TRS-80®

DMP-500
Operation Manual
Catalog Number 26-1252A
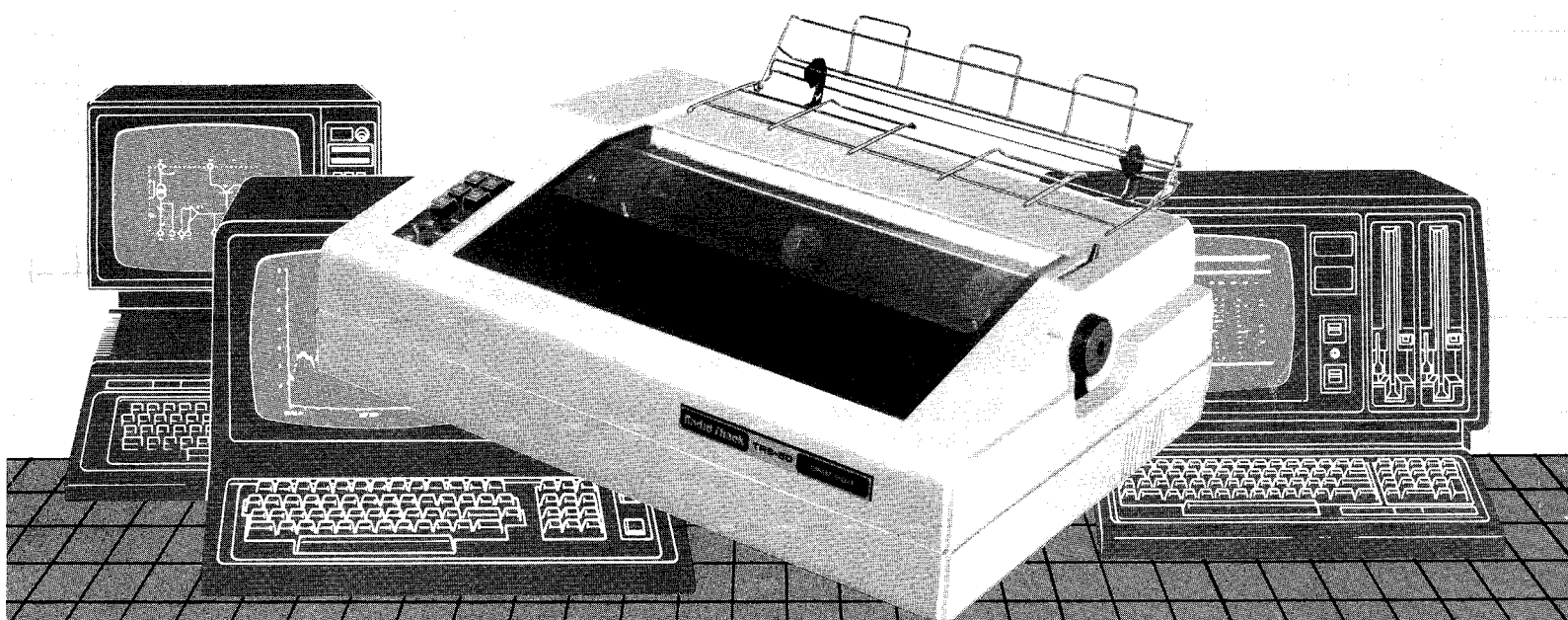
IMPORTANT INFORMATION

This equipment generates and uses radio frequency energy. If it is not installed and used properly, that is, in strict accordance with the manufacturer's instructions, 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, the user should consult the dealer or an experienced radio/television technical for additional suggestions. The user 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 United States Government Printing Office, Washington, DC 20402, Stock No. 004-000-0045-4.

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.) that are 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.

TRS-80® DMP-500 Owner's Manual

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Contents

Introduction

Congratulations for selecting this Radio Shack computer product! The DMP-500 is a high-density dot-matrix printer which can perform a variety of different printing operations. For instance, it can print:

- Proportional spaced characters.
- Monospaced characters (Normal, Condensed and Compressed).
- Correspondence Quality characters.
- Graphic characters.

For maximum efficiency, the DMP-500 operates in three modes:

- Data Processing Mode for 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, figures, or graphs.

For word processing, you'll find the DMP-500's Proportional spaced characters (created on a variable 9 x 23 dot-matrix) can produce letter-quality results.

If, however, you need a print-out that is produced faster, Monospaced characters (created on an 8 x 9 dot-matrix) are just the thing for you!

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

You can use two types of paper with the DMP-500.

- Standard (4"-15" wide) computer fanfold forms with guide holes. The Printer can also print one original and up to three carbon-copies.
- Standard single-sheet typewriter paper for use as an ordinary typewriter.

Other software-controlled features include:

- Bidirectional minimum-distance access carriage motion.
- Full- or Half-Line Forward and Reverse (for printing above to below the "current" line) and 3/4 Line Feed.
- Underline capability.

and much more!

1/ Description of the DMP-500

Carefully unpack the DMP-500, being sure to locate the Ribbon Cassette. Keep the empty box and packing material just in case you ever need to transport the Printer.

Be sure to remove the protective black plastic tube from the rear Carriage Guide.
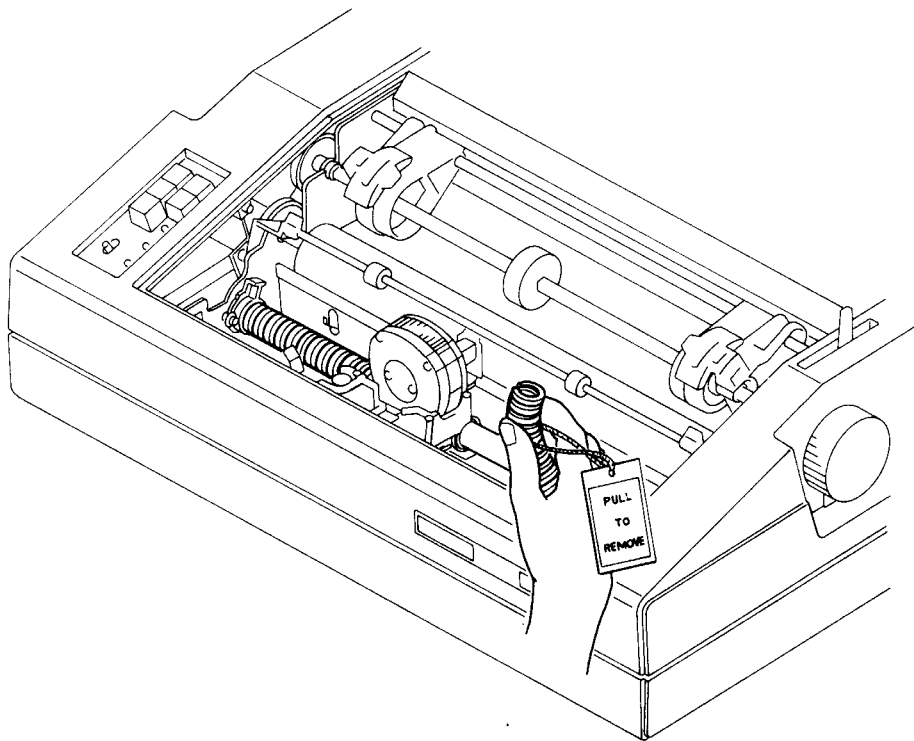
Figure 1. Removing the Black Tube

It's important to become familiar with the DMP-500 before you set it up and begin using it.
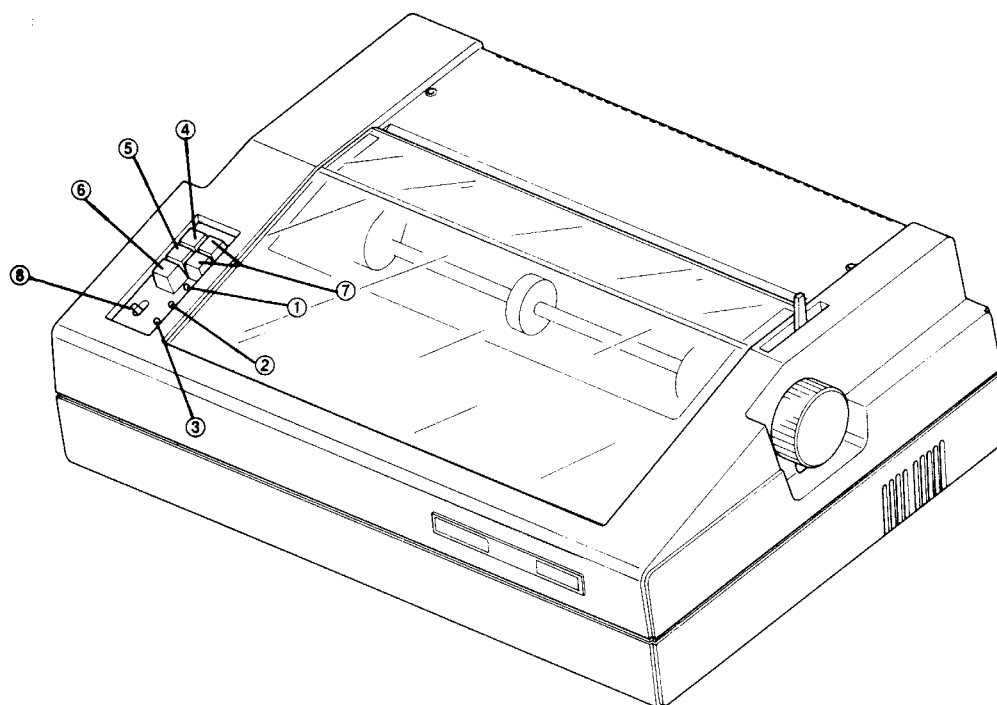
Figure 2. DMP-500 (Front View)

① **READY Indicator.** When this Indicator is ON, the DMP-500 is ON-LINE and ready to print.

② **ALERT Indicator.** This lamp will come on when the Printer is out of paper, when there is a carriage fault, or when there is some sort of electrical problem.

③ **POWER On Indicator.** This Indicator will illuminate when the DMP-500 is properly connected and the Power ON/OFF Switch is set to ON.

④ **LINE FEED.** When this Switch is pressed, the paper will advance one line. Holding the Switch "down" will cause continuous paper feed. *The Printer must be OFF-LINE before pressing this Switch.*

⑤ **RESTART Switch.** When the Printer runs out of paper, load more paper, then press this Switch to return the Printer to its status before the out-of-paper condition occurred.

⑥ **FORM FEED Switch.** Press this Switch to advance to Top-of-Form.

⑦ **Paper Movement Switches.** Press the Switch with the arrow pointing up to advance the paper 1/72" (1/12 line). (Hold the Switch *up* and the paper will continue to advance.) Press the Switch with the diamond pointing *down* to move the paper backwards (reverse feed) 1/72" (1/12 line). *The Printer must be OFF-LINE when you use these Switches.*

⑧ **ON-LINE/OFF-LINE Switch.** This Switch must be set to ON-LINE before the DMP-500 will print. To stop printing at anytime or to use other Front Panel Switches, set this Switch to OFF-LINE.

When the Printer stops because it is out of paper, the ALERT lamp will illuminate and the Printer automatically goes OFF-LINE. To continue printing, insert more paper and press RESTART. The DMP-500 will automatically go back ON-LINE (and continue printing without loss of data in the print buffer).

Model II users: If a BASIC program stops execution because of a Printer error, typing: CONT (ENTER) will cause printing to resume. However, the entire contents of the print buffer will be printed starting with the current Print Head position.
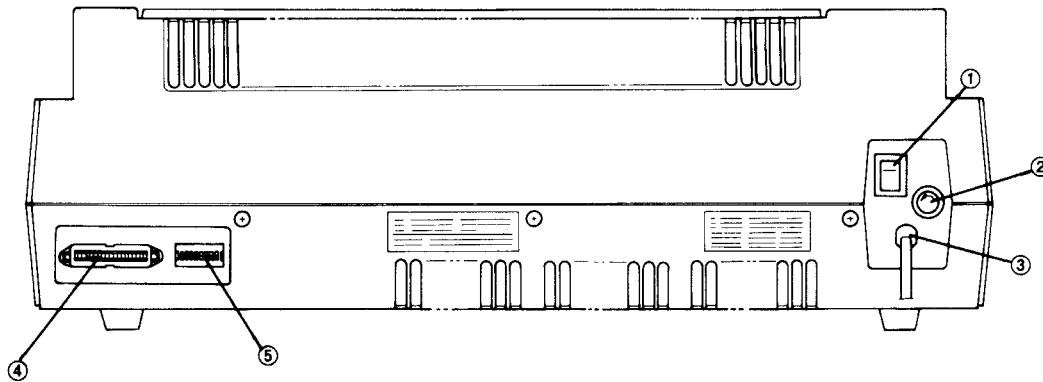
Figure 3. DMP-500 (Rear View)

① **Power ON/OFF Switch.** Press the white dot to turn the power ON. Press the Switch the other way to turn power OFF. Note that turning the power OFF and ON during operation may cause loss of the current program.

② **Fuse Holder.**

③ **Power Cord.** Plug the power cord into a wall-outlet or approved power strip.

④ **Parallel Interface Connector.** If your TRS-80 has parallel interface capabilities, connect the cable here. See **Setting Up the DMP-500** for the right cable for your TRS-80.

