

C. ITOH DIGITAL PRODUCTS

USER MANUAL

Dot Matrix Printer Models

8510S

8510SC

1550S

1550SC



C. ITOH DIGITAL PRODUCTS, INC.

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“This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer’s instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- reorient the receiving antenna
- relocate the computer with respect to the receiver
- move the computer away from the receiver
- plug the computer into a different outlet so that computer and receiver are on different branch circuits

If necessary, the user should consult the dealer or an experienced radio/television technician 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 U.S. Government Printing Office, Washington, D.C., 20402, Stock No. 004-00345-4.”**

CONGRATULATIONS AND WELCOME

to the world of quality printing and satisfied users that is synonymous with the name C. ITOH.

C. ITOH is a recognized leader in the field of high quality peripherals for computer systems. The printer you have just purchased has been manufactured to exacting detail to ensure its performance and your satisfaction.

Every item of operation, from attaching to your computer, loading paper, and changing ribbons, to programming normal or special printing modes, has been designed for ease. You will be using your printer in a short time, turning out professional documents on your own system.

This manual, following the same attention to detail and ease of use, presents instructions and answers to problems you may encounter. It will be your guide to using your printer to its fullest capability.

This manual is composed of sections, each covering general and detailed information to assist you.

There is a section on unpacking and setting up the printer, a section on testing the printer, a section giving an overview of the printer's operation, and sections on programming the printer from your computer, including actual programming examples written in BASIC. These examples are provided as simple guides which can be modified and incorporated directly into your own programs.

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SECTION I

Unpacking The Printer

This section contains information about **Unpacking The Printer**, **Repacking The Printer**, and **Items You Should Have Received**.

THE BOX

The packing carton for your printer is built to withstand normal bumping, jarring, and dropping which can happen during shipment. The printer is suspended within the shipping container with a specially designed styrofoam side pads to protect it from damage. Be sure to save the box and side pads in case you ever need to re-ship the printer. It's a good idea to repack it even if you're just going to throw it in your trunk to take it across town to a friend's house. You bought a precision instrument and you should protect your investment.

THE CONTENTS

As you are removing the printer from the box for the first time, you should find:

1. The printer,
2. One ribbon cassette,
3. One electrical power cord,
4. One user's manual,
5. Print samples from your printer done by our quality control department,
6. And, possibly, a paper guide separator. The paper guide separator is an optional item.

REMOVING THE PRINTER

Open the top cover of the box and remove the top pad containing the ribbon cassette and the power cord.

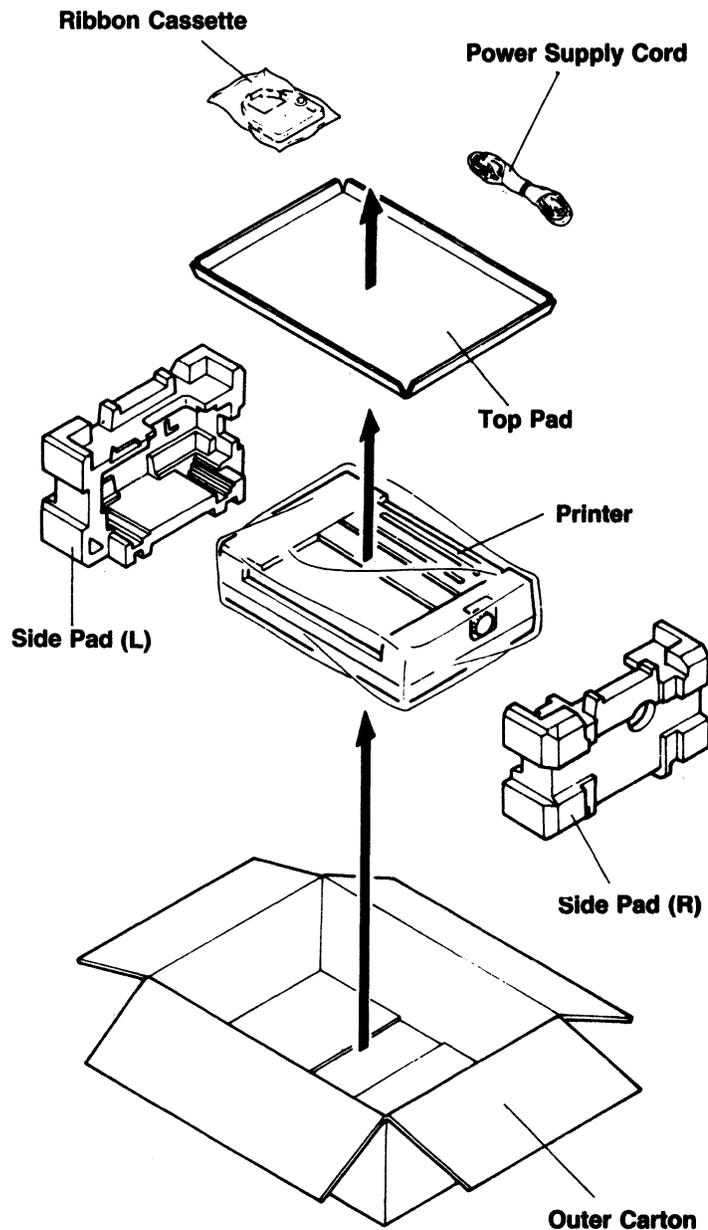
Grasp the left and right styrofoam side pads just below their top, and carefully lift the printer out of the box.

Carefully remove the left and right styrofoam side pads.

With the printer on a firm, flat surface, like a desk or table, remove the clear plastic dust protector.

Remove the filament packing tape holding the printer's top cover.

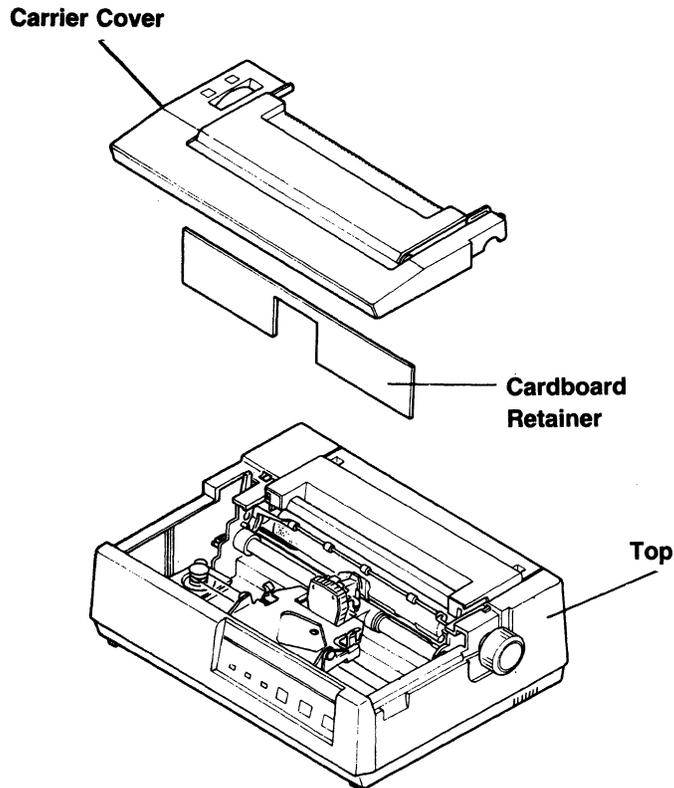
Inside the printer, a special cardboard retainer holds the print head so it can't move during shipping. Lift off the printer's carrier cover and then remove the special cardboard retainer. Save this cardboard retainer in case you re-ship the printer. Snap the printer's carrier cover back into place. Check the printer case for any signs of shipping damage.



1. Remove Printer From Box



2. Remove Plastic Bag



3. Remove Cardboard Retainer

SECTION II

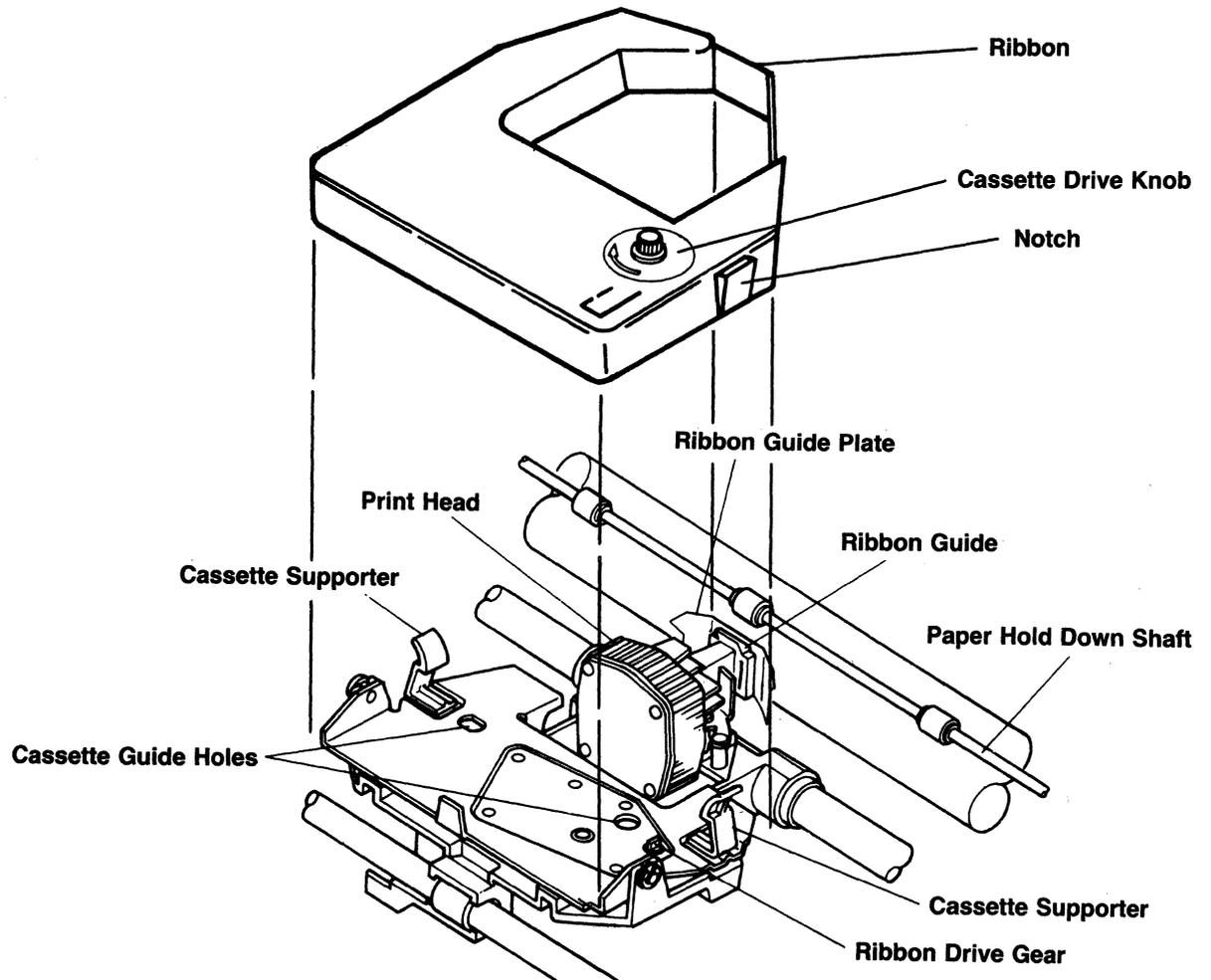
Printer Preparation

This section contains information about **Inserting The Ribbon Cassette**, **Inserting Paper**, **Attaching Optional Paper Separator**, **Adjusting Print Head Gap**, and **Running A Print Test Pattern**

INSERTING THE RIBBON

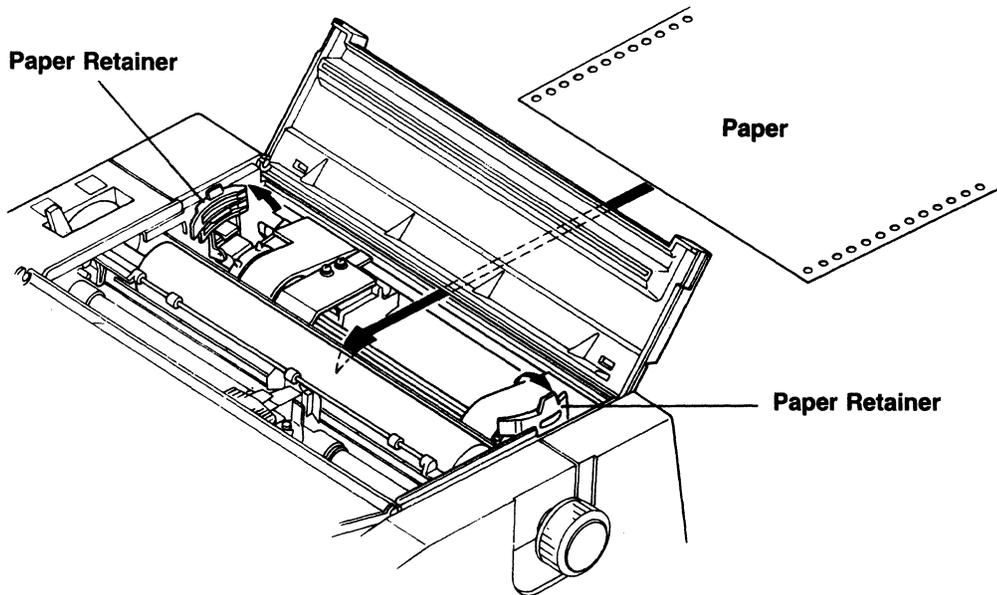
Inserting a ribbon cassette is like replacing a light bulb. It's easier to do than to describe. Look at the illustrations as you do it the first time. After a time or two, you will be able to do it with one hand . . .

1. Remove the printer's top cover and gently slide the print head to the center of its shaft to allow easy access.
2. Remove any slack in the ribbon cassette by turning the cassette drive knob clockwise.
3. Carefully insert the ribbon end of the cassette between the ribbon guide plate and the ribbon guide, then seat the rear of the cassette onto the ribbon deck plate. The right and left cassette supporters will snap over the notches on the right and left sides of the cassette. The cassette has holes to prevent you from seating it improperly.
4. If the right side of the ribbon cassette does not seat completely, gradually turn the cassette drive knob so that it matches with the ribbon drive gear just beneath it.

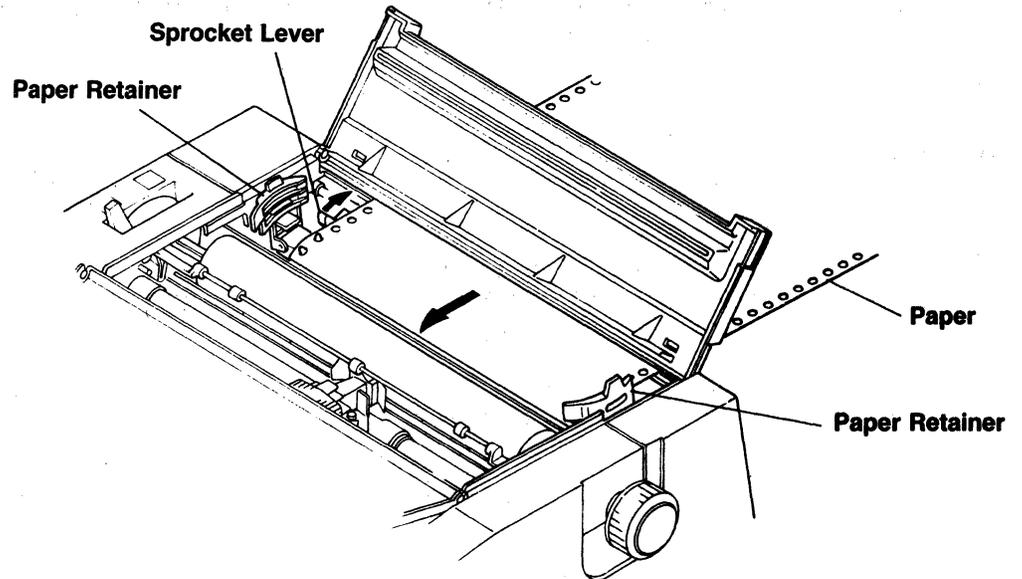


INSERTING PIN FEED PAPER

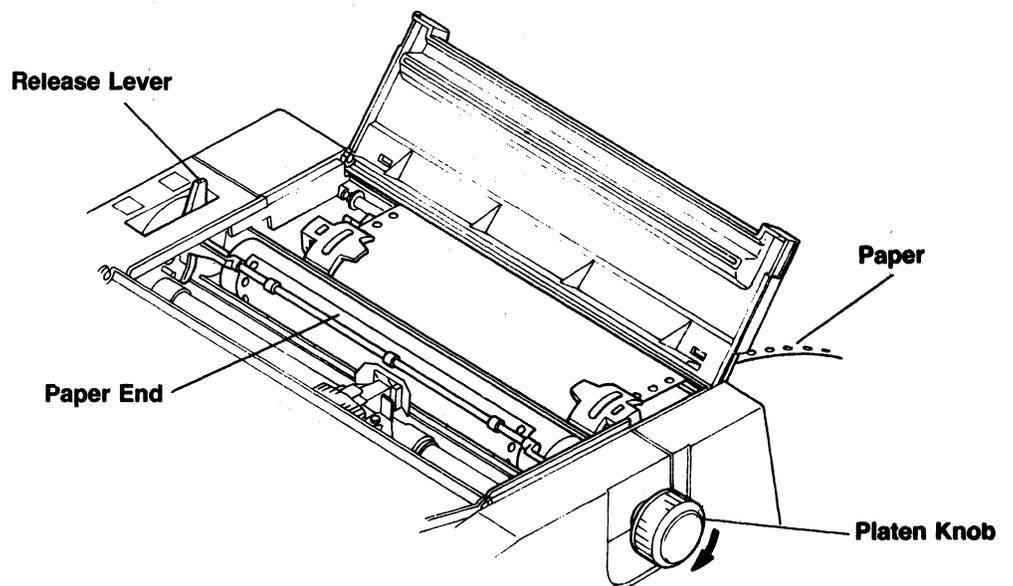
1. Open the rear paper cover, open the top printer cover, and pull the roller shaft toward the front. The paper hold case shaft has the three rubber rollers on it.



2. On the left side of the printer, pull the release lever toward the front. It will be in this position only to assist paper movement during the loading of paper.
3. Open the left and right paper retainer covers on the sprocket tractors.
4. Put the holes of your pin feed paper over the right and left side sprocket pins. If you need to adjust the position of the sprocket tractors, push the locking lever to the rear to release the lock. The tractors will then slide easily to adjust for the paper width. After adjusting for proper paper width, relock the locking levers. (Usually the left sprocket tractor is not moved, and the right sprocket tractor is moved to adjust for the proper width of paper.)

