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Serial Number _____

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It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna
- Relocate the computer with respect to the receiver
- Move the computer away from the receiver
- Plug the computer into a different outlet so that computer and receiver are on different branch circuits.

Warning

This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to this computer. Operation with non-certified peripherals is likely to result in interference to radio and TV reception.

2/86

Dot Matrix Printer DMP 132 Operation Manual:

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Contents

Introduction	1
About the Printer	1
Printer Components	3
1 Setting Up the DMP 132	5
Choosing a Location	5
Installing the Paper Rack	6
Tractor Feed Unit	7
Ribbon Cassette	10
Connecting the DMP 132 to a Power Source	12
Paper Loading	13
Print Head Adjustment Lever	18
Performing a Self-Test	19
Connecting the DMP 132 to the Computer	20
Print Function (DIP) Switches	21
Power Up Sequence	24
Character Pitch Set Switches	24
Hex Dump Function	26
Startup Checklist	26
2 Printing Applications	27
Control Codes	28
Sending Control Codes from BASIC	29
Data Processing Mode	30
Word Processing Mode	30
Graphics Mode	31
Selecting a Print Mode	32

3	Print Fonts and Character Width	35
	Selecting Fonts	36
	Standard and Condensed Fonts	36
	Correspondence Font	38
	Proportional Spacing Font	38
	Graphics Characters	39
	Right Justification	41
	Wrap-Around	43
	Elongated Characters	43
	Boldface	44
	Mixing Bold and Elongated	44
	Italics	44
	Superscript and Subscript	45
	Microfont	45
4	General Control Codes	47
	Buzzer	47
	Line Feed	47
	Special Line Feed Codes	49
	Carriage Return (CR)	49
	Backspace	50
	Setting Top-of-Form and Form Length	51
	Form Feed	52
	Entering IBM Mode	52
	Ignored or Undefined Codes	53
	DMP 132 Buffer Operation	54

5	Word and Data Processing Modes	57
	Superscript and Subscript (By LF Code)	57
	Repeat Printing	57
	Underline Printing	58
	Dot Positioning	58
	Left and Right Margins	60
	Skip Perforation	61
	Bidirectional and Unidirectional Printing	61
6	Graphics Mode	63
	Printing Graphics Patterns	65
	Line Feed	67
	Repeat Function	68
	Leaving Graphics Mode	68
	Freehand Drawing	68
7	Selecting a Code Set and Character Set	71
	Code Set Selection	71
	Character Set Selection	71
	International Character Set Selection	72
8	IBM Emulation Mode	73
	Description	73
	Code Set Selection	73
	Character Set Selection	73
	Carriage Return	74
	Vertical Formatting Control Codes	74
	Horizontal Formatting Control Codes	77

Contents

Printing Mode Control	79
Other Control Codes	83

Appendices

A Character Sets	87
Tandy Character Set Table	87
Dot-Column Width of Tandy Characters	88
IBM Character Set 1	90
IBM Character Set 2	91
Dot-Column Width of IBM Characters	92
International Character Table in Tandy Mode ..	94
B Control Codes	95
Tandy Control Codes	95
IBM Control Codes	99
C Programming Information	107
Programming Examples	108
D Care and Maintenance	111
General	111
If you have problems	112
E Specifications	113
F Interfaces	115
G Schematic Diagrams	117
Index	121

About the Printer

Congratulations on selecting the DMP 132, a high-density, dot-matrix printer that performs a variety of different printing operations, such as:

- Proportionally spaced characters
- Monospaced characters (standard, condensed and compressed)
- Correspondence-quality characters
- Italic characters
- Super-/subscript
- Microfont
- Graphics

The DMP 132 operates in three modes:

- Data processing mode for quick output of program listings or data
- Word processing mode for letter writing or creating text documentation
- Graphics mode for drawing pictures, figures, or graphs

For word processing, the DMP 132's correspondence or proportionally spaced characters produce letter-quality results. When you need a quick printout, standard characters probably suit your needs. In graphics mode, you can use graphic data to draw nearly any type of graphic configuration you desire.

With your versatile DMP 132, you can determine not only character style and printing mode, but you can also select the code set (control code sequence) and character set.

Code sets:

- Tandy (original) code set
- Code set for IBM 80 CPS graphics printers

Character sets:

- Tandy character set
- IBM character set

Introduction

You can use two types of paper with the DMP 132:

- Tractor-fed 4-inch or 10-inch computer fanfold forms with guide holes. The DMP 132 can also print one original and up to two non-carbon copies.
- Friction-fed, single-sheet typewriter paper.

Other features include:

- Full- or half-line feed and 3/4 or 4/5 line feed.
- Underline capability.
- Buzzer function.
- Automatic paper loading.
- Character pitch set function.

Printer Components

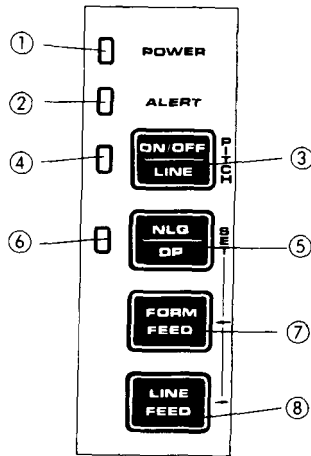


Figure 1. Front Panel Controls.

- ① **POWER indicator.** Illuminates when the DMP 132 is properly connected and the POWER ON/OFF switch is set to ON.
- ② **ALERT indicator.** Lights when the DMP 132 is out of paper. In this case, the printer enters the off-line state and the buzzer sounds for 1 second. Load more paper and press the ON/ OFF LINE switch. The ALERT indicator blinks when there is a carriage fault or some sort of electrical problem.

Note to MODEL II users: When a BASIC program stops execution because of a printer error, type `CONT` ENTER to resume printing. However, the entire contents of the print buffer prints starting with the current print head position.

- ③ **ON/OFF LINE switch.** At power-up, the DMP 132 is on line; pressing this switch once causes the printer to go off line. To stop printing at any time or to use other front panel switches, press this switch to set the printer to OFF LINE.

Introduction

Press and hold this switch for one second while in on line mode to enter the pitch-set mode.

Note: To print the remaining data in the buffer after you stopped printing by pressing the ON/OFF LINE switch, cancel the printing process using your computer software. Then, press the ON/OFF LINE switch to set the DMP 132 to ON LINE.

④ **ON/OFF LINE indicator.** When this indicator is on, the DMP 132 is on line and ready to print. The indicator flickers in the pitch-set mode.

⑤ **NLQ/DP switch.** Press this switch to select either the Near Letter Quality (NLQ) or standard print mode. When the NLQ mode is selected, the NLQ indicator lights. Press this switch again for standard mode. This switch works only when the DMP 132 is off line.

In the pitch-set mode, pressing this switch sets the pitch.

⑥ **NLQ indicator.** Illuminates when the DMP 132 is in the NLQ mode.

⑦ **FORM FEED switch.** Press this switch to advance the paper to the next top-of-form position. It is effective only when the DMP 132 is off line.

In the pitch-set mode, pressing this switch moves the print head to the left.

⑧ **LINE FEED switch.** Press this switch to advance the paper one line. Press and hold for continuous paper feed. This switch works only when the DMP 132 is off line.

In the pitch-set mode, pressing this switch moves the print head to the right.

Setting Up the DMP 132 1

This chapter shows you how to set up the DMP 132 so you can begin using it as soon as possible. Setting up the printer involves:

- Choosing a location for the printer
- Installing the paper rack
- Installing/adjusting the tractor feed unit
- Installing or replacing a ribbon
- Loading paper
- Connecting the printer to a power source
- Connecting the printer to your computer
- Powering up the printer
- Performing a self-test

Carefully unpack the DMP 132, being sure to locate the ribbon and the paper rack. Keep the empty box and packing material in case you ever need to transport the DMP 132.

Choosing a Location

When you choose the location for your printer, be sure to consider the following:

- The work surface. Place the printer on a sturdy surface.
- The length of the printer cable. This determines the distance from the computer that you can place the printer.
- Space for paper. Be sure to leave enough room for smooth flow of tractor-feed paper.
- Noise generation. Do not place the printer near noise generators such as refrigerators or industrial equipment.

Once you choose a location for the printer, you are ready to begin setting it up.

Installing the Paper Rack

The paper rack keeps both fanfold and single-sheet paper feeding smoothly into the printer. Mount this rack on the DMP 132 before operation. To do so:

1. Open the printer cover.
2. Holding the paper rack upright, insert the tips of the rack onto the supporters on both sides of the DMP 132, as shown below.

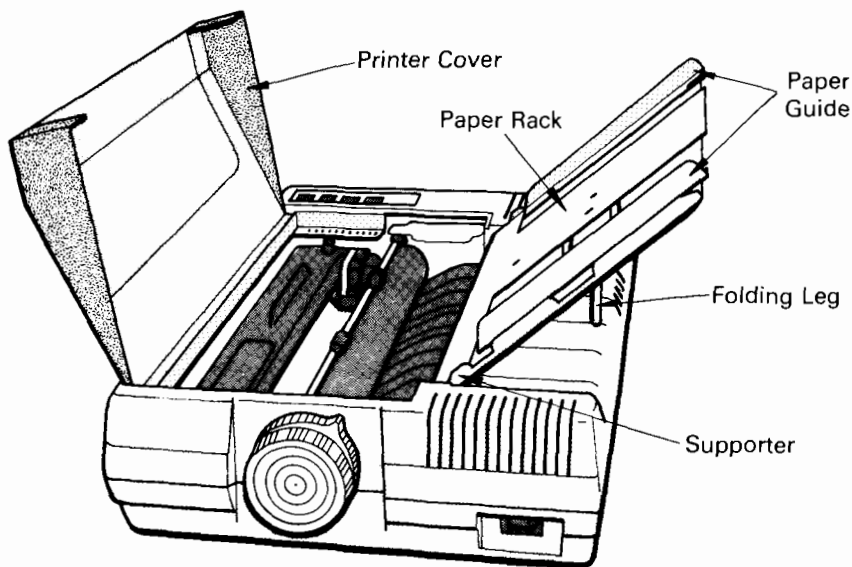


Figure 2. Installing the Paper Rack.

- 3a. For single-sheet printing, pull up the folding leg and insert it into the hole centered on top of the case.
- 3b. For printing on continuous fanfold paper, fold the leg and place the paper rack in its horizontal position. Or, you can detach the paper rack completely. However, note that proper paper flow is assured with the use of the paper rack.

You can adjust the paper rack's paper guides for paper of various widths. Pull the left paper guide upward to remove it from the rack. Then position it as you desire (within the range allowed). When using narrow paper, position the paper so that the left edge is within the range of the paper guide. This ensures proper operation of the paper empty switch and also reduces the possibility of paper jam. After setting a single sheet, slide the right paper guide to the left to match the paper width.

Tractor Feed Unit

You can use the DMP 132 with either the tractor feed or friction feed system. The difference is that the tractor feed system is used with paper (fanfold) that has guide holes on both edges, while the paper used with the friction feed system does not have these holes.

When you use the friction feed system, be sure to remove the tractor. When the tractor is installed, the friction mechanism is released and the DMP 132 might not feed the paper properly.

Installing the Tractor

1. Be sure the printer's power switch is off.
2. Remove the paper rack and open the printer cover.
3. Turn the paper loading knob forward to move the paper bail forward.

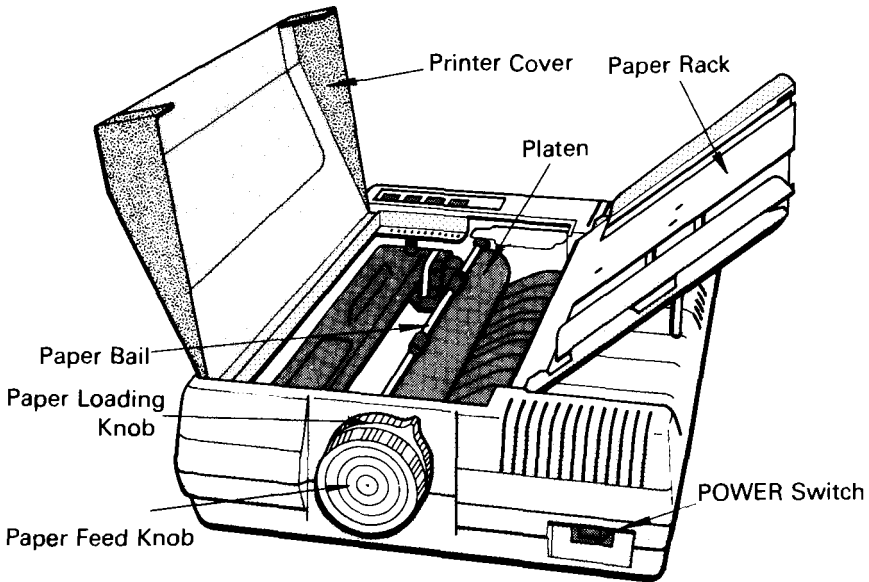


Figure 3. Right Side View.

4. Place the front pins of the tractor unit into the holes on both sides of the printer. Then push down on the rear of the tractor unit until the tractor is securely locked into position.

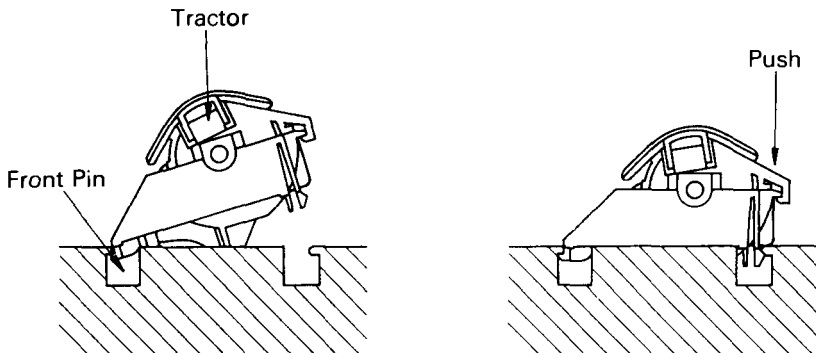


Figure 4. Installing the Tractor.

5. Turn the paper loading knob backward (away from you) to move the paper bail toward the platen.
6. Close the printer cover. Replace the paper rack if desired.

Removing the Tractor

1. Turn off the printer.
2. Open the printer cover. Remove the paper rack if necessary.
3. Turn the paper loading knob toward you to move the paper bail toward the front.
4. Lift the tractor unit from the rear, then pull it upward.
5. Turn the paper loading knob away from you.
6. Replace the paper rack and close the printer cover.

Ribbon Cassette

If the ribbon is already installed, simply check to see that it is properly threaded between the paper and print head.

If the ribbon cassette is not installed, or if you need to replace it due to excessive wear, faint printing, etc., follow this procedure:

1. Set the power switch to OFF.

Note: When you turn off the power, any information stored in the printer's buffer is automatically lost.

2. Remove the printer cover.
3. To replace the ribbon cassette, grasp the fin on the old ribbon cassette and gently pull it upward.
4. Unwrap the new cassette. Before inserting the new cassette, tighten the ribbon by turning the ribbon feed knob in the direction of the arrow.

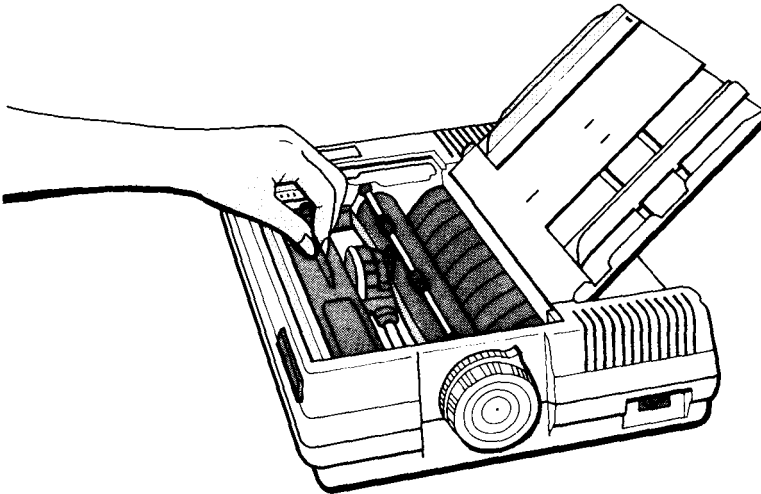


Figure 5. Removing the Ribbon Cassette.

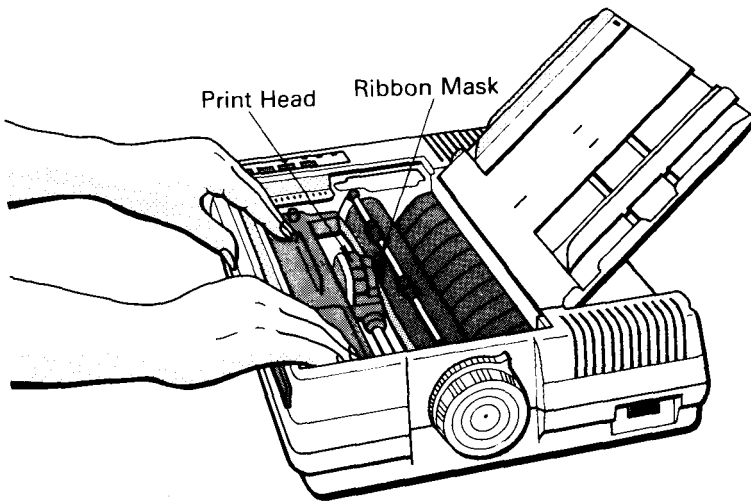


Figure 6. Installing the Ribbon Cassette.

5. Gently slide the ribbon between the ribbon mask and the print head. Press down on the left side of the cassette until you hear a click. While rotating the ribbon feed knob in the direction of the arrow, press down the right side of the cassette.

If the ribbon feed knob does not match up with the ribbon drive mechanism, the cassette will not fall into place. Do not force the cassette into place. Instead, fit it into place gradually while turning the ribbon feed knob.

6. Once the new cassette is installed, tighten the ribbon by turning the ribbon feed knob in the indicated direction.
7. Replace the printer cover.

Caution: Printing without paper or ribbon can damage the print head or platen.

Connecting the DMP 132 to a Power Source

Before plugging the power cord into an AC power outlet, be sure that:

- The power switch is set to OFF.
- The printer is not yet connected to the computer.

Connect the AC power plug to a 120-volt, 60Hz, grounded AC outlet or an approved power strip, such as the Radio Shack plug-in power strip, Cat. No. 26-1396, or the power switching system, Cat. No. 26-203.

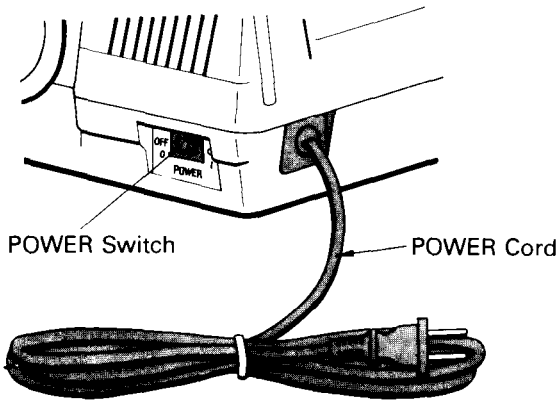


Figure 7. Connecting to a Power Source.

Set the power switch to ON/1 to turn on the power. Set the power switch to OFF/0 to turn off power. Note that turning the power off and on during operation may cause loss of the current program.

Paper Loading

Note: When loading paper (single-sheet or fanfold), be sure the paper correctly enters the paper insertion opening.

To prevent paper skewing or jamming, the paper must enter the DMP 132 straight and directly from the back of the printer. Proper positioning of the paper guide is also important to help prevent paper jamming.

Single-Sheet Paper

1. Be sure the printer's power is off. Open the printer cover.
2. Lift the paper rack and insert the folding leg into the hole centered on the top case.