⑤ **Print Function (DIP) Switch.** The settings of this Switch will determine exactly how your Printer prints in any situation.
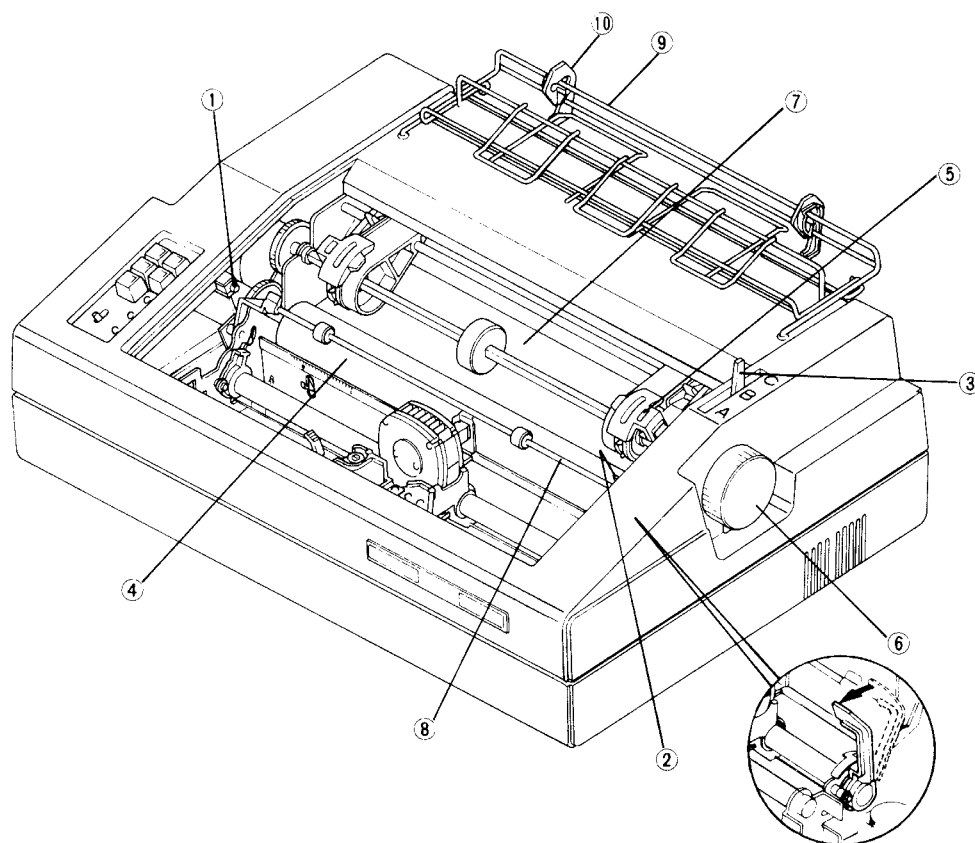
Figure 4. DMP-500 (Inside View)

① **Rotary Switch.** This Switch selects the desired character pitch on power-up. *Set the dial with the power OFF.* The dial can be turned by hand, but a small screwdriver makes the job much easier.

② **Print Head Adjustment Lever.** Move this Lever towards you (e.g., move the Print Head *away* from the paper) when changing ribbons. If printing is faint, move the Lever away from you (e.g., the Print Head *towards* the paper); if smudging occurs during printing, set the Printer off-line and move the Print Head one or two notches away from the paper.

③ **Platen Pressure Lever.** If you are "friction feeding" paper, set this Lever to **C** (and pressure will be ON). If you are "tractor feeding" paper and want to have a few Reverse Line Feeds, set this Lever to **B**. If you're using the Tractor Feed without Reverse Line Feeds, set this Lever to **A** (and pressure will be OFF). Be aware that any Reverse Line Feed action will cause loss of registration. When the Platen Pressure Lever is set to **B**, some backwards motion is allowed. **A** does not allow any Reverse Line Feed.

C
B
A

④ **Paper Bail.** For optimum print quality, keep the Bail down on the paper.

⑤ **Tractor Feed.** See **Setting Up the DMP-500** for details on using the Tractor Feed.

⑥ **Paper Feed Knob.** Turn this Knob to manually advance the paper.

⑦ **Paper Insertion Opening.** Be sure the paper enters the DMP-500 here.

⑧ **Platen.**

⑨ **Paper Rack**

⑩ **Paper Guide**

2/ Setting Up the DMP-500

This section will show you how to set up the DMP-500 so you can begin using it as quickly as possible. This includes:

- Loading paper.
- Replacing a ribbon.
- Connecting the DMP-500 to a TRS-80

and more!

The following **Start-Up Checklist** is a summary of how to set up your Printer. You should follow this procedure *every time* you start-up the Printer — not just the first time.

☑ Find a good spot for your Printer. Be sure to consider:

- The Printer should be placed on a sturdy work surface.
- The length of the printer cable will determine how far from the TRS-80 you can place the Printer.
- Paper takes up space. Be sure to leave enough room for smooth paper flow.
- Don't place the Printer near noise generators such as refrigerators and industrial equipment.

☑ Be sure the POWER switch (at left rear of Printer) is OFF.

☑ Remove the Top Cover and the packing materials.

☑ Install continuous form fanfold paper or single-sheet paper.

☑ Check the Ribbon Cassette. If it has not been installed, see **Ribbon Installation/Replacement.**

☑ Set Rotary Dial, Front Panel Switches, and Print Function (DIP) Switches (rear of Printer).

☑ Connect the AC power plug to a 3-wire, 120 volt, 60 Hz grounded AC outlet (220/240v, 50 Hz where the unit is so marked).

☑ Check that the Printer is ready by running the Self-Test.

☑ Connect the interface cable from the TRS-80 to the Printer Interface Connector.

☑ Turn the Power ON and check that the Power On Indicator (on the Front Panel) is illuminated.

☑ Push the RESTART Switch.

☑ Place ON-LINE/OFF-LINE Switch in ON-LINE position.

Paper Rack Installation

1. Install the Paper Rack by inserting the tips of the Rack into holes provided on the top of the Printer (behind the Paper Insertion Opening).

2. Snap the two black plastic Paper Guides into place by ''hooking'' them over the top, rear bar on the Rack. Snap the bottoms of the Guides into place to lock them in. The ''flat'' surfaces *should be facing each other*.

   Always move the Guides to the extreme left and right sides of the bar before installing or removing.
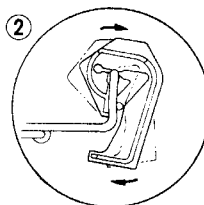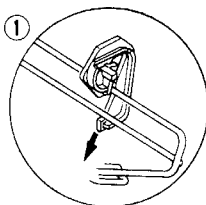
How Does the DMP-500 Handle Paper?

The DMP-500 provides both Tractor Feed for continuous forms and Friction Feed for single-sheet printing.

Paper Loading

When loading paper through the Paper Rack, be sure the paper enters the Printer *below* the two rear Rack bars and into the Paper Insertion Opening. Then slide the two Paper Guides to the side edges of the paper so there is about the width of a dime between the paper and the Guide on each side. The paper should exit the Printer by going over the top of the Paper Rack.

Warning! When loading paper (single-sheets or fanfold), be sure the paper correctly enters the Paper Insertion Opening. Paper may also enter through bottom slot.

It is very important that the paper enter the DMP-500 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 important to help prevent paper jamming.

If the paper is correctly loaded, it should *enter between the body of the Printer and the Paper Separator*. Once the paper is loaded and power is ON, check the ALERT Indicator. If the lamp is illuminated, press the RESTART Switch. If the lamp remains on, the paper is probably loaded incorrectly.

If the lamp is not illuminated after the paper is loaded, you may begin printing (if the power is ON).
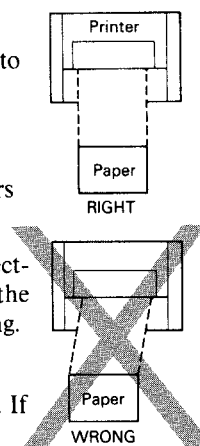
Single-Sheet Paper Loading

1. Be sure the Power Switch is OFF.

2. Remove the Top Cover.

3. Gently move the Penetration Control Lever away from the paper.

4. Move the Platen Pressure Lever forward (toward the front of the Printer).

5. Tilt the Paper Bail forward.

6. Insert the paper into the Paper Insertion Opening and push the Release Lever back towards the rear of the Printer. Use the Paper Feed Knob to pull the paper around until it appears between the Platen and the Print Head.

7. Move the Release Lever forward to align the paper. Push the Release Lever back again.

8. Tilt the Paper Bail back towards the rear of the Printer.

9. Set the Penetration Control Lever to the appropriate position.

   ● Single-Part Forms. Move the Lever towards the paper as far as it will go.

   ● Multiple-part Forms. Move the Lever as far as it will go toward the Platen without smudging the paper. Check for smudging by moving the Carriage back and forth at each of the Lever settings.

   Warning! The Penetration Control Lever must always be as close to the platen as possible; otherwise damage to the Print Head may result.

10. Replace the Top Cover.

8
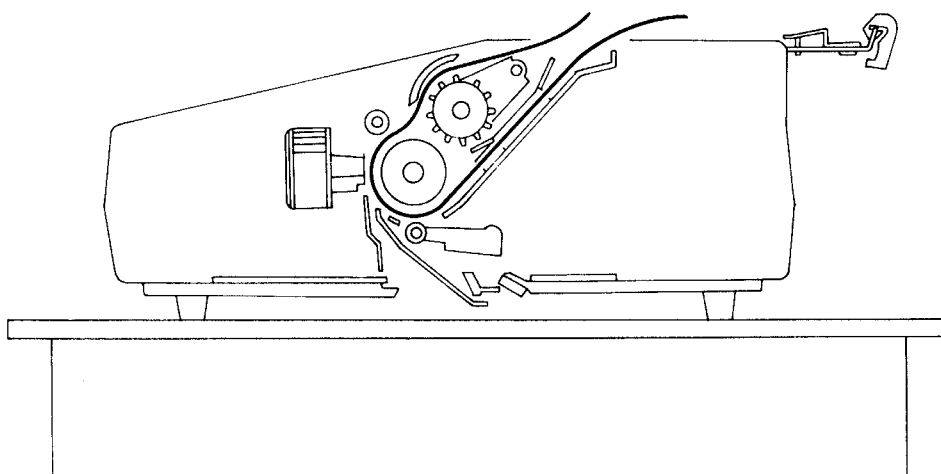
Figure 5. Single-Sheet Paper Feeding

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 piece of paper and turn the Paper Feed Knob to advance the paper. When the paper is in place, press the RESTART Switch and the DMP-500 will continue printing from where it left off.

● Remember to set the Platen Pressure Lever to the rear of the Printer while using single-sheet paper.

Fanfold Paper Loading

The DMP-500 will accept standard fanfold paper that is from 4" to 15" wide. The paper may contain one original and up to four non-carbon copies.

To load fanfold paper into the DMP-500:

1. Set the Power ON/OFF Switch to OFF.

2. Remove the Top Cover.

3. Move the Penetration Control Lever *away* from the paper.

4. Raise the Pin Feed paper Clamps to the side.

5. Insert the paper into the Paper Insertion Opening.

   Be sure the paper lines up straight so that the holes will line up with the pin feed sprockets. Use the Paper Feed Knob to pull the paper around until it appears between the Platen and the Print Head.

Note: There is another paper-entry slot in the bottom center of the Printer. Use this slot if your printer Stand allows paper to enter directly into the bottom of the Printer. This is convenient for loading paper directly out of the paper box.

6. Close the Pin Feed Clamps to secure the paper.

9

8. Set the Penetration Control Lever as follows:

- Single-Part Forms. Move the Lever towards the paper as far as it will go.
- Multiple-Part Forms. Move the Lever as far as it will go toward the Platen without smudging the paper.

Check for smudging by moving the Carriage back and forth at each of the Lever settings.

Warning! The Penetration Control Lever must always be as close to the Platen as possible; otherwise damage to the Print Head may result.

9. Replace the Top Cover.
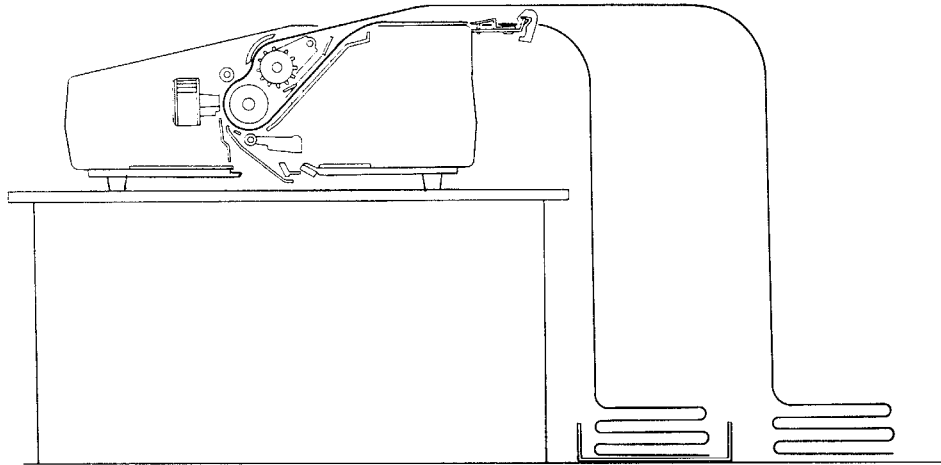
Figure 6. Fanfold Paper Feed (Rear Feed)
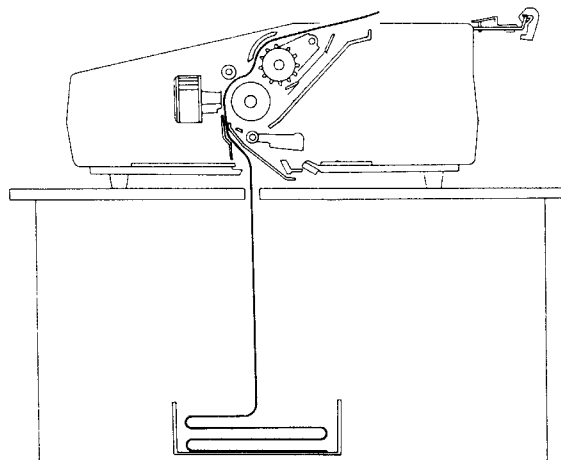
Figure 7. Fanfold Paper Feed (Bottom Feed)

Hints and Tips On Fanfold Paper Loading . . .

- Whenever pin feed paper is used, the Platen Pressure Lever must be toward the front of the Printer. For friction feed paper, set the Lever to the rear of the Printer to apply pressure to the paper.

- Be sure that the paper is positioned so that it can travel through the printer without binding.

- *Do not let paper* pile up on top of unprinted paper or printed paper may be pulled back into the Paper Insertion Opening. This could jam the paper feed or damage the Printer.

Ribbon Installation/Replacement

If the Ribbon Cassette 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. Remove the Top Cover and *gently* move the Penetration Control Lever *toward the front* of the Printer as far as it will go.

3. Gently move the Print Head towards the center of the printer.

4. Unlatch each side of the Ribbon Cassette by gently pulling the Cassette Latch away from the Ribbon Cassette about 1/4" and lifting up on that side of the Ribbon Cassette. Repeat for the other side.

5. Make sure the ribbon is between the Print Head and the Paper. Tighten the ribbon by turning the Cassette knob in the indicated direction.

6. Gently press the Cassette down until it is firmly secured by the "stopper claws."

   Do not force the Cassette into place! If the Cassette is not properly fitted, the Cassette knob will not match up with the shaft from the Carriage. Do not force the Cassette down but fit it in gradually while turning the Cassette knob in the indicated direction.

