

TRS-80[®]

TRP-100

Operation Manual

Catalog Number 26-1275



Radio Shack[®]

TRS-80

**COMPUTER
PRODUCTS**

CUSTOM MANUFACTURED FOR RADIO SHACK, A DIVISION OF TANDY CORPORATION

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:

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- 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. 004-000-00345-4.

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Introduction

Congratulations for selecting this Tandy computer product! The TRP-100 is a handy thermal method line printer which can be battery-operated. You can carry it with you and print while you're on the go, or anywhere AC power is not available. The TRP-100 is suitable to use in a quiet place, such as an office or a library, because it performs silent printing (less than 50 dBA).

The TRP-100 can perform a variety of different printing operations. For instance, it can print:

- Normal characters.
- Graphics characters.

The TRP-100 operates in two modes:

- Character Printing Mode for output of program listings, letter writing, or the creation of any text documentation.
- Graphics Mode for drawing pictures, figures, or graphs.

In the Character Printing Mode, the TRP-100 prints monospaced, 8×9 dot matrix characters.

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

You can use two types of printing methods by selecting the appropriate DIP Switch settings.

- Printing with plain paper and thermal carbon ribbon (the carbon is molten by heat and transferred onto plain paper).
- Printing with sensitized paper (without ribbon).

The TRP-100 accepts IBM PC printer codes when the correct DIP Switch positions have been selected.

Other software-controlled features include:

- Bidirectional minimum-distance access carriage motion when using thermal sensitized (heat sensitive) paper.
- Unidirectional minimum-distance access carriage motion when using thermal carbon ribbon.
- Full, half, 3/4 and 7/72 Forward Line Feed.
- Underline capability.
- Super-/Subscript capability.

and much more!



1/Description of the TRP-100

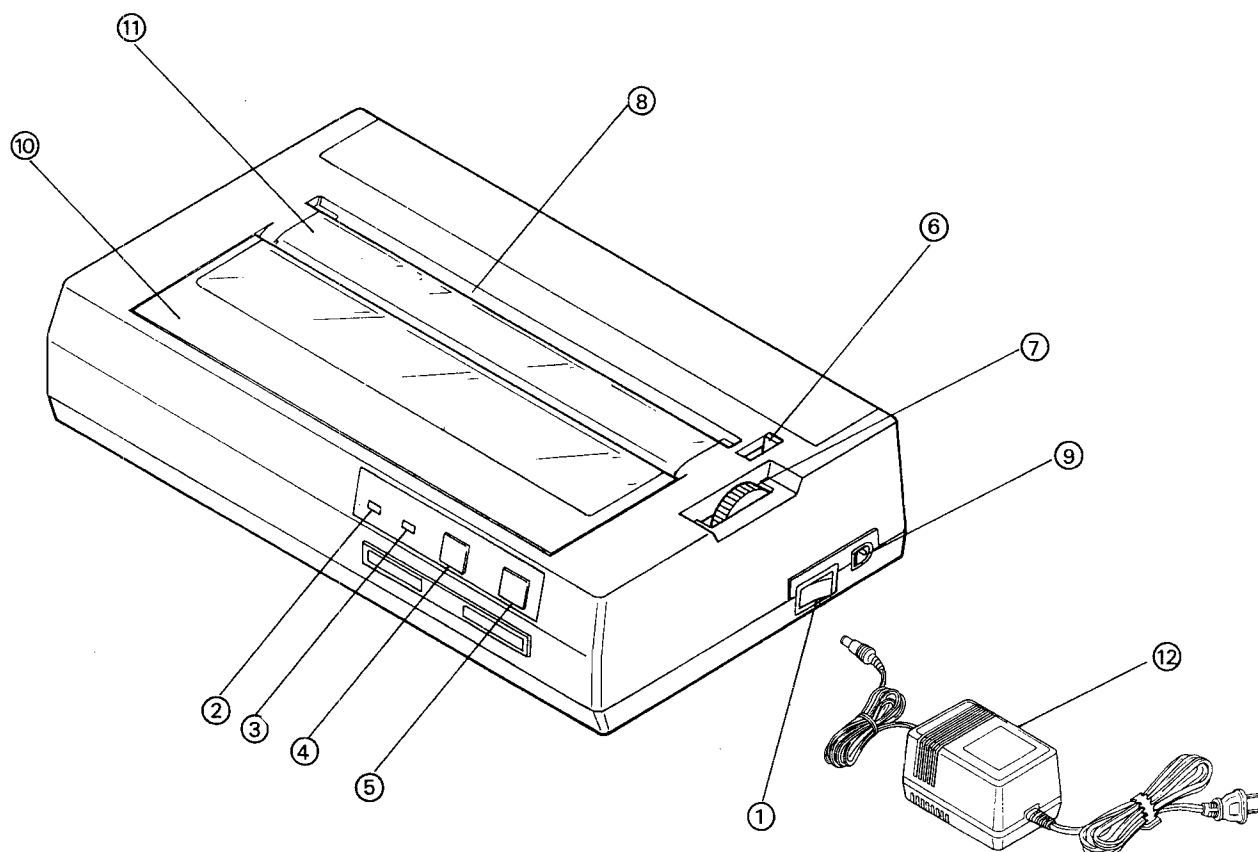


Figure 1. TRP-100 (Top View)

- ① **Power ON/OFF Switch.** Press the white dot to turn the power ON. Press the Switch the other way to turn the power OFF. Note that turning the power OFF and ON during operation may cause loss of the current program.
- ② **POWER ON Indicator.** This indicator will illuminate when the TRP-100 is properly connected and the Power ON/OFF Switch is set to ON.
- ③ **READY/ALERT Indicator.** This indicator will come on when the Printer is ON-LINE, and it will blink when any of the following errors occur.
 - Out of paper: Two short flashes following one long flash.
 - Home Position Error: Three short flashes followed by one long flash.
 - Low Battery Voltage: short, quick flashes. When the batteries become low, the Printer stops an operation and the indicator flashes on and off quickly. Press the ON-LINE Switch; the flashing slows down and the remaining data in the Printer buffer is printed. See **Battery Installation** for battery replacement.
- ④ **ON-LINE/OFF-LINE Switch.** Pressing this Switch sets the Printer to ON-LINE if it is OFF-LINE and vice versa.

- ⑤ **PAPER FEED Switch.** When this switch is pressed, the paper advances 1/6 inch. When it is held down, continuous paper feed is performed. This switch will work only when the Printer is OFF-LINE.
- ⑥ **Platen Pressure Lever.** This lever has two positions: **Release**, for inserting paper (toward the front of the Printer); and **Friction**, for feeding paper (toward the rear of the Printer).
- ⑦ **Paper Feed Knob.** Turn this knob to manually advance the paper.
- ⑧ **Paper Insertion Opening.** Be sure the paper enters the TRP-100 here.
- ⑨ **DC 6V Inlet.** The AC Adapter may be connected to this Inlet.
- ⑩ **Top Cover.** Open this Cover to install the Ribbon Cassette.
- ⑪ **Paper Guide.**
- ⑫ **AC Adapter.**

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.

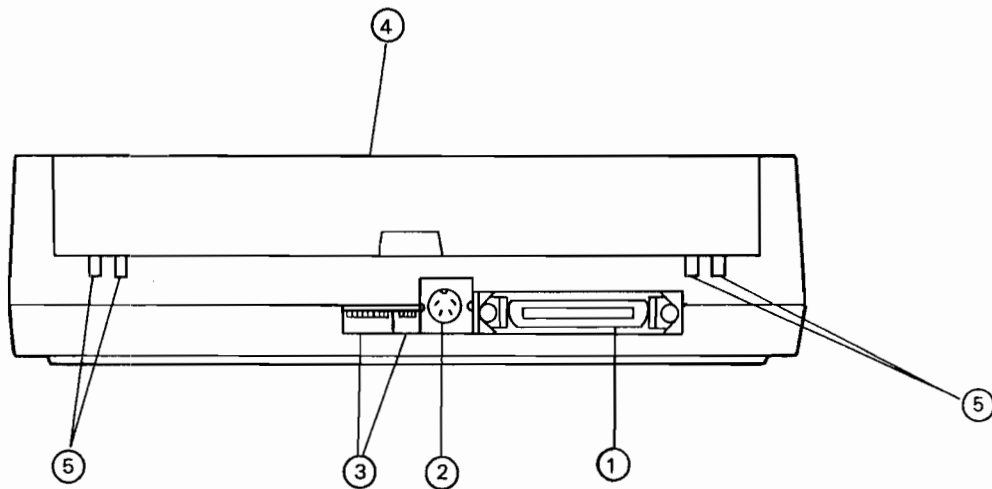


Figure 2. TRP-100 (Rear View)

- ① **Parallel Interface Connector.** If your Tandy Computer has parallel interface capabilities, connect the cable here. See **Setting Up the TRP-100** for the right cable for your computer.
- ② **Serial Interface Connector.** If your computer has serial interface capabilities, connect the cable here. See **Setting Up the TRP-100** for the right cable for your computer.
- ③ **Print Function (DIP) Switches.** The settings of these Switches will determine exactly how your Printer prints in any situation. Whether you're using the serial or parallel interface, the TANDY or IBM function, your choices must be set via these Switches.
- ④ **Battery Cover.** Open this Cover to replace the batteries. See **Battery Installation**.
- ⑤ **Roll Paper Holder Holes.** See **Roll Paper Loading**.



2/Setting Up the TRP-100

This section will show you how to set up the TRP-100 so you can begin using it as quickly as possible. This includes:

- Installing the batteries.
- Loading paper.
- Replacing a ribbon.
- Connecting the TRP-100 to a computer.

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 computer 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 (on the right side of the Printer) is OFF.
- Remove the packing materials.
- Install single-sheet paper or roll paper. Paper shall be plain or heat sensitive, depending on the DIP Switch setting. (The default setting of the DIP Switch on delivery is for plain paper.)
- Check the Ribbon Cassette if using plain paper. If it has not been installed, see **Ribbon Installation/Replacement.**
- Set the Print Function (DIP) Switches to the desired settings.
- Install the batteries or connect the power plug of the AC Adapter to a 2-wire, 120 volt, 60 Hz grounded AC outlet (220/240 V, 50 Hz where the unit is so marked).
- Connect the interface cable from the computer to the printer interface connector.
- Turn the power ON and check that the POWER ON Indicator (on the Control Panel) is illuminated.
- Check to see if the Printer is ready by running the Self-Test.
- Place the ON-LINE/OFF-LINE Switch in the ON-LINE position.

Battery Installation

The TRP-100 can either be battery-operated (7.5V DC, five C-cell batteries), or it can receive power through the AC Adapter. When you plug the outlet of the Adapter into the DC 6 V Inlet of the TRP-100, the batteries are automatically disconnected. You may want to use rechargeable nickel-cadmium batteries to save on replacement batteries. However you must use an external charger to recharge them; you cannot recharge them inside the TRP-100.

To install or replace the batteries

1. Set the Power ON/OFF Switch to OFF.
2. Open the Battery Cover located on the rear side of the Printer by pulling it upward.
3. Remove the old batteries.
4. Install five fresh batteries, paying attention to the polarity of the batteries.
5. Close the Battery Cover.

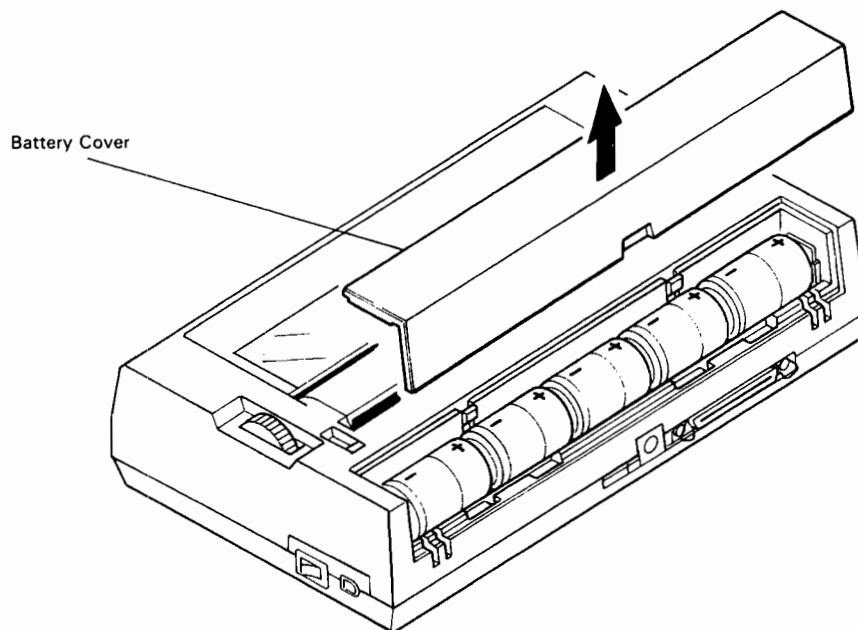


Figure 3. Installing Batteries

How Does the TRP-100 Handle Paper?

The TRP-100 can use both plain paper and sensitized paper. When plain paper is used, install a Thermal Carbon Ribbon Cassette. Remove the Ribbon Cassette if you're going to use sensitized paper. Which type paper to use must be determined by the DIP Switch setting; on delivery, the default setting is for plain paper.

Paper Loading

Warning! When loading paper, be sure the paper correctly enters the Paper Insertion Opening.

It is very important that the paper enters the TRP-100 straight. The paper must be directly behind the Printer or paper skewing or jamming may occur.

Once the paper is correctly loaded and power is ON, check the READY/ALERT Indicator. If the lamp is illuminated, press the ON-LINE/OFF-LINE Switch to set the Printer to ON-LINE. 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).

Note: Since the belt-type interface cable is placed under the roll paper, the paper may stick to the cable if the cable is twisted or becomes too slack, thus hampering smooth operation.