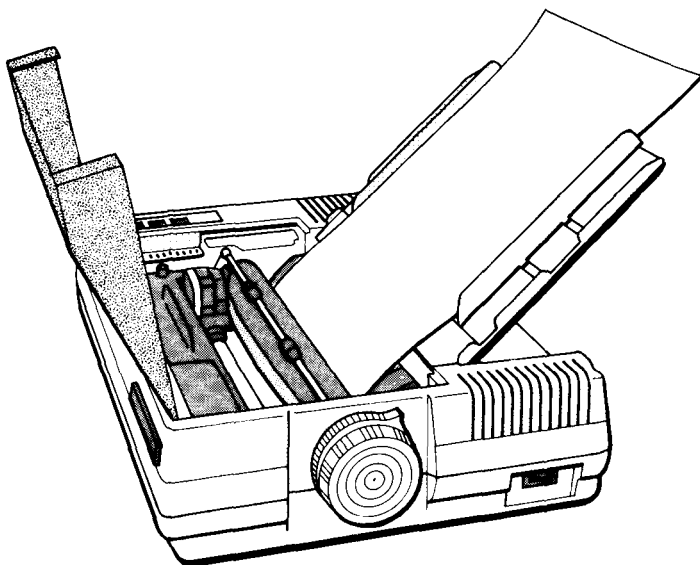


Figure 8. Positioning the Paper

Setting Up the DMP 132

3. Position the paper on the paper rack, aligning it with the paper guide. Since the auto-paper-loading system pulls the paper into the printer, just placing the paper on the paper rack is sufficient. If you insert the paper into the opening, the DMP 132 might “think” that the paper is already in place and might not activate the auto-loading mechanism.
4. Turn on the printer.
5. Turn the paper loading knob toward you. The paper automatically advances to the print-start position.

Note: If the ALERT indicator is not lit, the auto-paper-loading system does not work. In such a case, remove the sheet and position it again to turn on the indicator.

6. Turn the paper loading knob away from you to return the paper bail to the platen.
7. To align the paper, use the platen knob or the front panel LINE FEED switch (see “Printer Components”) to advance the paper. Verify that the paper bail is against the platen. Adjust the paper as necessary.

Note: The paper bail **MUST** be against the platen for paper adjustment.

8. Set the print head adjustment lever located on the inside right of the printer to the appropriate position. Refer to “Print Head Adjustment Lever.”
9. Close the printer cover.

Hints and Tips on Single-Sheet Paper Loading

- With the paper properly installed, printing continues until the paper passes the paper empty sensor. The printer then goes off line. Insert another sheet and turn the paper loading knob to set the paper. When the paper is in place, press the ON/OFF LINE switch and the DMP 132 continues printing where it left off.

- If you want to print another few lines after the paper empty sensor detects the paper end, press the ON/OFF LINE switch. Be careful not to exceed the bottom edge of the paper.

Fanfold Paper

The DMP 132 accepts standard fanfold paper from 4 inches to 10 inches wide. Before using fanfold paper, however, the tractor unit should be installed. Refer to “Tractor Feed Unit.”

1. Turn off the power.
2. Open the printer cover. Remove the paper rack temporarily.
3. Turn the paper loading knob toward you to move the paper bail away from the platen.
4. Feed the paper into the printer through the paper insertion opening. Use the paper feed knob to pull the paper around until it appears between the platen and the print head.
5. Adjust the pin-feed paper clamp positions for the width of the paper. Refer to Figure 9.
6. Open the pin-feed paper clamps.
7. Align the holes in the paper with the pin-feed sprockets. If you need to align the paper, return the paper bail to the platen to release friction on the paper.
8. Close the pin-feed clamps, and adjust the position of the paper.

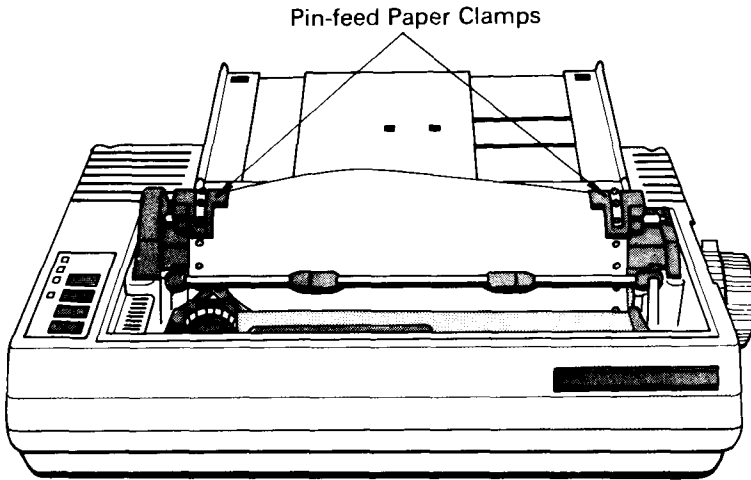


Figure 9. Front View.

9. Turn the paper loading knob away from you to move the paper bail toward the platen. The friction roller under the platen is released by setting the paper bail against the platen. (It is important that you perform this step to prevent a paper jam from occurring.)
10. Set the print head adjustment lever located on the inside right of the printer. Refer to "Print Head Adjustment Lever."
11. Replace the paper rack and the printer cover. For the proper paper flow, we recommend that you attach the paper rack and lay it down flat with the paper feeding underneath it into the printer (Figure 10).

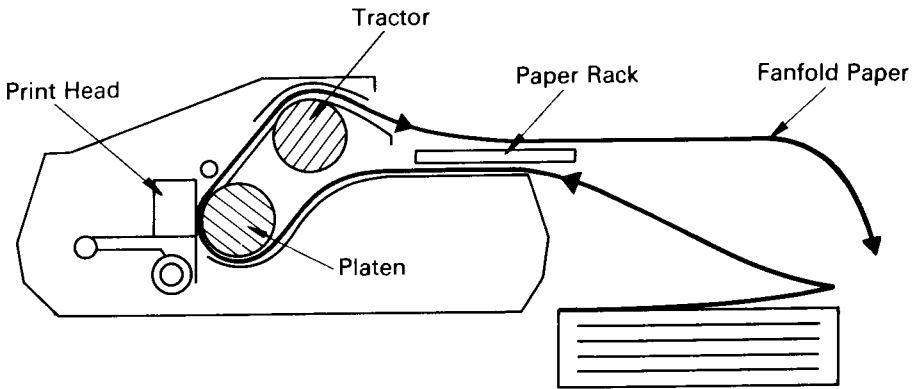


Figure 10. Fanfold Paper Path.

If fanfold paper is correctly loaded, it should enter between the body of the printer and the paper rack. Once the paper is loaded and power is on, check the **ALERT** indicator on the front panel. Refer to "Printer Components." Press the **ON/OFF LINE** switch if the **ALERT** lamp is illuminated. If the **ALERT** lamp remains lit, the paper is probably loaded incorrectly.

If the **ALERT** lamp does not illuminate after the paper is loaded, the printer is ready for operation.

Hints and Tips on Fanfold Paper Loading

- Be sure the paper is positioned so that it can travel through the printer without binding.
- Do not let printed paper pile on top of unprinted paper. This can cause the printed paper to be pulled into the paper insertion opening. This could jam the paper feed or damage the printer.
- When using fanfold paper, try to place the paper on the same level as the printer.

Print Head Adjustment Lever

The print head adjustment lever lets you adjust the gap between the print head and platen for using various paper weights. Adjust the print head according to the paper thickness variations, as described below. The lever is located on the inside right of the printer.

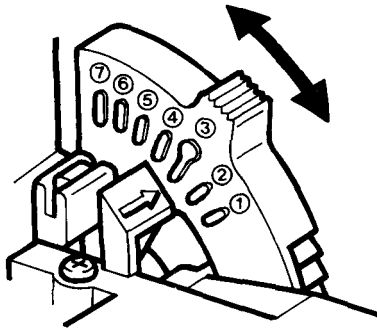


Figure 11. Print Head Adjustment Lever.

Single-part forms. Set the lever to position ③.

Multiple-part forms. Set the lever to position ⑤ or ⑥.

Too narrow a gap can cause:

- Paper damage at the left or right margin
- Inaccurate line feeding
- Ribbon to loosen or come off its guide during printing

Too wide a gap can cause:

- Light printing
- Missing characters

Caution: The print head must always be as close to the platen as possible; otherwise, damage to the print head may result.

If smudging occurs, set the print head adjustment lever to a higher setting, by moving the lever toward the front of the printer.

Performing a Self-Test

The DMP 132 has a built-in self-test feature to check the print quality and general printer operation before you begin using it.

Before running the self-test, be sure to load the DMP 132 with 10-inch paper since the test prints from one end of the platen to the other.

Caution: Printing on the platen can shorten the life of the platen and the print head.

To run the self-test:

1. Press and hold either the LINE FEED switch or NLQ switch. See "Printer Components."
2. Set the POWER switch to ON. Starting with the sound of the internal buzzer, the DMP 132 will print the ASCII 96 characters pre-programmed into the printer.

If you press LINE FEED, the self-test is performed in the standard font. The correspondence quality font is used during the test when the NLQ switch is pressed.

Printing continues until you press the ON/OFF LINE switch or paper end is detected.

Connecting the DMP 132 to the Computer

Before making any connections between the DMP 132 and computer, be sure the power to all units is off.

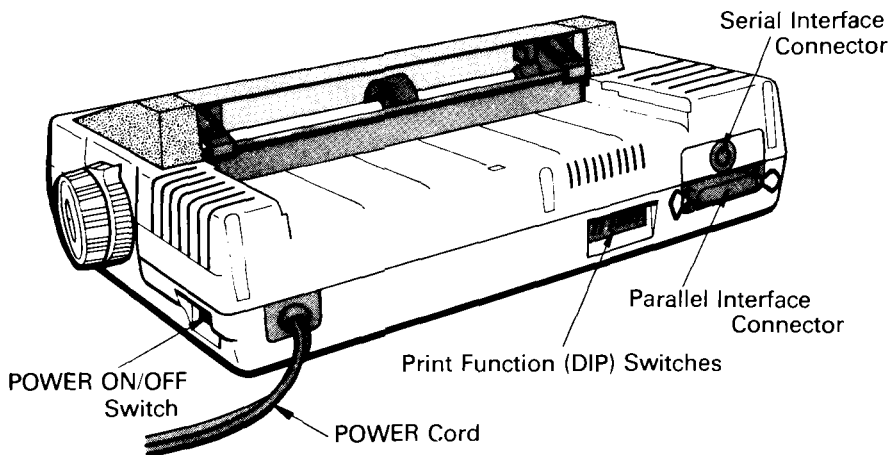


Figure 12. Computer Connections.

Be sure that you have the correct cable for connecting your computer to the DMP 132. Table 1 lists the printer cables that Radio Shack carries. If you have a color computer, connect the cable to the serial interface connector. If your computer has parallel interface capabilities, connect the cable to the parallel interface connector. See your computer owner's guide for connection locations on the computer.

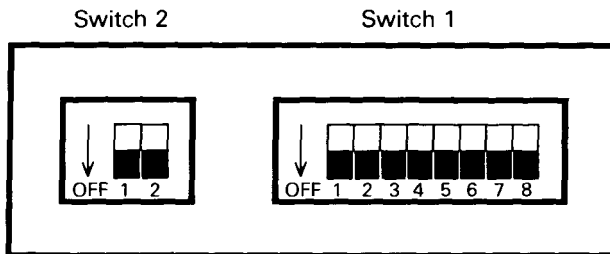
Table 1. Computer to DMP 132 Cables.

Computer	Cable Number
Model II/12/16/16B/DT-1/Tandy 2000/6000	26-4401
Model III/4/4D/4P	26-1401
Model 100/Tandy 102/200/600	26-1409
Tandy 1000EX/1000SX/1000HX/1000TX	26-225
Tandy 1200/3000HL/3000HD/4000/1400LT	26-227
Color Computer	26-3020

1. Attach the molded male end of the cable to the connector on the right rear of the DMP 132. Do not force the plug. If it does not fit one way, turn it over and try again. Lock a parallel interface connector to the DMP 132 by snapping the cable latches inward.
2. Connect the other end of the cable to your computer's printer jack. See your computer owner's manual for specific instructions.

Print Function (DIP) Switches

There are 10 switches located on the rear panel of the printer. These switches allow you to customize some DMP 132 features for your own applications.

**Figure 13. DIP Switch Panel.**

Setting Up the DMP 132

When you set Switch 1-1 to OFF before turning on the power, the DMP 132 selects Tandy codes. In this setting, the switches function as shown in Table 2. For instance, in Tandy mode, you can select word processing mode (better print quality) or data processing mode (faster printing speed). On the other hand, if you set Switch 1-1 to ON, the DMP 132 selects codes for the IBM mode. In this case, the switches function as shown in Table 3.

If you want to use the DMP 132 with the Color Computer, turn off the power and set the appropriate switches accordingly. The serial port is compatible with Color Computers only.

When you receive the DMP 132, all DIP switches should be set to OFF.

Remember! The printer's power must be off before you change any of the switches.

Table 2. DIP Switch Functions in Tandy Mode.
(Switch 1-1 is set to OFF)

Sw.	Symbol	ON	OFF
1-1	Control Codes		Tandy Codes
1-2	CR	Carriage Return Only (CR = CR)	Carriage Return and Line Feed (CR = NL)
1-3	LF	Line Feed and Carriage Return (LF = NL)	Line Feed Only (LF = LF)
1-4	Form Length	12 Inches	11 Inches
1-5	1-inch Skip	Valid Perforation	Not Valid
1-6	Line Spacing	1/8 Inch	1/6 Inch
1-7	Character Set	IBM Character	Tandy Character
1-8	WP/DP Mode	Word Processing Mode	Data Processing Mode

Switch 2-1 and Switch 2-2 select the interface and baud rate for serial interface.

Interface	Baud Rate	Switch	
		2-1	2-2
Parallel		OFF	OFF
Serial	600	OFF	ON
Serial	1200	ON	OFF
Serial	2400	ON	ON

Table 3. DIP Switch Functions in IBM Mode.
(Switch 1-1 is set to ON)

Sw.	Symbol	ON	OFF
1-1	Control Codes	Codes for IBM	
1-2	CR	Carriage Return Only (CR = CR)	Carriage Return and Line Feed (CR = NL)
1-3	LF	Line Feed and Carriage Return (LF = NL)	Line Feed Only (LF = LF)
1-4	Form Length	12 Inches	11 Inches
1-5	1-inch Skip Perforation	Valid	Not Valid
1-6	Line Spacing	1/8 Inch	1/6 Inch
1-7	Character Set	IBM Character Set 2	IBM Character Set 1
1-8	Buffer Full	Carriage Return Only	Carriage Return and Line Feed

Switch 2-1 and Switch 2-2 select the interface and baud rate for serial interface.

Interface	Baud Rate	Switch	
		2-1	2-2
Parallel		OFF	OFF
Serial	600	OFF	ON
Serial	1200	ON	OFF
Serial	2400	ON	ON

Power Up Sequence

The specific power-up sequence depends on your computer. Consult your computer owner's guide for details on powering up your computer with peripheral devices, such as printers.

In any event, the POWER indicator remains lit while the DMP 132 is on.

It is essential that the DMP 132 remains on when connected to the computer. If you turn the power on or off, or if the DMP 132 is connected but not turned on, the entire system might operate erratically.

Character Pitch Set Switches

You can set the character pitch of the DMP 132; however, note that once you set the pitch by the front panel method, any control code from the computer has no effect on the printing. If you want to change the pitch from the computer or your application software, do not set the pitch by the front panel method. The default CODE setting of pitch must be used. Turning the power off and then back on restores the pitch to default CODE.

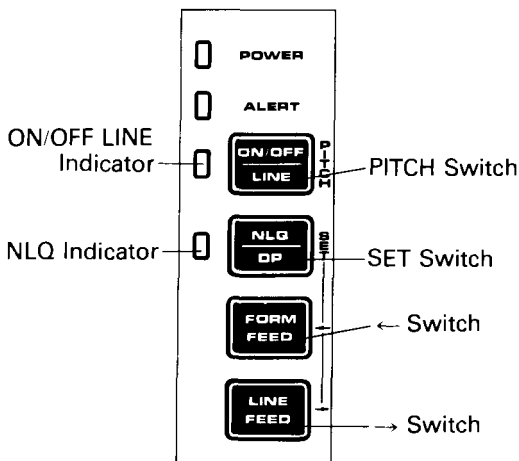


Figure 14. Front Panel.

1. Be sure the ON LINE indicator is lighted.
2. Press and hold the PITCH (ON/OFF LINE) switch until the ON LINE indicator blinks.
3. Press the → (LINE FEED) or ← (FORM FEED) switch to move the print head to the position indicated on the printer cover you wish to set as a character pitch.
4. Press the SET (NLQ/DP) switch to set the character pitch.

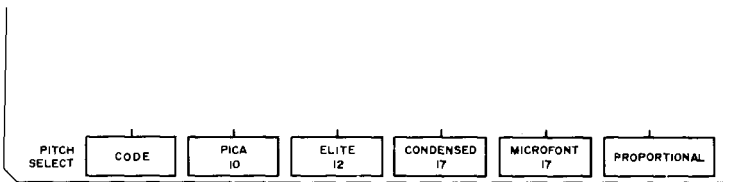


Figure 15. Printer Cover.

Print Examples.

Character Pitch	Print Example
PICA 10	abcdefghijklmnopqrstuvwxyz
ELITE 12	abcdefghijklmnopqrstuvwxyz
CONDENSED 17	abcdefghijklmnopqrstuvwxyz
MICROFONT 17	abcdefghijklmnopqrstuvwxyz
PROPORTIONAL	abcdefghijklmnopqrstuvwxyz

When the CODE is selected, you can change the character pitch by sending control codes from the computer.

Hex Dump Function

The DMP 132 can print the hexadecimal values for data transmitted to it. This mode is useful for checking exactly what information is being received by the DMP 132. To implement this function, turn on the power to the DMP 132 while simultaneously holding down the FORM FEED switch.

Before printing, be sure that 10-inch paper is loaded in the DMP 132 to avoid printing on the platen. Then press the ON-LINE switch and run the program that you want to check.

To exit hex dump mode, turn the printer off and then on again.

Start-up Checklist

The checklist that follows reminds you of the things you should do each time you use the DMP 132. Be sure to check the list each time you prepare to use the printer.

- ☐ Is the power off?
- ☐ Does the printer have enough paper?
- ☐ Is the ribbon installed?
- ☐ Is the printer connected to a power source?
- ☐ Is the printer connected to the computer?
- ☐ Are the DIP switch positions correct?
- ☐ Turn power on and perform self-test. Does the printer pass the self-test?

Printing Applications 2

The DMP 132 is designed for three distinct applications:

- Data processing
- Word processing
- Graphics

The DMP 132 has three different responses to software codes from the computer — one for each application. The three response patterns, or modes, have many similarities, but each has its own unique features.

Data processing and word processing modes are for printing characters. The only difference between these two modes is in the way they handle line feed commands — commands that determine the direction and distance the paper is fed.

- In the word processing mode, each line feed command causes an immediate paper advancement. Word processing programs (such as SCRIPSIT®) use immediate line feeds for superscripts, subscripts, and other special printing styles.
- In the data processing mode, a line feed command other than five special line feed commands (see page 49) does not cause an immediate line feed. Instead, line feeds are stored in the printer's memory along with other data. When a line is printed, the line feed commands stored in memory determine the direction and pitch of the paper feed.

In both data processing and word processing modes, the DMP 132 can print in different fonts (type styles) and pitches (character spacing). One font is the proportional character set and another is the monospaced character set.

- Proportionally spaced characters have variable widths. For example, an M takes up more space than an I. Use proportional characters to create professional-looking documents.
- Monospaced characters are so named because each character is allotted the same space width. This uniformity makes this font preferable for tables and charts that require vertical alignment.

Characters in the various fonts are created in a dot-matrix pattern. Monospaced characters use an 11 by 9 and a 23 by 18 matrix, while proportionally spaced characters use a matrix of n by 18. (The value of n depends on the width of the character being printed.)

The print pitch (character spacing) is designated by the space the DMP 132 puts between each printed character. The font selected is also a factor in determining the pitch. Consequently, you must think of pitch in terms of the number of characters printed per inch — 10CPI, 12CPI, and 17CPI for normal printing, and 5CPI, 6CPI, and 8.5CPI for elongated printing.

The graphics mode can be used to create custom letterheads, designs, and special fonts. However, many control codes which can be used in data processing and word processing modes cannot be used in graphics mode. The DMP 132 does not give you an error message when you send such a code; it simply ignores the code. This includes control codes that change line feed pitch and direction.

To ensure full coverage of the paper in graphics mode, the line feed length of the LF code (10 Dec.) is fixed at 7/72 inch. The five special line feeds can be executed by dynamic paper movement commands.

Control Codes

Before you proceed, consider how the computer communicates with the printer.

