

TANDY®

Dot-Matrix Printer DMP-130

OPERATION MANUAL
CAT NO. 26-1280



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The FCC Wants You to Know...

This equipment generates and uses radio frequency energy. If not installed and used properly, that is, in strict accordance with the manufacturer's instruction, it may cause interference to radio and television reception.

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

If necessary, you should consult the dealer or an experienced radio/television technician for additional suggestions. You may find the following booklet prepared by the Federal Communications Commission helpful: *How to Identify and Resolve Radio-TV Interference Problems*.

This booklet is available from the US Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

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.

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Dot-Matrix Printer DMP-130 Operation Manual
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Introduction

Congratulations for selecting this Tandy computer product! The DMP-130 is a high-density, dot-matrix printer which can perform a variety of different printing operations. For instance, it can print:

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

The DMP-130 operates in 3 modes:

- Data Processing Mode for the fastest output of program listings or data
- Word Processing Mode for letter writing or the creation of any text documentation
- Graphics Mode for drawing pictures, figure or graphs

For word processing, you'll find the DMP-130's proportionally spaced characters (created on a variable $n \times 18$ dot matrix) can produce letter-quality results.

If, however, you need a printout that is produced faster, monospaced characters (created on a 9×9 dot matrix) are just the thing for you!

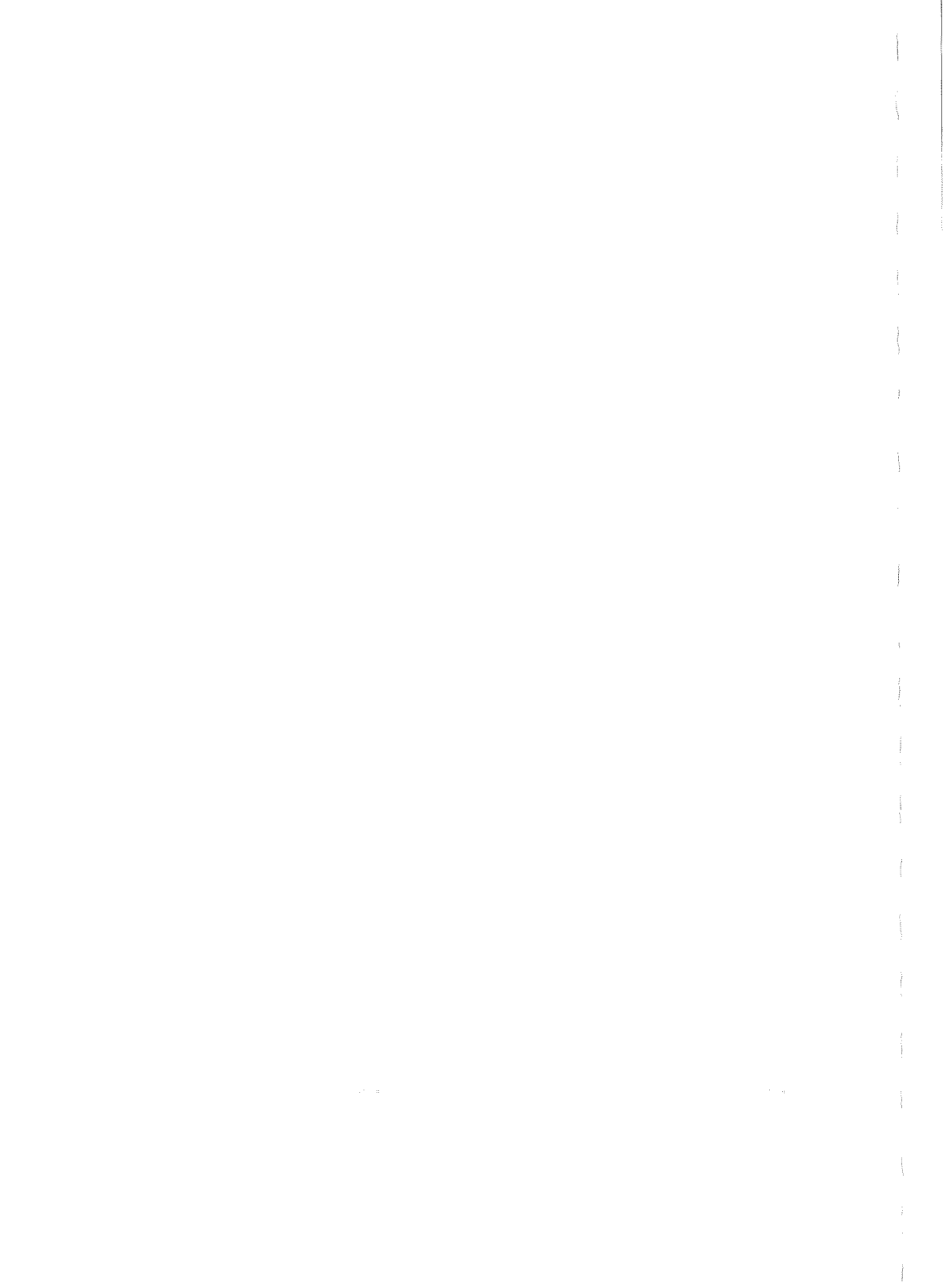
In Graphics mode, you can use graphic data to draw just about any type of graphic configuration you desire.

You can use 2 types of paper with the DMP-130:

- Standard 4" (10cm) to 10" (25cm) wide computer fanfold forms with guide holes (Cat. Nos. 26-1243, 26-1427, 26-1403, and 26-1456)
- Standard, single-sheet typewriter paper for use as in an ordinary typewriter

Other software-controlled features include:

- Full- or half-line feed and 3/4 or 4/5 line feed.
- Software-controlled form feed (from your computer).
- Underline capability.
- Buzzer function.
- Automatic paper loading.
- Margin-set function.
- Automatic paper feed at paper end. When the DMP-130 detects the paper end, it automatically advances the paper 3 more inches (7.5cm) for easier paper removal.



Description of the DMP-130

1

Carefully unpack the DMP-130, being sure to locate the ribbon and the paper rack. Keep the empty box and packing material just in case you ever need to transport the Printer.

It's important to become familiar with the DMP-130 before you set it up and begin using it.

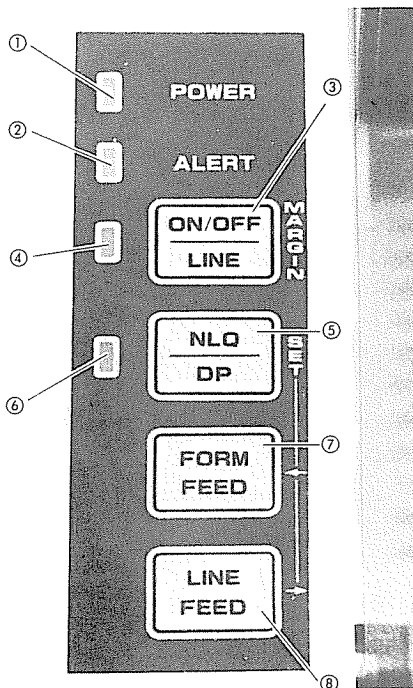


Figure 1. Front Panel View

Front Panel

- ① **POWER indicator.** This indicator will illuminate when the DMP-130 is properly connected and the POWER ON/OFF switch is set to ON.

- ② **ALERT indicator.** This lamp will light when the Printer 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. It flickers when there is a carriage fault or some sort of electrical problem.

Model II users: When a BASIC program stops execution because of a Printer error, type CONT and press **ENTER** to resume printing. However, the entire contents of the print buffer will be printed starting with the current print head position.

Note: To print the remaining data in the buffer when the ON/OFF LINE switch is pressed to stop the printing, first, cancel the printing process using your computer software, then press the ON/OFF LINE switch to set the DMP-130 to ON LINE.

- ③ **ON/OFF LINE switch.** At power-up, the Printer is ON LINE; pressing this switch 1 time 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.

Press and hold this switch for more than 1 second while in ON LINE mode to enter the margin-set mode.

The print head does not move when the Printer goes ON LINE after this switch is pressed.

- ④ **ON/OFF LINE indicator.** When this indicator is ON, the DMP-130 is ON LINE and ready to print. This indicator will flicker in the margin-set mode.
- ⑤ **NLQ/DP switch.** Press this switch to select the print mode – Near-Letter Quality or standard. When the NLQ mode is selected, the NLQ indicator turns ON. Press again for standard mode. This switch will work only when the Printer is OFF LINE.

In the margin-set mode, pressing this switch will set the margin position.

- ⑥ **NLQ indicator.** This indicator will illuminate when the Printer is in the NLQ mode.
- ⑦ **FORM FEED switch.** When this switch is pressed, the paper advances to the logical top of the next form. It is effective only when the Printer is OFF LINE.

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

- ⑧ **LINE FEED switch.** When this switch is pressed, the paper advances 1 line. When it is held down, continuous paper feed is performed. This switch will work only when the Printer is OFF LINE.

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

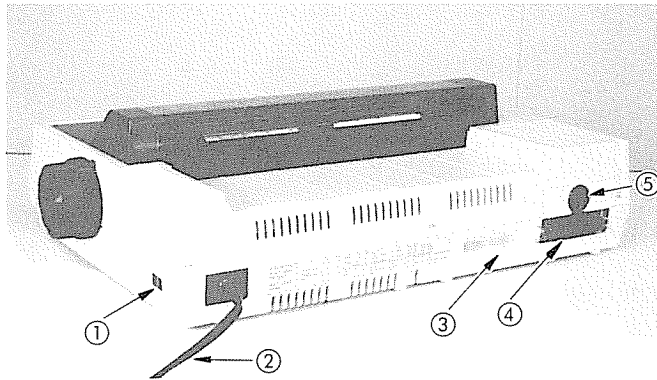


Figure 2. Rear Panel View

Rear Panel

- ① **POWER ON/OFF switch.** Press ON/I to turn the power ON. Press the left side of the switch to turn power OFF. Note that turning the power OFF and ON during operation may cause loss of the current program.
- ② **POWER cord.** Plug the power cord into a wall outlet or approved power strip.
- ③ **Print function (DIP) switches.** The setting of these switches will determine exactly how your Printer will print.
- ④ **Parallel interface connector.** If your Computer has parallel interface capabilities, connect the cable here. See **Setting up the DMP-130** for the right cable for your computer.

- ⑤ **Serial interface connector.** If you have a Color Computer, connect the cable to the serial interface connector indicated. See **Setting up the DMP-130** for the right cable for your Color Computer.

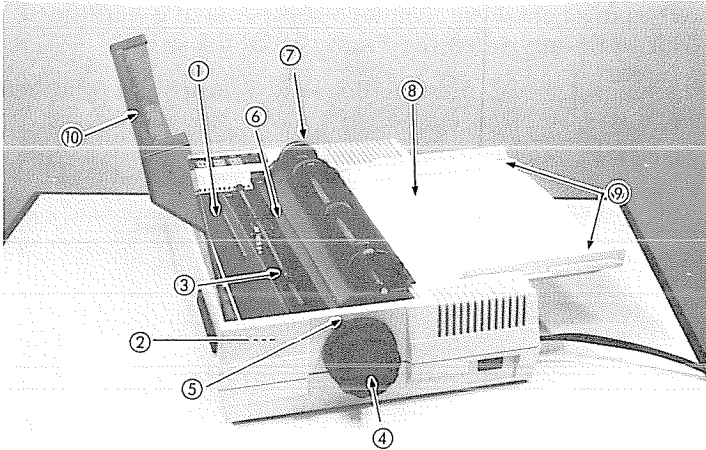


Figure 3. Inside View

- ① **Ribbon cassette.** Be sure to replace the ribbon when printing is faint.
- ② **Print head adjustment lever.** When printing is faint, move the lever away from you to move the print head toward the paper. When smudging occurs during printing, move the print head 1 or 2 notches away from the paper.
- ③ **Paper bail.** For single-sheet printing, keep the bail down on the paper. When you use fanfold paper, push the lever on the right toward the platen.
- ④ **Paper feed knob.** Turn this knob to manually advance the paper.
- ⑤ **Automatic paper loading knob.** Turn toward you to automatically load the paper. Turn backward to reset the paper bail.
- ⑥ **Platen.**
- ⑦ **Tractor feed unit.** See **Setting up the DMP-130** for details on using the tractor feed.

- ⑧ **Paper rack.** Lift this rack and insert the folding leg into the hole located on the top of the case for single-sheet paper. Lay the rack flat for fanfold paper.
- ⑨ **Paper guide.** Set according to the width of the paper used.
- ⑩ **Printer cover.**

Setting up the DMP-130

2

This section will show you how to set up the DMP-130 so you can begin using it as quickly as possible. This includes:

- Installing the paper rack
- Installing/adjusting the tractor feed unit
- Loading paper
- Replacing a ribbon
- Connecting the DMP-130 to a computer

and more!

The following **Start-Up Checklist** is a summary of how to set up your Printer and should be followed every time you start up the Printer – not just the first time.

- Find a good spot for your Printer. Be sure to consider:
 - Printer should be placed on a sturdy work surface.
 - Length of the printer cable, which will determine how far from the computer you can place the Printer.
 - Paper takes up space. Be sure to leave enough room for smooth paper flow.
 - Do not place the Printer near noise generators such as refrigerators and industrial equipment.
- Be sure the POWER switch (on the right side of the Printer) is OFF.
- Open the Printer cover.
- Install continuous-form fanfold or single-sheet paper.
- Check the ribbon cassette. If it has not been installed, see “Ribbon Installation/Replacement.”
- Set the print function (DIP) switches (on the rear of the Printer).
- Connect the AC power plug to a 120-volt, 60 Hz grounded AC outlet (220/240V, 50 Hz, where the unit is so marked).
- Connect the interface cable from the computer to the Printer interface connector.
- Turn the power ON and check that the POWER indicator (on the front panel) is illuminated.
- Check to see that the Printer is ready by running the self-test. To do this, turn the POWER switch OFF. Press and hold the LINE FEED switch or NLQ switch while turning the power back ON. If you press

the LINE FEED switch, the self-test is performed in standard mode: if you press NLQ, the self-test runs in NLQ mode. Printing will continue until you press the ON/OFF LINE switch.

Paper rack

Open the Printer cover. Holding the paper rack upright, insert the tips of the rack onto the supportters on both sides of the Printer, as shown.

For single-sheet printing, insert the folding leg into the hole centered on top of the case. For the continuous fan-fold paper, fold the leg and lay the rack down.

You can adjust the paper guide on the paper rack. Pull the left guide upward to remove it from the rack. Then position it as you desire (within the range allowed) and insert it fully. When using narrower paper, move the right guide so that the left edge of the paper is within the range of the paper guide. This ensures proper operation of the paper empty switch and also reduces the possibility of a paper jam.

Tractor feed unit

This Printer can be used with either the tractor feed system or friction feed system. The difference is that the tractor feed system is used with paper which 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 tractor is installed, the friction mechanism is released and the Printer may not feed the paper properly.

Installing the tractor

1. Be sure the Printer power 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.
4. Place the front pins of the tractor feed unit into the holes on both sides. Then push down on the rear of the tractor unit until the tractor is securely locked into position.
5. Turn the paper loading knob backward (away from you) to move the paper bail toward the platen.

6. Close the Printer cover and replace the paper rack.

Removing the tractor

1. Turn the Printer OFF.
2. Open the Printer cover and remove the paper rack.
3. Turn the paper loading knob toward you.
4. Lift the tractor feed 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.

Power source

Before plugging the power cord into an AC power outlet, check the following:

- Printer power ON/OFF switch is set to OFF.
- Printer is not connected to the Computer yet.