7. Once the new Cassette is installed, *gently slide the ribbon in between the paper and the Print Head*. Tighten the ribbon by turning the Cassette knob in the indicated direction.

8. Move the Carriage back and forth manually to check that the ribbon advances properly. If the ribbon has not been properly fitted between the paper and Print Head (i.e., into the Print Head Ribbon Guide Bezel), the Ribbon feed will not operate smoothly. (See Figure 8.)

9. Move the Penetration Control Lever towards the rear of the Printer.

10. Replace the Top Cover.

Remember! It is extremely important that the Print Head is as close to the paper as possible; otherwise damage to the Print Head may occur. Simply move the Penetration Control Lever towards the paper and move the Carriage back and forth until smudging occurs. Then gradually move the Print Head away from the paper until the smudging stops.
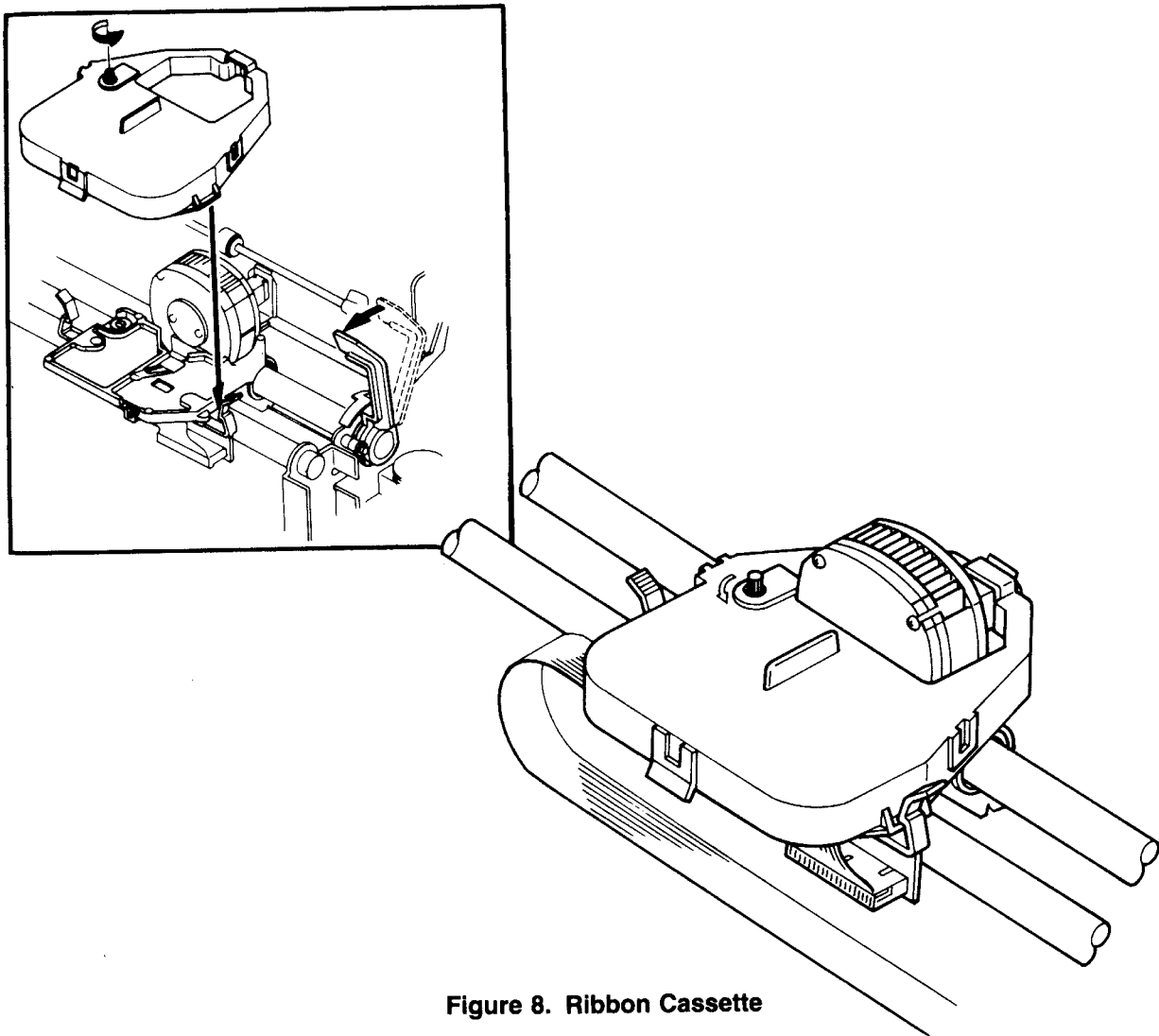
Figure 8. Ribbon Cassette

Setting Print Function Switches (DIP Switches)

There are 8 switches located at the left rear of the Printer. These Switches allow you to customize some of the DMP-500 features for your own applications.

For instance, by setting the appropriate Switches *before turning the DMP-500's power ON*, you can select Word Processing Mode (better print quality) or Data Processing Mode (higher printing speed).

When you receive the DMP-500, all Switches should be set to OFF (i.e., in the down position).

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

Japanese
              Not Used   WP Mode   CR   Kana

      LP-V   Not Used   NL   Modified
                                   ASCII

```
      [ ][ ][ ][ ][ ][ ][ ][ ]
      ON                              ON Side
       1   2   3   4   5   6   7   8   OFF Side
```

      DMP500 Not Used   LF   ASCII

              Not Used DP Mode   NL   European
                                        Symbol
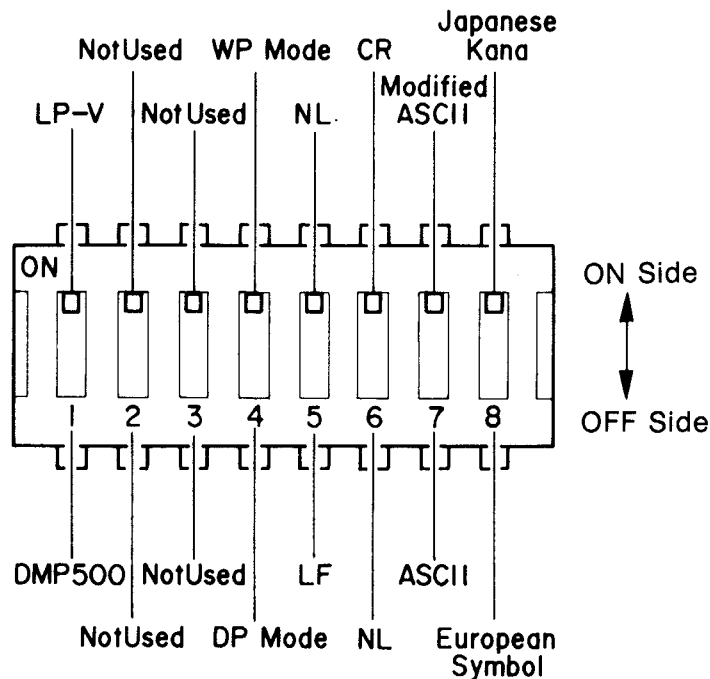
Figure 9, Print Function (DIP) Switches

If you've been using a Radio Shack Line Printer V (26-1165) and still have applications programs that are designed to run on the LP V, Switch #1 has been included for your convenience.

This Switch allows the DMP-500 to treat some codes just like the LP V.

For instance, CHR$(27);CHR$(19) is used to set the LP V into Graphic Mode. However, the DMP-500 uses a CHR$(18) to go into Graphic Mode. Therefore, because Switch #1 has been provided, you won't have to change the program if it uses a CHR$(27);CHR$(19) to set the Printer into Graphic Mode — just set Switch #1.

When Switch #1 is in the "up" position (ON), the Line Printer V codes are used.

When Switch #1 is in the "down" position (OFF), the new DMP-500 codes are used.

New DMP-500 Command Codes

If Switch #1 is set to OFF ▭, then the following codes are used:

If You Want To:	Use CHR$( ) Code:	
Start Graphic Mode	18	
End Graphic Mode	30	
Start Elongation	27	14
End Elongation	27	15
Standard Character	27	19
Condensed Character	27	20
End Bold Character	27	32
Half Reverse Line Feed	27	30

Table 1

Line Printer V Command Codes

If Switch #1 is set to ON ▬, then these codes are used:

If You Want To:	Use CHR$( ) Code:	
Start Elongation	31	
End Elongation	30	
Standard Character	27	15
Condensed Character	27	14
End Bold Character	27	30
Half Reverse Line Feed	27	32

Table 2

Remember! *Only change DIP Switch settings when the power is OFF.*

Setting the Rotary Switch

The Rotary Switch is located inside the DMP-500, just behind the Front Panel.

On power-up, it is used to select the desired character pitch (i.e., number of characters per inch — CPI). *Always set the Switch when the power is OFF.* This is also referred to as character spacing since the DMP-500 adjusts the space between the font style characters you have selected. The Switch can be set by hand, but a small screwdriver makes the job much easier.

When setting the Switch, the vertical groove must be positioned to the number you want.
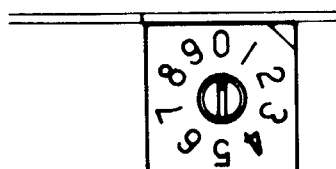
Figure 10. Rotary Switch Set to Position 0

Rotary Switch Settings

Position	Character Spacing	
0	Normal	10 CPI
1	Compressed	12 CPI
2	Condensed	16.7 CPI
3	Proportional	
4		
5	Correspondence	10 CPI
6	Quality	
7		
8	Normal	10 CPI
9	Compressed	12 CPI

Table 3

14

Connecting the DMP-500 to a Power Source

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

- ☑ Is Printer Power ON/OFF Switch set to OFF?
- ☑ Have you removed the black plastic protective tube from the Carriage Guide?
- ☑ Don't connect the Printer to the Computer yet.

Connect the AC power plug to a 3-wire, 120 volt, 60 Hz grounded AC outlet (220/240v, 50 Hz where the unit is so marked) or an approved power strip such as the Radio Shack Plug-In Power Strip (61-2619) or the Automatic Power Controller, SW-301 (26-1429).

Carriage Movement Test

The Carriage Movement Test allows you to check that the Carriage moves freely from one end of the Platen to the other and that the Platen is turning properly.

Printing is not performed during the Carriage Movement Test.

1. Set the ON-LINE/OFF-LINE Switch to ON-LINE, and set the Rotary Switch at position 1.

2. Press and hold the RESTART Switch while setting the Power Switch to ON. The Carriage will move back and forth, performing a Line Feed at the end of each line.

3. Turn the power OFF to end the Carriage Movement Test.

Self-Test

The DMP-500 has a "built-in" self-test feature which lets you check printing quality and general printer operation before you connect the Printer to a TRS-80. This is a good time to check that the Print Head is adjusted properly (printing is neither too faint or smudging occurs) and if the paper is feeding properly.

The Self-Test will last for several minutes. It includes the various printer font styles, print widths and intensities, graphics characters.

Before running the Self-Test, however, always be sure to load the DMP-500 with wide paper (15" wide) 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. Set the ON-LINE/OFF-LINE Switch to OFF-LINE.

3. Press and hold the RESTART Switch.

4. Set the Power ON/OFF Switch to ON.

   The Printer will begin printing all the characters according to the Font Style Slection Switch (Rotary Switch).

5. If the printing is too light, set the Printer off-line and gently move the Penetration Control Lever towards the paper. If printing is too dark or begins smudging, set the Printer off-line and move the Penetration Control Lever away from the paper slightly.

6. Printing will continue until you turn the power OFF.

Connecting the DMP-500 to the TRS-80

Before making any connections between the Printer and TRS-80, be sure all units are off!

You must also be sure you have the correct cable for your TRS-80 if the DMP-500 is to operate properly. Table 4 describes the printer cables Radio Shack provides; Table 5 provides quick instructions for printer connection locations.

1. Attach the molded male end of the cable to the connector at the left rear of the Printer.

   Do not force the plug. If it doesn't 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 TRS-80 owner's manual for specific instructions.

TRS-80 to DMP-500 Cables

TRS-80	Cable Number
Model I (Keyboard only)	26-1411
Model I (Exp. Interface)	26-1401
Model II/16/DT-1	26-4401
Model III	26-1401
Color Computer	26-3020

Table 4

TRS-80 Connection Points

TRS-80	Connector
Model I (Keyboard only)	Rear of Keyboard
Model I (Exp. Interface)	Left side of E.I
Model II/16	Rear Panel of Computer
Model III/DT-1	Underneath panel
Color Computer	Rear Panel of Computer

Table 5

Power-Up Sequence

The specific power-up sequence will depend upon your Computer. We suggest you consult your TRS-80 owner's manual for details on powering up your TRS-80 with peripheral devices (such as printers).

In any event, the Power Lamp 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 a Printer is connected but not turned on, erratic operation of the entire system may occur.

3/ Using the DMP-500 (General Printer Operation)

The DMP-500 is designed for three distinct applications:

- Data Processing
- Word Processing
- Graphics Printing

The Printer has three different ways it responds to software codes from the TRS-80 — one for each application. The three response patterns, or modes, have many similarities, but each has its own unique features.

Data and Word Processing modes are used for printing characters. The only difference between these two modes is the way they handle Line Feed commands (commands that decide which direction and how far the paper is fed).

- In the 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 the Data Processing mode, Line Feed Commands do not cause immediate printing. Instead, they are stored in the Printer's memory along with the 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 can print in different Print Font Styles and in different Pitches (character spacing). One font style is the Proportional character set and the other is Monospaced character set.

- **Proportionally spaced characters** have variable widths: an M takes up more space than an I. Proportional 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.

The font styles are determined by the dot-matrix pattern. Monospaced characters use a 9 x 9 and 15 x 9 matrix while Proportional spaced characters use 9 x 9, 15 x 9, and n x 9.

The Print Pitch (character spacing) is determined by the space the DMP-500 puts between each printed character and also by the Font Style. Consequently, you must think of Pitch in terms of the number of characters printed per inch — 10 CPI, 12 CPI, and 16.7 CPI for Standard printing and 5 CPI, 6 CPI, and 8.3 CPI for Elongated printing.

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 graphic operation, many control codes (which can be used with Data and Word Processing) cannot be used. The DMP-500 doesn't 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 uses only one line feed (7/72") to insure full coverage of the paper.

Control Codes

Before investigating the various print modes, consider how the TRS-80 communicates with the Printer.