All information is sent to the DMP 132 as numbers between 0 and 255 decimal (00- FF hexadecimal). The printer interprets these numbers according to the American Standard Code for Information Interchange, commonly referred to as the ASCII code. (See Appendix A for a list of ASCII codes.) Most numbers (or codes) are printed as letters, numbers, or symbols. However, the numbers 0-31, as well as some special sequences of code numbers, are used to “control” various printer functions. These control codes let you change character sets, select print modes, underline, superscript, subscript, and perform other special functions.

The control codes have different meanings, depending on the current print mode. If a code is not recognized by the printer, it is printed as **X**. The next few sections demonstrate how some of the control codes activate various printer functions.

Sending Control Codes from BASIC

Some printer features are activated by a single code, but many functions require a sequence of two or more codes. Most multiple-code sequences begin with decimal 27 referred to as the ESC (escape) code. The ESC code notifies the printer that a special sequence is on its way. The next code(s) sent determines which printer feature is selected. In BASIC, use `CHR$ ()` to send these codes to the printer.

For instance, set up the DMP 132 in Tandy mode as described earlier, and enter BASIC in the normal way.

Then, type and run the following program:

```
10 REM
20 LPRINT "DATA ";CHR$(27)CHR$(28);"PROCESSING"
30 LPRINT "MODE"
```

Note: The command LPRINT is used in the examples that send codes to the DMP 132. If you are using a Tandy Color Computer, substitute PRINT-2, for LPRINT.

Roll the paper forward and look at the results. The word **MODE** printed over part of the word **DATA**. Why? The codes `CHR$(27)` and `CHR$(28)` tell the printer to change the forward line feed to half its normal distance. The chart in Appendix B shows the various code sequences understood by the DMP 132.

Tandy Computer Code Set

The Tandy computer code set is the default DMP 132 code set. Usually, this code set is used on Tandy computer systems. When you use a Tandy computer, the DMP 132 lets you use the data processing, word processing, and graphics printing modes, as well as the other original DMP 132 control codes.

Code Set for IBM

When you select the code set for IBM, the DMP 132 emulates the IBM 80 CPS graphics printer's code set. If you select this operation mode, you can use the DMP 132 with the IBM personal computer system or IBM-compatible systems without code conversion and get the same results as you would with an IBM printer. Detailed information is in Chapter 7, "Selecting a Code Set and Character Set."

Character Set

The DMP 132 not only has two kinds of code sets, but three kinds of character sets as well. One is a Tandy character set (96 ASCII, 4 modified ASCII, 64 European symbol, and 30 block graphics), and the others are the IBM character sets 1 and 2. You can use any character set at any time.

Data Processing Mode

How can you tell which mode the DMP 132 is in when it is first turned on? Some reflection on the program you previously entered tells you all you need to know.

Line feed commands are executed immediately in word processing (WP) mode, but not in data processing (DP) mode. The (27, 28) sequence did not cause a half-forward line feed until after the first line was printed. Thus, the printer must be in DP mode. And this new line feed stays in effect until further notice (another characteristic of DP mode). To see this, type:

LLIST

The short line feed is still there.

Word Processing Mode

If you executed the same program in WP mode, the line feed would have occurred immediately after the word DATA. Go into WP mode and try it. To enter WP mode, change line 10 to:

```
10 LPRINT CHR$(20):REM CHR$(20) SELECTS WP MODE
```

and run the program.

As you can see, the line feed is immediately executed.

Note that in WP mode, the new line feed is only temporary. Type LLIST **ENTER** to prove that the half-forward line feed occurs only once. The line feed then returns to normal.

Graphics Mode

Graphics mode is very different from the other two printer modes. For one thing, in graphics mode the LF code (10 Dec.) feeds paper 7/72" as opposed to the ordinary 1/6" pitch in WP and DP modes. Furthermore, only a few WP and DP features are available in graphics mode. Normal letters and symbols, for example, are ignored by the DMP 132 when it is in graphics mode. Instead, numeric data from 128 to 255 is translated into dot patterns for the print head. This lets you produce graphic printouts of charts, graphs, logos, and so on.

For a quick look at this mode, change your test program to:

```
10 LPRINT CHR$(18)
20 FOR I=128 TO 255
30 LPRINT CHR$(I);
40 NEXT
```

and run the program.

CHR\$(18) puts the DMP 132 into graphics mode. The numbers 128 through 255 are interpreted as dot patterns.

Type LPRINT CHR\$(30) **ENTER** to return to WP mode. Try LLIST again to be sure you are no longer in graphics mode.

Selecting a Print Mode

To move from one mode to another, refer to Table 4 for the required codes.

Table 4. Control Codes to Move from Mode to Mode.

Mode	Change to:	Send a CHR\$()
DP	WP	20
	Graphics	18
WP	DP	19
	Graphics	18
Graphics	DP	30*
	WP	30*

* Returns to last mode (WP or DP) used.

You can also select data processing and word processing modes by the DIP switch setting. In Tandy mode, set the 1-8 switch to OFF for data processing mode or ON for word processing mode.

Tips About Print Modes

In data processing mode:

- All commands that determine line feed pitch and direction of movement (except five special line feeds) are stored in the DMP 132's memory. They are not executed until the printer receives an LF code (10 Dec.). Then, the paper advances according to the pitch and direction codes stored in the DMP 132 memory.
- Line feed commands stay in effect until replaced by a new command.
- All printable characters can be printed in this mode.

In word processing mode:

- Line feed codes that determine pitch or direction are executed immediately.
- Line feed pitch and direction changes affect only the current print line.
- All printable characters can be printed in this mode.

In graphics mode:

- The LF code causes the paper to move 7/72" forward.
- Decimal numbers 128-255 sent via CHR\$ in BASIC are interpreted as pin firing patterns for the print head.
- Only a few code sequences are recognized in graphics mode.

Print Fonts and Character Widths 3

The DMP 132 has four distinct print (character) fonts:

- Standard and condensed
- Correspondence (NLQ)
- Proportional
- Graphics

Each font is created with a unique dot pattern laid out in a grid, or matrix.

The character styles differ in the size of the matrix and the way in which individual characters are created within the matrix.

Table 5 shows that the DMP 132 has three basic dot pitches:

- 10 CPI
- 12 CPI
- 17 CPI

Table 5. Character Widths and Densities.

Font Style	Matrix Size	Pitch
Standard	11 × 18	Normal 10 CPI/Elongated 5 CPI Normal 12 CPI/Elongated 6 CPI
Condensed	11 × 9	Normal 17 CPI/Elongated 8.5 CPI
Correspondence (NLQ)	23 × 18	Normal 10 CPI/Elongated 5 CPI Normal 12 CPI/Elongated 6 CPI
Proportional	<i>n</i> × 18	Variable Width (can be Elongated)

Remember that the DMP 132 must be set to the default CODE pitch setting to receive character select control codes. If you set the pitch to other than CODE by using the front panel switch, the set character pitch stays valid even if you send control codes from the computer.

If you change a font in a line without changing the dot pitch, the line prints continuously without pausing. For example, the DMP 132 does not pause while changing from proportional printing to correspondence 10 CPI because both use the same dot density. On the other hand, if the density of the new style character is different from the preceding one, the DMP 132 prints the current buffer contents and then resumes printing in the new character style. When condensed characters are printed on the same line with other characters, some dot space is left because of the changing of the dot density. For example, this happens when you change from standard to condensed characters.

Selecting Fonts

You can select character fonts by using the control codes from the computer, as well as by using the control panel NLQ switch.

A font style stays in effect until you choose another font style. Entering graphics mode does not change the font. The DMP 132 simply returns to the last active font upon leaving graphics mode.

Standard and Condensed Fonts

Standard characters are composed of an 11 by 9 dot matrix. The character pitch is determined either by the space the DMP 132 puts between each character or by the dot pitch.

This font prints in three character widths:

- Standard-10 characters per inch (CPI)
- Standard-12 CPI
- Condensed-17 CPI

You can elongate each of these widths (print characters at double-width), which gives you half as many characters per inch and a total of six different print widths.

To see the different print widths available, print a few sample lines. Type this BASIC program:

NEW ENTER

```

110 F$="STANDARD AND CONDENSED "
120 N=19:W$="10 CPI":GOSUB 240
130 N=23:W$="12 CPI":GOSUB 240
140 N=20:W$="17 CPI":GOSUB 240
230 LPRINT CHR$(27);CHR$(19):STOP
240 LPRINT CHR$(27);CHR$(N);F$;"CHARACTERS ";W$
250 RETURN

```

Then, run the program.

```

STANDARD AND CONDENSED CHARACTERS 10 CPI
STANDARD AND CONDENSED CHARACTERS 12 CPI
STANDARD AND CONDENSED CHARACTERS 17 CPI

```

The subroutine in Line 240 sends the required control codes to the DMP 132. Line 230 returns to normal character width and stops program execution.

Table 6. Font Style Change Commands.

Send CHR\$():	If you want:	Print Example
27 19	Standard-10	ABChijk
27 18	Correspondence-10	ABChijk
27 17	Proportional	ABChijk
27 23	Standard-12	ABChijk
27 20	Condensed-17	ABChijk
27 29	Correspondence-12	ABChijk
27 14	Start Elongation	ABChijk
27 15	End Elongation	ABChijk
27 31	Start Bold	ABChijk
27 32	End Bold	ABChijk
27 66 01	Start Italics	ABChijk
27 66 00	End Italics	ABChijk
27 83 01	Start Subscript	ABChijk
27 83 00	Start Superscript	ABChijk
27 88	End Sub-/Superscript	ABChijk
27 77	Microfont	ABChijk

Correspondence Font

The second character set is a 23 by 18 dot matrix character set for correspondence 10 and 12 CPI. The characters have different total widths from standard-10 or 12 characters, but print with the condensed density. (23 dots wide fits in the same space as 11 dots wide.) You can elongate correspondence print to 5 and 6 CPI.

- Correspondence-10 CPI
- Correspondence-12 CPI

Correspondence characters appear to be the same as standard characters in normal width, but they are an entirely unique character style. As an example, add these lines to the program, and then compare the two styles.

```
150 F$="CORRESPONDENCE ":N=18:W$="10 CPI":GOSUB 240
160 N=29:W$="12 CPI":GOSUB 240
```

Run the program.

```
STANDARD AND CONDENSED CHARACTERS 10 CPI
STANDARD AND CONDENSED CHARACTERS 12 CPI
STANDARD AND CONDENSED CHARACTERS 17 CPI
CORRESPONDENCE CHARACTERS 10 CPI
CORRESPONDENCE CHARACTERS 12 CPI
```

You can see the differences between the characters. The correspondence style is good for use with word processing programs that do not support proportional characters.

Proportional Spacing Font

The third character set is the proportionally spaced character set. This font is also different from the other two fonts, and the character matrix width varies from character to character. The widths vary from 3 dots to 11 dots (including two columns of blank dots to allow space between the characters).

To see an example of this font, add this line to the program.

```
170 F$="PROPORTIONAL ":N=17
180 W$="VARIABLE PITCH":GOSUB 240
```

Run the program.

```
STANDARD AND CONDENSED CHARACTERS 10 CPI
STANDARD AND CONDENSED CHARACTERS 12 CPI
STANDARD AND CONDENSED CHARACTERS 17 CPI
CORRESPONDENCE CHARACTERS 10 CPI
CORRESPONDENCE CHARACTERS 12 CPI
PROPORTIONAL CHARACTERS VARIABLE PITCH
```

Proportional characters add a quality look to word processing documents by eliminating wide gaps between characters. You can also elongate these characters to twice their normal width.

Graphics Characters

The fourth character set is used for block graphics printing. The characters can be normal 10 CPI width, 12 CPI width or condensed 17 CPI. This set is not fully compatible with the screen graphics of most Tandy computers. Rather, it is a unique character set.

To see that the various character widths do not affect graphics characters, add these lines to the program:

```
190 N=19:W$="10 CPI":F$="GRAPHIC ":LPRINT
200 GOSUB 240:GOSUB 260
210 N=23:W$="12 CPI":GOSUB 240:GOSUB 260
220 N=20:W$="17 CPI":GOSUB 240:GOSUB 260
260 FOR I=224 TO 254:LPRINT CHR$(I);:NEXT I
270 LPRINT:RETURN
```

Print Fonts and Character Widths

Run the program.

STANDARD AND CONDENSED CHARACTERS 10 CPI
STANDARD AND CONDENSED CHARACTERS 12 CPI
STANDARD AND CONDENSED CHARACTERS 17 CPI
CORRESPONDENCE CHARACTERS 10 CPI
CORRESPONDENCE CHARACTERS 12 CPI
PROPORTIONAL CHARACTERS VARIABLE PITCH

GRAPHIC CHARACTERS 10 CPI

• •

GRAPHIC CHARACTERS 12 CPI

• •

GRAPHIC CHARACTERS 17 CPI

• •

Since the normal line-to-line spacing is 1/6 inch, or 12 dots high, and the graphics characters are 6 dots high, you can create continuous vertical graphics by using the half forward line feed (CHR\$(27); CHR\$(28)). Add these lines to the program and run it.

```
10 LPRINT CHR$(27);CHR$(28);  
20 FOR R=1 TO 3  
30 FOR C=1 TO 7  
40 READ N:LPRINT CHR$(N);  
50 NEXT C:LPRINT  
60 NEXT R:LPRINT CHR$(27);CHR$(54);  
70 DATA 241,243,241,224,241,243,241  
80 DATA 224,244,241,241,241,249,224  
90 DATA 241,248,241,224,241,248,241:STOP
```

II

After you print the results, delete lines 10 through 90.

Right Justification

Proportional characters are designed to use with word processing programs because they waste very little space between characters, unlike monospaced print styles. As a result, you can insert small spaces between characters to line up the right margin of text on a page without destroying the professional look. This process, called right justification, is usually handled by word processing software. The DMP 132 provides codes that let you insert spaces ranging from 1 to 9 dots wide between characters.

You can see the way these codes work by modifying your current program. Add the following two lines to make the DMP 132 print two lines of proportional characters.

```
70 DATA "THE PROPORTIONAL CHARACTER SET OF THE"  
80 DATA "DMP 132 PRINTER CAN BE RIGHT JUSTIFIED"
```

Now, insert enough space to line up the right margins. The lines are read in as a string of characters because of the MID\$ function. Enter:

```
10 LPRINT CHR$(27);CHR$(17)  
20 FOR I=1 TO 2:READ A$  
30 FOR J=1 TO LEN(A$)  
40 LPRINT MID$(A$,J,1);  
50 REM  
60 NEXT J:LPRINT:NEXT I  
90 LPRINT CHR$(27);CHR$(19):END
```

Run the program.

```
THE PROPORTIONAL CHARACTER SET OF THE  
DMP 132 PRINTER CAN BE RIGHT JUSTIFIED
```


Print Fonts and Character Widths

To line up the right edge, insert a single blank dot column between the first 34 letters in the first print line. Change line 50 to read:

```
50 IF I=1 AND J>34 THEN LPRINT CHR$(27);CHR$(1);
```

Run the program.

THE PROPORTIONAL CHARACTER SET OF THE
DMP 132 PRINTER CAN BE RIGHT JUSTIFIED

Delete lines 10 through 90 of your sample program before continuing.

The following table shows the CHR\$() codes that insert dot spaces.

Table 7. Inserting Spaces.

Send CHR\$():	Space Inserted
27 01	1 dot space
27 02	2 dot spaces
27 03	3 dot spaces
27 04	4 dot spaces
27 05	5 dot spaces
27 06	6 dot spaces
27 07	7 dot spaces
27 08	8 dot spaces
27 09	9 dot spaces

The dot widths include space between characters.

If you use a micro-space command at the end of text (exceeding a line length), it generates a line-full condition. Printing starts, and micro-spacing commands begin at the start of the next line. If you use several kinds of micro-spacing commands in succession at the end of text, and if the row of micro-spacing commands causes a line-full condition, only the last micro-spacing command is set at the head of the next line.

Wrap-Around

The DMP 132 is a dot-addressable printer. Therefore, line length is determined not by the number of characters but by the number of dots per line. The number of addressable dots per line in data processing or word processing mode is:

- Standard-10=960
- Standard-12=1152
- Condensed-17=1918
- Correspondence-10=1920
- Correspondence-12=2304

If the length of text the DMP 132 receives exceeds the limit of dots per line (or the right margin if it has been set), the printer inserts a line feed, and the “leftover” character(s) is printed at the beginning of the next line. This is called wrap-around.

Elongated Characters

You can elongate any font to twice its normal width.

Table 8. Elongated Printing.

Send CHR\$():		To:
27	14	Start elongation
27	15	End elongation

Enter the codes to start and end elongated characters any number of times within a line in any mode.

Boldface

The printer produces boldface characters by widening each character's line width horizontally.

Table 9. Bold Printing.

Send CHR\$():	To:
27 31	Start bold printing
27 32	End bold printing

When the printer receives a (27,31) code sequence, it begins bold character printing at the next character it receives.

Mixing Bold and Elongated

You can activate both bold and elongated characters at the same time.

Italics

You can print any font on a "slant."

Table 10. Italic Printing.

Send CHR\$():	To:
27 66 1	Start italic printing
27 66 0	End italic printing

The printer starts printing italic characters at the first character it encounters after receiving the (27 66 1) code sequence.

If the printer receives a super-/subscript command during italic character printing, the DMP 132 prints the current buffer contents and then enters the super-/subscript printing mode.

Superscript and Subscript

In superscript and subscript, character height is cut in half. In superscript character printing, the character prints on the upper half of the line. In subscript, the character prints on the lower half of the line.

Table 11. Super-/Subscript Printing.

Send CHR\$():	To:
27 83 0	Start superscript printing
27 83 1	Start subscript printing
27 88	End super-/subscript printing

When the printer receives a (27 83 0) or (27 83 1) code sequence, subsequent characters print in superscript or subscript until the printer receives a (27 88) code. It then returns to the font that was in use before entering super-/subscript character printing.

The printing speed or horizontal dot resolution is fixed at 17 CPI. The underline position is not changed.

Microfont

In the microfont mode, all printouts are in superscript, with half forward line feeds (1/12 inch) in WP mode, or half the designated line pitch in DP mode.

Table 12. Microfont Printing.

Send CHR\$():	To:
27 77	Start microfont

Microfont stops when you send another font select command, such as CHR\$(27);CHR\$(19); or CHR\$(27);CHR\$(23). (See Table 6 for other character style change commands.)

Print Fonts and Character Widths

As with superscript, printing pitch for the microfont mode is fixed to 17 CPI.

Buzzer

In IBM mode, when the printer receives the code CHR\$(07), the DMP 132 sounds a buzzer for one second.

Line Feed

When the DMP 132 receives an LF code (ASCII 10), all data in the print buffer is printed, followed by a line feed. Unless you tell it otherwise, the DMP 132 uses 1/6-inch forward line feed when advancing paper (or 1/8-inch if the DIP switch 1-6 is set to ON).

If the DIP switch 1-3 is set to ON, a carriage return is also performed with the line feed, moving the printing position to the next print line. If the setting is off, the printing position stays in the current print column and moves down one line.

Other line feed codes control the pitch and direction of the line feed. In DP mode, these codes are usually stored in the buffer. In WP mode, they take effect immediately.

Pitch and direction settings are sent to the DMP 132 in a two-code sequence. First, a control code 27 is sent (CHR\$(27)). This tells the DMP 132 that a special code sequence follows. The next number determines the specific pitch and direction. These control codes are listed in Table 13.

Table 13. Line Feed Control Codes.

Send CHR\$():	To:
27 10	Full reverse line feed (1/6 inch)
27 28	Half forward line feed (1/12 inch)
27 30	Half reverse line feed (1/12 inch)
27 54	Full forward line feed (1/6 inch)
27 56	3/4 forward line feed (1/8 inch)

Hints About Line Feed

- In data processing mode, codes are stored in the print buffer. They are not activated until you send an LF code. In word processing mode, these code sequences cause the DMP 132 to print the information in its buffer and then execute a line feed of the specified pitch and direction.
- `CHR$(27);CHR$(10)` does not work from some BASICs with the `CHR$` function. The LF code (10) is intercepted by BASIC and sent to the printer as 13.
- All the codes in Table 13 are ignored in graphics mode.
- If the DIP switch 1-3 is set to LF&CR, a carriage return follows each line feed.

Note these restrictions for paper feeding:

- None of the reverse feed commands can feed the paper backward beyond the “top-of-form” position. When the paper reaches this point, the printer ignores these commands.
- A paper jam occurs if paper is fed backward when the bottom edge of the paper is nearing the print head.

Special Line Feed Control Codes

There are five special line feed codes that operates in all three print mode. They are:

Table 14. Special Line Feed Control Codes.