Connect the AC power plug to a 220-volt, 50 Hz grounded AC outlet

Paper loading

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

It is very important that the paper enters the DMP-130 straight. The paper must be directly behind the Printer or paper skewing or jamming may occur. Proper positioning of the paper guides (which attach to the paper rack) is also important to help prevent paper jamming.

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. Press the ON/OFF LINE switch if the lamp is illuminated. When the lamp remains lit, the paper is probably loaded incorrectly.

You may begin printing if the lamp does not illuminate after the paper is loaded.

Single-sheet paper

1. Be sure the Printer power is OFF. Open the Printer cover.

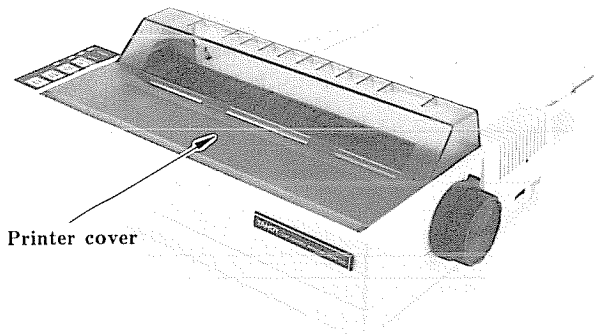


Figure 4

2. Lift the paper rack and insert the folding leg into the hole centered on the top case.

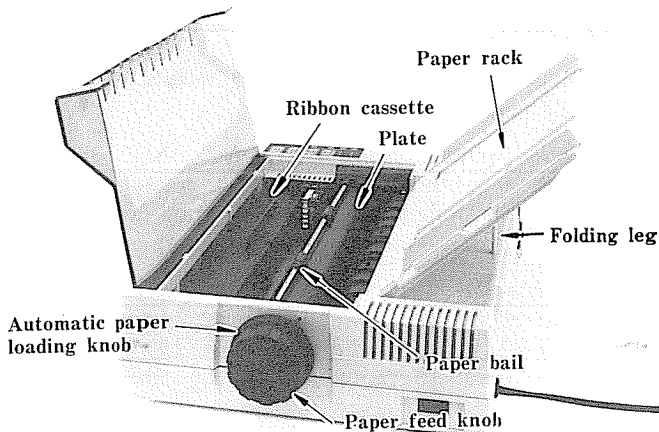


Figure 5

3. Position the single-sheet paper on the paper rack, aligning it with the paper guide. Since the auto-paper-loading system will pull the paper into the Printer, just placing the paper on the paper rack is sufficient. If you insert the paper into the opening, the Printer may “think” that the paper is already in place and may not activate the auto-loading mechanism.

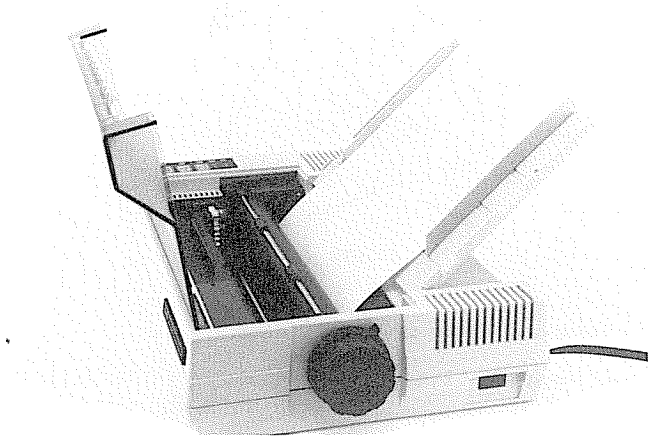


Figure 6

4. Turn the Printer power ON.
5. Turn the paper loading knob toward you. The paper automatically advances to the print-start position.
6. Turn the paper loading knob away from you to return the paper bail to the platen.
7. When you want to align the paper, use the paper feed knob or LINE FEED switch to advance the paper. Then, adjust the position. *Note:* The paper bail **MUST** be set against the platen for paper adjustment.

8. Set the print head adjustment lever to the appropriate position. Refer to "Print head adjustment lever."

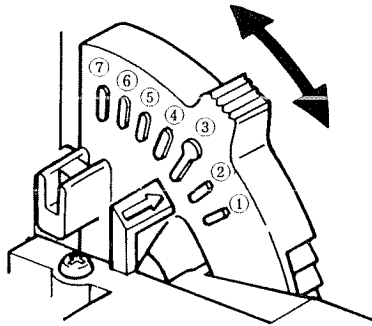


Figure 7

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

Multiple-part forms. Set the lever to position 5 or 6, without smudging the paper. Check for smudging by performing the self-test at each of the lever settings.

Warning! The print head must always be as close to the platen as possible; otherwise damage to the print head may result.

9. Close the Printer cover.

Hints and tips on single-sheet paper loading

- With the paper properly installed, printing will continue until the paper passes the paper empty sensor. The printer will then go 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-130 will continue printing where it left off.
- If you want to print another few lines after the paper empty sensor detects the paper end, press ON/OFF LINE. Be careful not to exceed the bottom edge of the paper.

Fanfold paper

The DMP-130 will accept standard fanfold paper from 4" to 10" wide. Before using fanfold paper, however, the tractor unit should be installed.

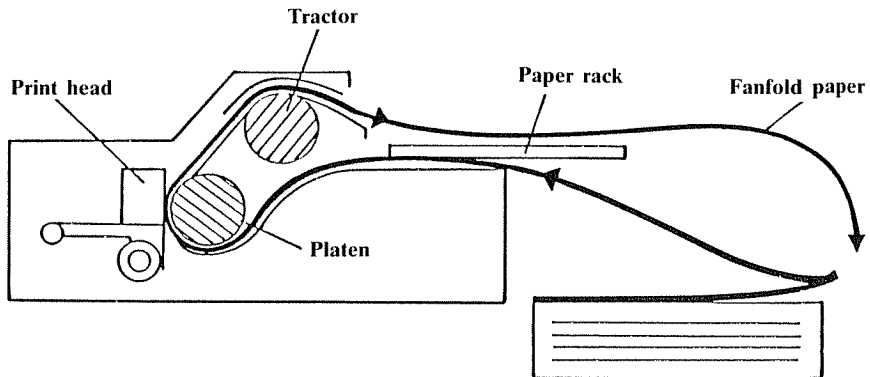


Figure 8

1. Turn the power OFF.
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 paper clamps to secure the paper.

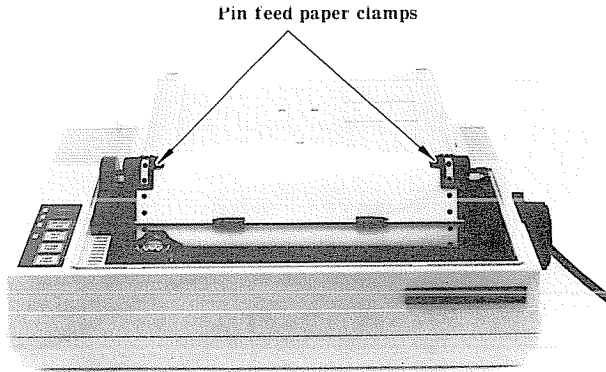


Figure 9

9. Set the print head adjustment lever as follows:

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

Multiple-part forms. Set the lever to position 5 or 6, without smudging the paper.

Check for smudging by performing the self-test at each of the lever settings.

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

10. Turn the paper loading knob away from you to move the paper bail toward the platen. This is important: the friction roller under the platen is released by setting the paper bail against the platen. If you do not do this, a paper jam may occur.
11. Replace the paper rack and the Printer cover. Proper paper flow will be obtained if you attach the paper rack and lay it down flat with the paper feeding underneath it into the Printer.

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 paper pile on top of unprinted paper or the printed paper may be pulled into the paper insertion opening. This could jam the paper feed or damage the Printer.
- As much as possible, place the paper on the same height as the printer.

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 it must be replaced due to excessive wear, faint printing, etc., follow this procedure:

1. Set the POWER switch to OFF. (*Note:* When you turn the power OFF, any information stored in the Printer's buffer will automatically be lost.)
2. Open the Printer cover.

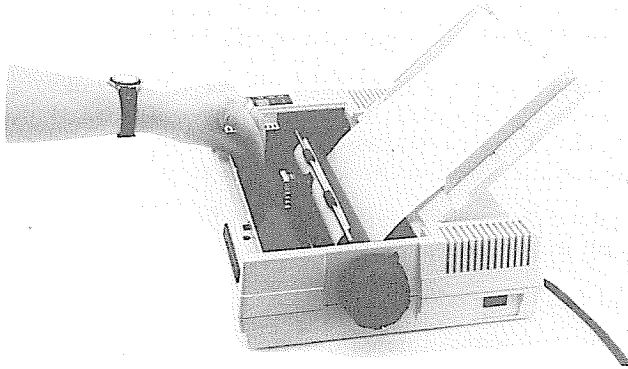


Figure 10

3. Hold the fin on the cassette and gently pull the ribbon cassette upward.
4. Unwrap the new cassette. Before inserting the new cassette, tighten the ribbon by turning the knob in the direction indicated by the arrow.

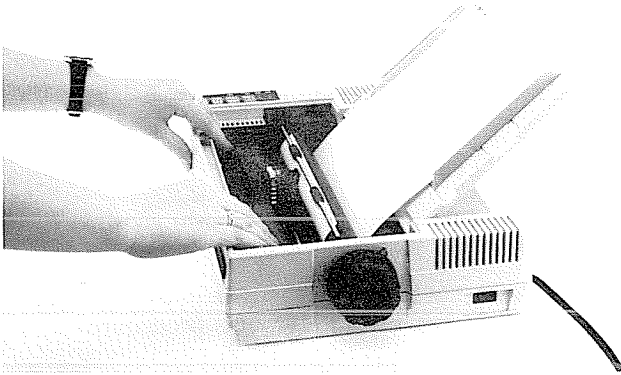


Figure 11

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

Do not force the cassette into place! If the cassette is not properly fitted, the cassette knob will not match up with the ribbon drive mechanism. Do not force the cassette down but fit it in gradually while turning the cassette knob in the indicated direction.

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

Note: Do not print without paper or a ribbon. The print head or platen will be damaged.

Print head adjustment lever

You will have to adjust the print head according to the thickness of the paper you are going to use. The print head adjustment lever is located on the inside right of the Printer.

Position ③ is suitable for one-part paper. Position ⑤ or ⑥ is for multiple part paper.

Margin-set switches

1. Be sure the ON LINE lamp is ON.
2. Press and hold the MARGIN (ON/OFF LINE) switch until the ON LINE lamp blinks.
3. Press the →(LINE FEED) and ← (FORM FEED) switches to move the print head to the position you wish to set as a left margin.
4. Press the SET (NLQ DP) switch to set the left margin.
5. Press the → switch to move the print head to a desired position for a right margin.
6. Press the SET switch to set the right margin.

Note: Once the left and right margins are set, you cannot *manually* reset margins wider than the present ones unless the power is turned OFF and back ON again. You can change margins via software. (Refer to chapter 6, “Left and right margins.”).

Print function (DIP) switches

There are 10 switches located on the rear panel of the Printer. These switches allow you to customize some DMP-130 features for your own applications.

When you set switch 1-1 to OFF before turning the power ON, the DMP-130 selects Tandy codes. In this setting, the switches function as shown in Table 1. On the other hand, if you set switch 1-1 to ON, the DMP-130 selects codes for the IBM mode. In this case, 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). Or, if you begin using the DMP-130 with a computer which has serial printer output (such as the Color Computer), turn the power OFF and set the appropriate switch accordingly.

When you receive the DMP-130, all DIP switches should be set to OFF.

Remember! The Printer power must be OFF before you change any of the switches.

**Table 1. DIP Switch Function in Tandy Mode
(Switch 1-1 set to OFF)**

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

SW2-1 and SW2-2 select the interface and baud rate for serial interfacing.

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

DIP switch view

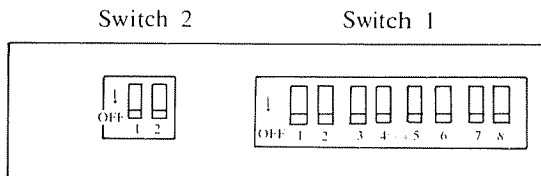


Figure 12

**Table 2. DIP Switch Function in IBM Mode
(Switch 1-1 set to ON)**

Sw.	Symbol	ON	OFF
1-1	Control Codes	Codes for IBM	
1-2	CR	Carriage Return Only (CR = CR)	Carriage Return & Line Feed (CR = NL)
1-3	LF	Line Feed & Carriage Return (LF = NL)	Line Feed Only (LF = LF)
1-4	Form Length	12 Inches	11 Inches
1-5	1-Inch Skip Over Perforation	Valid	Not Valid
1-6	Line Spacing	1/8 Inch	1/6 Inch
1-7	Character Generator	IBM Character Set 2	IBM Character Set 1
1-8	Buffer Full	Carriage Return Only	Carriage Return & Line Feed
2-1	Cancel Code	Not Valid	Valid
2-2	Error Buzzer	Sounds	Does Not Sound

Self-test

The DMP-130 has a built-in, self-test feature which lets you check the printing quality and general printer operation before you connect the Printer to your computer. This is a good time to check that the print head is adjusted properly (printing is neither too faint nor smudged) and the paper is feeding smoothly.

Before running the self-test, always be sure to load the DMP-130 with 10-inch-wide paper since the test prints from one end of the platen to the other. Printing on the platen can shorten the life of the platen and the print head.

To run the self-test:

1. Plug the Printer into an AC power outlet.
2. Press and hold either the LINE FEED switch or NLQ switch.

3. Set the POWER switch to on. Starting with the “music” of the internal buzzer, the Printer will begin printing rolling ASCII characters.

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 will continue until you press the ON/OFF LINE switch (or paper end is detected).

Computer connections

Before making any connections between the Printer and computer, be sure the power to all units is OFF!

You must also be sure you have the correct cable for your computer if the DMP-130 is to operate properly. Table 3 describes the printer cables Tandy provides. Table 4 provides quick instructions for printer connection locations.

Table 3. Computer-to-DMP-130 Cables

Computer	Cable Number
Model I (Keyboard only)	26-1411
Model I (Exp. Interface)	26-1401
Model II/16/2000/DT-1/DT-100	26-4401
Model III/4/1000	26-1401
Model 100/Tandy 200	26-1409
Tandy 1200	26-1347
Color Computer	26-3020

Table 4. Computer Connection Points

Computer	Connector
Model I (Keyboard only)	Rear of keyboard
Model I (Exp. interface)	Left side of expansion interface
Model II/16/100/200/2000	Rear panel of computer
Model III/4	Bottom panel of computer
DT-1/DT-100	Rear panel of terminal
Tandy 1000/1200	Rear panel of computer
Color Computer	Rear panel of computer

1. Attach the molded male end of the cable to the connector on the right rear of the Printer. Do not force the plug. If it does not fit one way, turn it over and try again.
2. Connect the other end of the cable to the Printer jack of your computer. See your computer owner's manual for specific instructions.

Power-up sequence

The specific power-up sequence will depend on your computer. Consult your computer owner's manual for details on powering up your computer with peripheral devices (such as printers).

In any event, the power lamp on the DMP-130 will remain lit while the Printer is ON.

It is essential that the Printer remain ON when connected to the computer. If you turn the power ON or OFF, or the Printer is connected but not turned ON, erratic operation of the entire system may occur.

The DMP-130 is designed for three applications:

- Data Processing
- Word Processing
- Graphics Printing

This Printer responds to software codes from the computer in three ways—one for each application. These response patterns, or modes, have many similarities, but each has its own unique features.

Data and word processing modes, both used for printing characters, differ only in the way they handle line feed commands (commands that decide which direction and how far the paper is fed).