All information is sent to the Printer as numbers between 0 and 255 decimal (00 — FF for you Hexadecimal fans). The Printer interprets these numbers according to the American Standard Code for Information Interchange, commonly referred to as the ASCII code. (See

Appendix B 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 two 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 determine which Printer feature is selected. In BASIC, use CHR$( ) to send these codes to the Printer.

Note: This section will use the command LPRINT in examples that send codes to the Printer. If you're using a TRS-80 Color Computer, substitute PRINT#-2, for LPRINT.

For instance, set up the DMP-500 as described earlier and enter BASIC in the normal way. Then type the following program:

```
10 REM
20 LPRINT "DATA";CHR$(27);CHR$(28);"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$(27) and CHR$(28) are the guilty parties. Take a quick look at Appendix A. This chart shows the various code sequences understood by the DMP-500. The Control Code sequence CHR$(27);CHR$(28) means "change the forward line feed to half its normal distance".

Data Processing Mode

How can you tell which mode the DMP-500 uses when it's 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 28) sequence didn't cause a Half 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 DP Mode).

Type: LLIST (ENTER)

Sure enough. You still have that short Line Feed.

Word Processing Mode

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

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

and RUN the program.

Just as you suspected, the Line Feed is immediately executed.

Note that in WP Mode, the new Line Feed is only temporary. Type: LLIST (ENTER) to prove that the Half Forward Line Feed occurs only once, then returns to normal.

Graphics Mode

Graphics Mode is very different from the other two printer modes. For one thing, Graphics Mode accepts only one Line Feed code — CHR$(10). This Line Feed is fixed at   . 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 high-resolution graphics print-outs of 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: LPRINT CHR$(30)
```

and RUN the program.

CHR$(18) puts the DMP-500 into Graphics Mode. The numbers 128 through 255 are interpreted as dot patterns.

Type: LPRINT CHR$(30) (ENTER) to return the Printer to WP Mode. Try LLISTing the program to be sure you're not stuck in Graphics land.

Selecting a Print Mode

Table 6 summarizes the Control Codes required to move from one mode to another.

If you're in:	and want to change to:	Send a CHR$( ):
DP	WP	20
	Graphics	18
WP	DP	19
	Graphics	18
Graphics	DP	30 *
	WP	30 *
	*Returns to last Mode (WP or DP) used.	

Table 6

Hints and Tips About Print Modes . . .

Data Processing Mode

- All commands which decide Line Feed pitch and the direction of movement 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 (except user-defined Graphics) can be printed in this mode.

Word Processing Mode

- Line Feed codes that determine pitch or direction are executed immediately.
- Line Feed pitch and direction changes affect only the current print line.
- All printable characters (except user-defined Graphics) can be printed in this mode.

Graphics Mode

- This mode is very different from the other two modes. In Graphics Mode, only one Line Feed code (10 Dec.) is acceptable. The LF code causes the paper to move 1/12" forward. No other pitch or direction is allowed.
- Decimal numbers 128 — 255 sent via CHR$ in BASIC are interpreted as pin firing patterns for the Print Head.
- Only a few code sequences are recognized in Graphics Mode.

4/ Print Font Styles and Character Widths

The DMP-500 has four distinct print (character) font styles:

- Standard
- Correspondence Quality
- Proportional
- Graphic Characters

Each font 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 don't.

Character Widths and Densities		
Font Style	**Matrix Size**	**Pitch**
Standard	9x8	Normal 10 CPI / Elongated 5 CPI Compressed 12 CPI / Elongated 6 CPI Condensed 16.7 CPI / Elongated 8.35
Correspondence Quality	15x8	Condensed 10 CPI / Elongated 5 CPI
Proportional	nx8	Variable width (Condensed)
Graphics	6x6	Normal 10 CPI Compressed 12 CPI Condensed 16.7 CPI

Table 7

There are three basic Pitches:

- Normal
- Compressed
- Condensed

If a font style is changed in a line without changing the pitch, the line is printed continuously without pausing. For example, the DMP-500 will not pause while changing from Standard Condensed 16.7 CPI printing to Correspondence Quality Condensed 10 CPI print since both use the same dot density. On the other hand, if the density of the new style character is different from the preceding one, the Printer will print the current buffer contents, leave some blank space, then resume printing in the new character style. For example, this will happen if you change from Standard Compressed to Correspondence Condensed.

Standard Condensed, Correspondence, and Proportional characters all have the same dot density. Standard Normal and Compressed are unique unto themselves.

Selecting Font Styles

Character font styles may be selected by the Rotary Switch setting before power-up (i.e., via hardware) or by Control Codes from the TRS-80 (i.e., via software) during operation.

The Rotary Switch determines the character style selected on power-up; after that, you control the styles via Control Codes.

Font styles stay in effect until another font style is selected. Even entering Graphics Mode does not change the font. The DMP-500 returns to the last active font on leaving Graphics Mode.

Table 8 is a summary of the Character Style change commands:

Set Rotary Switch To:*	Or Send a CHR$( ):		If You Want:
0 or 8	27	19	Normal
1 or 9	27	23	Compressed
2	27	20	Condensed
3	27	17	Proportional
4-7	27	18	Correspondence Quality
	27	14	Start Elongation
	27	15	End Elongation
	27	31	Start Bold
	27	32	End Bold

* Rotary Switch must be set before power-up.

Table 8

Note: Line Printer V uses codes (15) for Standard and (14) for Condensed.

Standard Character Font Style

The Standard character set is printed in a 9x8 dot matrix (9 dots wide by 8 dots high).

Each of the Standard characters can be printed in three main character widths:

● Normal 10 Characters Per Inch (CPI)
● Compressed 12 CPI
● Condensed 16.7 CPI

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 different available print widths by printing a few sample lines. Type in this program:

```
NEW (ENTER)
110 F$="STANDARD"
120 N=19: W$="NORMAL": GOSUB 240
130 N=23: W$="COMPRESSED": GOSUB 240
140 N=20: W$="CONDENSED": GOSUB 240
230 LPRINT CHR$(27) CHR$(19): STOP
240 LPRINT CHR$(27)CHR$(N) F$"CHARACTERS";
    W$; "DENSITY"
250 RETURN
```

and RUN it.

The subroutine in line 240 sends the required Control Codes to the DMP-500. Line 230 returns to Normal character width and stops program execution.

Correspondence Quality Font Style

The second character set is a 15 x 8 dot matrix character set for Correspondence Quality 10 CPI. The characters have the same total width as Normal width characters, but they are printed with the Condensed character density (15 dots wide fits in the same space as 9 dots wide). Correspondence Quality print can be elongated to 5 CPI.

Correspondence Quality characters appear to be the same as Standard characters in Normal width, but they are an entirely unique character style. Add these lines to the program, then compare the two styles.

```
150 F$="CORRESPONDENCE": LPRINT
160 N=18: W$="CONDENSED": GOSUB 240
```

and RUN the program.

The difference between some characters is very slight, but the O and W are quite different. This is a good style to use with word processing programs that do not support proportional characters.

Proportional Spacing Font Style

The third character set is the Proportional spaced character set. This character font style is the same as Correspondence Quality, but the character matrix width varies from character to character. The characters are 8 dots high; the widths vary from 10 dots to 20 dots (including 5 columns of blank dots to allow space between the characters).

Proportional 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.

Graphic Characters

The fourth character set is a 6x6 dot matrix character set used for Block Graphic printing. The 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 any of the TRS-80 computers; rather it is a unique character set.

A 6x6 dot matrix character set is available in Normal 10 or 5 CPI, Compressed 12 or 6 CPI and Condensed 16.7 or 8.3 CPI character conditions. The Graphic Characters are not available with Correspondence Characters or Proportional Characters.

To see how the various character widths affect the graphics 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 Graphic Characters are 6 dots high, we can create continuous vertical graphics by using the Half Forward 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.

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

Right Justification

Proportional Characters are designed to be used with word processing programs. They don't 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 the nice character spacing. This process, called "Right Justification", is usually handled by word processing software. The DMP-500 provides codes to allow you to insert spaces between characters ranging from 1 dot to 9 dots wide.

You can demonstrate the way these codes work by modifying the current program. When you add the following two lines, the DMP-500 will print two lines of Proportional Characters, then insert enough space to line up the right margins.

```
70 DATA "THE PROPORTIONAL CHARACTER SET OF THE"
80 DATA "DMP-500 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 22 characters in the second print line. Add:

```
50 IF I=2 AND J<22 LPRINT CHR$(27);CHR$(1);
```

then RUN the program.

Table 9 may help when inserting spaces.

Send CHR$( ):		To Insert This Much:
27	01	1 Dot Space
27	02	2 Dot Spaces
27	03	3 Dot Spaces
27	04	4 Dot Spaces
27	05	5 Dot Spaces
27	06	6 Dot Spaces
27	07	7 Dot Spaces
27	08	8 Dot Spaces
27	09	9 Dot Spaces

Table 9

If a Proportional space command is used at the end of text (exceeding a line length), it generates line-full condition. Printing will start and a Proportional spacing command will begin at the start of next line. If several kinds of proportional spacing commands in succession at the end of text are used, and if the row of proportional spacing commands cause 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-500 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 are:

- Normal = 1584
- Compressed = 1900
- Condensed = 2640
- Proportional = 2640
- Correspondence Quality = 2640

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".

If you print two or more different pitches on the same line, calculation of the line length can be somewhat complicated. Proportional dot spacing can be used to adjust for the different densities.

Elongated Characters

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

Elongated Printing		
Send CHR$( ):		**To:**
27	14	Start Elongation
27	15	End Elongation

Table 10

The start (27 14) and end (27 15) elongated characters may be entered any number of times within a line and can be 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.

Bold Printing	
Send CHR$( ):	**To:**
27 31	Start Bold Printing
27 32	End Bold Printing

Table 11

(With the Line Printer V, Bold characters start when you send a CHR$(27);CHR$(14)and stop when you send a CHR$(27);CHR$(15).

When a (27 31) code sequence is received, the DMP-500 prints the current buffer contents, then resumes Bold character printing from 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
```

and RUNning it.

Mixing Bold and Elongated

Bold and Elongated characters cannot be active at the same time. The first code (either Bold or Elongated) to be received and activated will take precedence. The DMP-500 then simply ignores the second code.

5/ General Control Codes

Line Feed Codes (LF)

When a LF code (ASCII 10) is received by the DMP-500, all data in the Printer buffer is printed followed by a Line Feed. Unless you tell it otherwise, the DMP-500 uses 1/6" forward Line Feed when advancing paper.

If DIP Switch #5 is ON (in the *up* position), a Carriage Return is also performed with the Line Feed, moving the Print Head to the start of the next print line. If Switch #5 is OFF, the Print Head stays in the current print column and moves down one line.

Other Line Feed codes control the pitch and direction of the Line Feed. In DP Mode, these codes may be stored in the buffer. In WP Mode, they cause immediate printing.

Pitch and direction settings are sent to the DMP-500 in a two code sequence. First, a Control Code 27 is sent (CHR$(27)). This tells the DMP-500 that a special code sequence will follow. The next number determines the specific pitch and direction. These Control Codes are listed in Table 12.

Line Feed Control Codes

Send CHR$( ):	To:
27 10	Full Reverse Line Feed (1/6")
27 28	Half Forward Line Feed (1/12")
27 30	Half Reverse Line Feed (1/12")
27 54 (Ignored in WP mode).	Full Forward Line Feed (1/6")
27 56	Three-quarter Forward Line Feed (1/8")

Table 12

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 the 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.
- CHR$(27);CHR$(10) will not work from BASIC with the CHR$ function. The LF code (10) is intercepted by BASIC and sent to the printer as a 13.
- CHR$(27);CHR$(54) is ignored in Word Processing Mode since it duplicates the LF code.
- Line Feed pitch and direction codes have no effect in Graphics Mode. The Line Feed is set to 1/12" forward.
- If DIP Switch # 5 is ON, a Carriage Return follows each Line Feed except for the 1/12" forward and 1/36" forward settings.

Special Line Feed Control Codes

There are two special forward Line Feed codes that operate the same regardless of the current print mode. They are:

Special Line Feed Control Codes	
Send CHR$( ):	**To:**
27 50	1/12 Forward Line Feed (1/72")
27 51	1/36 Forward Line Feed (1/216")

Table 13

They 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 Switch #5.

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, then perform a Carriage Return. If DIP Switch #6 is OFF, one line feed (the current active line feed) will be performed at that time. If Switch #6 is ON, a line feed is not activated and printing continues on the current line.

Backspace (BS)

The DMP-500 can be backspaced from one to 255 dot-columns with when you send it a two 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 two 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.

The backspace command is a print command. Receiving the backspace command causes the DMP-500 to print out all data in the buffer and to execute a backspace operation.

28

Type in this program:

```
10 LPRINT TAB(30);"D P 5 0";
20 LPRINT CHR$(8);CHR$(72);"M - 0"
```

and RUN it.

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 zero. CHR$(8);CHR$(72); backspaces six 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? Ouch.

To backspace over elongated characters, simply double the number of dots. Let's try it. Change the program to:

```
10 LPRINT TAB(30);CHR$(27);CHR$(14);"D P 5 0";
20 LPRINT CHR$(8);CHR$(144);"M - 0"
30 LPRINT CHR$(27);CHR$(15)
```

and RUN the program.

CHR$(27);CHR$(14) and CHR$(27);CHR$(15) get the DMP-500 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 font styles are shown in Table 14. The Proportional Character widths naturally vary from charcter to character.

Character Set Width

Font Style	Dots/Character	To Backspace			
		1 Character		n Characters	
Normal 10 CPI	12	08	12	08	12n
5 CPI	24	08	24	08	24n
Compressed 12 CPI	12	08	12	08	12n
6 CPI	24	08	24	08	24n
Condensed 16.7 CPI	12	08	12	08	12n
8.3 CPI	24	08	24	08	24n
Correspondence 10 CPI Quality	20	08	20	08	20n
5 CPI	40	08	40	08	40n

Table 14

The Dots/Character 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 three print modes. It resets the Line Feed count to zero and sets the current line as the Top-of-Form position. The line length per page is set to $n(\times 1/6'')$ 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-500 sets the Top-of-Form at the current paper position and the Form Length is set to 66 lines per page. Be sure the paper is properly positioned before you turn on the Printer.

Form Feed (FF)

When CHR$(12) command is received, the print buffer contents are printed out completely, paper is advanced to the next Top-of-Form position and the Line Feed counter is reset to zero.

However, there is one slight problem for those of you who 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 intercepter.

Important Note: Do not use CHR$(12) except for graphic applications. Radio Shack application programs have Top-of-Form "built-in." See your applications program user's guide for instructions on setting FORMS and the program will do the rest.