Send CHR\$():		To:
27	26	1/8 forward line feed (1/48 inch)
27	50	1/12 forward line feed (1/72 inch)
27	51	1/36 forward line feed (1/216 inch)
27	57	1/24 forward line feed (1/144 inch)
27	64 <i>n</i>	<i>n</i> /24 forward line feed (<i>n</i> /144 inch)

These codes initiate an immediate dump of the print buffer followed by the specified line feed, with one exception. In DP mode, the 27 64 *n* code sequence is stored in the buffer and is activated by the next LF code.

A carriage return is not performed, regardless of the setting of the DIP switch 1-3.

These special line feed codes are useful in adjusting a print line or dot-matrix picture.

Carriage Return (CR)

A CR (13 or 141) code tells the printer to print the current buffer contents and then perform a carriage return. If the DIP switch 1-2 is set to OFF, one line feed (the current active line feed) is performed at the same time. If the switch is set to ON, a line feed is not activated, and printing continues on the same line.

In addition, the line feed function can be set to ON or OFF via control codes, independent of switch settings. If you send control code CHR\$(27); CHR\$(22), the line feed function is turned ON; the line feed function is turned off when you send control code CHR\$(27); CHR\$(21).

Backspace

You can backspace on the DMP 132, from 1 to 255 dot-columns, by sending it a two-code sequence. The first code is `CHR$(8)`. The second code is in the form `CHR$(n)`, where *n* is a value from 1 to 255 specifying the number of dot-columns to backspace from the current printing position. For example:

```
LPRINT CHR$(8);CHR$(150)
```

would backspace the printing position 150 dot-columns from the current position.

In general, backspacing should be specified in multiples of the current character size. That is, backspacing for the standard-10 character set should be 12 dots per character (9 dots plus 3 for spacing between characters). For instance, `LPRINT CHR$(8);CHR$(24)` would backspace two characters. To backspace over elongated characters, simply double the number of dots.

If *n* is 0, backspacing does not occur. You can use the repeat feature to backspace more than 255 dot-spaces.

If *n* is greater than the current dot-position, printing starts at the beginning of the line.

Backspace works in both data and word processing modes. In graphics mode, the backspace code is ignored, and *n* is treated as an independent character.

The backspace command is a print command. Receiving the backspace command causes the DMP 132 to print all data in the buffer and then execute a backspace operation.

The widths of the available fonts are shown in Table 15. The proportional character widths naturally vary from character to character.

probably a typo

Table 15. Character Set Width.

Font Style		Dots/ Character	To Backspace			
			1 Character		<i>n</i> Character	
Standard-10	10 CPI	12	08	12	08	12× <i>n</i>
	5 CPI	24	08	24	08	24× <i>n</i>
Standard-12	12 CPI	12	08	12	08	12× <i>n</i>
	6 CPI	24	08	24	08	24× <i>n</i>
Condensed-17	17 CPI	14	08	14	08	14× <i>n</i>
	8.5 CPI	28	08	28	08	28× <i>n</i>
Correspondence-10	10 CPI	24	08	24	08	24× <i>n</i>
	5 CPI	48	08	48	08	48× <i>n</i>
Correspondence-12	12 CPI	24	08	24	08	24× <i>n</i>
	6 CPI	48	08	48	08	48× <i>n</i>

The dots/character column in the preceding table includes dots between characters.

Setting Top-of-Form and Form Length

The control code `CHR$(27);CHR$(52);CHR$(n)` sets the form length in all three print modes. After printing the current buffer contents, it resets the line feed count to zero and sets the current line as the top-of-form position. The line length per page is set to n (by 1/6 inch or 1/8 inch) to be used with the form feed code.

If n is 0 or 1, it is changed to 2. Whenever any line feed operation is activated, line feed pitch is counted up and compared with n (by 1/6 inch or 1/8 inch).

On initial power-up, the DMP 132 sets the top-of-form at the current paper position and the form length in accordance with the setting of the DIP switches 1-4 and 1-6. See Table 16.

Be sure the paper is properly positioned before you turn on the DMP 132.

Table 16. Form Length/Lines-per-Page.

DIP Switch		Form Length	Lines-per-Page
1-4	1-6		
OFF	OFF	11 inches	66 lines
OFF	ON	11 inches	88 lines
ON	OFF	12 inches	72 lines
ON	ON	12 inches	96 lines

In single-sheet printing, the number of lines-per-page is 56.

Form Feed

When the printer receives a `CHR$(12)` command, the print buffer contents print out completely, paper advances to the next top-of-form position, and the line feed counter resets to zero.

However, a small problem exists in communicating with the DMP 132 through BASIC. Most BASICs keep track of the top-of-form internally, intercept the form feed (FF) code on its way to the printer, and send out, instead, a series of line feeds. Since the FF code never gets to the printer, the `CHR$(12)` is not activated. Some BASICs can use the `POKE` or `OUT` statement to send the form feed directly to the printer and bypass the interceptor.

Note: Do not use `CHR$(12)` except in graphics applications. Most Tandy application programs have the top-of-form “built-in.” See your application program user’s guide for instructions on setting FORMS, and the program does the rest.

Entering IBM Mode

When the printer receives a `CHR$(27);CHR$(33)` code, the DMP 132 resets to the defaults of the IBM mode. That is, buffer contents print out, the carriage returns to its home position, and all settings of the DIP switches (except the switch 1-1) are read again.

Ignored or Undefined Codes

Codes that are unusable or undefined in a given print mode are either ignored or printed with the symbol \times , which represents an invalid code.

There are several reasons a code might be unusable in a certain mode. Redundant codes that do not change the current printer status are usually ignored. For example, if the DMP 132 is in DP mode, sending a CHR\$(19) (used to enter DP mode) is ignored. And there are many ASCII control codes in the range 0 to 31 that the DMP 132 does not recognize. ASCII 0, for example, is not used in any of the three print modes.

Table 17 summarizes the undefined print codes.

Table 17. DMP 132 Ignored Control Codes.

All Modes:	
<ul style="list-style-type: none">• Out of range on repeat sequence.• Out of range POS sequence.• Redundant codes that do not change the current printer status.	

DP Mode:	0, 1, 19, 30, 127, 255
WP Mode:	0, 1, 20, 30, 127, 255
Graphics Mode:	All codes in the range 0-127 are ignored except: (7), (10), (12), (13), (27, 14), (27, 15), (27, 16, <i>n1</i> , <i>n2</i>), (27, 21), (27, 22), (27, 33), (27, 50), (27, 51), (27, 52, <i>n</i>) (27, 57), (27, 64, <i>n</i>), (27, 72, <i>n</i>), (28, <i>n1</i> , <i>n2</i>), (30).

Unprintable repeat sequence data *n2* is also ignored.

Codes Printed as \times	
in DP and WP:	
<ul style="list-style-type: none">• All codes 0-31 and 128-159, except the active function codes or the above ignored codes.• Unprintable repeat data <i>n2</i>.	

DMP 132 Buffer Operation

The DMP 132's ability to temporarily store data is one of its main advantages over a typewriter. Codes sent to a typewriter (that is keys you press) are transferred immediately to the paper.

Codes sent to a printer are not printed immediately; they are stored in a separate section of memory in the printer called the buffer. When the buffer fills or certain codes are received (that is, LF or CR), the buffer is emptied and all data is printed on the paper. What happens after the buffer data prints depends on the circumstances. In some cases, printing continues on the same line; in others, the print head moves to a different position relative to the paper.

In the DP mode, commands for changing fonts, line feed, and so on, can be stored in the print buffer until data is printed.

Tips on the DMP 132 Buffer

For DP, WP, and graphics modes:

- The buffer allocates a fixed number of dots, depending on the character width selected. The buffer empties when the data stored equals that number. Printing resumes at the start of the next line.
- The last character received by the buffer is printed at the start of the next line following an automatic line feed and carriage return.
- The form feed code (FF = 12 decimal) automatically activates printing (if the code is received by the DMP 132).

If you select "LF only" (the DIP switch 1-3), the buffer prints and the print head moves to the next top-of-form line without a carriage return. Otherwise, the printing position is set at the start of the next top-of-form line.

- The carriage return code (CR = 13 decimal) automatically activates printing (assuming that at least one character code is already in the buffer). If you select "carriage return only" (the DIP switch 1-2), the printing position moves to the start of the current line, and the

next buffer full prints subsequent characters over the current line. Otherwise, subsequent characters print at the start of the next line.

- The line feed code (LF = 10) automatically activates printing. If you select “LF only” (the DIP switch 1-3), the buffer prints and the print head moves to the next print line without a carriage return. Otherwise, the printing position is set at the start of the next print line.
- If the computer delays more than a second before sending the next print code, the buffer prints. Printing continues from the current position.
- The dot positioning sequence (27, 16, n_1 , n_2) prints the buffer if the designated position is to the left of the current position. Printing continues in the current line at the dot address specified by the (27, 16) command.

Data and word processing modes only:

- The backspace command activates printing. Printing continues in the current line at the dot address specified by the command.
- If you select a character set of different dot density, the data in the buffer prints. Codes for changing character sets are: (27, 17), (27, 18), (27, 19), (27, 20), (27, 23), (27, 29), (27 31), and (27 32). Printing continues in the current line with the new character style.
- When the printer receives the start graphics mode code (18) followed by standard characters, the buffer prints. Dot graphics printing continues from the current character position.

Graphics mode only:

- When the printer receives the end graphics code and returns to a standard or condensed character printing condition, the buffer prints. The DMP 132 returns to the previous print mode, and printing continues in the same line from the current print position.

Notes:

- In the description, “next line” means the new line reached by performing a line feed operation. In data processing mode, if a reverse line feed is set in the memory, the line feed operation causes paper to move in the reverse direction.
- Repeat data can cause a buffer full or overflow condition. The overflow characters are wrapped around and printed at the beginning of the next line.

Word and Data Processing Modes 5

Superscript and Subscript (By LF Code)

In an earlier chapter, you learned that the difference between data processing and word processing modes is in the way they handle line feed codes. In data processing mode, LF codes are stored until the end of the line and become the current line feed standard; in word processing mode, these codes are executed immediately and are only temporary.

Printing superscripts and subscripts in word processing mode is one way to take advantage of the immediate response to line feed codes. Enter this program in BASIC:

```
10 E$=CHR$(27) 'ESC
20 D$=CHR$(28) 'DOWN
30 U$=CHR$(30) 'UP
40 LPRINT CHR$(20)
100 LPRINT "(X";
110 LPRINT E$D$;"1";E$U$;"X";
120 LPRINT E$D$;"2";E$U$;"")";
130 LPRINT E$U$;"2";E$D$
```

Run the program.

$(X_1 + X_2)^2$

In this program, frequently used codes are stored in variables E\$, D\$, and U\$ to shorten the program. The directions in lines 10 through 30 refer to the motion you would make when drawing the script characters by hand — move down to print the subscripts 1 and 2, then back up to the output line, and then move up to print the superscript 2.

Repeat Printing

The DMP 132 also provides a built-in repeat capability. You can use it to repeat a single character code as many as 255 times. It is also useful for repeating graphic codes, underlining, repeating block graphics, and so on. The repeat feature uses a three-code sequence:

- CHR\$(28)
- The number of repetitions
- The code to be repeated

Underline Printing

To underline any text in either DP or WP mode, send the DMP 132 a CHR\$(15). All text that follows this code is underlined until you send a CHR\$(14), which stops underlining.

Dot Positioning

In any mode, you can position the print head to a specified dot position. However, even though the character stored in ROM can use all the print head positions, you cannot.

For example, using the correspondence-10 character sets (10 CPI), there are 1920 dots per line, but only half (960) are accessible by you. The same is true with proportional characters.

Table 18. DMP 132 Dot Positioning.

Character	Dots Per Line	Available Columns
Standard-10	960	480
Standard-12	1152	576
Condensed-17	1918	959
Correspondence-10	1920	960
Correspondence-12	2304	1152

Elongated characters use the same dot columns, even though the characters are printed twice as wide.

To position the print head to a specific position, send a (27, 16) code sequence, and then send two numbers ($n1$ and $n2$) that specify the desired position. In other words:

1. Send a control code to specify the character set (standard, condensed, correspondence, proportional, or graphics).

2. Send a CHR\$(27); CHR\$(16) to tell the DMP 132 you want to position the print head at a specific dot column.
3. Tell the printer which dot column you want to print.
4. Tell the DMP 132 what you want to print.

To specify a dot column at which printing is to begin, first use CHR\$ to send the (27, 16) code. Follow this with another two-code sequence to specify the position. For instance:

```
LPRINT CHR$(27); CHR$(16); CHR$(n1); CHR$(n2)
```

where $n1$ is a value 0- 4 and $n2$ is a value 0-255.

Table 19. Dot Positioning.

To specify dot column:	$n1$ must be:	$n2$ must be:
0-255	0	0-255
256-511	1	0-255
512-767	2	0-255
768-1023	3	0-255
1024-1151	4	0-127

Remember that:

- standard-10 printing allows you to access up to 479 dot columns ($n1 = 1$, $n2 = 233$)
- standard-12 printing allows you to access up to 575 dot columns ($n1 = 2$, $n2 = 63$)
- condensed-17 printing allows you to access up to 958 dot columns ($n1 = 3$, $n2 = 190$)
- correspondence-10 printing allows you to access up to 959 dot columns ($n1 = 3$, $n2 = 191$)
- correspondence-12 printing allows you to access up to 1151 dot columns ($n1 = 4$, $n2 = 127$)

Why two numbers ($n1$ and $n2$)? The maximum value you can send to the DMP 132 with one number is 255, and you have more than 255 dot positions available.

The DMP 132 interprets these two numbers as a single 12-bit (bits 0 through 11) value. $n2$ represents bits 0 through 7. The four lower bits of $n1$ are used as bits 8 through 11; the four upper bits of $n1$ are ignored.

Left and Right Margin

You can position the left/right margin to a specific character position designated by the current font pitch.

To change the left/ right margin to a new position, first send a `CHR$(27);CHR$(81)` to tell the DMP 132 to change the margin. Follow this with another code to specify the number of characters from the leftmost position.

Table 20. Left/Right Margin Set.

Send <code>CHR\$()</code> :	To:
27 81 n	Set left margin
27 82 n	Set right margin

The value n indicates the number of characters counted by the current font pitch from the leftmost margin.

- Once the left/right margin position is set, this margin does not change, even when the character mode is changed.
- This command does not affect previously set tab stop positions.
- When setting the left margin, the maximum value of n is limited to the maximum printable characters in the current printing mode minus 2 (for example, $136 - 2 = 134$ in normal printing mode); otherwise, the printer ignores this command.

- When setting the right margin, the value of n must exceed the left margin value by at least 2; otherwise, the printer ignores this command.

Skip Perforation

You can set a skip zone for a perforation at the bottom of a form by sending the code sequence, `CHR$(27); CHR$(72); CHR$(n)`. The skip zone is determined by the number of n times 1/6 inch (or 1/8 inch if the DIP switch 1-6 is set to ON). n equals the number of full lines to leave blank at the bottom of the form.

- If the value is already set, the DMP 132 automatically skips the designated area when printing.
- If n exceeds the form length, the printer ignores this sequence.
- At power ON, the DIP switch 1-5 determines whether 1-inch skip perforation is performed.

Bidirectional and Unidirectional Printing

In DP or WP mode, you can select either bidirectional or unidirectional printing.

Table 21. Bidirectional/Unidirectional Printing.

Send <code>CHR\$()</code> :	To:
27 85 0	Start bidirectional printing
27 85 1	Start unidirectional printing

At power-up, bidirectional printing is selected.

In graphics mode, you have no pre-defined characters at your disposal. You are responsible for the positioning and action of the print head.

There are 480 addressable dot columns across the paper. There are 7 addressable dots vertically (dot columns). This means that you can specify one of up to 3,360 individual dots ($7 \times 480 = 3,360$).

To print only a few dots in a dot column, follow this general procedure:

1. Send a `CHR$(18)` to put the DMP 132 into graphics mode.
2. Send a `CHR$(27); CHR$(16)` to tell the DMP 132 you want to position the print head to print a specific dot.
3. Tell the DMP 132 in which dot column you want to print. This is explained shortly.
4. Tell the DMP 132 what you want to print. You can do this in a number of ways.

To specify a dot column at which printing is to begin, first use `CHR$` to send the (27, 16) code. Follow this with another two-code sequence to specify the position. For instance:

```
LPRINT CHR$(27);CHR$(16);CHR$(n1);CHR$(n2)
```

where *n1* is a value 0-1 and *n2* is a value 0-255.

Table 22. Graphics Dot Positioning.

To specify dot column:	<i>n1</i> must be:	<i>n2</i> must be:
0-255	0	0-255
256-479	1	0-223

Remember that graphics printing allows you to access as many as 479 dot columns (*n1*=1, *n2*=223).

Graphics Mode

Even though dot columns greater than 255 exist, you cannot send values greater than 255. That is, CHR\$(400) is not allowed. You must break it into a two-byte value.

For instance, to draw a vertical bar at dot column 144, try this program:

```
10 LPRINT CHR$(18)
20 LPRINT CHR$(27);CHR$(16);CHR$(0);
25 LPRINT CHR$(144);CHR$(255)
```

In line 10, CHR\$(18) puts the DMP 132 into graphics mode. In line 20, CHR\$(27); CHR\$(16) tells it to prepare to position the print head.

Try these program lines to print a vertical bar at the rightmost available dot column — 479.

```
10 LPRINT CHR$(18);CHR$(27);CHR$(16);
15 LPRINT CHR$(1);CHR$(223);CHR$(255);
```

The program works like this:

- CHR\$(18) puts the DMP 132 into graphics mode.
- CHR\$(27); CHR\$(16) tells the DMP 132 to prepare to position the print head.
- CHR\$(1) tells the DMP 132 that the position is greater than or equal to 255.
- CHR\$(223) specifies the last available dot column.

Note: If you had used CHR\$(48) in line 15 instead of CHR\$(47), the DMP 132 would ignore the positioning command and set the new position to the first dot column in the next line.

Printing Graphics Patterns

Besides positioning the print head, you also need to be able to tell the DMP 132 what to print once the head is positioned.

Remember that there are seven vertical dots in a dot column. You can print any or all of these dots in any combination you want.

Look back at the sample programs used to illustrate print head positioning. The last part of the program line (CHR\$(255)), which always printed a vertical bar, is an example of all seven dots being printed at once.

Try printing just the top dot of the last dot column (479):

```
10 LPRINT CHR$(18);CHR$(27);CHR$(16);
15 LPRINT CHR$(1);CHR$(223);CHR$(129);
```

How does the CHR\$(129) print just the top dot? Even though the seven dots in a dot column are a vertical row, they are not numbered sequentially from 1 to 7. Table 23 describes the numbering system to use with the DMP 132 when specifying an individual dot.

Table 23. DMP 132 Addressable Dot Numbering System.

Dot #:	Dot:	Number you must use to print the dot:
1	.	129
2	.	130
4	.	132
8	.	136
16	.	144
32	.	160
64	.	192

You have seen how to print the top dot in the column. To print the bottom dot, change the program lines to:

```
10 LPRINT CHR$(18);CHR$(27);CHR$(16);
15 LPRINT CHR$(1);CHR$(223);CHR$(192);
```

Graphics Mode

To print a combination of dots, use this procedure:

1. Specify the dot numbers that represent the individual dots you want to print.
2. Add those individual dot numbers together.
3. Add the sum of the combined dot numbers to 128.

For example, to print the first dot (dot #1), the fourth dot (dot #8), and the last dot (dot #64), add them together: $1 + 8 + 64 = 73$. Then add the sum (73) to 128: $73 + 128 = 201$. Use 201 as the addressable dot pattern in the form `CHR$(201)`:

```
10 LPRINT CHR$(18);CHR$(27);CHR$(16);
15 LPRINT CHR$(1);CHR$(223);CHR$(201);
```

The following sample program line prints a box with a line through the middle:

```
10 LPRINT CHR$(18);CHR$(27);CHR$(16);
20 LPRINT CHR$(1);CHR$(30);CHR$(255);CHR$(201);
30 LPRINT CHR$(201);CHR$(201);CHR$(201);CHR$(255);
```

Now, enter and run this new program:

```
5 WIDTH "LPT1:",255
10 LPRINT CHR$(18);
20 S=1:N=128
30 FOR I=1 TO 20:S=-S
40 FOR J=0 TO 6
80 IF S<0 THEN N=N+2^(6-J) ELSE N=N-2^J
90 LPRINT CHR$(N);
100 NEXT J:NEXT I
120 LPRINT CHR$(30)
```

Be prepared for a pause. It takes time to fill the print buffer.