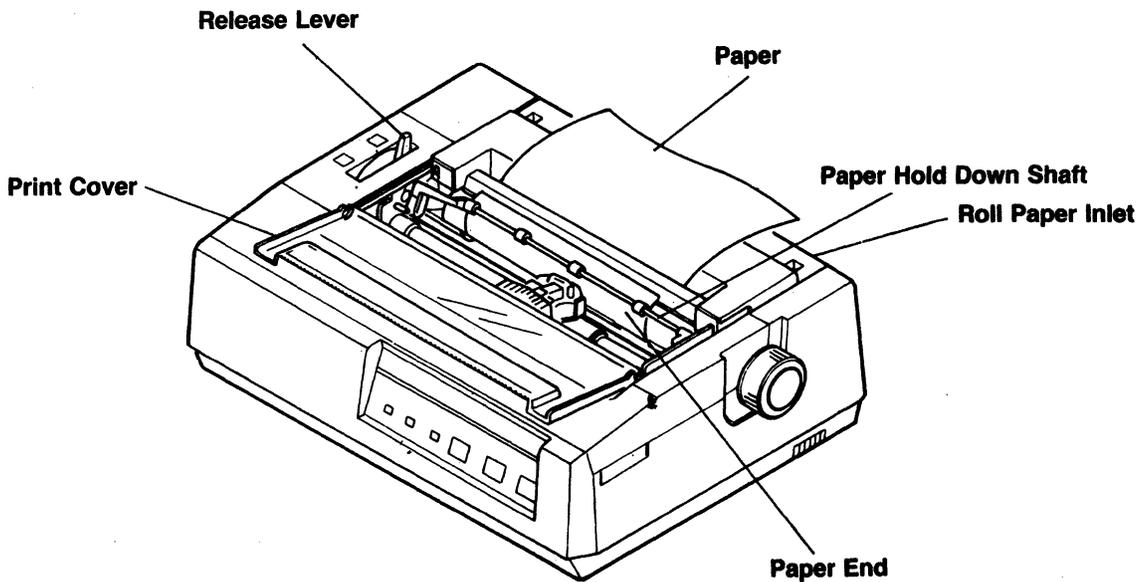


5. Close the left and right paper retainer covers to hold the paper onto the sprocket pins.
6. Turn the platen knob clockwise to advance the paper into the paper path and around the platen. Now with the paper between the ribbon and the platen, push the paper hold down shaft (with the three little rubber wheels) against the paper to hold the paper in place. Now that paper is loaded, push the release lever to the rear (open) position.



INSERTING ROLL PAPER OR SINGLE SHEETS

1. Open the top printer cover and pull the paper hold down shaft (with the three little rubber wheels) to the front.
2. Be sure that the release lever is in the closed position (to the rear of the printer).
3. Do not open the rear paper cover, but rather, insert the paper into the paper inlet slot.
4. Turn the platen knob to feed the paper around the platen, move the release lever to the front (open) position, adjust the paper, and move the release lever to the rear (closed) position.
5. Push the paper hold down shaft (with the three little rubber wheels) onto the platen, and close the front printer cover.



Inserting Single Sheets Or Roll Paper

COMMENTS ABOUT PAPER

Your printer will handle three kinds of paper:

1. Pin feed paper (sometimes called sprocket feed paper). This paper has guide holes punched on the left and right side of the paper to insure accurate alignment. Computer generated statements, invoices, checks, etc. are usually pre-printed on pin feed paper. For word processing, white pin feed paper is available with perforations between the pin feed holes and the sheets of paper, so that after it is printed, the pin feed holes can be torn off, leaving a standard 8 1/2"x11" sheet of paper. Even Rolodex cards, postcards, and index cards are available in pin feed format.

Paper width can be from 4.25" up to 10" because the sprockets on the printer are adjustable.

2. Roll paper. Roll paper is continuously wound around the feeding roll, like adding machine paper, and in past years was mostly used on teletype machines. The roller hole diameter should be at least one inch, and the overall paper roll diameter should be no more than five inches. Paper widths from 4.25 inches up to a maximum of 10 inches can be used.
3. Single sheet paper. This is a single sheet of paper, such as a letterhead, or an envelope, or a sheet of note paper. Almost any size can be hand fed into your printer, but a very small sheet, like the size of a business card, should not be used.

The pin feed sprockets are built into the paper path of your printer (they didn't cost you extra as an add on option). In the paper path, they are located before the print head and push the paper through the printer. This allows you to tear off a single printed sheet without wasting any paper, an important feature when using pre-numbered forms, such as checks. With pin feeds that mount on top of the printer, and pull the paper through the paper path, it is impossible to tear off a single sheet without feeding (wasting) an additional sheet of paper.

If you use multi-part paper (more than one sheet with carbons, or NCR paper), or extra thick paper such as index cards, or address labels, be sure to adjust the print-head-to-platen distance as described on the following pages.

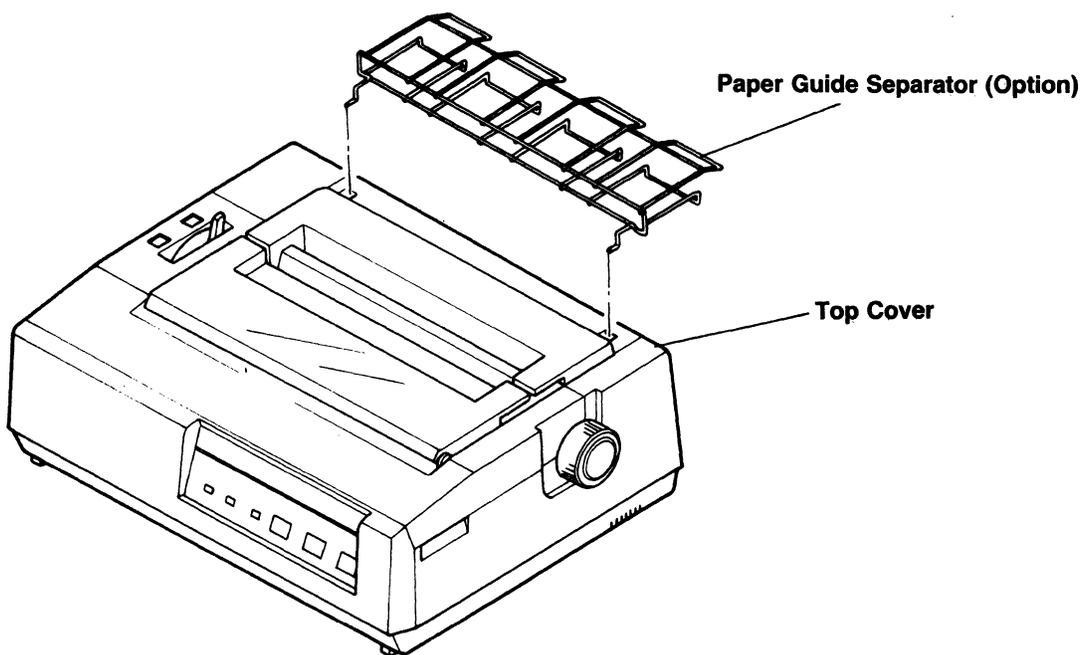
Your printer is versatile in the paper it can handle. If it is printing too light, check the ribbon for being too old, and re-check the print-head-to-platen distance.

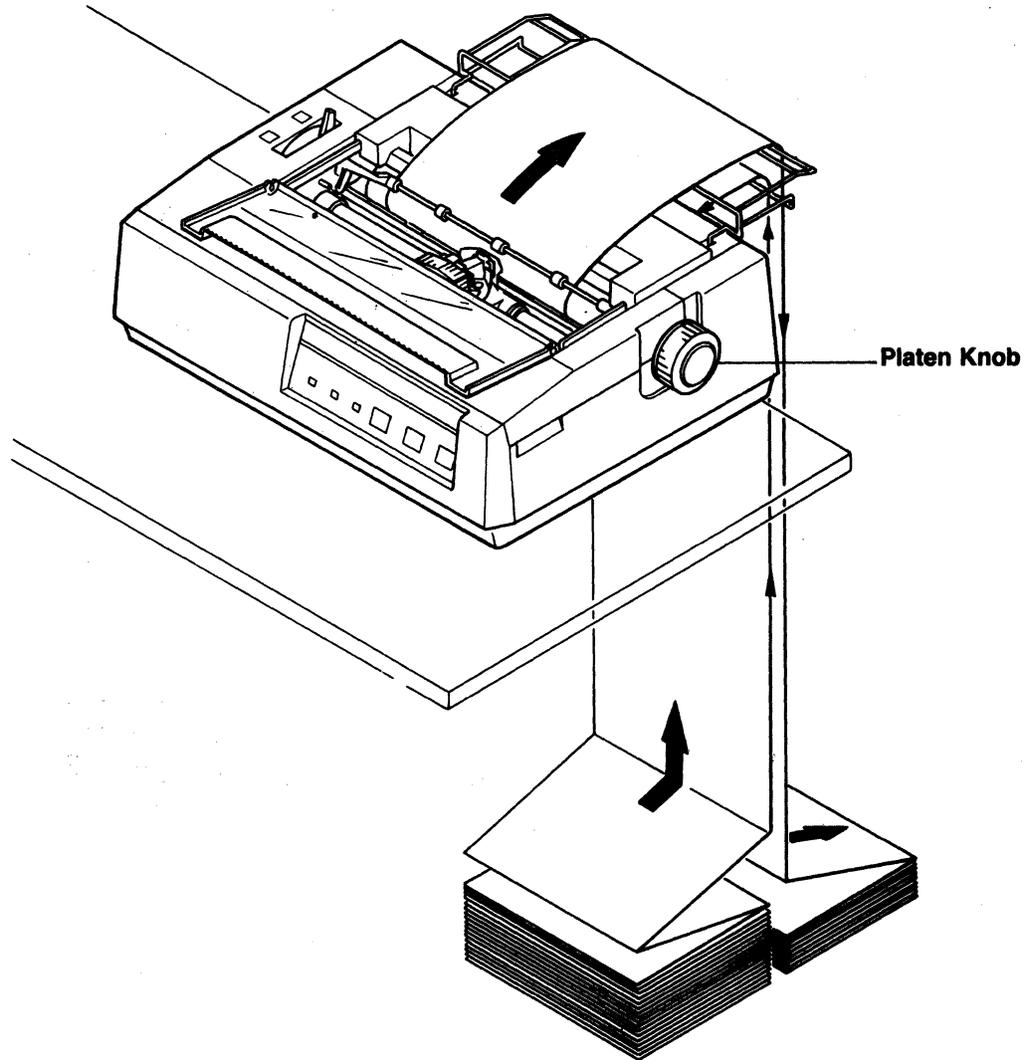
ATTACHING THE PAPER GUIDE SEPARATOR

The paper guide separator is an optional accessory. If you did not receive it with your printer, or do not plan to use it with your printer, just skip this section.

The paper guide separator is used when pin feed forms are to be printed continuously and stacked. It keeps the paper coming into the printer separate from the paper leaving the printer, thus reducing friction between the sheets of paper and potential feeding problems.

1. Insert the metal legs of the paper guide separator into the square holes on the top rear of the printer.
2. The "feed" paper path is between the two metal structures of the paper guide separator, into the printer and around the platen, then out of the printer over the top of the paper guide separator.





Typical Application Of Paper Guide Separator

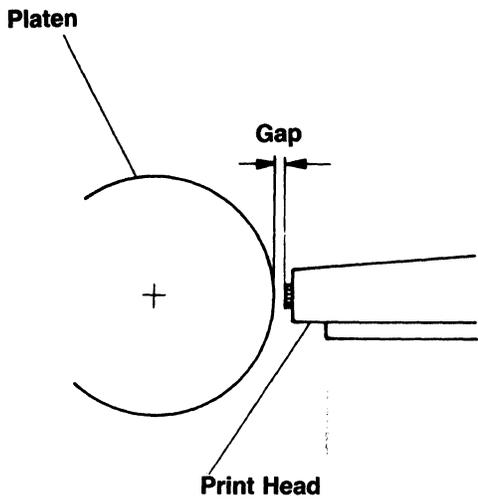
ADJUSTING PRINT HEAD TO PLATEN GAP

Your printer can handle single part paper up to three part paper. Single part paper may be a sheet of letterhead paper, an index card, or an address label.

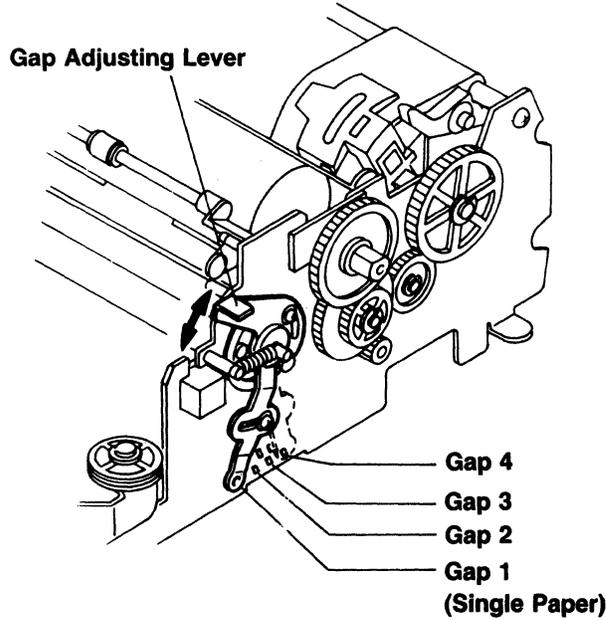
The distance between the print head and the paper affects the printing quality. As you use thicker paper, the print head must be moved further away from the platen. Likewise, when you use thinner paper, the print head must be moved closer to the platen.

Lifting the gap adjusting lever to its topmost position decreases the gap to its minimum. This is the normal position used for single part paper.

Pushing the gap adjusting lever to its bottom position increases the gap to its maximum. This would be used for multi-part paper.



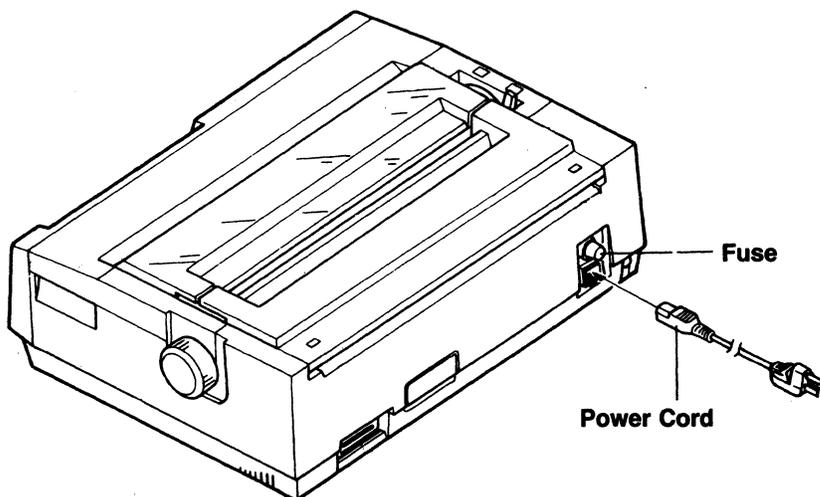
Platen-to-head gap with Gap adjusting lever pushed fully to rear.



As no fixed rules apply to the gap adjusting lever position, the best method is as follows: When in doubt about the lever position, set it to the full open position and close it down until you get the best print quality. In a short time, you will find the best position for all those odd thickness papers you may be using.

POWER CORD CONNECTION

Attach the power cord to the rear of the printer just below the fuse. Plug your printer into a standard 110 volt AC outlet.



TESTING THE PRINTER

Your printer has a special function built into it called self-test. SELF-TEST runs with nothing connected to the printer, only inserting a ribbon, a sheet of paper, and plugging into an AC power outlet.

SELF-TEST prints out the alphabet, numbers, and characters stored internally in your printer. It will continue to do this until you run out of paper or turn the power OFF. It's an excellent test that everything inside the printer is working OK. It should be used when you first take the printer out of the box, and in the future, if you suspect a problem with the printer, SELF-TEST will help you identify the unit causing the problem. This will be covered later under maintenance and troubleshooting.

YOU DON'T NEED A COMPUTER TO RUN SELF-TEST! Certainly, the real test will be that the printer runs perfectly on your complete system.

The self-test is the perfect way to test the printer just after you take it out of the box, to immediately reassure yourself that the printer is working OK — it can move paper, it can control the print head wires, it can form the characters, and it does it with the speed and precision you expect — in other words you bought a high quality printer.

DOING A SELF-TEST

The power on/off switch is located on the middle left side of the printer near the bottom of the case.

1. You should have already inserted the ribbon, a sheet of paper, and attached the power cord. If you haven't done this yet, do it now following the descriptions in the first part of this section.
2. With the power OFF, press and hold the "TOF" button on the front control panel with your right hand, and reach around the left side of the printer and press the power switch ON. Now release the "TOF" button.
3. The printer will move the print head left, then start printing the internal characters.
4. To STOP the self-test, press the power switch OFF. Also it will automatically stop when you run out of paper.

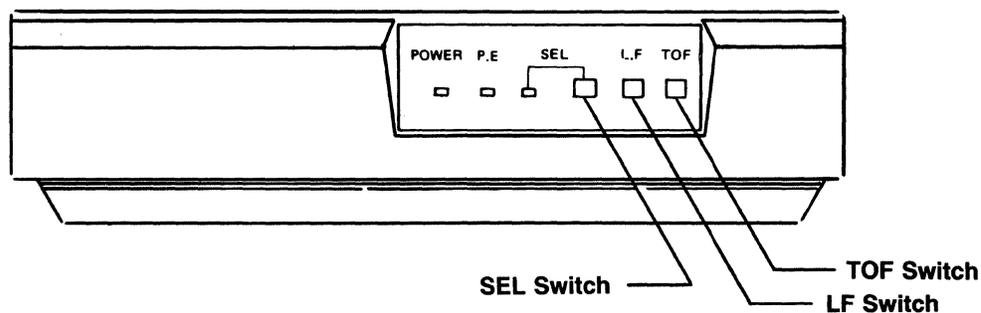
SECTION III

Printer Switches And Lights

This section contains information about **Control Panel Switches, Power Switch, Control Panel Lights, Hidden Switches, and Internal DIP Switches.**

THE CONTROL PANEL SWITCHES

The control panel, on the front of the printer, contains three pushbutton switches along with three lights.



SEL SWITCH

The SEL switch controls whether or not the printer can receive data from the computer. When the printer is **SELECTED**, also called **ONLINE**, the printer can receive data from the computer. When the printer is **DESELECTED**, also called **OFFLINE**, it cannot receive data from the computer. This switch won't do anything unless the printer is ready to print; that is, it has paper in it, and the printer top cover is closed. Otherwise, the red light (P.E.) will be lit, showing you that paper is needed or the top cover is not closed.

The SEL switch has a toggle action; it switches from its current condition to the alternate condition each time it is pressed. If the printer is selected (the green SEL light is on), and you push the SEL switch, the printer will then be **DESELECTED**. If the printer is deselected (the green SEL light is off), and you press the SEL switch, the printer will then be **SELECTED**.

When the printer is first powered on, it will be in the DESELECTED condition, because at our factory we set DIP switch 2-7 for deselect. If you want the printer to be SELECTED when you first power on, you can change this switch setting as described later in this section under INTERNAL SWITCHES.

LF SWITCH

The LF switch, short for LINE FEED, will advance the paper one line for each time it is pressed. If you hold the LF switch depressed, the paper will advance four lines at the normal speed, and then start moving paper continuously until you release the LF switch.

The LF switch will only work when the printer is DESELECTED (the green SEL light is off).

The LF switch also has a special diagnostic function covered in the Troubleshooting section.

TOF SWITCH

The TOF switch, short for TOP-OF-FORM, will move paper to the top of the next sheet. Normally, the length of each sheet is 11 inches, but the printer can be told that the paper is any length from top to top through a programming command. This is covered in section IV.

When the printer is first powered on, it will think it has a paper length of 11 inches, because at our factory we set DIP switch 2-3 for 11 inches. This switch is described under INTERNAL SWITCHES later in this section.

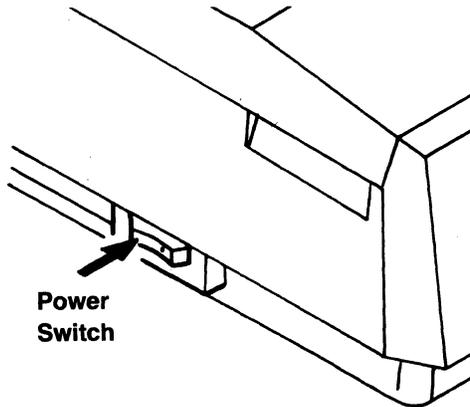
The TOF switch will only work when the printer is DESELECTED (the green SEL light is off).

The TOF switch also runs the internal self-test. With power off, press and hold the TOF switch, and turn power on. The printer will then print all the characters until it is turned off, or runs out of paper.