Ignored or Undefined Codes

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

There are several reasons a code may be unusable in a certain mode. Redundant codes that don't 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-500 simply doesn't recognize. ASCII 0, for example, is not used in any of the three print modes.

The following summarizes the undefined print codes:

DMP-500 Ignored Control Codes

All Modes:
- Out of range on repeat sequence.
- Out of range on POS sequence.
- Redundant codes that don't change the current printer status. For example, if you send a CHR$(14) when underline is already set.

DP: 0, 1, 19, 30, 127, 255

WP: 0, 1, 20, 127, 255, ESC 54

Graphic: All codes in the range 0 - 127 are ignored except
(10), (12), (27 14), (27 16 *n1 n2*), (28 *n1 n2*), (30), (27 50), and (27 51).

Unprintable repeat sequence data *n2* is also ignored.

Codes printed as 'X'

DP and WP:
- All codes from 0 - 31 and 128 - 159 except the active function codes or

the above ignored codes.
- Unprintable repeat data $n2$
- Standard, Compressed, Condensed if Switch #8 if OFF; codes 192 - 223 are printed as $\overline{X}$.
- Proportional or Correspondence, 192 - 254 are printed as $\overline{X}$.

DMP-500 Buffer Operation

The DMP-500'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 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 affect when the data is dumped to paper.

Understanding how the buffer works is important for those who wish to gain full control of the DMP-500.

Hints and Tips on the DMP-500 Buffer . . .

For DP, WP, and Graphic 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 Switch #6 is set to 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 start 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 (Switch #5), then the buffer is printed and the print head moves to the next Top-of-Form line without a carriage return to the start of the line. Otherwise, the Print Head is positioned at the start of the next Top-of-Form line.
- The Carriage Return code (CR = 13 decimal) automatically activates printing (assuming at least one character code is already in the buffer).
  If Carrige Return only has been selected via hardware, the Print Head is moved to the start of the current line and the next buffer full will over print the current line.
  Otherwise, subsequent characters will be printed at the start of the next print line.
- The Line Feed code (LF = 10) automatically activates printing.
  If LF only has been selected (Switch #5), then the buffer is printed and the Print Head moves to the next print line without a carriage return to the start 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, the buffer is printed.Printing continues from the current position.
- The Head Positioning sequence (27 16 $n1$ $n2$) 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), and (27 23). Printing continues in the current line with the new character style.
- When the start Graphic Mode (18) is received, the buffer is printed.
- Dot graphics printing continues from the current character position.
- When a start Bold or end Bold is received, the buffer is printed.
- Bold printing continues from the current character position.

Graphic Mode only:

- When the end Graphic Mode is received, the buffer is printed.
  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 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 or overflow condition as well as single characters.

6/ Word and Data Processing Modes

Superscript and Subscript

In an earlier section, we described that the difference between Data and Word Processing Modes is how they handle Line Feed codes. (In Data Processing Mode, LF codes are stored until the end of the line and become the current line feed standard; in Word Processing Mode, these codes are executed immediately and are only temporary.)

Printing superscripts and subscripts is the ideal time to take advantage of the immediate response to Line Feed codes in Word Processing Mode. Type in this new program:

Note: For smooth Reverse Line Feeds, be sure the Paper Release Lever is to the front of the Printer (e.g., Platen pressure is off), and keep the paper bail lever on the paper.

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

and RUN the program.

In this program, frequently used codes are stored in variables E$, D$, and U$. This shortens the program a bit. The directions in line 10 through 30 refer to the motion you would make drawing the script characters by hand (move down to do the subscripts 1 and 2, then back up to the output line). Then move up to do the superscript 2.

Repeat Printing

The DMP-500 also 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, repeated block graphics, etc. The Repeat feature uses a three code sequence:

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

Since we already have CHR$(28) saved as D$ in the current program, let's try out the repeat sequence. Change:

```
50 LPRINT "  /";  '2 BLANK SPACES BEFORE THE /
60 LPRINT E$; U$;
70 LPRINT D$; CHR$(13); CHR$(241)
```

Code 241 is from the Graphics character set.

```
 80 LPRINT "  "; '1 BLANK SPACE
 90 LPRINT CHR$(8); CHR$(7);
100 LPRINT CHR$(92); "/(X";
```

and RUN it.

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

Underline Printing

If you need to underline any text in either DP or WP Mode, send the DMP-500 a CHR$(15). All text that follows this code will be underlined until you send a CHR$(14) which stops underlining.

Underline Printing	
Send a CHR$( ):	**To:**
15	Start Underline
14	Stop Underline

Table 16

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"
```

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 any Mode, you can position the Print Head to a specific dot position.

Every other Print Head position is accessible through the positioning sequence. The characters stored in ROM can use the half step positions — you can't.

Using the Normal character sets (10 CPI), there are 1584 dot positions per line, but only half (792) are accessible by you. The same is true for Compressed and Condensed characters.

DMP-500 Print Head Positioning		
Character Width	**Dots-per-Line**	**Available Columns**
Normal	1584	792
Compressed	1900	950
Condensed	2640	1320

Table 17

Elongated characters use the same dot columns although the characters are printed twice as wide.

To position the Print Head to a specific position, send a (27 16), then two numbers (we'll call them *n*1 and *n*2) 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, 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 for printing to begin, you must first use CHR$ to send the (27 16) code. Follow this with another two-code sequence which specifies the position. For instance:

LPRINT CHR$(27);CHR$(16);CHR$(*n*1);CHR$(*n*2)

where *n*1 is a value between 0-5 and *n*2 is a value between 0-255.

Print Head Positioning

If you wish to specify dot-column:	*n*1 must be:	*n*2 must be:
0-255	0	0-255
256-511	1	0-255
512-767	2	0-255
768-1023	3	0-255
1024-1279	4	0-255
1280-1319	5	0-39

Table 18

Remember! Normal printing allows you to access dot-columns up to 791 (*n*1 = 3, *n*2 = 23); Compressed printing allows you to access dot-columns up to 949 (*n*1 = 3, *n*2 = 23); Condensed printing allows you to access up to 1319 (*n*1 = 5, *n*2 = 39).

Why two numbers (*n*1 and *n*2)? The maximum value you can send to the DMP-500 with one number is 255, and clearly you have more than 255 dot positions available.

Those of you who are fans of binary math will recognize that the DMP-500 is interpreting these two numbers as a single 10-bit (b(0) -b(9)) value. The two lower bits of *n*1 are used as b(8) and b(9).

Note: Use 15" wide paper for this next example.

See if you can print a character starting in position 792 in Normal density. *n*1 = 3 gives 768 of those dots, and 792 - 768 = 24 is the difference to be sent as *n*2. Type:

```
10 LPRINT CHR$(27);CHR$(16);CHR$(3);CHR$(24);"*"
```

and RUN the program.

Whoops! The asterisk printed at the 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$(3);CHR$(18);"*"
```

and RUN. 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 three print modes, its potential is greatest in Graphic 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
```

and RUN the program.

But get out of double-width first!

7/ Graphics Mode

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-500 allows you to have direct, programmable control over all of the available graphic dots.

How many "across the paper" addressable dot-columns are there? That varies depending on the Character styles you're using. See Table 19.

DMP-500 Print Head Positioning

Character Style	Available Dot-Columns
Normal	792
Compressed	950
Condensed	1320

Table 19

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 9,240 individual dots. (7 x 1320 = 9240).

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 3rd dot from the top in the 400th dot-column?)

Simple. Just follow this general procedure:

1. Send a Control Code which specifies the Character set (Normal, Condensed, Compressed).

2. Send a CHR$(18) to put the DMP-500 into Graphics Mode.

3. Send a CHR$(27);CHR$(16) to tell the Printer you want to position the Print Head to print a specific dot.

4. 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.

5. 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 for printing to begin, you must first use CHR$ to send the (27 16) code. Follow this with another two-code sequence which specifies the position. For instance:

LPRINT CHR$(27);CHR$(16);CHR$($n$1);CHR$(n2)

where n1 is a value between 0-5 and n2 is a value between 0-255.

Graphic Dot Positioning

If you wish to specify dot-column:	n1 must be:	n2 must be:
0-255	0	0-255
256-511	1	0-255
512-767	2	0-255
768-1023	3	0-255
1024-1279	4	0-255
1280-1319	5	0-39

Table 20

Remember! Normal graphic printing allows you to access dot-columns up to 791 ($n1$ =3, n2 = 23); Compressed graphic printing allows you to access dot-columns up to 949 ($n1$ = 3, $n2$ = 23); Condensed graphic printing allows you to access up to 1319 ($n1$ = 5, $n2$ = 39).

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)
```

Note: Model I users must use POKE 14312,0

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

In line 10, CHR$(18) puts the Printer into Graphics Mode and CHR$(27);CHR$(16) (line 20) tells it to get ready to position the Print Head. (Note that CHR$(0) is not necessary.)

Try this line to print a vertical bar at the right-most available dot-column — 1319.

```
10 LPRINT CHR$(27);CHR$(20);CHR$(18);CHR$(27);CHR$(16);
CHR$(5);CHR$(39);CHR$(255);
20 LPRINT CHR$(30)
```

What happens is:

- CHR$(27);CHR$(20) puts the DMP-500 into Condensed character set.
- CHR$(18) puts the Printer into Graphics Mode.
- CHR$(27);CHR$(16) tells the DMP-500 to get ready to position the Print Head.
- CHR$(5) tells the Printer that the position will be greater than 1280.
- CHR$(39) specifies the last available dot-column.

(Note: If you used CHR$(40) in this line instead of CHR$(39), the DMP-500 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-500 what to print once the Head is positioned.

Remember that we said there were 7 vertical dots in dot-column. You can print any or all of these dots in any combination you want.

Look back at the sample programs used when we talked about Print Head positioning.

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 (1319):

```
10 LPRINT CHR$(27);CHR$(20);CHR$(18);CHR$(27);CHR$(16);
CHR$(5);CHR$(39);CHR$(129);
```

How does the 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 down from 1 to 7. Table 21 describes the numbering system you must use with the DMP-500 when specifying an individual dot:

DMP-500 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

Table 21

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$(27);CHR$(20);CHR$(18);CHR$(27);CHR$(16);
CHR$(5);CHR$(39);CHR$(192);
```

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

It's actually quite simple too.

1. Specify the Dot #(1-64, see Table 21) that represent 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$(27);CHR$(20);CHR$(18);CHR$(27);CHR$(16);
CHR$(5);CHR$(39);CHR$(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$(27);CHR$(20);CHR$(18);CHR$(27);CHR$(16);
CHR$(1);CHR$(30);CHR$(255);CHR$(201);CHR$(201);CHR$(201);
CHR$(201);CHR$(255);
```

Now to flex our muscles.

Type in this NEW program:

```
 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)
```

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

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

Line Feed

In Graphics Mode, it is assumed that you want to print rows of graphics one right after another, each 7 dots high. Therefore, Graphics Mode provides only one line feed. A single 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.

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.

Repeat Function

CHR$(28) will tell the DMP-500 to repeat a graphic pattern a specified number of times.

The format for the Repeat Function is:

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

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

Change line 90 to:

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

and RUN.

Or run this program:

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

Print Density

Horizontal dot density in Graphics Mode is the same as that of the character width prior to entering Graphics Mode. Add to the current sample program:

```
5 LPRINT CHR$(27);CHR$(20);"CONDENSED CHARACTER WIDTH";
```

and RUN

Line 5 activates the Compressed character set. Graphics are then printed in Compressed character density.

Leaving Graphic Mode

CHR$(30) is used to exit Graphics Mode. It places the DMP-500 in 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:

```
90 LPRINT CHR$(N);
130 LPRINT "STILL IN CONDENSED MODE"
140 LPRINT CHR$(27);CHR$(19)
```

and RUN.

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

Mixing Modes on the Same Line

The fact that character density is unaffected as the DMP-500 moves in and out of Graphics Mode is a blessing when mixing Text and Graphics on the same line. It simplifies the calculation of the number of dots per line.

Free Hand Drawings

Having high resolution graphics at your disposal is great, but you must realize that it requires plenty of data. The Computer can do most of the work in drawing figures that can be described by a mathematical function. Free hand 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 (ENTER)
120 DATA 999
160 DATA 19,12,112,999
190 DATA 40,39,16,16,8,15,999
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 "DMP-500"
```

and RUN.

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 17,33,33,34,-4,66,68,-4,4,-5,8,-5,16,-5,32,
         -5,64,999
130 DATA 64,96,80,72,68,66,97,112,120,124,126,
         -7,127,-5,126
180 DATA 95,79,71,67,65,32,16,8,4,2,1,0,1,2,4,11,87,75
```

Don't RUN 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 figure still doesn't look like much. Add the remaining DATA lines and see what you've been working on.

```
110 DATA -7,0,64,64,96,96,80,80,72,72,-2,100,-2,114,57,57
140 DATA -5,124,-2,120,-3,121,-2,113,-3,114,98,98,-2,100
150 DATA -2,116,92,88,72,64,32,32,16,80,104,72,5,101,51
170 DATA 127,-4,64,-5,59,-5,7,-5,15,-5,31,-5,63,-6,127
200 DATA -5,0,-5,1,-5,2,-5,4,-5,8,-5,16,-5,32,-4,
         64,127,32,32
```

and RUN.

Now that's worth the effort!

APPENDIX A/Control Code Summary

Dec.	Code Hex	Data Processing Mode	Word Processing Mode	Graphics Mode	Remarks
00	00	Ignored	Ignored	Ignored	
01	01				
08n	08n	Backspace (n = Binary) n; Back Spaced Dot number	Backspace (n = Binary) n; Back Spaced Dot number	Ignored Receives n as character data	***
10 or 138	0A 8A	Executive Line Feed (Execute LF in accordance with information latched)	Full Line Feed (Executive)	11/108" Line Feed (Executive) .... 8A hex, 138 dec.	*LF/NL selectable ***
12	0C	Form Feed	Form Feed	Form Feed	LF/NL selectable
13 or 141	0D 8D	Carriage Return (When NL, LF pitch is latched one.)	Carriage Return (When NL, LF pitch is 1/6" per line.)	Carriage Return ... only 0D Hex. (When NL, LF pitch is 1/12" per line.)	NL/CR, selectable
14	0E	End Underline	End Underline	Ignored	
15	0F	Start Underline	Start Underline	Ignored	
18	12	Select Graphic Mode	Select Graphic Mode	Ignored	**Exchangeable for another code
19	13	Ignored	Select Data Processing Mode	Ignored	
20	14	Select Word Processing Mode	Ignored	Ignored	
27 01~09	1B 01~09	Proportional Spacing (2nd Byte is dot column number.)	Proportional Spacing (2nd Byte is column number.)	Ignored	***
27 14	1B 0E	Start Elongation	Start Elongation	Start Elongation	Exchangeable for another code
27 15	1B 0F	End Elongation	End Elongation	End Elongation	Exchangeable for another code
27 16	$n1, n2$	Positioning (3 pitches are available.) ($n1, n2$ indicate dot	Positioning (3 pitches are available.) ($n1, n2$ indicate dot	Positioning (3 pitches are available.) ($n1, n2$ indicate dot	$n1, n2$; Binary value ***
27 10	$n1, n2$	position from Home position.)	position from Home position.)	position from Home position.)	