- In **word processing mode**, each line feed command causes immediate paper advancement. Word processing programs (such as SCRIPSIT) can use immediate line feeds for superscripts, subscripts, and the like.
- In **data processing mode**, line feed commands do not cause immediate printing. Instead, they are stored in the Printer's memory along with other data. When the current line is printed, the line feed commands stored in memory determine the direction and pitch of the paper feed.

Both data and word processing modes print in 2 print styles. One style is the proportionally spaced character set and the other is the monospaced character set.

- **Proportionally spaced characters** have variable widths: M takes up more space than an I. Proportionally spaced characters are used to create professional looking documents.
- **Monospaced characters** are so named because each character takes up the same width. This uniformity makes it preferable for tables and charts that require vertical alignment.

In graphics mode, you have complete control of the print head. This mode can be used to create a custom letterhead, designs, special type fonts, etc.

However, with graphics operation, many control codes (which can be used with data and word processing) cannot be used. The DMP-130 does not return an error when you send such a code – it simply ignores the code. This includes codes that change line feed pitch and direction. Graphics mode has restricted numbers of line feed to ensure full coverage of the paper.

Control codes

Before investigating the various print modes, let's consider how the computer communicates with the Printer.

All information is sent to the Printer 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 functions of the Printer. These *control codes* allow you to change character sets, select print modes, underline, superscript, subscript, etc.

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. Read these sections carefully.

Sending control codes from BASIC

Some Printer features are activated by a single code, but many functions require a sequence of 2 or more codes. Most multiple code sequences begin with decimal 27 (referred to as the *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.

This section discusses Tandy codes (DIP switch 1-1 to OFF). To select IBM codes, turn the Printer OFF, set DIP switch 1-1 to ON and turn the Printer ON, or send ESC + ! CHR\$(27); CHR\$(33). This will allow you to use the DMP-130 with Tandy's MS-DOS operating systems. Refer to Chapter 8, **IBM emulation mode**, for the IBM codes.

Note: The command **LPRINT** will be used in examples that send codes to the Printer. If you're using a Tandy Color Computer, substitute **PRINT#-2**, for LPRINT.

For instance, set up the DMP-130 as described earlier and enter BASIC in the normal way. Then type the following program:

```

10 REM
20 LPRINT "DATA "; CHR$(27); CHR$(56);
   "PROCESSING"
30 LPRINT "MODE"

```

and RUN it.

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\$(56) are the guilty parties. Take a quick look at Appendix B. This chart shows the various code sequences understood by the DMP-130. The control code sequence CHR\$(27); CHR\$(56) means "change the forward line feed to three-quarter of its normal distance."

Data processing mode

How can you tell which mode the DMP-130 uses when it is first turned on? A little reflection on the above program 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, 56) sequence did not cause a 3/4-forward line feed until after the first line was printed. Thus, the Printer must be in DP mode. And, in case you missed it, this new line feed stays in effect until further notice (another characteristic of the DP mode). Type:

```
LLIST 
```

Sure enough. You still have that short line feed. To return to normal line feed pitch, type:

```
LPRINT CHR$(27); CHR$(54)
```

Word processing mode

When the same program is executed in WP mode, the line feed occurs 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.
```

Just as you suspected, the line feed is immediately executed.

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

Graphics mode

Graphics mode is different from the word and data processing modes. For one thing, code **CHR\$(10)** in graphics mode feeds paper 7/72" against the ordinary 1/6" pitch in WP and DP modes. Furthermore, only a few of the WP and DP features are available in graphics mode. Standard letters and symbols, for example, are ignored by the Printer 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 printouts of high-resolution graphics for charts, logos, etc.

For a quick look at this mode in action, change our 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-130 in graphics mode. The numbers 128 through 255 are interpreted as dot patterns.

Type **LPRINT CHR\$(30)** and press **ENTER** to return the Printer to WP mode. Try **LLIST**ing the program to be sure you're not stuck in graphics land.

Print mode selection

Table 5 summarizes the control codes required to move from one mode to another.

Table 5. Control Codes for Changing Modes

If you're in:	And want to change to:	Send a CHR\$():	
		(Dec)	(Hex)
DP	WP	20	14
	Graphics	18	12
WP	DP	19	13
	Graphics	18	12
Graphics	DP	30*	1E
	WP	30*	1E

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

Hints and tips about print modes

Data processing mode

- All commands which decide line feed pitch are stored in the Printer's memory. They are not executed until a LF code (10 Dec. or 138 Dec.) is received. Then, the paper advances according to the pitch and direction codes stored in the Printer's memory.
- Line feed commands stay in effect until replaced by a new command.
- All printable characters can be printed in this mode.

Word processing mode

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

Graphics mode

- The LF code causes the paper to move 7/72" forward.
- Decimal numbers 128 – 125 sent via CHR\$ in BASIC are interpreted as pin firing patterns for the print head.
- Only a few control code sequences are recognized.

Print font styles and character widths

4

The DMP-130 has four distinct print (character) font styles:

- Standard
- Correspondence quality (NLQ)
- Proportionally spaced
- Graphic characters

Each style 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 individual characters are created within the matrix.

The horizontal dot positions overlap; the vertical ones do not.

Table 6. Character Widths and Densities

Style	Matrix Size	Width and Density
Standard	9 × 9	Normal 10 CPI / Elongated 5 CPI Compressed 12 CPI / Elongated 6 CPI Condensed 17 CPI / Elongated 8.5 CPI
Correspondence Quality (NLQ)	19 × 19	Normal 10 CPI / Elongated 5 CPI Compressed 12 CPI / Elongated 6 CPI
Proportionally Spaced	$n \times 18$	Variable character width (Condensed density)

Table 6 shows that there are 3 basic pitches: normal, compressed, and condensed.

Selecting character styles

Character styles can be selected by control codes from the computer.

Character styles stay in effect until another character style is selected. Even entering graphics mode does not change the character set. The DMP-130 returns to the last active set on leaving graphics mode.

Table 7 is a summary of the character style change commands.

Table 7. Character Style Change Commands

Send CHR\$()				If you want:
(Dec)		(Hex)		
27	19	1B	13	Normal (10 CPI)
27	23	1B	17	Compressed (12 CPI)
27	20	1B	14	Condensed (17 CPI)
27	17	1B	11	Proportionally Spaced
27	18	1B	12	Correspondence Normal (10 CPI)
27	29	1B	1D	Correspondence Compressed (12CPI)
27	66 1	1B	42 1	Start Italics
27	66 0	1B	42 0	End Italics
27	83 1	1B	53 1	Start Subscript
27	83 0	1B	53 0	Start Superscript
27	88	1B	58	End sub-/superscript
27	77	1B	4D	Microfont
27	14	1B	0E	Start Elongation
27	15	1B	0F	End Elongation
27	31	1B	1F	Start Bold
27	32	1B	20	End Bold

Standard characters

Standard characters are printed in a 9 × 9 dot matrix (9 dots wide by 9 dots high).

Each of the standard characters can be printed in 3 main character widths:

- Normal, 10 Characters-per-inch (CPI)
- Elite, 12 CPI
- Condensed, 17 CPI

Condensed characters are printed in a 11 × 9 dot matrix for 17 CPI. This also can be elongated to double width. Each of these widths can be elongated (double width) which gives half as many characters per inch and a total of 6 different print widths.

You can get a better feel for the available print widths by printing a few sample lines. Type in this program:

NEW


```

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

```

and RUN it.

The subroutine in line 240 sends the required control codes to the DMP-130. Line 230 returns to normal characters width and stops program execution.

Correspondence quality characters

Correspondence quality characters are printed in a 19×18 dot matrix for 10 CPI. The characters have the same total width as normal width characters, but they are printed with the condensed character density (19 dots wide fit in the same space as 9 dots wide). Correspondence quality print also has 12 CPI and be elongated to 5 CPI/6 CPI.

Add these lines to the program, then compare the two styles.

```

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

```

and RUN the program.

You'll find a great difference between the two styles.

Proportionally spaced characters

Proportionally spaced characters are the same as correspondence quality, but the character matrix width varies from character to character. The characters are 18 dots high; the widths vary from 3 dots to 11 dots (including 2 columns of blank dots to allow space between the characters).

Proportionally spaced characters add a quality look to word processing documents by eliminating wide gaps between characters. These characters can also be elongated to double their normal width.

To see how this font looks, add:

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

and RUN the program.

Graphics characters

The graphics character set is used for block graphic printing. Characters can be normal 10 CPI width, compressed 12 CPI, or condensed 16.7 CPI. This set is not fully compatible with the screen graphics of most Tandy computers: it is a unique character set. The graphics characters are not available with correspondence characters or proportional characters.

To see how the various character widths affect the graphic characters, add:

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

and RUN the program.

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

Add these lines to the program:

```
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
```

and RUN it.

When you've printed out the results, delete lines 10 through 90.

Right justification

Proportionally spaced characters are designed to be used with word processing programs. They do not carry around all the wasted space between words that monospaced print styles do. As a result, you can sneak in little slivers of space between characters to line up the *right* margin of text on a page without destroying character spacing. This process, called *right justification*, is usually handled by word processing software. The DMP-130 provides codes to allow you to insert spaces between characters, ranging from 1 dot to 9 dots wide. These codes are summarized in Table 8.

You can demonstrate the way these codes work by modifying the current program. When you add the following 2 lines, the DMP-130 will print 2 lines of proportionally spaced characters, then insert enough space to line up the right margins.

```
70 DATA "THE PROPORTIONAL CHARACTER SET OF THE"
80 DATA "DMP-130 PRINTER CAN BE RIGHT JUSTIFIED"
```

The lines will be read in as a string of characters with 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
```

Now RUN the program.

To line up the right edge, insert a single, blank dot-column between the first 8 letters in the second print line. Add:

```
50 IF I=2 AND J<8 THEN LPRINT CHR$(27)CHR$(1);
```

then RUN the program.

The following table will help when inserting spaces.

Table 8. Proportional Spacing

Send CHR\$()		To insert:
(Dec)	(Hex)	
27 01	1B 01	1 Dot Space
27 02	1B 02	2 Dot Spaces
27 03	1B 03	3 Dot Spaces
27 04	1B 04	4 Dot Spaces
27 05	1B 05	5 Dot Spaces
27 06	1B 06	6 Dot Spaces
27 07	1B 07	7 Dot Spaces
27 08	1B 08	8 Dot Spaces
27 09	1B 09	9 Dot Spaces

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

Delete lines 10 through 90 of your sample program before going on.

Wrap-around

The DMP-130 is a dot-addressable printer. Therefore, line length is not determined 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 follows:

Standard 10 CPI	960
Standard 12 CPI	1152
Standard 17 CPI	1918
Correspondence 10 CPI	1920
Correspondence 12 CPI	2304

If the length of text the Printer receives exceeds the limit of dots-per-line, a line feed is inserted and the last character is printed from the start of the next line. This is called *wrap-around*.

Elongated characters

Any of the character styles can be elongated to twice their normal width.

Table 9. Elongated Printing

Send CHR\$()		
(Dec)	(Hex)	To:
27 14	1B 0E	Start Elongation
27 15	1B 0F	End Elongation

The start (27 14) and end (27 15) codes for elongated characters can be entered any number of times within a line and used in every mode.

You can easily elongate the characters in the current program. Change:

```
100 LPRINT CHR$(27)CHR$(14)
230 LPRINT CHR$(27)CHR$(19)CHR$(27)CHR$(15):STOP
```

and RUN the program.

Bold characters

Bold characters are implemented in much the same way as elongated characters.

Table 10. Bold Printing

Send CHR\$()		
(Dec)	(Hex)	To:
27 31	1B 1F	Start Bold Printing
27 32	1B 20	End Bold Printing

When a (27 31) code sequence is received, the DMP-130 prints the current buffer contents, then resumes bold character printing from the next character received.

Bold characters can be added to the current program by changing lines:

```
100 LPRINT CHR$(27)CHR$(31)
230 LPRINT CHR$(27)CHR$(19)CHR$(27)CHR$(32):STOP
```

Now RUN the program.

Italics

Any of the character font styles can be printed on a slant.

Table 11. Italic Printing

Send CHR\$()		To:
(Dec)	(Hex)	
27 66 1	1B 42 1	Start Italic Printing
27 66 0	1B 42 0	End Italic Printing

When a (27 66 1) code sequence is received, the DMP-130 prints the current buffer contents, then it begins italic printing from the next character received.

When a super-/subscript command is received during italic character printing, the DMP-130 prints the current buffer contents; then it enters into the super-/subscript printing mode.

Change the following program lines to:

```
100 LPRINT CHR$(27);CHR$(66);CHR$(1)
230 LPRINT CHR$(27);CHR$(66);CHR$(0);CHR$(27)
;CHR$(19):STOP
```

and RUN.

Superscript and subscript

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

Table 12. Super-/Subscript Printing

Send CHR\$()		To:
(Dec)	(Hex)	
27 83 0	1B 53 0	Start Superscript Printing
27 83 1	1B 53 1	Start Subscript Printing
27 88	1B 58	End Super-/Subscript Printing

When a (27 83 0) or (27 83 1) code sequence is received, subsequent characters are printed in superscript or subscript printing mode until a

(27 88) is received. When a (27 88) code sequence is received, the DMP-130 prints the current buffer contents; then it returns to the font style which prevailed before entering super-/subscript character printing.

The printing speed or horizontal dot resolution is not changed from what is current upon entering superscript or subscript. Neither is the underline position changed.

Type in this program.

```
10 LPRINT CHR$(27);CHR$(83);CHR$(0);
20 LPRINT "SUPERSCRIPT ";
30 LPRINT CHR$(27);CHR$(83);CHR$(1);
40 LPRINT "SUBSCRIPT ";
50 LPRINT CHR$(27);CHR$(88);
60 LPRINT "CHARACTERS"
70 END
```

and RUN it.

In this program, lines 10 and 30 start superscript and subscript and line 50 ends the super-/subscript.

Microfont

In microfont mode, all printouts will be in superscript with a half-forward line feed (1/12") in WP mode and half of the designated line pitch in DP mode.

Table 13. Microfont Printing

Send CHR\$()		
(Dec)	(Hex)	To:
27 77	1B 4B	Start Microfont

When a (27 77) code sequence is received, the DMP-130 prints the current buffer contents; then it enters the microfont mode.

In this mode, the italic function is invalid, even if you send an italic code.

As with superscript, the printing pitch for the microfont mode depends on the previous font as follows:

Type in the following NEW program:

Print font styles and character widths

```
10 LPRINT CHR$(27);CHR$(19)
20 GOSUB 100
30 LPRINT CHR$(27);CHR$(23):GOSUB 100
40 LPRINT CHR$(27);CHR$(20):GOSUB 100
50 LPRINT CHR$(27);CHR$(29):GOSUB 100
60 END
100 LPRINT CHR$(27);CHR$(77);
110 LPRINT "THIS IS MICROFONT."
120 RETURN
```

and RUN it.

Line feed codes (LF)

When the DMP-130 receives a LF code (ASCII 10), all data in the Printer buffer is printed followed by a line feed. Unless you tell it otherwise, the DMP-130 uses 1/6" forward line feed when advancing paper. If you set DIP switch 1-6 to ON before turning on the power, the line feed pitch is set to 1/8".

If DIP switch 1-3 is ON, a carriage return is also performed with the line feed, moving the print head to the start of the next print line. If DIP switch 1-3 is OFF, the print head stays in the current print column and moves down 1 line.

Other line feed codes control the pitch of the line feed. In DP mode, these codes can be stored in the buffer. In WP mode, they cause immediate printing.

Pitch setting is sent to the DMP-130 in a 2-code sequence. First, a control code 27 (CHR\$(27)) is sent. This tells the DMP-130 that a special code sequence will follow. The next number determines the specific pitch. These control codes are listed in Table 14.