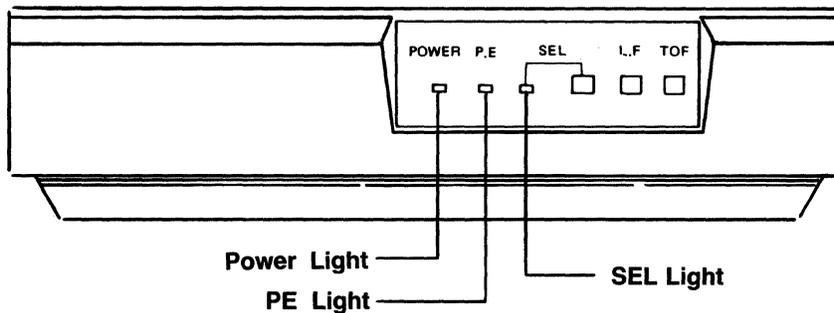
POWER SWITCH

The power on/off switch is located on the middle left side near the bottom of the case.

Pressing the switch where the white dot is printed will turn the printer on, and pressing the switch where there is no white dot will turn the printer off.



THE CONTROL PANEL LIGHTS



**SEL LIGHT
(Green)**

The SEL light, short for SELECTED, shows whether the printer is able to receive data from the computer. When it is lit, the printer can receive data. The light is turned on and off by pressing the SEL switch.

**PE LIGHT
(Red)**

The PE light, short for PAPER EMPTY, shows whether paper is properly inserted into the printer. When it is on, the printer thinks it doesn't have any paper. When it is off, the printer thinks it has paper.

If it is on, but you can see that paper is in the printer, try removing the paper, then inserting it again.

**POWER LIGHT
(Green)**

The POWER light shows whether AC power is being supplied to the printer. This means that it is plugged in, the power on/off switch is in the on position, and the printer fuse is ok.

If you see that it is plugged in, and you have the power switch to the on position, but the light is off, check that the power cable is fully seated in the back of the printer, the fuse is ok, and that the wall outlet really has power (maybe a circuit breaker in your house wiring is open).

HIDDEN SWITCHES

There are two switches inside the printer to detect Paper Empty and whether the printer top cover is closed.

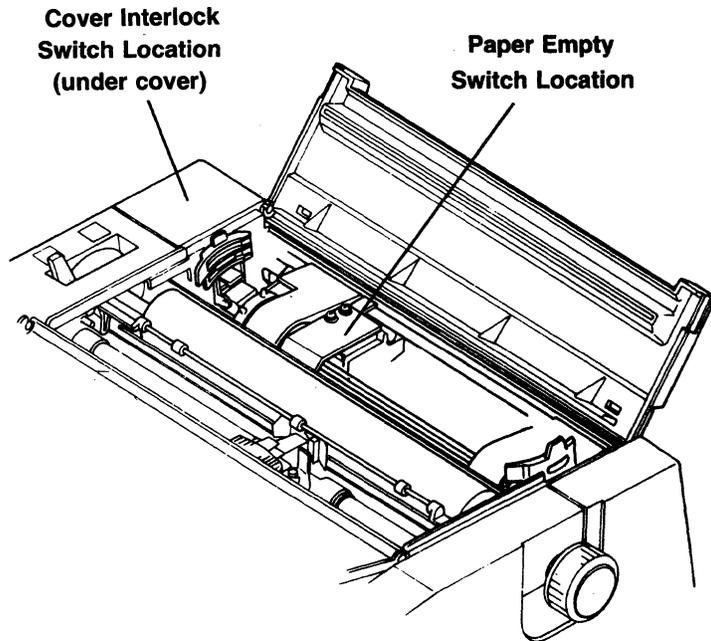
PE SWITCH

This microswitch is located beneath the paper platen and is difficult to see. It is placed there so that when paper is inserted into the printer, the paper will press on the switch, thus telling the printer that paper is installed. If the switch is not held closed by a sheet of paper being in the printer, then the printer knows that it should stop printing and turn on the red PE light and turn off the green SEL light. The printer is now DESELECTED (offline) and cannot receive more data from the computer until more paper is inserted, the red PE light turns off, and you press the SEL switch to SELECT the printer again.

If the SEL switch is pressed to continue printing, only one line will print, and then the printer will stop again.

COVER

The cover interlock switch is located on the right side of the printer in such a position that when the printer's top cover is in place, the cover presses on the switch. This tells the printer that the cover is in place, and it is ok to move the print head. You might injure your hand if it was accidentally in the moving print head path, so if the cover is open, the printer won't even try to print.

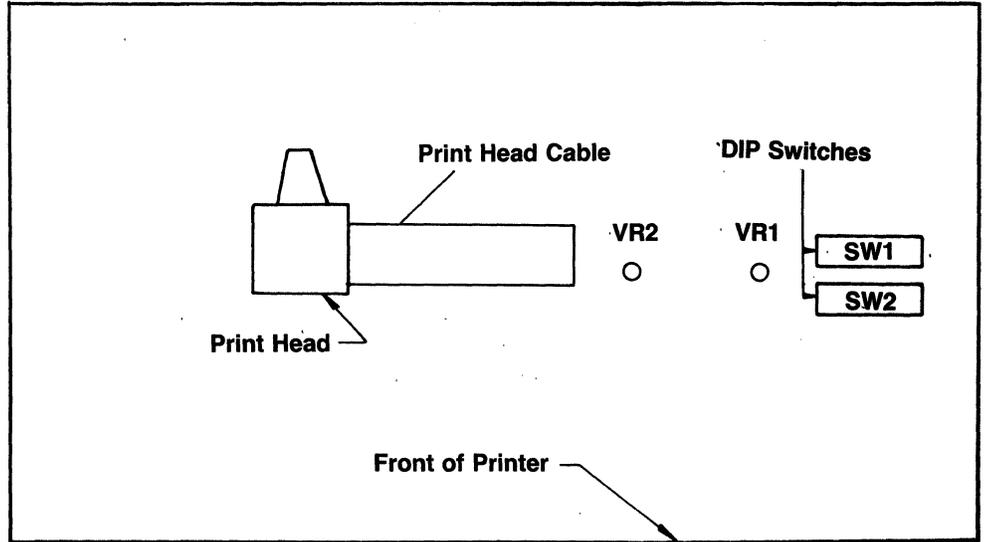


INTERNAL SWITCHES

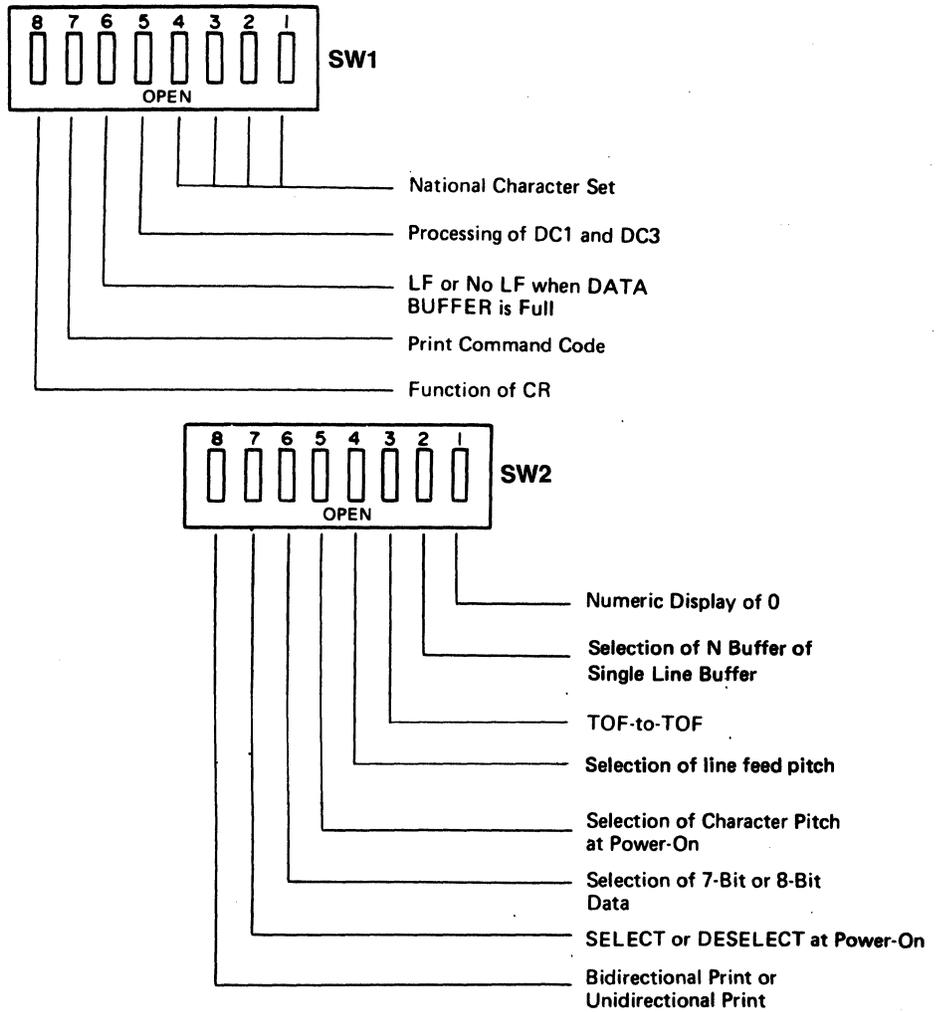
Inside the printer there are two DIP switches which control the printer when it is first powered on. They tell the printer what to do, like, should it be **SELECTED** or **DESELECTED**, should it print 6 or 8 lines per inch, should it print United States characters or French or Swedish, etc. This is not a permanent condition of the printer, as some of these switch settings can be overridden through programming commands. So if you select 6 lines per inch with a switch setting, your program can change it to 8 lines per inch, or 12 lines per inch. These switches just tell the printer what to do until your program tells it to do something different.

With the printer's top cover open, the DIP switches can be seen to the right of the print head path on the bottom of the printer. The switch closest to the front is **SWITCH 1**, and the switch closest to the rear is **SWITCH 2**.

We set the switches at our factory during final test to be at a "normal" position, but for your particular operation, you may have to reset one or another of the switches. Each of the two DIP switches have eight little slide switches. Be sure to turn power off, and then each little switch can be moved on or off with the tip of a ballpoint pen or a small screwdriver. The position of each of the little slide switches tells the printer how it is to act.



Location of Internal Switches 1 and 2



Internal DIP Switches 1 and 2

DIP SWITCH SUMMARY CHART

DIP SW No.	Function	Open	Close
1-1	National Character Selection		
1-2			
1-3			
1-4			
1-5	Processing Of DC1 And DC3 Signals		
1-6	Line Feed When Buffer Is Full	No LF	LF
1-7	Print Command Code	CR	CR, LF, VT, FF, US
1-8	Line Feed Invoked By CR Command Code	No	Yes
2-1	Printing Of Numeral 0	0	Ø
2-2	Select Buffer Option	N Buffer	One Line Buffer
2-3	Length Between Two TOFs	11 Inches	12 Inches
2-4	Line Spacing	1/6 Inch	1/8 Inch
2-5	Power On Character Pitch	10 CPI	Proportional
2-6	Selection of 7- Or 8-Bit Data	8-Bit	7-Bit
2-7	Power On Select/Deselect	Deselect	Select
2-8	Uni- Or Bi-direction Print	Bi-Direct	Uni-Direct

DIP SWITCH COUNTRY CHARACTER SELECTION

No.		SW1-4	SW1-3	SW1-2	SW1-1
0	JA	Open	Open	Open	Open
1	FR	Open	Open	Open	Closed
2	US	Open	Open	Closed	Open
3	UK	Open	Open	Closed	Closed
4	GE	Open	Closed	Open	Open
5	SW	Open	Closed	Open	Closed
6	IT	Open	Closed	Closed	Open
7	SP	Open	Closed	Closed	Closed
8	DN	Closed	Open	Open	Open
9	NOR	Closed	Open	Open	Closed
10	NET	Closed	Open	Closed	Open
11	AF	Closed	Open	Closed	Closed
12		Closed	Closed	Open	Open
13		Closed	Closed	Open	Closed
14	FR II	Closed	Closed	Closed	Open
15	UK II	Closed	Closed	Closed	Closed

SW1-1 thru SW1-4

Positions 1 thru 4 on DIP SWITCH 1 are used to identify which country's character set you want printed. Your printer can print 15 different character sets. This is set at the factory to print the U.S. character set, that is, SW1-1 is open, SW1-2 closed, SW1-3 open, and SW1-4 open. The following chart shows all possible positions of the four switches and the resulting country selected.

SW1-5

The position of SWITCH 1-5 tells the printer whether to allow two special characters to SELECT and DESELECT the printer, or to ignore these two special characters (DC1 and DC3). We set SW1-5 open at the factory (allow DC1 and DC3).

SW1-5 OPEN: When you receive a DC1 character, put the printer in SELECT mode. When you receive a DC3 character, put the printer in the DESELECT mode.

SW1-5 CLOSED: IGNORE DC1 and DC3 characters.

SW1-6

The position of SWITCH 1-6 tells the printer whether to insert an automatic line feed when it prints a buffer full condition. We set SW1-6 open at the factory (no auto LF).

SW1-6 OPEN: When the buffer is full, print the buffer, but do not advance to the next line.

SW1-6 CLOSED: When the buffer is full, print the buffer, then advance to the next line.

SW1-7

The position of SWITCH 1-7 tells the printer which codes to accept as print commands. This is valid only in Logic Seek Mode because Incremental Mode prints each character as it is received. At the factory, we set SW1-7 open (only CR).

SW1-7 OPEN: Print the buffer contents when you receive a carriage return (CR).

SW1-7 CLOSED: Print the buffer contents when you receive any of the following: CR, LF, VT, FF, or US.

SW1-8

The position of SWITCH 1-8 tells the printer whether a Line Feed (LF) should automatically be added to a carriage return (CR). Programs such as WordStar do NOT expect a CR to add a LF. If this switch is set to the wrong position, everything will come out double spaced or all printed on one line. At the factory, we set SW1-8 open (no auto LF).

SW1-8 OPEN: When you receive a CR, print the buffer but do not automatically go to the next line.

SW1-8 CLOSED: When you receive a CR, print the buffer and automatically go to the next line.

SW2-1

The position of SWITCH 2-1 tells the printer how it should print the zero character. Sometimes when text and numbers are combined, such as in a financial report, it is more difficult to tell a zero from a capital O. Your printer can print a normal zero or zero with a slash through it. At the factory, we set SW2-1 open (normal zero).

SW2-1 OPEN: Print a normal zero.

SW2-1 CLOSED: Print all zeroes with a slash through them.

SW2-2

The position of SWITCH 2-2 tells the printer what size input buffer it should use. When the buffer is full, the printer will print the buffer. If you use all available RAM as a buffer, usually the printer would have to receive 2,000 characters before it automatically printed. This is not bad, as normally, you only want the buffer to print when you send it a CR. If Single Line buffer is selected, the printer will print automatically when it is full, usually about 80 characters. At the factory, we set SW2-2 open (big buffer).

SW2-2 OPEN: Use all available RAM as a buffer.

SW2-2 CLOSED: Use only a single line buffer.

SW2-3

This position of SWITCH 2-3 tells the printer whether your normal paper size is 11 inches or 12 inches. At the factory, we set SW2-3 open (11").

SW2-3 OPEN: 11 inch paper top-to-top.

SW2-3 CLOSED: 12 inch paper top-to-top.

SW2-4

This position of SWITCH 2-4 tells the printer how many lines per inch it is to print. Six lines per inch or eight lines per inch can be selected. At the factory, we set SW2-4 open (6 LPI).

SW2-4 OPEN: Print at 6 lines per inch.

SW2-4 CLOSED: Print at 8 lines per inch.

SW2-5

This position of SWITCH 2-5 tells the printer how many characters per inch it is to print. Ten characters per inch is normal, but you may also select proportional printing where the amount of space used by a character is determined by its size, like the letter I would take less space than the letter W. At the factory, we set SW2-5 open (10 CPI).

SW2-5 OPEN: Print 10 characters in each inch.

SW2-5 CLOSED: Print as many characters per inch as the size of the character will allow.

SW2-6

This position of SWITCH 2-6 tells the printer how many data bits it is to expect in each byte sent by the computer. If 8 bits are to be expected, then the Greek and Graphics characters can be printed with no other commands. If only 7 bits are to be expected, to print Greek or Graphics, special Escape code commands must be sent first. At the factory, we set SW2-6 open (8 bits).

SW2-6 OPEN: Expect 8 bits of data in a byte.

SW2-6 CLOSED: Expect 7 bits of data in a byte.

SW2-7

This position of SWITCH 2-7 tells the printer whether it is to be SELECTED or DESELECTED when power is first turned on. In order to be SELECTED when first turned on, it must of course meet the other conditions — paper in place and printer top cover closed. At the factory, we set SW2-7 open (DESELECTED).

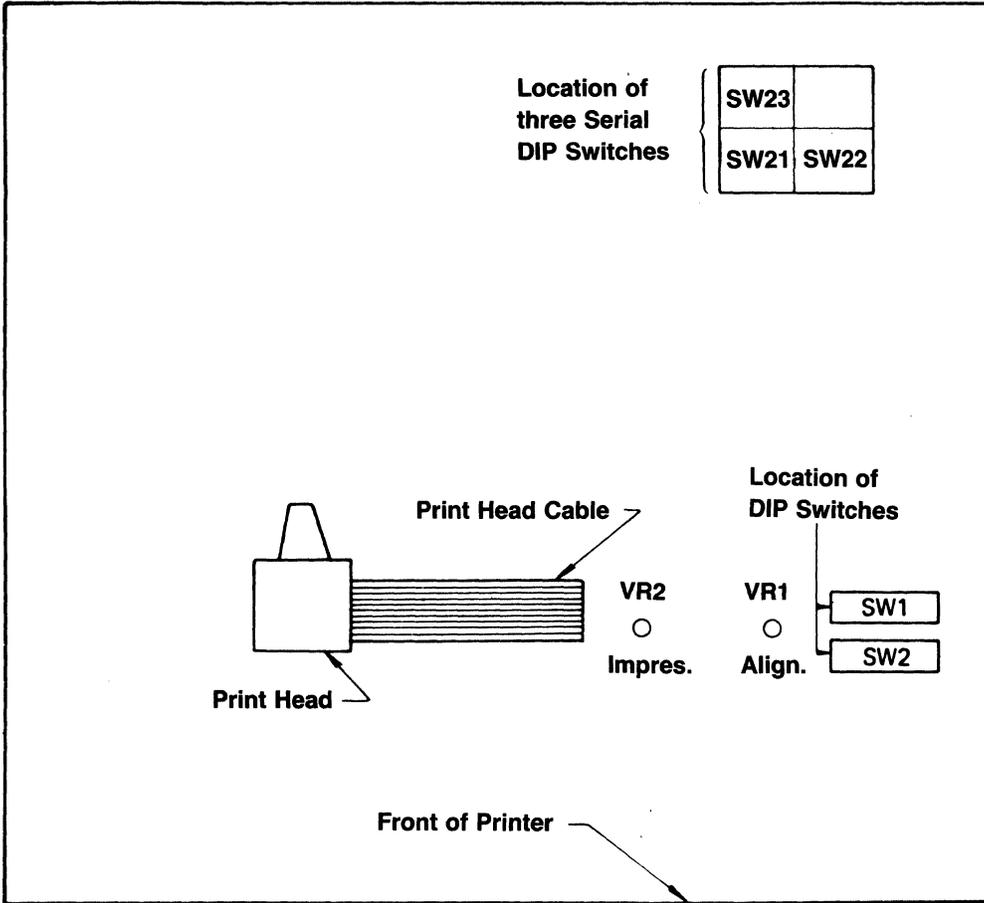
SW2-7 OPEN: Deselect on power up.

SW2-7 CLOSED: Select when first powered up.