Single-Sheet Paper Loading

1. Be sure the Power ON/OFF Switch is OFF.
2. Move the Platen Pressure Lever forward (towards the front of the Printer).
3. Insert the paper into the Paper Insertion Opening and push the Platen Pressure 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.
4. Move the Platen Pressure Lever forward to align the paper. Push the Platen Pressure Lever back again.

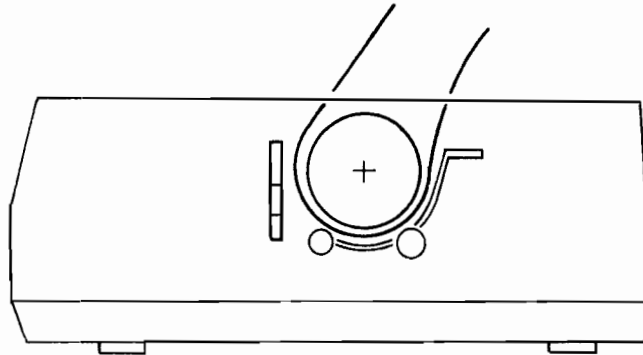


Figure 4. Single-Sheet Paper Feeding

Roll Paper Loading

1. Set the Power ON/OFF Switch to OFF.
2. Be sure that there is enough space behind the Printer for the Roll Paper Holder.
3. Insert the four protruding hooks (two for each end) of the Roll Paper Holder into the holes provided on the rear side of the Printer (under the Battery Cover edge) and then push down on the Paper Holder so that it is installed securely.
4. Pull out both pins of the Paper Holder by turning them gently. Install roll paper by inserting the knobs into the original places. Paper should be placed so that the paper feeds from the bottom of the Roll.
5. Move the Platen Release Lever forward.
6. Insert the end of the paper into the Paper Insertion Opening, then push the Platen Release Lever towards the rear of the Printer. Turn the Paper Feed Knob until the paper appears between the Platen and the Print Head.
7. Pull the Release Lever forward and feed the paper approximately 2". Be sure the paper is straight, then push the Release Lever back.

Note: The TRP-100 can only use roll paper that is not greater than 1.5" in diameter. Radio Shack sells a type of roll paper that is ideal for this Printer.

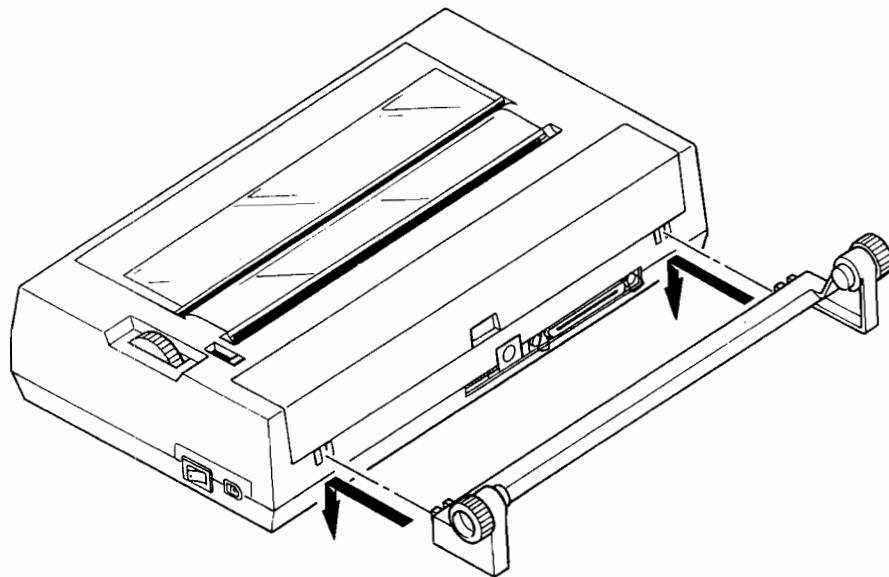


Figure 5A. Installing the Roll Paper Holder

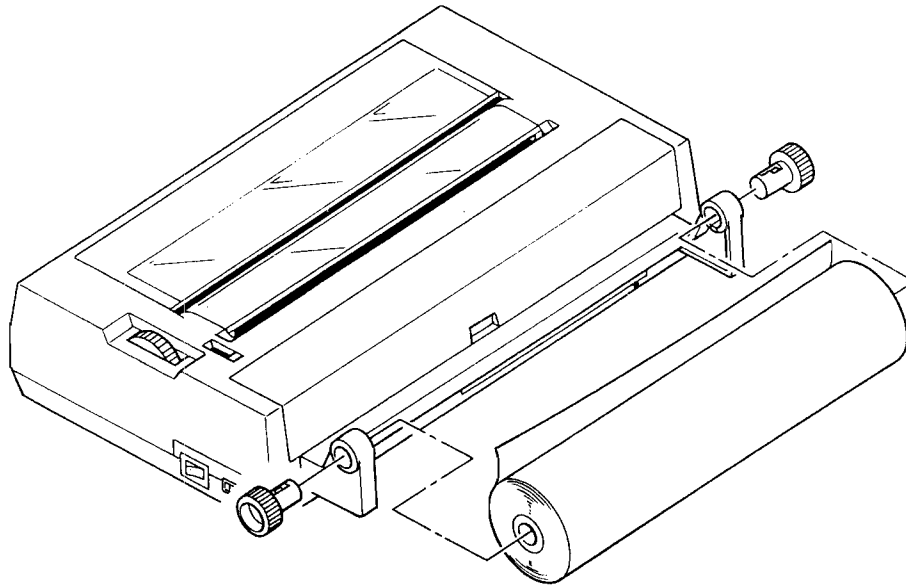


Figure 5B. Installing the Roll Paper Holder

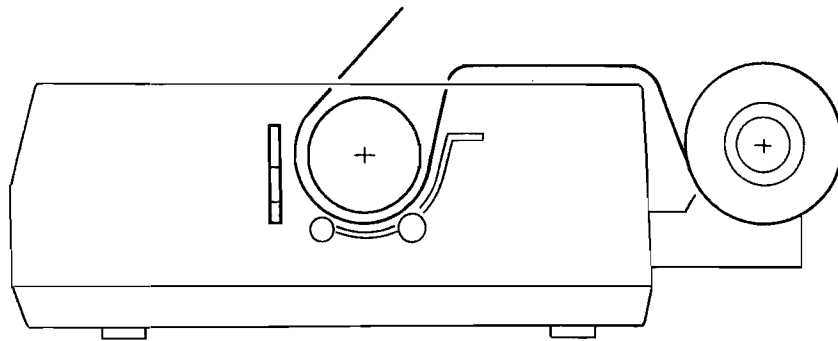


Figure 6. Roll Paper Feeding

Hints and Tips On Single-Sheet Paper and Roll 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 ON-LINE/OFF-LINE Switch and the TRP-100 will continue printing from where it left off, without loss of data in the Printer buffer.
- Remember to set the Platen Pressure Lever toward the rear of the Printer.

Ribbon Installation/Replacement

The Ribbon Cassette must be installed when you use plain paper. Remove it when you use heat-sensitive paper.

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, follow this procedure:

1. Set the Power ON/OFF Switch to OFF. (**Note:** When you turn the power OFF, any information stored in the Printer's buffer will automatically be lost.)
2. Open the Top Cover.
3. Move the Carriage towards the center of the Printer.
4. Gently grasp the Ribbon Cassette and remove the Cassette by lifting it upwards.
5. Unwrap the new Cassette and remove the packing foam. Before inserting the new Cassette, tighten the Ribbon by turning the ribbon wheel of the Cassette with your finger tip and then carefully pull out the Ribbon a little.
6. Engage the ribbon wheel of the Cassette with the Ribbon Drive Shaft on the Carriage while inserting the Ribbon between the Print Head and the Platen; press the Cassette down until it is firmly secured by the **Stopper Claw**.
7. Move the Carriage back and forth manually to check that the Ribbon advances properly. If the Ribbon has not been properly fitted between the Print Head and the Platen, the Ribbon feed will not operate smoothly. (See Figure 7.)
8. Close the Top Cover.

- Note:**
- The ribbon may jam or become entangled if you do any of the following:
 - a) Print directly on the platen without paper. (Be careful when using paper of narrow width.)
 - b) Feed the paper by turning the platen knobs or pull out the paper while printing.
 - c) DIP Switch A-5 is not set to OFF.
 - d) When the ribbon cassette is not set correctly.
 - Make sure all ribbon slack is taken up before reinserting the ribbon cassette after ribbon jamming has occurred.
 - If you wish, you can replace the ribbon only. Ask for Radio Shack Catalog No. 26-1297.

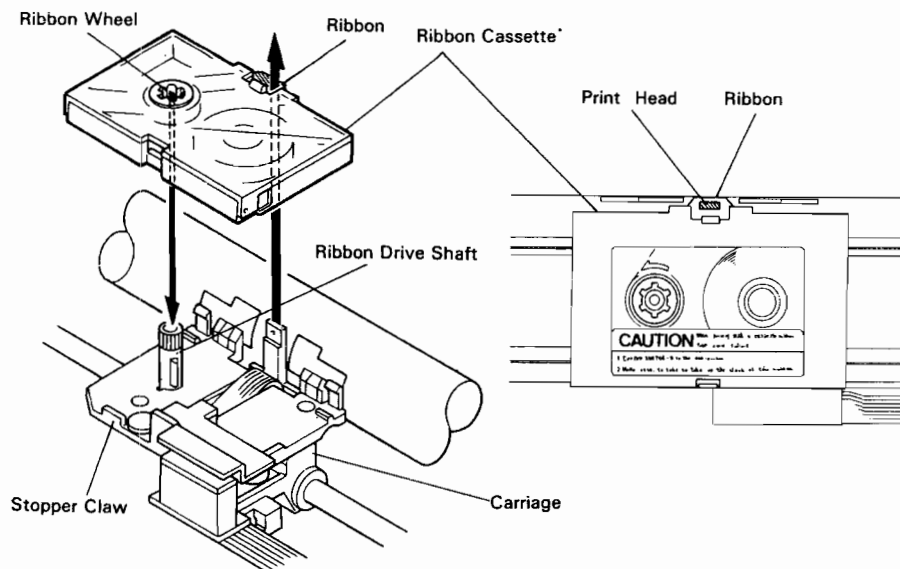


Figure 7. Ribbon Cassette Installation

Setting Print Function Switches (DIP Switches)

There are 12 Switches located on the left rear side of the Printer. These Switches allow you to customize some of the TRP-100 features for your own applications.

For instance, by setting the appropriate Switches before turning the TRP-100's power ON, you can select Tandy Codes/Characters or Codes/Characters for IBM; or you can select plain paper or sensitized paper use. Or, if you begin using the TRP-100 with a Tandy Computer which has serial printer output (such as the Color Computer), turn the power OFF and set the appropriate Switch accordingly.

When you receive the TRP-100, all switches should be set to OFF (i.e., in the up position).

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

Table 1. Functions of DIP Switch A

Switch Number	Function	ON	OFF
A-1	Control Codes	Codes for IBM	TANDY Codes
A-2	CR	CR Only	CR + LF
A-3	Buffer Full (Note 1)	Print Only	Print & Line Feed
A-4	Cancel Code (Note 1)	Invalid	Valid
A-5	Paper	Sensitized Paper	Plain Paper
A-6	Interface (Note 2)	Serial	Parallel
A-7	Character Generator (Note 2) Select Character Set (Note 1)	IBM character Set 1	TANDY character Set 2
A-8	1 Inch Skip Over Perforation (Note 1)	Valid	Invalid

Note 1: Applied for IBM Mode.

Note 2: Applied for TANDY Mode.

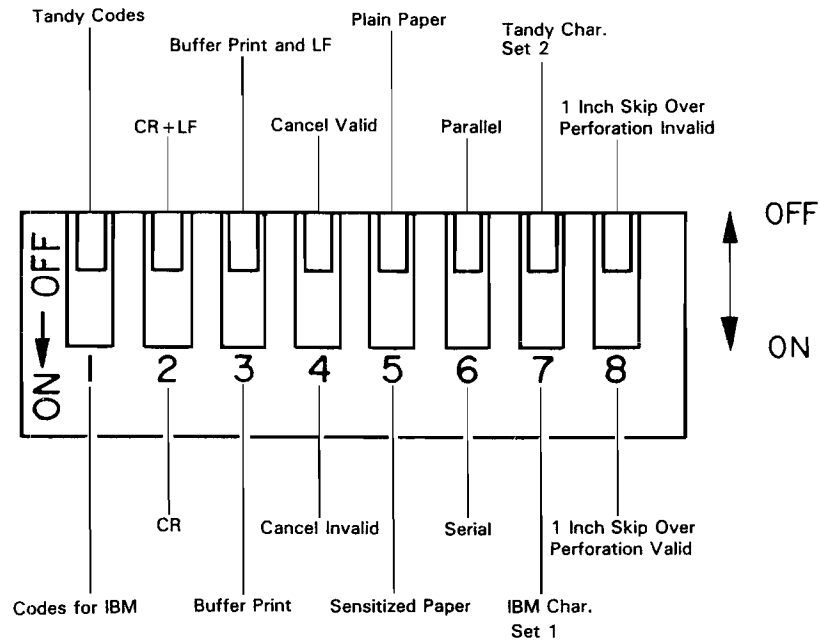


Figure 8. DIP Switch A

Note that TANDY Codes or Codes for IBM are selectable with DIP Switch A-1. If you need IBM compatibility, you can set DIP Switch A-1 to ON.