Table 14. Line Feed Control Codes

Send CHR\$()		To:	
(Dec)	(Hex)		
27 10	1B 0A	Full-Reverse Line Feed	(1/6" or 1/8")
27 28	1B 1C	Half-Forward Line Feed	(1/12" or 1/16")
27 30	1B 1E	Half-Reverse Line Feed	(1/12" or 1/16")
27 54	1B 36	Full-Forward Line Feed	(1/6" or 1/8")
27 56	1B 38	Three-quarter Forward Line Feed	(1/8" or 3/32")

Hints and tips on line feed

- In data processing mode, codes are stored in the Printer buffer. They are not activated until a LF code is sent. In word processing mode, these sequences cause the Printer to print the information in its buffer, then execute a line feed with the specified pitch and direction.

General control codes

- CHR\$(10) will not work from some BASIC with the CHR\$ function. The LF code (10) is intercepted by BASIC and sent to the Printer as 13.
- All the codes in Table 14 are ignored in graphics mode.
- When DIP switch 1-3 is ON, a carriage return follows each line feed.

Special line feed codes

There are 5 special forward line feed codes that operate in all 3 print modes.

Table 15. Special Line Feed Control Codes

Send CHR\$()				To:
(Dec)	(Hex)			
27 26	1B 1A			1/8 Forward Line Feed (1/48")
27 50	1B 32			1/12 Forward Line Feed (1/72")
27 51	1B 33			1/36 Forward Line Feed (1/216")
27 57	1B 39			1/24 Forward Line Feed (1/144")
27 64 n	1B 40 n			n/24 Forward Line Feed (n/144")

1/8, 1/12, 1/36, 1/24 forward line feed

These line feed codes are unique for two reasons:

- They cause an immediate dump of the Printer buffer followed by a line feed, regardless of the print mode.
- A carriage return is not performed, regardless of the setting of switch 1-3. These special line feed codes are useful for adjusting a print line or printing a 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 followed by a line feed or a carriage return only, depending on the following new line control code setting or on the setting of DIP switch 1-2.

Table 16. New Line Control Codes

Send CHR\$()		To:	
(Dec)	(Hex)		
27 21	1B 15	CR = CR Set	
27 22	1B 16	CR = CR + LF (NL) Set	

- When a CR (13 or 141) code is received by the DMP-130 with a CHR\$(27); CHR\$(21) already received, or with DIP switch 1-2 ON, only a carriage return is performed after printing the buffer.
- When a CR code is received with a CHR\$(27); CHR\$(22) already received, or with DIP switch 1-2 OFF, a carriage return followed by a line feed (NL) is carried out.
- At power-on, the Printer is set to a new line mode (provided DIP switch 1-2 is set to OFF).

Backspace

The DMP-130 can be backspaced from 1 to 255 dot columns when you send a 2-code sequence, of which the first code is CHR\$(8). The second code is in the form of CHR\$(*n*), where *n* is a value from 1 to 255 and specifies how many dot columns to backspace from the current print head position. For example:

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

would backspace the print head 150 dot columns from the current position.

In general, backspacing should be done in multiples of the current character size. That is, backspacing for the standard 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 2 characters.

If *n* is 0, backspacing is not done. The repeat feature can be used to backspace more than 255 dot spaces.

If *n* is greater than the current dot position, printing starts at the beginning of the line. In graphics mode, the backspace code is ignored and *n* is treated as an independent character. Backspace works in both data and word processing modes.

Type in this program:

General control codes

```
10 LPRINT TAB(30);"D P 1 0";  
20 LPRINT CHR$(8);CHR$(72);"M - 3"
```

and RUN the program.

Go ahead and run it again. This time watch the action of the print head. The first string starts at position 30. The trailing semicolon holds the position right after the 0. CHR\$(8); CHR\$(72); backspaces 6 normal character widths (12 dots each, remember?) to place the M right between the D and P. You can imagine what would happen if the dot distance is miscalculated!

To backspace over elongated characters, simply double the number of dots. Try it. Change the program to:

```
10 LPRINT TAB(30);CHR$(27);CHR$(14);"D P 1 0";  
20 LPRINT CHR$(8);CHR$(144);"M - 3"  
30 LPRINT CHR$(27);CHR$(15)
```

and RUN the program.

CHR\$(27); CHR\$(14) and CHR\$(27); CHR\$(15) get the DMP-130 in and out of elongated character width. Remember that you must compensate for the double-width characters by doubling the 72 in line 20 to 144.

The widths of the available character sets are shown in Table 17. The proportionally spaced character widths naturally vary from character to character.

Table 17. Character Set Width

Font style	Dots/Character	To Backspace	
		1 Character	n Characters
Standard	10 CPI	08 12	08 12 × n
	12 CPI	08 12	08 12 × n
	17 CPI	08 14	08 14 × n
NLQ	10 CPI	08 24	08 24 × n
	24 CPI	08 24	08 24 × n

The numbers in the dots/character column include blank dots between characters.

Setting top-of-form and form length

The control code `CHR$(27); CHR$(52)` is used to set the form length in all 3 print modes. It resets the line feed count to 0 and sets the current line as the top-of-form position. The line length per page is set to $n (\times 1/6")$ 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 $n (\times 1/6")$.

On initial power-up, the DMP-130 sets the top-of-form at the current paper position and the form length is set as follows, depending on the setting of DIP switches 1-4 and 1-6. Be sure the paper is properly positioned before you turn on the Printer.

Table 18. 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 (FF)

When a `CHR$(12)` command is received, the print buffer contents are printed out completely, the paper is advanced to the next top-of-form position, and the line feed counter is reset to 0.

However, there is one slight problem when you communicate to the Printer through BASIC. Most BASICs keep track of the top-of-form internally and intercept the form feed code on its way to the Printer and send out, instead, a series of line feeds. Since the FF code never makes it to the Printer, the `CHR$(12)` is not activated. Some BASICs can use the `POKE` or `OUT` statement to send a FF directly to the printer and bypass the interpreter.

Entering IBM mode

When a CHR\$(27); CHR\$(33) is received, the DMP-130 is reset to the defaults of the IBM mode. That is, buffer contents are printed out, the carriage returns to its home position, and all DIP switches (except 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 which represents an invalid code.

There are several reasons a code can be unusable in a certain mode. Redundant codes that do not change the current Printer status are usually ignored. For example, if the Printer is in DP mode, sending a CHR\$(19) (used to enter DP mode) is useless. And there are many ASCII control codes in the range 0 to 31 that the DMP-130 simply does not recognize. ASCII 0, for example, is not used in any of the 3 print modes.

The following table summarizes the undefined print codes.

Table 19. DMP-130 Ignored Control Codes

All Modes:	
• Out of range on repeat sequence.	
• Out of range on POS sequence.	
• Redundant codes that do not change the current Printer status. For example, if you send a CHR\$(14) when underline is already set.	

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 n1 n2), (27, 21), (27 22), (27 26), (27 33), (27 50), (27 51), (27 52 n) (27, 57), (27 64 n), (27 72 n), (28 n1 n2), and (30).

Unprintable repeat sequence data n2 is also ignored.

Codes printed as in DP and WP modes:	
• All codes from 0 – 31 and 128 – 159, except the active function codes or the above ignored codes.	
• Unprintable repeat data n2.	

DMP-130 buffer operation

The DMP-130's ability to temporarily store data is one of its main advantages over a typewriter. Codes sent to a typewriter (i.e., keys pressed) 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 (e.g., LF or CR), the buffer is emptied and all data is then printed on the paper. What happens after the buffer data is printed depends on the circumstances. In some cases, printing continues on the same line; in others, the print head is moved to a different position relative to the paper.

In the DP mode, commands for changing print fonts, line feed, etc., can be stored in the buffer to take effect when the data is dumped to paper.

Understanding how the buffer works is important if you wish to gain full control of the DMP-130.

Hints and tips on the DMP-130 buffer

DP, WP, and graphics modes

- The buffer allocates a fixed number of dots, depending on the character width selected. The buffer is emptied when the data stored equals that number. Printing resumes at the start of the next line unless DIP switch 1-2 is set to ON (CR only). If different character widths have been used on the same line, the last character added may exceed the dot count. The buffer is printed without this last character.
- The last character received by the buffer is printed at the beginning of the next print line following an automatic line feed and carriage return.
- The form feed code (FF = 12 decimal) automatically activates printing (if the code makes it to the Printer). If LF only has been selected (DIP switch 1-3), then the buffer is printed and the print head moves to the next top-of-form line without a carriage return to the beginning of the line. Otherwise, the print head is positioned at the beginning of the next top-of-form line.
- The carriage return code (CR = 13 decimal) automatically activates printing (assuming at least 1 character code is already in the buffer). If carriage return only has been selected by the setting of DIP switch 1-2, the print head is moved to the beginning of the current line and the next buffer-full condition will result in printing over the current line. Otherwise, subsequent characters will be printed at the start of the next

General control codes

print line.

- The line feed code (LF = 10 decimal) automatically activates printing. If LF only has been selected (DIP switch 1-3), then the buffer is printed and the print head moves to the next print line without a carriage return to the beginning of the line. Otherwise, the print head is positioned at the start of the next print line.
- If the computer delays more than a second before sending the next print code through the parallel interface, the buffer is printed. Printing continues from the current position.
- The head positioning sequence (27 16 n_1 n_2) prints the buffer. 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 a character set of different dot density is selected, the data in the buffer is printed. 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.
- Dot graphics printing continues from the current character position.
- When a start bold or end bold command is received, the buffer is printed. Bold printing continues from the current character position.
- When a start super-/subscript, italics, microfont, compressed correspondence, proportional quality 12 CPI, or compressed code is received, the buffer is printed.

Graphics mode only

When the end graphics mode command is received, the Printer returns to the previous print mode and printing continues in the same line from the current print position.

Note 1: In the description, *next line* means the new line performed by a line feed operation. In data processing mode, if a reverse line feed has been set in the memory, the line feed operation will cause paper to move in the reverse direction.

Note 2: Repeat data can cause a buffer-full condition, as well as an overflow by single characters.

Hex print mode

The DMP-130 is capable of printing hexadecimal values for data that is transmitted to it. This *hex print mode* is useful for checking exactly what information is being received by the Printer. To implement this function, turn ON the power to the Printer while simultaneously holding down the FORM FEED switch.

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

For example, the BASIC program line:

```
10 LPRINT "NOW IS THE TIME FOR"
```

will normally print out as

```
NOW IS THE TIME FOR
```

If you enter hex print mode, the printout will look like this:

```
4E 4F 57 20 49 53 20 54 48 45 20  
54 49 4D 45 20 46 4F 52 0D
```

To exit hex print mode, turn the Printer OFF and then ON again.

IBM character set

You can use the IBM character set 2 in Tandy mode by sending the code sequence `CHR$(27); CHR$(58)`.

To return to the Tandy character set, send `CHR$(27); CHR$(59)`. Only IBM character set 2 is applicable in Tandy mode.

Word and data processing modes

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Repeat printing

The DMP-130 provides a built-in repeat capability. You can use it to repeat a single character code up to 255 times. It's great for repeating graphics codes, underlining, block graphics, etc. The repeat feature uses a 3-code sequence:

- CHR\$(28)
- Number of repetitions
- Code to be repeated

Type in this new program:

```
10 LPRINT "  /"; REM 2 BLANK SPACES BEFORE TH  
E /  
20 LPRINT CHR$(27); CHR$(28);  
30 LPRINT CHR$(28); CHR$(13); CHR$(241)
```

Code 241 is from the graphics character set.

```
40 LPRINT " "; REM 1 BLANK SPACE  
50 LPRINT CHR$(8); CHR$(7);  
60 LPRINT CHR$(92); "/(X"CHR$(27); "S"; CHR$(0)  
;"2"; CHR$(27); "X";  
70 LPRINT "+2X+1)"  
80 END
```

Now RUN the program.

With a little fancy footwork, you were able to line up the 2 slashes and came up with a rough approximation of a square root sign. Brings back bad memories, doesn't it?

Note: Depending on the computer, the second parameter (number of repetitions) is interpreted differently. For example, CHR\$(9) may be interpreted as the TAB command, causing the print head to move to the next TAB position instead of printing characters 9 times. Refer to the owner's manual of your computer for details.

Underline printing

When you need to underline any text in either DP or WP mode, send the DMP-130 a CHR\$(15). All text that follows this code will be underlined

until you send a CHR\$(14) which stops underlining.

If a print head positioning code is received while the Printer is in an underline-selected condition, the underline is not printed between the home position (leftmost printing position) and the dot column position designated by the print head positioning code.

If you enter graphics mode while the Printer is in an underline-selected condition, when you return to the former character printing mode, the designation of underline is the same as it was before entering graphics mode.

Table 20. Underline Printing

Send CHR\$()		To:
(Dec)	(Hex)	
15	0F	Start Underline
14	0E	Stop Underline

For example, type in this short program:

```
10 LPRINT CHR$(20);:REM WORD PROCESSING
20 LPRINT CHR$(15);:REM START UNDERLINE
30 LPRINT "LEEWAY BUSINESS PRODUCTS "
40 LPRINT CHR$(14);:REM STOP UNDERLINE
50 LPRINT "GIVES GOOD SERVICE"
60 END
```

In this example, line 20 turns on the underline and the first line of text (LEEWAY BUSINESS PRODUCTS) is underlined. Line 40 turns the underline off and GIVES GOOD SERVICE is not underlined.

Print head positioning

In either DP or WP mode, you can position the print head to a specific dot position. Every other print head position is accessible through the positioning sequence.

Using the normal character sets (10 CPI), there are 960 dot positions per line, but only half (480) are accessible by you. the following table indicates the available columns in each mode.

Table 21. Print Head Positioning

Character Width	Dots-per-Line	Available Columns
Normal (10 CPI)	960	480
Compressed (12 CPI)	1152	576
Condensed (17 CPI)	1918	959
Correspondence (10 CPI)	1920	960
Correspondence (12 CPI)	2304	1152

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

Even if underline is designated, underline does not appear between the home position (the leftmost printing position) and the position designated by the print head positioning code.

To position the print head to a specific position, send a (27 16), then 2 numbers (we'll call them $n1$ and $n2$) that specify the desired position. In other words, just follow this general procedure:

1. Send a control code which specifies the character set (normal, condensed, or compressed).
2. Send a CHR\$(27); CHR\$(16) to tell the Printer you want to position the print head to print a specific dot column.
3. Tell the Printer which dot column you want to print. This is a little more complicated and will be explained shortly. For now, just understand that you simply tell the Printer which dot column you want.
4. Tell the Printer what you want to print.

When you want to specify a dot column where printing is to begin, you must first use CHR\$ to send the (27 16) code. Follow this with another 2-code sequence which specifies the position. For instance:

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

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

Table 22. Print Head Positioning

If you wish to specify dot column:	<i>n1</i> must be:	<i>n2</i> must be:
0-255	0	0-255
256-511	1	0-255
512-767	2	0-255
768-1023	3	0-255
1024-1152	4	0-128

Remember! Normal printing allows you to access dot columns up to 479 ($n1 = 1, n2 = 223$); compressed printing allows you to access dot columns up to 575 ($n1 = 2, n2 = 63$); condensed printing allows you to access dot columns up to 958 ($n1 = 3, n2 = 190$); correspondence 10 CPI printing allows you to access dot columns up to 959 ($n1 = 3, n2 = 189$); correspondence 12 CPI allows you to access dot columns up to 1151 ($n1 = 4, n2 = 127$).

Why 2 numbers ($n1$ and $n2$)? The maximum value you can send to the DMP-130 with 1 number is 255, and clearly you have more than 255 dot positions available.