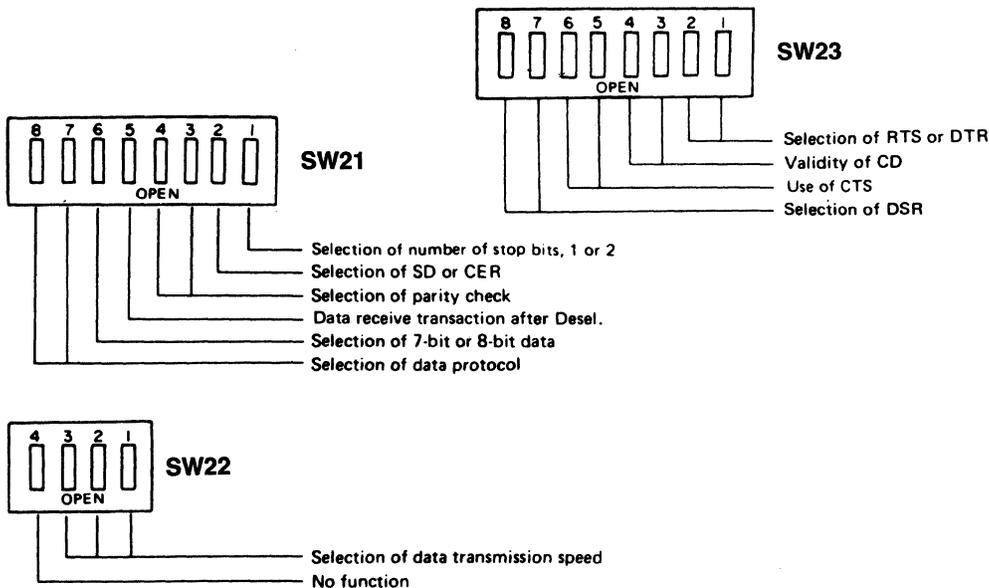
SW2-8

This position of SWITCH 2-8 tells the printer whether it is allowed to print in both directions while moving the head, or only print while moving the print head from left to right. Much faster printing can occur if the printer is allowed to print in both directions. But when you are doing graphics printing, the dot alignment will be much more accurate if printing is only allowed from left to right. At the factory, we set SW2-8 open (BIDIRECTIONAL).

RS-232C SERIAL PRINTER DIP SWITCH FUNCTIONS



Location of Internal DIP Switches 1, 2, 21, 22, and 23



Internal DIP Switches 21, 22, and 23

RS-232C SERIAL PRINTER DIP SWITCH SUMMARY CHARTS

DIP SW NO.	FUNCTION	OPEN	CLOSED
21-1	Selection of stop bit 1 or 2	1-Bit	2-Bit
21-2	Selection of SD or CER	SD	CER
21-5	Data Reception Processing after DESELECT	Receive all data input even in DESELECT state	Receive data for 350 ms after DESELECT and ignore following data
21-6	Selection of 7-bit or 8-bit data	8-Bit	7-Bit
23-1	Selection Timing of RTS	Synchronize it with DTR. (Can be used as RDY/BSY Signal)	Will be fixed on high while SELECT is ON. (Can be used for distinguishing SELECT/ DESELECT)
23-2	Selection Timing of RTS	Will be fixed on high while SELECT is on. (Can be used for distinguishing SELECT/ DESELECT)	Synchronize it with DTR. (Can be used as RDY/ BSY signal)
23-3	Validity of CD (CD is not in this printer)	CD Invalid	CD Valid
23-4	Validity of CD (CD is not in this printer)	CD Valid	CD Invalid
23-5	Selection of CTS	Not Used	Used
23-6	Selection of CTS	Used	Not Used
23-7	Selection of Valid/Invalid of DSR	Invalid	Valid
23-8	Selection of Valid/Invalid of DSR	Valid	Invalid

SELECTION OF PARITY CHECK	SW 21-3	SW 21-4
Even	Open	Open
Odd	Closed *	Open
No Parity	Open	Closed *

* Do not set SW21-3 and SW21-4 both to 'Closed' setting.

SELECTION OF DATA PROTOCOL	SW 21-7	SW 21-8
RDY/BSY ** 1	Open	Open
RDY/BSY **2	Closed	Open
XON/XOFF	Open	Closed
ETX/ACK	Closed	Closed

** 1 Low (CER)
 ** 2 High (CER)

DATA TRANSMISSION SPEED	SW 22-1	SW 22-2	SW 22-3
110 BPS	Closed	Closed	Closed
200 BPS	Closed	Closed	Open
300 BPS	Closed	Open	Closed
600 BPS	Closed	Open	Open
1200 BPS	Open	Closed	Closed
2400 BPS	Open	Closed	Open
4800 BPS	Open	Open	Closed
9600 BPS	Open	Open	Open

Jumper No	Synchronizes with RDY/BSY (DSY/BSY)	After power is turned ON. DTR will be fixed on high (XON/XOFF, ETX/ACK)
J-8	CONNECTED	NOT CONNECTED

SECTION IV

Connecting The Printer

This section contains information about **Connecting The Printer To Your Computer** and **Cabling Required**.

CONNECTING THE PRINTER TO YOUR COMPUTER

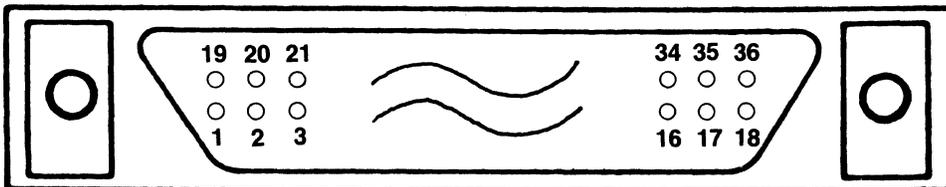
Before making any connections between the printer and your computer, be sure that power to all units is off!

You must also be sure you have the correct cable for your computer if the printer is to operate properly. Read your computer manual to determine what cable is needed and where it plugs into your computer.

PARALLEL PRINTER

The parallel printer has a parallel interface and requires the 36-pin parallel connector. The following table lists the signals on each connector pin. Check your computer manual for this information also. These signals are described technically in Appendix 3.

MATING CONNECTORS: AMP5730360-1 or equivalent



Parallel Connector

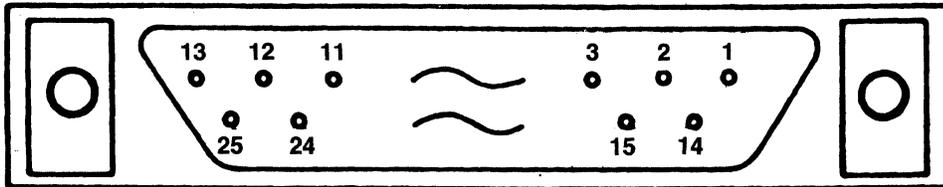
PARALLEL CONNECTOR PIN ASSIGNMENTS

PIN	SIGNAL NAME	SIGNAL RETURN	DIRECTION
1	<u>DATA STROBE</u>	19	Input
2	DATA 1	20	Input
3	DATA 2	21	Input
4	DATA 3		Input
5	DATA 4		Input
6	DATA 5	24	Input
7	DATA 6	25	Input
8	DATA 7	26	Input
9	<u>DATA 8</u>	27	Input
10	<u>ACKNOWLEDGE</u>	28	Output
11	INPUT - BUSY	29	Output
12	PAPER EMPTY		Output
13	SELECT		Output
14	OV		
15	No Connection		
16	OV		
17	CHASSIS GROUND		
18	+5 VDC		Input
19 through 30	SIGNAL GROUNDS		
31	<u>INPUT PRIME</u>	30	Input
32	<u>FAULT</u>		Output
33	OV		
34	No Connection		
35	No Connection		
36	INPUT - BUSY (Note: Normally NOT connected in cable)		OUTPUT

SERIAL RS-232C PRINTER

The serial printer has a serial interface and requires the 25-pin RS-232C serial connector. The SERIAL RS-232C PRINTER table lists the signals on each connector pin. Check your computer manual for this information also. These signals are described technically in Appendix 3.

MATING CONNECTOR: DB-25P (made by JAE) or the equivalent (male)



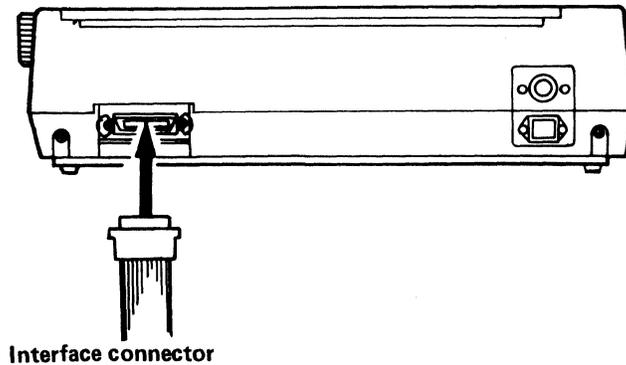
RS232 Serial Connector

RS-232C CONNECTOR PIN ASSIGNMENTS

PIN	SIGNAL NAME	DIRECTION
1	FRAME GROUND	
2	SEND DATA	Output
3	RECEIVED DATA	Input
4	REQUEST TO SEND	Output
5	CLEAR SET READY	Input
7	SIGNAL GROUND	
8	CARRIER DETECT	Input
14	FAULT	Output
15-19	No Connection	
20	DATA TERMINAL READY	Output
21-25	No Connection	

CONNECTING THE CABLE

1. Attach the molded male end of the cable at the rear of the printer (see figure below). It is important that you do not force the plug. If it doesn't fit one way, turn it over and try again. The connector should be locked in place with the wire bails on both sides of the connector.
2. Connect the other end of the cable to the printer jack of your computer. See your computer owner's manual for specific instructions.



SECTION V

Basic Printer Commands

This section contains information on how to perform basic communications with the printer.

BASIC PRINTER COMMUNICATIONS

In this section of the manual you will be shown how to send some simple commands to the printer (from your computer) in such a way that the printer will do what you want it to. You should become familiar with the commands in this section before going on to the advanced commands in Section VI.

First some basics . . .

When the computer talks to the printer the information is sent as a number between 0 and 255. Note if you have SW2-6 set to the closed position then the range is from 0 to 127. Each one of these numbers tells the printer what to do next. Here is a very simple example:

```
10 LPRINT CHR$(72);CHR$(73)
```

This program causes the printer to print out the message "HI" on the printer. This program is shown in BASIC as will all the examples in this section. Here is another example:

```
10 LPRINT "HI"
```

In this example the computer you are using will convert the letter H to the number 72 and send it to the printer, next it converts the letter I to the number 73 and sends it to the printer. Your computer (by using BASIC) can convert all the characters that are to be used by the printer with either of the methods shown above.

Unfortunately some computer versions of BASIC are not exactly as this manual will present and you may have to make some minor changes as specified in the User Manual for your computer.

Here is another quick example:

```
10 FOR C=32 TO 126
20 LPRINT C;"="";CHR$(C)
30 NEXT C
```

32 =	64 = @	96 = `
33 = !	65 = A	97 = a
34 = "	66 = B	98 = b
35 = #	67 = C	99 = c
36 = \$	68 = D	100 = d
37 = %	69 = E	101 = e
38 = &	70 = F	102 = f
39 = '	71 = G	103 = g
40 = (	72 = H	104 = h
41 =)	73 = I	105 = i
42 = *	74 = J	106 = j
43 = +	75 = K	107 = k
44 = ,	76 = L	108 = l
45 = -	77 = M	109 = m
46 = .	78 = N	110 = n
47 = /	79 = O	111 = o
48 = 0	80 = P	112 = p
49 = 1	81 = Q	113 = q
50 = 2	82 = R	114 = r
51 = 3	83 = S	115 = s
52 = 4	84 = T	116 = t
53 = 5	85 = U	117 = u
54 = 6	86 = V	118 = v
55 = 7	87 = W	119 = w
56 = 8	88 = X	120 = x
57 = 9	89 = Y	121 = y
58 = :	90 = Z	122 = z
59 = ;	91 = [	123 = {
60 = <	92 = \	124 = |
61 = =	93 =]	125 = }
62 = >	94 = ^	126 = ~
63 = ?	95 = _	

This example will give you a printout of all the "standard" characters that are provided by the printer. All of the characters printed by this program as well as additional characters are available for your use. This is explained under the "Extended Character Set" section of this manual.

The following pages will break down each command and show you how to use them.

FUNCTION NAME: Character Enhancements

PURPOSE: To allow the printing of characters in many different ways. Such things as italics, super/sub-script, bold (dark), underlined, and/or double-width printing is available with this printer. In addition, if you own the color version of this printer, then up to 8 different colors may be shown for each character.

COMMANDS:

ASCII	DECIMAL	HEX	FUNCTION
SO	14	0E	Double width characters
SI	15	0F	Normal width characters
ESC !	27,33	1B,21	Bold print
ESC "	27,34	1B,22	Turn off bold print
ESC X	27,88	1B,58	Underline characters
ESC Y	27,89	1B,59	Do not underline characters
ESC i 1	27,105,49	1B,69,31	Italics
ESC i 0	27,105,48	1B,69,30	No italics
ESC s 1	27,115,49	1B,73,31	Superscript
ESC s 2	27,115,50	1B,73,32	Subscript
ESC s 0	27,115,48	1B,73,30	Turn off super/sub-script

USAGE: These commands allow you to alter the printout to enhance the final result allow dramatic special effects.

```

10 REM Program to show character enhancements on the printer.
20 REM
30 DW$ = CHR$(14):REM           Double width on
40 NW$ = CHR$(15):REM           No double width
50 BP$ = CHR$(27) + CHR$(33):REM Bold print
60 NB$ = CHR$(27) + CHR$(34):REM No bold print
70 UL$ = CHR$(27) + CHR$(88):REM Underline characters
80 NL$ = CHR$(27) + CHR$(89):REM No underlining characters
90 IT$ = CHR$(27) + CHR$(105) + CHR$(49):REM Italics on
100 NI$ = CHR$(27) + CHR$(105) + CHR$(48):REM No italics
110 SP$ = CHR$(27) + CHR$(115) + CHR$(49):REM Superscript
120 SB$ = CHR$(27) + CHR$(115) + CHR$(50):REM Subscript
130 SO$ = CHR$(27) + CHR$(115) + CHR$(48):REM Super/sub-script off

```

```
140 REM
150 LPRINT"Congratulations on your purchase of the C. ITOH";
160 LPRINT"printer . . . . This printer can print ";DW$;" double width";NW$;
170 LPRINT" , ";BP$;"bold print";NB$
180 LPRINT "it can also print in ";IT$;" italics";NI$;" or even ";
190 LPRINT UL$;" underline your text.";NL$
200 LPRINT "Another handy feature is its ability to support both "
210 LPRINT SP$;" super ";SO$;" and ";SB$;"sub";SO$;"scripting of text."
220 LPRINT "But best of all these functions can even be ";
230 LPRINT DW$;BP$;UL$;IT$;" combined.";NW$;NB$;NL$;NI$
240 END
```

Congratulations on your purchase of the C. ITOH
printer.... This printer can print **double width**, bold print
it can also print in *italics* or even underline your text.
Another handy feature is it's ability to support both
^{super} and _{sub}scripting of text.
But best of all these functions can even be combined.

FUNCTION NAME: Color Commands

PURPOSE: To show the use of the color commands on the 8510 SC and 1550 SC printers. (The Model 8510S/1550S printers does not support color.)

COMMANDS:

ASCII	DECIMAL	HEX	FUNCTION
ESC C P . . .	27,67,80, . . .	1B,43,50, . . .	Set the color "palette"
ESC C N	27,67,N	1B,43,N	Set the ribbon color

USAGE: Welcome to the world of color printing. To start, install the color ribbon and perform the self-test to verify it is working. After this ribbon is installed then you will have the choice of any of the following colors:

COLOR NO.	COLOR	RIBBON(S) USED
0	White	No printing
1	Yellow	Yellow
2	Red	Red
3	Orange	Red;Yellow
4	Blue	Blue
5	Green	Blue;Yellow
6	Purple	Blue;Red
7	Black	Red;Yellow;Blue

As can be seen it is faster to print a line of red (one pass of the print head) than to print a line of black (three passes).

To change the current ribbon color a command such as:

```
100 LPRINT CHR$(27);CHR$(67);"1"
```

would be issued. This would select "palette color 1". What color is "palette color 1" you may ask. The palette colors are set by sending the "set color palette command" followed by a list of what color is #0,#1,#2 . . . , #7 as shown by the previous list.

```

10 REM Color example
20 CL$ = CHR$(27) + CHR$(67):REM
30 LPRINT CL$;"P01234567":REM
40 GOSUB 100:REM
50 LPRINT CL$;"P76543210":REM
60 GOSUB 100:REM
70 LPRINT CL$;"P25332156":REM
80 GOSUB 100:REM
90 GOTO 200:REM
100 REM
110 REM      This routine prints out a list of what each palette color is
120 REM
130 FOR I=0 to 7:REM
140 LPRINT CL$;CHR$(30+I);:REM
150 LPRINT "This is color ";I
160 NEXT I
170 LPRINT
180 RETURN
190 REM
200 END

```

Access color commands string
Set colors (note P = CHR\$(80))
Print out a list of the colors
Set colors again
Show off new colors
Yes more than one position is legal
The last show off
All done exit

8 colors total
Set ribbon color (30 + I = "0" to "7")

```

This is color 1
This is color 2
This is color 3
This is color 4
This is color 5
This is color 6
This is color 7

```

```

This is color 0
This is color 1
This is color 2
This is color 3
This is color 4
This is color 5
This is color 6

```

```

This is color 0
This is color 1
This is color 2
This is color 3
This is color 4
This is color 5
This is color 6
This is color 7

```

FUNCTION NAME: Alternate Character Sets

PURPOSE: Allows the printing of graphic and/or foreign language characters by the printer. Each printer contains two additional character sets, one which is Greek or Hiragana and one which is Graphic or Katakana. You can determine which character sets your printer has by reading Section III of this manual.

COMMANDS:

ASCII	DECIMAL	HEX	FUNCTION
ESC \$	27,36	1B,24	Use the standard set
ESC &	27,38	1B,26	Use Greek/Hiragana set
ESC #	27,35	1B,23	Use Graphic/Katakana set

USAGE: This set of commands causes the characters between 32 and 91 to be converted to new characters. This program will only work if S2-6 is in the closed position indicating 7 bit data.

```

10 REM Program to show the alternate character sets
20 REM
30 SS$ = CHR$(27) + CHR$(36):REM           The standard set
40 GH$ = CHR$(27) + CHR$(38):REM           The Greek/Hiragana set
50 GK$ = CHR$(27) + CHR$(35):REM           The Graphic/Katakana set
60 REM
70 REM Now we will print out each set one at a time
80 REM
90 LPRINT SS$;"This is the standard set of characters:"
100 LPRINT SS$;
110 GOSUB 300
120 LPRINT "This is the Greek or Hiragana set of characters"
130 LPRINT GH$;

```


FUNCTION NAME: Tabs and Margins

PURPOSE: The setting of tabs and margins allows for professional looking output from the computer.

COMMANDS:

ASCII	DECIMAL	HEX	FUNCTION
ESC L N	27,76,n	1B,4C,(N)	Set left margin
ESC / N	27,47,n	1B,2F,(N)	Set right margin
ESC (. . .	27,40, . . .	1B,28, . . .	Set a tab
ESC) . . .	27,41, . . .	1B,29, . . .	Clear a tab
ESC 0	27,48	1B,30	Initialize tabs
HT	9	09	Move to next tab

USAGE: First let's talk about margins. With this printer when you reach the margin, the printer automatically skips to the next line.