This program alternately adds and subtracts powers of two to the current code pattern stored in the variable *n*. The net effect is to add or remove a single dot from the preceding dot pattern.

Line Feed

In graphics mode, it is assumed that you want to print rows of graphics one right after another, each seven dots high. Therefore, graphics mode provides only one line feed. A single line feed advances the paper seven dots, or approximately 0.12 inch. This small paper advance allows for continuous printing without unwanted space between lines.

Modify the current program to demonstrate this fixed line feed. Add or change:

```
20 FOR K=1 TO 2:S=1:N=128
50 IF K=1 THEN 80
60 IF S<0 THEN N=N+2^J ELSE N=N-2^(6-J)
70 GOTO 90
110 LPRINT:NEXT K
```

Run the program.

These lines infiltrate the current loop and produce a mirror image of the first pass of the print head. The LPRINT in line 110 causes the line feed between passes.

In addition to a 7/72 inch line feed, the following four line feed codes are available:

- 1/72 inch line feed—(27 50)
- 1/144 inch line feed—(27 57)
- *n*/144 inch line feed—(27 64 *n*)
n should be a value between 1-255.
- 1/216 inch line feed—(27 51)

Repeat Function

CHR\$(28);CHR\$(*n*) tells the DMP 132 to repeat a graphics pattern a specified number of times.

The format for the repeat function is:

repeat code + number of times to repeat + what to repeat

For instance, LPRINT CHR\$(28);CHR\$(15);CHR\$(255) prints the solid vertical bar 15 times.

Change line 90 to:

```
90 LPRINT CHR$(28);CHR$(2);CHR$(N);
```

and run the program.

Or run this program:

```
10 LPRINT CHR$(18);  
20 LPRINT CHR$(28);CHR$(50);CHR$(135);
```

Leaving Graphics Mode

CHR\$(30) exits graphics mode. It places the DMP 132 in the mode (DP or WP) the printer was in when it entered graphics mode. In addition, all the previous conditions, such as underline and character style, are restored.

Freehand Drawing

Having graphics at your disposal requires a good amount of data. The computer can do most of the work in drawing figures that can be described by a mathematical function. Freehand drawing, on the other hand, requires translating the figure into a matrix of dots and then calculating the dot printing combinations for each print head position.

Because seven dots are available for graphics, separate the matrix into rows seven dots high.

The numbers can be stored in DATA statements. To conserve memory and typing time, store the data as numbers from 0 to 127. Then, add 128 as you send them to the DMP 132.

NEW ENTER

```
120 DATA 999
160 DATA 4,102,3,115,1,127,999
190 DATA 14,31,15,70,64,32,39,16,19,8,15,999
210 DATA 16,16,8,8,4,4,2,2,1,1,999
```

The 999's signify the end of a line. The other numbers are between 0 and 127. Now, for the program to read the numbers, add 128, and then send them to the DMP 132.

Enter and run this program.

```
10 LPRINT CHR$(18)
20 FOR I=1 TO 4
30 READ N: IF N=999 THEN 80
40 LPRINT CHR$(128+N);: GOTO 30
80 LPRINT: NEXT I
90 LPRINT CHR$(30)
100 LPRINT "DMP 132"
```

The result is not spectacular. However, you can make it repeat a number several times. A good approach is to use negative numbers to indicate the number of repetitions, followed by the number to be repeated. Add:

```
120 DATA 34,-4,66,68,-4,4,-5,8,-5,16,-5,32,-8,64,999
130 DATA 64,96,80,72,68,66,33,16,24,28,30,31,31,-5,62
180 DATA -3,35,39,39,71,103,87,79,71,67,33,16,8,4,2,1,0,0
```

Do not run the program yet!

In line 120, the sequence -4, 66 means four 66s: 66, 66, 66, 66. Modify the program to recognize the negative numbers. Change:

Graphics Mode

```
40 IF N>=0 THEN LPRINT CHR$(128+N);:GOTO 30
50 READ M
60 LPRINT CHR$(28);CHR$(-N);CHR$(128+M);
70 GOTO 30
```

Now, run the program.

The figure still does not look like much. Add the remaining DATA lines and see what you have been working on.

```
110 DATA -7,0,64,64,96,96,16,15,72,72,36,36,18,18,17,-4,33
140 DATA -5,124,-5,120,-2,112,-2,113,-3,97,-3,98,66,66,68
150 DATA 100,68,-2,100,84,8,72,32,32,16,16,8,8
170 DATA 63,32,32,64,64,-5,1,-5,2,-5,4,8,8,-3,9,-3,17,19,19
200 DATA -5,0,-5,1,-5,2,-5,4,-5,8,-5,16,-5,39,64,127,32
```

Run the program.

The result is worth the effort!

The DMP 132 provides two operation modes with different capabilities. These modes can operate independently of each other. Three different character sets are also provided so that different characters can be printed using the same binary code.

Code Set Selection

Two types of code sets are available with the DMP 132. One is the original Tandy code set, described earlier in this manual. The other is a code set for IBM, which is like that used with the IBM 80 CPS graphics printer. (Refer to Chapter 8, "IBM Emulation Mode" for details.)

Select these two operation modes by performing one of the following operations:

- Send control code `CHR$(27);CHR$(33)` in either mode. This changes the operation mode to the other mode.
- Set the DIP switch 1-1 to ON; this selects the code set for IBM. To use the Tandy code set, set the switch to OFF.

Character Set Selection

The DMP 132 has three kinds of character sets. One is the Tandy character set, which can print 94 ASCII characters, four modified ASCII characters, 64 European symbols, and 30 block graphics characters. The other character sets are the IBM character sets 1 and 2, which can print 94 ASCII characters and 48 block graphics characters. You can select a character set from either Tandy or IBM emulation mode.

Select IBM character set 1 by using control code `CHR$(27);CHR$(58)`. To return to the Tandy character set, send control code `CHR$(27);CHR$(59)`. Only IBM character set 1 is applicable in Tandy mode.

Note: Select between IBM character sets 1 and 2 by using the following code sequences in IBM code set mode.

`LPRINT CHR$(27) "7"` for character set 1
`LPRINT CHR$(27) "6"` for character set 2

International Character Set Selection

You can select the following international character sets using the “international character sets” command (27, 89, *n*) by selecting one of the following numbers for *n*.

Table 25. International Characters Sets.

Character Sets	Codes (Hexadecimal)
U.S.A.	20
Germany	21
France	22
Norway	23
Sweden	24
Denmark	25
Finland	26
Italy	27
Spain	28
England	29
Belgium	2A

When the DMP 132 receives this command, the ASCII codes that are input print characters specified as in Appendix A. USA is designated at power up.

Description

The DMP 132 has two different control code sets; one is the original DMP 132 code set, and the other is a code set for IBM, similar to the one used with the IBM 80 CPS graphics printer. These two code sets are independent.

Code Set Selection

You can easily select the code set for IBM by performing one of the following operations:

- Set the DIP switch 1-1 to ON.
- When using the Tandy (original code set) mode, send the code sequence `CHR$(27);"!"`.

Character Set Selection

In the IBM emulation mode, you can select two different character sets (not character styles). One is IBM character set 1, and another is IBM character set 2. Select IBM emulation mode by setting the DIP switch 1-1 to ON or by sending the correct control code. For details on correspondence between ASCII codes and character patterns, refer to Appendix A.

Choose between IBM character sets 1 and 2 by sending the following control codes at any time:

- `CHR$(27);"6"` for IBM character set 2
- `CHR$(27);"7"` for IBM character set 1

You can also select the IBM character sets by the setting of the DIP switch 1-7: set to OFF to designate the character set 1, set to ON to designate the character set 2.

In addition, character codes with a decimal value below 32 (normally used as control codes) can be printed by sending control code `CHR$(27);"^"`. That is, one character following this control code sequence is handled like a normal printable character, even if the charac-

ter code has a decimal value less than 32. For the character patterns of codes with a decimal value below 32, refer to printable characters for codes below 32 (decimal) in Appendix A.

Carriage Return

A carriage return (CHR\$(13)) prints the data in the buffer, then the print head moves to the leftmost dot position. A line feed is executed if the DIP switch 1-2 is set to OFF or if the printer has received a CHR\$(27);"5";CHR\$(1) code sequence. This command terminates the double-width print mode. Automatic line feed capability can be set to ON or OFF using the following code sequence:

- CHR\$(27);"5";CHR\$(0) for carriage return without line feed
- CHR\$(27);"5";CHR\$(1) for carriage return with line feed

Vertical Formatting Control Codes

Setting the Command for Line Feed Pitch

The line feed pitch is set to 1/6 inch or 1/8 inch (designated by the setting of DIP switch 1-6) at power up. You can change the pitch by sending one of these control codes: CHR\$(27);"0", CHR\$(27);"1", CHR\$(27);"3", or CHR\$(27);"A".

The control code CHR\$(27);"0" changes the line feed distance to 1/8 inch.

The control code CHR\$(27);"1" changes the line feed distance to 7/72 inch.

Start Variable Line Feed

The control code CHR\$(27);"2" is an execution command for the CHR\$(27);"A" command. That is, the line feed pitch designated by the CHR\$(27);"A" command is sent after the CHR\$(27);"2" command is sent. If no CHR\$(27);"A" command has been given, the line feed distance is set to 1/6 inch.

For example, if the line spacing is set to 7/72 inch for the bit image mode and you want to return the line spacing to 1/6 inch, send a control code `CHR$(27);"2"` only (without a `CHR$(27);"A"` command). The line spacing will return to 1/6 inch.

Variable Line Feed

The control code `CHR$(27);"3";CHR$(n)` changes the line feed distance to $n/216$ inch. n is a single-byte binary number and can represent any number between 1-255.

Setting the Variable Line Feed

The control code `CHR$(27);"A";CHR$(n)` defines the line feed pitch in increments of 1/72 inch. n is a single-byte binary number and can represent any value 1-127.

Remember that this command only defines the pitch; you need to send a control code `CHR$(27);"2"` to change the line feed distance.

Execution Command for Line Feed

The code `CHR$(10)` prints out the character and feeds the paper one line. The paper feed distance is specified by the function selection switch or by the line spacing set commands discussed above. This command terminates a double-width print mode.

Carriage return is performed if the DIP switch 1-3 is set to ON; otherwise, it is not performed.

Execute Variable Line Feed

The control code `CHR$(27);"J";CHR$(n)` prints out the current buffer contents and feeds the paper $n/216$ inch. n is a single-byte binary number and can represent any value 1-255. A carriage return is performed if the DIP switch 1-3 is set to ON; otherwise, it is not performed.

When, for example, you want a one-inch line feed, send the control code `CHR$(27);"J";CHR$(216)` instead of sending an LF command six times.

Reverse Line Feed

When you issue the control code `CHR$(27);CHR$(93)`, the printer prints out the character followed by this code and feeds paper 1/6 inch in the reverse direction.

Notes:

- Reverse line feed cannot be executed beyond the top-of-form position.
- A paper jam can occur if the printer performs a reverse line feed near the end of a page.
- Carriage return is performed if the automatic carriage return (function selection switch 1-3) is set to ON; otherwise, it is not performed.

Setting Top-of-Form and Form Length

You can change the form length at any time, whether you are using the friction feed or the bidirectional tractor feed. The control code `CHR$(27);"C";CHR$(n)` sets lines per page, and the control code `CHR$(27);"C";CHR$(0);CHR$(m)` sets inches per page. *n* is a single-byte binary number and can represent any value 1-127. *m* is also a single-byte binary number and can represent any value 1-22. The top-of-form position is set at the current line after the printer executes the form length setting command. Form length is set to 11 inches or 12 inches (selected by the DIP switch 1-4) at power up.

Setting Top-of-Form Position

You can set the top-of-form position at any vertical position by using control code `CHR$(27);"4"`. To set the top-of-form position for the top margin setting, first feed the paper to the target line, and then issue control code `CHR$(27);"4"`.

Note: Since the control code sequence `CHR$(27);"C";CHR$(n)` counts the form length in line numbers, the actual form length varies according to the line feed pitch you select.

Form Feed

When you issue control code `CHR$(12)`, the current buffer contents print out, and the paper feeds to the next top-of-form position. This command terminates a double-width print mode. Carriage return is performed if the DIP switch 1-3 is set to ON; otherwise, it is not performed.

Skip Perforation

Set the skip perforation function by using the `CHR$(27);"N";CHR$(n)` command. *n* shows the value for the number of lines to be used on a page, allowing you to avoid printing on the perforation. *n* is a single-byte binary number and can represent any value 1-127. This function is terminated by the `CHR$(27);"O"` command or the form length set command.

Note: If you designate *n* to exceed the page length, the printer ignores this command.

You can also set the 1-inch skip perforation by setting the DIP switch 1-5 to on.

Horizontal Formatting Control Codes

Selecting Fonts and Pitches

To select the font, you can use the control panel NLQ switch, but you can also change the font from your computer. Send `CHR$(27);"I";CHR$(1)` to select the high-speed, standard font. The code sequence `CHR$(27);"I";CHR$(2)` or `CHR$(27);"I";CHR$(3)` selects the IBM near letter quality font.

Once you have selected the font, designate the pitch by sending:

- `CHR$(18)` for 10 characters per inch
- `CHR$(27);CHR$(58)` for 12 characters per inch
- `CHR$(27);"P";CHR$(n)` for proportional spacing

Proportional Spacing

When proportional spacing is on, characters print in different sized spaces, depending on the width of each character. That is, narrow characters, such as *i*, are given a small amount of space, while wide characters, such as *W*, are given a wide space.

Control code `CHR$(27);"P";CHR$(1)` changes the printing pitch from monospacing to proportional spacing, and control code `CHR$(27);"P";CHR$(0)` terminates proportional spacing and returns to monospacing.

Note: The proportional spacing is not terminated by control code `CHR$(18)` or control code `CHR$(27);CHR$(58)`, but only by control code `CHR$(27);"P";CHR$(0)`.

Horizontal Tabulation

Using horizontal tabulation, you can easily place and format sections horizontally aligned. You can set the maximum 28 horizontal TAB stops to any column (left margin is column 0) using the following control codes:

- `CHR$(27);"D";CHR$(n1);CHR$(n2) ... CHR$(nk);CHR$(0)`

n is a single-byte binary number that indicates the horizontal column position; it represents any value 1-136. Designate other column positions in ascending order. Send a null code (`CHR$(0)`) to terminate the horizontal TAB designation. Once TAB stops are set, control code `CHR$(9)` skips to the next right TAB position. Horizontal TAB position is affected by character pitch and printing mode. Therefore, when you change character pitches during compressed print or double-width print mode, horizontal TAB positions shift. If proportional spacing is on, the width of the space code is used as the character pitch.

Control code `CHR$(27);"R"` sets the horizontal TAB stops to the same positions they were in at power up (one TAB in every eighth column).

Notes:

- If the horizontal TAB stop is not set, the printer ignores control code CHR\$(9).
- When the horizontal TAB is set, if the TAB stops are not entered in ascending order, or if the number of TABs exceeds 28, TAB setting is terminated.
- All previously set TABs are cleared when you designate new TAB stop positions. To clear all TAB stops, send the control code CHR\$(27);"D";CHR\$(0).
- Horizontal TAB stops are set at every eight columns when the printer powers up.

Printing Mode Control

In IBM emulation mode, you can print elongated, condensed, bold, emphasized, superscript, or subscript characters, or even change the printing mode. These features are useful in printing a title or highlighting in word processing systems.

Double-Width Printing

In double-width printing mode, the width of a printed character is doubled; space is affected, and its pitch is doubled, but horizontal TABs are not affected, and their pitches are not doubled. Start double-width printing with CHR\$(14), CHR\$(27);CHR\$(14) or CHR\$(27);"W";CHR\$(1). When you establish double-width printing with CHR\$(14) or CHR\$(27);CHR\$(14), it is released with CHR\$(20) or a line feed. When it is established with CHR\$(27);"W";CHR\$(1), it is released with CHR\$(27);"W";CHR\$(0) only.

Compressed Printing

In compressed printing mode, 10 CPI is changed to 17 CPI.

Horizontal TABs and spaces are condensed, too. Designate compressed printing with CHR\$(15) or CHR\$(27);CHR\$(15), and release it with CHR\$(18).

Notes:

- Compressed printing is suspended in bit image mode or emphasized printing mode. When the DMP 132 exits either mode, compressed printing restores.
- Compressed printing is available only in standard font; the printer ignores the code if it is in correspondence font mode.

Data can be printed with up to 136 characters in a line when using eight-inch paper.

Emphasized Printing

In emphasized printing mode, the current characters are wider than “normal” ones, thereby forming a sort of boldface. This emphasized printing mode is established using control code, `CHR$(27);“E”` and cancelled by `CHR$(27);“F”`.

Double-Strike Printing

In double-strike printing mode, characters are printed once on the normal print line, and again with a small shift vertically. Start this mode by using `CHR$(27);“G”`, and cancel it by using `CHR$(27);“H”`.

Superscript/Subscript

You can print superscript and subscript characters in IBM emulation mode. These modes are useful for printing algebraic expressions. In superscript mode, a character prints on the upper half of a normal character space, and in subscript mode, a character is printed on the lower half of a normal character space. Superscript mode is established by `CHR$(27);“S”`; `CHR$(0)`, and subscript mode is established by `CHR$(27);“S”`; `CHR$(1)`; both are cancelled by `CHR$(27);“T”`.

Underlining

In this mode, all characters, spaces, and the spaces moved by horizontal TABs (except bit image data and graphic symbols) are underlined. This mode is established by `CHR$(27);“-”`; `CHR$(1)`. To terminate the underline mode, send the code sequence `CHR$(27);“-”`; `CHR$(0)`.

Bit Image Mode

There are four kinds of bit image modes in the DMP 132, and one vertical line of dot image consists of eight-bit data. Each mode has its particular horizontal dot density, and its maximum number of bits on one line is as follows:

Table 26. Bit Image Modes.

Mode	Number of bits/line
60 DPI bit image	816 bits/line
120 DPI bit image	1632 bits/line
120 DPI bit image (Normal speed)	1632 bits/line
240 DPI bit image	3264 bits/line

60 DPI Bit Image Mode

In 60 DPI bit image mode, horizontal dot (bit) density is 1/60 inch. The code sequence of this mode is:

```
LPRINT CHR$(27); "K"; CHR$(n1); CHR$(n2); CHR$(d1); ... ;
CHR$(dn)
```

$n1$ and $n2$ are the numbers of the horizontal dot positions. Each is a single-byte binary number; $n1$ is the lower part of the value, and $n2$ is the upper part of the value. Therefore, the actual value is $n1 + 256 \times n2$. The total data number ($n1, n2$) should not exceed 816. $d1$ to dn is the dot pattern per vertical line and is a single-byte binary number.

Unlike Tandy mode, the dot patterns are numbered from bottom to top.

*All bit image modes have 72 dots per vertical inch.
When printing graphics, set vertical line feed distance
to 24/216" (= 1/9"), using <esc>-3 (q.v.).*

IBM Emulation Mode

128 •
64 •
32 •
16 •
8 •
4 •
2 •
1 •

Add the numbers of the dot patterns you want to print to obtain the data for $d1$ through dn .

120 DPI Bit Image Mode

In 120 DPI bit image mode, horizontal dot (bit) density is 1/120 inch. The code sequence of this mode is:

```
LPRINT CHR$(27); "L"; CHR$(n1); CHR$(n2); CHR$(d1); . . . ;  
CHR$(dn)
```

The total data number ($n1$, $n2$) should not exceed 960.

120 DPI Bit Image Mode (Normal Speed)

In 120 DPI bit image mode (normal speed), the dot density is also 1/120 inch, and the dot construction is the same as 120 DPI bit image, but the bits on the same vertical position cannot be printed continuously, or damage to the printer could occur. The code sequence of this mode is:

```
LPRINT CHR$(27); "Y"; CHR$(n1); CHR$(n2); CHR$(d1); . . . ;  
CHR$(dn)
```

The definition and limits of this mode are the same as described in "120 DPI Bit Image Mode."

240 DPI Bit Image Mode

In 240 DPI bit image mode, horizontal dot (bit) density is 1/240 inch. In this mode, the DMP 132 does not print the bits on the same vertical line continuously. The code sequence of this mode is:

```
LPRINT CHR$(27); "Z"; CHR$(n1); CHR$(n2); CHR$(d1); . . . ;  
CHR$(dn)
```

The total data number ($n1$, $n2$) should not exceed 1920.