Table 2. Functions of DIP Switch B

Switch Number	Function	ON	OFF
B-1	Form Length (Note 1)	12 Inches	11 Inches
B-2	Line spacing (Note 1)	1/8 Inch	1/6 Inch
B-3	LF	Print & (LF + CR)	Print & LF
B-4	Intensity (Note 2)	High Intensity	Normal Intensity

Note 1: Applied for IBM Mode.

Note 2: Selection of print intensity. If you are using US Xerography Paper (with ribbon), set DIP Switch B-4 to **High Intensity**.

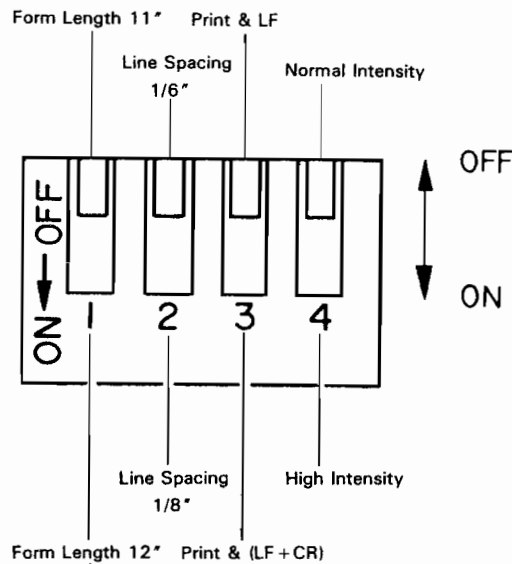


Figure 9. DIP Switch B

Before starting anything, check the following:

- Is the Printer Power ON/OFF Switch set to OFF?
- Don't connect the Printer to the Computer yet.

If you want to power your TRP-100 via the AC Adapter connect the plug to the DC 6V jack on the side of the unit. Then connect the AC power plug of the AC Adapter to a 2-wire, 120 volt, 60 Hz grounded AC outlet (220/240 V, 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 without paper 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. Be sure no paper is loaded.

1. Press and hold the PAPER FEED 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.
2. Press the ON-LINE/OFF-LINE Switch to end the Carriage Movement Test.

Self-Test

The TRP-100 has a **built-in** self-test feature which lets you check printing quality and general printer operation before you connect the Printer to a computer. This is a good time to check that the Print Head is set properly (printing is neither too faint nor smudged) and that the paper is feeding correctly.

The Self-Test will run until you stop it by pressing the ON-LINE/OFF—LINE switch.

To run the Self-Test:

1. Load the paper as described earlier.
2. Press and hold the PAPER FEED 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.
The Printer will begin printing rolling (ASCII 96 char. when setting TANDY char., while all char. when setting IBM char.).
3. Printing will continue until you press the ON-LINE/OFF-LINE Switch.

Connecting the TRP-100 to a Computer

Before making any connections between the Printer and your computer, be sure all units are off!

You must also be sure you have the correct cable for your computer if the TRP-100 is to operate properly. Table 3 describes the printer cables Radio Shack carries; Table 4 provides a quick reference for printer connection locations.

Table 3. Tandy Computer to TRP-100 Cables

TANDY	Cable Number
Model I (Keyboard only)	26-1411 (available through National Parts)
Model I (Exp. Interface)	26-1401
Model II/16/2000/DT-1	26-4401
Model III/4	26-1401
Color Computer	26-3020
Model 100	26-1409

Table 4. Tandy Computer Connection Points

TANDY	Connector
Model I (Keyboard only)	Rear side of Keyboard
Model I (Exp. Interface)	Left side of E.I.
Model II/16/100/2000	Rear Panel of Computer
Model III/4/DT-1	Underneath Panel
Color Computer	Rear Panel of Computer

1. Attach the molded male end of the cable to the connector on the left rear side 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 computer owner's manual for specific instructions.



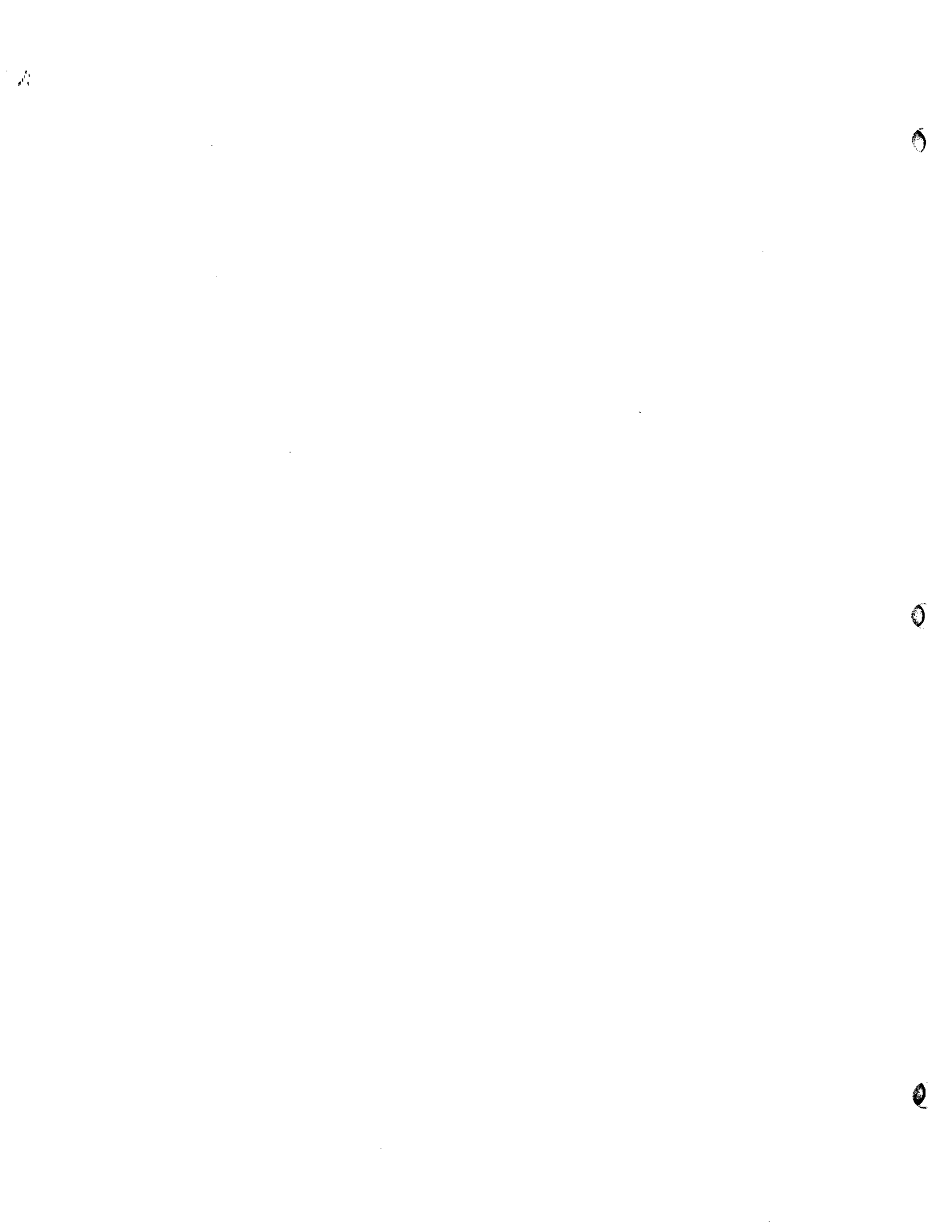
Power-Up Sequence

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

In any event, the Power Lamp will remain lit while the Printer is ON.

It is essential that the Printer remains 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 TRP-100 (General Printer Operation)

The TRP-100 is designed for two distinct applications:

- Character Printing
- Graphics Printing

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

The Character Printing Mode is used for printing characters. In this 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 pitch of the paper feed.

The Print Pitch (character spacing) is determined by the space the TRP-100 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 for Standard printing and 5 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 Graphics Mode, many control codes (which can be used with Character Printing Mode) cannot be used. The TRP-100 doesn't return an error when you send such a code — it simply ignores the code. This includes codes that change line feed pitch. Graphics Mode uses 7/72" line feed to insure full coverage of the paper and 1/72" line feed.

Control Codes

Before investigating the various print modes, consider how the computer 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 C** 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 select print modes, underline, 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 determines 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 Tandy Color Computer, substitute **PRINT #-2**, for **LPRINT**.

For instance, set up the TRP-100 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 **DATA PROCESSING**. 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 TRP-100. The Control Code sequence CHR\$(27);CHR\$(28) means *change the forward line feed to half its normal distance*.

Character Printing Mode

Line Feed commands are not executed immediately in the Character Printing (CP) Mode. The (27 28) sequence didn't cause a Half Forward Line Feed until after the first line was printed. And, in case you missed it, this new Line Feed stays in effect until going into Graphics Mode.

Type: **LLIST** **(ENTER)**

Sure enough. You still have that short Line Feed.

Graphics Mode

Graphics Mode is very different from the Character Printing Mode. For one thing, Graphics Mode accepts only two Line Feed Codes — CHR\$(10) and CHR\$(27);CHR\$(50) (either 7/72" or 1/72" Line Feed). Furthermore, only a few of the Character Printing Mode features are available in the 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 graphic 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 TRP-100 into Graphics Mode. The numbers 128 through 255 are interpreted as dot patterns.

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

Selecting a Print Mode

Table 5 summarizes the Control Codes required to move from one mode to another.

Table 5. Control Codes for Changing Modes

If you're in:	and want to change to:	(Dec.)	Send a CHR\$()	(Hex.)
CP	Graphics	18		12
Graphics	CP	30		1E

Hints and Tips About Print Modes...

Character Printing Mode

- All commands which determine Line Feed pitch are stored in the Printer's memory. They are not executed until a LF code (10 Dec.) is received. Then, the paper advances according to the pitch 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.

Graphics Mode

- Line Feed Codes (10, 27 50 Dec.) are acceptable. The LF Codes cause the paper to move 7/72" and 1/72" forward. No other pitch is allowed.
- Decimal numbers 128-255 sent via CHR\$ in BASIC are interpreted as firing patterns for the Print Head.
- Only a few code sequences are recognized in Graphics Mode.

△

0

0

0

4/Print Font Styles and Character Widths

The TRP-100 has two distinct print (character) font styles:

- Standard
- Block 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; vertical ones don't.

Table 6. Character Widths and Densities

Font Style	Matrix Size	Pitch
Standard	8×9	Normal 10 CPI/Elongated 5 CPI
Block Graphics	6×6	Normal 10 CPI

Standard Character Font Style

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

The width can be elongated (double-width), which gives half as many characters per inch.

Type in this program to see the font style:

```
NEW (ENTER)
110 LPRINT "NORMAL CHARACTER DENSITY"
120 END
```

and then RUN it.

Graphics Characters

The second character set is a 6×6 dot-matrix character set used for Block Graphics printing. The characters are printed in Normal 10 CPI width. This set is not fully compatible with the screen graphics of most Tandy computers; it is a unique character set.

A 6×6 dot-matrix character set is available in Normal 10 or 5 CPI character condition.

To see how the various character widths affect the Graphics characters, type:

```
110 LPRINT "GRAPHIC CHARACTER"
120 FOR I=224 TO 254: LPRINT CHR$(I);: NEXT I
130 LPRINT: STOP
```

and RUN the program.

Since the normal line-to-line spacing is 1/6" or 12 dots high and the Graphics characters are 6 dots high, 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 it.

```

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

Wrap-Around

The TRP-100 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 numbers of addressable dots-per-line in the Character Printing Mode is 960.

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

Elongated Characters

The character font style can be elongated to twice the normal width.

Table 7. Elongated Printing

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

The start (27 14) and end (27 15) codes for Elongated characters 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)
130 LPRINT CHR$(27);CHR$(15):STOP
and RUN the program.

```

5/General Control Codes

Line Feed Codes (LF)

When a LF (ASCII 10) code is received by the TRP-100, all data in the Printer buffer is printed followed by a Line Feed. Unless you tell it otherwise, the TRP-100 uses 1/6" Forward Line Feed when advancing paper. If DIP Switch B-2 is ON, the pitch is set to 1/8".

Pitch settings are sent to the TRP-100 in a two-code sequence. First, a Control Code 27 is sent (CHR\$(27)). This tells the TRP-100 that a special code sequence will follow. The next number determines the specific pitch. These Control Codes are listed in Table 8.

Table 8. Line Feed Control Codes

Send CHR\$():		To:
(Dec.)	(Hex.)	
27 28	1B 1C	1/2 Forward LF (1/12")
27 54	1B 36	Full Forward LF (1/6")
27 56	1B 38	3/4 Forward LF (1/8")

Hints and Tips on Line Feed.....

- In the Character Printing Mode, codes are stored in the Printer buffer. They are not activated until a LF code is sent.
- Line Feed Pitch codes have no effect in the Graphics Mode. The Line Feed is set at 7/72" forward.

Special Line Feed Control Codes

Table 9. Special Line Feed Control Codes

Send CHR\$():		To:
(Dec.)	(Hex.)	
27 50	1B 32	1/12 Forward Line Feed (1/72")
27 91 n	1B 5B n	Set n/72" Forward Line Feed

1/12 Forward Line Feed:

This code operates the same, regardless of the current print mode (CP or Graphics).

- This causes an immediate dump of the Printer buffer followed by a Line Feed, regardless of the print mode.

n/72" Forward Line Feed:

This code is effective only in CP Mode.

- When a CHR\$(27);CHR\$(91),CHR\$(n) is received by the TRP-100, no Line Feed occurs at that time but it is stored in the Printer buffer. The n/72" Forward Line Feed will be executed with the reception of the Line Feed code (LF = 10). n is a value between 1-85.

Carriage Return (CR)

A CR (13) code tells the Printer to print the current buffer contents, and then performs a Carriage Return.