The value shown in the command above as "N" or n is a three digit number between 1 and the value given below (See the section on character spacing for what pica, elite, compressed and proportional refer to):

TYPE OF SPACING	RANGE
Pica	1 - 80
Elite	1 - 96
Compressed	1 - 136
Proportional	1 - 80

```

10 REM Program to show left and right margin setting
20 REM
30 LM$ = CHR$(27) + CHR$(76):REM      Command to set left margin
40 RM$ = CHR$(27) + CHR$(47):REM      Command to set right margin
50 REM
60 REM Now set the margins very short to show the automatic
70 REM linefeed command.
80 REM
90 LPRINT LM$;"010":REM                10 Char from left side of paper
95 REM                                  for the left margin
97 REM
100 LPRINT RM$;"020":REM               20 Char from left side of paper
105 REM                                 for the right margin
107 REM
110 LPRINT "The quick brown fox jumped over the lazy dog's back"
120 LPRINT LM$;"X":REM                 Clear left margins
130 LPRINT RM$;"X":REM                 Clear right margin
140 END

```

```

The quick
brown fox
jumped ove
r the lazy
dog's bac
k

```

Now for tabs. Setting of tabs is performed by the following sequence:

- 1) Issue the set tab command
- 2) Send the position for the tab just as you did to set the margins above (a 3 digit number)
- 3) Send a comma
- 4) To send another tab position repeat steps 2 and 3 (you are allowed a maximum of 32 tab positions)
- 5) When you are done, send a period (or CHR\$(46))

To clear a tab use the same sequence except for step 1 you issue the clear tab command.

The tab initialize command actually sets a tab at every 8 printer positions.

```

10 REM Setting and clearing tabs
20 REM
30 ST$ = CHR$(27) + CHR$(40):REM           Set tab command
40 RT$ = CHR$(27) + CHR$(41):REM         Clear tab command
50 IT$ = CHR$(27) + CHR$(48):REM         Initialize tabs
60 TB$ = CHR$(128 + 9):REM               Printer tab command
70 QB$ = "The" + TB$ + "quick" + TB$ + "fox" + TB$ + "etc."
80 REM
90 REM Use the initial tab settings (every 8 positions)
100 REM
110 LPRINT IT$;QB$
120 REM
130 REM Set three tab stops at positions 10, 20 and 30
140 REM
150 LPRINT ST$;"010,020,030,,:REM       Don't forget the period
160 LPRINT QB$
170 REM
180 REM Now clear a couple of tabs
190 REM
200 LPRINT RT$;"020,,:REM               Clear middle tab
210 LPRINT QB$
220 REM
230 REM Reset tabs to initial position and quit
240 REM
250 LPRINT IT$
260 END

```

```

The      quick    fox      etc.

The      quick      fox      etc.

The      quick                fox      etc.

```

FUNCTION NAME: Character Spacing (Pitch)

PURPOSE: These functions allow your printer to simulate three popular typewriter formats and also print in a compressed format which will allow up to 136 characters on a line to be printed.

COMMANDS:

ASCII	DECIMAL	HEX	FUNCTION
ESC N	27,78	1B,4E	Set pica mode (10 CPI)
ESC E	27,69	1B,45	Set elite mode (12 CPI)
ESC Q	27,81	1B,51	Set compressed mode (17 CPI)
ESC P	27,80	1B,50	Set proportional mode
ESC "N"	27,N	1B,("N")	Set proportional spacing

USAGE: These commands allow the simulation of the popular pica and elite typewriter formats. The number next to the format is how many characters are in one inch of printed output, or put another way, the larger the number the smaller the print. Proportional spacing is where each character is a different size; this gives the printout a very high quality look.

The spacing is how much space is to be inserted between each character while in the proportional spacing mode. The "N" is a number from 1 to 6 (ASCII) or CHR\$(49) to CHR\$(54) in decimal.

10 REM Examples of the character pitch

20 REM

30 PI\$ = CHR\$(27) + CHR\$(78):REM

Set Pica command

40 EL\$ = CHR\$(27) + CHR\$(69):REM

Set Elite command

50 CP\$ = CHR\$(27) + CHR\$(81):REM

Set Compressed command

60 PR\$ = CHR\$(27) + CHR\$(80):REM

Set Proportional mode

70 PS\$ = CHR\$(27):REM

Set dot spacing

75 REM

(for proportional mode)

80 QB\$ = "The quick brown fox jumped over the lazy dog's back"

90 REM

```

100 REM Now show Pica, Elite, and Compressed formats
110 REM
120 LPRINT PI$;"This is the PICA format"
130 LPRINT QB$
140 LPRINT
150 LPRINT EL$;"This is the Elite format"
160 LPRINT QB$
170 LPRINT
180 LPRINT CP$;"This is the compressed format"
190 LPRINT QB$
200 LPRINT
210 REM
220 REM Now print the proportional mode
230 REM
240 FOR I=1 to 6
250 LPRINT PI$;"This is proportional spacing at ";I;" dot spacing."
260 LPRINT PR$;PS$;CHR$(48+I):REM           Sets value from 49-54
270 LPRINT QB$
280 NEXT I
290 LPRINT PI$:REM                           Leave printer in pica
300 END

```

This is the PICA format
The quick brown fox jumped over the lazy dogs back

This is the Elite format
The quick brown fox jumped over the lazy dogs back

This is the compressed format
The quick brown fox jumped over the lazy dogs back

This is proportional spacing at 1 dot spacing.

The quick brown fox jumped over the lazy dogs back
This is proportional spacing at 2 dot spacing.

The quick brown fox jumped over the lazy dogs back
This is proportional spacing at 3 dot spacing.

The quick brown fox jumped over the lazy dogs back
This is proportional spacing at 4 dot spacing.

The quick brown fox jumped over the lazy dogs back
This is proportional spacing at 5 dot spacing.

The quick brown fox jumped over the lazy dogs back
This is proportional spacing at 6 dot spacing.

The quick brown fox jumped over the lazy dogs back

FUNCTION NAME: Line Spacing

PURPOSE: In addition to being able to control the size of characters and the spacing between them (see previous section on character spacing), this printer can also control the distance between lines.

COMMANDS:

ASCII	DECIMAL	HEX	FUNCTION
ESC f	27,102	1B,66	Set forward mode
ESC r	27,114	1B,72	Set reverse mode
LF	10	0A	Line feed
ESC A	27,65	1B,41	Set 6 LPI mode
ESC B	27,66	1B,42	Set 8 LPI mode
ESC T, . .	27,84, . .	1B,54, . .	Set N/144 LPI mode
FF	12	0C	Form feed to top of form
VT	11	0B	Vertical tab

USAGE: Each of the commands above allow you to set the direction and spacing of lines on the page. The spacing is set in lines per inch (LPI) which is how many lines of text will be printed for each inch of paper when measured from top to bottom.

Before going into the size of lines, first let's discuss the forward/reverse mode. When the printer receives a line of text (from the computer) to print, the last thing it will usually receive is the command to line feed. This tells the printer to skip down to the next line. However, if the printer is in the reverse mode, then the printer will backup to the previous line after printing.

```

10 REM Forward and reverse mode of operation
20 REM
30 FM$ = CHR$(27) + CHR$(102):REM           Forward mode
40 RM$ = CHR$(27) + CHR$(114):REM         Reverse mode
50 LF$ = CHR$(10):REM                       Line feed
60 REM
70 LPRINT LF$:REM                           Skip a line
80 LPRINT RM$;"This is the first line printed"
90 LPRINT "and this is the second.";FM$
100 LPRINT LF$:REM                          Skip over first line
110 END

```

```

and this is the second.
This is the first line printed

```

A few other handy commands are the form feed and vertical tabs. The form feed advances the paper to the start of a new page and the vertical tab skip down to either line 6 or 12 or 18 or 24 or . . . (skip by six). A more detailed explanation of these commands is given in the VFU and EVFU portion of Section VI.

Now (finally) comes the discussion of vertical spacing. Actually it is very simple. All you do is have the computer tell the printer how many lines are allowed in 1 inch and the printer does it. The . . . portion under N/144 spacing refers to a two digit number (0-99). It should be noted that a value of 0 causes the printer not to line feed.

```

10 REM Programmable Line Spacing
20 REM
30 S6$ = CHR$(27) + CHR$(65):REM           SIX LPI Spacing
40 S8$ = CHR$(27) + CHR$(66):REM         EIGHT LPI Spacing
50 SP$ = CHR$(27) + CHR$(84):REM         N/144 spacing
60 REM
70 LPRINT S6$
80 FOR I=1 to 6
90 LPRINT "This is the 6 LPI mode"
100 NEXT I
110 REM
120 LPRINT S8$
130 FOR I=1 to 8
140 LPRINT "This is the 8 LPI mode"

```

```

150 NEXT I
160 REM
170 LPRINT SP$;"99"
180 FOR I=1 to 3
190 LPRINT "This is the largest spacing available (99/144 LPI)"
200 NEXT I
210 REM
220 LPRINT SP$;"10"
230 FOR I=1 to 14
240 LPRINT "This is 14/144 LPI mode"
250 NEXT I
260 LPRINT S6$
270 END

```

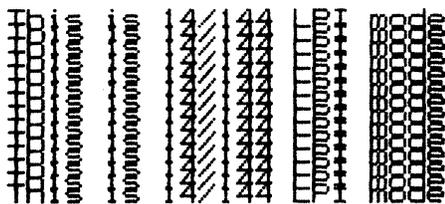
This is the 6 LPI mode
This is the 6 LPI mode

This is the 8 LPI mode
This is the 8 LPI mode
This is the 8 LPI mode
This is the 8 LPI mode
This is the 8 LPI mode
This is the 8 LPI mode
This is the 8 LPI mode
This is the 8 LPI mode

This is the largest spacing available (99/144 LPI)

This is the largest spacing available (99/144 LPI)

This is the largest spacing available (99/144 LPI)



Note the initial setting of LPI is set by dip switch S2-4. If the switch is closed then 8 LPI is selected; if open, then 6 LPI is set.

FUNCTION NAME: Other Simple Commands

PURPOSE: These commands allow the printer to perform various functions that do not fall into any of the other classifications.

COMMANDS:

ASCII	DECIMAL	HEX	FUNCTION
CR	13	0D	Carriage return
DC1	17	11	Select the printer
DC3	19	13	Deselect the printer
DC2	18	12	Elongate Japanese
DC4	20	14	Normal Japanese
ESC m 0	27,109,48	1B,6D,30	Draft mode
ESC m 1	27,109,49	1B,6D,31	Normal mode
ESC [ob	27,91	1B,5B	Incremental mode
ESC]cb	27,93	1B,5D	Logic mode
BS	8	08	Backspace
CAN	24	18	Cancel buffer
ESC R . . .	27,82, . . .	1B,52, . . .	Character repeat
ESC c 1	27,99,49	1B,63,31	Software reset

USAGE: This hodgepodge of commands gives you even more control over the printing functions (but isn't that what it is all about anyway?)

The easiest command is the carriage return. All this does is move the carriage on the printer to the left hand margin. If dip switch 1-8 is set to the closed position then a line feed is also output. But, for this example it is assumed that the switch is open.

```
10 REM The carriage return
20 CR$ = CHR$(13)
30 LPRINT "This is an example of";CR$;"overprinting"
40 END
```

~~This is an example of~~

The next set of commands will act as if you pressed the Select Switch upon the front panel of the printer. Please note that if dip switch 1-5 is set to the closed position, then both of these commands are ignored.

```

10 REM Select/Deselect the printer
20 REM
30 SE$ = CHR$(17):REM          Select printer
40 DS$ = CHR$(19):REM          Deselect printer
50 INPUT "Turn on the printer (1 = Yes 0 = No)",IN
60 IF IN=1 THEN 100
70 PRINT "The printer is now off-line"
80 LPRINT DS$
90 GOTO 50
100 PRINT "The printer is now ON-line"
110 LPRINT SE$
120 GOTO 50
130 END

```

If you do not have the Japanese character sets (Hiragana and Katakana) you can ignore these commands. But if you do have them, then you can elongate the characters in this set by use of these commands.

```

10 REM Elongate the Japanese Characters
20 REM
30 KA$ = CHR$(27) + CHR$(35):REM      Katakana set
40 NM$ = CHR$(27) + CHR$(36):REM      The normal set
50 EL$ = CHR$(18):REM                 Elongate
60 NJ$ = CHR$(20):REM                 Normal Japanese
70 REM
80 LPRINT KA$;NJ$;"ABCDEFGHIJKLMNOPQRSTUVWXYZ":REM  Will print using
85 REM                                 Katakana (Normal height)
87 REM
90 LPRINT EL$;"ABCDEFGHIJKLMNOPQRSTUVWXYZ"  Katakana (Elongated)
100 LPRINT NM$;NJ$:REM                 Reset commands
110 END

```

The use of the draft mode allows you to increase the speed of the printout from 120 CPS (Characters Per Second) to 180 CPS. However, you must take the bad with the good:


```

This is an example of the high quality normal mode
This is an example of the high quality normal mode
This is an example of the high quality normal mode
This is an example of the high quality normal mode
This is an example of the high quality normal mode
This is an example of the high quality normal mode
This is an example of the high quality normal mode
This is an example of the high quality normal mode
This is an example of the high quality normal mode
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This is an example of the high quality normal mode
This is an example of the high quality normal mode
This is an example of the high quality normal mode
This is an example of the high quality normal mode
This is an example of the high quality normal mode
This is an example of the high quality normal mode
This is an example of the high quality normal mode

```

The software reset is a method of restoring the printer to its original power-on condition. (A few exceptions do exist and are covered in Section VI of this manual.) This gets rid of any unusual mode the printer may be in due to previous commands.

```

10 REM Reset the printer
20 RS$ = CHR$(27) + CHR$(99) + CHR$(49)
30 LPRINT RS$
40 PRINT "The printer is now re-initialized"
50 END

```

The character repeat function allows you to send any printable character up to 999 times. The ". . ." in the command section stands for a three digit number telling the printer how many times to print the character.

```

10 REM Repeat Character Function
20 REM
30 RP$ = CHR$(27) + CHR$(82):REM
40 HT$ = "050":REM
50 CH$ = "***":REM
60 LPRINT RP$;HT$;CH$
70 END

```

The repeat function
How many times
What to print

```

*****

```

Finally, the incremental and logic functions decide if the data is to be printed a line at a time or a character at a time.

The Incremental mode prints data a character at a time as it is received from the computer. An added feature in this mode is the addition of the backspace command which can be used to perform strikeouts and other functions.

When the printer is in the logic mode data is saved in the buffer memory until a full line of data is ready to be printed. At that point the data is printed. This mode is faster than the Incremental mode and also adds the cancel command which clears the line of print currently in the buffer.

```

10 REM Incremental and Logic modes
20 REM
30 LG$;CHR$(27);CHR$(93):REM           Logic mode
40 IC$;CHR$(27);CHR$(91):REM           Incremental mode
50 BS$;CHR$(8):REM                     Backspace
60 CN$;CHR$(24):REM                    Cancel buffer
70 REM
80 LPRINT IC$
90 LPRINT "The incremental mode can be a very usable";
100 LPRINT BS$;BS$;BS$;BS$;BS$;BS$;.REM Backup for slash out
110 LPRINT "///// usable feature"
120 REM
130 LPRINT LG$
140 LPRINT "The default (power on) condition is the logic mode"
150 LPRINT "This line will never be printed";CN$;
160 LPRINT
170 END

```

The incremental mode can be a very ~~usable~~ a usable feature

The default (power on) condition is the logic mode

SECTION VI

Advanced Printer Commands

This section contains information on using the more advanced features of the printer.

ADVANCED PRINTER OPERATION

In this section you will be shown some more commands for talking to the printer. These commands are a little more complex to understand but allow the printer to be an even more powerful tool.

One of the key concepts of this section is the print head assignment. The print head is composed of nine wires which strike the ribbon to make patterns upon the paper. In this section you will learn how to talk directly to each of these wires to make your own characters and graphics.

Each wire on the print head has been given a number as shown below:

1	Top of print head
2	
3	
4	
5	
6	
7	
8	
9	Bottom of print head (underline)

You can directly talk to wires 1–8 and talk indirectly to wire 9 (using the underline command). Please note that if DIP switch S2-6 is in the closed position then you will only be able to talk directly to wires 1–7.

Each wire has been given a value to allow it to be on (printing) or off.

Wire number	Value
1	1
2	2
3	4
4	8
5	16
6	32
7	64
8	128

So to talk to wire 3 you would use a value of 4. To turn on wires 2 and 5 you would need a value of (2 + 16) 18. In this section the wire on/off state is referred to as the wire pattern.

All this talk has been about vertical dots; to make more than nine you would perform a line feed then a carriage return followed by another wire pattern.

Horizontally, the number of dots will vary according to the current pitch selection.

PITCH	NUMBER OF DOTS (MAX)
Pica	640
Elite	768
Compressed	1088
Proportional	1280

The horizontal dot position (left to right) is the number of dots from the left side of the paper. This means that the left side of the paper is at position 0 and the right side (for pica pitch) is position 639.

FUNCTION NAME: Direct Print Head Access (Graphics)

PURPOSE: To allow the printing of individual dots upon the paper, giving a possible resolution of up to 1248 dots horizontally.

COMMANDS:

ASCII	DECIMAL	HEX	FUNCTION
ESC F, . . .	27,70, . . .	1B,46, . . .	Set dot address
ESC V, . . .	27,86, . . .	1B,56, . . .	Dot repeat
ESC S, . . .	27,83, . . .	1B,53, . . .	Bit Graphics

USAGE: These commands allow you to "draw" with the printer using a variety of methods.

The set dot address command is used to position the print head at a specified horizontal dot position (left to right). From this position the printer can continue printing or produce a graphics image starting at that position. The ". . ." in this command refers to a four digit number representing the dot position.

The dot repeat function is used to repeat a wire pattern up to 9999 times. The ". . ." in this command refers to a four digit number representing the number of times to print the wire pattern followed by the value of the wire pattern.

```

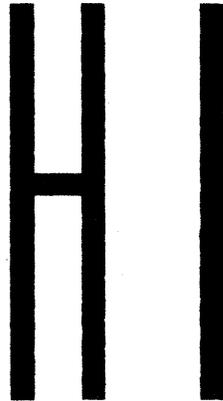
10 REM Using Dot Addressing and Dot Repeat
20 REM
30 DA$ = CHR$(27) + CHR$(70):REM          Dot address command
40 DR$ = CHR$(27) + CHR$(86):REM          Dot repeat command
50 DP$ = CHR$(255):REM                     All dots on
60 LS$ = CHR$(27) + CHR$(84) + "14":REM    14/144 Dot spacing
70 PI$ = CHR$(27) + CHR$(78):REM          Pica pitch
75 S6$ = CHR$(27) + CHR$(65):REM          Return to 6 LPI spacing
80 REM
90 LPRINT LS$;PI$
100 REM
110 FOR I=1 TO 21
120 LPRINT DA$;"0020":REM                  Space from left
130 LPRINT DR$;"0010";DP$;:REM           First bar
140 IF I<>10 THEN 170

```

```

150 LPRINT DR$;"0020";DP$;
160 GOTO 180
170 LPRINT DA$;"0050";
180 REM
190 LPRINT DR$;"0010";DP$;
200 LPRINT DA$;"0100";
210 LPRINT DR$;"0010";DP$
220 NEXT I
225 LPRINT S6$
230 END

```



You can (if you want to) use the graphics command to create your own characters on a one-at-a-time basis as shown below:

```

10 REM Dot graphic drawing
20 REM
30 PI$ = CHR$(27) + CHR$(78):REM
40 LP$ = CHR$(27) + CHR$(65):REM
50 BG$ = CHR$(27) + CHR$(83):REM
60 FOR I=1 to 9:REM
70 READ T
80 UA$ = UA$ + CHR$(T)
90 NEXT I
100 REM
110 LPRINT PI$;LP$
120 LPRINT "Sometimes we all get a little CR";BG$;"0009";UA$;"ZY"
125 DATA 31,40,72,72,72,40,31,0,0
130 END

```

Pica pitch
6 LPI
Bit graphics command
Upside down A pattern

Sometimes we all get a little CRZY

FUNCTION NAME: Programmable Character Generation

PURPOSE: Allows the creation of up to 95 unique characters as specified by you.