If you are a fan of binary math, you will recognize that the DMP-130 is interpreting these 2 numbers as a single 11-bit ($b(0) - b(10)$) value. The 3 lower bits of $n1$ are used as $b(8), b(9),$ and $b(10)$.

Note: Use 10-inch-wide paper for this next example.

See if you can print a character starting in position 480 in normal density. $n1 = 1$ gives 256 of those dots, and $480 - 256 = 224$ is the difference to be sent as $n2$. Type:

```
10 LPRINT CHR$(27);CHR$(16);CHR$(1);CHR$(224);"*"
```

and RUN the program.

Whoops! The asterisk printed at left edge of the paper. Hmmm! Maybe you need to leave enough room for the asterisk to fit on the end of the line. Try:

```
10 LPRINT CHR$(27);CHR$(16);CHR$(1);CHR$(218);"*"
```

and RUN the program. That's better. It fits nicely at the end of the line. Try this program with the different character densities.

Position is a little like a TAB, but it gets right down to the dot level, giving you much finer control. Although it is available in all 3 print modes, its potential is greatest in graphics mode.

If you want to make a real mess on your paper, try:

```
10 LPRINT CHR$(27);CHR$(28);
20 FOR I=1 TO 100
30 LPRINT CHR$(27);CHR$(16);CHR$(1);CHR$(150
+I*SIN(I/5));
40 LPRINT "*"
50 NEXT I
```

Get out of the double-width mode and then RUN the program.

Left and right margins

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

When you want to change the left/right margin to a new position, you must first send a CHR\$(27); CHR\$(81) to tell the Printer to change the margin. Follow this with another code which specifies the number of characters from the leftmost position.

Table 23. Left/Right Margin Set

Send CHR\$()		To:
(Dec)	(Hex)	
27 81 <i>n</i>	1B 51	Left Margin Set
27 82 <i>n</i>	1B 52	Right Margin Set

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 will not be changed even when the character mode is changed.
- Previously set tab-stop positions will not be affected by this command.
- When setting the left margin, the maximum value of *n* is limited to the maximum printable characters in the current printing mode minus 2

(e.g., $137 - 2 = 135$ in normal printing mode); otherwise, this command will be ignored.

- When setting the right margin, the value of n must exceed the left margin value by 2; otherwise, this command will be ignored.

Skip perforation

You can set a skip zone for a perforation at the bottom of the form.

Table 24. Skip Perforation Set

Send CHR\$()		To:
(Dec)	(Hex)	
27 72 n	1B 48 n	Set Skip Perforation

The skip zone is determined by the number of n times $1/6''$ (or $1/8''$ if 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 Printer automatically skips the designated area when printing.
- If n extends the form length, this sequence will be ignored.
- At power-on, DIP switch 1-5 determines whether 1-inch skip perforation will be performed.

Bidirectional and unidirectional printing

In DP or WP mode, either bidirectional or unidirectional printing is selectable.

Table 25. Bidirectional/Unidirectional Printing

Send CHR\$()		To:
(Dec)	(Hex)	
27 85 0	1B 55 0	Start Unidirectional Printing
27 85 1	1B 55 1	Start Bidirectional Printing

If you need to select unidirectional printing, send a CHR\$(27); CHR\$(85); CHR\$(0) and, to return to bidirectional printing, send a CHR\$(27);

CHR\$(85);CHR\$(1). At power-up, bidirectional printing is selected.

International characters

The (27 89 n) command is used to designate each International character. n must be within the range of $32 \leq n \leq 42$.

Table 26. International Character Table

n	32 (20)H	33 (21)H	34 (22)H	35 (23)H	36 (24)H	37 (25)H	38 (26)H	39 (27)H	40 (28)H	41 (29)H	42 (2A)H
Country	USA	Germany	France	Norway	Sweden	Denmark	Finland	Italy	Spain	England	Belgium
ASCII Code											
35 (23)H	#	#	£	#	#	#	#	£	£	£	#
36 (24)H	\$	\$	\$	☒	☒	\$	☒	\$	\$	\$	\$
64 (40)H	@	§	à	U	É	É	@	§	•§	@	à
91 (5B)H	[	Ä	°	Æ	Ä	Æ	Ä	°	i	[°
92 (5C)H	\	Ö	ç	Ø	Ö	Ø	Ö	ç	Ñ	\	ç
93 (5D)H	]	U	§	Á	Á	Á	Á	é	¿]	§
94 (5E)H	^	^	^	Ä	U	U	^	^	^	^	^
96 (60)H	`	`	`	ü	é	é	`	ù	`	`	`
123 (7B)H	{	ä	é	æ	ä	æ	ä	à	°	{	é
124 (7C)H	|	ö	ù	ø	ö	ø	ö	ò	ñ	|	ij
125 (7D)H	}	ü	è	å	å	å	å	è	ç	}	è
126 (7E)H	-	β	..	ä	ü	u	—	i	~	—	—

When the DMP-130 receives this command, the ASCII codes that are input will print characters as specified above. USA is designated at power-on.

Graphics mode

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

The DMP-130 allows you to have direct, programmable control over all of the available graphic dots.

How many *across the paper* addressable dot columns are there? The correct answer is 480.

How many *up and down* (dot columns) addressable dots are there? The answer is 7.

That means you can specify any one of up to 3,360 individual dots ($7 \times 480 = 3,360$).

How do you print just one (or two or three) of those dots in the dot column you want? (For example, how can you print the third dot from the top in the 400th dot column?)

Simple. Just follow this general procedure:

1. Send a CHR\$(18) to put the DMP-130 in graphics mode.
2. Send a CHR\$(27); CHR\$(16) to tell the Printer you want to position the print head to print a specific dot.
3. Tell the Printer in which dot column you wish to print. This is a little more complicated and will be explained shortly. For now, just understand that you simply tell the Printer which dot column you want.
4. Tell the Printer what you want to print. You can do this a number of ways. Again, this will be explained in more detail shortly. For now, just keep this overall procedure in mind.

When you want to specify a dot column where printing is to begin, you must first use CHR\$ to send the (27 16) code. Follow this with another 2-code sequence which specifies the position. For instance:

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

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

Table 27. Graphic Dot Positioning

If you wish to specify dot column:	n1 must be:	n2 must be:
0-255	0	0-255
256-479	1	0-223

Remember! Graphic printing allows you to access dot columns up to 479 ($n1 = 1$, $n2 = 223$).

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); CHR$(144)
; CHR$(255)
```

(Don't worry, that last `CHR$(255)` will be discussed shortly.)

In line 10, `CHR$(18)` puts the Printer in graphics mode and, in line 20, `CHR$(27); CHR$(16)` tells it to get ready to position the print head. (Note that `CHR$(0)` is necessary.)

Try this line to print a vertical bar at the rightmost available dot column.

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

What happens is:

1. `CHR$(18)` puts the Printer into graphics mode.
2. `CHR$(27); CHR$(16)` tells the DMP-130 to get ready to position the print head.
3. `CHR$(1)` tells the Printer that the position will be greater than 255.
4. `CHR$(223)` specifies the last available dot column.

Note: If you use `CHR$(224)` in this line instead of `CHR$(223)`, the DMP-130 would *wrap-around* to the first dot column in the next line.

Printing graphics patterns

By now, you should be adept at positioning the print head. But you also need to be able to tell the DMP-130 what to print once the head is positioned.

Remember that there are 7 vertical dots in each dot column. You can print any or all of these dots in any combination you want.

Look back at the sample programs used when print head positioning was discussed. Do you remember the last part of the program line (`CHR$(255)`) which always printed a vertical bar? That's an example of all 7 dots being printed at once.

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

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

How does `CHR$(129)` print just the top dot?

Even though the 7 dots in a dot column are in a vertical row, they are not numbered sequentially from 1 to 7. Table 28 describes the numbering system you must use with the DMP-130 when specifying an individual dot.

Table 28. DMP-130 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

For instance, you've already seen how to print the top dot in the column, but to print the bottom dot, change the program line to:

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

This is fine if you want to print an individual dot, but how do you print a combination of dots?

Graphics mode

That's actually quite simple, too.

1. Specify the dot # (1-64, see Table 28) that represents the individual dots you want to print.
2. Add those individual dot #'s together.
3. Add the sum of the combined dot #'s to 128.

For example, if you want 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$(16);CHR$(1)
;CHR$(223);CHR$(201);
```

Remember how `CHR$(255)` printed a solid (all dots printed) vertical bar? Try out the formula on that:

$$1 + 2 + 4 + 8 + 16 + 32 + 64 = 127 + 128 = 255$$

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

```
10 LPRINT CHR$(18);CHR$(27);CHR$(16);CHR$(1)
;CHR$(3);CHR$(255);CHR$(201);CHR$(201);CHR$(
201);CHR$(201);CHR$(255);
```

Now to flex our muscles. Type in the following program:

NEW

```
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)
```

RUN the program. Be prepared for a pause; it takes time to fill the print buffer.

This program alternately adds and subtracts powers of 2 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 7 dots high. Therefore, graphics mode provides a 7/72" line feed. A single 7/72" line feed advances the paper 7 dots or approximately 0.1 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
and 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" line feed, the following 4 line feed codes are available:

- 1/72" line feed — CHR\$(27);CHR\$(50)
- 1/144" line feed — CHR\$(27);CHR\$(57)
- $n/144$ " line feed — CHR\$(27);CHR\$(64);CHR\$(n)
 n should be a value between 1-255.
- 1/216" line feed — CHR\$(27);CHR\$(51)

Repeat function

CHR\$(28) will tell the DMP-130 to repeat a graphic pattern a specified number of times.

The format for this repeat function is:

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

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

Change line 90 to:

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

and RUN the program.

Leaving graphics mode

CHR\$(30) is used to exit graphics mode. It returns the DMP-130 to the same 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. Change the sample program to:

```
5 LPRINT CHR$(27);CHR$(23);"COMPRESSED CHARA  
CTER WIDTH"
```

```
90 LPRINT CHR$(N);  
130 LPRINT "STILL IN COMPRESSED MODE"
```

and RUN it.

Sure enough, the compressed mode is still alive and well.

Freehand drawing

The computer can do most of the work in drawing figures that can be described by a mathematical function. Freehand drawings, on the other hand, require translating the figure into a matrix of dots, then calculating the dot printing combinations for each print head position. Since there are 7 dots available for graphics, separate the matrix into rows 7 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 Printer. Enter these sample DATA lines:

```
NEW   
120 DATA 999  
160 DATA 13, 12, 112, 999  
190 DATA 32, 32, 18, 18, 8, 15, 999  
210 DATA 16, 16, 8, 8, 4, 4, 2, 2, 1, 1, 999
```

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


```

10 LPRINT CHR$(18)
20 FOR R=1 TO 4
30 READ N: IF N=999 THEN 80
40 LPRINT CHR$(128+N);:GOTO 30
80 LPRINT:NEXT R
90 LPRINT CHR$(30)
100 LPRINT "DMP130"

```

Now RUN the program.

Not much to brag about yet. Maybe what it needs is to be jazzed up to 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 17, -2, 33, 34, -4, 66, 68, -4, 4, -5, 8, -5,
16, -5, 32, -5, 64, 999
130 DATA 64, 96, 80, 72, 68, 66, 33, 16, 8, 12, 94, -7,
127, -5, 126
180 DATA 95, 79, 71, 67, 65, 32, 16, 8, 4, 2, 1, -4, 0, 3
, 71, 67

```

Don't RUN it yet!

In line 120, the sequence $-4,66$ is used to mean four 66s: 66,66,66,66. You must modify the program to recognize the negative numbers. Change:

```

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

```

and RUN the program.

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

Graphics mode

```
110 DATA -7, 0, -2, 64, -2, 96, 80, -2, 72, -2, 100, -2,
114, -2, 57
140 DATA -5, 124, -2, 120, -3, 121, -2, 113, -3, 114, 9
8, 98, -2, 100
150 DATA -2, 116, 92, 88, 72, 64, 32, 32, 16, 80, 104, 7
2, 5, 5, 3
170 DATA 127, -4, 64, 3, -3, 2, 3, -5, 7, -5, 15, -5, 31,
-5, 63, -6, 127
200 DATA -5, 0, -5, 1, -5, 2, -5, 4, -5, 8, -5, 19, -5, 38
, -4, 64, 127, 32, 32
```

RUN the program.

Now, that's worth the effort!

The DMP-130 has 2 control code sets; one is the original Tandy control code set and the other is the IBM control code set. These two code sets are independent of each other.

Code set selection

The IBM emulation mode is provided for use with the IBM code set. You can select it by setting DIP switch 1-1 to ON and then turning the power ON.

If you send a `CHR$(27);"!'`, it resets the Printer to the defaulted Tandy mode. (Refer to **Appendix B**.)

Character set selection

Three character sets (not character styles) are provided in the DMP-130; one is the Tandy character set and the other two are the IBM character sets (refer to **Appendix A**). In the IBM emulation mode, setting DIP switch 1-7 to OFF selects the IBM character set 1, while setting it ON selects the IBM character set 2. You can also designate character set 1 or character set 2 via software by sending the control codes `CHR$(27);"7"` (set 1) or `CHR$(27);"6"` (set 2).

Font selection

The code `CHR$(27);"I"; CHR$(1)` selects the IBM high-speed font, and `CHR$(27);"I"; CHR$(2)` or `CHR$(27);"I"; CHR$(3)` selects the IBM letter-quality font.

When either of these commands is designated, the current buffer contents are printed out; the Printer then enters the new font.

Carriage return

The code `CHR$(13)` prints the buffer contents and then moves the printing position to the leftmost dot position. A line feed is executed if DIP switch 1-2 is set to OFF (CR with LF).

When CR is received, only a carriage return is performed if `CHR$(27);"5"; CHR$(0)` is set; both carriage return and line feed are performed if `CHR$(27);"5"; CHR$(1)` is set. This command is given priority over the DIP switch 1-2 selection.

Vertical formatting control codes

Setting the line feed pitch

The LF pitch is set to 1/6 inch or 1/8 inch (designated by the setting of DIP switch 1-6) at power ON. You can change the pitch by sending the command `CHR$(27); "0"`, `CHR$(27); "1"` or the command `CHR$(27); "A"`.

1/8-inch line feed

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

7/72-inch line feed

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

Variable line feed

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

Useful Hint: If you want to return the LF pitch to 1/6 inch when, for example, the line spacing has been set at 7/72 inch for the bit image mode, send a control code `CHR$(27); "2"` only (without a `CHR$(27); "A"` command). The LF pitch will return to 1/6 inch.

Setting the variable pitch 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 between 1 and 85. For bit image graphics, line spacing can be set to 7/72 inch by designating n as 7.

This command is only to define the LF pitch; you need to send a control code `CHR$(27); "2"` to *change* the line feed pitch.

Enter the following program:

```
10 LPRINT CHR$(27);"A";CHR$(6);
20 LPRINT CHR$(27);"2"
30 LPRINT "NORMAL SPACING LINE FEED"
40 LPRINT "HALF LINE FEED IS EXECUTED"
```

then RUN it. LF pitch is changed to 1/12 inch.

Setting the variable line feed (*n/216*)

The control code CHR\$(27);"3";CHR\$(*n*) sets the line feed pitch to *n/216* inch. *n* is a value between 1 and 255.

Variable line feed execution (*n/216*)

The control code CHR\$(27);"J";CHR\$(*n*) executes a *n/216*" line feed determined by the value of *n*. *n* is a number between 1 and 255.

Execution command for line feed

Line feed

The code CHR\$(10) prints out the character and feeds the paper 1 line. The paper feed distance is specified by the DIP switch or the line spacing set commands (mentioned above). This command will terminate a double-width print mode set by code 14 or code sequence (27 14).

Reverse line feed

The code sequence (27 93) executes a 1/6" reverse line feed.

Setting top-of-form and form length

The form length can be changed at any time if the friction feed is used. The control code CHR\$(27);"C";CHR\$(*n*) sets the lines per page and the control code CHR\$(27);"C";CHR\$(0);CHR\$(*m*) sets the inches per page. *n* is a single-byte binary number and can represent any value between 1 and 127. *m* is also a single-byte binary number and can represent any value between 1 and 22. The top-of-form position is set at the current line after a form length setting command is executed. The form length is set to 11 or 12 inches (selected by DIP switch 1-4) at power ON. To set the current print position as the top-of-form, send CHR\$(27);"4".

Form feed

When a control code CHR\$(12) is issued, the Printer prints out the buffer contents and feeds the paper to the next top-of-form position.

Skip perforation

The skip perforation function can be set by the CHR\$(27); "N"; CHR\$(*n*) command. *n* designates the number of lines to skip. *n* is a single-byte binary number and can represent any value between 1 and 127. This function is terminated by the CHR\$(27); "O" command or the form length set command.

If the value for *n* exceeds the page length, the CHR\$(27); "N"; CHR\$(*n*) command is ignored.

If you want to print 60 lines per page on a sheet of 11-inch paper, RUN the following program:

```
10 LPRINT CHR$(27); "N"; CHR$(60);
```

Line 61 is printed on the next top-of-form without a form feed command.

Horizontal formatting control codes

Horizontal tabulation

With horizontal tabulation, you can easily align sections horizontally. The maximum 28 horizontal TAB stops can be set to any column (the left margin is column 0) by using the following control codes:

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

n indicates the horizontal column position and can represent any number between 1 and 80; column positions should be designated in ascending order. When all TABs have been selected, send a null code (CHR\$(0)) to terminate the horizontal TAB designation. Once the TABs are set, send control code CHR\$(9) to skip to the next right TAB position.

- When TAB stops are not set, control code CHR\$(9) is ignored.
- All the previously set TABs are cleared by designating new TAB stop positions.

- Horizontal TAB stops are set at every eighth column when the Printer is powered ON.

Reset all TABs

The code `CHR$(27); "R"` restores all TAB columns to the default value of every eighth column.

Backspace

`CHR$(8)` causes the print head to backspace the length of 1 character after printing the current buffer contents. If proportional spacing is selected, the length of the backspace is the same as the length of a space (ASCII 32, 20 hex).

Home head

If you send the code sequence `CHR$(27); CHR$(60)`, the print head will return to the home position to print a line. This will occur for 1 line only.

Left and right margins

You can position the left and right margins to a specific character position designated by the current font pitch. Send control codes `(27 88 n1 n2)`, where `n1` is the left margin position and `n2` is the right margin position ($1 < n1 < n2 < 233$). Both values `n1` and `n2` indicate the number of characters counted by the current font pitch from the leftmost margin. If the current font is proportionally spaced, the width of space (ASCII 32) is used.

Once set, the margin positions do not change even if you change the character font pitch.

The minimum distance between the left and right margins is $1/5''$. If you give values that result in less than $1/5''$, the Printer sets to minimum $1/5''$.

The command is a print start command. When this command is received, the Printer prints out the current buffer contents and subsequent data will be printed from the designated left margin.

Variable forward/backward space

You can move the print head forward or backward in increments of $1/120''$. Use the code sequence `(27 100 n1 n2)` for forward spacing and

(27 101 n1 n2) for backward spacing. In either case, n1 and n2 are the number of print head motions in the unit of 1/120". 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 $n1 + 256 \times n2 (\times 1/120")$.

If the position you specify is beyond the right margin in forward spacing, the next print position is set to the left margin position. If the specified position is beyond the left margin in backward spacing, the Printer sets the next print position to the left margin.

Printing mode control

In IBM emulation mode, you can print elongated, condensed, bold, and emphasized characters; you can also print in super- or subscript mode, bit image mode and so on. Use these various print styles to print a title or to highlight effectively in the character printing mode.

Double-width printing

In double-width printing mode, the width of a printed character is doubled; the pitch space is also doubled. Double-width printing can be executed via CHR\$(14) or CHR\$(27); CHR\$(14) or CHR\$(27); "W"; CHR\$(1). When this mode is established with CHR\$(14) or CHR\$(27); CHR\$(14), it is released by CHR\$(20) or a line feed; when it is established with CHR\$(27); "W"; CHR\$(1), it is released by CHR\$(27); "W"; CHR\$(0) only.

For instance, enter the following program:

```
10 LPRINT CHR$(27);CHR$(14);"      TITLE      "  
20 LPRINT "TEXT PRINTING"
```

and RUN it. **TITLE** is printed in double-width character mode, but **TEXT PRINTING** is not since a LF took place at the end of line 10. Compare these results with the results of the following program:

```
10 LPRINT CHR$(27);"W";CHR$(1);"      TITLE      "  
20 LPRINT "TEXT PRINTING"
```

Compressed printing

In the compressed printing mode, 10 CPI is changed to 17 CPI. Compressed printing can be selected with CHR\$(15) or CHR\$(27); CHR\$(15), and released with CHR\$(18).

- Notes:*
1. Condensed printing is suspended in bit image or emphasized printing mode; when the Printer exits either of these modes, condensed printing is restored.
 2. Condensed printing is available only in standard font; it is ignored when the correspondence font is selected.

Type in the following program:

```
10 LPRINT CHR$(15);  
20 LPRINT "THIS IS COMPRESSED"
```

and RUN it. Data can be printed with up to 137 characters in a line.

Selecting 12 CPI

If the current font is one of the high-speed character sets, when the code CHR(27); ":" is sent to the Printer, 12 CPI will be selected. If the current font is a letter-quality character set, correspondence 12 CPI characters will be selected. To return to 10 CPI, send CHR(27); "M".

Proportional spacing ON/OFF

Proportional spacing OFF

When the code CHR(27); "P"; CHR(0) is received, the current buffer contents are printed out and the font is changed to a monospaced font.

This command only resets the proportional spacing condition.

Proportional spacing ON

When the code CHR(27); "P"; CHR(1) is sent to the DMP-130, the current buffer contents are printed out and the font is changed to a proportional spacing font.

This command sets the character font to proportional spacing.

Emphasized printing

In the emphasized printing mode, each character is printed once on the normal printing line, and again with a small shift horizontally. This emphasized printing mode is established by the control code, CHR(27); "E" and cancelled by CHR(27); "F".

Enter the following program:

```
10 LPRINT CHR$(27);"E";
20 LPRINT "Emphasized ";
30 LPRINT CHR$(27);"F";
40 LPRINT "Printing"
```

and RUN it. The word **Emphasized** is printed in boldfaced characters.

Double-strike printing

In the double-strike printing mode, characters are printed once on the normal printing line, and again with a small shift vertically; therefore, highlighted characters can be printed not only by emphasized printing, but also by the double-strike printing mode. This mode is established by CHR\$(27); "G" and cancelled by CHR\$(27); "H".

Superscript and subscript

With your DMP-130, you can print superscript and subscript characters. In superscript mode, a character is printed on the upper half of a normal character line, and in subscript mode, a character is printed on the lower half of a normal character line. The superscript printing mode is established by CHR\$(27); "S"; CHR\$(0), and the subscript printing mode is established by CHR\$(27); "S"; CHR\$(1). Both superscript and subscript can be cancelled by CHR\$(27); "T".

This function is useful for printing algebraic expressions.

Try the example program below:

```
10 LPRINT "Y=AX";
20 LPRINT CHR$(27);"S"; CHR$(0);
30 LPRINT "3";
40 LPRINT CHR$(27);"T";
50 LPRINT "+BX";
60 LPRINT CHR$(27);"S"; CHR$(0);
70 LPRINT "2";
80 LPRINT CHR$(27);"T";
90 LPRINT "+C"
```

Underlining

In the underlining mode, all characters, spaces and the spaces which are moved by horizontal TABs (except bit image data and graphic symbols) will be underlined. This mode is established by `CHR$(27); "-" ; CHR$(1)` and cancelled by `CHR$(27); "-" ; CHR$(0)`.

Enter the following program:

```
10 LPRINT "THIS FUNCTION CAN PRINT"
20 LPRINT CHR$(27); "-" ; CHR$(1) ; "UNDERLINE"
   ; CHR$(27); "-" ; CHR$(0) ;
30 LPRINT " WITH TEXT AUTOMATICALLY"
```

and RUN it.

The word **UNDERLINE** is printed with an underline.

Bit image mode

There are four kinds of bit image modes in the DMP-130. One vertical line of dot image consists of 8-bit data. Each mode has its particular horizontal dot density, and its maximum number of bits on a line, as indicated.

Mode	Number of Bits/Line
480 Bit Image	480 Bits/Line
960 Bit Image	960 Bits/Line
960 Bit Image (Normal Speed)	960 Bits/Line
1920 Bit Image	1920 Bits/Line

480 bit image mode

In 480 bit image mode, horizontal dot (bit) density is 1/60 inch. The code sequence of this mode is as follows:

```
CHR$(27) ; "K" ; CHR$(n1) ; CHR$(n2) ; CHR$(v1) ; . . . .
CHR$(vK)
```

$n1$, $n2$ are the number 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 480.

$v1$ through vK represent the dot patterns for each vertical line and single-byte binary number. Unlike in the Tandy mode, the dot patterns are numbered

IBM emulation mode

from bottom to top:

128
64
32
16
8
4
2
1

Add the numbers of the dot patterns you want to print to obtain the data for $v1$ through vK .

960 bit image mode

In 960 bit image mode, horizontal dot (bit) density is 1/120 inch. A dot pattern which corresponds with 1 bit is composed of 3 vertical dots \times 3 horizontal dots in 1/360-inch dot pitch. The code sequence of this mode is as follows:

```
CHR$ (27) ; " L" ; CHR$ (n1) ; CHR$ (n2) ; CHR$ (v1) + . . . .  
CHR$ (vK)
```

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

960 bit image mode (normal speed)

In 960 bit image mode (normal speed), the dot density is equally 1/120 inch. The difference between these two 960 bit image modes is equivalent to the difference between boldfaced characters and normal characters. The code sequence of this mode is as follows:

```
CHR$ (27) ; " Y" ; CHR$ (n1) ; CHR$ (n2) ; CHR$ (v1) ; . . . .  
CHR$ (vK)
```

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

1920 bit image mode

In 1920 bit image mode, horizontal dot (bit) density is 1/240 inch. The bits on the same horizontal line should not be printed continuously in this mode. The code sequence of this mode is as follows:

```
CHR$ (27) ; " Z" ; CHR$ (n1) ; CHR$ (n2) ; CHR$ (v1) ; . . . .  
CHR$ (vK)
```

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

Other control codes

Paper end detection

The FAULT signal to the interface, when a paper end condition is detected, can be turned ON or OFF. By combining this function with an override function, the last printable line on the paper can be printed without a device fault on the external terminal. The FAULT signal is inhibited by CHR\$(27); "8" (ignore paper end), and is made available by CHR\$(27); "9" (cancel ignore paper end).

Cancel

CHR\$(24) clears the *data* in the print buffer that was received prior to this command; the other *control codes* that were received prior to this control code remain in effect.

Unidirectional printing

Usually, the DMP-130 executes bidirectional printing, but this Printer allows you to print by using a unidirectional printing method to avoid slight vertical misalignment. By using this function, you can print a chart or a graph perfectly. This function is executed by the code sequence CHR\$(27); "U"; CHR\$(1), and cancelled by CHR\$(27); "U"; CHR\$(0). When only a small number of characters are to be printed unidirectionally, printing all the characters on a page in the unidirectional mode decreases the efficiency of the DMP-130. Use the code CHR\$(27); "<" to print only specific characters in the unidirectional mode. This code is cancelled by CHR\$(13); only 1 line which follows this code is printed unidirectionally.

Printing characters below 20 hex

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

Bell

When the code CHR\$(07) is received, the Printer buzzer sounds for 1 second. If DIP switch 2-2 is OFF, the buzzer does not sound.

Appendices

Dot-column width of Tandy characters

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

GRAPHICS

∕	⊗	—	ò	i	|	ij
11	11	12	11	9	9	11

Correspondence and proportional characters

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

GRAPHICS

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23	23	24	22	20	13	24

IBM character set 2

Upper Bit	Lower Bit	Hex.	Binary	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	"	P		p	C	É	á	█	L	⊥	"	≡	
		1	0001			!	1	A	Q		a	q	u	æ	i	█	⊥	⊥	β	†
		2	0010		DC2		2	B	R		b	r	é	Æ	ó		⊥	⊥	⊥	≡
		3	0011	♥		#	3	C	S		c	s	á	ò	u	|	⊥	⊥	⊥	≡
		4	0100	♦	DC4		4	D	T		d	t	a	o	ñ	⊥	⊥	⊥	⊥	≡
		5	0101	♣		%	5	E	U		e	u	á	ó	Ñ	⊥	⊥	⊥	⊥	≡
		6	0110	♠		&	6	F	V		f	v	á	ú	a	⊥	⊥	⊥	⊥	≡
		7	0111	BEL			7	G	W		g	w	ç	u	o	⊥	⊥	⊥	⊥	≡
		8	1000	BS	CAN	()	8	H	X		h	x	ç	ý	ç	⊥	⊥	⊥	⊥	≡
		9	1001	HT		)	9	I	Y		i	y	e	O	⊥	⊥	⊥	⊥	⊥	≡
		A	1010	LF		*		J	Z		j	z	é	U	⊥	⊥	⊥	⊥	⊥	≡
		B	1011	VT	ESC	⊥	:	K	|		k	|	ç	¼	⊥	⊥	⊥	⊥	⊥	≡
		C	1100	FF				L	\		l	\	ç	¼	⊥	⊥	⊥	⊥	⊥	≡
		D	1101	CR		-	-	M	|		m	|	ç	¼	⊥	⊥	⊥	⊥	⊥	≡
		E	1110	SO		>	>	N	`		n	`	A	Pt	⊥	⊥	⊥	⊥	⊥	≡
		F	1111	SI		?	?	O	—		o	—	A	f	»	⊥	⊥	⊥	⊥	≡

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

♥♣♠S !"#\$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNQRSTU
 VWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ÇÙŠÀÁÂÃÄÅÆÇÈÉÊËÌÍÎÏ
 ÑÒÓÔÕÖ×ØÙÚÛÜÝÞßàáâãäåæçèéêëìíîïðñ
 òóôõö÷øùúûüýþÿÀÁÂÃÄÅÆÇÈÉÊËÌÍÎÏ
 ÑÒÓÔÕÖ×ØÙÚÛÜÝÞßàáâãäåæçèéêëìíîïðñ
 òóôõö÷øùúûüýþÿ

Dot-column width of IBM characters

Standard and 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	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	11	9	11	11	11	11	9	11	11	11	11	12	12	12	10	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	11	9	11	11	11	11	12	12	12	11	11	
7	0111	11	11	11	11	11	11	11	11	9	11	11	12	12	12	11	11	
8	1000	8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248	
9	1001	9	25	41	57	73	89	105	121	137	153	169	185	201	217	233	249	
A	1010	10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250	
B	1011	11	27	43	59	75	91	107	123	139	155	171	187	203	219	235	251	
C	1100	12	28	44	60	76	92	108	124	140	156	172	188	204	220	236	252	
D	1101	13	29	45	61	77	93	109	125	141	157	173	189	205	221	237	253	
E	1110	14	30	46	62	78	94	110	126	142	158	174	190	206	222	238	254	
F	1111	15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255	

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11	11	12	9	8	9	11	11

Correspondence and 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			24	21	21	22	17	23	23	23	22	24	24	24	24	24	24
1	0001		0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
2	0010				17	21	23	23	23	22	21	24	22	24	24	24	19	24
3	0011		24	19	23	21	23	23	22	23	22	22	23	24	24	24	23	24
4	0100																	
5	0101		24	21	23	21	23	23	21	23	22	22	24	24	24	24	20	24
6	0110																	
7	0111				13	21	23	24	23	24	22	23	23	24	24	24	19	24
8	1000				20	21	23	23	23	21	23	21	23	21	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	23	24	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

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19	23	24	20	19	13	24	23

Control codes

B

Tandy control codes

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

Control codes

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

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	<i>n</i> × 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 1	Select IBM Character Set 1	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 <i>n</i> /144" LF	Perform <i>n</i> /144" LF	Perform <i>n</i> /144" LF	
27 66 <i>n</i>	(1B) (42) <i>n</i>	ESC B <i>n</i>	Select Italic Character	Select Italic Character	Ignored	<i>n</i> =1: Starts Italic <i>n</i> =0: Ends Italic
27 72 <i>n</i>	(1B) (48) <i>n</i>	ESC H <i>n</i>	Set <i>n</i> /6" Skip Perforation	Set <i>n</i> /6" Skip Perforation	Set <i>n</i> /6" Skip Perforation	<i>n</i> =0: Ends Skip Perforation

Control codes

Code Dec.	Hex	Symbol	DP Mode	WP Mode	BI Mode	Remarks
27	(1B)	ESC				
77	(4D)	M	Select Microfont	Select Microfont	Ignored	1/2 LF is set
27	(1B)	ESC				
81	(51)	Q	Set Left Margin	Set Left Margin	Ignored	Set at position ($n \times$ character width)
n		n				
27	(1B)	ESC				
82	(52)	R	Set Right Margin	Set Right Margin	Ignored	Set at position ($n \times$ character width)
n		n				
27	(1B)	ESC				
83	(53)	S	$n=0$ Sets Unidirectional $n=1$ Sets Subscript	$n=0$ Sets Superscript $n=1$ Sets Subscript	Ignored	ESC X ends this selection
n		n				
27	(1B)	ESC				
85	(55)	U	$n=0$ Sets Unidirectional $n=1$ Sets Bidirectional	$n=0$ Sets Unidirectional $n=1$ Sets Bidirectional	Ignored	
n		n				
27	(1B)	ESC				
88	(58)	X	End Superscript and Subscript	End Superscript and Subscript	Ignored	
27	(1B)	ESC				
89	(59)	Y	Select International Character	Select International Character	Ignored	$n = 32 \sim 42$
n		n				
28	(1C)	FS	Repeat Character (Undefined code is ignored)	Repeat Character (Undefined code is ignored)	Repeat Print Data	$n1$: Repeat number $n2$: Char or print data
$n1$		$n1$				
$n2$		$n2$				
30	(1E)	RS	Ignored	Ignored	End graphics	
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
7 135	(07) (87)	BELL	Sound buzzer for 1 second
27 7	(1B) (07)	ESC BEL	Same as BEL
27 135	(1B) (87)		
8 136	(08) (88)	BS	Move 1 character position to the left
27 8	(1B) (08)	ESC BS	Same as BS
27 136	(1B) (88)		
9 137	(09) (89)	HT	Move to next horizontal tab position
27 9	(1B) (09)	ESC HT	Same as HT
27 137	(1B) (89)		
10 138	(0A) (8A)	LF	Print and Line Feed according to latched information with or without Carriage Return (DIP switch 1-3)
27 10	(1B) (0A)	ESC LF	Same as LF
27 138	(1B) (8A)		
11 139	(0B) (8B)	VT	Same as LF

Control codes

Decimal	Hex	Symbol	Function
27 11	(1B) (0B)	ESC VT	Same as LF
27 139	(1B) (8B)		
12 140	(0C) (8C)		
27 12	(1B) (0C)	ESC FF	Same as FF
27 140	(1B) (8C)		
13 141	(0D) (8D)		
27 13	(1B) (0D)	ESC CR	Same as CR
27 141	(1B) (8D)		
14 142	(0E) (8E)		
27 14	(1B) (0E)	ESC SO	Same as SO
27 142	(1B) (8E)		
15 143	(0F) (8F)		
27 15	(1B) (0F)	ESC SI	Same as SI
27 143	(1B) (8F)		

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

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 $0 \leq n \leq 255$
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

Decimal	Hex	Symbol	Function
27 68 $m_1 m_2 \dots m_k$ 0	(1B) (44) (00)	ESC D $m_1 m_2 \dots m_k$ 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 NLO font
27 74 n	(1B) (4A)	ESC J n	Execute Line Feed pitch by $n/216$ inch $0 \leq n \leq 255$
27 75 $m_1 m_2 D_1 \dots D_k$	(1B) (4B)	ESC K $m_1 m_2 D_1 \dots D_k$	Select 60 DPI (dot/inch) Bit Image $K = m_1(\text{LSB}) + 256 \times m_2(\text{MSB})$
27 76 $m_1 m_2 D_1 \dots D_k$	(1B) (4C)	ESC L $m_1 m_2 D_1 \dots D_k$	Select 120 DPI Bit Image. Half Speed $K = m_1 + 256 \times m_2$
27 77	(1B) (4D)	ESC M	Select 10 CPI character mode
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 <i>n</i> = 1: ON, <i>n</i> = 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>	<i>n</i> = 1 selects subscript <i>n</i> = 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>	<i>n</i> = 1 selects Unidirectional print <i>n</i> = 0 selects Bidirectional print
27 87 <i>n</i>	(1B) (57)	ESC W <i>n</i>	<i>n</i> = 1 selects Double-Width Mode <i>n</i> = 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> . $1 \leq m < n \leq \text{maximum character column}$
27 89 <i>n</i> ₁ <i>n</i> ₂ D ₁ ... D _k	(1B) (59)	ESC Y <i>m</i> ₁ <i>m</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>m</i> ₁ <i>m</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 exceeding right margin, 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 exceeding left margin.
101	(65)	e	
Ln		Ln	
Hn		Hn	

Character category priority table

C

In print mode, the following priorities exist:

1. Compressed > Proportional > Bold > Condensed > Normal
2. Superscript/Subscript > Correspondence (NLQ) > Double Strike
 - a. If the Compressed, Condensed, Superscript, and Double-Strike modes are designated, according to Priority chart No. 84, Compressed Superscript characters will be printed.
 - b. If the Compressed mode is terminated from the above example, Condensed Superscript characters will be printed according to No. 20.
 - c. If the Superscript mode is terminated from example a., Compressed Double-Strike characters will be printed according to No. 83.

Character category priority table

Prop: Proportional Cond: Condensed NLQ: Near Letter Quality
 D S : Double-Strike Sup/Sub: Superscript/Subscript Comp: Compressed

NO	Command Combination								Character Mode Prinred								Printed Ex.
	Comp	Prop	Cond	Bold	NLQ	D S	Sup/Sub	Normal	Comp	Prop	Cond	Bold	NLQ	D S	Sup/Sub	ABChijk	
1								○								ABChijk	
2							○	○							○	ABChijk	
3						○		○						○		ABChijk	
4						○	○	○							○	ABChijk	
5					○			○					○			ABChijk	
6					○		○	○							○	ABChijk	
7					○	○		○					○			ABChijk	
8					○	○	○	○							○	ABChijk	
9				○				○					○			ABChijk	
10				○			○	○					○		○	ABChijk	
11				○		○		○					○		○	ABChijk	
12				○		○	○	○					○		○	ABChijk	
13				○	○			○					○	○		ABChijk	
14				○	○		○	○					○		○	ABChijk	
15				○	○	○		○					○	○		ABChijk	
16				○	○	○	○	○					○		○	ABChijk	
17			○										○			ABChijk	
18			○				○						○		○	ABChijk	
19			○			○							○		○	ABChijk	
20			○			○	○						○		○	ABChijk	
21			○		○								○			ABChijk	
22			○		○		○						○		○	ABChijk	
23			○		○	○							○		○	ABChijk	
24			○		○	○	○						○		○	ABChijk	
25			○	○				○					○			ABChijk	
26			○	○			○	○					○		○	ABChijk	
27			○	○		○		○					○		○	ABChijk	
28			○	○		○	○	○					○		○	ABChijk	
29			○	○	○			○					○			ABChijk	
30			○	○	○		○	○					○		○	ABChijk	
31			○	○	○	○		○					○		○	ABChijk	
32			○	○	○	○	○	○					○		○	ABChijk	
33		○											○			ABChijk	
34		○					○						○		○	ABChijk	

Prop: Proportional Cond: Condensed NLO: Near Letter Quality
 D.S.: Double-Strike Sup/Sub: Superscript/Subscript Comp: Compressed

NO	Command Combination							Character Mode Printed							Printed Ex	
	Comp	Prop	Cond	Bold	NLO	D S	Sup/Sub	Normal	Comp	Prop	Cond	Bold	NLO	D S		Sup/Sub	ABChijk
35		<input type="radio"/>				<input type="radio"/>				<input type="radio"/>				<input type="radio"/>		ABChijk
36		<input type="radio"/>				<input type="radio"/>	<input type="radio"/>			<input type="radio"/>					<input type="radio"/>	ABChijk
37		<input type="radio"/>			<input type="radio"/>					<input type="radio"/>			<input type="radio"/>			ABChijk
38		<input type="radio"/>			<input type="radio"/>		<input type="radio"/>			<input type="radio"/>					<input type="radio"/>	ABChijk
39		<input type="radio"/>			<input type="radio"/>	<input type="radio"/>				<input type="radio"/>			<input type="radio"/>			ABChijk
40		<input type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>					<input type="radio"/>	ABChijk
41		<input type="radio"/>		<input type="radio"/>						<input type="radio"/>		<input type="radio"/>				ABChijk
42		<input type="radio"/>		<input type="radio"/>			<input type="radio"/>			<input type="radio"/>		<input type="radio"/>			<input type="radio"/>	ABChijk
43		<input type="radio"/>		<input type="radio"/>		<input type="radio"/>				<input type="radio"/>		<input type="radio"/>		<input type="radio"/>		ABChijk
44		<input type="radio"/>		<input type="radio"/>		<input type="radio"/>	<input type="radio"/>			<input type="radio"/>		<input type="radio"/>			<input type="radio"/>	ABChijk
45		<input type="radio"/>		<input type="radio"/>	<input type="radio"/>					<input type="radio"/>		<input type="radio"/>	<input type="radio"/>			ABChijk
46		<input type="radio"/>		<input type="radio"/>	<input type="radio"/>		<input type="radio"/>			<input type="radio"/>		<input type="radio"/>			<input type="radio"/>	ABChijk
47		<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				<input type="radio"/>		<input type="radio"/>	<input type="radio"/>			ABChijk
48		<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>		<input type="radio"/>			<input type="radio"/>	ABChijk
49		<input type="radio"/>	<input type="radio"/>							<input type="radio"/>						ABChijk
50		<input type="radio"/>	<input type="radio"/>				<input type="radio"/>			<input type="radio"/>					<input type="radio"/>	ABChijk
51		<input type="radio"/>	<input type="radio"/>			<input type="radio"/>				<input type="radio"/>				<input type="radio"/>		ABChijk
52		<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	<input type="radio"/>			<input type="radio"/>					<input type="radio"/>	ABChijk
53		<input type="radio"/>	<input type="radio"/>		<input type="radio"/>					<input type="radio"/>			<input type="radio"/>			ABChijk
54		<input type="radio"/>	<input type="radio"/>		<input type="radio"/>		<input type="radio"/>			<input type="radio"/>					<input type="radio"/>	ABChijk
55		<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>				<input type="radio"/>			<input type="radio"/>			ABChijk
56		<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>					<input type="radio"/>	ABChijk
57		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>						<input type="radio"/>		<input type="radio"/>				ABChijk
58		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>			<input type="radio"/>		<input type="radio"/>			<input type="radio"/>	ABChijk
59		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>				<input type="radio"/>		<input type="radio"/>		<input type="radio"/>		ABChijk
60		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>			<input type="radio"/>		<input type="radio"/>			<input type="radio"/>	ABChijk
61		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					<input type="radio"/>		<input type="radio"/>	<input type="radio"/>			ABChijk
62		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>			<input type="radio"/>		<input type="radio"/>			<input type="radio"/>	ABChijk
63		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				<input type="radio"/>		<input type="radio"/>	<input type="radio"/>			ABChijk
64		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>		<input type="radio"/>			<input type="radio"/>	ABChijk
65	<input type="radio"/>								<input type="radio"/>							ABChijk
66	<input type="radio"/>						<input type="radio"/>		<input type="radio"/>						<input type="radio"/>	ABChijk
67	<input type="radio"/>					<input type="radio"/>			<input type="radio"/>				<input type="radio"/>			ABChijk
68	<input type="radio"/>					<input type="radio"/>	<input type="radio"/>		<input type="radio"/>						<input type="radio"/>	ABChijk

Character category priority table

Prop: Proportional Cond: Condensed NLO: Near Letter Quality
 D.S.: Double-Strike Sup/Sub: Superscript/Subscript Comp: Compressed

NO	Command Combination							Character Mode Printed							Printed Ex.	
	Comp	Prop	Cond	Bold	NLO	D S	Sup/Sub	Normal	Comp	Prop	Cond	Bold	NLO	D S	Sup/Sub	ABChijk
69	○				○				○				○			ABChijk
70	○				○		○		○						○	ABChijk
71	○				○	○			○				○			ABChijk
72	○				○	○	○		○						○	ABChijk
73	○			○					○			○				ABChijk
74	○			○			○		○			○			○	ABChijk
75	○			○		○			○			○		○		ABChijk
76	○			○		○	○		○			○			○	ABChijk
77	○			○	○				○			○	○			ABChijk
78	○			○	○		○		○			○			○	ABChijk
79	○			○	○	○			○			○	○			ABChijk
80	○			○	○	○	○		○			○			○	ABChijk
81	○		○						○							ABChijk
82	○		○				○		○						○	ABChijk
83	○		○			○			○					○		ABChijk
84	○		○			○	○		○						○	ABChijk
85	○		○		○				○				○			ABChijk
86	○		○		○		○		○						○	ABChijk
87	○		○		○	○			○				○			ABChijk
88	○		○		○	○	○		○						○	ABChijk
89	○		○	○					○			○				ABChijk
90	○		○	○			○		○			○			○	ABChijk
91	○		○	○		○			○			○		○		ABChijk
92	○		○	○		○	○		○			○			○	ABChijk
93	○		○	○	○				○			○	○			ABChijk
94	○		○	○	○		○		○			○			○	ABChijk
95	○		○	○	○	○			○			○	○			ABChijk
96	○		○	○	○	○	○		○			○			○	ABChijk
97	○	○							○							ABChijk
98	○	○					○		○						○	ABChijk
99	○	○				○			○					○		ABChijk
100	○	○				○	○		○						○	ABChijk
101	○	○			○				○				○			ABChijk
102	○	○			○		○		○						○	ABChijk

Prop: Proportional Cond: Condensed NLO: Near Letter Quality
 D.S.: Double-Strike Sup/Sub: Superscript/Subscript Comp: Compressed

NO	Command Combination							Character Mode Printed							Printed Ex	
	Comp	Prop	Cond	Bold	NLO	D S	Sup/Sub	Normal	Comp	Prop	Cond	Bold	NLO	D S		Sup/Sub
																ABChijk
103	○	○			○	○			○				○			ABChijk
104	○	○			○	○	○		○						○	ABChijk
105	○	○		○					○			○				ABChijk
106	○	○		○			○		○			○			○	ABChijk
107	○	○		○		○			○			○		○		ABChijk
108	○	○		○		○	○		○			○			○	ABChijk
109	○	○		○	○				○			○	○			ABChijk
110	○	○		○	○		○		○			○			○	ABChijk
111	○	○		○	○	○			○			○	○			ABChijk
112	○	○		○	○	○	○		○			○			○	ABChijk
113	○	○	○						○							ABChijk
114	○	○	○				○		○						○	ABChijk
115	○	○	○			○			○					○		ABChijk
116	○	○	○			○	○		○						○	ABChijk
117	○	○	○		○				○				○			ABChijk
118	○	○	○		○		○		○						○	ABChijk
119	○	○	○		○	○			○				○			ABChijk
120	○	○	○		○	○	○		○						○	ABChijk
121	○	○	○	○					○			○				ABChijk
122	○	○	○	○			○		○			○			○	ABChijk
123	○	○	○	○		○			○			○		○		ABChijk
124	○	○	○	○		○	○		○			○			○	ABChijk
125	○	○	○	○	○				○			○	○			ABChijk
126	○	○	○	○	○		○		○			○			○	ABChijk
127	○	○	○	○	○	○			○			○	○			ABChijk
128	○	○	○	○	○	○	○		○			○			○	ABChijk

Programming information

D

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

1. When the Printer 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 wrap-around. 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 a wrap-around. A wrap-around 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 out, 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** 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$(27);CHR$(47);"COMPRESSED  
PROPORTIONAL" 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, one underlined and the other not underlined, in the same line.