Code					
Dec.	Hex.	Data Processing Mode	Word Processing Mode	Graphics Mode	Remarks
27 17	1B 11	Select Proportional character	Select Proportional character	Ignored	
27 18	1B 12	Select Correspondence Quality character	Select Correspondence Quality character	Ignored	
27 19	1B 13	Select Standard character	Select Standard character	Ignored	**Exchangeable for another code
27 20	1B 14	Select Condensed character	Select Condensed character	Ignored	**Exchangeable for another code
27 21	1B 15	Select Compressed character	Select Compressed character	Ignored Ignored	
27 31	1B 1F	Start Bold	Start Bold	Ignored	
27 32	1B 20	End Bold	End Bold	Ignored	**Exchangeable for another code
27 52, *n*	1B 34, *n*	Form Feed set	Form Feed set	Form Feed set	
27 50	1B 32	1/12 Forward Line Feed	1/12 Forward Line Feed	1/12 Forward Line Feed	
27 51	1B 33	1/36 Forward Line Feed	1/36 Forward Line Feed	1/36 Forward Line Feed	
27 10	1B 0A	Set Full Reverse Line Feed (No motion)	*Full Reverse Line Feed (Executive)	Ignored	***
27 28	1B 1C	Set Half Forward Line Feed (No motion)	*Half Forward Line Feed (Executive)	Ignored	
27 30	1B 1E	Set Half Reverse Line Feed (No motion)	*Half Reverse Line Feed (Executive)	Ignored	**Exchangeable for another code
27 54	1B 36	Set Full Forward Line Feed (No motion)	Ignored	Ignored	
27 56	1B 38	Set 3/4 Forward Line Feed (No motion)	*3/4 Forward Line Feed	Ignored	
28 *n1, n2*	1C *n1, n2*	Repeat Print Data (Undefined Code is changed to "X.")	Repeat Print Data (Undefined Code is changed to "X.")	Repeat Print Data (IF MSB = 0, Data is ignored.)	

Code					
Dec.	Hex.	Data Processing Mode	Word Processing Mode	Graphics Mode	Remarks
30	1E	Ignored	Ignored	End Graphic Mode	**Exchangeable for another code
127	7E	Ignored	Ignored	Ignored	
255	FF	Ignored	Ignored	(Printing Data)	
Other Codes in Function Area (02 to 31 decimal) (02 to 1F hex.)		Prints " X . " marks	Prints " X . " marks	Ignored	
Other Codes in Function Area (128 to 159 decimal) (80 to 9F hex.)		Prints " X . " marks	Prints " X . " marks	(Printing Data)	

Note: *   If Function Selection switch 6 is set to OPEN side, one line feed operation is performed at the same time.

      ** Refer to page ____.

     *** These codes may not be able to send to the printer by your computer. In this case, use system command to send them.

Appendix B/Interfacing

The DMP-500 is equipped with 8-bit parallel interface with strobe signal.

Parallel Interface

A 36-pin plastic female connector located at the right rear of the printer provides the means for connecting the printer to a computer.

The pin arrangement of the connector, signal summary, and the interface timing are shown below.
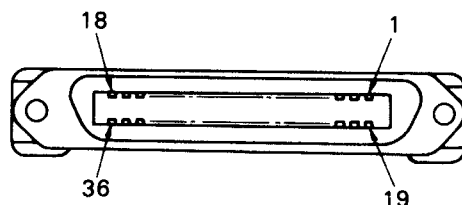
Parallel Interface Connector Pin Arrangement

Signal Pin	Name of signals	Signal Pin	Name of signals
1	STROBE	19	0V (Return for 1)
2	DATA 1	20	0V (Return for 2)
3	DATA 2	21	0V (Return for 3)
4	DATA 3	22	0V (Return for 4)
5	DATA 4	23	0V (Return for 5)
6	DATA 5	24	0V (Return for 6)
7	DATA 6	25	0V (Return for 7)
8	DATA 7	26	0V (Return for 8)
9	DATA 8	27	0V (Return for 9)
10	ACK	28	0V
11	BUSY	29	0V
12	PE (Paper Out)	30	0V
13	BUSY	31	NC
14	0V	32	FAULT (Printer Error Condition)
15	NC	33	NC
16	0V	34	NC
17	CHASSIS GROUND	35	NC
18	+5V (80 mA Maximum)	36	NC

- **Signal level**

Signal Level and Turn-ON/OFF Time.
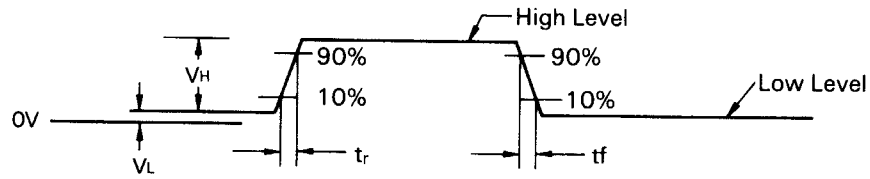
$t_r \leqq 30$ ns
$t_r \leqq 30$ ns

$2.4V \leqq V_H \leqq 5.0V$
$0V \leqq V_L \leqq 0.4V$

Parallel Interface Signal Waveform

- **Allowable Cable Length**

Twisted pair cable	Up to 5m
Flat cable	Up to 2m

Parallel Interface Timing •
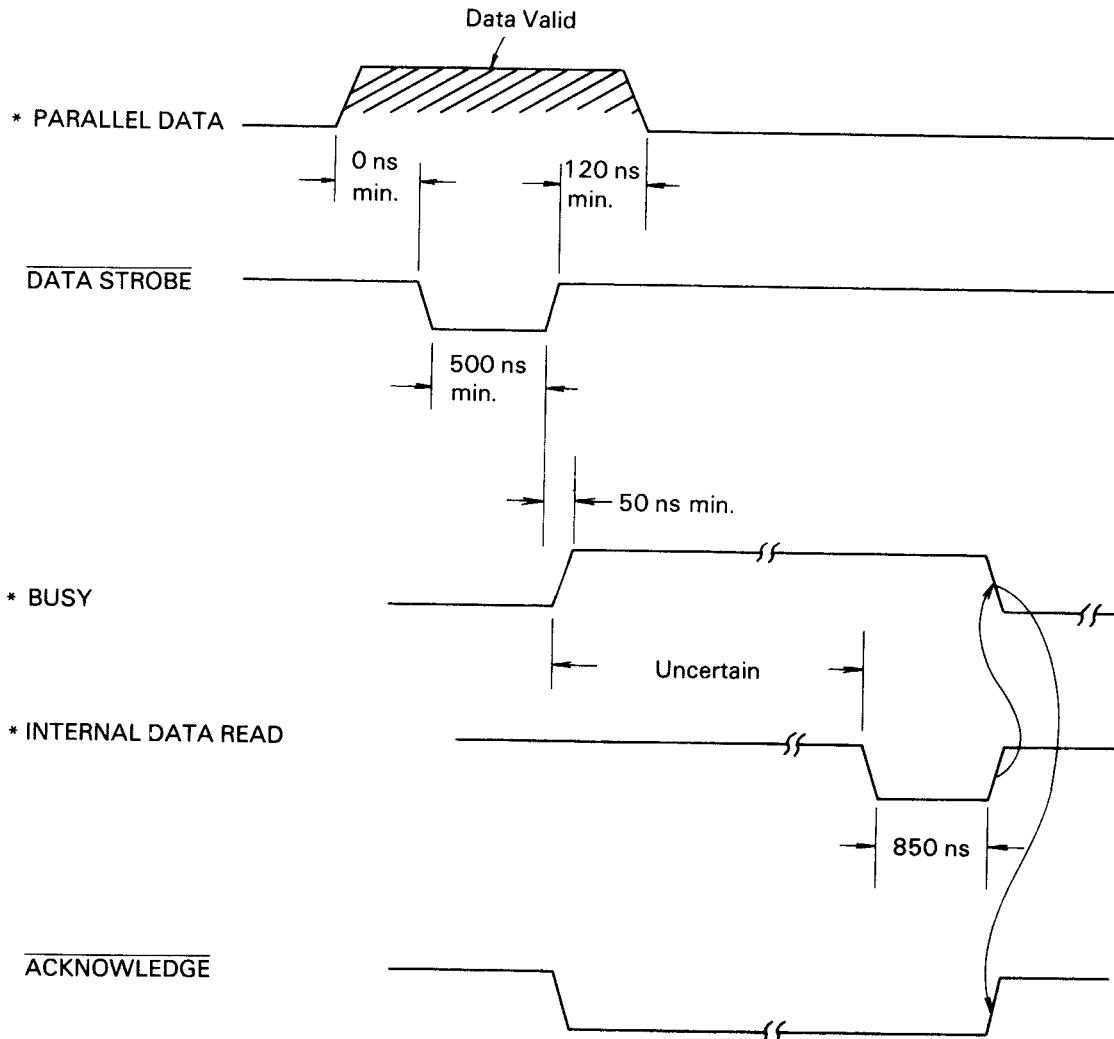
Note: 250 μS minimum
In the case of discontinuous transmission, the BUSY condition occupies upto three seconds.

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Parallel Interface Date Transmission Timing

Appendix C/Character Sets

The DMP-500 has 349 dot matrix patterns in the ROM (Read Only Memory). The following is a table of the character codes.

The printable characters may be classified as follows.

- Proportion or
  Proportional Elongated
- Correspondence Quality or
  Correspondence Quality Elongated
- Condensed or
  Condensed Elongated
- Compressed or
  Compressed Elongated
- Standard or
- Standard Elongated

} ASCII + Modified ASCII ....94 + 5
  European Symbol 32

} ASCII + Modified ASCII ....94 + 5
  European Symbol ....25 Selectable
  Japanese Kana 64
  Block Graphic 30

94 (+5) ASCII Code
ASCII Character Sets

Code			Char.	Code			Char.	Code			Char.
Dec.	Hex	Oct.		Dec.	Hex	Oct.		Dec.	Hex	Oct.	
32	20	40	(Space)	64	40	100	@	96	60	140	`
33	21	41	!	65	41	101	A	97	61	141	a
34	22	42	''	66	42	102	B	98	62	142	b
35	23	43	#	67	43	103	C	99	63	143	c
36	24	44	$	68	44	104	D	100	64	144	d
37	25	45	%	69	45	105	E	101	65	145	e
38	26	46	&	70	46	106	F	102	66	146	f
39	27	47	'	71	47	107	G	103	67	147	g
40	28	50	(	72	48	110	H	104	68	150	h
41	29	51	(	73	49	111	I	105	69	151	i
42	2A	52	*	74	4A	112	J	106	6A	152	j
43	2B	53	+	75	4B	113	K	107	6B	153	k
44	2C	54	,	76	4C	114	L	108	6C	154	l
45	2D	55	—	77	4D	115	M	109	6D	155	m
46	2E	56	.	78	4E	116	N	110	6E	156	n
47	2F	57	/	79	4F	117	O	111	6F	157	o
48	30	60	0	80	50	120	P	112	70	160	p
49	31	61	1	81	51	121	Q	113	71	161	q
50	32	62	2	82	52	122	R	114	72	162	r
51	33	63	3	83	53	123	S	115	73	163	s
52	34	64	4	84	54	124	T	116	74	164	t
53	35	65	5	85	55	125	U	117	75	165	u
54	36	66	6	86	56	126	V	118	76	166	v
55	37	67	7	87	57	127	W	119	77	167	w
56	38	70	8	88	58	130	X	120	78	170	x
57	39	71	9	89	59	131	Y	121	79	171	y
58	3A	72	:	90	5A	132	Z	122	7A	172	z
59	3B	73	;	91	5B	133	[(↑)	123	7B	173	{
60	3C	74	<	92	5C	134	/ (↓)	124	7C	174	¦
61	3D	75	=	93	5D	135	] (←)	125	7D	175	}
62	3E	76	>	94	5E	136	∧ (→)	126	7E	176	~
63	3F	77	?	95	5F	137	— (—)				

Note: 1 Codes 5B Hex (91 Dec) through 5F Hex (95 Dec) can be changed to the characters within parentheses by setting the Function Selection Switch 7 to CLOSE (opposite to OPEN).

Note: 2 Following characters are descended by one dots. Small Letter; g,p,q,y,j, (Underline)

32 European Symbol Code

Standard, Compressed or Condensed Character Set **Proportional Correspondence Quality Character Set**

Code Dec.	Hex	Oct.	Char.
160	A0	240	(Blank)
161	A1	241	à
162	A2	242	ç
163	A3	243	£
164	A4	244	(Blank)
165	A5	245	µ
166	A6	246	°
167	A7	247	▼
168	A8	250	†
169	A9	251	§
170	AA	252	(Blank)
171	AB	253	©
172	AC	254	¼
173	AD	255	(Blank)
174	AE	256	½
175	AF	257	¶
176	B0	260	¥
177	B1	261	Ä
178	B2	262	Ö
179	B3	263	Ü
180	B4	264	¢
181	B5	265	(Blank)
182	B6	266	ā
183	B7	267	ō
184	B8	270	ü
185	B9	271	β
186	BA	272	(Blank)
187	BB	273	é
188	BC	274	ù
189	BD	275	è
190	BE	276	(Blank)
191	BF	277	ƒ

Code Dec.	Hex	Oct.	Char.
160	A0	240	´
161	A1	241	à
162	A2	242	ç
163	A3	243	£
164	A4	244	`
165	A5	245	µ
166	A6	246	°
167	A7	247	▼
168	A8	250	†
169	A9	251	§
170	AA	252	®
171	AB	253	©
172	AC	254	¼
173	AD	255	¾
174	AE	256	½
175	AF	257	¶
176	B0	260	¥
177	B1	261	Ä
178	B2	262	Ö
179	B3	263	Ü
180	B4	264	¢
181	B5	265	~
182	B6	266	ä
183	B7	267	ö
184	B8	270	ü
185	B9	271	β
186	BA	272	TM
187	BB	273	é
188	BC	274	ù
189	BD	275	è
190	BE	276	¨
191	BF	277	ƒ

Note: 1 The "optimizer function" allows the following: If a spacing code (fixed space and/or proportional space) is received, the carriage moves only the shortest distance, and the action will take place without unnecessary movement. This saves printing time. When the character data (SP, proportional space or printable code) are sent to the Printer within a 1 sec. interval, the Printer automatically stores them until: (1) Function codes are sent (2) when the interval is greater than 1 sec. The printing is then executed. (See page 22). If a blank code (in the left table) is received under Standard, Elite or Condensed character set condition, the carriage will move in the same manner as when receiving a printable character. When printing, the use of blank code can be very convenient, and produce attractive/useful printouts.