If DIP Switch A-2 is OFF, one line feed (the current active line feed) will be performed at that time. If the Switch is ON, a line feed is not activated and printing continues on the current line.

Setting Top-of-Form and Form Length

The Control Code CHR\$(27);CHR\$(52) is used to set the Form Length. It resets the Line Feed counter to zero and sets the current line as the Top-of-Form position. The line length per page is set to n to be used with the Form Feed code. Whenever any Line Feed operation is activated, Line Feed pitch is counted up and compared with n .

On initial power-up, the TRP-100 sets the Top-of-Form at the current paper position and the Form Length is set to 66 lines per page (when DIP Switches B-1 and B-2 are both set to OFF). Be sure the paper is properly positioned before you turn on the Printer.

Note that the combination of DIP Switches B-1 and B-2 allows the following Form Length:

Table 10. Form Length

SWB-1	SWB-2	Form Length
OFF (11")	OFF (1/6")	66 lines
	ON (1/8")	88 lines
ON (12")	OFF (1/6")	72 lines
	ON (1/8")	96 lines

Form Feed (FF)

When a 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, sending 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 a **POKE** or **OUT** statement to send a FF code directly to the Printer and bypass the interceptor.

Important Note: Do not use CHR\$(12) except for graphics 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 mode are either ignored or printed with the symbol X which represents an invalid code.

There are several reasons why 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 Graphics Mode, sending a CHR\$(18) (used to enter Graphics Mode) is useless. And there are many ASCII control codes in the range 0 to 31 that the TRP-100 simply doesn't recognize. ASCII 0, for example, is not used in either print mode.

The following table summarizes the undefined codes:

Table 11. TRP-100 Ignored Control Codes

Both Modes:

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

CP Mode: 0, 1, 30, 127

Graphics Mode:

All codes in the range 0-127 are ignored, except (10), (12), (13), (27 32), (30), (27 16 n1 n2), (27 52) and (28 n1 n2).

Codes printed as X

CP Mode only:

- All codes from 2-31 and 128-159, except the active function codes or the above ignored codes.
-

TRP-100 Buffer Operation

The TRP-100's ability to temporarily store data is one of its main advantages over a typewriter. Codes sent to a typewriter (i.e., keys pressed) are transferred immediately to the paper. Codes sent to a Printer are not printed immediately; they are stored in a separate section of memory in the Printer called the buffer. When the buffer fills, or certain codes are received (e.g., LF or CR), the buffer is emptied and all data is then printed on the paper. What happens after the buffer data is printed depends on the circumstances. In some cases, printing continues on the same line; in others, the Print Head is moved to a different position relative to the paper.

In the CP 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 use their TRP-100 to its greatest capacity.

Hints and Tips on the TRP-100 Buffer....

For CP and Graphics Modes:

- The buffer allocates a fixed number of dots, depending on the character width selected. The buffer is emptied when the data stored equals that number.
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 Carriage Return code (CR = 13 decimal) automatically activates printing (assuming at least one character code is already in the buffer).
If Carriage Return only has been selected via hardware, the Print Head is moved to the beginning of the current line and the next full buffer will print over the current line. Otherwise, subsequent characters will be printed at the start of the next print line.
- The Line Feed codes (LF = 10 and 1/12 Forward Line Feed (27 50)) automatically activate printing, and 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 Dot 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.
- When the buffer is full, the buffer is printed. Printing continues from the current position.

CP Mode only:

- Dot graphics printing continues from the current character position.

Graphics Mode only:

- When the **End Graphics Mode** command is received, the buffer is printed. The Printer returns to the CP Mode and printing continues in the same line from the current print position.

Note: Repeat data can cause a buffer full or overflow condition, as well as single characters.

6/Character Printing Mode

Superscript and Subscript

When the sequence CHR\$(27);CHR\$(83);CHR\$(n) is received, print data following this code is printed in Super-/Subscript Mode until a CHR\$(27);CHR\$(88) is received.

If n equals 0 (27 83 0), Superscript characters are printed on the upper half of a line. While, if n equals 1 (27 83 1), Subscript characters are printed on the lower half of a line.

- Super-/Subscript characters are one half the height of Normal characters, but they are the same width.
- The line which contains a Super-/Subscript character will be printed unidirectionally in two passes.

Table 12. Superscript and Subscript

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

For example, type in this program:

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

In this program, lines 10 and 30 turn on the Superscript and Subscript, and line 50 turns off the Super-/Subscript.

Repeat Printing

The TRP-100 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. (Up to 255. If the number is 0, the repetition number is regarded as 256.)
- The code to be repeated.

Type in this new program:

```
10 E$=CHR$(27)+"S"  
20 D$=CHR$(1): U$=CHR$(0)  
30 EN$=CHR$(27)+"X"  
40 LPRINT " /"E$U$;CHR$(28);CHR$(11);CHR$(241)
```

Code 241 is from the Graphics character set.

```
50 LPRINT EN$; CHR$(92);"/ (X";  
60 LPRINT E$D$"1"EN$+"X";  
70 LPRINT E$D$"2"EN$)";  
80 LPRINT E$U$"2"EN$
```

Now RUN the program.

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 the Character Printing Mode, send the TRP-100 a CHR\$(15). All text that follows this code will be underlined until you send a CHR\$(14) which stops underlining.

Underline is accomplished by track 9 of the Print Head to create a continuous unbroken line.

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

If you enter Graphics Mode while the Printer is in an underline-selected condition, when you return to the Character Printing Mode, the designation of underline is the same as it was before entering Graphics Mode.

Table 13. Underline Printing

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

For example, type in this short program:

```
10 LPRINT CHR$(30);:REM DATA PROCESSING  
20 LPRINT CHR$(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 position sequence. The characters stored in ROM can use the half step positions — you can't.

Using the Normal character sets (10 CPI), there are 960 dot positions per line, but only half (480) are accessible by you.

Table 14. TRP-100 Print Head Positioning

Character width	Dots-per-Line	Available Columns
Normal	960	480

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

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

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

1. Send a CHR\$(27);CHR\$(16) to tell the Printer you want to position the Print Head to print a specific dot column.
2. 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.
3. Tell the Printer what you want to print.

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

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

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

Table 15. Print Head Positioning

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

Remember! You can access dot columns up to 479 ($n1 = 1$, $n2 = 223$).

Why two numbers ($n1$ and $n2$)? The maximum value you can send to the TRP-100 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 TRP-100 is interpreting these two numbers as a single 9-bit (b(0)-b(8)) value. The lower bit of $n1$ is used as b(8).

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

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

and RUN the program.

Whoops! The asterisk printed at 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$(1);CHR$(218);"*"
```

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

Position is a little like a TAB, but it gets right down to the dot level, giving you much finer control. Although it is available in both modes, its potential is greatest in Graphics Mode.

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

```
10 LPRINT CHR$(27);CHR$(28);
20 FOR I=1 TO 150
30 LPRINT CHR$(27);CHR$(16);CHR$(0);
CHR$(150+I*SIN(I/5));
40 LPRINT "*"
50 NEXT I
```

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

Printing Directions

In the Character Printing Mode, either bidirectional or unidirectional printing is selectable. At power ON, bidirectional printing is selected initially. If you need to select unidirectional printing, send the sequence CHR\$(27);CHR\$(85);CHR\$(1). To end unidirectional printing, send the sequence CHR\$(27);CHR\$(85);CHR\$(0).

Bidirectional printing is available only when you use sensitized paper (DIP switch A-5 set to on). When you use plain paper with the ribbon, you may not use bidirectional printing (or ribbon may get jammed). Be sure you set DIP switch A-5 to OFF when you use plain paper. This switch position disables the control code sequence 27 85 0 and 27 85 1.

Table 16. Printing Direction Control Codes

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

Horizontal Tab

The TRP-100 may skip to the next Horizontal Tab position when the Horizontal Tab Code (09) is received. Horizontal Tab position can be set by the Horizontal Tab Set command.

At power ON, Tabs are set at every 8 columns.

If no Tab is set in a line, reception of the Horizontal Tab Code will cause the Printer to print out the current line and perform CR and LF.

Table 17. Horizontal Tab

(Dec.)	Send CHR\$(): (Hex.)	To:
09	09	Horizontal Tab
27 68 n1 n2....nk 0	1B 44 n1 n2....nk 0	Set Horizontal Tab

Set Horizontal Tab:

This command sets the Horizontal Tab position according to the data $n1$ $n2$ nk .

Each n indicates a tab set position in the number of characters from the left margin.

The character size is the same as that of the normal font characters. n should be a number between 1-80. Up to 28 tab positions can be set; that is, "k" can be 28.

When you use elongated characters, the tab set position is also "elongated."

This sequence should be terminated by a Null code (0).

Type:

```
10 LPRINT CHR$(27);CHR$(68);CHR$(1);CHR$(10);
CHR$(20);CHR$(0);
20 LPRINT CHR$(9);"1";CHR$(9)"10";CHR$(9);"20"
30 END
```

Line 10 sets tabs at columns 1, 10, and 20. Line 20 executes the tab setting designated in line 10, printing the characters 1, 10, and 20 in their respective columns.

Skip Perforation

The Set Skip Perforation code (27 72 n) sets the Skip Perforation zone to a specific number of lines (n) from the bottom of the form.

- If the value of n is already set, the Printer automatically skips the designated area when printing.
- If n extends the form length, this sequence will be ignored.
- At power ON, n is set to 0 or 1 automatically.

For IBM

- The Set Skip Perforation Code (27 78 n) sets it, if IBM mode.

Table 18. Skip Perforation

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

Note: For the control codes that require number parameters (CHR\$(*m*)), some numbers may be interpreted differently. For example, if you want to repeat a certain character nine times, CHR\$(28) CHR\$(9) does *not* cause a 9-time repeat; CHR(9) is interpreted as a TAB code. In a case like this, simply split the number data into two parts. LPRINT CHR\$(28) CHR\$(5) "A"; LRPINT CHR\$(28) CHR\$(4) "A" will print 'A' 9 times.

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 TRP-100 allows you to have direct, programmable control over all of the available graphic dots.

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

That means you can specify any one of up to 3,360 individual dots ($7 \times 480 = 3360$).

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 CHR\$(18) to put the TRP-100 into Graphics Mode.
2. Send a CHR\$(27);CHR\$(16) to tell the Printer you wish to position the Print Head to print a specific dot.
3. Tell the Printer in which dot column you wish to print. This is a little more complicated and will be explained shortly. For now, just understand that you simply tell the Printer which dot column you want.
4. Tell the Printer what you want to print. You can do this a number of ways. Again, this will be explained in more detail shortly. For now, just keep this overall procedure in mind.

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

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

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

Table 19. Graphic Dot Positioning

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

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

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

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

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

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

In line 10, CHR\$(18) puts the Printer into Graphics Mode and, in line 20, CHR\$(27);CHR\$(16) tells it to get ready to position the Print Head. (Note that CHR\$(0) is necessary.)

Try this line to print a vertical bar at the rightmost available dot column — 479.

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

What happens is:

- CHR\$(18) puts the Printer into Graphics Mode.
- CHR\$(27);CHR\$(16) tells the TRP-100 to get ready to position the Print Head.
- CHR\$(1) tells the Printer that the position will be greater than 256.
- CHR\$(223) specifies the last available dot column.

Note: If you used CHR\$(224) in this line instead of CHR\$(223), the TRP-100 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 TRP-100 what to print once the Head is positioned.

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

Look back at the sample programs used when we talked about Dot 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 (479):

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

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

Even though the 7 dots in a dot column are in a vertical row, they are not numbered sequentially down from 1 to 7. Table 20 describes the numbering system you must use with the TRP-100 when specifying an individual dot:

Table 20. TRP-100 Addressable Dot Numbering System

Dot #:	Dot:	Number You Must Use To Print the Dot:
1	•	129
2	•	130
4	•	132
8	•	136
16	•	144
32	•	160
64	•	192

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

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

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

That's actually quite simple, too.

1. Specify the Dot # (1-64, see Table 20) that represents the individual dots you want to print.
2. Add those individual Dot #'s together.
3. Add the sum of the combined Dot #'s to 128.

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

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

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

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

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

```
10 LPRINT CHR$(18);CHR$(27);CHR$(16);CHR$(0);
CHR$(189);CHR$(255);CHR$(201);CHR$(201);CHR$(201);
CHR$(201);CHR$(255);
```

Now to flex our muscles.

Type in:

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

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

This program alternately adds and subtracts powers of 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. A Line Feed code (10) advances the paper 7 dots or approximately 0.1 inch. This small paper advance allows for continuous printing without unwanted space between lines. 1/12 Forward Line Feed is also provided in Graphics Mode.

Modify the current program to demonstrate this fixed Line Feed. Add or change:

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

and RUN the program.

These lines infiltrate the current loop and produce a mirror image of the first pass of the Print Head. The LPRINT in line 110 causes the Line Feed between passes.

Repeat Function

CHR\$(28) will tell the TRP-100 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 the program.

Leaving Graphics Mode

CHR\$(30) is used to exit Graphics Mode. It returns the TRP-100 to the CP Mode. In addition, all the previous conditions, such as underline and character style, are restored.

Mixing Modes on the Same Line

The fact that character density is unaffected as the TRP-100 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.

Freehand Drawing

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. Freehand drawings, on the other hand, require translating the figure into a matrix of dots, then calculating the dot printing combinations for each Print Head position. Since there are 7 dots available for graphics, separate the matrix into rows 7 dots high.

The numbers can be stored in DATA statements. To conserve memory and typing time, store the data as numbers from 0 to 127, then add 128 as you send them to the Printer. Enter these sample DATA lines:

```
NEW (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 "TRP100"
```

Now RUN the program.