Other Control Codes

Paper End Detection

You can turn the FAULT signal to the interface on or off when the printer detects a paper end condition. By combining this function and the override function, you can print the last printable line on a page without a device fault on the external terminal.

The FAULT signal is inhibited by sending CHR\$(27);"8" (ignore paper end), and is enabled afterward by sending CHR\$(27);"9" (cancel ignore paper end).

Backspace

In this mode, the printer prints out the character that is followed by a control code CHR\$(8) and moves the printing position to the left one character space. This command is useful for printing composite characters such as slashed zeroes. The distance of a backspace is determined by the currently selected pitch. If proportional spacing is on, the printer uses the width of the space code as the backspace distance.

Cancel

This command clears all data in the print buffer that was received before CHR\$(24). Other control codes received before this code are not affected at all.

Unidirectional Printing

Usually, the DMP 132 executes printing with a bidirectional logic-seeking technique, but it allows you to print using a unidirectional printing method to avoid slight vertical misalignment. This function is useful in printing charts, graphs, and so on.

Execute this function using CHR\$(27);"U";CHR\$(1), and cancel it with CHR\$(27);"U";CHR\$(0).

When only a small number of characters are required to print, printing the other characters in bidirectional mode decreases the efficiency of the DMP 132. Use the home head code CHR\$(27);"⟲" to print only the required characters in unidirectional mode. This code is cancelled by CHR\$(13).

Printing Characters with a Code Below 20 Hex

The code sequence CHR\$(27);"";CHR\$(*n*) prints the character assigned to code *n* when *n* is below 20 hex. If there is no character assigned to *n*, a space (20 hex) prints instead.

Bell

When the printer receives the code, CHR\$(07), the printer buzzer sounds for one second.

Appendices

Character Sets

Tandy Character Set Table

Upper Bit	Hex.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
Lower Bit	Hex.	Binary	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000		POS	SP	0	(	P		p				¥	à	Æ			
1	0001		DC1		1	A	Q	a	q				à	À	æ			
2	0010		DC2	"	2	B	R	b	r				ç	Ö	ï	À		
3	0011		DC3	#	3	C	S	c	s				£	Û	ò	á		
4	0100		DC4	\$	4	D	T	d	t				¢	û	Ø			
5	0101			%	5	E	U	e	u				µ	ˆ	ø			
6	0110			&	6	F	V	f	v				ˆ	ä	ë	Ñ		
7	0111		BEL	ETB	7	G	W	g	w				▼	o	ï	É		
8	1000		BS	(	8	H	X	h	x				†	ü	á	Á		
9	1001			)	9	I	Y	i	y				§	ß	í	í		
A	1010		LF	SUB	*	:	J	Z	j	z	LF		®	TM	ó	Ö		
B	1011			ESC	+		K	I	k	(			©	é	ú	Ú		
C	1100		FF	FS	<	L		I					¼	û	ì	¿		
D	1101		CR	GS	=	M	J	m	)	CR			¾	è	ñ	Û		
E	1110		SO	RS	>	N	^	n	~				½	ˆ	ä	È		
F	1111		SI	US	?	O	—	o					¶	f	ó	À		

[illegible]

Dot Column Width of Tandy Characters

Standard Proportional Characters

Upper Bit	Lower Bit	Hex.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Hex.	Binary	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111	
0	0000	<div>0</div>	<div>16</div>	<div>32</div>	<div>48</div>	<div>64</div>	<div>80</div>	<div>96</div>	<div>112</div>	<div>128</div>	<div>144</div>	<div>160</div>	<div>176</div>	<div>192</div>	<div>208</div>	<div>224</div>	<div>240</div>	
1	0001	<div>1</div>	<div>17</div>	<div>33</div>	<div>49</div>	<div>65</div>	<div>81</div>	<div>97</div>	<div>113</div>	<div>129</div>	<div>145</div>	<div>161</div>	<div>177</div>	<div>193</div>	<div>209</div>	<div>225</div>	<div>241</div>	
2	0010	<div>2</div>	<div>18</div>	<div>34</div>	<div>50</div>	<div>66</div>	<div>82</div>	<div>98</div>	<div>114</div>	<div>130</div>	<div>146</div>	<div>162</div>	<div>178</div>	<div>194</div>	<div>210</div>	<div>226</div>	<div>242</div>	
3	0011	<div>3</div>	<div>19</div>	<div>35</div>	<div>51</div>	<div>67</div>	<div>83</div>	<div>99</div>	<div>115</div>	<div>131</div>	<div>147</div>	<div>163</div>	<div>179</div>	<div>195</div>	<div>211</div>	<div>227</div>	<div>243</div>	
4	0100	<div>4</div>	<div>20</div>	<div>36</div>	<div>52</div>	<div>68</div>	<div>84</div>	<div>100</div>	<div>116</div>	<div>132</div>	<div>148</div>	<div>164</div>	<div>180</div>	<div>196</div>	<div>212</div>	<div>228</div>	<div>244</div>	
5	0101	<div>5</div>	<div>21</div>	<div>37</div>	<div>53</div>	<div>69</div>	<div>85</div>	<div>101</div>	<div>117</div>	<div>133</div>	<div>149</div>	<div>165</div>	<div>181</div>	<div>197</div>	<div>213</div>	<div>229</div>	<div>245</div>	
6	0110	<div>6</div>	<div>22</div>	<div>38</div>	<div>54</div>	<div>70</div>	<div>86</div>	<div>102</div>	<div>118</div>	<div>134</div>	<div>150</div>	<div>166</div>	<div>182</div>	<div>198</div>	<div>214</div>	<div>230</div>	<div>246</div>	
7	0111	<div>7</div>	<div>23</div>	<div>39</div>	<div>55</div>	<div>71</div>	<div>87</div>	<div>103</div>	<div>119</div>	<div>135</div>	<div>151</div>	<div>167</div>	<div>183</div>	<div>199</div>	<div>215</div>	<div>231</div>	<div>247</div>	
8	1000	<div>8</div>	<div>24</div>	<div>40</div>	<div>56</div>	<div>72</div>	<div>88</div>	<div>104</div>	<div>120</div>	<div>136</div>	<div>152</div>	<div>168</div>	<div>184</div>	<div>200</div>	<div>216</div>	<div>232</div>	<div>248</div>	
9	1001	<div>9</div>	<div>25</div>	<div>41</div>	<div>57</div>	<div>73</div>	<div>89</div>	<div>105</div>	<div>121</div>	<div>137</div>	<div>153</div>	<div>169</div>	<div>185</div>	<div>201</div>	<div>217</div>	<div>233</div>	<div>249</div>	
A	1010	<div>10</div>	<div>26</div>	<div>42</div>	<div>58</div>	<div>74</div>	<div>90</div>	<div>106</div>	<div>122</div>	<div>138</div>	<div>154</div>	<div>170</div>	<div>186</div>	<div>202</div>	<div>218</div>	<div>234</div>	<div>250</div>	
B	1011	<div>11</div>	<div>27</div>	<div>43</div>	<div>59</div>	<div>75</div>	<div>91</div>	<div>107</div>	<div>123</div>	<div>139</div>	<div>155</div>	<div>171</div>	<div>187</div>	<div>203</div>	<div>219</div>	<div>235</div>	<div>251</div>	
C	1100	<div>12</div>	<div>28</div>	<div>44</div>	<div>60</div>	<div>76</div>	<div>92</div>	<div>108</div>	<div>124</div>	<div>140</div>	<div>156</div>	<div>172</div>	<div>188</div>	<div>204</div>	<div>220</div>	<div>236</div>	<div>252</div>	
D	1101	<div>13</div>	<div>29</div>	<div>45</div>	<div>61</div>	<div>77</div>	<div>93</div>	<div>109</div>	<div>125</div>	<div>141</div>	<div>157</div>	<div>173</div>	<div>189</div>	<div>205</div>	<div>221</div>	<div>237</div>	<div>253</div>	
E	1110	<div>14</div>	<div>30</div>	<div>46</div>	<div>62</div>	<div>78</div>	<div>94</div>	<div>110</div>	<div>126</div>	<div>142</div>	<div>158</div>	<div>174</div>	<div>190</div>	<div>206</div>	<div>222</div>	<div>238</div>	<div>254</div>	
F	1111	<div>15</div>	<div>31</div>	<div>47</div>	<div>63</div>	<div>79</div>	<div>95</div>	<div>111</div>	<div>127</div>	<div>143</div>	<div>159</div>	<div>175</div>	<div>191</div>	<div>207</div>	<div>223</div>	<div>239</div>	<div>255</div>	

GRAPHICS

⌂	⌘	—	ò	ì	|	lj
11	11	12	11	9	9	11

Correspondence Proportional Characters

Upper Bit	Lower Bit	Hex.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Hex.	Binary	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111	
0	0000	<div>0</div>	<div>16</div>	<div>32</div>	<div>48</div>	<div>64</div>	<div>80</div>	<div>96</div>	<div>112</div>	<div>128</div>	<div>144</div>	<div>160</div>	<div>176</div>	<div>192</div>	<div>208</div>	<div>224</div>	<div>240</div>	
1	0001	<div>1</div>	<div>17</div>	<div>13</div>	<div>20</div>	<div>23</div>	<div>23</div>	<div>23</div>	<div>23</div>	<div>129</div>	<div>145</div>	<div>22</div>	<div>23</div>	<div>21</div>	<div>24</div>	<div>24</div>	<div>241</div>	
2	0010	<div>2</div>	<div>18</div>	<div>34</div>	<div>50</div>	<div>66</div>	<div>82</div>	<div>98</div>	<div>114</div>	<div>130</div>	<div>146</div>	<div>162</div>	<div>178</div>	<div>194</div>	<div>210</div>	<div>226</div>	<div>242</div>	
3	0011	<div>3</div>	<div>19</div>	<div>35</div>	<div>51</div>	<div>67</div>	<div>83</div>	<div>99</div>	<div>115</div>	<div>131</div>	<div>147</div>	<div>163</div>	<div>179</div>	<div>195</div>	<div>211</div>	<div>227</div>	<div>243</div>	
4	0100	<div>4</div>	<div>20</div>	<div>36</div>	<div>52</div>	<div>68</div>	<div>84</div>	<div>100</div>	<div>116</div>	<div>132</div>	<div>148</div>	<div>164</div>	<div>180</div>	<div>196</div>	<div>212</div>	<div>228</div>	<div>244</div>	
5	0101	<div>5</div>	<div>21</div>	<div>37</div>	<div>53</div>	<div>69</div>	<div>85</div>	<div>101</div>	<div>117</div>	<div>133</div>	<div>149</div>	<div>165</div>	<div>181</div>	<div>197</div>	<div>213</div>	<div>229</div>	<div>245</div>	
6	0110	<div>6</div>	<div>22</div>	<div>38</div>	<div>54</div>	<div>70</div>	<div>86</div>	<div>102</div>	<div>118</div>	<div>134</div>	<div>150</div>	<div>166</div>	<div>182</div>	<div>198</div>	<div>214</div>	<div>230</div>	<div>246</div>	
7	0111	<div>7</div>	<div>23</div>	<div>39</div>	<div>55</div>	<div>71</div>	<div>87</div>	<div>103</div>	<div>119</div>	<div>135</div>	<div>151</div>	<div>167</div>	<div>183</div>	<div>199</div>	<div>215</div>	<div>231</div>	<div>247</div>	
8	1000	<div>8</div>	<div>24</div>	<div>40</div>	<div>56</div>	<div>72</div>	<div>88</div>	<div>104</div>	<div>120</div>	<div>136</div>	<div>152</div>	<div>168</div>	<div>184</div>	<div>200</div>	<div>216</div>	<div>232</div>	<div>248</div>	
9	1001	<div>9</div>	<div>25</div>	<div>41</div>	<div>57</div>	<div>73</div>	<div>89</div>	<div>105</div>	<div>121</div>	<div>137</div>	<div>153</div>	<div>169</div>	<div>185</div>	<div>201</div>	<div>217</div>	<div>233</div>	<div>249</div>	
A	1010	<div>10</div>	<div>26</div>	<div>42</div>	<div>58</div>	<div>74</div>	<div>90</div>	<div>106</div>	<div>122</div>	<div>138</div>	<div>154</div>	<div>170</div>	<div>186</div>	<div>202</div>	<div>218</div>	<div>234</div>	<div>250</div>	
B	1011	<div>11</div>	<div>27</div>	<div>43</div>	<div>59</div>	<div>75</div>	<div>91</div>	<div>107</div>	<div>123</div>	<div>139</div>	<div>155</div>	<div>171</div>	<div>187</div>	<div>203</div>	<div>219</div>	<div>235</div>	<div>251</div>	
C	1100	<div>12</div>	<div>28</div>	<div>44</div>	<div>60</div>	<div>76</div>	<div>92</div>	<div>108</div>	<div>124</div>	<div>140</div>	<div>156</div>	<div>172</div>	<div>188</div>	<div>204</div>	<div>220</div>	<div>236</div>	<div>252</div>	
D	1101	<div>13</div>	<div>29</div>	<div>45</div>	<div>61</div>	<div>77</div>	<div>93</div>	<div>109</div>	<div>125</div>	<div>141</div>	<div>157</div>	<div>173</div>	<div>189</div>	<div>205</div>	<div>221</div>	<div>237</div>	<div>253</div>	
E	1110	<div>14</div>	<div>30</div>	<div>46</div>	<div>62</div>	<div>78</div>	<div>94</div>	<div>110</div>	<div>126</div>	<div>142</div>	<div>158</div>	<div>174</div>	<div>190</div>	<div>206</div>	<div>222</div>	<div>238</div>	<div>254</div>	
F	1111	<div>15</div>	<div>31</div>	<div>47</div>	<div>63</div>	<div>79</div>	<div>95</div>	<div>111</div>	<div>127</div>	<div>143</div>	<div>159</div>	<div>175</div>	<div>191</div>	<div>207</div>	<div>223</div>	<div>239</div>	<div>255</div>	

GRAPHICS

Σ	×	—	ò	ì	|	lj
23	23	24	22	20	13	24

IBM Character Set 1

Upper Bit	Lower Bit	Hex.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Hex.	Binary	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111	
0	0000	NUL		SP	0	α	P	p				á	⋮	⌞	⌞	α	≡	
1	0001		0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
2	0010		1	17	33	49	65	81	97	113	129	145	161	177	193	209	225	241
3	0011		DC2	"	2	B	R	b	r		DC2	ó	⋮	T	T	Γ	≥	
4	0100		3	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243
5	0101		DC4	\$	4	D	T	d	t		DC4	ñ	⋮	⋮	⋮	Σ	f	
6	0110		5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245
7	0111		6	22	38	54	70	86	102	118	134	150	166	182	198	214	230	246
8	1000	BEL	7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247
9	1001	BS	CAN	(	8	H	X	h	x	BS	CAN	¿	⋮	⋮	⋮	⋮	⋮	⋮
A	1010	HT		)	9	I	Y	i	y	HT		⋮	⋮	⋮	⋮	⋮	⋮	⋮
B	1011	LF		*	:	J	Z	j	z	LF		⋮	⋮	⋮	⋮	⋮	⋮	⋮
C	1100	VT	ESC	+	;	K	|	k	{	VT	ESC	½	⋮	⋮	⋮	⋮	⋮	⋮
D	1101	FF		,	<	L	\	l	|	FF		¼	⋮	⋮	⋮	⋮	⋮	⋮
E	1110	CR		-	=	M	]	m	}	CR		⋮	⋮	⋮	⋮	⋮	⋮	⋮
F	1111	SO		>	N	^	n	~	~	SO		«	⋮	⋮	⋮	⋮	⋮	⋮
		SI		/	?	O	—	o	~	SI		»	⋮	⋮	⋮	⋮	⋮	⋮

Note: When using the ESC·^·n command, codes 3, 4, 5, 6, 19, 20 and 21 are printed as ♥, ♦, ♣, ♠, !!, ¶ and §, respectively.

!"#\$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ
 [\]^_`abcdefghijklmnopqrstuvwxyz{|}~
 ¡¢£¥¦§¨ª«¬®¯°±²³´µ¶·¸¹º»¼½¾¿ÀÁÂÃÄÅÆÇÈÉÊËÌÍÎÏÐÑÒÓÔÕÖ×ØÙÚÛÜÝÞßàáâãäåæçèéêëìíîïðñ
 òóôõö÷øùúûüýþÿ

[illegible]

Note: When using the ESC · ^ · n command, codes 19 and 20 are printed as !! and ¶, respectively.

[illegible]

Dot Column Width of IBM Characters

Standard Proportional Characters

Upper Bit	Hex.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
Lower Bit	Hex.	Binary	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000			12	11	11	11	8	11	11	11	11	12	12	12	11	11	
1	0001			9	9	11	11	11	11	11	11	9	12	12	12	11	11	
2	0010			9	11	11	11	11	10	11	11	11	12	12	12	10	10	
3	0011	11	9	11	11	11	11	9	11	11	11	11	12	12	12	11	10	
4	0100	11	9	11	11	11	11	11	11	11	11	11	12	12	12	10	12	
5	0101	11	11	11	11	11	11	11	11	11	11	11	12	12	12	11	12	
6	0110	11		11	11	11	11	9	11	11	11	11	12	12	12	12	11	
7	0111			9	11	11	11	11	11	9	11	11	12	12	12	11	11	
8	1000			8	11	11	10	11	11	11	11	10	12	12	12	10	9	
9	1001			9	11	9	11	9	11	11	11	11	12	12	12	11	9	
A	1010			11	9	11	11	8	11	11	11	11	12	12	12	11	9	
B	1011			11	9	11	9	9	9	9	10	11	12	12	12	11	11	
C	1100			9	10	11	10	9	9	9	11	11	12	12	12	11	9	
D	1101			11	11	11	9	11	9	9	11	9	12	12	12	11	8	
E	1110			9	10	11	9	11	10	11	11	11	12	12	12	10	9	
F	1111			10	10	11	11	11		11	10	11	12	12	12	10	12	

GRAPHICS

ø	☒	—	..	·	|	ij	∞
11	11	12	9	8	9	11	11

Correspondence Proportional Characters

Upper Bit	Hex.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
Lower Bit	Hex.	Binary	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000		0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
1	0001		1	17	33	49	65	81	97	113	129	145	161	177	193	209	225	241
2	0010		2	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242
3	0011	24	19	23	21	23	23	22	23	22	22	23	24	24	24	23	24	
4	0100	24	20	21	21	23	23	23	21	22	22	23	24	24	24	17	24	
5	0101	24	21	23	21	23	23	21	23	22	22	24	24	24	24	20	24	
6	0110	24		23	21	23	23	21	23	22	23	23	24	24	24	23	23	
7	0111			13	21	23	24	23	24	22	23	23	24	24	24	19	24	
8	1000			20	21	23	23	23	23	21	23	21	24	24	24	23	19	
9	1001			16	21	18	23	20	23	21	23	24	24	24	24	19	13	
A	1010			22	13	19	22	16	21	21	23	24	24	24	24	23	13	
B	1011			22	13	23	13	23	21	21	21	23	24	24	24	21	24	
C	1100			13	19	22	23	20	13	20	21	23	24	24	24	23	18	
D	1101			21	21	24	13	24	16	20	23	13	24	24	24	23	15	
E	1110			13	19	24	19	23	21	23	24	22	24	24	24	18	17	
F	1111			23	21	23	24	22		23	21	22	24	24	24	19	24	

GRAPHICS

ø	⊗	—	“	’	|	ij	⌘
19	23	24	20	19	13	24	23

Tandy Control Codes

Code Dec. Hex	Symbol	DP Mode	WP Mode	BI Mode	Remarks
0 (00) 1 (01)	NUL SOH	Ignored	Ignored	Ignored	
7 (07)	BEL	Sound buzzer	Sound buzzer	Sound buzzer	
8 (08) <i>n</i>	BS <i>n</i>	Dot column backspace <i>n</i> : dot number	Dot column backspace <i>n</i> : dot number	Ignored Receive <i>n</i> as character data	$1 \leq n \leq 255$
10 (0A) or or 138 (8A)	LF	Execute LF accord- ing to latched information	1/6" LF 1/12" LF in Micro font	7/72" LF Receive 138 as a print data	
12 (0C)	FF	Form Feed	Form Feed	Form Feed	Page length is selectable
13 (0D) or or 141 (8D)	CR	Carriage Return only or plus Line Feed	Carriage Return only or plus Line Feed	Carriage Return only or plus Line Feed	DIP switch selects CR or CR+LF.
14 (0E)	SO	End Underline	End Underline	Ignored	
15 (0F)	SI	Start Underline	Start Underline	Ignored	
18 (12)	DC2	Select Graphics Mode	Select Graphics Mode	Ignored	
19 (13)	DC3	Ignored	Select DP Mode.	Ignored	
20 (14)	DC4	Select WP Mode	Ignored	Ignored	
27 (1B) <i>n</i>	ESC <i>n</i>	Microspacing	Microspacing	Ignored	2nd byte is dot column number. $1 \leq n \leq 9$
27 (1B) 10 (0A)	ESC LF	Set 1/6" Reverse LF	Perform 1/6" Reverse LF	Ignored	
27 (1B) 14 (0E)	ESC SO	Start Elongation	Start Elongation	Start Elongation	
27 (1B) 15 (0F)	ESC SI	End Elongation	End Elongation	End Elongation	