```
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.

Programming information

```
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

E

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 the power OFF and carefully remove the object.
- When you turn the power OFF, 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 surface. Do not use solvents or harsh cleaning agents. A mild detergent solution or desk top cleanser may be used sparingly.
- The Printer must be kept dry. If water is accidentally spilled on the machine, turn the power OFF immediately and wipe it dry. Do not turn the power ON 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.

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

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 80 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. <ul style="list-style-type: none">• 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. <ul style="list-style-type: none">• Check to make sure that the cable connecting the Printer and computer is correctly connected. 2) The ribbon cassette is not properly installed. <ul style="list-style-type: none">• Install it properly.
The Printer is operating properly, but the paper is not feeding through properly.	1) The paper is jammed in the Printer. <ul style="list-style-type: none">• Remove the paper and reinsert it properly.
The print is light or smeared.	1) The print head position is not correct. <ul style="list-style-type: none">• Move the head adjustment lever to match the paper being used. 2) The ribbon cassette is not properly installed. <ul style="list-style-type: none">• Properly install the cassette. 3) The ink ribbon is old or is worn out. <ul style="list-style-type: none">• Replace the old ribbon cassette with a new one.
The ALERT lamp is blinking.	1) An error condition has been detected. <ul style="list-style-type: none">• 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 of all connectors. If you cannot eliminate the problem, take the unit to your Radio Shack Computer Center or store for repair.

Specifications

F

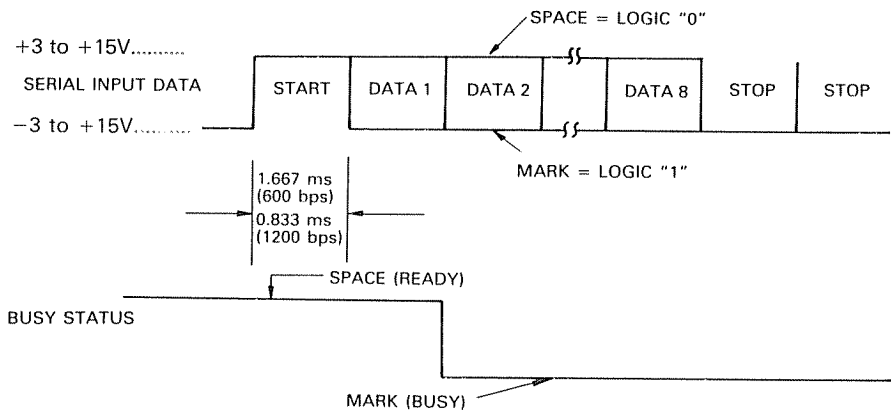
Print Speed	100 CPS
Paper Feed Type	Pin feed and friction feed
Line Pitch	1/6", 1/8", 1/9", 1/12", 1/36", 1/48", 1/72", 1/144" and <i>n</i> /216". Reverse: 1/6" and 1/12"
Paper Feed Speed	10 lines/sec. when continuously feeding by 1/9" unit.
Print Method	Impact dot matrix
Print Direction	Bidirectional 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 plus 2, max. 0.2mm (7.7 mils)
Paper Width	4" to 10" wide
Power Requirements	120 ± 15 V AC, 60 Hz in USA and Canada 220/240 V AC, 50 Hz in Europe and Australia
Power Consumption	33 Watts (self-test printing) 16 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 × 5" H × 10" D (390mm × 119mm × 266mm)
Weight	11 lbs. (5 kg)

Pin Configuration of the Serial RS-232C DIN Jack

Pin NO. 1	NOT USED
Pin NO. 2	STATUS
Pin NO. 3	GROUND
Pin NO. 4	DATA

Time Chart of Serial Input

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

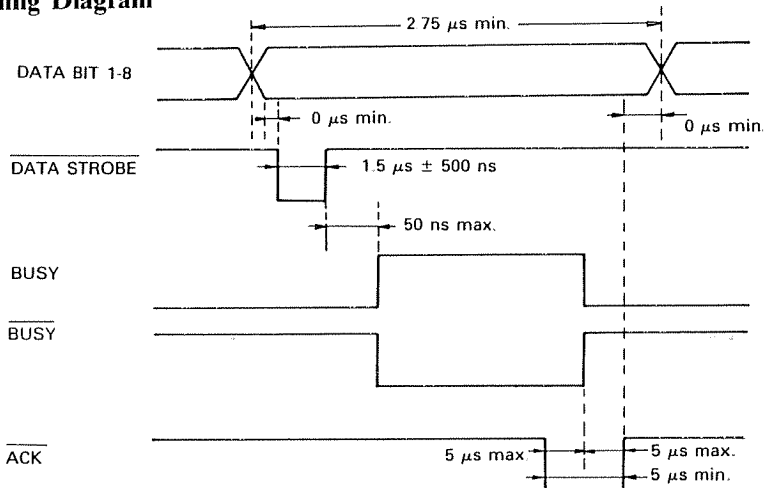


- One start bit, 8-bit data, no parity, two stop bits

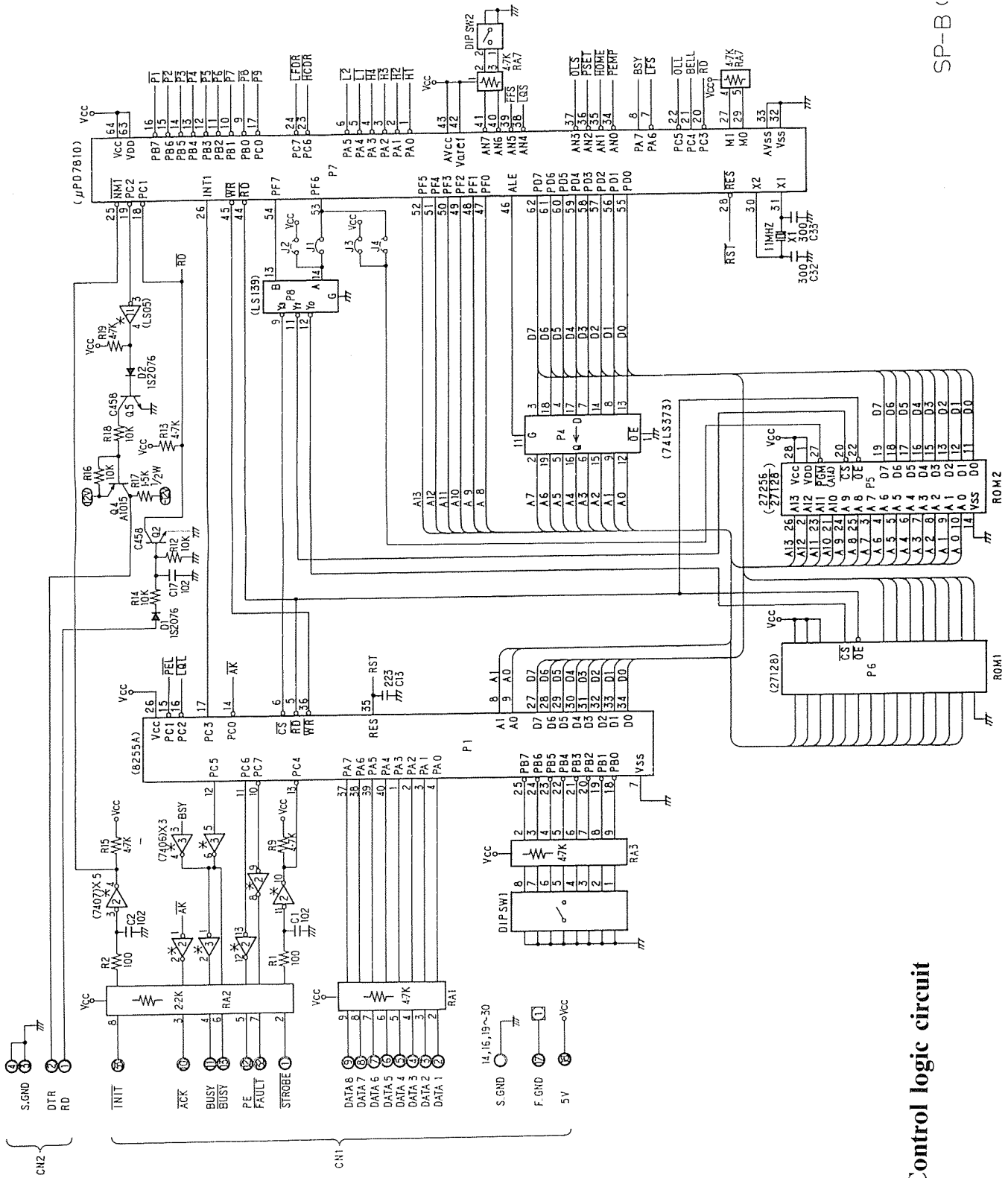
Pin Configuration of the PARALLEL Connector

PIN	SIGNAL	IN/OUT	PIN	SIGNAL	IN/OUT
1	$\overline{\text{STROBE}}$	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	$\overline{\text{ACK}}$	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	$\overline{\text{BUSY}}$	OUT	31	NC	
14	GND		32	$\overline{\text{FAULT}}$	
15	NC		33	$\overline{\text{INIT}}$	
16	GND		34	NC	
17	CHASSIS GND		35	NC	
18	+5V 80mA Max.		36	NC	

Timing Diagram

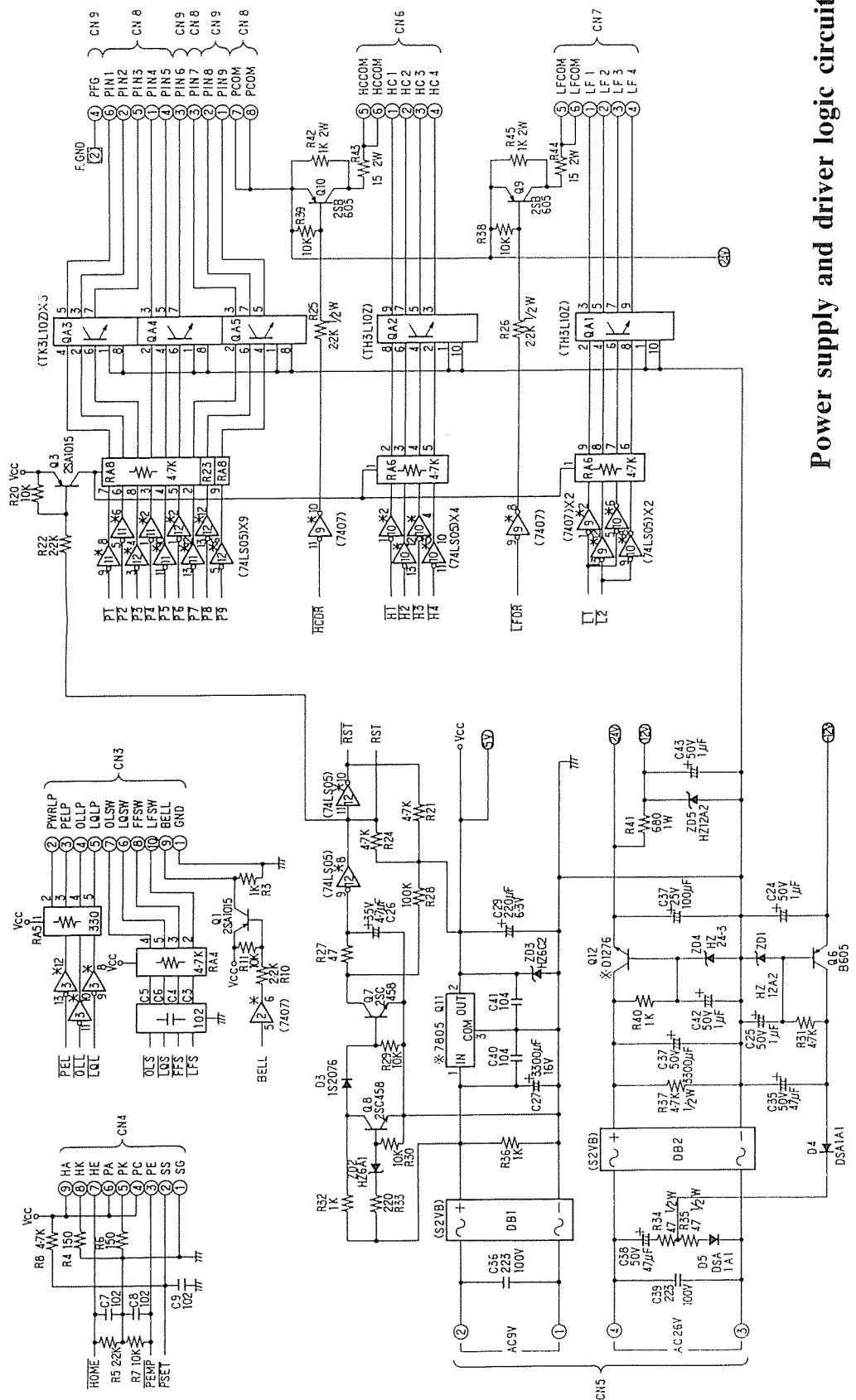


Schematic Diagrams

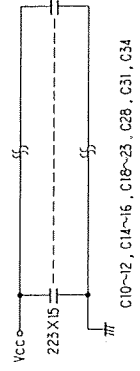


Control logic circuit

SP-B (1/2)



Power supply and driver logic circuit



(NOTE)
 RESISTOR VALUES ARE IN [Ω] UNLESS OTHERWISE SPECIFIED.
 CAPACITOR VALUES ARE IN [μF] UNLESS OTHERWISE SPECIFIED.
 * WITH HEAT SINK.

SP-B (1/2)

SERVICE POLICY

Radio Shack's nationwide network of service facilities provides quick, convenient, and reliable repair services for all TANDY/Radio Shack 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.

Because of the sensitivity of computer products, and the problems which can result from improper servicing, the following limitations also apply to the services offered by Radio Shack:

1. If any of the warranty seals on any Radio Shack and Tandy computer products it sells are broken, Radio Shack reserves the right to refuse to service the product or to void any remaining warranty on the product.
2. If any computer product purchased from Radio Shack has been modified so that it is not within manufacturer's specifications, including, but not limited to, the installation of any non-Radio Shack parts, components, or replacement boards, then Radio Shack reserves the right to refuse to service the product, void any remaining warranty, remove and replace any non-Radio Shack part found in the product, and perform whatever modifications are necessary to return the product to original factory manufacturer's specifications.
3. The cost for the labor and parts required to return the computer product to original manufacturer's specifications will be charged to the customer in addition to the normal repair charge.

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