Not much to brag about yet. Maybe what it needs is to be jazzed up to repeat a number several times. A good approach is to use negative numbers to indicate the number of repetitions followed by the number to be repeated. Add:

```
125 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
```

In line 125, the sequence -4,66 is used to mean four 66s: 66,66,66,66. You must modify the program to recognize the negative numbers. Change:

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

and RUN the program.

The figure still 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
```

RUN the program.

Now that's worth the effort!

8/IBM Emulation Mode

Description of the IBM Emulation Mode

The TRP-100 has two different control code sets — one is the original TRP-100 Tandy code set, and the other is an IBM 80 CPS Graphics Printer code set. These two code sets are independent from each other.

Code Set Selection

The IBM Emulation Mode is provided so that the IBM code set can be utilized. You can select the IBM Mode by setting DIP Switch A-1 to ON, and then turning the power ON.

Character Set Selection

Two different character sets (not character styles) are also provided in the TRP-100 — one is the Tandy character set (96 ASCII + 64 European characters + 30 Block Graphics), and the other is the IBM character set (refer to Appendix C). Setting DIP Switch A-7 to OFF selects the Tandy character set, while setting this Switch to ON selects the IBM character set.

Carriage Return

Code CHR\$(13) prints the buffer contents and then moves the printing position to the leftmost dot position. A Line Feed is executed if DIP Switch A-2 is set to OFF (CR with LF).

Vertical Formatting Control Codes

Setting the Line Feed Pitch

The LF Pitch is set to 1/6 inch or 1/8 inch (designated by DIP Switch B-2) at Power ON. You can change the pitch by sending the code sequence CHR\$(27);“0”, CHR\$(27);“1” or CHR\$(27);“A”.

1/8 Inch Line Feed:

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

7/72 Inch Line Feed:

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

Variable Line Feed

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

Useful Hint: If you want to return the LF pitch to 1/6 inch (for example, line spacing has been set to 7/72 inch for Graphics Mode), send only the control code CHR\$(27);“2” (without the CHR\$(27); “A” command). The LF pitch will return to 1/6 inch.

Set the Variable Pitch Line Feed

The control code `CHR$(27);"A";CHR$(n)` defines the line feed pitch in increments of 1/72 inch. *n* is a single byte decimal number and can represent any value between one and 85. For Graphics, line spacing can be set to 7/72 inch, by designating *n* as 7.

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

Enter the following program, and then RUN it.

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

The LF pitch is changed to 1/12 inch.

Execution Command for Line Feed

Line Feed

The code `CHR$(10)` prints out the character and feeds the paper one line. The paper feed distance is specified by the Function Switch or the line spacing set commands (mentioned above).

This command will also terminate a double-width print mode.

Setting Top-of-Form and Form Length

The Form Length can be changed at any time. The control code `CHR$(27);"C";CHR$(n)` sets the number of lines per page, and the control code `CHR$(27);"C";CHR$(0);CHR$(m)` sets the number of inches per page. *n* is a single byte decimal number and can represent any value between one and 127. *m* is also a single byte decimal number and can represent any value between one and 22. The Top-of-Form position is set at the current line after a Form Length Set command is executed.

Note: The printing area on the form is counted by lines; the actual length will vary according to the Line Feed pitch selected (1/8", 1/6" or n/72").

Form Length is set to 11 or 12 inches (selected by Function Switch 2-1) at power ON.

Vertical Tabulation

The vertical tabulation code `CHR$(11)` will only perform the same function as the line feed code `CHR$(10)`, Vertical Tabulation is not accepted.

Form Feed

When control code `CHR$(12)` is issued, the TRP-100 prints out the Printer buffer contents and feeds the paper to next Top-of-Form position.

Skip Perforation

The Skip Perforation function can be set by the `CHR$(27);"N";CHR$(n)` command. *n* is a single byte decimal number and can represent any value between one and 127. This function is terminated by the `CHR$(27);"0"` command or the Form Length Set command.

Note: If the number designated by n causes the page length to be exceeded, only one line is printed on a page.

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

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

The 61st line will be printed on the next page without issuing a Form Feed command.

Horizontal Formatting Control Codes

Horizontal Tabulation

With Horizontal Tabulation, you can easily place and format sections horizontally aligned. The maximum 28 horizontal TAB stops can be set to any column (left margin is column 0) via the following control codes:

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

n means the horizontal column position and can represent columns 1 through 80, then column positions should be designated in ascending order. Send Null code (CHR\$(0)) to terminate the horizontal TAB designation. Once set, send Control Code CHR\$(9) to skip to the next right Tab position. The Horizontal Tab position is affected by the Printing Mode. Therefore, during Double-Width Print mode, the Horizontal Tab position is shifted.

- Note:**
- When a Tab stop is not set, Control Code CHR\$(9) is ignored.
 - During Horizontal Tab setting, if Tab stops are not entered in ascending order, or if the total number of Tabs is more than 28, this procedure should be terminated and begun again.
 - All the Tabs which were previously set are cleared by designating new Tab positions.
 - Horizontal Tab stops are set at every 8 characters (standard) when the Printer's power is turned ON.

Home Head

The Print Head will return to the left margin to print a line after receiving the code sequence CHR\$(27);CHR\$(60). This will occur for one line only.

Print Mode Control

In IBM Emulation Mode, you can print Elongated Characters, Super- or Subscript, and so on. These styles can be used to print a title or highlight effectively in the Character Printing Mode.

Double-Width Printing

In Double-Width printing mode, the width of a printed character is doubled; horizontal Tabs and spaces double their pitches. Double-Width printing can be executed with CHR\$(14) or CHR\$(27);CHR\$(14) or CHR\$(27);"W";CHR\$(1).

When it is established with CHR\$(14) or CHR\$(27);CHR\$(14), it is released with CHR\$(20) or a Line Feed; when it is established with CHR\$(27);"W";CHR\$(1), it is released with CHR\$(27);"W";CHR\$(0) only.

For instance, enter the following program:

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

and RUN it. **TITLE** is printed in Double-Width character mode, but **TEXT PRINTING** is not, since LF took place at the end of line 10. Compare this with the following program.

```
10 LPRINT CHR$(14);"W";CHR$(1);"TITLE"  
20 LPRINT "TEXT PRINTING"
```

Superscript/Subscript

In IBM Emulation Mode, you can print Superscript and Subscript characters. In Superscript Mode, characters are printed on the upper half of a normal line, and in Subscript Mode, characters are printed on the lower half of normal line. The Superscript Printing Mode is established by CHR\$(27);"S";CHR\$(0), and the Subscript Printing Mode is established by CHR\$(27);"S";CHR\$(1); both modes can be cancelled by CHR(27);"T".

This function is useful for printing algebraic expressions.

For an example of Superscript/Subscript, try the following program:

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

Underlining

In the Underline Mode, all characters and spaces, except Bit Image Data and Graphic Symbols, are underlined.

This mode is established by CHR\$(27);"-";CHR\$(1), and cancelled by CHR\$(27);"-";CHR\$(0).

Enter the following program:

```
10 LPRINT "This function can print"  
20 LPRINT CHR$(27);"-";CHR$(1);"Underline";  
CHR$(27);"-";CHR$(0);  
30 LPRINT " with text automatically"
```

and RUN it.

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

Bit Image Mode

There are two kinds of Bit Image Mode available with the TRP-100 — 480 and 960. One vertical line of Dot Image consists of 8-bit data. Each mode has its particular horizontal dot density; the maximum number of bits per line in each mode is as follows:

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

480 Bit Image Mode

In 480 Bit Image Mode, the horizontal dot (bit) density is 1/60 inch. The code sequence for this mode is as follows:

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

The combination of $n1$ and $n2$ determines the number for the horizontal dot position. $n1$ and $n2$ are both single byte decimal numbers; $n1$ is the lower part of the value and $n2$ is the upper part of the value.

Therefore, the actual value is $n1 + 256 \times n2$. The total data number ($n1$, $n2$) should not exceed 480. $d1$ to dn indicate the dot pattern per vertical line in single byte decimal numbers. Unlike in the TRS mode, the dot patterns are numbered from bottom to top.

- 128 •
- 64 •
- 32 •
- 16 •
- 8 •
- 4 •
- 2 •
- 1 •

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

960 Bit Image Mode, Normal Speed

In 960 Bit Image Mode, the dot density is equally 1/120 inch.

The code sequence for this mode is as follows:

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

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

Other Control Codes

Paper End Detection

A FAULT signal is sent to the Interface when a Paper End condition is detected. By combining the FAULT signal with the Override function, the last printable line on the paper can be printed without causing a device fault on the external terminal.

The FAULT signal can be turned ON or OFF; it is inhibited by CHR\$(27);"8" (Ignore paper End), and is made available by CHR\$(27);"9" (Cancel Ignore Paper End).

Cancel

The Cancel command CHR\$(24) clears any data in the Print Buffer; the control codes that were received before this command was issued remain in effect.

Unidirectional Printing

Usually, the TRP-100 executes printing by using a Bidirectional Logic-Seeking Technique when you use sensitized paper, but the Printer allows you to print by using the Unidirectional printing method to avoid slight vertical misalignment. By using this printing method, you can print a chart or a graph perfectly. This function is executed by `CHR$(27);"U";CHR$(1)`, and cancelled by `CHR$(27);"U";CHR$(0)`.

When you only need to print a few characters in the Unidirectional Mode, printing other characters in the Unidirectional Mode when it is not really necessary decreases the output of this Printer. Use the code `CHR$(27);` to print only the required characters in the Unidirectional Mode. This code is cancelled by `CHR$(13)`, so only one of the following lines is printed Unidirectionally.

L

Appendix A/Control Code Summary

1. TRS Codes

Code Dec.	Code Hex.	Character Printing Mode	Graphics Mode	Remarks
00	00	Ignored	Ignored	
01	01	Ignored	Ignored	
10 or 138	0A or 8A	Executive Line Feed (Execute LF in accordance with information latched)	1/72" Line Feed (Executive) 8A hex - Printing data	
12	0C	Form Feed	Form Feed	
13 or 141	0D or 8D	Carrriage Return (When NL, LF pitch is latched one.)	Carrriage Return (When NL, LF pitch is 1/72" per line.) 8D hex - Printing data	NL/CR Code Selectable
14	0E	End Underline	Ignored	
15	0F	Start Underline	Ignored	
18	12	Select Bit Graphics Mode	Ignored	
30	1E	Ignored	End Graphics Mode	
27 14	1B 0E	Start Elongation	Start Elongation	
27 15	1B 0F	End Elongation	End Elongation	
27, 16 <i>n1, n2</i>	1B, 10 <i>n1, n2</i>	Dot Positioning (<i>n1, n2</i> indicate dot position from Home position.)	Dot Positioning (<i>n1, n2</i> indicate dot position from Home position.)	<i>n1, n2:</i> Binary value ***
27 28	1B 1C	Set Half Forward Line Feed (No motion)	Ignored	
27 50	1B 32	1/12 Forward Line Feed (1/72") (Executive)	1/12 Forward Line Feed (1/72") (Executive)	
27 52 <i>n</i>	1B 34 <i>n</i>	Set Form Length	Set Form Length	
27 54	1B 36	Set Full Forward Line Feed (No motion)	Ignored	

Code Dec.	Code Hex.	Character Printing Mode	Graphics Mode	Remarks
27 56	1B 38	Set 3/4 Forward Line Feed (No motion)	Ignored	
27 72 <i>n</i>	1B 48 <i>n</i>	Set Skip Perforation	Ignored	
27 83 00	1B 53 00	Set Superscript	Ignored	
27 83 01	1B 53 01	Set Subscript	Ignored	
27 85 00	1B 55 00	End Unidirectional Printing	Ignored	
27 85 01	1B 55 01	Start Unidirectional Printing	Ignored	
1B 88	1B 58	End Super-/Subscript	Ignored	
27 91 <i>n</i>	1B 5B <i>n</i>	Set <i>n</i> /72" Forward Line Feed (No motion)	Ignored	
28 <i>n1</i> <i>n2</i>	1C <i>n1</i> <i>n2</i>	Repeat Print Data (Undefined Code is changed to X)	Repeat Print Data (If MSB of <i>n2</i> =0, Data is ignored.)	
127 255	7F FF	Ignored	Ignored (Printing Data)	
Other Codes in Function Area (02 to 31 dec.) (02 to 1F hex.)		Prints X	Ignored	
Other Codes in Function Area (128 to 159, 192 to 223 dec.) (80 to 9F, C0 to DF hex.)		Prints X	(Printing Data)	

2. Codes for IBM

Code Dec.	Code Hex.	Code ASCII	Function	Remarks
00	00	NULL	Null	
09	09	HT	Horizontal Tab	
10	0A	LF	Line Feed	
11	0B	LF	Line Feed	
12	0C	FF	Form Feed	
13	0D	CR	Carriage Return	Performs CR + LF. CR only is selectable by DIP Switch A-2.
14	0E	SO	Start Double-Width	
20	14	DC4	End Double-Width	
24	18	CAN	Cancel	Clears Printer buffer. DIP Switch Selectable.
27 14	1B 0E	ESC SO	Start Double-Width	
27 45 00	1B 2D 00	ESC — NULL	End Underline	
27 45 01	1B 2D 01	ESC — SOH	Start Underline	
27 48	1B 30	ESC 0	1/8" Forward Line Feed	
27 49	1B 31	ESC 1	7/72" Forward Line Feed	
27 50	1B 32	ESC 2	1/6" Forward Line Feed or execution command for ESC A	
27 54	1B 36	ESC 6	Select Character Set 2	
27 55	1B 37	ESC 7	Select Character Set 1	
27 56	1B 38	ESC 8	Ignore Paper End	

Code Dec.	Code Hex.	Code ASCII	Function	Remarks
27 57	1B 39	ESC 9	Cancel Ignore Paper End	
27 60	1B 3C	ESC <	Home Head	
27 65 <i>n</i>	1B 41 <i>n</i>	ESC A (<i>n</i>)	Set <i>n/72</i> Forward Line Feed (No motion)	
27 67 <i>n</i>	1B 43 <i>n</i>	ESC C (<i>n</i>)	Set Form Length (No motion)	Set number of lines
27 67 00 <i>m</i>	1B 43 00 <i>m</i>	ESC O NULL (<i>m</i>)	Set Form Length (No motion)	Set in inches
27 68 <i>n1</i> <i>n2</i>	1B 44 <i>n1</i> <i>n2</i>	ESC D (<i>n1</i>) (<i>n2</i>)	Set Horizontal Tab (No motion)	
27 75 <i>n1</i> <i>n2</i>	1B 4B <i>n1</i> <i>n2</i>	ESC K (<i>n1</i>) (<i>n2</i>)	480 Full Dot Bit Image Graphics Mode	
27 78 <i>n</i>	1B 4E <i>n</i>	ESC N (<i>n</i>)	Set Skip Perforation	
27 79	1B 4F	ESC O	Cancel Skip Perforation	
27 83 00	1B 53 00	ESC S NULL	Set Superscript	
27 83 01	1B 53 01	ESC S SOH	Set Subscript	
27 84	1B 54	ESC T	Cancel Super-/Subscript	
27 85 00	1B 55 00	ESC U NULL	End Unidirectional Printing	

Code Dec.	Code Hex.	Code ASCII	Function	Remarks
27 85 01	1B 55 01	ESC U SOH	Start Unidirectional Printing	
27 87 00	1B 57 00	ESC W NULL	End Double-Width	
27 87 01	1B 57 01	ESC W SOH	Start Double-Width	
27 89 <i>n1</i> <i>n2</i>	1B 59 <i>n1</i> <i>n2</i>	ESC Y (<i>n1</i>) (<i>n2</i>)	960 Half Dot Bit Image Graphics Mode	



Appendix B/Interface

Parallel Interface

Interface Connector

Type 36-Pin Receptacle (with Bail Lock)

Model 552742-1 or equivalent

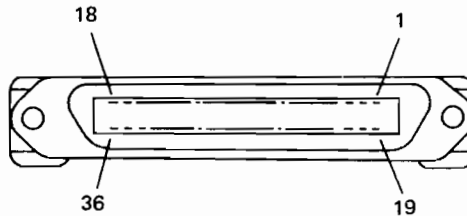
Manufacturer AMP or equivalent

Allowable Cable Length

Twisted Pair Cable up to 5 m

Flat Cable up to 2 m

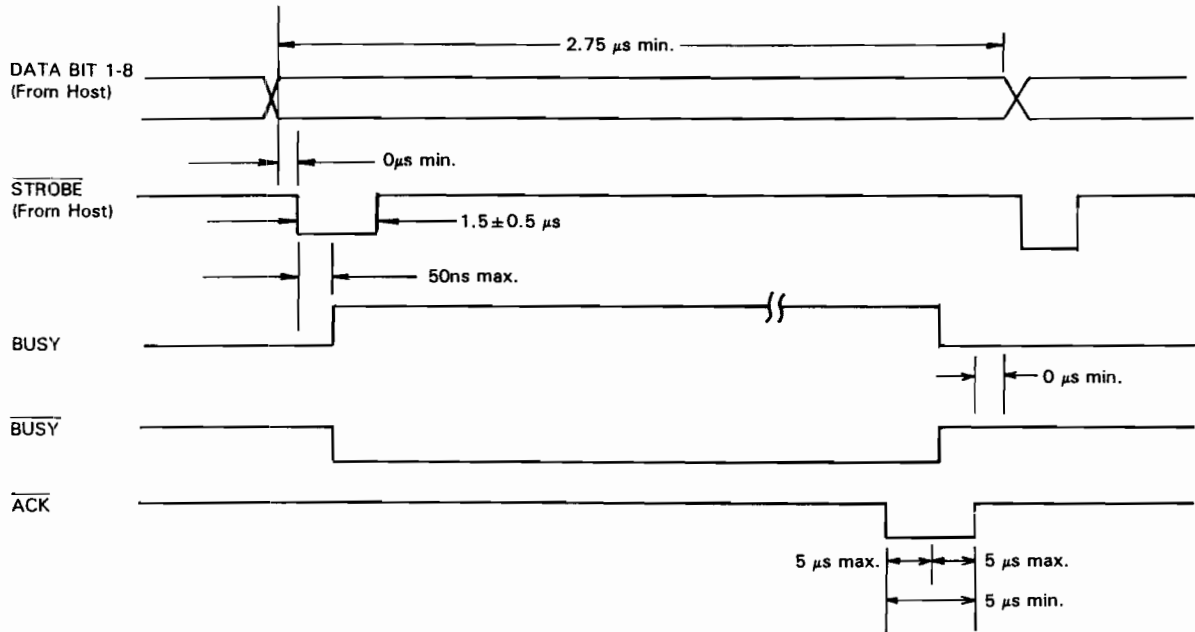
Pin Assignment



Signals

Signal Pin	Name of Signal	Signal Pin	Name of Signal
1	STROBE	19	0 V (Return for 1)
2	DATA1	20	0 V (Return for 2)
3	DATA2	21	0 V (Return for 3)
4	DATA3	22	0 V (Return for 4)
5	DATA4	23	0 V (Return for 5)
6	DATA5	24	0 V (Return for 6)
7	DATA6	25	0 V (Return for 7)
8	DATA7	26	0 V (Return for 8)
9	DATA8	27	0 V (Return for 9)
10	ACK	28	0 V (Return for 10)
11	BUSY	29	0 V (Return for 11)
12	PE (Paper Out)	30	0 V
13	BUSY	31	NC (Not Connected)
14	NC (Not Connected)	32	FAULT (Printer Error Condition)