Character Sets

Code Dec.	Hex	Symbol	DP Mode	WP Mode	BI Mode	Remarks
27 16 <i>n1</i> <i>n2</i>	(1B) (10)	ESC POS <i>n1</i> <i>n2</i>	Positioning	Positioning	Positioning	<i>n1 n2</i> indicate dot position from home position.
27 17	(1B) (11)	ESC DC1	Select NLO Proportional Character	Select NLO Proportional Character	Ignored	
27 18	(1B) (12)	ESC DC2	Select NLO Character	Select NLO Character	Ignored	10 CPI
27 19	(1B) (13)	ESC DC3	Select Standard Character	Select Standard Character	Ignored	10 CPI
27 20	(1B) (14)	ESC DC4	Select Condensed Character	Select Condensed Character	Ignored	17 CPI
27 21	(1B) (15)	ESC NAK	Set only CR for CR Code	Set only CR for CR Code	Set only CR for CR Code	Reset DIP Switch 1-7.
27 22	(1B) (16)	ESC SYN	Set CR and LF for CR Code	Set CR and LF for CR Code	Set CR and LF for CR Code	Reset DIP Switch 1-7.
27 23	(1B) (17)	ESC ETB	Select Compressed Character	Select Compressed Character	Ignored	12 CPI
27 26	(1B) (1A)	ESC SUB	Perform 1/8 LF	Perform 1/8 LF	Perform 1/8 LF	1/48 Inch
27 28	(1B) (1C)	ESC FS	Set 1/2 LF	Perform 1/2 LF	Ignored	1/12 Inch
27 29	(1B) (1D)	ESC GS	Select NLO Compressed Character	Select NLO Compressed Character	Ignored	12 CPI
27 30	(1B) (1E)	ESC RS	Select 1/12" Reverse LF	Perform 1/12" Reverse LF	Ignored	
27 31	(1B) (1F)	ESC US	Select Bold Character	Select Bold Character	Ignored	Invalid in condensed, microfont, superscript

Code Dec.	Hex	Symbol	DP Mode	WP Mode	BI Mode	Remarks
27 32	(1B) (20)	ESC SP	End Bold Character	End Bold Character	Ignored	
27 33	(1B) (21)	ESC !	Select IBM Mode	Select IBM Mode	Select IBM Mode	
27 50	(1B) (32)	ESC 2	Perform 1/12 LF	Perform 1/12 LF	Perform 1/12 LF	1/72 Inch
27 51	(1B) (33)	ESC 3	Perform 1/36 LF	Perform 1/36 LF	Perform 1/36 LF	1/216 Inch
27 52 <i>n</i>	(1B) (34) <i>n</i>	ESC 4 <i>n</i>	Specify Page Length	Specify Page Length	Specify Page Length	$n \times 1/6$ Inch
27 54	(1B) (36)	ESC 6	Set 1 LF	Ignored	Ignored	1/6 Inch
27 56	(1B) (38)	ESC 8	Set 3/4 LF	Perform 3/4 LF	Ignored	1/8 Inch
27 57	(1B) (39)	ESC 9	Perform 1/144" LF	Perform 1/144" LF	Perform 1/144" LF	
27 58	(1B) (3A)	ESC :	Select IBM Character Set	Select IBM Character Set	Ignored	
27 59	(1B) (3B)	ESC ;	Select Tandy Character Set	Select Tandy Character Set	Ignored	
27 64 <i>n</i>	(1B) (40) <i>n</i>	ESC @ <i>n</i>	Set $n/144$ " LF	Perform $n/144$ " LF	Perform $n/144$ " LF	
27 66 <i>n</i>	(1B) (42) <i>n</i>	ESC B <i>n</i>	Select Italic Character	Select Italic Character	Ignored	$n=1$: Start Italic $n=0$: End Italic
27 72 <i>n</i>	(1B) (48) <i>n</i>	ESC H <i>n</i>	Set $n/6$ " Skip Perforation	Set $n/6$ " Skip Perforation	Set $n/6$ " Skip Perforation	$n=0$: End Skip Perforation

Control Codes

Code Dec.	Hex	Symbol	DP Mode	WP Mode	BI Mode	Remarks
27 77	(1B) (4D)	ESC M	Select Micro Font	Select Micro Font	Ignored	1/2 LF(1/12") is set.
27 81 <i>n</i>	(1B) (51) <i>n</i>	ESC Q <i>n</i>	Set Left Margin	Set Left Margin	Ignored	Set at position (<i>n</i> ×character width).
27 82 <i>n</i>	(1B) (52) <i>n</i>	ESC R <i>n</i>	Set Right Margin	Set Right Margin	Ignored	Set at position (<i>n</i> ×character width).
27 83 <i>n</i>	(1B) (53) <i>n</i>	ESC S <i>n</i>	<i>n</i> =0 Set Superscript <i>n</i> =1 Set Subscript	<i>n</i> =0 Set Superscript <i>n</i> =1 Set Subscript	Ignored	ESC·X ends this selection.
27 85	(1B) (55)	ESC U	<i>n</i> =0 Set Bidirectional <i>n</i> =1 Set Unidirectional	<i>n</i> =0 Set Bidirectional <i>n</i> =1 Set Unidirectional	Ignored	
27 88	(1B) (58)	ESC X	End Superscript and Subscript	End Superscript and Subscript	Ignored	
27 89 <i>n</i>	(1B) (59) <i>n</i>	ESC Y <i>n</i>	Select Country Character	Select Country Character	Ignored	<i>n</i> =32~42
28 <i>n</i> ₁ <i>n</i> ₂	(1C)	FS <i>n</i> ₁ <i>n</i> ₂	Repeat Character (Undefined code is ignored.)	Repeat Character (Undefined code is ignored.)	Repeat Print Data	<i>n</i> ₁ : Repeat number <i>n</i> ₂ : Char. or print data
30	(1E)	RS	Ignored	Ignored	End Bit Image	
127	(7F)	DEL	Ignored	Ignored	Ignored	
255	(FF)	DEL	Ignored	Ignored	Ignored	
Other undefined codes in function area. 2 to 31 (02 to 1F hex)			Print X	Print X	Ignored	
Other undefined codes in function area. 128 to 159 (80 to 9F hex)			Print X	Print X	Printing Data	

IBM Control Codes

Decimal	Hex	Symbol	Function
7	(07)	BEL	Sound buzzer for 1 second
135	(87)		
27	(1B)	ESC BEL	Same as BEL
7	(07)		
27	(1B)		
135	(87)		
8	(08)	BS	Move 1 character position to the left
136	(88)		
27	(1B)	ESC BS	Same as BS
8	(08)		
27	(1B)		
136	(88)		
9	(09)	HT	Move to next horizontal tab position
137	(89)		
27	(1B)	ESC HT	Same as HT
9	(09)		
27	(1B)		
137	(89)		
10	(0A)	LF	Print and Line Feed according to latched information with or without Carriage Return (DIP switch 1-3)
138	(8A)		
27	(1B)	ESC LF	Same as LF
10	(0A)		
27	(1B)		
138	(8A)		
11	(0B)	VT	Same as LF
139	(8B)		

Control Codes

Decimal	Hex	Symbol	Function
27 11	(1B) (0B)	ESC VT	Same as LF
27 139	(1B) (8B)		
12 140	(0C) (8C)	FF	Form Feed after printing
27 12	(1B) (0C)		
27 140	(1B) (8C)	ESC FF	Same as FF
13 141	(0D) (8D)		
13 141	(0D) (8D)	CR	Printing and Carriage Return with or without Line Feed (DIP switch 1-2)
27 13	(1B) (0D)		
27 141	(1B) (8D)	ESC CR	Same as CR
14 142	(0E) (8E)		
14 142	(0E) (8E)	SO	Printing and Double-Width Mode designation (print command terminates this mode)
27 14	(1B) (0E)		
27 142	(1B) (8E)	ESC SO	Same as SO
15 143	(0F) (8F)		
15 143	(0F) (8F)	SI	Printing and Condensed Mode designation
27 15	(1B) (0F)		
27 143	(1B) (8F)	ESC SI	Same as SI
27 143	(1B) (8F)		

Decimal	Hex	Symbol	Function
18	(12)	DC2	Printing and termination of Condensed Mode and Compressed Mode
146	(92)		
27	(1B)	ESC DC2	Same as DC2
18	(12)		
27	(1B)		
146	(92)		
20	(14)	DC4	Printing and Double-Width Mode termination
148	(94)		
27	(1B)	ESC DC4	Same as DC4
20	(14)		
27	(1B)		
148	(94)		
27	(1B)	ESC !	Select TANDY Mode
33	(21)		
24	(18)	CAN	Clear all print data in the internal buffer
152	(98)		
27	(1B)	ESC CAN	Same as CAN
24	(18)		
27	(1B)		
152	(98)		
27	(1B)	ESC — <i>n</i>	<i>n</i> = 1 Starts Underline <i>n</i> = 0 Ends Underline
45	(2D)		
<i>n</i>	<i>n</i>		
27	(1B)	ESC 0	Line Feed pitch is set to 1/8 inch
48	(30)		
27	(1B)	ESC 1	Line Feed pitch is set to 7/72 inch
49	(31)		
27	(1B)	ESC 2	Perform ESC-A or set Line Feed pitch to 1/6 inch
50	(32)		

Control Codes

Decimal	Hex	Symbol	Function
27 51 <i>n</i>	(1B) (33) <i>n</i>	ESC 3 <i>n</i>	Set Line Feed pitch to $n/216$ inch $0 \leq n \leq 255$ <i>Set to 24/216" (= 1/9) for bit image modes</i>
27 52	(1B) (34)	ESC 4	Current position is set as top-of-form
27 53 <i>n</i>	(1B) (35) <i>n</i>	ESC 5 <i>n</i>	Print and Carriage Return with or without Line Feed
27 54	(1B) (36)	ESC 6	Select Character Set 2
27 55	(1B) (37)	ESC 7	Select Character Set 1
27 56	(1B) (38)	ESC 8	Ignore paper out
27 57	(1B) (39)	ESC 9	Cancel ESC·8
27 58	(1B) (3A)	ESC :	Select 12 CPI
27 60	(1B) (3C)	ESC <	Move print head to home position
27 65 <i>n</i>	(1B) (41) <i>n</i>	ESC A <i>n</i>	Set Line Feed pitch to $n/72$ inch when ESC·2 is input. $0 \leq n \leq 85$
27 67 <i>n</i>	(1B) (43) <i>n</i>	ESC C <i>n</i>	Specify page length in line units with n ranging from 1 to 127
27 67 0 <i>m</i>	(1B) (43) (00) <i>m</i>	ESC C NULL <i>m</i>	Set page length in inch units with m ranging from 1 to 22

All bit image modes have 72 dots per vertical inch.

Decimal	Hex	Symbol	Function
27 68 $n_1 n_2 \dots n_k$ 0	(1B) (44) (00)	ESC D $n_1 n_2 \dots n_k$ NULL	Horizontal Tab position setting $1 \leq K \leq 28, 1 \leq n \leq 80$ or 137
27 69	(1B) (45)	ESC E	Print and set Bold Character Mode
27 70	(1B) (46)	ESC F	End Bold Character Mode
27 71	(1B) (47)	ESC G	Print and set Double-Strike Character Mode
27 72	(1B) (48)	ESC H	End Double-Strike Character Mode
27 73 n	(1B) (49) 	ESC I n	$n = 1$ selects standard font and $n = 2$ or 3 selects NLQ font
27 74 n	(1B) (4A) 	ESC J n	Set Line Feed pitch to $n/216$ inch
27 75 $n_1 n_2 D_1 \dots D_k$	(1B) (4B) 	ESC K $n_1 n_2 D_1 \dots D_k$	Select 60 DPI (dot/inch) Bit Image $K = n_1(\text{LSB}) + 256 \times n_2(\text{MSB})$
27 76 $n_1 n_2 D_1 \dots D_k$	(1B) (4C) 	ESC L $n_1 n_2 D_1 \dots D_k$	Select 120 DPI Bit Image, Half Speed $K = n_1 + 256 \times n_2$
27 78 n	(1B) (4E) 	ESC N n	Set skip over perforation in line feed unit $1 \leq n \leq 127$
27 79	(1B) (4F)	ESC O	End skip over perforation

Control Codes

Decimal	Hex	Symbol	Function
27 80 <i>n</i>	(1B) (50)	ESC P <i>n</i>	Proportional character mode designation $n = 1$: ON, $n = 0$: OFF
27 82	(1B) (52)	ESC R	Set horizontal tabs at every 8th character column
27 83 <i>n</i>	(1B) (53)	ESC S <i>n</i>	$n = 1$ selects subscript $n = 0$ selects superscript
27 84	(1B) (54)	ESC T	End Subscript and Superscript
27 85 <i>n</i>	(1B) (55)	ESC U <i>n</i>	$n = 1$ selects Unidirectional print $n = 0$ selects Bidirectional print
27 87 <i>n</i>	(1B) (57)	ESC W <i>n</i>	$n = 1$ selects Double-Width Mode $n = 0$ cancels Double-Width Mode
27 88 <i>m</i> <i>n</i>	(1B) (58)	ESC X <i>m</i> <i>n</i>	Set left and right margins in present character columns. Left margin is specified by <i>m</i> and right margin, <i>n</i> . $1 \leq m < n \leq$ maximum character column
27 89 <i>n</i> ₁ <i>n</i> ₂ D ₁ ... D _k	(1B) (59)	ESC Y <i>n</i> ₁ <i>n</i> ₂ D ₁ ... D _k	Select 120 DPI Bit Image, Normal Speed $K = n_1(\text{LSB}) + n_2(\text{MSB}) \times 256$ Horizontally aligned dots cannot be printed.
27 90 <i>n</i> ₁ <i>n</i> ₂ D ₁ ... D _k	(1B) (5A)	ESC Z <i>n</i> ₁ <i>n</i> ₂ D ₁ ... D _k	Select 240 DPI Bit Image $K = n_1(\text{LSB}) + n_2(\text{MSB}) \times 256$
27 93	(1B) (5D)	ESC |	Perform printing and 1/6-inch Reverse Line Feed
27 94 <i>n</i>	(1B) (5E)	ESC ^ <i>n</i>	Print characters of codes 3, 4, 5, 6, 19, 20 and 21 specified by <i>n</i>

Decimal	Hex	Symbol	Function
27	(1B)	ESC	Move print position toward right by $1/120 \times (Ln + Hn \times 256)$ inches. If right margin is exceeded, this command is ignored.
100	(64)	d	
Ln		Ln	
Hn		Hn	
27	(1B)	ESC	Move print position toward left by $1/120 \times (Ln + Hn \times 256)$ inches. Ignored if exceeds left margin.
101	(65)	e	
Ln		Ln	
Hn		Hn	

Programming Information C

The following items should be considered when you program the computer:

1. When the printer's power is turned on:
 - Optional functions are selected according to the setting of the function selection switches.
 - Full-forward line feed is set when the data processing mode is selected.
 - Underline is not set.
 - Standard character is set (not elongated and not bold).
 - Buffer memory is completely cleared.
 - Page length is set as 56 lines.
2. Every character font can be intermixed with another style of character in the same line. However, the printer will insert dot spaces to ensure that the new dot position is valid for the current character size. This may cause unexpected, automatic wraparound. To prevent this, intermix characters only on short lines, or do not mix character sizes on the same line.
3. Since a proportional spacing command can be used in any character set condition, right-justification can be performed. You must consider that proportional spacing commands can indicate up to 9-dot spacing; normal (10 or 5 CPI), compressed (12 or 6 CPI), or condensed (17 or 8.5 CPI) characters (normal space = 20 hex or 32 dec) give 12 or 24 dot spaces.
4. Elongated (double-width) characters and underline are not terminated at the end of a line, and such printing continues until a terminating command is received.

Note: In IBM mode, elongation is set by sending a (27 14) command and terminated by sending a CR/LF command.
5. You should avoid wraparound. A wraparound will disturb the dot count of the text in a line.
6. Backspace is performed in the same manner under any character set condition. This command indicates the number of dots to backspace.
7. In the repeat data commands, printable characters can be repeated as many times as provided in the count number. If any function code is received for repetition, it is ignored.
8. POS commands can be used at any carriage position. If a designated dot-column address is in the current text which is already printed, overprint will occur.

9. In block graphic printing, half-forward line feed should be used for printing diagrams.
10. Line feed in graphics mode is different from line feed pitches in data processing or word processing mode.
11. Graphic printing can be intermixed with character printing in the same line.
12. Bold character mode is useful for headings or titles.

Programming Examples

Note to Model II programmers: If the Printer goes off-line during a print operation, and remains off-line for a certain period of time, Model II TRSDOS will present an error message. Application programs should be written to trap such errors, inform the operator of the error condition, and give the operator a chance to correct the condition and continue printing. If it is a BASIC applications program, an I/O error will occur and the operator can type **CONT** **ENTER** to continue.

The BASIC statements **LPRINT** and **LLIST** output to the line printer. See your computer's reference manual for syntax details. If you have a Color Computer, read *LPRINT* as *PRINT* #-2,.

Examples:

LLIST

Lists the resident program to the Printer.

LPRINT "THIS IS A TEST."

Prints the message in quotes and tells the printer that the next printable character brings a new line.

LPRINT "THIS IS PART OF A LINE";:LPRINT "THIS IS THE REST"

Prints both messages on the same line (because of the semi-colon). The next printable character received starts a new line.

LPRINT "SMALL";CHR\$(27);CHR\$(14);"LARGE"; CHR\$(27);CHR\$(15);"SMALL AGAIN"

Prints both normal and elongated characters on the same line.


```
LPRINT CHR$(27);CHR$(29);"CORRESPONDENCE  
12 CPI";CHR$(27);CHR$(17);"PROPORTIONAL";  
CHR$(27);CHR$(18);"CORRESPONDENCE 10 CPI";  
CHR$(27);CHR$(20);"CONDENSED";CHR$(27);  
CHR$(23);"COMPRESSED";CHR$(27);CHR$(19);  
"NORMAL"
```

Prints proportional, correspondence, condensed, compressed, and normal characters in the same line.

```
LPRINT CHR$(19);"START";CHR$(27);CHR$(56);  
CHR$(138);"LINE ONE";CHR$(138);"LINE TWO"
```

Prints these letters at 3/4-line pitch.

```
LPRINT CHR$(15);"UNDERLINE";CHR$(14);  
"WITHOUT UNDERLINE"
```

Prints both messages in the same line: one underlined and the other not underlined.

```
LPRINT CHR$(27);CHR$(31);"BOLD  
LETTERS";CHR$(27);CHR$(32);"NORMAL LETTERS"
```

Prints bold letters and normal letters in the same line.

```
LPRINT CHR$(28);CHR$(9);"ABC"
```

Prints 9 characters of **A** and one character **BC**.

```
LPRINT CHR$(13);CHR$(27);CHR$(16);CHR$(01);  
CHR$(44);"300TH POSITION"
```

Prints the above message from the 300th column address.

```
LPRINT CHR$(27);CHR$(17);"A";CHR$(27);  
CHR$(09);"B";CHR$(27);CHR$(06);  
"C";CHR$(27);CHR$(03);"DE"
```

Prints **ABCDE** by using proportional spacing.

```
LPRINT CHR$(18);CHR$(255);CHR$(247);  
CHR$(227);CHR$(193);CHR$(227);CHR$(247);  
CHR$(255);CHR$(30)
```

Prints a special symbol in graphics mode.

```
LPRINT "DELETE";CHR$(08);CHR$(72);"////////"
```

Prints the message **DELETE**; then it is deleted by diagonal lines.

```
LPRINT "X";CHR$(27);CHR$(83);CHR$(0);  
"2";CHR$(27);CHR$(88);" + X = Y"
```

Prints an algebraic function expression $X^2 + X = Y$.

```
LPRINT "H";CHR$(27);CHR$(83);CHR$(1);  
"2";CHR$(27);CHR$(88);"O"
```

Prints the formula of water **H₂O**.

```
LPRINT CHR$(27);CHR$(66);CHR$(1);  
"ITALIC";CHR$(27);CHR$(66);CHR$(0);"NORMAL"
```

Prints italicized letters and non-italicized letters in the same line.

```
LPRINT CHR$(27);CHR$(77);"MICROFONT"
```

Prints microfont letters.