COMMANDS:

ASCII	DECIMAL	HEX	FUNCTION
ESC ?, . . .	27,63, . . .	1B,3F, . . .	Reserve character space
ESC u	27,117	1B,75	Copy character set
ESC +	27,43, . . .	1B,2B, . . .	Create a character
ESC ' . . .	27,39, . . .	1B,27, . . .	Enable "new" characters

USAGE: This series of commands allows the creation and use of custom designed characters by the printer/computer. To create a character set, you perform the following functions:

- 1) Reserve an area in the printer's buffer to hold the new character set.

What you are doing here is borrowing some space in the line buffer to use to hold this new character set. How much room is dependent upon how many wire patterns are required to make up a character. It is always a good idea to leave extra space in this buffer to allow for future expansion. The ". . ." in this command is a four digit number telling how many wire patterns to reserve.

- 2) Set which set is to be used if an uncreated character is specified.

In this step you are deciding what will happen if an undefined character is accessed by the computer and if it will print out a Pica or Proportional type character.

- 3) Set the characters to be used

Perform the following functions:

Send the character create code.

Send the name of the character.

Send a count + a type code.

Send the wire pattern(s) for the code.

The name of the character is a number between 32 and 126 that you will use (in a CHR\$()) to refer to the character.

The count is a number from 1 and 31 and is the number of wire patterns that will follow.

The type code is one of the following values:

Type code	Meaning
0	Normal characters
32	Move character down one dot (make decenders)
96	Optional move down (move down only if wire 8 is specified)

- 4) Finally, send the turn-on command to enable the character set. You can use the ESC \$ (CHR\$(27)+CHR\$(36)) to turn the character set back off.

```

120 E$ = CHR$(27)
190 REM. . . .
192 REM. . . . sending ? 0 1 0 0
194 REM. . . . reserve 100 bytes for down load area
196 REM. . . .
200 LPRINT E$;"0100";
210 FOR I=1 to 99
220 LPRINT CHR$(0);
230 NEXT
232 REM. . . .
234 REM. . . . sending ESC u
235 REM. . . . copy internal CG to down load area
236 REM. . . .
240 LPRINT E$;"u";
250 LPRINT"PRINT SAMPLE FOR DOWN LOADING
CHARACTER":PRINT:PRINT
252 REM. . . .
253 REM. . . . register custom character to down load area
254 REM. . . . sending ESC +
255 REM. . . . 20 6D
256 REM. . . . 0C 12 21 21 12 C3 C2 FE 0 0 0 0 0
257 REM. . . . 21 0B
258 REM. . . . 0C 12 21 ADA5 99 41 22 1C 0 0
259 REM. . . . 22 0D
260 REM. . . . 01 7E 80 8E 95 99 81 8E 81 81 7E 0 0
    
```

```

261 REM. . . .          23  2D
262 REM. . . .          01 7E 80 8E 95 99 81 8E 81 81 7E 0  0
265 REM. . . .          EOT
267 REM. . . .
270 LPRINT E$;" ";
275 LPRINT CHR$(32)CHR$(109);
280 LPRINT CHR$(12)CHR$(18)CHR$(33)CHR$(33)CHR$(18)CHR$(195)
      CHR$(194);
290 LPRINT CHR$(254)CHR$(0)CHR$(0)CHR$(0)CHR$(0)CHR$(0);
300 LPRINT CHR$(33)CHR$(11);
310 LPRINT CHR$(12)CHR$(18)CHR$(33)CHR$(173)CHR$(165)CHR$(153)
      CHR$(65);
320 LPRINT CHR$(34)CHR$(28)CHR$(0)CHR$(0);
325 LPRINT CHR$(34)CHR$(13);
330 LPRINT CHR$(1)CHR$(126)CHR$(128)CHR$(142)CHR$(149)CHR$(153)
      CHR$(129);
335 LPRINT CHR$(142)CHR$(129)CHR$(129)CHR$(126)CHR$(0)CHR$(0);
340 LPRINT CHR$(35)CHR$(45);
350 LPRINT CHR$(1)CHR$(126)CHR$(128)CHR$(142)CHR$(149)CHR$(153)
      CHR$(129);
352 LPRINT CHR$(142)CHR$(129)CHR$(129)CHR$(126)CHR$(0)CHR$(0);
355 LPRINT CHR$(4);
390 REM. . . .
392          to access down loading character generator area
394 REM. . . . sending ESC '
396 REM. . . .
400 LPRINT E$;""";
420 FOR I=32 to 35
440 FOR J=1 to 25
450 LPRINT CHR$(I);
460 NEXT J
470 LPRINT
480 NEXT I
500 LPRINT E$;"$";
505 LPRINT:PRINT
510 LPRINT"COMPARE NORMAL AND DESCENDER CHARACTER
      ":LPRINT:LPRINT
520 LPRINT E$;""";
530 N=34:GOSUB 1000:LPRINT" ";
540 N=35:GOSUB 1000
550 LPRINT:LPRINT
560 N=34:LPRINT E$;"X";:GOSUB 1000:LPRINT " ";
570 N=35:GOSUB 1000:LPRINT:LPRINT
580 N=32:GOSUB 1000:LPRINT E$;"Y";" "
590 N=32:GOSUB 1000
592 REM. . . .
593 REM. . . . to access alphanumeric character (ASCII)
594 REM. . . . sending ESC $
595 REM. . . .

```


FUNCTION NAME: VFU and EVFU Processing

PURPOSE: This command allows the setting of the Vertical Format Unit (VFU) and the Electronic Vertical Format Unit (EVFU).

COMMANDS:

ASCII	DECIMAL	HEX	FUNCTION
GS	29	1D	Start of EVFU
RS	30	1E	End of EVFU
US	31	1F	Use EVFU
ESC v	27,118	1B,76	Set VFU

USAGE: This command allows a method of defining where the top and bottom of the page is. It also allows you to give a line one or more channels which, in conjunction with the US command, allows rapid skipping forward on a form.

This discussion will start with the setting of the VFU.

The VFU is a simplified version of the EVFU which will allow you to set the top of form, the bottom of form and where each vertical tab is to occur.

To use the command the following is performed:

- 1) The "set VFU" command is sent
- 2) The number of lines in the page is sent
- 3) A comma is sent (CHR\$(44))
- 4) How many lines from the bottom of the paper that is the last printing line is sent.
- 5) Another comma is sent
- 6) The position (from the top) that a vertical tab is to occur.
- 7) To add more vertical tabs repeat steps 5 and 6
- 8) Send a period (CHR\$(46)) to indicate done.

```

100 REM Using the VFU settings
110 VF$ = CHR$(27) + CHR$(118):REM      Set VFU command
120 LPRINT VF$;"160,2";:REM           Form is 16 lines long
130 REM                                2 lines from bottom is bottom
140 REM                                of form
150 LPRINT ",05,12,,"                Set vertical tabs
160 LPRINT "REM IS NOW THE TOP OF THE FORM"

```

```

170 LPRINT CHR$(12);"THIS IS NOW THE TOP OF THE NEXT FORM"
180 END
THIS IS NOW THE TOP OF THE FORM

```

THIS IS NOW THE TOP OF THE NEXT FORM

Each EVFU channel has an extension and an associated function that goes with it.

Channel	Function
1	Specifies top of form
2	Specifies where VT will go to
3-6	Specifies where US will go to for EVFU

As can be seen above, the EVFU is the VFU with the addition of information that is used by the US (Use EVFU) command.

To set a EVFU perform the following operations:

- 1) Send the Start EVFU command
- 2) Send the Top of Form command (always 65)
- 3) Send a check byte (always 64)
- 4) Send the channels to be selected (+ 64) as shown below

Channel number	value to add
2	2
3	4
4	8
5	16
6	32

- 5) Send another check byte of 64
- 6) Repeat steps 4 and 5 for each line of the form (up to 66)
- 7) Send the bottom of form command (always 67)
- 8) Send a check byte (of 64)
- 9) Send a top of form command (65)
- 10) Send a check byte (64)
- 11) Send an end of EVFU command (30)

To use the VFU, the computer will send the US (Use EVFU) command followed by the number of the channel to jump to (CHR\$(2) to CHR\$(6)). If a value of 16 or greater is specified, then the command has the effect of performing the number specified minus 16 line feeds (1-15)

10 REM Example of EVFU Operation

```

20 REM
30 SV$ = CHR$(29):REM           P + t VFU
40 EV$ = CHR$(30):REM          End of Set VFU
50 UV$ = CHR$(31):REM          Use VFU
60 REM
70 REM Read each byte of the VFU; every other byte is always 64
80 REM
90 LPRINT SV$;:REM             Start VFU
100 READ T
110 IF T = 0 THEN 140
120 LPRINT CHR$(T);CHR$(64);
130 GOTO 100
140 REM
150 REM Send the ending code sequence
160 REM
170 LPRINT EV$
180 LPRINT "This is the top of form"
190 LPRINT UV$;CHR$(27);"Advance of 13 lines (step 1)"
200 LPRINT UV$(2);"Skip to next channel 2 found (Step 2)"
210 GOTO 400
220 DATA 65:REM                TOF Command
230 DATA 64,64,64,64,64,66,66,66,66,66
240 DATA 64,64,64,64,64,66,66,66,66,66
250 DATA 67,65
260 DATA 0:REM                 End of VFU signal
400 END

```

This is the top of form

Advance of 13 lines (step 1)
This is position 1

Advance to next mark
This is position 2

FUNCTION NAME: Other Advanced Subjects

PURPOSE: To allow other enhanced operation of the printer

COMMANDS:

ASCII	DECIMAL	HEX	FUNCTION
ESC D "N"	27,68,N	1B,44,N	Close switch
ESC Z "N"	27,90,N	1B,5A,N	Open switch
ESC = 0	27,61,48	1B,3D,30	Uni-Directional
ESC >	27,62	1B,3E	Same as above
ESC = 1	27,61,49	1B,3D,31	Bi-Directional
ESC <	27,60	1B,3C	Same as above
ESC = 2	27,61,50	1B,3D,32	Quasi-Directional
ESC c 1	27,99,49	1B,63,31	Software Reset

USAGE: We will start with the switch commands.

See Section II for the exact operation of each switch.

These commands allow the printer to 'think' that a switch has been changed. The value of N is 2 single byte values which refer to dip switch 1 (DS1) followed by the value for dip switch 2 (DS2).

The values for each switch setting are:

SWITCH POSITION	VALUE	COMMENTS
1	1	
2	2	Not affected on DS2
3	4	If changed resets VFU
4	8	Not affected on DS2
5	16	Not affected on DS2
6	32	
7	64	Not affected on DS2
8	128	Not affected on DS2

So to set positions 1,3 and 5 on DS1 and also to set positions 2,4, and 6 on DS2 the commands would be:

```
100 REM Setting dip switches by way of software
110 SD$ = CHR$(27) + CHR$(68):REM Set dip switch command
```

```

120 D1$ = CHR$(1 + 4 + 16):REM          Set 1,3 and 5 on DS1
130 D2$ = CHR$(2 + 8 + 32):REM        Set 2,4 and 6 on DS2
140 LPRINT SD$;D1$;D2$;:REM          Switches are now "changed"
150 END

```

Now we will discuss the commands that control the direction of the print head. In operation the printer can print while the print head is moving in either the left to right or while moving in the right to left direction. By printing in both directions the printer will operate at a much faster speed than if it only prints in one of the two directions.

For this printer there are three ways in which the printer can print:

- 1) In the Uni-Directional mode the printer only prints in the left to right direction. This is very useful when printing in the graphics modes. When using this mode the dots printed by the print head are aligned to the previous row of dots.
- 2) In the Bi-Directional mode the printer will alternate in the direction in which printing will occur. This is the fastest mode for printing. When this mode is used it should be remembered that the dots printed in the left to right direction may not line up exactly with the dots printed in the right to left direction. This offset can cause the printing of "out-of-focus" looking bold face and color characters.
- 3) The final method of printing is the Quasi-Directional mode. When the printer is in this mode then the printer operates in a Bi-Directional mode until a double printed (bold face) or color character occurs, at this point the printer will act in the Uni-Directional mode.

In general it is ok to use the Quasi-Directional mode for all applications except graphics. When printing multiple line graphics it is best to use the Uni-Directional mode.

```

100 REM Program showing use of Directional modes.
110 UD$ = CHR$(27) + CHR$(62):REM      Uni-Directional mode
120 BD$ = CHR$(27) + CHR$(61) + CHR$(49):REM  Bi-Directional mode

```

```

130 QD$ = CHR$(27) + CHR$(61) + CHR$(50):REM   Quasi-Directional mode
140 BF$ = CHR$(27) + CHR$(33):REM             Bold face printing
145 NB$ = CHR$(27) + CHR$(34):REM             Bold face off command
150 LPRINT UD$;"This is an example of Uni-Directional printing"
160 GOSUB 500
170 LPRINT BD$;"This is an example of Bi-Directional printing"
180 GOSUB 500
190 LPRINT QD$;"This is an example of Quasi-Directional printing"
200 GOTO 1000:REM                               End of program
500 REM   This routine prints out 10 lines of text in the current
510 REM   directional mode.
520 FOR I = 1 to 10
530 LPRINT BF$;"This is printing bold face";NB$
540 NEXT I
550 RETURN
1000 END

```

```

This is an example of Uni-Directional printing
This is printing bold face
This is an example of Bi-Directional printing
This is printing bold face
This is an example of Quasi-Directional printing
This is printing bold face

```

The software reset command was briefly discussed in Section V. Although this command is very similar to turning the printer off and then on again, a few exceptions do occur.

- 1) The current condition of the VFU, Extended Character Set and values for the horizontal tab are not changed.
- 2) The current select status of the printer (whether it is selected or de-selected) is not changed.
- 3) For dip switch 2 (see Section III for more detail) switch positions 2,3 and 7 are not looked at, even if they were altered before sending this command.
- 4) The EVFU is reset to its power on condition
- 5) All of the data currently in the printer buffer is output before the command is acted upon.

SECTION VII

Maintenance

This section contains information about **Preventive Maintenance, Cleaning and Lubrication, Troubleshooting, and Parts Replacement**

PREVENTIVE MAINTENANCE

The printer requires cleaning and lubrication periodically. Proper care of your printer will result in a longer life and less maintenance problems.

GENERAL PRECAUTIONS

Remove power to the printer before doing any servicing.

DO NOT print without a ribbon. This can damage the head pins.

Use only the recommended ribbon. The use of other ribbons can damage the head.

The ribbon should be replaced whenever worn due to excessive use. Ribbon life is approximately 500,000 characters.

Use the recommended paper.

Remove any foreign material dropped into the printer before applying power.

It is important to perform the following periodic maintenance to ensure proper printer operation.

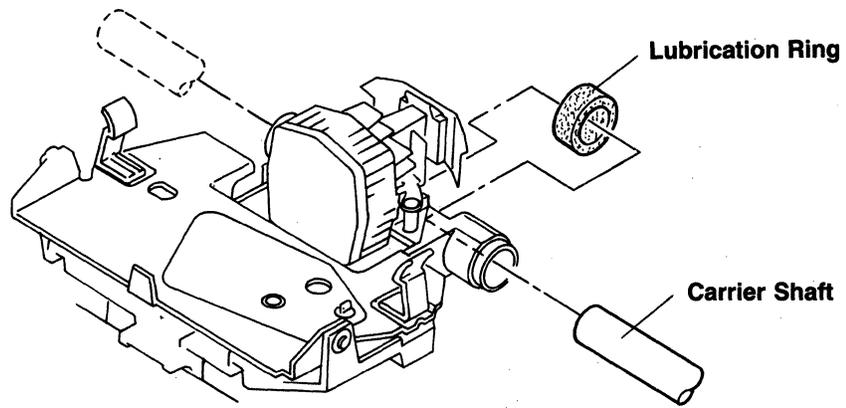
Lubrication

a. Lubrication Method

Prior to application of any lubrication, remove all accumulated dirt and old lubrication from the carrier shaft and the carrier shaft guide with a lintless cloth. Then apply a small amount of lubricant to the lubrication ring.

b. Lubrication Period

Oil should be applied yearly or every 500,000 lines of printing.



Lubrication Points

c. Notes on Lubrication

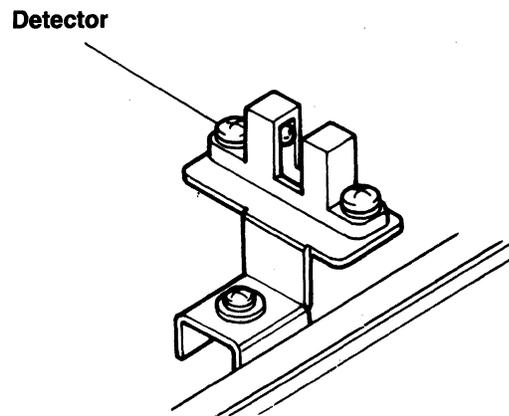
Use only high viscosity, non-drying synthetic lubricant. (Do not use vegetable or petroleum-based lubricants.) Lubricate only the lubrication ring as shown above.

Cleaning

a. Cleaning Points and Method

1. Detector

Brush off any paper dust on and around the detector. (Refer to figure).



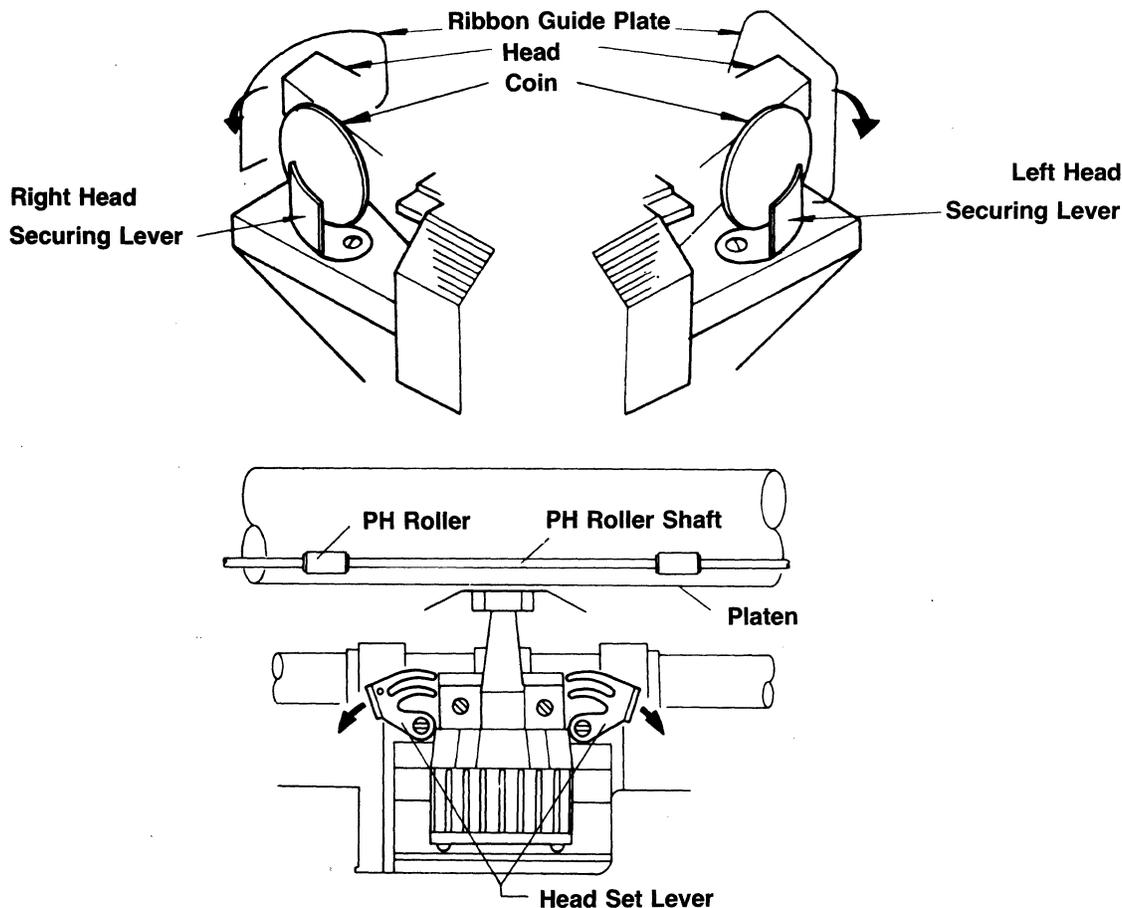
Home Position Sensor

2. The Head Top

Detach the ribbon, and remove the head as described later. Next, remove ribbon blocks and paper particles from the head top with the brush (option).

