	MISSING COMMA OR SEMICOLON	CODE 83	DISK HARDWARE FAILURE
CODE 36	ILLEGAL IMAGE STATEMENT	CODE 84	NOT ENOUGH MEMORY FOR MOVE OR COPY
CODE 37	STATEMENT NOT IMAGE STATEMENT	CODE 85	READ AFTER WRITE ERROR
CODE 38	ILLEGAL FLOATING POINT FORMAT	CODE 86	FILE NOT OPEN
CODE 39	MISSING LITERAL STRING	CODE 87	COMMON VARIABLE REQUIRED
CODE 40	MISSING ALPHANUMERIC VARIABLE	CODE 88	LIBRARY INDEX FULL
CODE 41	ILLEGAL STR(ARGUMENTS	CODE 89	MATRIX NOT SQUARE
CODE 42	FILE NAME TOO LONG	CODE 90	MATRIX OPERANDS NOT COMPATIBLE
CODE 43	WRONG VARIABLE TYPE	CODE 91	ILLEGAL MATRIX OPERAND
CODE 44	PROGRAM PROTECTED	CODE 92	ILLEGAL REDIMENSIONING OF ARRAY
CODE 45	STATEMENT LINE TOO LONG	CODE 93	SINGULAR MATRIX
CODE 46	NEW STARTING STATEMENT NUMBER TOO LOW	CODE 94	MISSING ASTERISK
CODE 47	ILLEGAL OR UNDEFINED DEVICE SPECIFICATION		



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