Care and Maintenance D

General

- Never operate the printer without paper. Be sure that printing does not exceed the paper width.
- If any object is accidentally dropped into the machine, turn off the power and carefully remove the object.
- When you turn off the power, all data stored in the printer's buffer will be lost. Keep this in mind as you perform routine maintenance. Remember that toggling the printer's power can also cause erratic operation of the CPU.
- Use only a lint-free cloth to clean the printer's surface. Do not use solvents or harsh cleaning agents. A mild detergent solution or desktop cleaner may be used sparingly.
- The printer must be kept dry. If water is accidentally spilled on the machine, turn off the power immediately and wipe it dry. Do not turn on the power again until the printer is completely dry.
- When printed material is too light or too dark, check to see if the print head is positioned properly.

Care

- Do not use organic solvents or alcohol when cleaning the cover.
- Never set the printer where it is exposed to direct sunlight.
- Prevent the printer from vibrating during operation.
- Graphics printing places a heavier load on the print head than do text characters. If you print too many block graphic characters or graphics without pausing, the print head may be damaged.

Note: When you must print graphics continuously, be sure to pause the printing for at least a few minutes after printing about 50 lines to prevent damage to the print head.

Maintenance

- If the print head becomes clogged with ribbon material or paper lint, carefully remove such material with a finely pointed tool (preferably a toothpick).
- A print head's life expectancy is approximately 60 million characters. When poor print quality, sticking ribbon, or bent character printing occurs, you should have the print head replaced by a Radio Shack service technician.

If you have problems...

If the printer fails to operate properly, try to solve the trouble by using the following table:

PROBLEM	CAUSE AND REMEDY
The printer does not print. The POWER lamp does not light.	1) Power is not getting to the printer. ● Check the power cord and power switch.
The printer does not print. The POWER lamp is lit.	1) The connection to the computer is not correct. ● Check that the cable connecting the Printer and computer is correctly connected. 2) The ribbon cassette is not properly installed. ● Install it properly.
The printer is operating properly, but the paper is not feeding through properly.	1) The paper is jammed in the printer. ● Remove the paper and reinsert it properly.
The print is light or smeared.	1) The print head position is not correct. ● Move the head adjustment lever to match the paper being used. 2) The ribbon cassette is not properly installed. ● Properly install the cassette. 3) The ink ribbon is old or is worn out. ● Replace the old ribbon cassette with a new one.
The ALERT lamp is blinking.	1) An error condition has been detected. ● Turn the power OFF and then back ON again.

If the trouble cannot be corrected after making the above check-up and adjustment, check for secure contacts on all connectors. If you cannot eliminate the problem, take the unit to your Radio Shack Computer Center or store for repair.

Specifications E

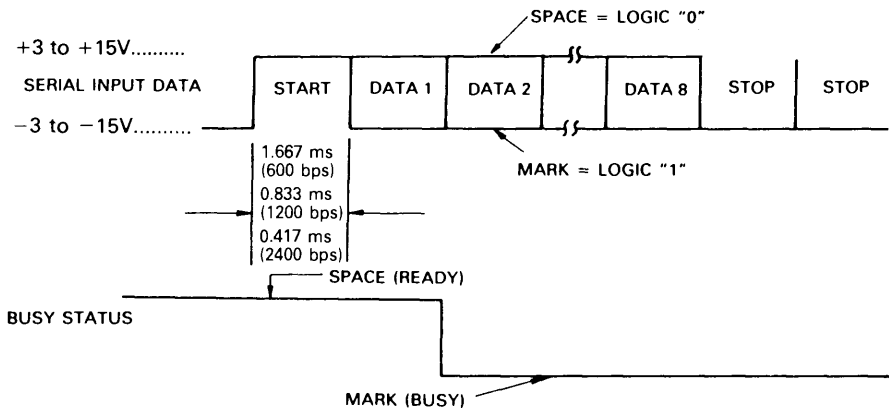
Print Speed	120 CPS
Paper Feed Type	Pin feed and friction feed
Line Pitch	1/6", 1/8", 1/9", 1/12", 1/36", 1/48", 1/72", 1/144" and $n/216"$. Reverse: 1/6" and 1/12"
Paper Feed Speed	6.7 lines/sec. when continuously feeding by 1/6" unit.
Print Method	Impact dot matrix
Print Direction	Bidirectional logic seeking in draft printing. Unidirectional in NLQ and graphics printing.
Ink Ribbon	Special cassette-type
Paper Weight	15 lbs. to 20 lbs. (45 kg. to 65 kg.)
Paper Thickness	
Single Sheet	0.06 – 0.1mm (2.5 – 3.8 mils)
Multiple Copies	Original + 2 copies. Max thickness: 0.2mm (7.7 mils)
Paper Width	4" to 10" wide
Power Requirements	120 \pm 15 V AC, 60 Hz in USA and Canada 220/240 V AC, 50 Hz in Europe and Australia
Power Consumption	18 Watts (self-test printing) 9 Watts (standby)
Temperature	
Operation	55°F to 85°F (13°C to 29°C)
Storage	–40°F to 160°F (–40°C to 71°C)
Humidity	20% to 80% (non-condensing)
Dimensions	15"W \times 5"H \times 10"D (390mm \times 119mm \times 266mm)
Weight	8.8 lbs. (4 kg)

Pin Configuration of the Serial RS-232C DIN Jack

Pin 1	NOT USED
Pin 2	STATUS
Pin 3	GROUND
Pin 4	DATA

Time Chart of Serial Input

Baud rate selectable to 600 bps, 1200 bps, or 2400 bps.

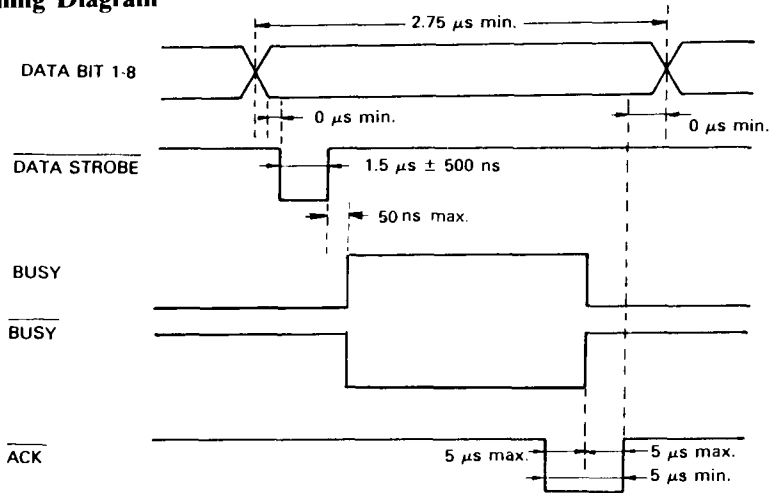


- One start bit, 8-bit data, no parity, 2 stop bits

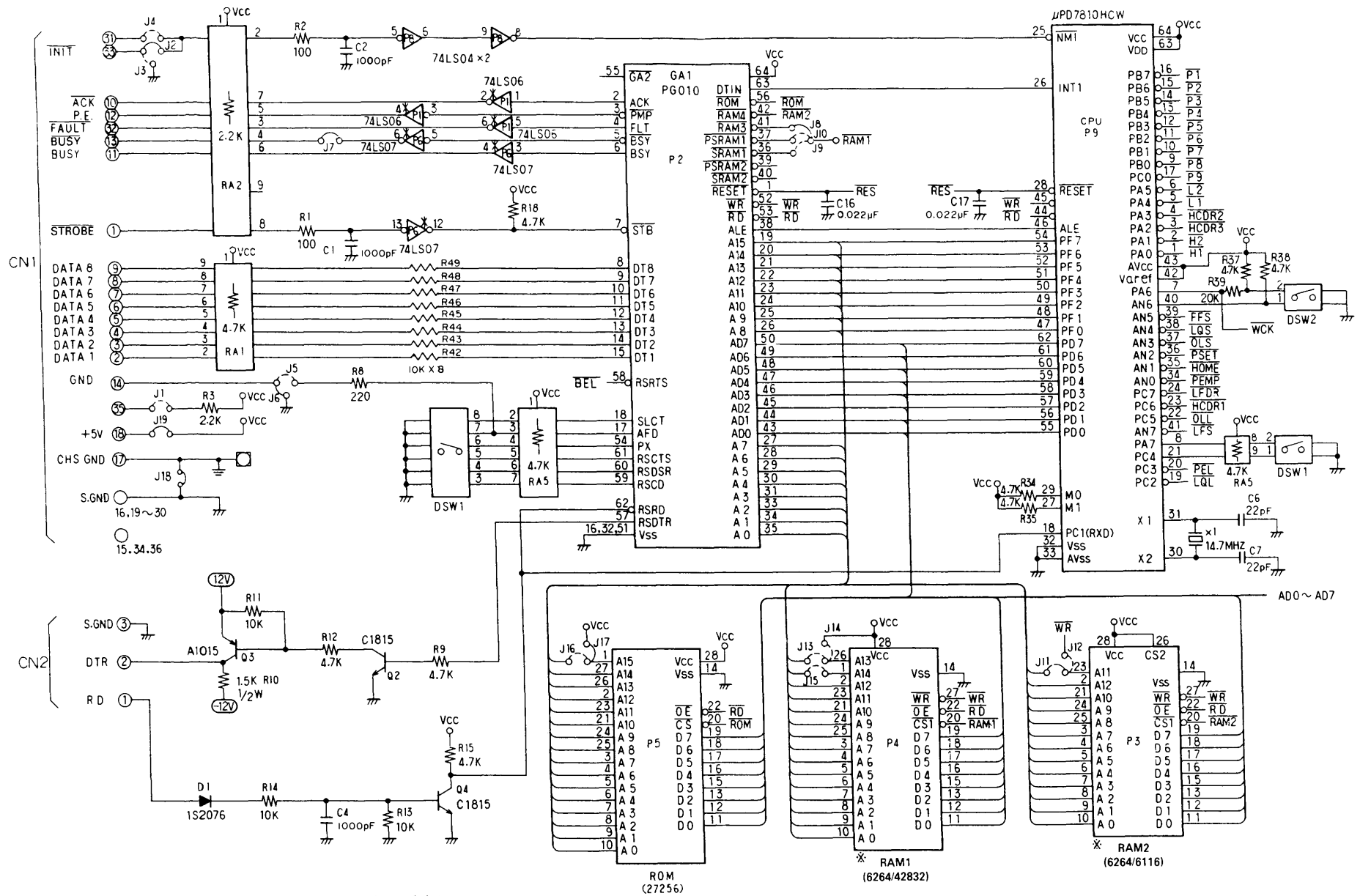
Pin Configuration of the PARALLEL Connector

PIN	SIGNAL	IN/OUT	PIN	SIGNAL	IN/OUT
1	STROBE	IN	19	TWISTED PAIR GND (PAIR WITH 1 PIN)	OUT IN
2	DATA 1	IN	20	TWISTED PAIR GND (PAIR WITH 2 PIN)	
3	DATA 2	IN	21	TWISTED PAIR GND (PAIR WITH 3 PIN)	
4	DATA 3	IN	22	TWISTED PAIR GND (PAIR WITH 4 PIN)	
5	DATA 4	IN	23	TWISTED PAIR GND (PAIR WITH 5 PIN)	
6	DATA 5	IN	24	TWISTED PAIR GND (PAIR WITH 6 PIN)	
7	DATA 6	IN	25	TWISTED PAIR GND (PAIR WITH 7 PIN)	
8	DATA 7	IN	26	TWISTED PAIR GND (PAIR WITH 8 PIN)	
9	DATA 8	IN	27	TWISTED PAIR GND (PAIR WITH 9 PIN)	
10	ACK	OUT	28	TWISTED PAIR GND (PAIR WITH 10 PIN)	
11	BUSY	OUT	29	TWISTED PAIR GND (PAIR WITH 11 PIN)	
12	P.E.	OUT	30	GND	
13	BUSY	OUT	31	NC	
14	GND	OUT IN	32	FAULT	
15	NC		33	INIT	
16	GND		34	NC	
17	CHASSIS GND		35	NC	
18	+5V 80mA Max.		36	NC	

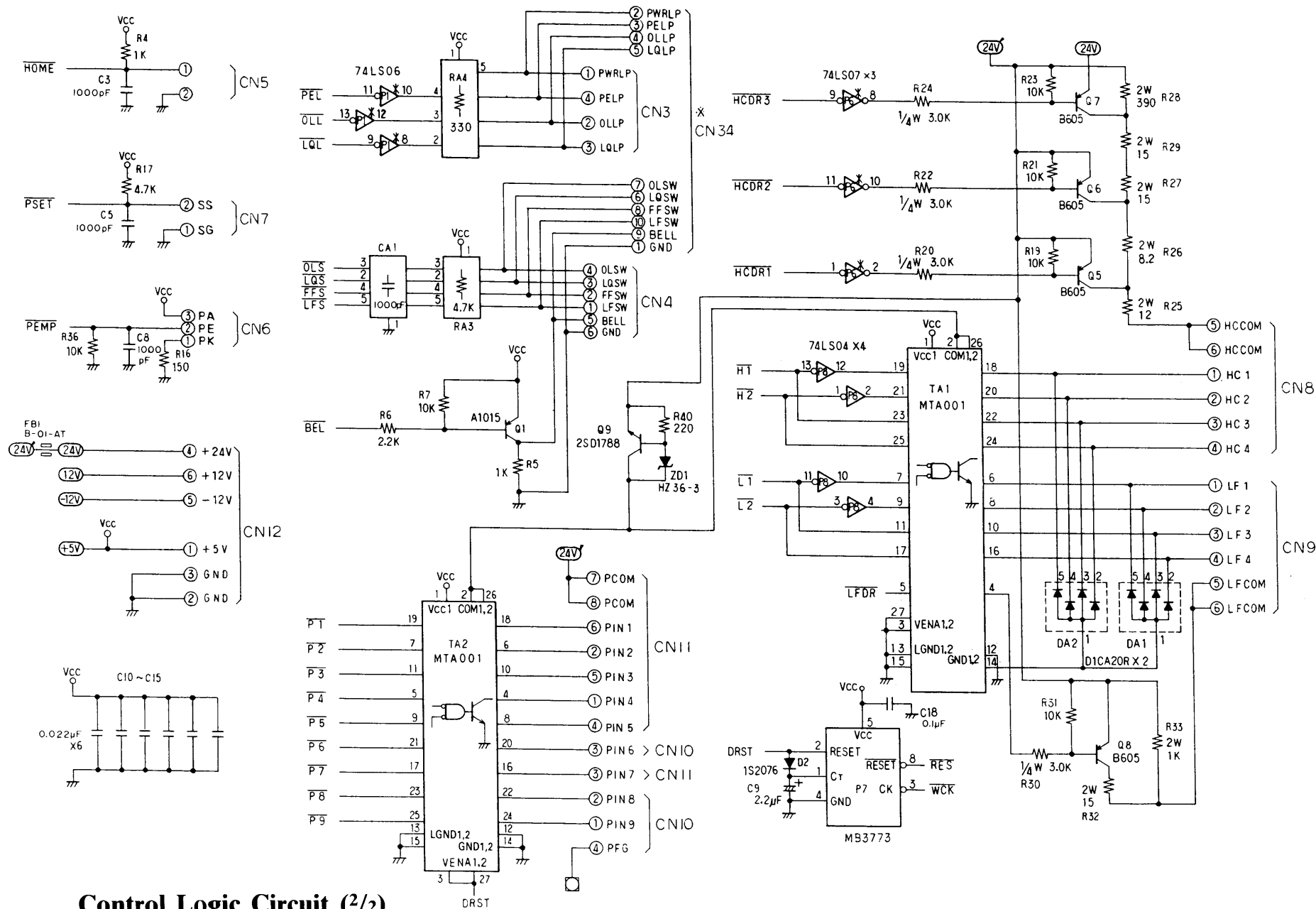
Timing Diagram



Schematic Diagrams G



* RAM1, RAM2, CN34; Not installed and not used in DMP 132



Control Logic Circuit (2/2)

- about the printer 1
- addressable dot numbering system 65
- ALERT indicator 3

- backspace 50-51, 83
- bell 84
- bidirectional printing 61
- bit image mode 81-83
- boldface 44
 - printing 44
- buffer operation 54-56

- cancel 84
- care 111
- carriage return 49, 74
- character set selection 73
 - pitch set switches 24-25
 - set width 51
 - widths and densities 35
 - below 20 hex 84
- code set selection 73
- compressed printing 79-80
- computer connections 20
- computer-to-DMP 132 cables 21
- control codes 28-29
 - from BASIC 29-30
 - to move from mode to mode 32
 - logic circuit 117-119
- correspondence font 38

Index

- data processing mode 27, 30
- DIP switch functions
 - in IBM mode 23
 - in Tandy mode 22
- DIP switch panel 21
- dot column width
 - IBM characters 92-93
 - Tandy characters 88-89
 - positioning 58-60
- double-strike printing 80
- double-width printing 79

- elongated characters 43
 - printing 43
- emphasized printing 80

- fanfold paper 15-17
 - loading (hints and tips) 17
 - paper path 17
- folding leg 6
- font style change commands 37
- form feed 52, 77
 - FORM FEED switch 4
- form length/lines-per-page 52
- freehand drawing 68-70
- front panel 3, 24
 - view 16

- graphic dot positioning 63
 - characters 39-40
 - mode 28, 31, 63-70
 - patterns 65-67

horizontal formatting control codes 77-79
 tabulation 78

IBM character set 71
 character set 1 90
 character set 2 91
 control codes, table of 99-105
 mode 52, 73-84

if you have problems... 112

ignored control codes 53
 undefined codes 53

inserting spaces 42

installing the tractor 7-9

international characters 72
 table in Tandy mode 94

italics 44
 printing 44

left/right margin set 60

line feed 47-48, 67
 control codes 47
 execution command 75
 execution variable 75
 hints about 48.
 pitch 74
 reverse 76
 special control codes 49
 switch 4
 variable 75
 variable setting 75

Index

- maintenance 111
- microfont printing 45-46
- monospaced characters 27

- NLQ/DP switch 4
 - indicator 4, 24

- ON/OFF LINE indicator 4
 - switch 3

- paper bail 8
 - end detection 83
 - feed knob 8
 - guide 6
 - loading 13-17
 - loading knob 8
 - rack 6-7
- parallel interface connector 20
- pin configuration
 - parallel connector 116
 - serial RS-232C DIN jack 115
- platen 8, 17
- power cord 12
 - indicator 3
 - source 12
 - switch 12
- power-up sequence 24
- Print fonts and character widths 35-46
- print function (DIP) switches 21-23

- print head 11
 - adjustment lever 18-19
- printer components 3-4
 - cover 6, 25
- printing mode control 79-83
- programming examples 108-110
- proportional characters 88-89, 92-93
 - spacing 78
 - spacing font 38-39
- proportionally spaced characters 27

- removing the tractor 9
- repeat function 68
 - printing 57-58
- ribbon cassette 10-11
 - mask 11
- right justification 41-42

- self-test 19
- selecting a print mode 32-33
- serial interface connector 20
- SET switch 25
- single-sheet paper 13-15
 - loading (hints and tips) 14-15
- skip perforation 61, 77
- standard and condensed fonts 36-37
- start-up checklist 26
- subscript 45, 80
- superscript 45, 80
- supporter 6

Index

Tandy character set table 87
 control codes, table of 95-98
time chart, serial input 115
timing diagram 116
top-of-form and form length 51
tractor feed unit, installing 7-8

underline printing 58
underlining 80
unidirectional printing 61

vertical formatting control codes 74-77

word processing mode 27, 30-31
wrap-around 43

SERVICE POLICY

Radio Shack's nationwide network of service facilities provides quick, convenient, and reliable repair services for all of its computer products, in most instances. Warranty service will be performed in accordance with Radio Shack's Limited Warranty. Non-warranty service will be provided at reasonable parts and labor costs.

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