When removing the head, follow the procedure described below:

1. Remove the print cover, and move the head to a position where no paper hold down roller is fitted (see figure below).
2. Insert a coin between the head and the right and left head securing levers. Turn the right coin clockwise and left coin counterclockwise to open the levers.
3. Pull the paper hold down shaft toward the front, and lift the head straight up. The head male connector then parts from the female connector attached to the printer. Next, push the paper hold down shaft toward the rear, and lift the head again to complete removal. Be careful not to bend the ribbon guide plate while removing or replacing the head.



Head Removal

b. Cleaning Period

1. Whenever ribbon chips or dust accumulate on the detector or the end of the print head.
2. Every 500,000 lines of printing or every year.

- c. Notes on Cleaning
 1. To avoid disturbing delicate mechanical adjustments made during assembly, do not remove parts other than the ribbon when cleaning.
 2. Do not use detergents or solvents such as benzine when cleaning.
 3. To clean the cover, use cloth with water or weak soap solution.

TROUBLESHOOTING

If the printer fails to operate properly, try to solve the problem as follows:

1. Power ON lamp does not turn on.
 - a. Check to see if AC power cord is plugged securely into printer and power source.
 - b. Check the printer fuse. If blown, replace with one of the same type and rating.
2. Computer and printer do not communicate.
 - a. Check to see if interface cable is properly connected.
 - b. Check to see if ON/OFF switch is ON.
3. Printer does not print.
 - a. Check that covers are closed.
 - b. Check and change ribbon if necessary.
 - c. Run SELF-TEST to check if printer is capable of printing.
 - d. Check if anything has fallen into the mechanism which physically obstructs the head movement.

PARTS REPLACEMENT

Troubleshooting and repair of the printer is complex. Only limited repairs and parts replacement should be attempted.

Print Head

If the print head is found to be the trouble, such as a worn dot wire, the head can be replaced. Follow the head removal steps in the cleaning procedures for removing the print head.

APPENDIX I

Specifications

PRINT SPECIFICATIONS

Print Method	Logic Seek Printing or Incremental Printing		
Print Speed			
Draft Pica Mode	180 CPS (Instantaneous print speed.) 100 LPM (80 Col. Full Print, N-Line Buffer, and Bidirection Print)		
Normal Pica Mode	120 CPS (Instantaneous print speed.) 74 LPM (80 Col. Full Print, N-Line Buffer, and Bidirection Print)		
Character Format	7(H) × 9(V) Dot Matrix (Alpha-Numeric, Kana & Symbols) N(H) × 8(V) Dot Matrix (Character Generator Based Graphic, Hiragana, Greek) N(H) × 8(V) Dot Matrix (Bit Image Graphic) 9 Half (H) × 9(V) (Draft Print Mode)		
Characters	Normal	Draft	Italic
ASCII	95	95	95
JIS (ASCII + Katakana) Character Generator	159	159	159
Graphic	64	—	64
National Character	42	42	42
Hiragana*	64	—	64
Greek*	64	—	64
Extended CG	95	—	95

*For JIS Specification 'Hiragana' is adopted; otherwise, Greek is instead.

Character Pitch	Character/Line	Character/Inch
Compressed Character	136	17
Compressed Character being Elongated	68	8.5
Pica Pitch Character	80	10
Pica Pitch Character being Elongated	40	5
Elite Pitch Character	96	12
Elite Pitch Character being Elongated	48	6
Proportional Character	—	—
Proportional Character being Elongated	—	—
Draft Character	80	10
Paper Feed Direction	Forward, (Reverse)	
Line Spacing	1/6", 1/8", N/144" (N = 0 to 99) (Minimum Pitch 1/144")	
Line Feed Speed	Max. 100 ms (1/6" Pitch)	
Form Width	Max. 10" (8510S/SC); 15.5" (1550 S/SC)	
Form Thickness	0.05 to 0.28mm	
Number of Copies	Original + 3 (The total paper thickness may not exceed the range stated in Form Thickness)	
Type of Form	Fan-Folded Sprocket Paper Rolled Paper (with special roll paper adapter) Single Sheet Paper	
Paper Feed Method	Friction Feed Sprocket/Pin Feed (Incorporated)	
Form Loading	From Rear-Top	
Driving Method	Stepper Motor	
Inked Ribbon	Black Color (8510/1550SC only)	
Ribbon Dimensions	13mm(W) × 13,000mm(L)	
Ribbon Materials	66 Nylon, 40/34 Vinyl	
Ribbon Unit (Black)	CLABK-12802	
Ribbon Unit (Color)	CLABK-19101 (8510/1150SC Only)	

PHYSICAL

	8510	1550
Weight	19.8 pounds (9 kg)	24.2 pounds (11 kg)
Dimensions		
Width	16.80 inches (420 mm)	22 inches (550 mm) (not including platen knob)
Depth	11.88 inches (297 mm)	12 inches (300 mm)
Height	5.48 inches (137 mm)	5.32 inches (133 mm)

ENVIRONMENTAL

Operating Temperature & Humidity	41 to 104°F (5 to 40°C), 10 to 85% relative humidity
Storage Temperature & Humidity	-13 to 140°F (-25 to 60°C), 10 to 90% relative humidity

ELECTRICAL

Interface	8-bit Parallel or RS-232C (separate models), 8- or 7-bit serial
Power	115V \pm 10%, 60 Hz
Power Consumption	Less than 180W (while printing) 20W (stand-by)
Main Fuse	110V/115V 2A (Use a specified fuse when replacing the main fuse or the fuse on the PC board.)

APPENDIX II

Commands And Special Functions Summary

FUNCTION NAME: Character Enhancements (Page 5-3)

ASCII	DECIMAL	HEX	FUNCTION
SO	14	0E	Double width characters
SI	15	0F	Normal width characters
ESC !	27,33	1B,21	Bold Print
ESC "	27,34	1B,22	Turn off bold print
ESC X	27,88	1B,58	Underline characters
ESC Y	27,89	1B,59	Do not underline characters
ESC i 1	27,105,49	1B,69,31	Italics
ESC i 0	27,105,48	1B,69,30	No italics
ESC s 1	27,115,49	1B,73,31	Superscript
ESC s 2	27,115,50	1B,73,32	Subscript
ESC s 0	27,115,48	1B,73,30	Turn off super/sub-script

FUNCTION NAME: Color Commands (Page 5-5)

ASCII	DECIMAL	HEX	FUNCTION
ESC C P	27,67,80, . . .	1B,43,50, . . .	Set the color "palette"
ESC C N	27,67,N	1B,43,N	Set the ribbon color

FUNCTION NAME: Alternate Character Sets (Page 5-7)

ASCII	DECIMAL	HEX	NAME
ESC \$	27,36	1B,24	Use the standard set
ESC &	27,38	1B,26	Use Greek/Hiragana set
ESC #	27,35	1B,23	Use Graphic/Katakana set

FUNCTION NAME: Tabs and Margins (Page 5-10)

ASCII	DECIMAL	HEX	FUNCTION
ESC L N	27,76,n	1B,4C,(N)	Set left margin
ESC / N	27,47,n	1B,2F,(N)	Set right margin
ESC (. . .	27,40, . . .	1B,28, . . .	Set a tab
ESC) . . .	27,41, . . .	1B,29, . . .	Clear a tab
ESC 0	27,48	1B,30	Initialize tabs
HT	9	09	Move to next tab

FUNCTION NAME: Character Spacing (Pitch) (Page 5-13)

ASCII	DECIMAL	HEX	FUNCTION
ESC N	27,78	1B,4E	Set pica mode (10 CPI)
ESC E	27,69	1B,45	Set elite mode (12 CPI)
ESC Q	27,81	1B,51	Set compressed mode (17 CPI)
ESC P	27,80	1B,50	Set propotional mode
ESC "N"	27,N	1B,("N")	Set proportional spacing

FUNCTION NAME: Line Spacing (Page 5-15)

ASCII	DECIMAL	HEX	FUNCTION
ESC f	27,102	,66	Set forward mode
ESC r	27,114	1B,72	Set reverse mode
LF	10	0A	Line feed
ESC A	27,65	1B,41	Set 6 LPI mode
ESC B	27,66	1B,42	Set 8 PLI mode
ESC T, . . .	27,84, . .	1B,54, . .	Set N/144 LPI mode
FF	12	0C	Form feed to top of form
VT	11	0B	Vertical tab

FUNCTION NAME: Other Simple Commands (Page 5-18)

ASCII	DECIMAL	HEX	FUNCTION
CR	13	0D	Carriage return
DC1	17	11	Select the printer
DC3	19	13	Deselect the printer
DC2	18	12	Elongate Japanese
DC4	20	14	Normal Japanese
ESC m 0	27,109,48	1B,6D,30	Draft mode
ESC m 1	27,109,49	1B,6D,31	Normal mode
ESC [	27,91	1B,5B	Incremental mode
ESC]	27,93	1B,5D	Logic mode
BS	8	08	Backspace
CAN	24	18	Cancel buffer
ESC R . . .	27,82, . . .	1B,52, . . .	Character repeat
ESC c 1	27,99,49	1B,63,31	Software reset

FUNCTION NAME: Direct Print Head Access (Graphics) (Page 6-3)

ASCII	DECIMAL	HEX	FUNCTION
GS . . .	29 . . .	1D . . .	Start of EVFU
. . . RS	. . . 30	. . . 1E	End of EVFU
US . . .	31 . . .	1F . . .	Use EVFU
ESC v . . .	27,118 . . .	1B,76 . . .	Set VFU

FUNCTION NAME: Other Advanced Subjects (Page 6-13)

ASCII	DECIMAL	HEX	FUNCTION
ESC D "N"	27,68,N	1B,44,N	Close switch
ESC Z "N"	27,90,N	1B,5A,N	Open switch
ESC = 0	27,61,48	1B,3D,30	Uni-Directional
ESC >	27,62	1B,3E	Same as above
ESC = 1	27,61,49	1B,3D,31	Bi-Directional
ESC <	27,60	1B,3C	Same as above
ESC = 2	27,61,50	1B,3D,32	Quasi-Directional
ESC c 1	27,99,49	1B,63,31	Software Reset

APPENDIX III

Interface Specification

PARALLEL PRINTER INTERFACE SIGNALS

SIGNAL	FUNCTION
DATA 1-8	<p>8-bit parallel input data signal (bit 8 reserved for special characters); also used in graphics mode.</p> <p>Logic 1 represents HIGH level.</p> <p>Minimum data pulse width is 3 microseconds.</p>
<u>DATA. STROBE</u> or <u>DATA. STB</u>	<p>This is a synchronizing input signal for reading-in the above data signal.</p> <p>This signal is normally HIGH. The above data signal is clocked-in when <u>DATA STB</u> is made LOW by the host computer.</p> <p>Minimum pulse width is 1 microsecond.</p>
<u>INPUT. PRIME</u>	<p>This input signal resets the printer to the initial state; however, this signal does not affect SELECT/DESELECT or the pre-set VFU conditions</p> <p>Upon receipt of this signal, all data stored in the DATA BUFFER will be printed; the printer will then return to the initial state.</p> <p>This signal is normally HIGH. <u>INPUT PRIME</u> is active when the signal is LOW.</p> <p>Minimum pulse width is 1 microsecond.</p> <p>After receiving an <u>INPUT PRIME</u>, allow a delay time (5 ms.) until next data is received.</p>
<u>ACKNOWLEDGE</u> or <u>NO</u> <u>ACK</u>	<p>The printer transmits this output signal to the host computer after it has received and processed input data and performed any function commands. This signal indicates that the printer is ready to receive additional data or function codes.</p> <p>When the DESELECT state changes to the SELECT state, an <u>ACK</u> signal is also output.</p> <p>The printer will not transmit this signal when either a DC1 code is entered during PE status, or when a DC3 code is received under a SELECT state.</p>

SIGNAL	FUNCTION
BUSY	<p data-bbox="768 346 1328 378">Nominal pulse width is 5.5 microseconds.</p> <p data-bbox="768 396 1503 495">This signal is normally HIGH. $\overline{\text{ACK}}$ is active when the signal is LOW. $\overline{\text{ACK}}$ is output when BUSY changes from HIGH to LOW.</p> <p data-bbox="768 556 1503 655">This is an output signal from the printer. When the signal is HIGH, no input codes or data except DC1 may enter the printer.</p> <p data-bbox="768 695 1503 758">This signal will be HIGH (BUSY) under any of the following conditions:</p> <ol data-bbox="768 779 1503 1052" style="list-style-type: none">1. The RECEIVE BUFFER is full.2. The printer is in the DESELECT state.3. The <u>printer is in the FAULT</u> state.4. An INPUT PRIME code is received. (The BUSY status in this case will be cancelled a specified period of time after INPUT PRIME goes high.)5. Data processing fails to catch up with transmitted data while printing. <p data-bbox="768 1092 1390 1123">The printer does not receive data while BUSY.</p>
SELECT	<p data-bbox="768 1157 1503 1360">This is an output signal from the printer, indicating whether the printer is in a SELECT or DESELECT state. Receiving of data is possible in SELECT state. In the DESELECT state no code other than DC1 is acceptable. If DIP SW1-5 is closed, DC1 is also ignored.</p> <p data-bbox="768 1400 1487 1432">The signal is HIGH for SELECT and LOW for DESELECT.</p> <p data-bbox="768 1472 1503 1535">SELECT state occurs under any of the following conditions:</p> <ol data-bbox="768 1575 1503 1942" style="list-style-type: none">1. The SEL switch is depressed under a DESELECT state. (However, if the SEL switch is depressed during a PE state, the Printer will temporarily assume the SELECT state and print one line of data and return to the DESELECT state. This override function enables the printing of the last few lines of a report, after PE has occurred.)2. The DC1 code is received of DC1 code will not cause to be set in a SELECT state.3. The power switch is turned-on while the DIP SW2-7 is closed.

SIGNAL

FUNCTION

DESELECT state will occur under any of the following conditions:

1. The SEL switch is depressed under a SELECT state.
2. A DC3 code is received while the DIP SW1-5 is open.
3. The printed is in the PE state.
4. The power switch is turned-on while the DIP SW22-7 is open.
5. The printer is in a FAULT state.
6. Cover open is detected.

 $\overline{\text{FAULT}}$

This is an output signal from the printer indicating printer FAULT state.

The signal is LOW during a $\overline{\text{FAULT}}$ state.

$\overline{\text{FAULT}}$ state occurs under any of the following conditions:

1. Under a PE state. (However, if the SEL switch is depressed during a FAULT state, the Fault signal will temporarily become HIGH, enabling the printing of one line before returning to LOW.)
2. Under a DESELECT state.
3. An error or malfunction has occurred in the printer. (When the Head Carrier overruns or initialization can not be made at Power on.)
4. Cover Open is detected.

PAPER EMPTY
(PE)

This is an output signal from the printer indicating that the paper end is near (approx. 25mm from the paper's edge). PE status is also created when no paper is present.

This signal is activated by a micro switch located below the platen.

INPUT BUSY

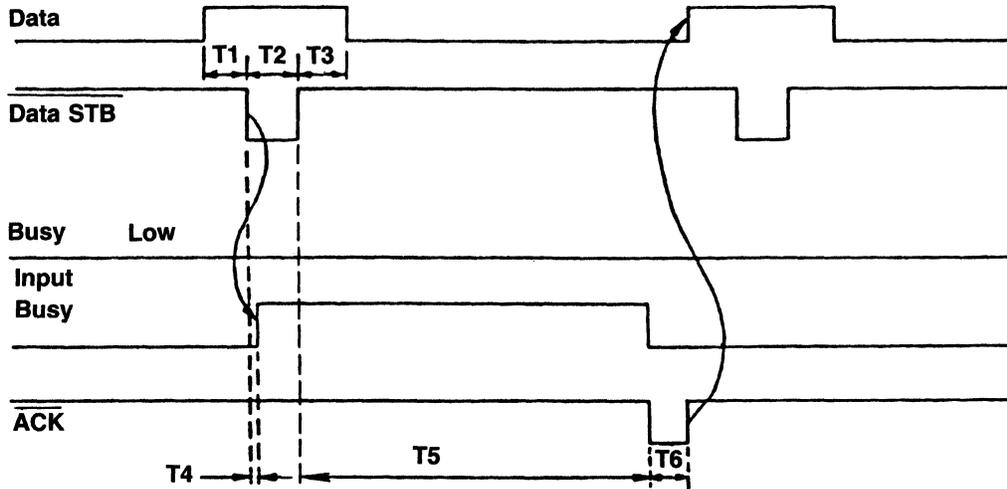
This output signal is similar to the BUSY signal. When HIGH, INPUT BUSY indicates that the printer is not ready to receive data.

INPUT BUSY becomes HIGH whenever $\overline{\text{DATA STB}}$ or BUSY is active.