15	NC (Not Connected)	33	INIT
16	0 V	34	NC (Not Connected)
17	CHASSIS GROUND	35	NC (Not Connected)
18	NC (Not Connected)	36	NC (Not Connected)

Parallel Interface Signals



Note 1: 550 μ sec. Minimum

In the case of discontinuous data reception or Function Code reception, the BUSY condition occupies much time.

Note 2: Measured by using Tandy Model III computer.

Timing Diagram

DB1-DB8 — Host Generated

Data Bits DB1-DB8 contain ASCII character data information. Data bit levels are positive true logic.

ACKNOWLEDGE — Printer Generated

The ACK signal is a negative-going signal which indicates, by the rising edge, that the Printer is no longer busy.

BUSY — Printer Generated

The BUSY signal goes positive to indicate when the Printer cannot accept new data from the Host, or some Fault condition has occurred. Timing is illustrated in the Timing Diagram.

PAPER OUT (PE) — Printer Generated

The paper out signal is a positive-going pulse which indicates that the Printer is out of paper or that the Printer is not ready to receive data.

BUSY— Printer Generated

The BUSY signal is the logical inverse of BUSY.

FAULT — Printer Generated

The FAULT line is a negative-going signal that indicates there is a fault condition present; i.e., paper out, logic fault, off-line condition, or other mechanical fault.

STROBE — Host Generated

The STROBE signal is a negative-going signal which indicates, by the rising edge, that the Host sends data to the Printer.

INIT (INITIAL) — Host Generated

When the level of this signal becomes LOW, the print controller is reset to its initial state and the Printer buffer is cleared. This signal is normally at a HIGH level. The pulse width input must be more than 50 μ sec.

In TRS Mode, this signal is ignored.

Note: When the TRP-100 is ON-LINE, a buffer-full condition shall result in the following:

- After the buffer is full, BUSY will go true (High), BUSY will go low, and the data which has already been buffered will be printed.

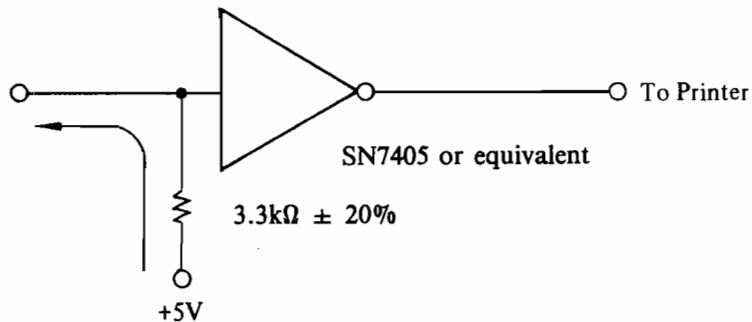
CHASSIS GROUND

This line is connected to the chassis of the Printer.

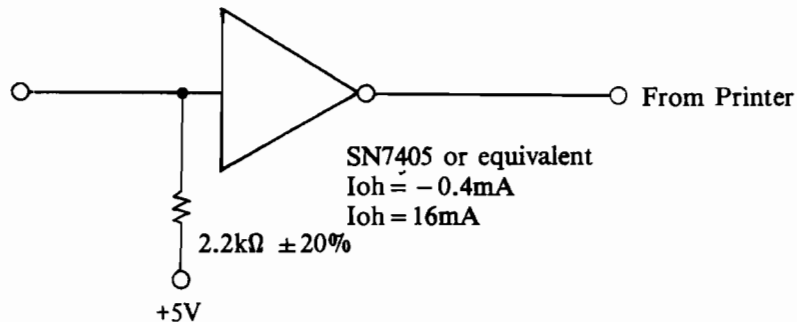
Parallel Interface Receivers and Drivers

All I/O Signals are TTL-compatible

Receiver



Driver



Note: Printer-generated signals, **BUSY**, $\overline{\text{FAULT}}$, **PE**, $\overline{\text{BUSY}}$, and $\overline{\text{ACK}}$, have a 2.2 kohm pull-up resistor.

Serial Interface

Serial Interface is selected by setting Function Selection Switch A-1 to OFF side (TANDY mode) and Switch A-6 to ON.

The transmission Rate is 600 BPS.

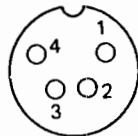
General Specifications for Serial Interface

Standard	Meet with RS-232C Serial
Baud Rate	600 BPS Serial
Parity	Non-parity
Data Bit	8
Start Bit	1 Space bit
Stop Bit	1 or 2 Mark bits
Signal Cable	15 m Max.

Interface Connector and Signals

Type	4-Pin DIN Jack (Receptacle)
Model	TCS 4640-01A or equivalent
Manufacturer	HOSIDEN CO., LTD. or equivalent

Pin Assignment and Signals



Pin No.	Signal
1	NC
2	$\overline{\text{BUSY}}$
3	GND (0 V)
4	DATA

DATA — To Printer

Signals on this circuit are generated by the Host Computer for transmission of data to the Printer.

$\overline{\text{BUSY}}$ — From Printer

This signal indicates to the Host Computer whether or not the Printer can accept data. The OFF condition (low) indicates that the Printer is BUSY and cannot accept any more data. The ON condition (high) indicates the printer is not BUSY, and can accept more data from the computer.

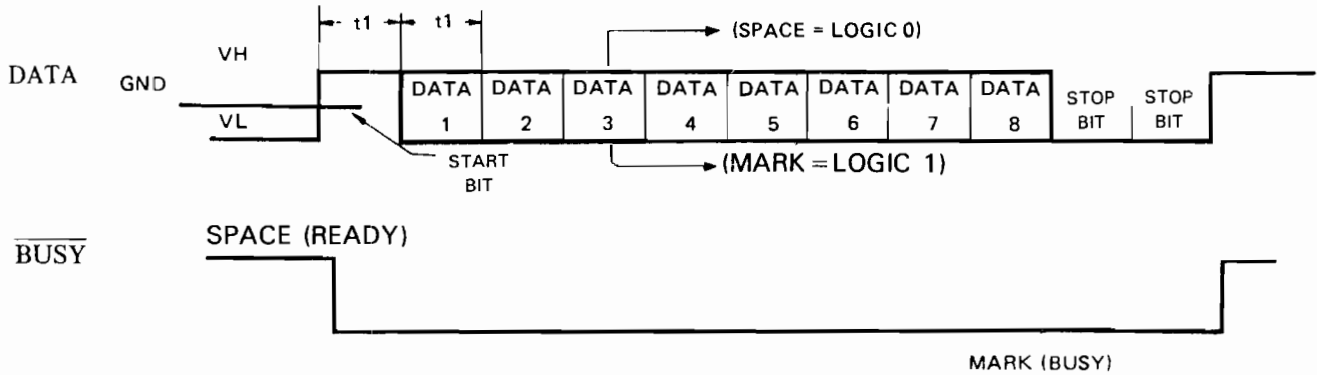
The $\overline{\text{BUSY}}$ signal is low under the following conditions:

- Buffer full
- OFF-LINE mode
- Error condition, i.e., Paper End, Carriage Fault, etc.

GND

This signal wire establishes a common ground between the Printer and the Host.

Interface Timing and Signal Level



Input Level

$3\text{ V} < \text{VH} < 15\text{V}$ (SPACE)
 $-3\text{ V} > \text{VL} > -15\text{V}$ (MARK)

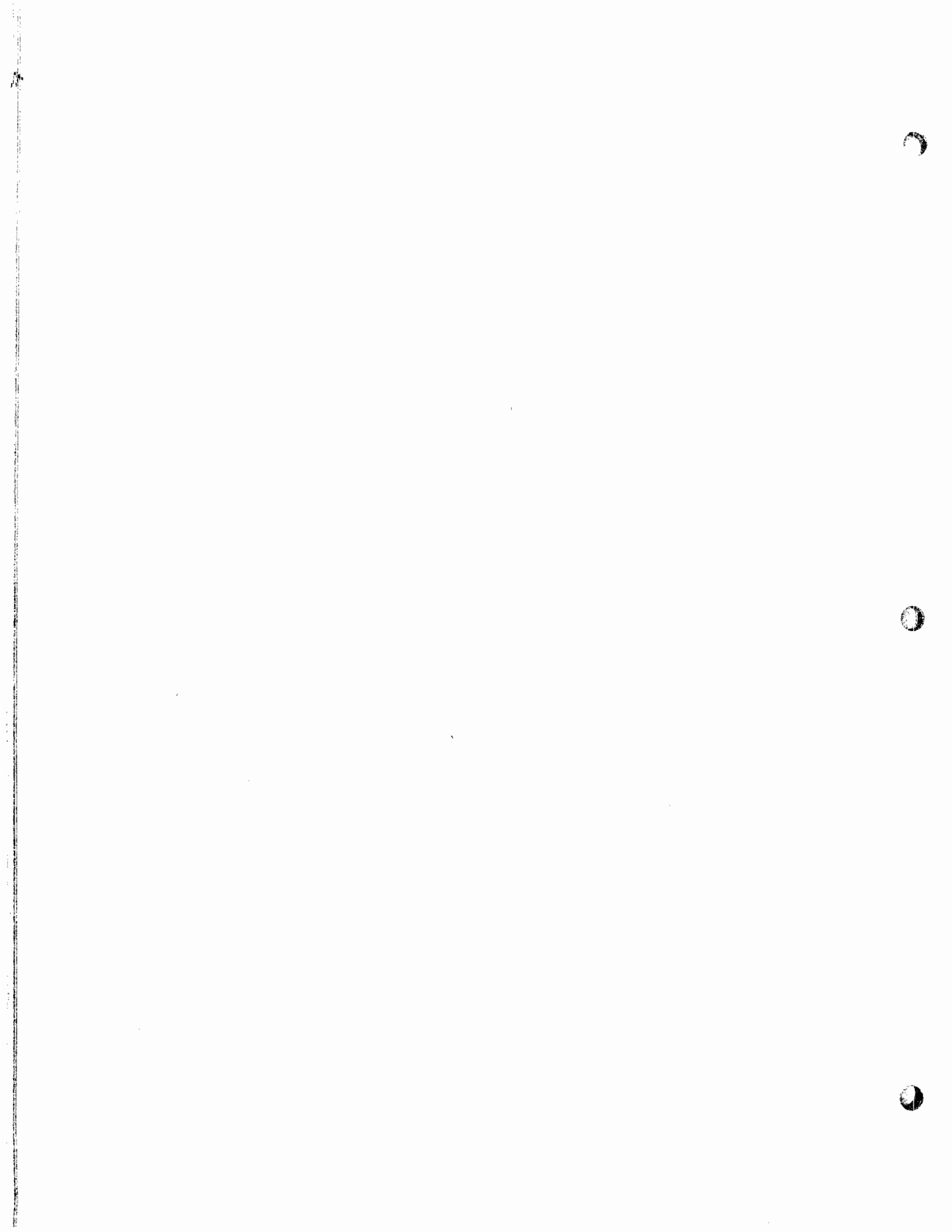
Output Level

$3\text{ V} < \text{VH} < 6\text{V}$ (SPACE)
 $-3\text{ V} > \text{VL} > -6\text{V}$ (MARK)

Baud Rate	t1
600 BPS	1.664 msec.

Remarks on Serial Interfacing Conditions

- When a Stop Bit ERROR is detected, the Printer will print a special code (X). In Graphics Mode, this special code is an unprintable code, so no printing will be performed. In character mode, this is a "X" mark code of TANDY character or a "@" mark code of IBM character.
- The Printer checks only the first stop-bit and ignores the second stop-bit when a two stop-bit condition exists.
- When the Printer is connected to a host device with a cable and the host's power is OFF, or when the Printer is not connected to the host, it may receive uncertain character codes and printing may be performed without any control. In these cases, the ON-LINE/OFF-LINE Switch of the Printer should be set to OFF-LINE.



Appendix C/Character Sets

1. Tandy Character Sets

The TRP-100 has 190 characters 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:

Standard or	ASCII	94
Standard Elongated	European Symbol	64
	Block Graphic	30

94 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	[(t)	123	7B	173	[
60	3C	74	<	92	5C	134	\ (l)	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: The following characters descend by one dot: Small Letters g,p,q,y,j,_(Underline)

64 European Symbol Code

Code		Char.
Hex	Dec.	
A0	160	´
A1	161	à
A2	162	ç
A3	163	£
A4	164	`
A5	165	µ
A6	166	°
A7	167	▼
A8	168	†
A9	169	§
AA	170	®
AB	171	©
AC	172	1/4
AD	173	3/4
AE	174	1/2
AF	175	¶
B0	176	¥
B1	177	Ä
B2	178	Ö
B3	179	Ü
B4	180	¢
B5	181	~
B6	182	ä
B7	183	ö
B8	184	ü
B9	185	ß
BA	186	™
BB	187	é
BC	188	ù
BD	189	è
BE	190	ˆ
BF	191	f

Code		Char.
Hex	Dec.	
C0	192	â
C1	193	ê
C2	194	î
C3	195	ô
C4	196	û
C5	197	˜
C6	198	ë
C7	199	ï
C8	200	á
C9	201	í
CA	202	ó
CB	203	ú
CC	204	ï
CD	205	ñ
CE	206	ã
CF	207	õ
D0	208	Æ
D1	209	æ
D2	210	Å
D3	211	å
D4	212	Ø
D5	213	ø
D6	214	Ñ
D7	215	É
D8	216	Á
D9	217	Í
DA	218	Ó
DB	219	Ú
DC	220	¿
DD	221	Ù
DE	222	È
DF	223	À

Note: The following characters descend by one dot: ç, µ, c

30 Block Graphic Code

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	350	■	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: These characters are composed of six vertical dots. When using these codes to prepare diagrams, Line Feed should be set to **Half Forward Line Feed**. If another paper feed pitch is used, the diagram will not be accurate.

2. IBM Character Sets

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL		SP	0	@	P	`	p	ç	É	á	▒	⌞	⌟	α	≡
1		DC1	!	1	A	Q	a	q	ü	æ	í	▒	⌞	⌟	β	±
2		DC2	"	2	B	R	b	r	é	Æ	ó	▒	⌞	⌟	Γ	≥
3	♥	DC3	#	3	C	S	c	s	â	ô	ú	▒	⌞	⌟	π	≤
4	♦	DC4	\$	4	D	T	d	t	ä	ö	ñ	▒	⌞	⌟	Σ	↵
5	♣	⋈	%	5	E	U	e	u	à	ò	Ñ	▒	⌞	⌟	σ	⋇
6	♠		&	6	F	V	f	v	ã	û	à	▒	⌞	⌟	μ	÷
7			'	7	G	W	g	w	ç	ù	ò	▒	⌞	⌟	τ	≈
8		CAN	(	8	H	X	h	x	ê	ÿ	¿	▒	⌞	⌟	ϕ	○
9	HT		)	9	I	Y	i	y	ë	Ö	▒	⌞	⌟	⊖	▪	
A	LF		*	:	J	Z	j	z	è	Ü	▒	⌞	⌟	Ω	-	
B	VT	ESC	+	;	K	[	k	{	ï	¢	½	▒	⌞	⌟	δ	√
C	FF		,	<	L	\	l	|	î	£	¼	▒	⌞	⌟	∞	ⁿ
D	CR		—	=	M	]	m	}	ì	¥	¡	▒	⌞	⌟	∅	²
E	SO		.	>	N	^	n	~	Ä	P _t	«	▒	⌞	⌟	€	■
F	SI		/	?	O	_	o		Â	f	»	▒	⌞	⌟	∩	SP

Appendix D/Programming Information

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

1. When Printer Power is turned on:
 - Optional functions are selected according to the setting of the Function Selection Switches.
 - If CP Mode is selected, Full Forward Line Feed is set.
 - Underline is not set.
 - Elongation is not set.
 - Form length is set to 11 inches.
 - Horizontal Tab is set at every 8 characters. (standard)
 - Buffer memory is completely cleared.
 - ON-LINE mode is selected.
2. Elongated (Double-width) characters and Underline are not terminated at the end of the line, and printing continues until a terminating command is received, (except CHR\$(14), CHR\$(27);CHR\$(14) in IBM Mode which is terminated by a Line Feed command).
3. You should avoid wrap-around. Wrap-around will disturb the dot count of the text in a line.
4. In the Repeat Data commands, 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 code (X).
5. POS commands can be used at any carriage position. If a designated dot column address is in the current text which is already printed out, overprint will occur.