2 Following characters are descended by one dot. Small Letter; g, p, q, y, j. (Under line)

30 Block Graphic Code

Standard, Compressed or Condensed

Code			Char.	Code			Char.
Dec.	Hex	Oct.		Dec.	Hex	Oct.	
224	E0	340	(Blank)	240	F0	360	┌
225	E1	341	■	241	F1	361	─
226	E2	342	■	242	F2	362	┐
227	E3	343	■	243	F3	363	┬
228	E4	344	■	244	F4	364	├
229	E5	345	◥	245	F5	365	│
230	E6	346	◢	246	F6	366	─
231	E7	347	▬	247	F7	367	┘
232	E8	250	▬	248	F8	370	┴
233	E9	351	▮	249	F9	371	┤
234	EA	352	▮	250	FA	372	┼
235	EB	353	▛	251	FB	373	◤
236	EC	354	◥	252	FC	374	◢
237	ED	355	▙	253	FD	375	◣
238	EE	356	◢	254	FE	376	◣
239	EF	357	■				

Note: 1 When Proportional or Correspondence Quality character set condition is selected, these characters will be changed to "X" mark (invalid code).

2 These characters are composed of six vertical dots. When using these codes to prepare diagrams, Line Feed should be set to "half line in forward." If other paper feed pitch is used, the diagram will not be accurate.

Proportional or Correspondence Quality Character Set

Proportional or Correspondence Quality characters are selected by using ESC DC1 or ESC DC2 control code sequence. The characters are composed by n x 9 dot matrix. These widths (n) vary from 10 dot columns to 20 dot columns. Since all proportional numerals are composed of the same number of dots the horizontal axis (16 dot columns), tabulation of numbers are aligned vertically.

● Proportional Character Code Table

The following lists all printable Proportional or Correspondence Quality characters:

Dec.	Hex	Oct.	Char.	Width	Dec.	Hex	Oct.	Char.	Width	Dec.	Hex	Oct.	Char.	Width	Dec.	Hex	Oct.	Char.	Width
32	20	40	(Space)	10	64	40	100	@	18	96	60	140	\	18	160	A0	240	✔	18
33	21	41	!	10	65	41	101	A	20	97	61	141	a	18	161	A1	241	à	18
34	22	42	"	12	66	42	102	B	18	98	62	142	b	16	162	A2	242	ç	16
35	23	43	#	20	67	43	103	C	18	99	63	143	c	16	163	A3	243	£	20
36	24	44	$	18	68	44	104	D	20	100	64	144	d	16	164	A4	244	✖	18
37	25	45	%	20	69	45	105	E	18	101	65	145	e	16	165	A5	245	µ	20
38	26	46	&	18	70	46	106	F	18	102	66	146	f	14	166	A6	246	°	12
39	27	47	'	10	71	47	107	G	20	103	67	147	g	16	167	A7	247	▼	10
40	28	50	(	10	72	48	110	H	20	104	68	150	h	16	168	A8	250	↑	16
41	29	51	)	10	73	49	111	I	12	105	69	151	i	10	169	A9	251	§	18
42	2A	52	*	16	74	4A	112	J	18	106	6A	152	j	10	170	AA	252	®	20
43	2B	53	+	16	75	4B	113	K	18	107	6B	153	k	16	171	AB	253	©	20
44	2C	54	,	10	76	4C	114	L	18	108	6C	154	l	10	172	AC	254	¼	20
45	2D	55	—	16	77	4D	115	M	20	109	6D	155	m	20	173	AD	255	¾	20
46	2E	56	.	10	78	4E	116	N	18	110	6E	156	n	16	174	AE	256	½	20
47	2F	57	/	16	79	4F	117	O	20	111	6F	157	o	16	175	AF	257	¶	16
48	30	60	0	16	80	50	120	P	18	112	70	160	p	16	176	B0	260	¥	20
49	31	61	1	16	81	51	121	Q	18	113	71	161	q	16	177	B1	261	Ä	20
50	32	62	2	16	82	52	122	R	18	114	72	162	r	14	178	B2	262	Ö	20
51	33	63	3	16	83	53	123	S	18	115	73	163	s	16	179	B3	263	Ü	20
52	34	64	4	16	84	54	124	T	20	116	74	164	t	14	180	B4	264	¢	18
53	35	65	5	16	85	55	125	U	18	117	75	165	u	16	181	B5	265	~	16
54	36	66	6	16	86	56	126	V	18	118	76	166	v	16	182	B6	266	ä	18
55	37	67	7	16	87	57	127	W	20	119	77	167	w	20	183	B7	267	ö	16
56	38	70	8	16	88	58	130	X	18	120	78	170	x	16	184	B8	270	ü	16
57	39	71	9	16	89	59	131	Y	18	121	79	171	y	16	185	B9	271	β	20
58	3A	72	:	10	90	5A	132	Z	16	122	7A	172	z	14	186	BA	272	TM	20
59	3B	73	;	10	91	5B	133	[(↑)	14(16)	123	7B	173	{	14	187	BB	273	e	16
60	3C	74	<	14	92	5C	134	/ (↓)	16(16)	124	7C	174	¦	10	188	BC	274	ù	16
61	3D	75	=	16	93	5D	135	] (←)	14(20)	125	7D	175	}	14	189	BD	275	è	16
62	3E	76	>	14	94	5E	136	∧(→)	18(20)	126	7E	176	~	16	190	BE	276	¨	16
63	3F	77	?	16	95	5F	137	—(—)	20(16					18	191	BF	277	ƒ	16

Note: The number on width-column indicates a dot size of each character.

● Proportional Character Sets Dots Per Column

	DEC/HEX 10 DOTS		DEC/HEX 12 DOTS		DEC/HEX 14 DOTS
Space —	32/20	" —	34/22	< —	60/3C
! —	33/32	l —	73/49	> —	62/3E
acute —	39/27	○ —	166/A6	f —	102/66
(—	40/28			r —	114/72
) —	41/29			t —	116/74
, —	44/2C			z —	112/7A
. —	46/2E			{ —	123/7B
: —	58/3A			} —	125/7D
; —	59/3B				
` —	96/60				
i —	105/69				
j —	106-6A				
l —	108/6C				
| —	124/7C				
▼ —	167/A7				

16 DOTS

	DEC/HEX		DEC/HEX
* —	42/2A	e —	101/65
+ —	43/2B	g —	103/67
– —	45/2D	h —	104/68
0 —	48/30	k —	107/6B
1 —	49/31	n —	110-6E
2 —	50/32	o —	111/6F
3 —	51/33	p —	112/70
4 —	52/34	q —	113/71
5 —	53/35	s —	115/73
6 —	54/36	u —	117/75
7 —	55/37	v —	118/76
8 —	56/38	x —	120/78
9 —	57/39	y —	121/79
= —	61/3D	~ —	126/7E
? —	63/3F	, —	162/A2
Z —	90/5A	† —	168/A8
[—	91/5B	¶ —	175/AF
↑ —	91/5B(TANDY)	~ —	181-B5
\ —	92/5C	ö —	183/B7
↓ —	92/5C(TANDY)	ü —	184/B8
] —	93/5D	e —	187/BB
b —	98/62	u —	188/BC
c —	99/63	e —	189/BD
d —	100/64	¨ —	190/BE
		f —	191/BF

18 DOTS

#	—35/23	S —	83/53	
$	—36/24	U —	85/55	
&	—38/26	V —	86/56	
@	—64/40	X —	88/58	
B	—66/42	Y —	89/59	
C	—67/43	∧ —	94/5E	
E	—69/45	a —	97/61	
F	—70/46	′ —	160/A0	
J	—74/4A	à —	161/A1	
K	—75/4B	` —	164/A4	
L	—76/4C	§ —	169/A9	
N	—78/4E	¢ —	180/B4	
P	—80/50	ä —	182/B6	
Q	—81/51			
R	—82/52			

20 DOTS

%	—37/25	£ —	163/A3
A	—65/41	μ —	165/A5
D	—68/44	® —	170/AA
G	—71/47	© —	171/AB
H	—72/48	¼—	172/AC
M	—77/4D	¾—	173/AD
O	—79/4F	½—	174/AE
T	—84/54	¥ —	176/B0
W	—87/57	Ä —	177/B1
←	—93/5D(TANDY)	Ö —	178/B2
→	—94/5E(TANDY)	Ü —	179/B3
Underline(1)	—95/5F	β —	185/B9
Underline	—95/5F(TANDY)	TM—	186/BA
m	—109/6D		
w	—119/77		

Appendix D/Programming Information

The following items should be considered when you program the Computer.

1. When Printer Power is turned on.

   - Selects optional function set by Function Selection Switch.
   - If Data Processing mode is selected, Full Forward Line Feed is set.
   - Selects one of five character styles by Rotary Switch position.
   - Underline is not set.
   - Sets normal character (not-Elongated and not-Bold)
   - Buffer memory is completely cleared.

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 auto-wraparound. To prevent this, intermix characters only on short lines, or don't mix character sizes on the same line.

3. Since a proportional spacing command may 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 while using Standard, (10 or 5 CPI), (12 or 6 CPI) or condensed (16.7 or 8.3 CPI) characters, therefore, a normal space 20 Hex (32 Dec) gives 12 or 24 dot spaces.

4. Elongated (Double-width) characters and Underline are not terminated at the end of the line and Printing continues until a terminating command is received.

5. You should avoid wrap-around. 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. If block graphic character codes (EO Hex through FE Hex — 224 Dec through 254 Dec) is accessed in Proportional character mode, these codes will be converted to an invalid code (X mark).

8. In the Repeat Data command, printable characters can be repeated as many times as provided for in the count number. If any function code is received for repetition, it will be considered an invalid symbol (X mark).

9. POS command can be used at any carriage position. If designated dot column address is in the current text which is already printed out, overprint will occur.

10. Under block graphic printing, Half Line Feed Forward should be used for printing of diagrams.

11. Line Feed in Graphics mode is different from Line Feed pitches in Data Processing or Word Processing mode. It will generate an odd vertical spacing in Graphic mode while the other modes intermix in a form. Consider the following relationship between Line Feed pitches.

    1 times of Full Line Feed = 2 times of Graphic Line Feed
    1 times of Half Line Feed = 1 times of Graphic Line Feed

12. Graphic printing can be intermixed with character printing in a same line. Dot density in Graphic mode is same as the density of former character style.

13. Bold character is useful for heading or title.

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 may type C O N T (ENTER).

The BASIC statements LPRINT and LLIST output to the Line Printer. See Your Computer's Reference Manual for syntax details.

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 semicolon).
            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$(27); CHR$(17); "PROPORTIONAL"; CHR$(27); CHR$(27);
    CHR$(18); "CORRESPONDENCE"; CHR$(27); CHR$(20); "CONDENSED";
    CHR$(27); CHR$(25); "GOTHIC"; CHR$(27); CHR$(19) "STANDARD"
            Prints proportional correspondence, condensed elite, and standard characters in
            the same line.
    LPRINT "X"; CHR$(20); CHR$(27); CHR$(30); "2"; CHR$(26); CHR$(28); " +
    X = Y"
            Prints an algebraical function expression $X^2 + X = Y$.
    LPRINT "H"; CHR$(27); CHR$(28); "2" CHR$(27); CHR$(30); "0"
            Prints the formula of water H_2O.
    LPRINT CHR$(19); "START"; CHR$(27); CHR$(56); CHR$(138); "ONE
    LINE"; CHR$(138); "TWO LINE"
            Prints these letters at ¾ line pitch.
    LPRINT CHR$(15); "UNDERLINE"; CHR$(14); "WITHOUT UNDERLINE"
            Prints both messages underlined and non-underlined in the same line.
    LPRINT CHR$(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 above message from 300th column address.
    LPRINT CHR$(27); CHR$(17); "A"; CHR$(27); CHR$(09); "B"; CHR$(27);
    CHR$(06); "C"; CHR$(27); CHR$(03); "DE"
            Prints ABCDE by using proportional spacing.
    LPRINT CHR$(18); CHR$(255); CHR$(247); CHR$(227); CHR$(193);
    CHR$(227); CHR$(247); CHR$(255); CHR$(30)
            Prints a special symbol in Graphic mode.
    LPRINT "DELETE"; CHR$(08); CHR$(72); "//////"
            Prints the message DELETE, then it is deleted by diagonal lines.

Appendix E/Care and Maintenance

1. Always plug Printer into a 3-wire grounded receptacle.

2. Be sure that Front Cover is closed and secured while in operation.

3. Never operate Printer without paper. If paper used is less than 4" wide, take care to see that printing does not exceed paper width.

4. Avoid leaning objects against Printer or placing anything on top. If any object is accidentally dropped into the machine, turn power off and carefully remove object.

5. Be sure to turn power off before adjusting the penetration or replacing ribbon.
   Note: When you turn power off, all data stored in 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.

6. Use only lint-free cloth to clean printer surface. Do not use solvents or harsh cleaning agents. Mild detergent solution or desk top cleanser may be used sparingly.

7. Keep hands away from carriage mechanism while Printer is in operation. Since carriage moves with considerable force, inserting hand would be extremely hazardous.

8. Printer must be kept dry. If water is accidentally spilled on machine, turn power OFF immediately and wipe dry. Do not turn power ON until completely dry.

9. If printed material is too light or too dark, check to see if the Print Head is adjusted properly. See the section entitled ''Fanfold Paper Loading'' for specific details on adjusting the Print Head.

Care

- Do not use organic solvents or alcohol when cleaning the cover.
- Never operate Printer when Front Cover is opened.
- 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 bit images without pausing, the print head could overheat, causing the fuse to blow.