SIGNAL	FUNCTION
+5V DC	<p data-bbox="761 342 1503 415">INPUT BUSY becomes LOW when $\overline{\text{ACK}}$ is active either simultaneously with ACK or immediately after.</p> <p data-bbox="761 447 1503 520">This is not a signal. This is a +5V DC power source to an outside device.</p> <p data-bbox="761 552 1425 590">The maximum output current available is 50 mA.</p>

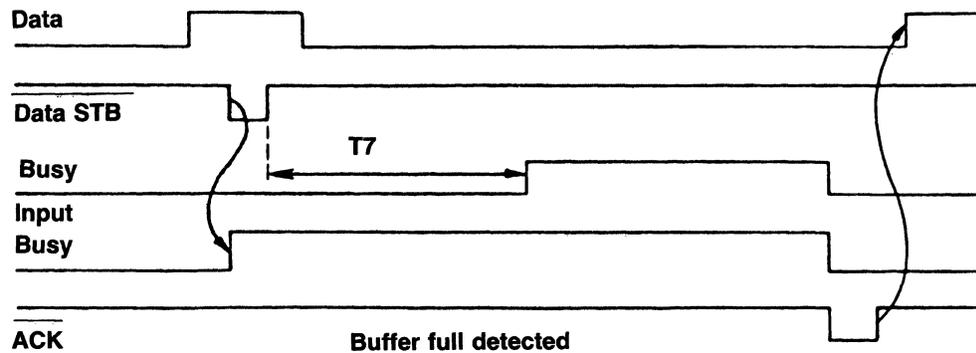
PARALLEL TIMING DIAGRAMS

DATA RECEIVED



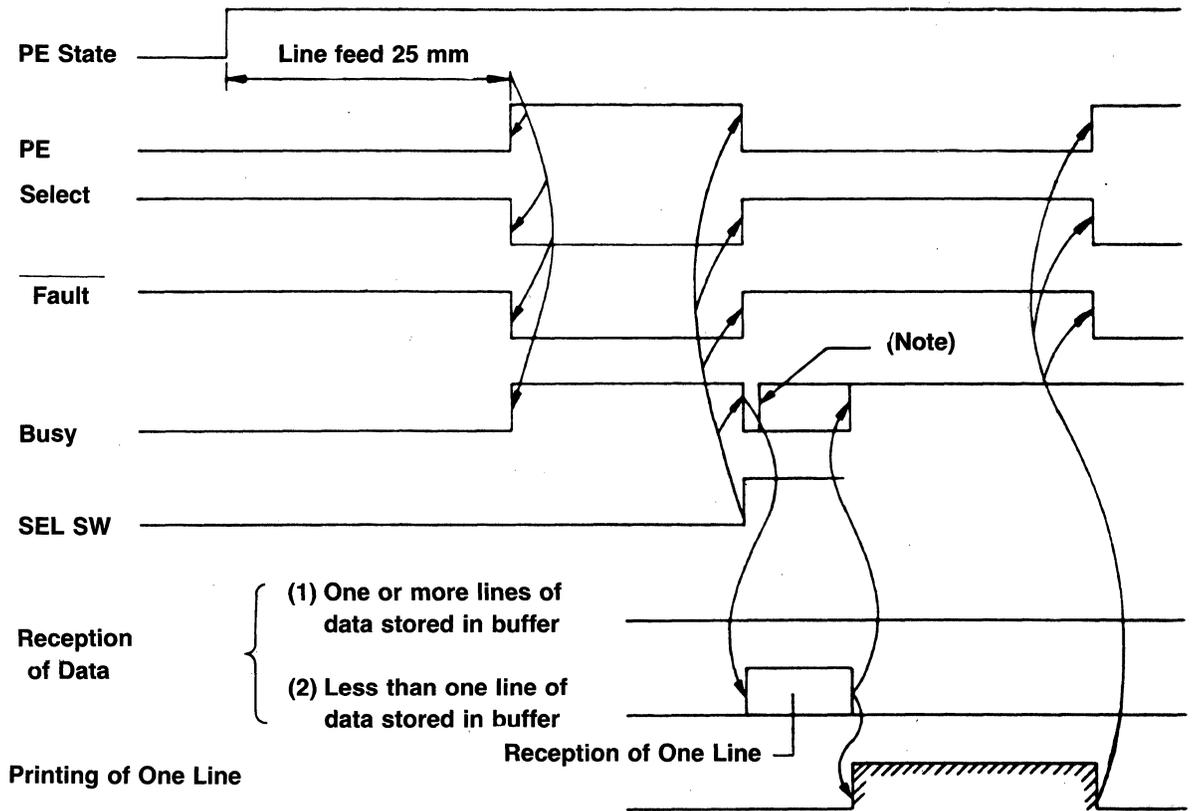
- = MIN 1 μ s
- = MAX 400 ns
- = MAX 2 ms
- = 5.5 μ s

DATA BUFFER FULL



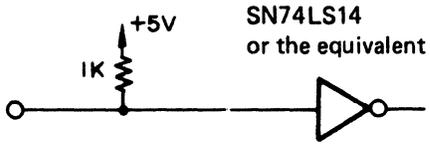
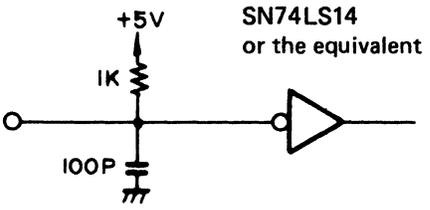
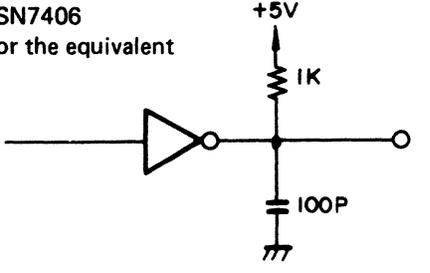
T7 = MAX 2ms

PE DETECTED IN SELECT STATUS



Note: In case that one or more lines of data are stored in the buffer.

PARALLEL INPUT/OUTPUT CIRCUITS AND SIGNAL LEVELS

	SIGNAL	CONFIGURATION
Input	DATA 1 ~ 8	 <p>SN74LS14 or the equivalent</p>
	$\overline{\text{DATA-STB}}$ $\overline{\text{INPUT-PRIME}}$	 <p>SN74LS14 or the equivalent</p>
Output	$\overline{\text{BUSY}}$, $\overline{\text{SELECT}}$ $\overline{\text{FAULT}}$, $\overline{\text{ACK}}$ $\overline{\text{INPUT-BUSY}}$, PE	 <p>SN7406 or the equivalent</p>

Logical Level (Input)

"1" = 2 ~ 5V

"0" = 0 ~ 0.4V

Logical Level (Output)

"1" = 2.4 ~ 5V

"0" = 0 ~ 0.4V

SERIAL PRINTER INTERFACE SIGNALS

SIGNAL	FUNCTION
DATA RDY/BSY	
System	
Frame Ground (FG)	Grounding line for circuit protection this signal is output by switching DIP switch 21-2 on the PCB. When any of the errors (parity, framing, or overrun) is detected, this signal goes low within 1ms from the step bit end of receive data. If the host computer continue to send data to the printer without sending CAN code, the printer will continue to receive data.
Carrier Error (CER)	
	In case the CER line is low level when the printer receives the CAN code or the DC3 code, or when the printer is deselected by the select switch, this line goes high.
	NOTE: In the Bit Image Graphic mode the CAN code and the DC3 code become Bit Image Graphic data. When a transmission error occurs in the Bit Graphic mode and the CER line becomes low (high) level, the host CPU does not turn the CER line to high (Low) level until the Bit Image Graphic mode is finished.
Received Data (RD)	This is a serial data transmission line to the printer from a host CPU. When no data is transmitted, this line must be in "MARK" (low) state.
<u>Signal Ground (SG)</u> FAULT (Fault)	This is a signal ground line This signal is low when the printer has an abnormal condition or when deselected. It is high when the printer is normal and selected.
Data Terminal Ready (DTR)	This line becomes high while the printer can receive data. This line becomes low while the printer can not receive data.

XON/XOFF, ETX/
ACK System

Frame Ground (FG) Send Data (SD)	Grounding line for circuit protection this is a serial data transmission line to the host CPU from the printer. When no data is transmitted, this line must be in "MARK" (low) state. The SD signal is low when the logic is "0" and high when the logic is "1".
Received Data (RD)	This is a serial data transmission line to the printer from a host CPU. When no data is transmitted, this line must be in the "MARK" state. It goes low level when the logic is "0" and high level when the logic is "1".
Request to Send (RTS)	This is an output signal from the printer, and goes high (Logic 1) when the printer is selected.
Clear to Send (CTS)	This is a control line for printer input signals. This line must go high to allow the printer to output the data to the host.
Data Set Ready (DSR)	This is an input signal line to the printer. It must go high in order to permit the printer to receive data.
Signal Ground (SG)	This is a grounding line for signals.
Carrier Detected (CD)	This line is used to indicate the presence of an input carrier signal entering the printer. It is normally ignored. It is not used in this printer.
<u>FAULT</u> (Fault)	This signal is low when the printer has an abnormal condition or when deselected. It is high when the printer is normal and selected.
Data Terminal Ready (DTR)	This is a printer output status signal. When power is supplied to the printer and the printer is ready to receive the data, this line becomes high.
	NOTE: The use DSR and CTS may be selected by switch 23-7 and 8, and switch 23-5 and 6 respectively.

SERIAL INPUT/INPUT Circuit Configuration

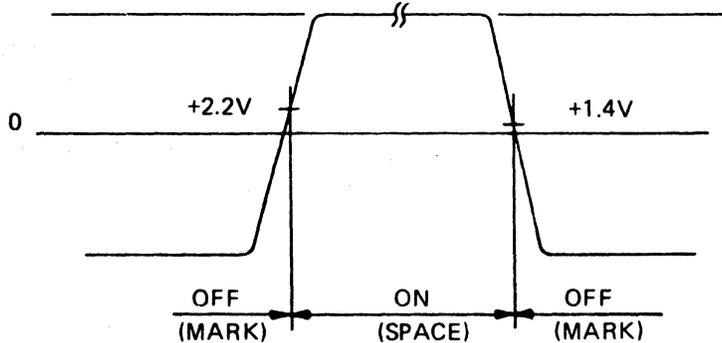
	SIGNALS	CIRCUIT
Output	FAULT SD (CER) RTS DTR	<p>SN75150 or the equivalent</p>

	SIGNALS	CIRCUIT
Input	RD CTS DSR CD	<p>SN74154 or the equivalent</p>

- 1 Output level: Nominal $\pm 12V$
- 2 Input level: Max. $\pm 15V$
Min. $\pm 5V$

Note: The circuit is protected against input signals (fail-safe operation).

The threshold voltage level is shown below:



APPENDIX IV

Character Sets

ASCII Tables

Switch Selectable Character Sets

By the appropriate setting of DIP switches SW1-1, SW1-2, SW1-3 and SW1-4, the printer can replace eleven of the ASCII special characters (\$, @, etc.) with special characters used in other countries. Refer to Section 3 for switch settings. Table A4.1 shows the alternate characters with their hexadecimal codes. If a box is left empty, the character is the same as the United States character.

Software Selectable Character Sets in 8-Bit Mode

When DIP switch SW2-6 is in the OPEN position, the 8-bit data format is established. This allows 256 characters to be printed instead of the usual 128. Characters with codes between 0 and 127 are the standard ASCII character set, while characters with codes between 128 and 255 cause graphics, Greek letters and/or Katakana characters to be printed.

Table A4.2 shows the 256 character set that is standard in the printer for all national designations except Japan. (See DIP switches SW1-1 to 1-4 in Section 3.) For the Japanese configuration, substitute Table A4.3 for columns A through D of Table A4.2. This is the Katakana character set.

The eight data bits in a character are number 7 – 0 from left to right; Bit 7 is the most significant bit (value = 128) and Bit 0 is the least significant Bit (Value = 1). Referring to Table A4.2, symbols in columns 0 – 7 are printed when character Bit 7 is 0 (decimal value of character code is less than 128); symbols in columns 8 – F are printed when Bit 7 is set to 1 (decimal value is 128 or greater).

Note: Some printer interfaces automatically set Bit 7 of all characters. This is done because standard ASCII codes use only Bit 6 – 0.

If no provision has been made for program control of Bit 7, the 8-bit character data format cannot be used. See Section 3 for an alternate 7-bit method.

Software Selectable Character Sets in 7-Bit Mode

When DIP switch SW2-6 is closed, the 7-bit data format is established. Seven-bit data allows only the standard 128 character ASCII codes, so commands have been provided to replace a section of the standard ASCII code table with either Greek/Japanese Hiragana, Japanese Katakana or Graphic Symbols. Columns 0 to 7 of Table A4.2 show the standard 7-bit ASCII character set, and Tables A4.4 through A4.7 show the characters that can be substituted by use of the commands listed below.

COMMAND	DEC CODES	CHARACTER SET SELECTED
ESC \$	27 96	United States Standard ASCII (Table A4.2)
ESC #	27 35	Graphic Symbols (Table A4.5)
ESC &	27 38	Greek Letters (Table A4.6) or Hiragana (Table A4.7)

Table A4.1 Special Characters For Foreign Character Sets

Remarks: The US specification is effective at corresponding portions of being spaced.

No.	No. HEX	0 23	1 24	2 40	3 5B	4 5C	5 6D	6 5E	7 60	8 7B	9 7C	10 7D	11 7E
0	JA					¥							
1	FR			à	°	ç	§			é	ù	è	¨
2	US	#	\$	@	[	\	\]	·	·	{	|	}	~
3	UK		£										
4	GE			š	Ä	Ö	Ü			ä	ö	ü	ß
5	SW		☉	É	Ä	Ö	Å	Û	é	ä	ö	å	ü
6	IT			š	°	ç	é		ù	à	ò	è	ì
7	SP			š	ı	Ñ	ı			°	ñ	ç	
8	DN				Æ	Φ	Å			æ	φ	å	
9	NOR				Æ	Φ	Å	°		æ	φ	å	
10	NET					IJ					ij		
11	AF		ê	Ê	Ë	Ö	è	Û	é	ë	ö	ô	ü
12													
13													
14	FRII		â	à	ı	ç	ê	û	ô	é	ú	è	ı
15	UKII	£											

Table A4.2 8510S/SC Character Set, 7- And 8-Bit Code

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			SP	0	*2	P	*7	P	▬	┌	a	ρ	↑	1	≡	×
1	SOH	DC1	!	1	A	Q	a	q	▬	└	β	σ	↓	2	≡	...
2	STX	DC2	..	2	B	R	b	r	▬	┌	γ	τ	←	3	≡	⋮
3	ETX	DC3	#	3	C	S	c	s	▬	└	δ	υ	→	4	≡	⋮
4	EOT	DC4	*1	4	D	T	d	t	▬	—	ε	φ	±	5	▴	⋮
5	ENQ		%	5	E	U	e	u	▬	—	ζ	χ	≠	6	▴	...|
6	ACK		&	6	F	V	f	v	▬	|	η	φ	≥	7	▴	|...
7			'	7	G	W	g	w	▬	|	θ	ω	≤	8	▴	⋮
8	BS	CAN	(	8	H	X	h	x	▬	┐	ι	Δ	≈	9	♠	⋮
9	HT	EM	)	9	I	Y	i	y	▬	┐	κ	Γ	.	(	♥	...|
A	LF		*	:	J	Z	j	z	▬	┐	λ	Σ	⊕)	♦	≡
B	VT	ESC	+	;	K	*3	k	*8	▬	┐	μ	Λ	∞	+	♣	≡
C	FF	FS	,	<	L	*4	l	*9	▬	┐	ν	Ω	∴	—	●	≡
D	CR	GS	-	=	M	*5	m	*10	▬	┐	ξ	ϕ	1/2	.	○	≡
E	SO	RS	.	>	N	*6	n	*11	▬	┐	ο	√	1/4	*	/	≡
F	SI	US	/	?	O	-	o		+	┐	π	□	○	/	\	

(7-bit code uses only columns 0-7)

* Circled number: Refer to Table A4.1

See Section 3 for explanation.

* To print Greek and other characters shown in columns A to D above, the "ESC &" command must be issued.

Table 3-8
Katakana (8-bit)

	A	B	C	D
0	SP	ー	タ	ミ
1	.	ア	チ	ム
2	「	イ	ツ	メ
3	」	ウ	テ	モ
4	,	エ	ト	ヤ
5	。	オ	ナ	ユ
6	ヲ	カ	ニ	ヨ
7	ァ	キ	ヌ	ラ
8	ィ	ク	ネ	リ
9	ゥ	ケ	ノ	ル
A	ェ	コ	ハ	レ
B	ォ	サ	ヒ	ロ
C	ャ	シ	フ	ワ
D	ュ	ス	ヘ	ン
E	ョ	セ	ホ	。
F	ッ	ソ	マ	。

Table 3-9
Katakana (7-bit)

	2	3	4	5
0	SP	ー	タ	ミ
1	.	ア	チ	ム
2	「	イ	ツ	メ
3	」	ウ	テ	モ
4	,	エ	ト	ヤ
5	。	オ	ナ	ユ
6	ヲ	カ	ニ	ヨ
7	ァ	キ	ヌ	ラ
8	ィ	ク	ネ	リ
9	ゥ	ケ	ノ	ル
A	ェ	コ	ハ	レ
B	ォ	サ	ヒ	ロ
C	ャ	シ	フ	ワ
D	ュ	ス	ヘ	ン
E	ョ	セ	ホ	。
F	ッ	ソ	マ	。

Table 3-10
Graphic Symbols (7-bit)

	2	3	4	5
0	—	⊥	≡	×
1	—	⊥	⊥	---
2	—	⊥	⊥	⋮
3	—	⊥	⊥	⊥
4	—	—	△	⊥
5	—	—	△	⊥
6	—	|	△	⊥
7	—	|	△	⊥
8	|	└	♠	÷
9	|	└	♥	⋮
A	|	└	♦	≠
B	|	└	♣	±
C	|	└	●	≠
D	|	└	○	≠
E	|	└	/	≠
F	+	└	/	

Table 3-11
Greek (7-bit)

	2	3	4	5
0	α	ρ	↑	1
1	β	σ	↓	2
2	γ	τ	←	3
3	δ	υ	→	4
4	ε	φ	±	5
5	ζ	χ	≠	6
6	η	ψ	≥	7
7	θ	ω	≤	8
8	ι	Δ	≈	9
9	κ	Γ	·	(
A	λ	Σ	⊕)
B	μ	Λ	∞	+
C	ν	Ω	∴	-
D	ξ	φ	1/2	.
E	ο	√	1/4	*
F	π	□	○	/

Table 3-12
Hiragana (7-bit)

	2	3	4	5
0			た	み
1		あ	ち	む
2	「	い	つ	め
3	」	う	て	も
4	.	え	と	や
5	。	お	な	ゆ
6	を	か	に	よ
7	あ	き	ぬ	ら
8	い	く	ね	り
9	う	け	の	る
A	え	こ	は	れ
B	お	さ	ひ	ろ
C	ゃ	し	ふ	わ
D	ゅ	す	へ	ん
E	ょ	せ	ほ	。
F	っ	そ	ま	。

Note: Tables use the hexadecimal numbering system (base 16). Each character is represented by a two-digit hexadecimal number. The first (left-most) digit can be found at the top of the table and the second digit is on the left side. To convert to decimal, multiply the first digit by 16, then add the second digit (the letters A-F represent the decimal numbers 10-15).

* Programmable down loaded characters — If you wish to print special characters or symbols not contained in Table A4.2 you can program them yourself, and load them into the printer. For details, see the separate "Instructions", which are available from local distributors.

Dot Width Of Proportional Characters

8 DOTS		11 DOTS		13 DOTS		14 DOTS	
CHAR.	HEX CODE	CHAR.	HEX CODE	CHAR.	HEX CODE	CHAR.	HEX CODE
,	27	!	21	SP	20	”	22
,	2C	(	28			#	23
.	2E	)	29			\$	24
;	3B	/	2F			*	2A
f	66	:	3A			+	2B
i	69	I	49			-	2D
j	6A	J	4A			0	30
l	6C	r	72			1	31
		s	73			2	32
		t	74			3	33
						4	34

14 DOTS				16 DOTS			
CHAR.	HEX CODE	CHAR.	HEX CODE	CHAR.	HEX CODE	CHAR.	HEX CODE
5	35	[	5B	n	6E	B	42
6	36	]	5D	o	6F	C	43
7	37	`	60	p	70	E	45
8	38	a	61	q	71	F	46
9	39	b	62	u	75	L	4C
<	3C	c	63	v	76	T	54
=	3D	d	64	x	78	Z	5A
>	3E	e	65	y	79	-	5F
?	3F	z	67	z	7A		
P	50	h	68		7B		
S	53	k	6B		7D		

19 DOTS				22 DOTS			
CHAR.	HEX CODE	CHAR.	HEX CODE	CHAR.	HEX CODE	CHAR.	HEX CODE
%	25	Q	51	~	7E	W	57
&	26	R	52			m	6D
@	40	U	55				
A	41	V	56				
D	44	X	58				
G	47	¥	59				
H	48	\	5C				
K	4B	^	5E				
M	4D	w	77				
N	4E	í	7C				
O	4F						

Dot Width of Proportional Foreign Characters

11 DOTS		14 DOTS				19 DOTS	
CHAR.	HEX CODE	CHAR.	HEX CODE	CHAR.	HEX CODE	CHAR.	HEX CODE
i	SP: 5B	ä	GE: 7B SW: 7B	ı	SP: 5D	Ÿ	JA: 5C
		ö	GE: 7C SW: 7C AF: 7C	ñ	SP: 7C	Ä	GE: 5B SW: 5B
				æ	DN: 7B NOR: 7B		Ö
				φ	DN: 7C NOR: 7C	Ü	
		ü	GE: 7D SW: 7E AF: 7E	â	FR2: 24		
				î	FR2: 5B	Ɔ	SW: 24
		é	FR: 7B SW: 60 IT: 5D AF: 60 FR2: 7B	ê	AF: 24 FR2: 5D		É
				û	FR2: 5E	Å	
				ô	AF: 7D FR2: 60		§
		å	SW: 7D DN: 7D NOR: 7D	ï	FR2: 7E	Æ	
				ú	FR2: 7C		Ñ
		£	UK: 24 UK2: 23			IJ	
		0	30				j
		à	FR: 40 IT: 7B FR2: 40			Ê	
							ó
		ç	FR: 5C IT: 5C SP: 7D FR2: 5C				
						¨	FR: 7E
		ù	FR: 7C IT: 60				
						ò	IT: 7C
		ì	IT: 7E				
		è	FR: 7D IT: 7D AF: 5D FR2: 7D				