6. Under Block Graphic printing, Half Forward Line Feed should be used for printing diagrams.
7. Line Feed in Graphics Mode is different from Line Feed pitches in the CP Mode. It will generate an odd vertical spacing in Graphics Mode. Consider the following relationship between Line Feed pitches.
 - 11 times Full Line Feed = 18 times Graphics Line Feed
 - 11 times Half Line Feed = 9 times Graphics Line Feed
8. Graphic printing can be intermixed with character printing in the same line. Dot density in Graphics Mode is the same as the density of the former character style.

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: `CONT` **[ENTER]** to continue.

The BASIC statements `LPRINT` and `LLIST` output to the Line Printer. See your Computer's reference manual for syntax details. If you have a Color Computer, read `LPRINT` as `PRINT #2`.

Examples:

`LLIST`

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

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

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

Prints the formula of water H_2O .

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

Prints these letters at 3/4 line pitch.

`LPRINT "START";CHR$(27);CHR$(91);CHR$(12);"FULL ONE LINE";CHR$(27);CHR$(91);CHR$(8);"2/3 LINE"`

Prints these letters at full line pitch, then at 2/3 line pitch (8/72" = 1/9").

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

Prints both messages underlined and non-underlined in the same line.

`LPRINT CHR$(28);CHR$(8);"ABC"`

Prints 8 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$(18);CHR$(255);CHR$(247);CHR$(227);CHR$(193);CHR$(227);CHR$(247);CHR$(255);CHR$(30)`

Prints a special symbol in Graphics Mode.

Appendix E/Care and Maintenance

1. Always plug the AC Adapter into a 2-wire grounded receptacle. Otherwise, install batteries.
2. Be sure that the Top Cover is closed and secured while in operation.
3. Never operate the Printer without paper. Take care to see that printing does not exceed paper width.
4. Avoid leaning objects against the Printer or placing anything on top of it. If any object is accidentally dropped into the machine, turn the power OFF and carefully remove the object.
5. Be sure to turn the power **OFF** before replacing the ribbon.
Note: When you turn power **OFF**, all data stored in the Printer's buffer will be lost; keep this in mind as you perform routine maintenance.
Remember that toggling the Printer's Power switch can also cause erratic operation of the CPU.
6. Use only lint-free cloths to clean the 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 the Carriage mechanism while the Printer is in operation. Since the Carriage moves with considerable force, inserting your hand would be extremely hazardous.
8. The Printer must be kept dry. If water is accidentally spilled on the machine, turn the printer power OFF immediately and wipe it dry. Do not turn power ON until the printer is completely dry.

Care

- Do not use organic solvents or alcohol when cleaning the cover.
- Never operate the Printer when the Top Cover is open.
- 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 text characters. If you print too many block graphic characters or graphics 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 page is printed. 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

- A Print Head's life expectancy is approximately 300 hours (in other words, if you use the Printer two hours a day on the average, the Print Head should be changed every 5 months). When poor print quality occurs, you should have the Print Head replaced by a Radio Shack service technician.
- After cleaning with a soft cloth, lightly oil the *carriage guide* with a high-grade ester lubricating oil or with high-grade sewing machine oil. (This should be done at least every six months.) Lubricate the *platen removing shaft*, the *ribbon feed revolving shaft*, and the *gear revolving shaft*, using molybdenum disulfide compound or another high-grade lubricating grease.

If You Have Problems. . .

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

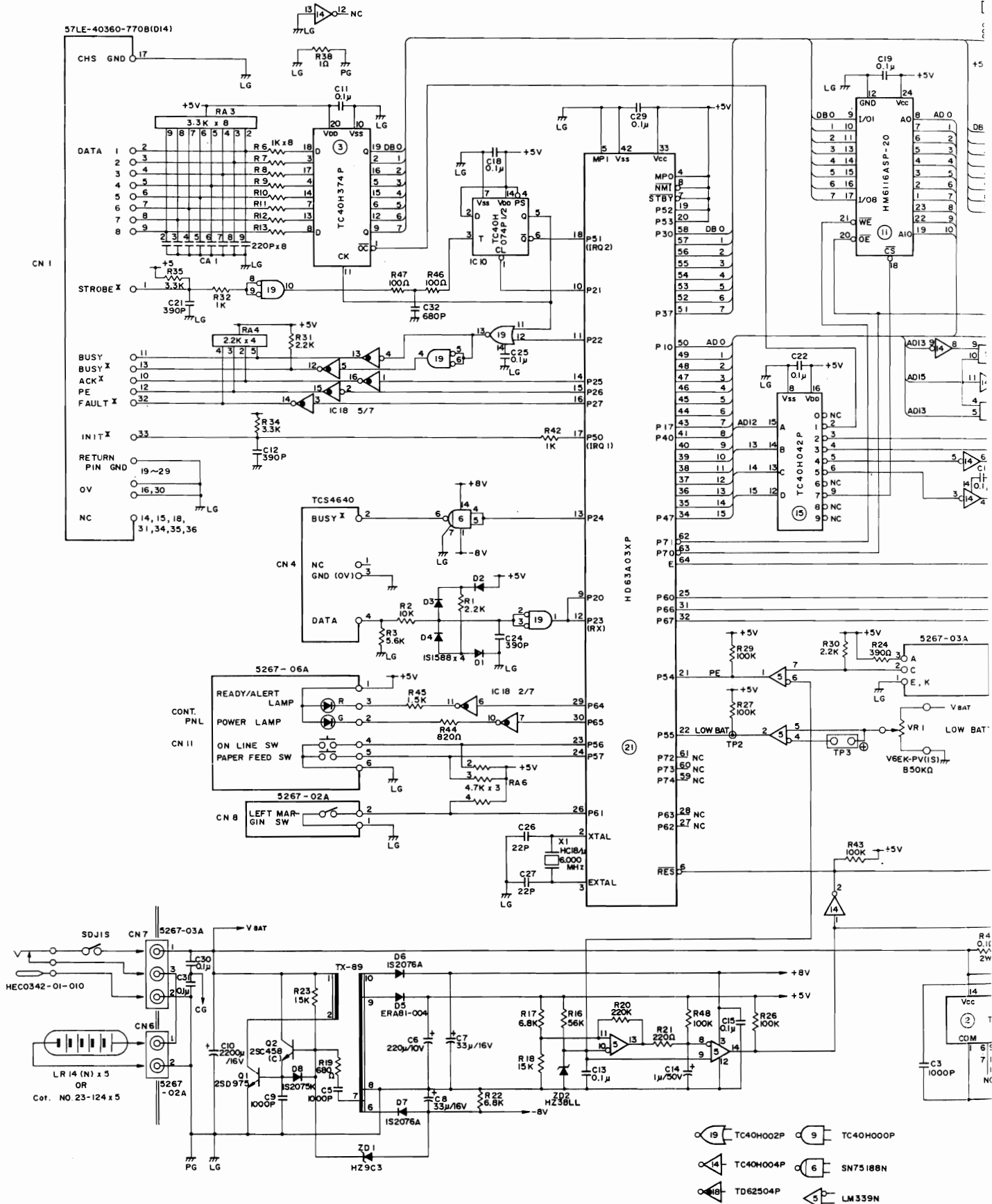
Symptom	Inspection and Adjustment
Printer does not operate when Power switch is turned ON . Printer stops before paper runs out.	<ul style="list-style-type: none">• Are batteries installed?• Is power cord properly connected?• Is power source voltage too low?
Printer stops with ALERT indicator lit.	<ul style="list-style-type: none">• Is paper loaded properly?• Is carriage guide dirty? If so, clean it by using a soft cloth and lubricate it with a 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.	<ul style="list-style-type: none">• Is ribbon cassette properly set?• Has ribbon come loose from the print head ribbon guide?
Poor print quality.	<ul style="list-style-type: none">• Is ribbon old and/or worn?• Is the Print Head set at the proper position?• Is the Print Head surface dirty? If dirty, clean it off with a soft cloth.
Erratic operation or wrong character printing.	<ul style="list-style-type: none">• Is the interface cable and/or connector damaged?• Are interface connectors inserted properly to the Computer or to the Printer?
The paper cannot be advanced smoothly.	<ul style="list-style-type: none">• Is paper loaded properly into the entrance of the insertion opening?• Is any obstacle preventing smooth paper motion?

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.

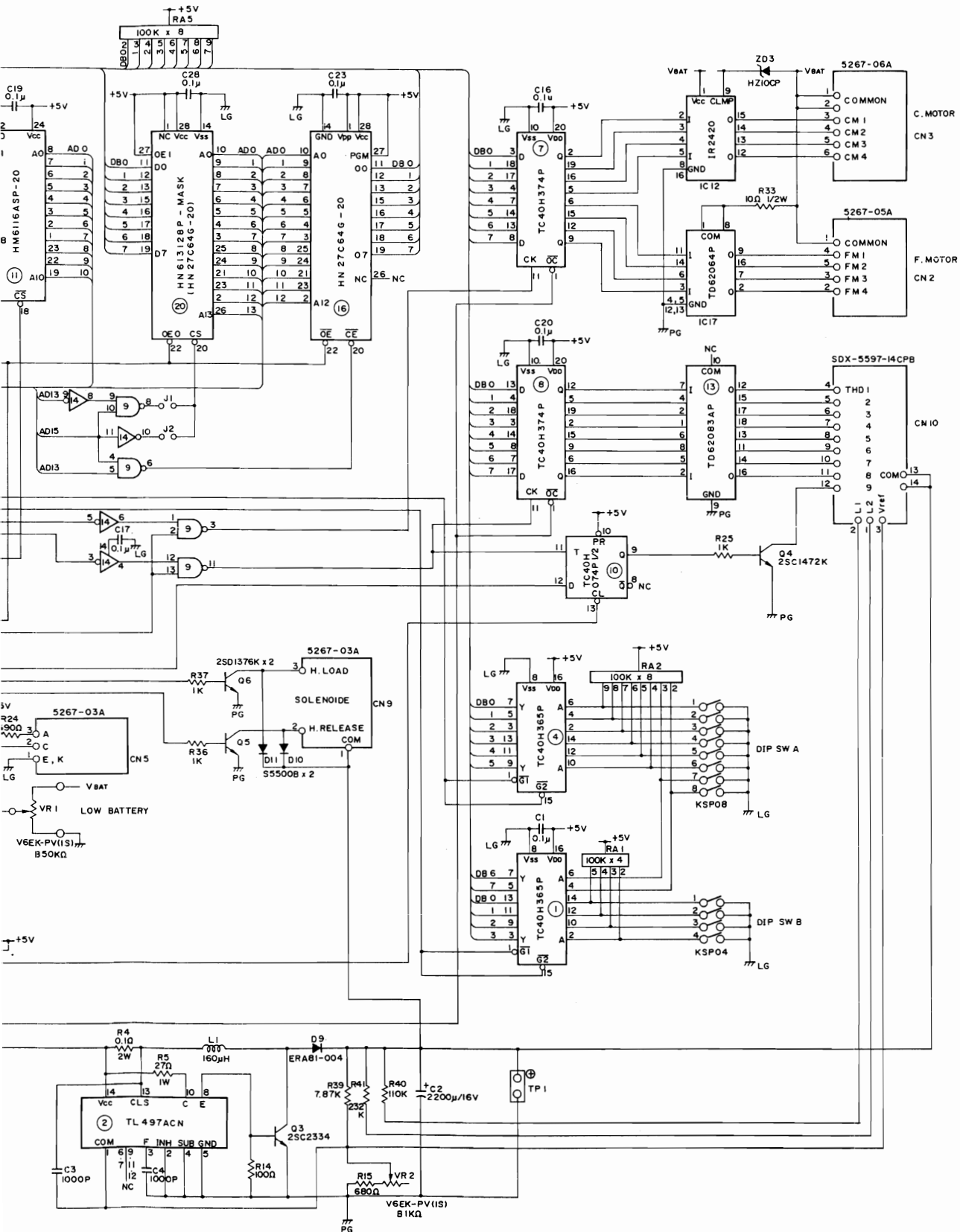
—



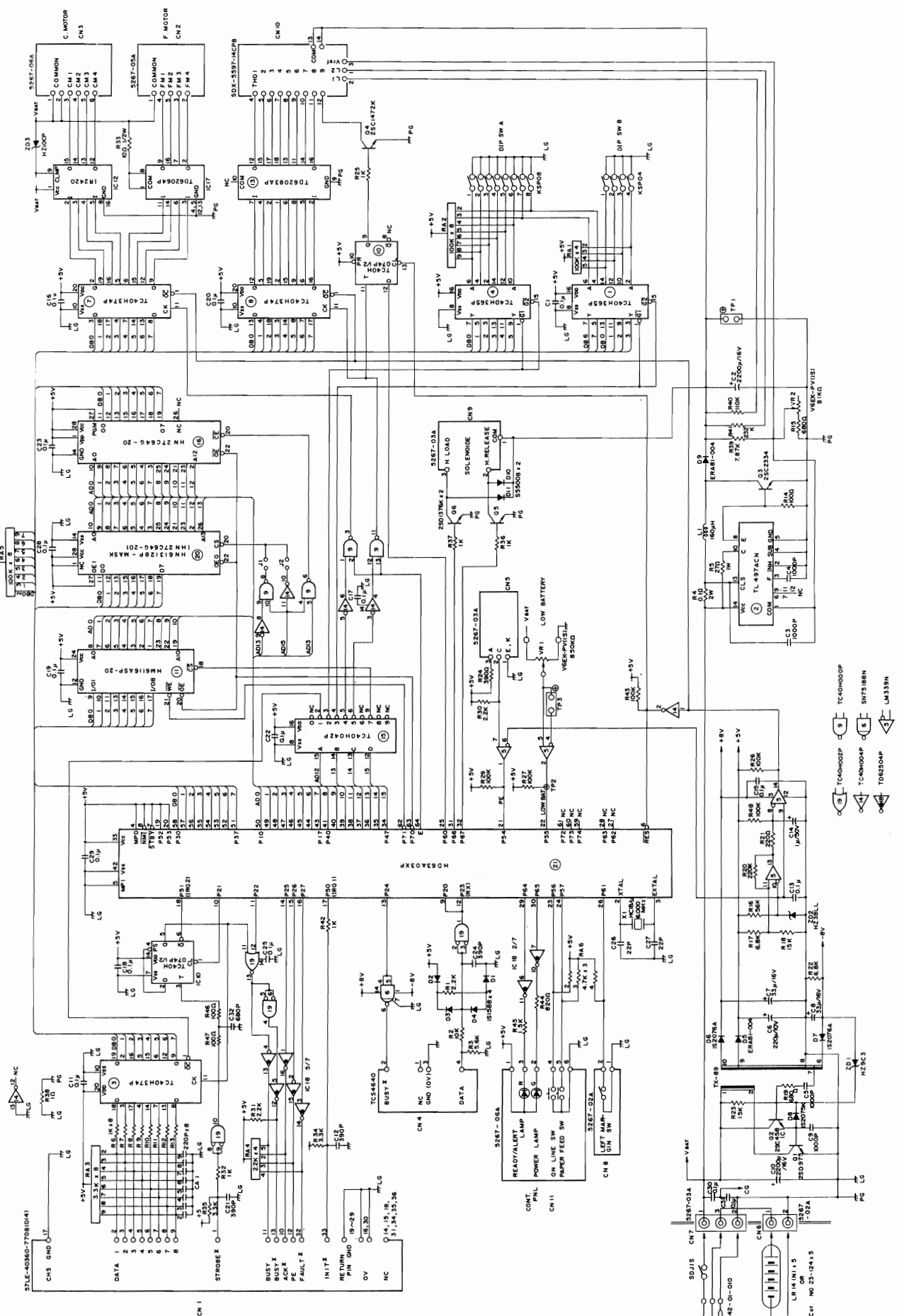
Appendix F/Schematic Diagram



- ⊖ 19 TC40H02P
- ⊖ 14 TC40H04P
- ⊖ 18 TD62504P
- ⊖ 9 TC40H00P
- ⊖ 6 SN75188N
- ⊖ 5 LM339N



Appendix F/Schematic Diagram



37LE-00560-7708(0/4)

CN 1

CN 2

CN 3

CN 4

CN 5

CN 6

CN 7

CN 8

CN 9

CN 10

CN 11

CN 12

CN 13

CN 14

1



Appendix G/Specifications

Printing speed (characters per second)	
Standard 10 CPI	50
Elongated Standard 5 CPI	25
Characters Per Line	
Standard 10 CPI	80
Elongated Standard 5 CPI	40
Dots Per Character	
Standard 10 CPI	12
Elongated Standard 5 CPI	24
Vertical Spacing	12, 6, 8 lines per inch (Computer selectable), 7/72", 1/72" (1/12 line feed) and n/72" (n/12 line feed) available.
Dots Per Line	
Standard 10 CPI	960 dots
Elongated Standard 5 CPI	960 dots
Character Set	
Standard	ASCII 94, European Symbols 64, Block Graphics 30
Interface	
Parallel	8-bit with strobe signal
Serial	8-bit, 600 BPS
Print Head Life	4 × 10 ⁷ characters typical (At ASCII Character printing)
Preventive Maintenance	Normally every 6 months
Temperature and Humidity Range	
Operating	with Ribbon 41°F-95°F (5°C-35°C) without Ribbon 41°F-104°F (5°C-40°C) 40-80% RH
Storage	with Ribbon -4°F-122°F (-20°C-50°C) without Ribbon -40°F-160°F (-40°C-71°C) 20%-90% RH
Paper	
Plain Paper (used with Thermal Ribbon)	
Type Recommended	High quality plain paper Recommend: US Xerography paper (Xerox 4024)
Thickness	0.0028 inch (0.07mm) to 0.0043 inch (0.11mm)
Width	8.5 inches (216mm) maximum

Sensitized (Heat-Sensitive) Paper	
Type	Radio Shack thermal paper (Cat. No. 76-1003)
Color	White
Thickness	0.0028 inch (0.07mm) to 0.0043 inch (0.11mm)
Width	8.5 inches (216mm) maximum
Ribbon	Radio Shack Catalog Number 26-1297
Battery	
Nickel-Cadmium Battery (5 pcs. 6 V)	Radio Shack Catalog Number 23-124
Alkaline Battery (5 pcs. 7.5 V)	Life time — 300 charging times
	Radio Shack Catalog Number 23-551
Battery Life	
Nickel-Cadmium Battery	Approx. 1 hour printing (charge allowable)
Alkaline Battery	Approx. 1 hour printing
	Printing condition:
	10 CPI rolling ASCII characters, unidirectional, normal intensity
Size	11.8" (W) × 2.76" (H) × 6.93" (D) 30cm(W) × 7cm(H) × 17.6cm(D) (without Roll Paper Holder)
Weight	5.5 lbs. (2.5 kg) maximum (without Batteries)
Power Requirement	6 V ± 0.2V, 2A AC Adapter 120 VAC, 60 Hz (for USA/Canada), or 220 V/240 VAC, 50 Hz (for European and Australian models).

Memo



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.

RADIO SHACK, A DIVISION OF TANDY CORPORATION

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