  When you must print graphics continuously, be sure to pause the printing for at least one minute after each 1/6th paper is printed (assuming a 15" x 11" page). This will prevent the unit from overheating. In terms of load on the print head, the underline falls into the graphics category, and should be treated as such.

Maintenance

- If the Print Head become clogged with ribbon material or paper lint, carefully remove such material with a finely pointed tool (preferably a toothpick). This should be regularly checked.
- A Print Head's life expectancy is approximately 2000 hours (in other words, if you use the Printer two hours a day on the average, the Print Head should be changed every 32 months). When poor print quality, sticking ribbon, or bent character printing occurs, you should have the Print Head replaced by a Radio Shack service technician.
- After cleaning with a soft cloth, lightly oil the two carriage guides with a high-grade ester lubrication oil or with high-grade sewing machine oil. (This should be done at least every six months.) Lubricate the platen removing shaft, the left wire pulley shaft, the right wire pulley shaft, the ribbon feed revolving shaft and the gear revolving shaft, using molybdenum disulfide compound or other high-grade lubricating grease.
- Because ink from the paper can get on the paper bail rollers, we suggest a periodic cleaning of the rollers. Use 90% isopropyl alcohol to remove ink build up on the rollers as often as necessary.

If You Have Problems . . .

If the Printer fails to operate properly, try to solve the trouble by using the following table.

SYMPTOM	INSPECTION and ADJUSTMENT
Printer does not operate when POWER switch is turned ON. Printer stops before paper runs out	● Is power cord properly connected? ● Is power source voltage too low? Printer should stop if below 90% of rated voltage. ● If you cannot hear any sound or see any movement, remove the Front Cover and check the fuses. (Even if DC driver power fuse is broken, the indicator on the control panel will be lit when power is ON.)
Printer stops with ALERT indicator lit.	● Is paper loaded properly? ● Is carriage guide dirty? If so, clean it by using soft cloth and lubricate high-grade ester lubricating oil or high-grade sewing machine oil. ● Has some object dropped inside the Printer? ● If nothing is wrong, turn power OFF, then ON.
Ribbon fails to track properly.	● Is ribbon cassette properly set? ● Has ribbon come off from print head ribbon guide and is loose? ● Is ribbon so worn that it does not feed smoothly from cassette? ● Has the print head reached its life expectancy? Worn out head will stick to ribbon and interfere with smooth movement. Replace the print head with a new one.
Poor Print Quality or smudging on paper.	● Is ribbon old and/or worn? ● Is Penetration Control Lever set at proper position? ● Is tip of print head dirty? If dirty, clean off with a toothpick or needle.
Erratic operation or wrong character printing.	● Is interface cable and/or connector damaged? ● Are interface connectors inserted properly to the Computer and to the Printer?
The paper cannot be advanced smoothly.	● Is paper loaded properly into entrance of insertion opening? ● Is any obstacle preventing smooth paper motion? ● Does paper stick or tear because of side guide pins?

If the trouble cannot be corrected after making the above check-up and adjustment, check for secure contacts of all connectors. If you can't eliminate the problem, take the unit to your Radio Shack Store or Computer Center for repair. We'll have it back to you ASAP!

Printing Limits (Duty Cycle)

The DMP-500 does have its limits when it comes to heavy, continuous printing. Depending upon the type of printing being performed, those limits vary.
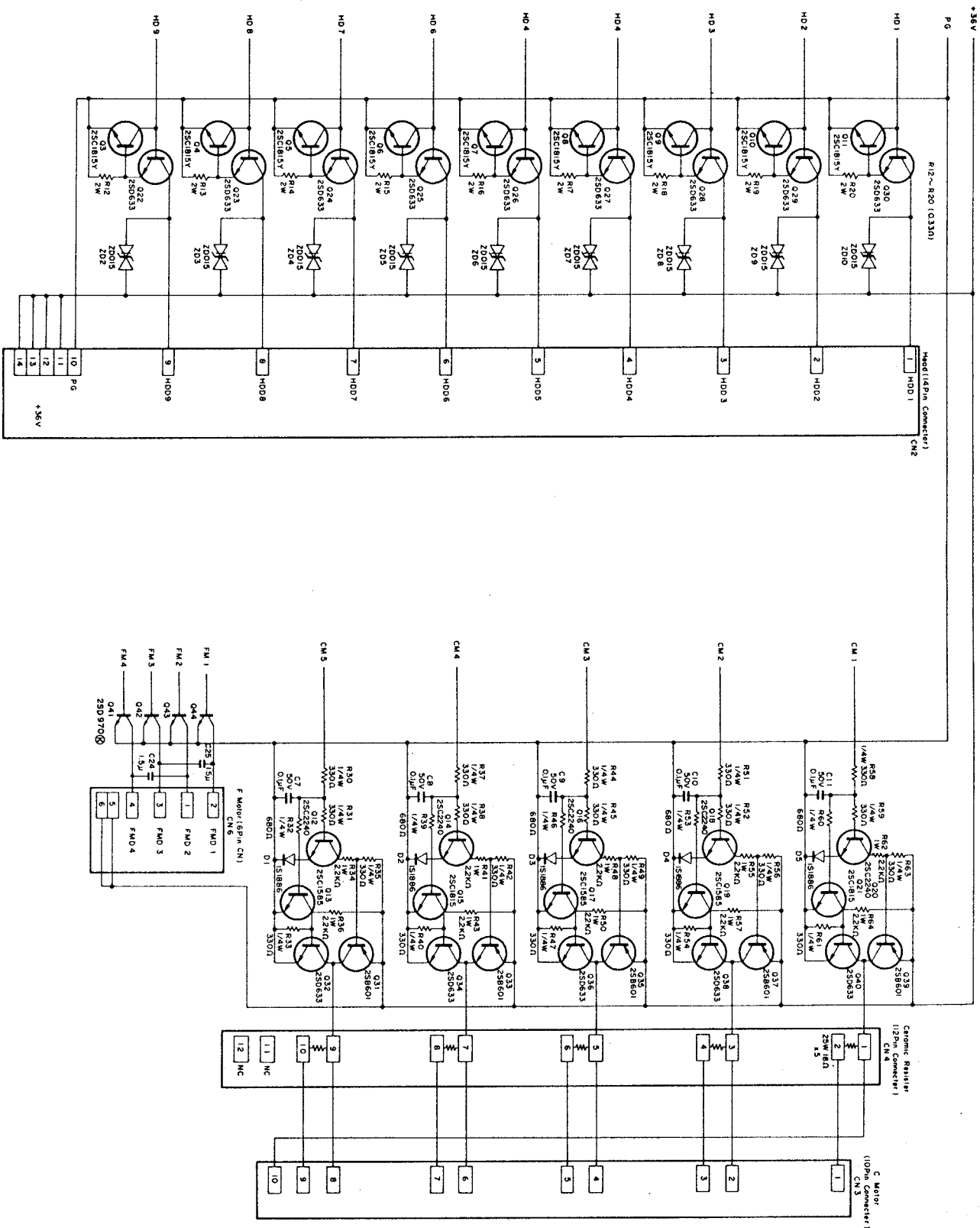
DMP-500 Printing Limits			
Type of Printing	%		Number of Pages
Character	at	100% for	5
		70%	15
		50%	continuous
Bit Image		100%	1/2
		70%	1
		50%	continuous
Block Graphics		100%	1/3
		50%	1

Note: These figures are based on a 132-column printing width. 100% printing would mean every column is printed; 50% printing means that every other column is printed.
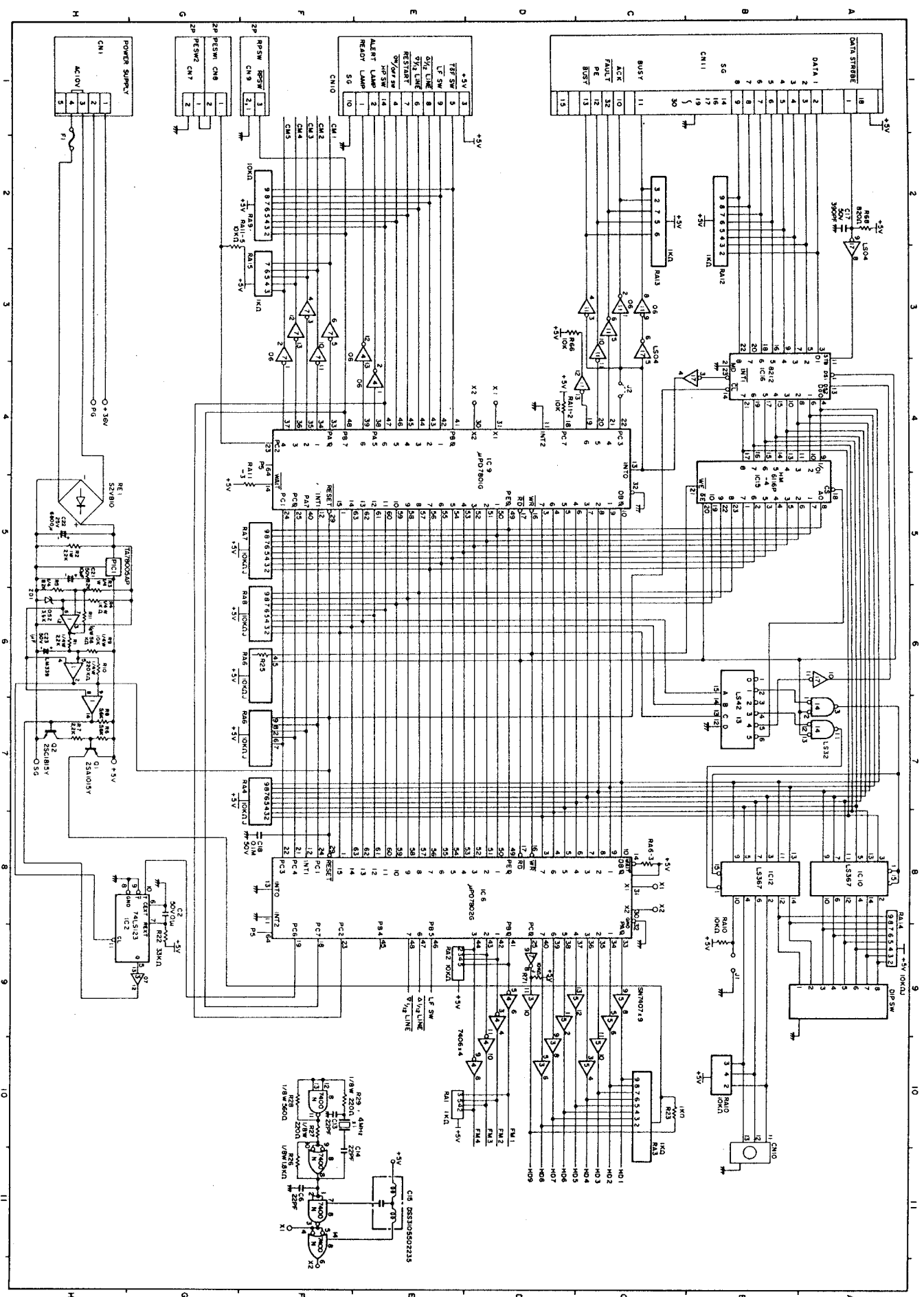
Schematic Diagram – (cont.)

Appendix G/Specifications

Printing speed

Correspondence Quality 10 CPI	131
Elongated Correspondence Quality 5 CPI	65
Proportional	154
Elongated Proportional	77
Condensed 16.7 CPI	220
Elongated Condensed 8.3 CPI	110
Standard 10 CPI	220
Elongated Standard 5 CPI	110
Compressed 12 CPI	220
Elongated Compressed 6 CPI	110

Character Per Line

Correspondence Quality 10 CPI	132
Elongated Correspondence Quality 5 CPI	66
Proportional	114 to 293
Elongated Proportional	58 to 146
Condensed 16.7 CPI	220
Elongated Condensed 8.3 CPI	110
Standard 10 CPI	132
Elongated Standard 5 CPI	66
Compressed 12 CPI	158
Elongated Compressed 6 CPI	74

Dots Per Character

Proportional	10 to 20
Condensed Compressed or Standard	12

Vertical Spacing .... 12, 6, 8 lines per inch (Computer selectable) and 1/12, 1/36 line feed available (Bidirectional when 12 or 6 lines per inch are selected.)

Dots Per Line

Correspondent Quality 10 CPI	2640
Elongated Correspondent Quality 5 CPI	2640
Proportional	2640
Elongated Proportional	2640
Condensed 16.7 CPI	2640
Elongated Condensed 8.3 CPI	2640
Standard 10 CPI	1584
Elongated Standard 5 CPI	1584
Compressed 12 CPI	1900
Elongated Compressed 6 CPI	1900

Character set

Proportional or Correspondence Quality	ASCII 94 or modified ASCII 94, European symbol 32
Condensed, or Elite Standard	ASCII 94 or modified ASCII 94, European Symbol 25 or Japanese Kana 64, and Block Graphics 30

Interface

Parallel	8-bit Data and 4 bit Status

Print Head Life .... 2000 Hours typical
Preventive Maintenance .... Normally every 6 months

Temperature and Humidity Range
    Operating .... 41°F (5°C) to 104°F (40°C)
    Storage .... −40°F (−40°C) to 160°F (71°C)

Paper
    Fan Fold Paper .... Continuous business paper (4-15″ wide) with feed holes
    Copy Paper .... 1 original +4 copies (34 kg (75 lbs) non-carbon paper)
    Single Sheet Paper .... 40∼60 (88∼132 lbs) kg good quality paper

Ribbon .... Radio Shack Catalog Number 26-1482
Size .... 24.4″ × 7.6″ × 15.9″
                                                           62.0 cm × 19.5 cm × 40.5 cm
Weight .... 50 lbs. (26.3 kg) maximum
Power Requirement .... 120V AC, 60 Hz, (for USA/Canada), or 220V/240V AC, 50 Hz (for European and Australian models). 170W maximum.

SERVICE POLICY

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

Because of the sensitivity of computer equipment, 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 computer products are broken, Radio Shack reserves the right to refuse to service the equipment or to void any remaining warranty on the equipment.

2. If any Radio Shack computer equipment 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 equipment, void any remaining warranty, remove and replace any non-Radio Shack part found in the equipment, and perform whatever modifications are necessary to return the equipment to original factory manufacturer's specifications.

3. The cost for the labor and parts required to return the Radio Shack computer equipment to original manufacturer's specifications will be charged to the customer in addition to the normal repair charge.